Medical School

UNIVERSITY OF MINNESOTA

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How to Use This Bulletin

Contents

The Admission section of this bulletin is your guide to all official policies and procedures related to application for admission to the Medical School.

The departmental listings of courses represent selections that are relevant primarily to the interests of medical students and, in some instances, those who plan to pursue graduate studies in certain health sciences areas.

For information about special fields or specific baccalaureate or graduate degree programs, you may also want to consult the following University of Minnesota bulletins:

- Graduate Programs in the Health Sciences
- Baccalaureate Programs in Medical Technology, Mortuary Science, Nursing, Occupational Therapy, Physical Therapy, and Related Health Science Disciplines
- Other health science fields
- College of Liberal Arts

This biennial bulletin contains information that is current as of fall quarter 1981. For information about policy changes, procedural revisions, or new requirements that may have occurred after publication of the bulletin, consult administrative officials in the Office of Student Affairs and Admissions.

Medical School

I. GENERAL INFORMATION

History

The first classes in medicine at the University of Minnesota began in 1888 when three of the four private or proprietary medical schools in Minneapolis and St. Paul offered their charters and resources to the state. In accepting this offer, the Board of Regents assumed responsibility for medical education on behalf of the people of the state of Minnesota. In 1908 the remaining proprietary school was incorporated into the University of Minnesota Medical School. In 1969 the legislature appropriated planning funds for a two-year medical basic science program at the University of Minnesota, Duluth, and in 1971 provided additional support for development of the Duluth school and endorsed an additional undergraduate medical school at Rochester, to be designated the Mayo Medical School of the University of Minnesota. The charter class in each of these two new medical schools began in 1973.

In 1905 money for the construction of a hospital was offered to the University by the executor of a private estate. Various delays were encountered, but eventually legislative approval and additional money were obtained. The Elliot Memorial Hospital, the first unit of University Hospitals, was dedicated in 1911. The act of acceptance passed by the legislature stated that the hospital would belong to and be a part of the University, that indigent residents of Minnesota would receive free care and treatment, and that the hospital would be managed and controlled by the regents of the University. Additional hospital and Medical School buildings have been added along a similar pattern of private donation to the University, with control and management by the regents and with legislative appropriations to supplement the gifts of private donors. These include the Todd Hospital, Eustis Hospital, Mayo Memorial Building, Variety Club Heart Hospital, Masonic Cancer Center, Veterans of Foreign Wars Cancer Research Center, Children's Rehabilitation Center, Phillips-Wangensteen Building, and Dwan Variety Club Cardiovascular Research Center—all designated collectively as the University Hospitals.

The history of the Medical School at Minnesota has a rich tradition of research and clinical achievement. The excellence of the Medical School's programs can be traced to strong departments in the basic medical sciences and clinical sciences. These departments share a tradition of research and a spirit of inquiry.

Administration

The Medical School is one of several health science units organized through the office of the vice president for health sciences. The other units are the School of Dentistry, School of Nursing, College of Pharmacy, School of Public Health, and University Hospitals. The chief administrative officer of the Medical School is the dean. The dean is assisted by several associate and assistant deans in carrying out the policies developed by the faculty to achieve the goals set forth in the Board of Regents Statement of the Mission of the Health Sciences, as it pertains to the Medical School. The administrative offices of the Medical School are located in Owre Hall on the Twin Cities campus/Minneapolis.

The dean's office is responsible for the general administration of the Medical School, for the administration of selected aspects of graduate education programs, and for school budget and fiscal matters. Those involved in these activities include Dean N. L. Gault, Jr.,

Associate Dean H. M. Cavert, and Assistant Dean E. W. Drehmel. Special administrative support is provided for the Rural Physician Associate Program and for the Department of History of Medicine.

The Student Affairs and Admissions office is concerned with admissions, student counseling, maintaining student records, and monitoring student progress toward graduation. Those responsible for these activities include Associate Dean W. A. Sullivan, Jr., Assistant Deans P. P. Rosenberg and G. E. Williams, and Assistant to the Dean Cassius Ellis.

The Curriculum Affairs office provides support for faculty teaching activities, assists in curriculum administration and evaluation, and aids in development of all aspects of undergraduate educational programs. It is responsible for central class scheduling and student registration for elective courses. The office is administered by Associate Dean R. J. McCollister.

The Continuing Education office develops a variety of educational programs for physicians of the state. It is supervised by Director of Continuing Education D. A. Fenderson.

Faculty

The full-time faculty of the Medical School numbers approximately 900. The executive faculty, consisting of the full-time professors and associate professors and 10 members elected from the instructor and assistant professor ranks, is the faculty governing body responsible for policymaking. The executive faculty has delegated to its appropriate committees the responsibility for determining student qualifications for admission and readmission and for decisions pertaining to student scholastic standing and dismissal from the Medical School.

The Medical School Admissions Committee selects each year's entering class and approves applications for transfer or readmission to the Medical School. The Student Scholastic Standing Committee evaluates each student's academic and clinical performance and developing personal and professional attributes periodically throughout the course of medical study in light of the requirements expected of a practicing physician. Each year this committee decides which students are permitted to progress to the succeeding class or phase. The committee reviews each student's academic record for satisfactory completion of all required and elective course work and of other school requirements before recommending that the M.D. degree be granted by the University. Students may appeal decisions made by this committee. The Educational Policy Committee develops and evaluates undergraduate and graduate educational programs and conducts ongoing curriculum review. Committee recommendations for curriculum change are submitted for discussion and final approval by the executive faculty. Each of these major committees includes within its membership at least one student representative.

Physical Facilities

The basic science complex and administrative offices of the Medical School are located in a quadrangle of buildings adjacent and connected to the Mayo Memorial Building, Health Sciences Unit A, and Phillips-Wangensteen Building. Within Unit A are health sciences classrooms and seminar rooms, health science student areas, the Spectrum Cafeteria, some basic medical science laboratories, as well as Medical School, School of Public Health, and School of Dentistry departmental space. In the Phillips-Wangensteen Building are medical center outpatient clinics, a large clinical amphitheater, a Health Sciences Learning Center, audiovisual support units, as well as several Medical School clinical departmental offices and laboratories. Other units, each close to and connected with the complex, include the several buildings of University Hospitals, Variety

Club Heart Hospital, Masonic Cancer Center, Veterans of Foreign Wars Cancer Research Center, and Children's Rehabilitation Center. The close physical relationship of the Medical School and its associated units facilitates professional and scientific communication across departmental lines. The Medical School maintains affiliate relationships with many hospitals in the Twin Cities metropolitan area. These affiliations provide resources that afford medical students access to a wide spectrum of health care institutions and, through them, to patients with a variety of medical problems.

Resources and services of the Biomedical Library are spaciously housed on three floors of Diehl Hall, located immediately adjacent to the Medical School and the University Hospitals. The library contains extensive collections of periodical reference materials and subscribes to more than 3,500 periodicals. There are more than 302,000 volumes in the library, almost all of which are shelved on open stacks. Photoduplication services, computer-assisted literature searches, and interlibrary loans are available.

Departmental libraries within the Medical School are maintained to supplement the Biomedical Library collections. Walter Library on the East Bank, Wilson Library on the West Bank, and departmental libraries are available for the use of students and faculty members. A collection of medical books of historical interest, with many rare and valuable items, is located in the comfortably appointed Owen H. Wangensteen Historical Library of Biology and Medicine on the fifth floor of Diehl Hall.

The Learning Resources Center is located in Diehl Hall. Learning carrels, equipped with audiotape players and slide or filmstrip projectors, are available for student use. The growing collection of audiovisual instructional resources is housed in this center, which is open more than 90 hours per week. Other resources incorporated in the Learning Resources Center include models, viewing areas for motion picture and videotapes, texts, test files, and a variety of print materials organized to serve the several instructional programs. Terminals with access to a number of computer-assisted instructional programs are also available for use.

Minnesota Medical Foundation

Mission

The Minnesota Medical Foundation (MMF) is an independent organization formed in 1939 to encourage private support of medical research and education at the University of Minnesota. The foundation raises, manages, and distributes private funds for our tax-assisted medical schools at Minneapolis and Duluth.

Medical students obtain critical financial help and counseling from the foundation's extensive program of student loans and scholarships.

Medical scientists have access to more than $1 million granted annually by MMF for medical research aimed at new and better knowledge about disease and health.

Alumni receive news of their medical school through the *University of Minnesota Medical Bulletin,* published by the foundation, which also sponsors a variety of events linking graduates, students, parents, faculty, and the administration.

To underwrite this work, the foundation solicits contributions from friends of medicine everywhere, particularly alumni of the medical schools. MMF receives and acknowledges gifts, manages special purpose donations, and generally serves as a flexible and vital link between people and medicine at the University.

The foundation's professional staff is directed by Eivind O. Hoff, executive director, chief executive officer, and treasurer. Policies are set by a 36-member Board of Trustees. The foundation is located at 535 Diehl Hall. The telephone number is 373-8023.

Student Aid

The student aid program, a major foundation activity, distributes aid on the basis of need and emphasizes the recycling of dollars to provide for the needs of future students.

Extended term loans are available to qualified students without interest charges during their Medical School years. They are repayable within the first five years after graduation at 8 percent simple annual interest. The average loan is $1,000.

A few scholarships are also available from MMF's Reciprocal Aid Bank. Recipients are chosen on the basis of their qualifications for a particular scholarship, and are asked to pledge restoration of the funds by future gifts.

Interim loans are also available from the foundation, affording medical students an opportunity to obtain ready cash on brief notice, without interest charges, for educational expenses. Interim loans are limited to $300 and must be repaid within 90 days.

Awards

Medical Student Achievement Awards of $1,000 each are offered each year to students who demonstrate exceptional accomplishment in academic work, community service, or student leadership. Several other annual prizes are conferred on students for achievement in biomedical research. The coveted Distinguished Teaching Awards of $1,000 each are bestowed on faculty members whose teaching ability has been recognized by the student body.

Research Opportunities

For students with a serious interest in biomedical research and potential for the field of academic medicine, the foundation offers $1,200 stipends for full-time research endeavors that are conducted during free or elective periods. Both basic and clinical research projects are supported. Research is done under the supervision of Medical School faculty members.

Publications

The foundation is publisher of the *University of Minnesota Medical Bulletin*, a quarterly magazine circulated to the more than 10,000 alumni of the Medical School, all physicians practicing in Minnesota, and contributors of at least $25 to the foundation. An annual report of MMF activities is published, as well as a *Directory of Medical Students*.

Fund Raising

The foundation coodinates extensive fund raising programs on behalf of the two medical schools, encouraging alumni gifts to the annual fund of the Medical School, and broadly promotes the cause of private support for these tax-assisted institutions. A full range of development activities are conducted, including annual giving, planned giving, deferred giving, memorial giving, and capital campaigns.

Outreach Programs

The foundation promotes public understanding and support of medicine by sponsorship of several events at the medical schools: a welcome day for entering students, parents' day, a graduation day reception, and other informal gatherings. Medical School alumni reunions at the University and in other states are also supported in concert with the Medical Alumni Society.

Continuing Medical Education

The award of a degree in any profession is only a milestone in a continuum of education. Physicians faced with rapid advances in medical science and in applied clinical knowledge are obliged to continue as students of medicine for the duration of their professional careers. Recognition of this important educational need led, in 1936, to the opening of the Center for Continuation Study, unique for its time, at the University of Minnesota. In 1937 this nation's first organized Department of Continuing Medical Education was founded to regularly offer a recurring program of short postgraduate courses for physicians.

Today the Office of Continuing Medical Education serves the educational needs of the physician and lifelong student of medicine through its annual series of programs, taught by faculty members in various disciplines in the Health Sciences Center.

Each year about 45 individual courses are conducted, utilizing several formats including a variety of combinations of lectures, workshops, seminars, and individual instruction. New and innovative programs are being developed to meet the changing needs of members of the medical profession and to utilize technological advances in the various media. Currently, emphasis is being placed on developing regional programs that can reach physicians in their own communities and involve them as active learners, participating in programs that offer opportunity to address educational needs relevant to their medical practice.

Close liaison with the other medical schools in the state allows the Medical School to offer a program that is well rounded, strong, and complementary to other continuing education opportunities, so that physicians may select those most appropriate to their own educational goals.

II. ADMISSION

Information Sources

Staff members in the Medical School Student Affairs office, Owre Hall, are prepared to discuss premedical programs with students, college teachers, and advisers, either in person or through correspondence. *Medical School Admission Requirements* is a useful reference booklet that summarizes the admission requirements of each of the medical schools in the United States and Canada. This annual publication can be purchased for $6.75 from the Association of American Medical Colleges, 1 Dupont Circle N.W., Washington, D.C. 20036, and is available in most college reference libraries. Another useful reference is the *American Medical College Application Service (AMCAS) Information Booklet*, which contains details about application procedures. This publication is available from AMCAS, 1776 Massachusetts Avenue N.W., Washington, D.C. 20036.

Academic Requirements

Although academic excellence is necessary in order to complete studies in the Medical School, neither high grades nor high New MCAT scores alone are adequate to gain admission. The Medical School Admissions Committee is also looking for candidates who possess personal integrity, motivation, intellectual curiosity, enthusiasm, a sense of dedication in service to others, and the ability to work with others.

Students *must* earn a bachelor's degree before entering the Medical School. Credits in physical education, military science, and religion courses can not be included in the degree program.

Since physicians have an increasing responsibility to understand and deal with the social, cultural, and psychological forces that may adversely affect their patients, studies in the humanities, social and behavioral sciences, and English and literature are required in addition to preparation in the physical and biological sciences.

The following table lists minimum course and credit requirements. Students will complete additional courses and credits, depending on their own special interests, baccalaureate degree or the other college requirements, and the counsel of their college advisers. Those students with special interests in basic science, research, or careers in academic medicine are encouraged to complete advanced level course work in preparation for entering Medical School.

COURSE REQUIREMENTS

	Semester Credits	Quarter Credits
General Biology or Zoology Must include laboratory exercises	7	10
Chemistry General or inorganic, quantitative, and organic required (must include laboratory exercises)	15	22
English and Literature Additional literature courses are strongly encouraged	8	12
Mathematics Introductory calculus required		
Physics Must include laboratory exercises	8	12
Social and Behavioral Sciences and Humanities As examples, psychology, anthropology, history, sociology, economics, philosophy, or a modern language	18	27
Additional academic courses to complete minimum required credits	90	135

Residence

Preference for admission to the Medical School is given to residents of Minnesota . Nonresident applicants (excluding those who apply under the Equal Opportunity Program) will be considered for admission *only* under the Early Decision Program. Determination of residency, as defined by regulations of the University of Minnesota, is the responsibility of the Board of Review for Residence Classification, Office of Admissions and Records, Williamson Hall, Twin Cities campus/Minneapolis.

Application Procedures

The University of Minnesota Medical School is a participant in the American Medical College Application Service (AMCAS), which is sponsored by the Association of American Medical Colleges. All applications to the Medical School for the entering freshman class must be processed through AMCAS. Application forms, with detailed instructions for their completion, can be obtained from AMCAS, 1776 Massachusetts Avenue N.W., Washington, D.C. 20036. Applications should be completed and returned to AMCAS between June 15 and November 15 of the *calendar year before* the student plans to enter the Medical School. Since all first-year students begin the course of study in September, the application is thus made a little more than a year before matriculation. Additional information concerning letters of evaluation and special tests required will be provided to applicants *after* the completed application forms have been sent to the school by AMCAS.

All applicants for the freshman class are required to complete several special tests, including the Minnesota Multiphasic Personality Inventory (MMPI), the Strong-Campbell Interest Inventory (SCII), and the *New* Medical College Admission Test (New MCAT). These tests measure the candidate's factual knowledge and help the Admissions Committee learn more about the individual's aptitudes and suitability for a career in medicine. With the exception of the Medical College Admission Test, the Medical School Student Affairs and Admissions office assists in arranging for students to take the tests at their own college or other convenient testing center.

Premedical students must make individual arrangements to take the Medical College Admission Test. A booklet detailing application deadlines, dates of the tests, sample questions, and testing centers can be obtained by writing to the Medical College Admission Test, American College Testing Program, P.O. Box 414, Iowa City, Iowa 52240. This booklet is also available from college premedical advisers. The test is given throughout the country at many colleges in the spring and fall of each year. Applicants should take the MCAT in the spring prior to submitting their applications for admission. The test results are sent to the student. There is a fee for the examination, which entitles the student to have the scores sent to several medical schools.

In accordance with the acceptance procedures approved by the Association of American Medical Colleges, applicants are notified of the decision of the Admissions Committee between December and May prior to matriculation. Applicants participating in the Early Decision Program will be notified by October 1.

Admitted students will receive a separate application for admission from the University Office of Admissions. This form should be returned as soon as possible along with the University credentials examination fee of $15 ($5 for students who have been granted baccalaureate degrees from the University).

Early Decision Program

The Medical School participates in the Early Decision Program sponsored by the Association of American Medical Colleges, in which early acceptance is granted to students choosing to apply *only* to this Medical School. Applicants must have exceptional

academic and nonacademic qualifications and must follow the rules set forth for application to this program. Information about application procedures is available from the American Medical College Application Service and from the admissons office of the Medical School.

Transfers

Transfers to the University of Minnesota Medical School in Minneapolis are accepted from students enrolled in the accredited two-year medical school at the University of Minnesota, Duluth.

Transfers from four-year medical schools, dental schools, or osteopathic schools in the United States and Canada are ordinarily not considered. The Medical School does *not* participate in the COTRANS program for U.S. citizens studying in foreign medical schools, nor in the fifth pathway program of special clinical studies for students who have completed academic programs in foreign medical schools.

Tuition and Fees

Tuition for medical students varies according to the number of credits for which they register. Tuition for the academic year 1981-82 for students enrolled in the Medical School in Minneapolis is as follows:

Credits Per Quarter	*Residents*	*Nonresidents*
1-5	$229	$ 628
6-10	458	1,256
11-15	687	1,883
16 or more	916	2,511

A student services fee of $70.30 per quarter is required of both residents and nonresidents. Tuition and fees are subject to change by the Board of Regents. Students who complete the four-year Medical School curriculum and who make satisfactory progress may arrange two free or vacation quarters for which tuition is not assessed. For more information about tuition and fees, see the *General Information Bulletin.*

Books, instruments, and other necessary equipment must be provided by the student. Information about required items is sent to all entering students during the summer before entering Medical School. Detailed information about microscope rental is provided to students during the summer prior to matriculation.

Loan Funds, Scholarships, and Prizes

Financial aid is available in the form of federal loans to students in the health professions, special loan funds, and certain regional scholarships. With few exceptions, students must have been regularly enrolled to qualify for these funds. Most financial assistance is administered by the University's Office of Student Financial Aid, 210 Fraser Hall, which is the first source students should consult after acceptance for questions concerning financial need. The Minnesota Medical Foundation also provides financial assistance for medical students and for special programs.

A limited number of student research grants are available for vacation or free-time work in several Medical School departments. These grants support students who are pursuing medical or basic science research interests. Medical School faculty members provide advice and counsel for student investigative work. Students with training in education may be able to pursue special projects in medical education and curriculum evaluation.

III. THE MEDICAL STUDENT

The Adytum and Other Facilities

A major center of medical student activities is the Medical Student Adytum. The word adytum is a transliteration of a Greek word meaning an innermost sanctuary; hence the Medical School Adytum is an area to be used only by medical students and their guests. This spacious, comfortably appointed area is centrally located on the first floor of the Mayo Memorial Building. It is a place for students to eat and relax, and it has a quiet room for study. Funds for constructing and equipping the Adytum were donated by the Minnesota Medical Alumni Association. The facilities were dedicated in 1964. A center for medical students is also located in Health Sciences Unit A, convenient to lockers, health sciences classrooms, and the cafeteria. Active exchange among students from a variety of health professions is fostered through the sharing of these facilities.

Living Arrangements

Dormitory housing with meals is available to medical students on an annual contract basis in University-operated residence halls conveniently located near the medical center. Arrangements for dormitory housing are made through the University Housing Office, Comstock Hall, 210 Delaware Street S.E. The typical cost of a single room with maintenance is $790.00 per quarter for the 1981-82 school year. Accommodations with meals are also available on a space-available basis in the several medical fraternities located near the medical center. Privately owned apartments adjacent to the campus are rented by students, often on a shared basis.

Students may purchase meals in University Hospitals, Coffman Union, or the Spectrum cafeteria in Health Sciences Unit A. The lunch shop in University Hospitals as well as sandwich and beverage vending machines in other convenient locations offer alternative food sources.

Boynton Health Service

The Boynton Health Service provides medical care for full-time students and maintains outpatient clinic facilities close to the medical center. All students are entitled to certain outpatient services as part of their quarterly student services fee payment. Students desiring medical-surgical hospital insurance coverage through the University-sponsored program must purchase it each quarter at registration. The cost is added to the fee statement. Supplementary health care benefits, including hospital coverage during vacation, extended benefits, and family coverage, are available for an additional charge through a group plan. For more details, see the *General Information Bulletin.*

Employment

The Medical School undergraduate program is organized on a schedule that ordinarily requires the student's full-time commitment to make the most of the course work and experience. Therefore, students are urged not to seek employment or schedule other activities and obligations outside their medical studies that could significantly interfere with the pursuit of their medical education. Prospective students should carefully scrutinize their projected financial needs for their complete Medical School program and should make appropriate long-range plans to meet these needs through personal savings, the help of parents, and loans when needed.

Medical Student Government and Student Societies

The Medical Student Council, the student governing body, is composed of representatives from each class and from several minority groups who are elected each year. Council members meet regularly and frequently to discuss problems common to members of the student body and to plan a variety of projects and service activities. The council represents the interests of the medical students to the administration and the faculty. The medical students, through the council, have adopted an honor code covering examination procedures. Upon acceptance by the Medical School, each student, after suitable briefing, signs a statement indicating that he or she is well acquainted with the provisions of this code and agrees to abide by it. The Ethics Committee of the Medical Student Council is responsible for investigating reports of any suspected violations of this code.

There are several medical fraternities available for men. These organizations play a major role in the social life of many medical students.

The national medical honor society, Alpha Omega Alpha, selects academically high-ranking students from the junior and senior classes for membership. The Cyrus P. Barnum, Jr., Society, an organization of students working toward the combined M.D.-Ph.D. degree, meets regularly for scientific and informative evening discussions to which speakers are invited.

The local chapter of the American Medical Student Association (AMSA) is incorporated as an integral part of the Medical Student Council. The association chairperson acts as local AMSA chapter president. This group sponsors certain school-wide functions through the student council. The membership fee is nominal, and members receive monthly copies of the national periodical.

The wives of many medical students are active in the Women's Auxiliary of the Student American Medical Association (WA-SAMA). This group holds monthly meetings featuring speakers who discuss topics of interest.

IV. M.D. PROGRAM

The Medical School provides the faculty and facilities for instruction of students in the course in medicine. The primary goal of medical education is to produce good physicians possessing sound training in quantitative human biology. Beyond the Medical School and the award of the M.D. degree, all graduates are obliged, by requirements for specialization and/or licensure, to undertake additional formal education or training. And beyond these formal programs are the continuing education activities that individuals in practice must participate in to keep abreast of developments in medicine. Much of the success of the sequence of undergraduate-graduate-continuing education, called the continuum of medical education, is dependent on individual responsibility and initiative. Therefore, to encourage such development in medical students, the concept of the student as an independent learner is emphasized in the curriculum.

The course of study for the M.D. degree consists of a core program of eight academic quarters and a track (option, elective) program of five academic quarters. Within the core program, the first four quarters, termed Phase A, include course work in basic medical sciences, behavioral science, and introductory experiences with patients. The next four academic quarters of the core program, termed Phase B, consist of integrated interdepartmental courses organized and taught along organ, system, and topical lines. In the Phase D portion of the curriculum, the student, with the help of an adviser, plans a program of elective courses. All students must include in this program experience in medicine, surgery, pediatrics, and obstetrics-gynecology that will provide suitable preparation for advanced clinical responsibilities in subsequent training after completion of work for the M.D. degree. Students making satisfactory progress may, after adviser, track, and special committee review, be approved to complete Phase D in fewer than five academic quarters (minimum three quarters of study). In such cases, arrangements for a first year of graduate study in a teaching hospital must be made. Students who complete five quarters in Phase D have no restrictions or requirements regarding their selection of graduate program activity. Students are required to take and pass Parts I and II of the National Board Examinations as a requirement for graduation and the M.D. degree.

Phase A

In the first four quarters of the Medical School program, studies cover the structure and function of the human organism and the emotional, social, and psychological development of the individual. In Phase A, the student begins clinical activities through tutorial assignments and clinical correlation sessions in Introduction to Clinical Medicine. The Phase A program is intended to involve the student physician in individual synthesis and correlation of the basic sciences with clinical applications and in direct, personal confrontation with human illness and patient care. The required program in Phase A consists of the following courses:

Gross Anatomy (Anat 5100)
Human Histology (Anat 5103)
Embryology (Anat 5106)
Medical Biochemistry (MdBc 5100)
Introduction to Clinical Medicine (InMd 5100-5103)
Medical Physiology (Phsl 5110-5111)
Pathology (LaMP 5101)
Neuroanatomy (Anat 5111)
Microbiology (MicB 5205-5206)
Pharmacology (Phcl 5110)
Human Behavior (AdPy 5107)

In both fall and winter quarters, students may elect to attend one of several weekly small group meetings at which topics of personal concern, current interest, or medical importance are brought up for discussion.

Phase B

The four-quarter sequence of Phase B begins in the fall and consists of integrated interdepartmental courses designed to highlight fundamental principles in clinical medicine and to emphasize pathophysiologic concepts. The courses are organized in relation to organs, systems, or topics. Two courses in the Phase B sequence, Student as Physician and Psyche, are designed, respectively, to develop the student's clinical skills and knowledge and to enhance the student's awareness of psychopathology and psychological factors related to illness.

Core activities in some courses consist of small group discussions, with lectures and other formal presentations optional. Extensive syllabi and reference lists are provided for each student. The student is encouraged to exercise independent and mature judgment during the learning process by arranging her or his own activities. The student may utilize this time for study in the Learning Center, participation in additional clinical experiences, or completion of elective courses available to students in Phase B. The formal Medical School activities in Phase B are divided into three categories:

1. **Core Time**—Lectures or small group discussions related to a specific organ, system, or topic, and weekly clinical tutorials. Attendance is expected.
2. **Optional Activities**—Supplementary scheduled activities, such as lectures that expand on material presented in the core or, in some cases where lectures are optional, films, additional clinical experiences, laboratories, demonstrations, clinical rounds, teaching rounds, or clinical-pathological conferences. Attendance is voluntary.
3. **Electives**—Courses offered throughout the year covering various topics of interest to medical students but not necessarily related to the core program.

The required program in Phase B consists of the following courses:

REQUIRED PHASE B COURSES

InMd 5110—Human Genetics	2 cr
InMd 5220—Cardiovascular	3 cr
InMd 5221—Respiratory	3 cr
InMd 5228—Ear, Nose, and Throat	2 cr
InMd 5212—Psyche	5 cr
InMd 5231—Gut	4 cr
InMd 5226—Blood	3 cr
InMd 5222—Fluid and Electrolytes	3 cr
InMd 5223—Kidney and Urinary Tract	3 cr
InMd 5230—Nervous System and Muscle Disorders	5 cr
InMd 5232—Bones, Joints, and Connective Tissue	4 cr
InMd 5224—Endocrine and Metabolism	4 cr
InMd 5225—Reproduction	4 cr
InMd 5227—Skin	2 cr
InMd 5229—Eye	2 cr
InMd 5233—Human Sexuality	3 cr

Student as Physician Tutorials

Medicine Tutorials	8 cr
Pediatrics Tutorial	3 cr
Neurologic Tutorial	3 cr
Obstetrics-Gynecology Tutorial	2 cr
Psychiatry Tutorial	1 cr
Surgery Tutorial	3 cr
Family Practice and Community Health Tutorial	3 cr
Physical Medicine and Rehabilitation Tutorial	1 cr
Patient Assessment Tutorial	1 cr
Chemical Dependency Tutorial	1 cr
Laboratory Medicine	1 cr

Phase D

Phase D is designed to extend the curriculum goals of relevance, flexibility, and the student as learner. Prior to completion of Phase B, students select a track and a faculty member within that track to act as an adviser for the balance of the Medical School program. Students are reminded not to confuse the selection of a track at this point with the need to eventually choose a practice specialty. The six broadly defined career pathways or tracks, encompassing all disciplines and providing varied options for all students, are the following:

Track 1—Medicine, Pediatrics, Medical Specialties including Obstetrics

Track 2—Surgical Specialties

Track 3—Psychiatry and Behavioral Sciences

Track 4—Neurological Sciences

Track 5—Family Medicine

Track 6—Medical Investigation and Special Programs

The student, with the help of the adviser, develops an individualized elective program of study related to personal interests and career goals. Each student's program is approved and progress monitored by the appropriate track committee. Each track committee has identified a program of courses that students on the track are expected to take.

As a logical extension of the core material and tutorials in Phase B, each student is expected to spend a minimum of 24 weeks in externship-type electives in medicine, surgery, obstetrics, and pediatrics. In addition, each track committee has designated one or two additional courses that are of special potential value for students in the track. The balance of the student's program is drawn from the extensive elective courses offered by each Medical School department. Students may consider elective work in other medical schools, in the United States or elsewhere. Up to one quarter of credit for such activities may be approved by the adviser and track committee depending upon the length of the Phase D program and the length of time spent away from the Medical School and its affiliated hospitals. The flexibility of the elective program and the general nature of the pathways provide an opportunity for creative and interested students to avail themselves of the wide spectrum of educational activities to further their professional growth.

Students are eligible to begin Phase D on completion of Phases A and B and after taking Part I of the National Board Examinations. Students with deficiencies in Phase A or B or who have taken but not passed Part I are reviewed by the Student Scholastic Standing Committee for a decision regarding arrangement of their continuing academic program. Each student's Phase D program must meet track requirements and be approved by adviser and track committee. The balance of work in Phase D is determined by a review of

each student's educational needs in light of his or her projected career goals. There are no restrictions on the type of internship or first-year training program for students graduating in four years, after completing the regular five-quarter Phase D program. In the case of shorter Phase D programs, students must provide evidence that they will spend their first postdoctoral year (internship or first year of graduate training) in a university or other major affiliated teaching hospital.

Evaluation and Academic Progress

Examinations and other methods, both subjective and objective, to evaluate peformance of medical students, are administered by the various departments and interdepartmental teaching sections. Feedback is available to all students regarding their performance on examinations. There is an opportunity for personal review of clinical work with the faculty supervisor. Written evaluations of each student's clinical performance are submitted so that students may be apprised of their educational progress and may take steps to improve areas in which deficiencies may exist.

Grades are reported as O (outstanding), S (satisfactory), I (incomplete), and N (no credit, fail). Beginning with the entering class in 1979, an additional grade of E (excellent) is assigned for performance at a suitable level between the evaluations S and O. Students who receive I or N grades in courses are reviewed by the Student Scholastic Standing Committee. Opportunity for makeup work is one option that permits students to satisfy course requirements and continue their progress toward the M.D. degree. According to provisions of an honor code, detailed in the Statement of Intellectual Responsibility students sign and pledge to abide by on admission to the program in medicine, the faculty does not monitor Medical School examinations, and students are strictly on their individual honor to maintain ethical personal conduct during examinations. The statement is also a guide to professional conduct for medical students in their years in medical school and beyond.

Scholastic Standing and Dismissal

A student may be dismissed from Medical School if, in the opinion of the Student Scholastic Standing Committee, he or she has not performed at a satisfactory academic level in individual courses or if there are other factors, such as personality, attitude, or emotional stability, that would prevent the individual from responsibly undertaking the duties of a physician. Academic probationary status is one mechanism used by the Student Scholastic Standing Committee to signal to the student that his or her standing as a medical student is in jeopardy.

Access to Student Educational Records

In accordance with regents' policy on access to student records, information about a student generally may not be released to a third party without the student's permission. The policy also permits students to review their educational records and to challenge the contents of those records.

Some student information—name, address, telephone number, dates of attendance, college and class, major, adviser, and degrees earned—is considered public or directory information. To prevent release of such information outside the University while in attendance at the University, a student must notify the records office on his or her campus.

Students are notified annually of their right to review their educational records. The regents' policy, including a directory of student records, is available for review at the information booth in Williamson Hall, Twin Cities campus/Minneapolis, and at the records offices on other campuses of the University. Questions may be directed to the Office of the Coordinator of Student Support Services, 260E Williamson Hall, (612) 373-2106.

Graduation

Requirements for graduation and award of the M.D. degree include satisfactory performance in all courses in the Phase A and Phase B programs plus satisfactory completion of the adviser- and track-approved Phase D program. Students completing fewer than five quarters of Phase D work must have the approval of their adviser, their track committee, and the Student Scholastic Standing Committee. In addition, passing scores on Parts I and II of the National Board Examinations must be earned and final review and approval by the Student Scholastic Standing Committee must be obtained before a recommendation that the M.D. degree be granted is forwarded to the Board of Regents.

Most students elect to graduate in June, just prior to beginning their specialty training. Students who wish to graduate in midyear must make special arrangements through the Student Affairs office. On Recognition Day, usually held in early June, a program is organized to honor the graduating class and to recognize special achievements.

V. GRADUATE STUDY PROGRAMS AND RESEARCH OPPORTUNITIES

In addition to completing the prescribed course of study leading to the M.D. degree, there are excellent opportunities for qualified students to earn the master's and/or Ph.D. degrees in a variety of medical science fields. Medical School facilities are available for original investigations. Some students work with established faculty researchers as assistants and coworkers. The formally established programs are outlined here; other programs of study and research are arranged individually within the department in which the student's work is to be conducted.

To obtain information about graduate study opportunities and advanced degree programs, a prospective student should consult the *Graduate School Bulletin,* the *Graduate Programs in the Health Sciences Bulletin,* and the departmental faculty in the field of the student's interest.

A combined M.D.-Ph.D. program may be planned by an academically superior medical student with an interest in graduate study in a fundamental medical or related biomedical science. The combined program allows distribution of the student's time between a graduate degree program and the core medical curriculum of Phases A and B and the track program in Phase D, extending the period for completion of both doctoral degrees over five or more years. The program emphasizes flexibility and is adaptable to each student's individual needs and research interests. A student is usually accepted for the M.D.-Ph.D. program after completion of the first year of the core Medical School curriculum. Frequently, selection is based in part on the quality of the work completed during that year. Application is made through the dean's office of the Medical School and the basic health sciences department of the student's interest. The student must be eligible or accepted for admission to the Graduate School in her or his chosen medical science field.

All of the basic health sciences departments, under the aegis of the Graduate School, conduct active and extensive programs of graduate student research and study leading to the M.S. or Ph.D. degree. Some research fellowships, teaching assistantships, or scholarships are available to academically qualified students in these fields. Inquiry should be directed to a faculty member or to the departmental office of the field of the student's interest.

More than 1,000 physicians are enrolled each year in post-M.D. graduate training programs in the clinical departments of the Medical School and its affiliated hospitals. These physicians are engaged in training as specialists in their chosen fields. They have qualified for registration as medical fellows in the Graduate School or as medical fellow specialists in the Medical School and receive academic credit during their residency training.

The Mayo Graduate School of Medicine in Rochester, Minnesota, is affiliated with the Graduate School of the University. Graduate students and physicians engaged in postdoctoral training and research at Rochester may receive graduate credit for their work and may earn advanced degrees from the University.

VI. DESCRIPTION OF SELECTED COURSES

Symbols—The following symbols are used throughout the course descriptions in lieu of page footnotes:

§ Credit will not be granted if the equivalent course listed after the section mark has been taken for credit.

¶ Concurrent registration is allowed (or required) in the course listed after the paragraph mark.

Consent of instructor is required prior to registration.

△ Consent of division, department, or school offering the course is required prior to registration.

f,w,s,su Following a course number indicate fall, winter, spring, or summer quarters.

A hyphen between course numbers (e.g., 5142-5143-5144) indicates a sequence of courses that must be taken in the order listed.

A comma between course numbers (e.g., 8234, 8235, 8236) indicates a series of courses that may be entered any quarter.

Anatomy (Anat)

David W. Hamilton, Ph.D., professor and head

Professor Emeritus

Lemen J. Wells, M.D.

Professor

G. Eric Bauer, Ph.D.
Anna-Mary Carpenter, M.D., Ph.D
Padmakar Dixit, Ph.D.
Stanley L. Erlandsen, Ph.D.
Carl B. Heggestad, M.D., Ph.D.
Judson D. Sheridan, Ph.D.
Morris Smithberg, Ph.D.
R. Dorothy Sundberg, M.D., Ph.D.

Associate Professor

Robert P. Elde, Ph.D.
Orion D. Hegre, Ph.D.
Jonathan A. Parsons, Ph.D.
Donald Robertson, Ph.D.
Robert Sorenson, Ph.D.

Assistant Professor

Matthew L. Bjerknes, Ph.D.
H. David Coulter, Ph.D.
Glenn J. Giesler, Ph.D.
Hue Lee Kaung, Ph.D.
Paul C. Letourneau, Ph.D.
Stephen Litton, Ph.D., D.D.S.
Donald C. Quick, Ph.D.
Virginia S. Seybold, Ph.D.
Ivan Suzman

The course work in the Department of Anatomy provides an opportunity for students to examine the structure of the human body. In gross anatomy, the three-dimensional architecture in all body regions is studied through dissection and X-rays. In microscopic anatomy, the organization of cells, tissues, and organs is assessed from stained sections using light microscopy and electron micrographs. In embryology, normal development and anomalies of each body system are presented. The topics in the three above-mentioned courses are integrated in time. Neuroanatomy is taught in conjunction with neurophysiology. Where appropriate, the courses are correlated with the various clinical disciplines. The courses are designed to help students enhance their powers of observation, their ability to communicate using specific terminology, and their synthesis of morphology with biochemistry and physiology. Greater depth in any of the subjects can be obtained through advanced course work completed during elective time.

REQUIRED COURSES

5100. GROSS HUMAN ANATOMY. (8-11 cr; prereq regis med fr or grad student with #)
Dissection of the human body.

5103. HUMAN HISTOLOGY. (3-6 cr; prereq regis med fr or grad student with #)
Microscopic structure, cytochemical and functional aspects of cells, tissues, and organs.

5106. HUMAN EMBRYOLOGY. (3 cr; prereq regis med fr or grad student with #)
Development of the human body.

5111. HUMAN NEUROANATOMY. (3 cr; prereq regis med fr)
Structure and function of the nervous system including the organs of special sense.

ELECTIVE COURSE

5190. ADVANCED ANATOMY. (2 cr; prereq regis med, 5103)
Instruction in teaching methods or supervision of student's original research or combination of both.

ADVANCED CREDIT COURSES

5102. HUMAN EVOLUTIONARY BIOLOGY

5121. FUNCTIONAL MORPHOLOGY

5122. PRIMATE ANATOMY

5127. PROBLEMS IN MODERN DEVELOPMENTAL BIOLOGY

5211. BIOLOGY OF NERVE CELLS

5301. SURGICAL ANATOMY FOR ORAL SURGEONS

5304. HEAD AND NECK ANATOMY FOR MEDICAL AND DENTAL RESIDENTS

5765-5766. HEMATOLOGY. (4 cr per qtr; prereq 5103 or #)
Blood and blood-forming organs; emphasis on blood and bone marrow from the standpoint of diagnosis and prognosis.

5767. SEMINAR: HEMATOLOGY. (1 cr; prereq 5766)
Discussion of literature and research.

8101. ADVANCED GROSS HUMAN ANATOMY

8104. ADVANCED HISTOLOGY

8111. HUMAN NEUROANATOMY

8135. BIOLOGICAL ELECTRON MICROSCOPY—TECHNICS

8136. BIOLOGICAL ELECTRON MICROSCOPY—TECHNICS

8137. BIOLOGICAL ELECTRON MICROSCOPY—INTERPRETATION

8141. NEUROANATOMICAL METHODS

8153, 8154, 8155, 8156. ADVANCED ANATOMY

8161, 8162, 8163. METHODS IN ANATOMICAL RESEARCH

8166. CYTOLOGICAL ASPECTS OF PROTEIN SYNTHESIS AND SECRETION

8201, 8202, 8203, 8204. RESEARCH IN ANATOMY

8205, 8206, 8207. SEMINAR: ANATOMY

Anesthesiology (Anes)

Joseph J. Buckley, M.D., M.S., professor and head

Professor Emeritus

Frederick Van Bergen, M.D.

Professor

John R. Gordon, M.D., M.S.

Associate Professor

James F. Cumming, M.D., Ph.D.
Edward C. Hanisch, Jr., M.D.
Ji-Chia Liao, M.D., Ph.D.

Assistant Professor

William W. Anderson, M.D., Ph.D.
Jorge A. Estrin, M.D.
Ian J. Gilmour, M.D., F.R.C.P. (C)
Douglas E. Koehntop, M.D., M.S.
Russell H. Larsen, M.D., M.S.
Josephine Lo, M.D., M.S.

Instructor

Kumar G. Belani, M.D.
Jon F. Berlauk, M.D.
Thomas A. Polta, M.D.

ELECTIVE COURSE

5181. EXTERNSHIP IN CLINICAL PRACTICE OF ANESTHESIOLOGY. (Cr ar; prereq regis med)

ADVANCED CREDIT COURSES

8265. GENERAL ANESTHESIA

8266. REGIONAL ANESTHESIA

8267. PRE- AND POST-ANESTHETIC EVALUATION

8268. SEMINAR: ANESTHESIOLOGY

8269. RESEARCH IN ANESTHESIA

Biochemistry (MdBc)

Harry P. C. Hogenkamp, Ph.D., professor and head

Regents' Professor Emeritus

Wallace D. Armstrong, M.D.

Professor

James W. Bodley, Ph.D.
Charles W. Carr, Ph.D.
Mary E. Dempsey, Ph.D.
Ivan D. Frantz, Jr., M.D.
Helmut R. Gutmann, Ph.D.
Ralph T. Holman, Ph.D.[1]
James F. Koerner, Ph.D.
Andreas Rosenberg, D.Sc., Ph.D.
Leon Singer, Ph.D.
Frank Ungar, Ph.D.
John F. Van Pilsum, Ph.D.

Adjunct Professor

Quenton T. Smith, Ph.D.

Associate Professor

Ronald D. Edstrom, Ph.D.
Ernest D. Gray, Ph.D.
James B. Howard, Ph.D.
Robert J. Roon, Ph.D.

Assistant Professor

Kenneth Adolph, Ph.D
Daniel P. Gilboe, Ph.D.
John D. Lipscomb, Ph.D.
Dennis M. Livingston, Ph.D.
Theodore R. Oegema, Ph.D.
Agnes W. Tan, Ph.D.
David D. Thomas, Ph.D.
Howard C. Towle, Ph.D.

Adjunct Assistant Professor

Govin T. Vatassery, Ph.D.

Lecturer

Charles H. Blomquist, Ph.D.

Biochemistry occupies a central position in all medical science and in clinical medicine. The required courses deal with general biochemistry and treat the chemical transformations fundamental to life processes occurring at the cellular and subcellular levels. Major emphases are on the integration of biochemical processes and on the regulation and coordination of metabolic reactions. Biochemical abnormalities in disease are examined to strengthen the student's understanding of normal processes and to demonstrate the application of principles of biochemistry to future studies of disease processes.

The lectures furnish comprehensive surveys of some of the main topics, but they require supplementation through reading or advanced course work for exploration in depth. Laboratory work is used to examine some of the ways through which biochemical knowledge is obtained.

Discussions of biochemical aspects of medicine are presented in Phase B of the medical curriculum.

REQUIRED COURSE

5100. BIOCHEMISTRY. (10 cr; prereq regis med fr, physics, organic chemistry)

ELECTIVE COURSE

5053. PROBLEMS IN BIOCHEMISTRY. (Cr ar [may be repeated for cr]; prereq 5100)

[1]Hormel Institute

ADVANCED CREDIT COURSES

8206. ADVANCED ENDOCRINOLOGY AND STEROID CHEMISTRY

8211. NUCLEIC ACID STRUCTURE AND FUNCTION

8215. LIPIDS

8217. PROTEIN CHEMISTRY

8218. STRUCTURE AND MECHANISM IN ENZYME CATALYSIS

8219. BIOCHEMISTRY OF SPECIALIZED TISSUES

8220. CARBOHYDRATE METABOLISM

8230. MEMBRANE BIOCHEMISTRY

Dermatology (Derm)

Robert W. Goltz, M.D., professor and head

Professor Emeritus

Francis W. Lynch, M.D.

Professor

Robert J. Gorlin, D.D.S.
Kenneth P. Manick, M.D.
Carl J. Witkop, Jr., D.D.S.

Clinical Professor

Bruce J. Bart, M.D.
Harry I. Katz, M.D.
Sheldon I. Mandel, M.D.
Milton Orkin, M.D.
Franklin Pass, M.D.
Willard C. Peterson, Jr., M.D.
Harold G. Ravits, M.D.
Alvin S. Zelickson, M.D.

Associate Professor

Mark V. Dahl, M.D.
William C. Gentry, Jr., M.D.

Clinical Associate Professor

Manuel Jaffe, M.D.
Irvine M. Karon, M.D.
William Schorr, M.D.
Stephen B. Webster, M.D.

Assistant Professor

Maria Hardinsky, M.D.
J. Corwin Vance, M.D.

Clinical Assistant Professor

Thomas H. Alt, M.D.
David W. Anderson, M.D.
Charles J. Balogh, M.D.
Garrett C. Bayrd, M.D.
John Bergman, M.D.
Daryl Brockberg, M.D.
R. Chris Diercks, M.D.
Carl E. Ehmann, M.D.
John R. Fenyk, M.D.
LeRoy Geis, M.D.
Fred S. Gurtman, M.D.
Noel A. Hauge, M.D.
Ngo Thanh Hien, M.D.
H. Spencer Holmes, M.D.
Eugene O. Hoxtell, M.D.
Daniel L. Jones, M.D.
Thomas Kalb, M.D.
Dennis Knutson, M.D.
Dennis Leahy, M.D.
Donald J. Miech, M.D.
Orville Ockuly, M.D.
Steven Prawer, M.D.
Edwin G. Rice, M.D.
Nadine Smith, M.D.
Carol A. Soutor, M.D.
Gerry Stanke, M.D.
John A. Stansbury, M.D.
Paul R. Vandersteen, M.D.
C. Gordon Vaughn, M.D.

The elective program in the clinics of major hospitals offers the student an opportunity to acquire diagnostic skills and to learn medical and surgical techniques for treatment of diseases of the skin. This program prepares the graduate for the management of dermatologic problems as a family practitioner or as a clinician in pediatrics or internal medicine.

ELECTIVE COURSES

5181. CLINICAL PROBLEMS IN DERMATOLOGY

5182. PRECEPTORSHIP IN DERMATOLOGY

5183. ADVANCED COURSE IN DERMATOLOGY

5184. SPECIAL COURSE: DERMATOLOGY

ADVANCED CREDIT COURSES

8225. CLINICAL DERMATOLOGY

8226. CLINICAL SEMINAR: DERMATOLOGY

8227. HISTOLOGY OF THE SKIN

8228. RESEARCH: DERMATOLOGY AND SYPHILOLOGY

8229. ELECTRON MICROSCOPY IN DERMATOLOGY

8230. FUNCTIONAL BIOLOGY OF THE SKIN

8231. CLINICS: DERMATOLOGY: NONDERMATOLOGISTS

8232. SEMINAR: DERMATOLOGIC HISTOPATHOLOGY, MYCOLOGY

Family Practice and Community Health (FPCH)

Edward W. Ciriacy, M.D., professor and head

Professor

Eldon Berglund, M.D.
John T. Kelly, M.D.
John B. O'Leary, M.D.
John E. Verby, M.D.
Vernon E. Weckwerth, Ph.D.

Clinical Professor

Milton Baker, M.D.
David Craig, M.D.
Herman Drill, M.D.
John H. Flinn, M.D.
Benjamin Fuller, M.D.
James T. Garvey, M.D.
James LaFave, M.D.
Lawrence J. Schut, M.D.
William Scott, M.D.
Bruce F. Williams, M.D.

Associate Professor

Donald S. Asp, M.D.
Carole J. Bland, Ph.D.
Stephen Boros, M.D.
Joseph P. Connolly, M.D.
Robert A. Derro, M.D.
Vincent R. Hunt, M.D.
Harold R. Ireton, Ph.D.
John W. McConnell, M.D.
Karen Oiness, M.D.
Krishna Saxena, M.D.
Stuart V. Thorson, M.D.

Clinical Associate Professor

James R. Allen, M.D.
Charles M. Bagley, M.D.
Peter J. Bartzen, M.D.
Raymond C. Bonnabeau, M.D.
Terrance Capistrant, M.D.
Joseph Cella, M.D.
Bart S. Cuderman, M.D.
Arie W. Dieperink, M.D.
Ronald W. Ellis, M.D.
John D. Farr, M.D.
Peter Fehr, M.D.
Louis J. Filiatrault, M.D.
Robert S. Flom, M.D.
Richard T. Foreman, M.D.
William Jacott, M.D.
James Janecek, M.D.
F. Bruce Lewis, M.D.
Charles McCarthey, M.D.
Harold D. Miller, M.D.
Gerald T. Mullin, M.D.
Edward N. Nelson, M.D.
Hardin Olson, M.D.
Frank S. Preston, Jr., M.D.
William Remole, M.D.
Donald Swenson, M.D.
William E. Walsh, M.D.
Richard M. Warhol, M.D.
William Woyda, M.D.
Frederick Wuest, M.D.
Richard E. Yadeau, M.D.

Assistant Professor

Patricia J. Aletky, Ph.D.
Richard M. Bick, M.D.
James R. Blackman, M.D.
James L. Canine, M.D.
Patricia M. Cole, M.D.
Edmond J. Coleman, M.D.
Ray M. Conroe, Ph.D.
Richard Gehrz, M.D.
Eric W. Goad, M.D.
Richard L. Holloway, Ph.D.
Donald Houge, Ph.D.
Edward J. Hughes, M.S.W.
John H. Kiernan, Jr., M.D.
Herbert H. Laube, M.D.
Selmer M. Loken, M.D.
John A. McLeod, M.D.
David J. Mersy, M.D.
Delbert R. Nelson, M.D.
Elof G. Nelson, S.T.D.
Leon J. Nesvacil, M.D.
Daniel K. O'Brien, M.D.
Bernerd L. O'Neil, M.D.
Daniel Ostergaard, M.D.
Eugene C. Ott, M.D.
James J. Pattee, M.D.
David R. Preston, M.H.A.
Gerald Ronning, M.D.
Robert Rotenberg, M.D.
M. Olwen Sanderson, M.D.
John H. Sargent, M.D.
Sharon Satterfield, M.D.

Jack B. Schaffer, Ph.D.
Jerome E. Schutz, M.D.
Harold C. Seim, M.D.
Leif I. Solberg, M.D.
Carl E. Vorhes, M.D.
Pat Noonan Wagner, Ph.D.

Clinical Assistant Professor

Johannes Aas, M.D.
Martha Aas, M.D.
Ronald L. Abler, M.D.
Alexander Abrams, M.D.
Donald J. Abrams, M.D.
Bruce Adams, M.D.
Jan Adams, M.D.
Patrick J. Adams, M.D.
James T. Adkins, M.D.
Robert C. Ahlstrom, M.D.
Werner W. Amerongen, M.D.
Thomas W. Amsden, M.D.
Arden O. Anderson, M.D.
Craig E. Anderson, M.D.
Franklin C. Anderson, M.D.
Jo E. Anderson, M.D.
John W. Anderson, M.D.
Richard W. Anderson, M.D.
Ross Anderson, M.D.
James J. Arms, M.D.
Frederick D. Arny, M.D.
David S. Arvold, Jr., M.D.
Byron C. Backus, M.D.
Lloyd B. Backus, M.D.
Jean L. Bader, M.D.
John W. Balkins, M.D.
Joel Bamford, M.D.
Patrick J. Barrett, M.D.
Charles J. Beck, M.D.
Roger W. Becklund, M.D.
Lee H. Beecher, M.D.
Maurice W. Beers, M.D.
Alphonso A. Belsito, M.D.
Clyde Bentzin, M.D.
Dean H. Bergerson, M.D.
Barbara Berggren, M.D.
Carol A. Bernards, M.D.
Douglas Berry, M.D.
Thomas G. Birkey, M.D.
William A. Black, M.D.
Stephen Bloom, M.D.
Donald R. Blowers, M.D.
Clifford J. Blum, M.D.
Joseph F. Bocklage, M.D.
Peter L. Boman, M.D.
Mark E. Boyken, M.D.
Donald E. Brandt, M.D.
Henry E. Brandt, M.D.
Larry J. Brettingen, M.D.
Carl O. Bretzke, M.D.
Thomas G. Briggs, M.D.
Harold R. Broman, M.D.
Michael Bronson, M.D.
Glen W. Brown, M.D.
Robert S. Brown, M.D.
William B. Buege, M.D.
Robert E. Bundt, M.D.
Dayton D. Burkholder, M.D.
Edgar C. Burseth, M.D.
Bruce P. Cameron, M.D.
Joseph T. Capell, M.D.
Vernon J. Carlson, M.D.
William J. Carr, M.D.
John F. Carson, M.D.
Kenneth R. Carter, M.D.
Frank J. Carthey, M.D.
Chris P. Ceman, M.D.
Peter M. Cermak, M.D.
H. Chris Chapman, M.D.
Sherman B. Child, M.D.
Raymond G. Christensen, M.D.
David A. Christenson, M.D.
Leland R. Christenson, M.D.
William L. Christian, M.D.
Bruce T. Clayton, M.D.
Charles L. Cohen, M.D.
Milton A. Cornwall, M.D.
Daniel Cortez, M.D.
Enrique Cortez, M.D.
Glen G. Cramer, M.D.
George M. Crow, M.D.
Leonard V. Crowley, M.D.
Diane A. Dahl, M.D.
Thomas W. Day, M.D.
Allen W. Delzell, M.D.
Robert J. Deutsch, M.D.
Paul B. Dickinson, M.D.
Roy W. Dickman, M.D.
William Doebler, M.D.
James H. Dokken, M.D.
Robert Donley, M.D.
John E. Doyle, Jr., M.D.
Holly L. Doyne, M.D.
Charles Dunham, M.D.
David Dunlap, M.D.
Robert C. Dunn, M.D.
John L. Durkin, M.D.
Paul J. Dyrdal, M.D.
Stephan H. Earl, M.D.
Walter P. Eder, M.D.
Thomas Edwards, M.D.
Myles E. Efteland, M.D.
John G. Eichten, M.D.
Fredrick Ekberg, M.D.
Joseph S. Emond, Jr., M.D.
Paul L. Eneboe, M.D.
E. Duane Engstrom, M.D.
Gary L. Falk, M.D.
John Fangman, M.D.
Brett A. Feighner, M.D.
Arnold W. Fenske, M.D.
Albert D. Fetzek, M.D.
James D. Foley, M.D.
Donald Foss, M.D.
Donald B. Frane, M.D.
Harvey J. Frank, M.D.
Richard Freeman, M.D.
Bayard T. French, M.D.
Bradford E. Friedrich, M.D.
Charles A. Friend, M.D.
Paul Fruen, M.D.
Edson V. Fuglestad, M.D.
Joseph M. Gasik, M.D.
LeRoy F. Geis, M.D.
Joseph L. Gendron, M.D.
Robert W. Gibbs, M.D.
David L. Gilbertson, D.O.
Malcolm E. Gillespie, M.D.
Eric Gilster, M.D.
Gary D. Good, M.D.

James Green, M.D.
Patrick Greenwood, M.D.
Carl V. Griesy, M.D.
Richard P. Griffen, M.D.
Paul T. Grimes, M.D.
Roger Grimm, M.D.
David W. Grube, M.D.
Joseph J. Gutenkauf, M.D.
Stephen L. Hadley, M.D.
Norman L. Hagberg, M.D.
John C. Halversen, M.D.
William G. Halverson, M.D.
Carl W. Hansen M.D.
Peter O. Hansen, M.D.
Allen S. Hanson, M.D.
John T. Harbaugh, M.D.
Vicky Hastings, M.D.
George W. Haugen, M.D.
Robert J. Havel, M.D.
Kenneth C. Haycraft, M.D.
Laurel Haycraft, M.D.
Richard H. Hedenstrom, M.D.
Robert Heeter, M.D.
Robert L. Hegrenes, M.D.
James K. Heid, M.D.
Richard Heinrichs, M.D.
Terrance P. Henderson, M.D.
Douglas J. Hiza, M.D.
Kenneth V. Hodges, M.D.
Ronald Hoekstra, M.D.
John Holcomb, M.D.
Robert Holmen, M.D.
Douglas J. Holt, M.D.
Glen Holt, M.D.
John R. Holten, M.D.
Leong Y. W. Hom, M.D.
Roderick Hood, M.D.
George J. Hopkins, M.D.
Allen Horn, M.D.
James Hover, M.D.
Richard Hovland, M.D.
Newell Howe, M.D.
Frank J. Indihar, M.D.
Mark N. Issacs, M.D.
William C. Jackson, M.D.
Dennis R. Jacobson, M.D.
Ronald J. Jankowski, M.D.
William L. Jefferies, M.D.
Gerald Jensen, M.D.
Dirk G. Jochems, M.D.
Alan R. Johnson, M.D.
Bradley D. Johnson, M.D.
Byron R. Johnson, M.D.
Carolyn Johnson, M.D.
Franklin L. Johnson, M.D.
Gordon E. Johnson, M.D.
O. Guy Johnson, M.D.
Spencer Johnson, M.D.
Stanley Johnson, M.D.
Theodore Johnson, M.D.
David Johnsrud, M.D.
Arthur Kaemmer, M.D.
Milton L. Kaiser, M.D.
Marianne D. Kanning, M.D.
Dale Kaye, M.D.
James W. Keane, M.D.
Joseph M. Keenan, M.D.
Patrick A. Keenan, M.D.
Curtis D. Keller, M.D.
Robert T. Kelly, M.D.
Thomas Kiefer, M.D.
James F. Knapp, M.D.
John Knoedler, M.D.
James M. Koberstein, M.D.
Gary G. Kohls, M.D.
Peter S. Koontz, M.D.
William Kosiak, M.D.
Larry Koteck, M.D.
Freeman Kovack, M.D.
Michael J. Kozak, M.D.
Walter E. Krafft, M.D.
James E. Krook, M.D.
Theodore P. Kubista, M.D.
James N. Kvale, M.D.
Arne Lagus, M.D.
Daniel H. Lambrides, D.Min.
David Lamusga, M.D.
Vincent LaPorte, M.D.
Robert E. Larsen, M.D.
Dorette Larson, M.D.
Gerald E. Larson, M.D.
Roland R. Larter, M.D.
Charlotte A. Lee, M.D.
Gordon E. Lee, M.D.
Joseph Leek, M.D.
Donald Lehman, M.D.
Robert E. Leiferman, M.D.
John S. Leighton, M.D.
Cecil M. Leitch, M.D.
Kenneth Lerdahl, M.D.
Richard J. Lessard, M.D.
Gordon J. Lester, M.D.
Alexander A. Levitan, M.D.
G. Patrick Lilja, M.D.
Raymond J. Lindeman, M.D.
Dale C. Lindquist, M.D.
Dennis E. Lofstrom, M.D.
Selmer M. Loken, M.D.
Thomas A. Love, M.D.
Douglas M. Lowin, M.D.
Olaf Lukk, M.D.
Kristofer T. Lund, M.D.
William Lundberg, M.D.
George E. Lundgren, M.D.
Donald R. Lynch, M.D.
Michael Lynch, M.D.
Charles MacDonald, M.D.
Roger A. MacDonald, M.D.
Neil Macheledt, M.D.
Hugh MacMenamin, M.D.
David MacMillan, M.D.
Raymond C. Magnuson, M.D.
Khalid Mahmud, M.D.
J. Anthony Malerich, Jr., M.D.
John Manion, M.D.
George A. Mann, M.D.
Merle S. Mark, M.D.
Charles P. Martin, M.D.
George R. Martin, M.D.
Donald J. Maus, M.D.
David K. McAfee, M.D.
Charles B. McCreary, M.D.
Samuel K. McHutchison, M.D.
Eva E. McKenzie, M.D.
David W. McQuoid, M.D.
Frederick A. Melms, M.D.
William G. Merrick, M.D.
Robert Merrill, M.D.

Donald D. Metz, M.D.
George M. Miks, M.D.
Gary J. Miller, M.D.
James D. Miller, M.D.
Thomas W. Miller, M.D.
William P. Miller, M.D.
Robert E. Molenaar, M.D.
John C. Morgan, M.D.
Frank E. Mork, Jr., M.D.
John B. Moyer, M.D.
Mark A. Muesing, M.D.
Albrecht E. Muller, M.D.
Venkata K. Murthy, M.B.B.S.
John William Myers, M.D.
Timothy E. Nealy, M.D.
John D. Nehring, M.D.
Delbert Nelson, M.D.
Leo K. Nelson, M.D.
Maxine O. Nelson, M.D.
Robert P. Nelson, M.D.
Ronald J. Nelson, M.D.
Paul Nerothin, M.D.
Thomas O. Nichols, M.D.
Neil D. Nickerson, M.D.
David J. Nielsen, M.D.
Kenneth O. Nimlos, M.D.
Bruce A. Norback, M.D.
Stephen Normann, M.D.
Joseph L. Norquist, M.D.
Thomas A. Oas, M.D.
William J. O'Brien, M.D.
Olin M. Odland, M.D.
Myron Olmanson, M.D.
Vern C. Olmanson, M.D.
Bradley K. Olson, M.D.
Kenneth Olson, M.D.
Lloyd L. Olson, M.D.
Richard E. Olson, M.D.
Robert Olson, M.D.
Burton A. Orr, M.D
John D. Parod, M.D.
Elizabeth Payne, M.D.
Carl F. Peikert, M.D.
Charles R. Pelzl, M.D.
Herschel L. Perlman, M.D.
Evan H. Peterson, M.D.
Norman Peterson, M.D.
Charles E. Pexa, M.D.
Donald A. Pine, M.D.
Rolland D. Pistulka, M.D.
David A. Pope, M.D.
Robert L. Powers, M.D.
Paul V. Quinn, M.D.
John R. Ragan, M.D.
Larry L. Rapp, D.O.
Henry H. Reed, M.D.
Ronald E. Rehmann, M.D.
Leland G. Reichelt, M.D.
Fred B. Riegel, M.D.
Lawrence R. Ringhofer, M.D.
Donald E. Roach, M.D.
William H. Rock, M.D.
Gordon A. Rockswold, M.D.
William W. Rodman, M.D.
James Rohde, M.D.
Pat Rollins, M.D.
David L. Rosenbaum, M.D.
Hanan Rosenstein, M.D.
Robert S. Ross, M.D.
Robert J. Rotenberg, M.D.
Philemon C. Roy, M.D.
Jane Rozsnafszky, Ph.D.
Thomas Rozycki, M.D.
M. Ruegsegger, M.D.
Peter L. Russell, M.D.
Harry M. St. Cyr, M.D.
John J. Salchert, M.D.
Edward Salovich, M.D.
Paul S. Sanders, M.D.
A. Lee Sandler, Ph.D.
Kusum Saxena, M.D.
Hugh A. Scanlon, M.D.
Richard J. Schindler, M.D.
Ruben F. Schmidt, M.D.
Thomas A. Schmidt, M.D.
George W. Schossow, M.D.
John R. Schotzko, M.D.
Christian Schrock, M.D.
William R. Schroeder, M.D.
Roger O. Schroeppel, M.D.
E. Robert Schwartz, M.D.
Thomas G. Schwinghamer, M.D.
James Sebastian, M.D.
Milton H. Seifert, Jr., M.D.
Harold C. Seim, M.D.
Richard J. Sells, M.D.
Peter Setness, M.D.
Robert I. Shragg, M.D.
Franklin D. Sidell, M.D.
Leighton Siegel, M.D.
Richard K. Simmons, M.D.
Kathleen K. Simo, M.D.
Kirk W. Simpson, M.D.
James W. Sipe, M.D.
Carl Sjoding, M.D.
William Slack, M.D.
Archie M. Smith, M.D.
George F. Smith, M.D.
George R. Smith, M.D.
John E. Smith, M.D.
Vernon Sommerdorf, M.D.
Ernest J. Sowada, M.D.
A. A. Spagnolo, M.D.
Maurice Spangler, M.D.
Paul M. Spilseth, M.D.
Clifford D. Stiles, M.D.
Curtis W. Stolee, M.D.
Robert A. Stoy, M.D.
Herbert S. Strait, M.D.
Richard E. Streu, M.D.
Jack L. Strobel, M.D.
James K. Struve, M.D.
John E. Sutherland, M.D.
Lawrence J. Swanson, M.D.
Ralph H. Swanson, M.D.
Floyd J. Swenson, M.D.
Orville P. Swenson, M.D.
Richard W. Swenson, Jr., M.D.
Leslie A. Syverson, M.D.
Wayne E. Tate, M.D.
Terrance J. Thiel, M.D.
John M. Thomas, M.D.
Ernest Thorsgard, M.D.
James J. Tiede, M.D.
Robert P. Titzler, M.D.
Chris Tountas, M.D.
James E. Trow, M.D.
Romil Valgemae, M.D.

John M. Vener, M.D.
Norman Virnig, M.D.
Thomas W. Votel, M.D.
Frederick E. Walker, Jr., M.D.
Stuart B. Walker, M.D.
Alvin W. Waters, M.D.
Thomas E. Watts, M.D.
Douglas C. Weeks, M.D.
Marwood E. Wegner, M.D.
Jon D. Wempner, M.D.
Mark C. Werpy, M.D.
Joseph F. Wethington, M.D.
Lloyd A. Whitesell, M.D.
Paul Wicklund, M.D.
William M. Wiencke, M.D.
Paul A. Williams, M.D.
Richard E. Williams, M.D.
Robert E. Wilson, M.D.
Herbert C. Winge, M.D.
Richard Woellner, M.D.
Frank Wolf, M.D.
Robert WonSavage, M.D.
Phillip J. Worrell, M.D.
Donald L. Wright, M.D.
Matthew D. Yelle, M.D.
William W. Young, M.D.
John D. Zapf, M.D.
Leo A. Zaworski, M.D.
Anusuya Zdenek, M.D.
Robert L. Zemke, M.D.

Instructor

Sharon S. Allen, M.D.
Thomas M. Altemeier, M.D.
Philip L. Colgan, M.A.
Diane Daehlin, M.S.W.
Luis de Cubas, M.D.
James W. Haefemeyer, M.D.
Kristen A. Johnson, M.D.
Daniel Kohen, M.D.
Robert W. Reif, M.D.
Vincent J. Rogalski, M.A.

Clinical Instructor

Geoffrey T. Abbott, M.S.W.
Dennis J. Abraham, M.D.
John D. Adolphson, M.D.
Bruce Agneberg, M.D.
Gregory Amer, M.D.
Stanley J. Antolak, M.D.
Barry K. Baines, M.D.
Charles H. Beck, M.D.
Robert J. Beck, M.D.
Daniel Beckman, M.D.
John T. Beecher, M.D.
Philip Benson, M.D.
Dale Berry, M.D.
Barry A. Bershow, M.D.
Jean T. Bieraugel, M.D.
John Bordwell, M.D.
Daniel Bowers, M.D.
Mark H. Brakke, M.D.
Foster D. Bucher, M.D.
Michael Busian, M.D.
John Canfield, M.D.
Steve R. Carlson, M.D.
Darrell L. Carter, M.D.
James Cicero, M.D.
David Claudon, M.D.
Gayle J. Cousins, M.D.
Elizabeth Craig, M.D.
Robert Dahms, M.D.
William G. Dicks, M.D.
John A. Dow, D.P.M.
Irene G. Duckett Cass, M.D.
Brian T. Ebeling, M.D.
David R. Eckes, M.D.
K. James Ehlen, M.D.
Charles Erickson, M.D.
Robert Florence, M.D.
Allen Fongemie, M.D.
Ralph Frascone, M.D.
John Frederick, M.D.
Peter Garske, M.D.
James Gehant, M.D.
George R. Gordon, M.D.
Richard A. Gordon, M.D.
Gary Hanovich, M.D.
Robert D. Hart, M.D.
Terril H. Hart, M.D.
John Haugen, M.D.
Gerald Heideman, M.D.
Clarence E. Henke, M.D.
William R. Hilgedick, M.D.
David Hunter, M.D.
Kenneth Irons, M.D.
Deane Johnson, M.D.
Robert J. Johnson, M.D.
James Jordan, M.D.
William Kimber, M.D.
Julie Klosterman, M.D.
James Klotter, M.D.
Robert J. Knip, M.D.
James F. Krominga, M.D.
John Lamey, M.D.
Richard Lamon, M.D.
Timothy Lane, M.D.
Dean A. Lee, M.D.
Steven Lucas, M.D.
David D. Luehr, M.D.
Kathleen Macken, M.D.
Donald O. Madsen, M.D.
Susan Mahle, M.D.
Lynn C. P. Manning, M.D.
Thomas G. Mayer, M.D.
Steven McCabe, M.D.
Ronald Menk, M.D.
Jeffrey R. Michell, M.D.
Robert P. Miller, M.D.
James Mohs, M.D.
Lawrence Mottl, M.D.
James P. Noreen, M.D.
David Olson, M.D.
Jennie M. Orr, M.D.
David J. Pearson, M.D.
Harold V. Pearson, M.D.
Elizabeth A. Perkett, M.D.
John R. Peters, M.D.
D. William Pfeffer, M.D.
Timothy D. Pryor, M.D.
Teresa E. Quinn, M.D.
David J. Roberts, M.D.
Gayle J. Rogers, M.S.
Henry J. Rupp, M.D.
David Sanderson, M.D.
Glen A. Schiffler, M.D.
Milan C. Schmidt, M.D.
William Shores, M.D.

Michael Smith, M.D.
William M. Spinelli, M.D.
James V. Springrose, M.D.
Mark A. Steinhauser, M.D.
Jerrold Stempel, M.D.
Peggy A. Stephenson, M.D.
Steven P. Sterner, M.D.
Larry Stetzner, M.D.
Marlen Strefling, M.D.
C. L. Thiesenhusen, M.D.
Elizabeth C. Tonn, M.D.
John M. Toso, M.D.
Clark D. Tungseth, M.D.
Joseph Twidwell, M.D.
Jeffrey Vadheim, M.D.
Paul Van Gorp, M.D.
Gene W. Velasco, M.D.
Judith Wanschura, M.D.
William Youmans, M.D.

Lecturer

Faruk Abuzzahab, M.D., Ph.D.
Lyman V. Anderson
Thomas W. Hoban, M.S.

Research Associate

James P. Held
Alan M. Listiak, Ph.D.

Research Specialist

Stephen Prestwood, M.A.

Research Fellow

Jean M. Egerman, M.D.
Debra G. Froberg, M.A.
Sandra L. Nohre, M.A.

Course work in the Department of Family Practice and Community Health introduces students to the fundamentals of continuing and comprehensive patient care within the context of the patient's family and community. Consistent with the breadth of interests and responsibilities of the family physician, training in all basic areas of medical knowledge is stressed. Preventive medicine and the behavioral science aspects of patient care are also emphasized.

During Phase A, the Department of Family Practice and Community Health participates in planning, teaching, and providing clinical facilities for Introduction to Clinical Medicine. Department faculty members share responsibility for teaching the medical history taking, interviewing techniques, and physical diagnosis sections of the course. The Department of Family Practice and Community Health also contributes small group leaders to Social Behavior, an elective counseling course for Phase A students.

In Phase B, students spend one-half day each week for 14 weeks with a family physician, caring for patients in the clinic and hospital. Through this experience, students gain firsthand knowledge of the role of the family physician in the health care system. The Department of Family Practice and Community Health also collaborates with the Department of Psychiatry to provide advanced training in medical interviewing for Phase B students.

During Phase D, students have the opportunity to participate in a variety of family practice programs and courses. Before completing the M.D. requirements, students may elect to spend nine months or one year with a rural family doctor as part of the Rural Physician Associate Program, a combined educational-service program of the Medical School administered by Department of Family Practice and Community Health faculty. The program is designed to acquaint students with the world of rural family practice. For a similar but shorter experience, Phase D students may elect to complete a six-week preceptorship with a family physician. The department offers a variety of elective courses relevant to family practice, and these are listed below.

Model family practice units have been established at the University and at five additional sites located within or near hospitals affiliated with the department. These units are designed primarily for the graduate education of residents in the family practice training program. In addition, they serve as classrooms for teaching continuing and comprehensive primary health care to medical students. The patients represent a cross section of age and socioeconomic status. Students may elect to participate in the ongoing care of patients in these model family practice units.

The Program in Human Sexuality is an administrative and academic unit of the Department of Family Practice and Community Health. It conducts the Human Sexuality course in the Phase A and B core curricula and offers several elective courses in Phase D as well as advanced workshops and internships for residents and practicing physicians.

Additional educational opportunities in the Department of Family Practice and Community Health are available through the offices of individual practicing physicians and through affiliated hospitals in both rural and urban settings.

ELECTIVE COURSES

5500. PRECEPTORSHIP IN CLINICAL PRACTICE. (9 cr; prereq regis med)
Participation in delivery of primary medical care as performed by a practitioner within the community.

5501. RURAL PHYSICIAN ASSOCIATE PROGRAM. (36 cr; prereq minimum, completion of Phase A and B curricula of University of Minnesota Medical School)
Nine-month (optional for 12 months) participation in the practice of an outstate clinical faculty member. Patient care in a nonurban community. Extensive exposure to clinical medicine and delivery of primary health care. Includes stipend.

5502. THE PHYSICIAN AS COUNSELOR IN MARRIAGE AND FAMILY PROBLEMS. (2 cr; prereq 5501)
Four seminars, three hours each, held over seven months for RPAP participants. Opportunity to do clinical interviewing, examine relevant literature, and review case studies.

5503. RURAL PHYSICIAN ASSOCIATE PROGRAM RESEARCH PAPER. (1 cr; prereq 5501)
Requires a typewritten essay of at least 1,000 words that provides a comprehensive overview of the RPAP experience.

5504. MEDICAL ETHICS. (2 cr; prereq regis med or #)
Readings and discussions on major ethical issues relevant to the practice of medicine. Critical review of case studies to gain exposure to solution of medical ethics problems.

5510. MIGRANT WORKER PROGRAM. (9 cr; prereq regis med and #)
Delivery of primary health care to migrant workers, primarily Mexican-Americans, in Minnesota and California.

5515. PRECEPTORSHIP IN GERONTOLOGIC COMMUNITY HEALTH. (9 cr; prereq regis med)
In-depth experience in all facets of health care for elderly patients.

5516. RESEARCH IN HUMAN SEXUALITY. (Cr ar; prereq #)
Clinical and/or laboratory research related to human sexuality. Adaptable to interests of the student and faculty member. Ongoing research projects include such areas as incest, rape, sexuality of prisoners, and sexual dysfunctioning. Contact Sharon Satterfield, M.D., to make arrangements.

5520. RURAL HEALTH CARE MODEL, ONAMIA, MINNESOTA. (9 cr; prereq regis med)
Participation in delivery of primary medical care in a small town setting with an emphasis on a team approach.

5525. MANAGEMENT OF PATIENTS WITH CARDIOVASCULAR PROBLEMS BY THE FAMILY PHYSICIAN. (9 cr; prereq regis med)
Practicum designed to increase understanding of cardiovascular disease and to enable participation in various treatment modalities.

5530. CLINICAL PROBLEMS IN FAMILY PRACTICE. (9 cr; prereq regis med)
Participation in patient care in a model family practice clinic.

5535. COMMUNITY HEALTH IN FAMILY PRACTICE. (9 cr; prereq regis med or #)
Introduction to community health problems and to resources available in different practice settings. Practicum, readings, and seminars.

5560. ALCOHOL AND DRUG ADDICTION TREATMENT CENTER. (4.5 cr; prereq regis med)
Current methods and approaches to therapy and rehabilitation of chemically dependent patients.

5562. INTERVIEWING, PHYSICAL EXAMINATION, AND PATIENT COUNSELING. (Cr ar; prereq 5501)
Practicum and seminar course designed to provide the RPAP student with the basic skills and attitudes necessary to effectively interview, physically examine, and counsel the ambulatory patient. Use of videotaping and critique methods.

5566. FUNDAMENTALS OF COUNSELING. (4.5 or 9 cr; prereq regis Phase D or #)
Introduction to short term psychological counseling in the family practice setting. Three- or six-week sessions: (1) counseling skills training, (2) conducting counseling under supervision.

5575. MANAGEMENT CONCEPTS AND APPLICATIONS IN MEDICAL PRACTICE. (2 cr; prereq regis med)
Basic management topics such as accounting, finance, personnel management, and operations analysis. Topics specific to clinic management: staff policies, task analysis, clinic organization, credit control, purchasing, financial management, and data processing.

5580. INDEPENDENT STUDY ON MANAGEMENT CONCEPTS AND SYSTEMS WITHIN MEDICAL PRACTICES. (2 cr; prereq 5575)
Independent study for students who wish to pursue further work in practice management concepts and systems of medical care delivery.

5585. SEXUAL PROBLEMS IN CLINICAL PRACTICE. (Cr ar; open to medical students only; prereq #)
Clinical management of sex-related problems.

5599. INDEPENDENT STUDY. (Cr ar; prereq regis med)
On- or off-campus learning experiences individually arranged between the student and a faculty member for earning credit in areas not covered by regular courses. May include basic science research, library research, or special projects.

ADVANCED CREDIT COURSES

0555f, 0556w, 0557s. SPECIAL TOPICS IN PSYCHOLOGICAL MEDICINE

5563. CLINICAL NEUROPSYCHOPHARMACOLOGY

5567. COMMUNICATIONS

5570. PRACTICUM IN COUNSELING TECHNIQUES

5581. PRACTICE MANAGEMENT, PERSONAL FINANCES, AND PROFESSIONAL RELATIONS

5583. PERSONAL AND FINANCIAL PLANNING

5598. INTRODUCTION TO THE PHYSICIAN'S ROLE IN NURSING HOMES

5903. COMMUNITY HEALTH

5904. COMMUNITY HEALTH

5950. SEXUAL HEALTH SEMINAR

5951. RESEARCH IN HUMAN SEXUALITY

5952-5953-5954. PRACTICUM IN SEXUAL COUNSELING

5955. DIRECTED STUDY

5956. HUMAN SEXUALITY IN THE LIFE CYCLE

5957. FEMALE SEXUALITY

5958. SMALL GROUP PROCESS

8201. CLINICAL FAMILY MEDICINE

8202. DYNAMICS OF MARRIAGE AND FAMILY

8204. SEMINAR: QUANTITATIVE STRATEGIES IN HEALTH CARE PRACTICE AND RESEARCH

8205. SEMINAR: MEDICAL RECORDS SYSTEMS

8207. SEMINAR: COMMON DISEASES SEEN IN FAMILY PRACTICE

8208. FAMILY MEDICINE CONFERENCES

8209. FAMILY MEDICINE X-RAY CONFERENCE

8210. FAMILY MEDICINE GRAND ROUNDS

8212. CLINICAL PSYCHIATRY ROUNDS

8215. SEMINAR: PSYCHOSOMATIC MEDICINE

8216. SEMINAR: PSYCHOLOGICAL PROBLEMS OF CHILDREN

8217. SEMINAR IN COUNSELING

8223. INTRODUCTION TO GERONTOLOGY AND GERIATRIC MEDICINE

8224. SEMINAR: COMMUNITY HEALTH

8225. MEDICAL SOCIOLOGY

8226. SEMINAR: MEDICAL SOCIOLOGY

8228. SEMINAR: INTERDISCIPLINARY HEALTH

8240. COMMUNITY RESOURCES

8243. FAMILY MEDICINE IN THE RURAL AREA

8245. ANALYSIS OF INSTRUCTION AND EDUCATIONAL EVALUATION

8250. QUANTITATIVE STRATEGIES IN HEALTH CARE PRACTICE AND RESEARCH II

8253. RESEARCH PROBLEMS

8582. PRACTICE MANAGEMENT II

History of Medicine (HMed)

Leonard G. Wilson, M.Sc., Ph.D., professor and head

Associate Professor
John M. Eyler, Ph.D.

Assistant Professor
Dale C. Smith, Ph.D.

The history of medicine is essential to the understanding of the present state of medicine. It explores the historical foundations of medical knowledge, the sources of medical concepts, and the development of the traditions of medical theory and practice. Knowledge of the history of medicine is valuable to a physician because it helps to clarify the physician's knowledge and promotes a view of medicine in historical perspective.

Courses in the department are intended to provide students with a broad survey of the history of medicine (5400, 5401, 5402) which may be followed by a seminar dealing more intensively with specific developments in the history of medicine. Seminars give students an opportunity to read original literature and to investigate a historical problem for themselves, with assistance from faculty members as needed.

The department also offers a series of public noon hour lectures on selected subjects to acquaint both faculty members and students with the interests and diversity of medical history.

ELECTIVE COURSES

5002. PUBLIC HEALTH ISSUES IN HISTORICAL PERSPECTIVE. (3 cr, §PubH 5002) Eyler
Introduction to the evolution of major recurring problems and issues in public health including environment and health, food customs and nutrition, control of alcohol and drugs, venereal diseases and public policy, human resources regulation, and relationship of science to promotion of health.

5035. THE GERM THEORY AND THE MEDICAL PROFESSION. (4 cr, §Hist 5035)
Analysis of the formulation of the germ theory of disease and of its consequences for medical procedures (therapeutics, surgery, management of hospitals), public health programs, and the structure and prestige of the medical profession.

5045. MEDICAL PROFESSION IN AMERICA. (4 cr, §Hist 5045)
Historical analysis of the American medical profession in the 19th and 20th centuries; the role of institutions, influence of social and moral values, and consequences of specialization and scientific innovation.

5102s. SEMINAR: MEDICINE AND SOCIETY IN THE ENLIGHTENMENT. (3 cr; prereq #) Eyler
The interrelations of medicine and society from the late 17th to the early 19th centuries.

5120-5130. HISTORICAL TOPICS: MEDICINE AND THE MODERN STATE. (4 cr per qtr [sequence may be repeated for a max of 16 cr]; prereq #) Eyler
A seminar on the historical relations between medicine and the state from the 18th to 20th centuries. Topics vary from year to year.

5400f. EARLY HISTORY OF MEDICINE. (3 cr; 2 lect and 1 seminar hrs per wk) Wilson
The archaeology of disease, disease concepts in primitive medicine; Near and Far Eastern medicine, Hippocratic medicine, medical science in Alexandria, Galen and Greek medicine in Rome, the transmission of Greek medicine through the Arabic and Byzantine cultures, medical theory and practice in the Middle Ages.

5401w. MEDICINE DURING THE SCIENTIFIC REVOLUTION, 1500-1800. (3 cr; 2 lect and 1 seminar hrs per wk) Wilson
The recovery of ancient Greek medical writings, Vesalius and the revival of anatomy, Harvey and the discovery of circulation of the blood, emergence of new chemical and mechanical theories of medicine, classification of disease, rise of medical teaching.

5402s. MEDICINE IN THE 19TH AND 20TH CENTURIES. (3 cr; 2 lect and 1 seminar hrs per wk) Wilson
The impact of physics and chemistry on physiology; cell theory and cellular pathology; the germ theory of disease; anesthesia and the revolution in surgery; the rise of bacteriology, immunology, endocrinology, reproductive physiology, and chemotherapy; the reform of medical education; and the rise of modern medical research.

5410f, 5411w, 5412s. SEMINAR: THE EMERGENCE OF MODERN MEDICINE, 1750-1900. (3 cr per qtr; one 2-hr seminar per wk) Wilson
Study of the development of modern medicine through reading, discussion, and pursuit of a selected problem in depth. Ordinarily, students do general reading during fall quarter, select a topic for intensive study and write the first draft of a paper on it during winter quarter, and revise the first draft and submit their paper in final form during spring quarter. Intended to enable students to gain experience in research and writing in the history of medicine.

8220f, 8221w, 8222s. HISTORY OF THE BIOLOGICAL SCIENCES. (3 cr per qtr) Wilson

8230f, 8231w, 8232s. READINGS: HISTORY OF SCIENCE. (3 cr per qtr) Wilson

8630f, 8631w, 8632s. DIRECTED STUDY. (3-15 cr; prereq #) Staff

Interdisciplinary Medicine (InMd)

The courses listed under this heading are part of the core curriculum for undergraduate medical students and are offered in Phase A and Phase B. Direct administrative responsibility for these courses is vested in the individual course directors; planning, teaching, and evaluation of the courses and of student performance is carried out by interdepartmental committees.

REQUIRED COURSES

5100f. INTRODUCTION TO CLINICAL MEDICINE. (2 cr; prereq regis med) Petzel and staff
Interviewing techniques and communication with patients.

5101w. INTRODUCTION TO CLINICAL MEDICINE. (2 cr; prereq regis med) Petzel and staff
Medical history taking.

5102s. INTRODUCTION TO CLINICAL MEDICINE. (2 cr; prereq regis med) Petzel and staff
Physical diagnosis technique and practice.

5103su. INTRODUCTION TO CLINICAL MEDICINE. (2 cr; prereq regis med) Petzel and staff
Physical diagnosis and medical problems.

5110. HUMAN GENETICS. (2 cr; prereq regis med) King and staff
Principles of genetics and their application to human diseases.

5212. PSYCHE. (5 cr; prereq regis med) MacKenzie and staff
Normal development and the manner in which deviations lead to disordered behavior. Treatment methods, clinical presentations, and patient interview techniques.

5220. CARDIOVASCULAR. (3 cr; prereq regis med) Asinger and staff
Fundamental concepts in cardiovascular system pathophysiology and clinical application in diagnosis and management.

5221. RESPIRATORY. (3 cr; prereq regis med) Davies and staff
Clinical and laboratory applications of respiratory anatomy, pathology, physiology, pharmacology, and microbiology; essentials of normal respiration and respiratory disease.

5222. FLUID AND ELECTROLYTES. (3 cr; prereq regis med) Ehlers and staff
Fluid, electrolytes, and acid-base balance.

5223. KIDNEY AND URINARY TRACT. (3 cr; prereq regis med) Davidman and staff
Comprehensive review of anatomy, embryology, and pathophysiology in relation to renal function and disease processes affecting the organ system.

5224. ENDOCRINE AND METABOLISM. (4 cr; prereq regis med) Steffes and staff
Integrated basic science and clinical presentations in endocrinology and metabolism with emphasis on self-learning and group discussions.

5225. REPRODUCTION. (4 cr; prereq regis med) Foreman and staff
Human reproductive physiology, clinical problems and management, including practical consideration of contraception and population control.

5226. BLOOD. (3 cr; prereq regis med) Johnson and staff
Homeostatic mechanisms influencing cellular elements of blood and hemeostasis. Pathophysiology and study of hematologic disease, with emphasis on morphology. Includes laboratory studies and group discussions.

5227. SKIN. (2 cr; prereq regis med) Manick and staff
Study of biochemical, immunologic, microbiologic, and histopathologic disturbances in a variety of normal and abnormal processes affecting the integument.

5228. EAR, NOSE, AND THROAT. (2 cr; prereq regis med) Adams and staff
Pathophysiological mechanisms in relation to clinical medicine and the ear, nose, and throat.

5229. EYE. (2 cr; prereq regis med) Cantrill and staff
Anatomy, embryology, and physiology of the human eye; common ocular problems and management of the patient.

5230. NERVOUS SYSTEM AND MUSCLE DISORDERS. (5 cr; prereq regis med) Klassen and staff
A correlated presentation of clinical neurological science.

5231. GUT. (4 cr; prereq regis med) Soltis and staff
Normal function, pathophysiology, and clinical aspects of the gastrointestinal tract, liver, and pancreas.

5232. BONES, JOINTS, AND CONNECTIVE TISSUE. (4 cr; prereq regis med) House and staff
Integrated basic science and clinical approach to pathophysiology of disease affecting these tissues. Emergency room care, treatment of trauma, chronic care, and rehabilitation also emphasized.

5233. HUMAN SEXUALITY. (3 cr; prereq regis med) Satterfield and staff

5279. STUDENT AS PHYSICIAN—PATIENT ASSESSMENT TUTORIAL. (Cr ar; prereq regis med) Clawson and staff

5280. STUDENT AS PHYSICIAN—MEDICINE I TUTORIAL. (Cr ar; prereq regis med) Clawson and staff

5281. STUDENT AS PHYSICIAN—PEDIATRICS TUTORIAL. (Cr ar; prereq regis med) Clawson and staff

5282. STUDENT AS PHYSICIAN—OBSTETRICS-GYNECOLOGY TUTORIAL. (Cr ar; prereq regis med) Clawson and staff

5283. STUDENT AS PHYSICIAN—PSYCHIATRY TUTORIAL. (Cr ar; prereq regis med) Clawson and staff

5284. STUDENT AS PHYSICIAN—NEUROLOGY TUTORIAL. (Cr ar; prereq regis med) Clawson and staff

5285. STUDENT AS PHYSICIAN—SURGERY TUTORIAL. (Cr ar; prereq regis med) Clawson and staff

5286. STUDENT AS PHYSICIAN—FAMILY PRACTICE AND COMMUNITY HEALTH TUTORIAL. (Cr ar; prereq regis med) Clawson and staff

5287. STUDENT AS PHYSICIAN—PHYSICAL MEDICINE AND REHABILITATION TUTORIAL. (Cr ar; prereq regis med) Clawson and staff

5288. STUDENT AS PHYSICIAN—MEDICINE II TUTORIAL. (Cr ar; prereq regis med) Clawson and staff

5289. STUDENT AS PHYSICIAN—CHEMICAL DEPENDENCY TUTORIAL. (Cr ar; prereq regis med) Clawson and staff

5290f. LABORATORY MEDICINE. (Cr ar; prereq regis med) Bradley and staff

Laboratory Medicine and Pathology (LaMP)

Ellis S. Benson, M.D., professor and head

Professor

Eugene Ackerman, Ph.D.
Kahlil Ahmed, M.D.
W. Robert Anderson, M.D.
Miguel Azar, M.D., Ph.D.
Fritz Bach, M.D.
Henry Balfour, M.D.
Donna Blazevic, M.P.H.
David M. Brown, M.D.
Richard Brunning, M.D.
Barbara Burke, M.D.
John I. Coe, M.D.
Agustin Dalmasso, M.D.
Louis Dehner, M.D.
John Eaton, Ph.D.
Grace Mary Ederer, M.S.
J. Roger Edson, M.D.
Jesse Edwards, M.D.
Richard Estensen, M.D.
Esther F. Freier, M.S.
Kazimiera Gajl-Peczalska, M.D.
Leonard Greenberg, Ph.D.
Franz Halberg, M.D.
Erhard Haus, M.D., Ph.D.
Charles Horwitz, M.D.
Ruth Hovde, M.S.
John Kersey, M.D.
Paul H. Lober, M.D., Ph.D.
Jeffrey McCullough, M.D.
Herbert Polesky, M.D.
Verna Rausch, M.S.
Juan Rosai, M.D.
Andreas Rosenberg, Ph.D.
Michael Steffes, M.D., Ph.D.
R. Dorothy Sundberg, M.D., Ph.D.
Patrick C. J. Ward, M.D.
Lee W. Wattenberg, M.D.
James G. White, M.D.
Jorge J. Yunis, M.D.

Clinical Professor

Donald Gleason, M.D.

Associate Professor

Marilyn Bach, Ph.D.
G. Mary Bradley, M.D.
John Crosson, M.D.
Lynda Ellis, Ph.D.
Stanley Finkelstein, M.D.
Glauco Frizzera, M.D.
Leo Furcht, M.D.
Laël Gatewood, Ph.D.
Catherine Limas, M.D.
Patrick Manning, M.D.
Toni Mariani, Ph.D.
Robert McKenna, M.D.
Zoltan Posalaky, M.D.
Walter Runge, M.D.

Lorraine G. Stewart, M.S.
William Swaim, M.D.
Walid G. Yasmineh, Ph.D.

Clinical Associate Professor

Edward Segal, M.D.
Martin Segal, M.D.

Assistant Professor

Thomas Arlander, M.D.
Calvin Bandt, M.D.
Connie Clark, Ph.D.
Donald Connelly, M.D.
John Eckfeldt, M.D.
Stephen Ewing, M.D.
Danuta Giganti, Ph.D.
Robert Gruninger, M.D.
Seymour Handler, M.D.
Duane Hasegawa, M.D.
David Lakatua, M.D.
Paul Larson, M.D.
Stephen Marker, M.D.
Kiyoshi Mukai, M.D.
James O'Leary, M.D.
Garry F. Peterson, M.D.
Lance Peterson, M.D.
LoAnn Peterson, M.D.
Irene Posalaky, M.D.
Frank Rhame, M.D.
Robert E. Rydell, M.D.
Thomas Semba, M.D.
Richard Sibley, M.D.
Dale C. Snover, M.D.
Nancy Staley, M.D.
Robert Strom, M.D.
Thomas Swallen, M.D.
Michael Tsai, Ph.D.
Nancy Wang, M.D.
Charles Weigent, M.D.
Michael Wilson, Ph.D.
Bertram Woolfrey, M.D., Ph.D.
Kathryn Zieske, M.S.

Clinical Assistant Professor

Richard W. Anderson, M.D.
Henry Bates, M.D.
David Blomberg, M.D.
Leonard Crowley, M.D.
Robert N. Drake, M.D.
Ralph Franciosi, M.D.
Vincent Garry, M.D.
Thomas Hallin, M.D.
Charles Jarvis, M.D.
F. Donald Kapps, M.D.
Donn Leaf, M.D.
Joseph Leverone, M.D.
Frederick Lott, M.D.
Stephen Marker, M.D.
Donald Nollet, M.D.
John Raich, M.D.
Solomon Zak, M.D.

Instructor

Abraham T. Lin, M.D.
Daniel Savino, M.D.

Clinical Instructor

C. T. Anderson, M.D.
William Bendel, M.D.
Charles Chedister, M.D.
William A. Foley, M.D.
Abe Fox, M.D.
Craig Freeman, M.D.
J. Roald Fuglestad, M.D.
William Glenny, M.D.
Jerome Harty, M.D.
Norman Horns, M.D.
Allen Judd, M.D.
Nicola D. Kostich, M.D.
John E. Kyllo, M.D.
Richard P. Lynch, M.D.
Ellias N. Manoles, M.D.
Paul Nordlie, M.D.
Walter Subby, M.D.
Robert L. Woodburn, M.D.

Pathology is defined as the study of disease, and it constitutes a large proportion of the scientific basis for all clinical medicine. Courses offered by the Department of Laboratory Medicine and Pathology provide a common thread relating to all parts of the curriculum of study.

In Phase A, the General Pathology course introduces students to the major general principles of pathology, principles that are essential to the understanding of all disease processes including those related to cell injury, inflammation and repair, immunopathology, circulatory disturbances, metabolic and endocrine disorders, molecular and genetic pathology, and neoplasia. Examples of specific diseases are used to illustrate these principles, to prepare students for the study of specific diseases in Phase B. In Phase B, a separate course in laboratory medicine (InMd 5290) together with the systemic pathology covered in the major organ system courses help students acquire a thorough understanding of disease processes. In Phase D, the department contributes to all tracks and also provides its own pathway within the medical specialties track. Students are expected to learn and develop the ability to interpret laboratory data concerning the management of patients.

The major areas of the department include clinical chemistry, blood banking, hematology (with coagulation), diagnostic microbiology, surgical pathology, autopsy pathology, genetics, immunology, and computer medicine. In addition, there are many specialized laboratory divisions and research activities in which study may be elected.

REQUIRED COURSE

5101w,s. GENERAL PATHOLOGY. (Cr ar; prereq regis med fr or grad student, #)

ELECTIVE COURSES

General Courses in Anatomic Pathology

5150. ANATOMIC PATHOLOGY IN A HOSPITAL SETTING—University Hospitals. (Cr ar; prereq Phase B)
The student works in the anatomic pathology department taking part in autopsy pathology, surgical pathology, and clinicopathology correlation sessions.

5151. ANATOMIC PATHOLOGY IN A HOSPITAL SETTING—Hennepin County Medical Center. (Cr ar; prereq Phase B) Anderson
For a description, see 5150.

5152. ANATOMIC PATHOLOGY IN A HOSPITAL SETTING—Veterans Administration Hospital. (Cr ar; prereq Phase B) Weigent
For a description, see 5150.

5153. ANATOMIC PATHOLOGY IN A HOSPITAL SETTING—St. Paul-Ramsey Medical Center. (Cr ar; prereq Phase B) Posalaky
For a description, see 5150.

General Courses in Clinical Pathology

5186. LABORATORY MEDICINE IN A COMMUNITY HOSPITAL. (Cr ar; prereq Phase D) Bandt
Correlations between clinical presentations and laboratory results from the perspective of a busy general hospital clinical laboratory.

5187. INTERPRETATION OF LAB DATA—Mt. Sinai Hospital. (Cr ar; prereq #) Ward, Burke, Horwitz
Daily teaching sessions are conducted by three pathologists in the following areas: laboratory aspects and diagnosis of acid-base and electrolyte disturbances; hematologic and coagulative disorders; immunologic disorders; endocrinologic disease; enzymology and isoenzyme screening procedures; SMA12-60 chemical profile; renal disease; cerebrospinal fluid; synovial fluid.

5188. CLINICAL PATHOLOGY EXTERNSHIP—Methodist Hospital. (Cr ar; prereq #) E Segal, M Segal
Students study a variety of laboratory analyses in hematology, microbiology, chemistry, radioisotope use, and blood banking and accompany physicians on ward rounds. Individual cases involving cytology, surgery, and pathologic anatomy studied. Daily laboratory and weekly clinical conferences.

5189. APPLIED CLINICAL PATHOLOGY—St. Paul-Ramsey. (Cr ar; prereq Phase D) Haus, Lakatua
The background, uses, and limitations of frequently used clinical laboratory examinations. Appropriate choice and evaluation of laboratory testing in clinical medicine.

5190. LABORATORY MEDICINE IN A COMMUNITY HOSPITAL—Duluth. (Cr ar; prereq Phase D, #) D M Larson
Overview of the practice of laboratory medicine in a community hospital. Offered at St. Luke's Hospital, Duluth.

5192. LABORATORY MEDICINE FOR PRIMARY CARE—Virginia. (Cr ar; prereq Phase D)
Students participate in certain daily activities of the laboratory to learn what services are available, how they are provided, and how they are best utilized by primary care physicians. Through selected case studies students examine the cost-benefit aspects of laboratory services and how these services contribute to health care costs. Offered at Virginia Municipal Hospital, Virginia, Minnesota.

5193. CLINICAL PATHOLOGY EXTERNSHIP—Hibbing. (Cr ar; prereq #) Nollet
The student works directly with hospital pathologists in all phases of laboratory practice. Emphasis on close clinical correlations, with daily rounds of selected patients and review of all laboratory work. Surgical, cytologic, and autopsy pathology material available for review. Daily conference with clinicians and radiologists.

5201. DIAGNOSTIC LABORATORY PROCEDURES—University Hospitals. (Cr ar; prereq #) Bradley
Commonly performed office procedures practiced by the student—screening tests in hematology, urology, microbiology, and immunology. Chemical screening tests evaluated.

Courses in Specialized Subjects

5113. SURGICAL PATHOLOGY—University Hospitals. (Cr ar; prereq Phase B) Rosai
The student gains experience in the macroscopic and microscopic diagnosis of biopsy and surgical material.

5114. SURGICAL PATHOLOGY—Hennepin County Medical Center. (Cr ar; prereq Phase B) Anderson
For a description, see 5113.

5115. SURGICAL PATHOLOGY—Veterans Administration Hospital. (Cr ar; prereq Phase B) Limas
For a description, see 5113.

5116. CLINICAL AND SURGICAL PATHOLOGY CORRELATIONS—Basic Science Update. (Cr ar; prereq Phase D) Handler
Major divisions of clinical pathology (laboratory medicine) and a sampling of common surgical pathology situations, aiming at efficient use of the clinical laboratory for common problems

5118. ENDOCRINE PATHOLOGY—St. Paul-Ramsey Medical Center. (Cr ar; prereq Phase B, △) Haus, Lakatua
The correlation of clinical presentation, laboratory investigation, and pathologic findings concerning endocrine problems.

5119. FORENSIC PATHOLOGY—Medical Examiner's Office, Hennepin County Medical Center. (Cr ar; prereq Phase D) Coe
The function of a medical examiner's office in determining the cause and manner of types of death.

5125. CHRONOBIOLOGY. (Cr ar; prereq Phase B, #) Halberg
Implementation of chronobiologic medicine in the many instances in which it can prevent illness or save life in established disease.

5141. PROBLEMS IN EXPERIMENTAL PATHOLOGY. (Cr ar; prereq Phase B, #) Staff
Work in ongoing programs in the department. Topics under investigation include membrane structure and function, chemical carcinogenesis, viral carcinogenesis, and chronobiology. Any member of the staff will discuss a project on these topics.

5158. CARDIAC PATHOLOGY—Miller Hospital. (Cr ar; prereq Phase B, #)
Work with Dr. Jesse Edwards in the cardiac pathology laboratory.

5181. LABORATORY AND CLINICAL HEMATOLOGY. (Cr ar; prereq #) Brunning, Sundberg
Peripheral blood, bone marrow morphology, and other hematologic analyses are related to case studies. Clinical case conferences, hematology slide sessions, and ward rounds.

5182. LABORATORY STUDIES OF GENETIC DISORDERS. (Cr ar; prereq #) Eaton
Methods include cytogenetic analysis of chromosomes and a variety of biochemical genetic analyses. Individual discussions of cases and of laboratory methods.

5184. CLINICAL AND LABORATORY ASPECTS OF BLOOD TRANSFUSION. (Cr ar; prereq #) McCullough
Blood donor evaluation, blood collection, blood storage, and the clinical use of blood components. Suspected transfusion reactions, hemolytic diseases of the newborn, and other clinical problems studied using immunohematologic methods. Experience at the St. Paul Regional Red Cross Blood Center available.

5185. CLINICAL AND LABORATORY BLOOD COAGULATION. (Cr ar; prereq #) Edson
Includes laboratory methods in the study of coagulative disorders, clinical ward rounds, individual case studies, conferences, and hematology rounds.

5194. COMPUTER APPLICATIONS IN MEDICINE. (Cr ar; prereq #) Gatewood
Current and anticipated uses of electronic computers. Opportunity to use a variety of computer terminals, but emphasis is on reading and seminars. Seminars include the postdoctoral and advanced predoctoral students in the Division of Health Computer Sciences.

5195. COMPUTER APPLICATIONS IN MEDICAL RESEARCH. (Cr ar; prereq #) Gatewood
Students observe operation of the nine computer facilities currently used for medical research, including monitoring in the intensive care ward and in radiation therapy. The roles of computers in current and future medical research studied through reading and special seminars.

5198. HEMATOLOGY—St. Paul-Ramsey Medical Center. (Cr ar; prereq #) Staff
Peripheral blood, bone marrow morphology, and other hematologic procedures are correlated with clinical cases in the Hematology Clinic. Routine hematologic procedures and the aspiration and preparation of bone marrow.

5203. CLINICAL BLOOD BANK IMMUNOLOGY—Minneapolis War Memorial Blood Bank. (Cr ar; prereq #) Polesky
Laboratory analyses in blood banking and practical problems of blood bank immunology; clinical problems included. Conferences, study of individual cases, and investigation of practical problems.

Lecture Courses and Seminars—Predominantly for Students in the Phase D Basic Science Track and in Other Graduate Programs

5103. PRINCIPLES OF DIAGNOSTIC MICROBIOLOGY. (3 cr; prereq MdBc 3103 and 5232 or #) Blazevic, Ederer

5104. AUTOPSIES. (Cr ar; prereq Phase B) Staff

5106. DISEASES OF THE HEART. (1 cr; prereq Phase B) Edwards

5110. SEMINAR: PATHOLOGY. (1 cr; prereq Phase B)

5111. CONFERENCE ON AUTOPSY HISTOPATHOLOGY. (1 cr; prereq Phase B) Staff

5122. BASIC SCIENCE OF CANCER. (Cr ar; prereq Phase B) Wattenberg

5133f. MEDICAL MYCOLOGY. (3 cr; hrs ar; prereq medical microbiology, diagnostic microbiology or #) Blazevic
Laboratory diagnosis of infections caused by yeast, dermatophytes, and systemic fungi.

5136su. ANAEROBIC BACTERIOLOGY. (4 cr; prereq biochemistry, medical microbiology, diagnostic microbiology or #) Blazevic
Anaerobic respiration in bacteria. Methods of anaerobic culture. Taxonomy and classification of anaerobes. Biochemical and gas chromatographic differentiation of anaerobes. The role of anaerobes in disease.

5138. CLINICAL MICROBIOLOGY SEMINAR. (1 cr; prereq #) Blazevic, Ederer

5160. HUMAN CYTOGENETICS. (3 cr; prereq #; offered 1982 and alt yrs) J Yunis
Chromosome structure and function and genetic and clinical problems associated with the study of human chromosomes.

5161s. HUMAN CYTOGENETICS LABORATORY. (2 cr; prereq #; offered 1982 and alt yrs) J Yunis and staff
Techniques for study of mammalian and human chromosomes: cell culture, autoradiography, new techniques for chromosome identification, and chromosome isolation techniques.

5162s. HUMAN BIOCHEMICAL GENETICS. (3 cr; prereq #; offered 1982 and alt yrs) Eaton
Molecular and genetic basis of genetic traits in mammals.

5163s. HUMAN BIOCHEMICAL GENETICS LABORATORY. (Cr ar; prereq #; offered 1982 and alt yrs) Eaton

5166. FORENSIC PATHOLOGY. (2 cr; prereq Phase B) Coe

5270f. IMMUNOHEMATOLOGY. (3 cr) Azar
The immune response. Blood cells as antigens. Antibodies to blood groups and mechanisms of their reactions. White cells as antigens and antibodies. Autoimmune hemolysis. Humoral and cellular factors in immunohematology.

5271f. IMMUNOHEMATOLOGY LABORATORY. (2 cr; prereq 5272 or #) Azar, McCullough, Swanson

5274s. MOLECULAR ASPECTS OF IMMUNOLOGY. (3 cr; prereq #) Dalmasso
Chemistry and pathobiology of immunoglobulins, complement, cell membrane, and mediators of anaphylaxis and cellular immunity.

5765f, 5766w. HEMATOLOGY. (4 cr per qtr, §Anat 5765-5766; prereq #) Sundberg and staff
Blood and blood-forming organs; blood and bone marrow from the standpoint of diagnosis and prognosis.

5767s. HEMATOLOGY SEMINAR. (1 cr, §Anat 5767; prereq #) Brunning, Edson, Sundberg

Medicine (Med)

Thomas F. Ferris, M.D., professor and head

Regents' Professor Emeritus

Cecil J. Watson, M.D.

Professor Emeritus

Richard Ebert, M.D.
Wesley W. Spink, M.D.

Professor

David W. Allen, M.D.
V. Elving Anderson, M.D.
Robert Bache, M.D.
Henry W. Blackburn, Jr., M.D.
Joseph Bloomer, M.D.
Clara Bloomfield, M.D.
John Bond, M.D.
J. Cervenka, M.D.
Elliot Chesler, M.D.
Jay N. Cohn, M.D.
Richard P. Doe, M.D., Ph.D.
Charles W. Drage, M.D.
John Eaton, M.D.
Ivan D. Frantz, Jr., M.D.
N. L. Gault, Jr., M.D.
Frederick C. Goetz, M.D.
Wendell H. Hall, M.D., Ph.D.
Russell Hanson, M.D.
Robert B. Howard, M.D.
Robert B. Howe, M.D.
Harry S. Jacob, M.D.
Maynard E. Jacobson, M.D.
Manuel E. Kaplan, M.D.
B.J. Kennedy, M.D., M.S.
Carl M. Kjellstrand, M.D.
Richard S. Kronenberg, M.D.
John LaBree, M.D.
Michael D. Levitt, M.D.
Frank M. MacDonald, M.D.
Ronald Messner, M.D.
Robert O. Mulhausen, M.D., M.S.
M. John Murray, M.D.
Frank Q. Nuttall, M.D., Ph.D.
Jack Oppenheimer, M.D.
L. D. Sabath, M.D.
George A. Sarosi, M.D.
Alvin L. Schultz, M.D.
Samuel Schwartz, M.D., Ph.D.
Fred Shapiro, M.D.
John Sheppard, M.D.
Stephen E. Silvis, M.D.
Werner Simon, M.D.

Luigi Taddeini, M.D.
Athanasios Theologides, M.D., Ph.D.
Louis Tobian, Jr., M.D.
Naip Tuna, M.D.
Jack Vennes, M.D.
Yang Wang, M.D.
I. Dodd Wilson, M.D.
Leonard G. Wilson, M.D.
C. Paul Winchell, M.D.
Esmail Zanjani, M.D.
Leslie Zieve, M.D., Ph.D.

Clinical Professor

Rolf L. Andreassen, M.D.
Paul J. Bilka, M.D.
Robert D. Blomberg, M.D.
David M. Craig, M.D.
James L. Craig, M.D.
James C. Dahl, M.D.
Robert E. Doan, M.D.
William Fifer, M.D.
John H. Flinn, M.D.
Benjamin F. Fuller, Jr., M.D.
Albert J. Greenberg, M.D.
Mark C. L. Hanson, M.D.
Wilbert J. Henke, M.D.
Howard Horns, M.D.
Kjeld Husebye, M.D.
Arnold Kaplan, M.D.
Michael Levy, M.D.
James L. McKenna, M.D.
James G. Myhre, M.D.
William O'Brien, M.D.
Paul D. Redleaf, M.D.
Fred A. Rice, M.D.
Dean K. Rizer, M.D.
Francis B. Tiffany, M.D.
Lowell W. Weber, M.D.

Associate Professor

Jose Barbosa, M.D.
Richard Branda, M.D.
Robert B. Breitenbucher, M.D.
Brian C. Campion, M.D.
Christina M. Comty, M.D.
Kent Crossley, M.D.
William Duane, M.D.
Arthur H. L. From, M.D.
Dale Gerding, M.D.
Richard F. Gillum, M.D.
Morrison Hodges, M.D.
James Hoffman, M.D.
John R. Hoidal, M.D.
Jordan L. Holtzman, M.D.
Donald B. Hunninghake, M.D.
Gerhard Johnson, M.D.
J. Richard Johnson, M.D.
Neil E. Kay, M.D.
Mohammed Khan, M.D.
David T. Kiang, M.D.
Richard A. King, M.D.
Robert Knodell, M.D.
Constance Limas, M.D.
Robert J. McCollister, M.D.
Charles R. Moldow, M.D.
John E. Morley, M.D.
Dennis E. Niewoehner, M.D.
Gerald R. Onstad, M.D.
Phillip Peterson, M.D.
Claus A. Pierach, M.D.
Michael Popkin, M.D.
Leopoldo Raij, M.D.
Harold L. Schwartz, Ph.D.
Rex B. Shafer, M.D.
Ronald D. Soltis, M.D.
William R. Swaim, M.D.
Edward Weir, M.D.

Clinical Associate Professor

Robert L. Altman, M.D.
Alfred F. Anderegg, M.D.
Thomas B. Arnold, M.D.
Thomas C. Bagnoli, M.D.
David Berman, M.D.
Malcolm N. Blumenthal, M.D.
Paul F. Bowlin, M.D.
David C. Brown, M.D.
John H. Brown, M.D.
Erskine M. Caperton, Jr., M.D.
Joseph Cardamone, M.D.
Roger S. Colton, M.D.
Kenneth Dedeker, M.D.
Jerome W. Dougan, M.D.
Donald A. Duncan, M.D.
Ronald W. Ellis, M.D.
Rodney W. England, M.D.
Ignacio E. Fortuny, M.D.
Richard J. Frey, M.D.
Fredarick L. Gobel, M.D.
Benjie Goldfarb, M.D.
Earl Hill, M.D.
William H. Hollingshead, M.D.
Wayne L. Hoseth, M.D.
Milton M. Hurwitz, M.D., M.S.
Charles Jacobson, M.D.
Herbert W. Johnson, M.D.
Charles Jorgensen, M.D.
David G. Jones, M.D.
Harold B. Kaiser, M.D.
Everett H. Karon, M.D.
James H. Kelly, M.D.
Joseph R. Kelly, M.D.
Allan C. Kind, M.D.
Edward Kraus, M.D.
Irving J. Lerner, M.D.
John I. Levitt, M.D.
F. Bruce Lewis, M.D.
James P. Lillehei, M.D.
Robert E. Lindell, M.D.
Charles M. Lindemann, M.D.
Michael Lobell, M.D.
Paul T. Lowry, M.D.
James C. Mankey, M.D.
Dwight L. Martin, M.D.
Frank E. Martin, M.D.
Leonard Mastbaum, M.D.
Todd C. Miller, M.D.
Gerald T. Mullin, M.D.
Charles L. Murray, M.D.
S. Scott Nicholas, M.D.
William J. Paule, M.D.
William E. Petersen, M.D.
Charles R. Peterson, M.D.
Richard A. Pfohl, M.D.
Phillip Ranheim, M.D.
William D. Remole, M.D.

Harold G. Richman, M.D.
Eugene Rinkey, M.D.
Lawrence A. Savett, M.D.
Raymond W. Scallen, M.D.
Leonard D. Schloff, M.D.
William F. Schoenwetter, M.D.
Burton Schwartz, M.D.
Robert Scott, M.D.
Marvin Segal, M.D.
Henry T. Smith, M.D.
Paul Steinberg, M.D.
Wayne Stern, M.D.
Donald B. Swenson, M.D.
William B. Torp, M.D.
Richard B. Tregilgas, M.D.
Frank A. Ubel, Jr., M.D.
Robert VanTassel, M.D.
Kyuhyun Wang, M.D.
Richard M. Warhol, M.D.
Stephen C. Weisberg, M.D.
David Williams, M.D.

Assistant Professor

Samuel Ackerman, M.D.
Arnold Adicoff, M.D.
Uma Alladi, M.D.
Richard W. Asinger, M.D.
Silvia H. Azar, M.D.
John Bantle, M.D.
Hans Bauer, M.D.
Michael Belzer, M.D.
David G. Benditt, M.D.
Robert Berkseth, M.D.
Jesus Bianco, M.D.
Philip Bloom, M.D.
Thomas Bloss, M.D.
David C. Brown, M.D.
Milton L. Bullock, M.D.
Manuel G. Cosio, M.D.
Richard S. Crow, M.D.
Terry W. Crowson, M.D.
Russell Curry, M.D.
Morris Davidman, M.D.
Scott Davies, M.D.
Thomas Davin, M.D.
Alfred Doscherholmen, M.D., Ph.D.
John J. Drucker, M.D.
Sally M. Ehlers, M.D.
James Ewing, M.D.
Mary Forcia, M.D.
Gary Francis, M.D.
Linda L. Francisco, M.D.
Juan Fried, M.D.
Joyce L. Funke, M.D.
Roger L. Gebhard, M.D.
Michael Goodman, M.D.
Kathryn A. Hale, M.D.
Samuel W. Hall, M.D.
Dale Hammerschmidt, M.D.
Barry S. Handwerger, M.D.
David Hanley, M.D.
James Hatch, M.D.
Daniel E. Hathaway, M.D.
Robert Hebbel, M.D.
John Heefner, M.D.
Neal Holtan, M.D.
William Hrushesky, M.D.
David Hurd, M.D.
Patrick W. Irvine, M.D.
Paul B. Johnson, M.D.
John A. Juers, M.D.
Lawrence R. Kaplan, M.D.
William F. Keane, M.D.
Mohammed Khan, M.D.
Douglas L. Kjellsen, M.D.
William P. Korchik, M.D.
Thomas Kottke, M.D.
T. Barry Levine, M.D.
Edith Leyasmeyer, Ph.D.
Linda A. Long, M.D.
Russell V. Luepker, M.D.
King-Wai Ma, M.D.
Thomas MacKenzie, M.D.
James Madison, M.D.
Maren L. Mahowald, M.D.
Cary N. Mariash, M.D.
David C. Martin, M.D.
Donald S. Masler, M.D.
John W. McBride, M.D.
Craig McClain, M.D.
Philip McGlave, M.D.
Robert Nesheim, M.D.
Martin M. Oken, M.D.
Robert C. Olson, M.D.
Thomas A. Ophoven, M.D.
Bruce A. Peterson, M.D.
Lance Peterson, M.D.
Phillip K. Peterson, M.D.
Robert A. Petzel, M.D.
Gordon Pierpont, M.D.
James Pries, M.D.
Koppanadham V. Rao, M.D.
Eugene P. Reese, Jr., M.D.
Frank Rhame, M.D.
Terry Rosborough, M.D.
Jeffrey S. Schwartz, M.D.
Bimlendra Sharma, M.D.
Geza Simon, M.D.
Lars Skoldstam, M.D.
Charles Smith, M.D.
Michael T. Spilane, M.D.
Norman Steinberg, M.D.
M. Thomas Stillman, M.D.
David A. Stuart, M.D.
Padub Sukhum, M.D.
Joel D. Taurog, M.D.
Robert Tofte, M.D.
Harold C. Towle, M.D.
Tryg Velde, M.D.
Paul Waytz, M.D.
David Zoschke, M.D.

Clinical Assistant Professor

Richard F. Adair, M.D.
Thomas W. Amsden, M.D.
Harold T. Arneson, M.D.
Frederick D. Arny, M.D.
David C. Bartisch, M.D.
John Baumgartner, M.D.
Jack G. Beaird, M.D.
Gregory Beall, M.D.
Richard Beck, M.D.
Alphonso A. Belsito, M.D.
William J. Bergstrom, M.D.
Stuart H. Borken, M.D.
Thomas Braxton, M.D.
Arnold M. Brier, M.D.
Robert Burmaster, M.D.

Conrad S. Butwinick, M.D.
Kenneth Caldwell, M.D.
William Callahan, M.D.
David J. Carlson, M.D.
Samuel Carlson, M.D.
Cecil H. Chally, M.D.
Thaddeus Chao, M.D.
Victor Corbet, M.D.
James Daniel, M.D.
Charles Dash, M.D.
Paul Dickinson, M.D.
Ronald C. Eggert, M.D.
Hans Engman, M.D.
John G. Fee, M.D.
Jeffrey Felt, M.D.
Vincent L. Fromke, M.D.
Carl R. Guiton, M.D.
Paul R. Hamann, M.D.
A. Stuart Hanson, M.D.
David Hanson, M.D.
William L. Hedrick, M.D.
Katherine Hiduschenko, M.D.
Neil R. Hoffman, M.D.
Frank J. Indihar, M.D.
Bruce Jacobson, M.D.
Randall Johnson, M.D.
Lawrence Kaplan, M.D.
Lorraine Kretchman, M.D.
Catherine H. Lang, M.D.
Jerrold V. Larson, M.D.
Robert B. Lasser, M.D.
Elliot M. Latts, M.D.
Herbert Lauritzen, M.D.
Wayne Leebaw, M.D.
James D. Lehmann, M.D.
Jeanette K. Lowry, M.D.
John C. Manion, M.D.
Raymond L. Maracek, M.D.
Aaron L. Mark, M.D.
C. Paul Martin, M.D.
Thomas Martin, M.D.
Eugene McCrery, M.D.
Byron C. McGregor, M.D.
Ambrosio Medina, M.D.
Paul T. Moran, M.D.
Richard Morris, M.D.
Donn G. Mosser, M.D.
Beatrice Mulford, M.D.
Lawrence Mulmed, M.D.
Thomas F. Mulrooney, M.D.
Richard R. Nelson, M.D.
William F. Nuessle, M.D.
William B. Ogden, M.D.
Eugene Ollila, M.D.
David Paulson, M.D.
Ronald J. Pizinger, M.D.
Fred Rasp, M.D.
James Reinertsen, M.D.
Thomas Rose, M.D.
James Rubin, M.D.
Kusum Saxena, M.D.
Lawrence Schuster, M.D.
Robert H. Scott, M.D.
Surendra Sethi, M.D.
James R. Shanks, M.D.
John S. Shronts, M.D.
James C. Smith, M.D.
Louis H. Stahn, M.D.
George Strauss, M.D.
Richard R. Sturgeon, M.D.
Joseph M. Tombers, M.D.
Frank Tycast, M.D.
David Vagneur, M.D.
Richard Wahlstrom, M.D.
William E. Walsh, M.D.
Helen Wang, M.D.
John A. Wangsness, M.D.
Harold M. Wexler, M.D.
James Wiberg, M.D.
Stephen Zuckerman, M.D.

Instructor

Allan Collins, M.D.
Dennis Doorneweerd, M.D.
Paul Dorsher, M.D.
Craig Elliot, M.D.
David Ernst, M.D.
Franklin Fleming, M.D.
Thomas Flynn, M.D.
Daniel Francisco, M.D.
David Griffin, M.D.
Daniel Hankins, M.D.
Linda Hedemark, M.D.
John Kleinman, M.D.
Mary Leida, M.D.
Jonathon Li, M.D.
Roger Luckmann, M.D.
Frank Mikell, M.D.
Wesley Miller, M.D.
Carrie Jo Nelson, M.D.
Rolf Paulson, M.D.
Paul Pentel, M.D.
Eugene Rich, M.D.
Susan Schwartz, M.D.
Donald Somers, M.D.
Richard Terry, M.D.

Clinical Instructor

Madeline M. Adcock, M.D.
Lowell Becker, M.D.
Theodore Berman, M.D.
Michael Bozivich, M.D.
Robert Bundtzen, M.D.
Robert A. Coates, M.D.
Thomas E. Davis, M.D.
K. James Ehlen, M.D.
Elliot Francke, M.D.
Donald Gehig, M.D.
Gary Hanovich, M.D.
Wayne Hass, M.D.
Mark I. Hewitt, M.D.
Priscilla Hollander, M.D.
Roger L. Johnson, M.D.
Victor Kelmensen, M.D.
John P. Kieley, M.D.
William Kimber, M.D.
Charles P. Kolars, M.D.
Stuart Lancer, M.D.
Norman Lazerow, M.D.
Frank G. Lushine, M.D.
Gordon L. McKinlay, M.D.
Charles Meyer, M.D.
Michael I. Neren, M.D.
Jerrol Noller, M.D.
David B. Plimpton, M.D.
John Raines, M.D.
Jonathan Rogers, M.D.
Joseph M. Ryan, M.D.

Kamal K. Sahgal, M.D.
Mark J. Schmidt, M.D.
David J. Scott, M.D.
Richard D. Shank, M.D.
Mark Sharon, M.D.
Thomas Smith, M.D.
Cheryle D. Southern, M.D.
Jerrold M. Stempel, M.D.
Elizabeth Styrvoky, M.D.
Victor Tschida, M.D.
Ronald R. Vessey, M.D.
David E. Weinberg, M.D.
James J. Wheeler, M.D.
F. Douglas Whiting, M.D.
Paul E. Youngquist, M.D.
Daniel Zydowicz, M.D.

ELECTIVE COURSES

5500. ADVANCED INTERNAL MEDICINE. (9 cr per period; offered all periods) Ferris
Students care for patients on the inpatient services. Focus is on therapy and treatment in one or two of the major subspecialties of medicine.

5501. MEDICAL ONCOLOGY INTERNSHIP IN MEDICINE. (9 cr per period; offered all periods) Kennedy
Training in internal medicine with emphasis on the total care of patients with cancer. Students, as interns, have direct patient responsibilities.

5502. MEDICINE EXTERNSHIP. (9 cr per period; offered all periods) Rosborough
The diagnosis, treatment, and management of patients on medical wards, allowing students as much individual patient care responsibility as possible.

5503. MEDICINE EXTERNSHIP II. (9 cr per period; offered all periods) Howard
Provides experience in the overall management of internal medicine inpatients.

5504. MEDICINE EXTERNSHIP. (9 cr per period; offered all periods) Wang
Provides experience in the overall management of internal medicine inpatients in a community hospital.

5505. INFECTIOUS DISEASE RESEARCH. (9 cr; offered all periods) Sabath
Examination in depth of a clinical or laboratory problem related to infectious diseases.

5506. MEDICINE SUBINTERNSHIP. (Cr ar; periods offered ar) Rosborough
Students act as interns working directly with a resident sharing responsibility of patient care with another subintern.

5509. RESEARCH IN IMMUNOLOGY—RHEUMATOLOGY. (9 cr per period) Handwerger/Messner
Research in rheumatology with emphasis on immune mechanisms of injury, inflammatory reactions, innovative therapeutic trials in induced disease. Broad latitude allowed student in designing individual research project. Multidisciplinary approach encouraged.

5511. RESEARCH IN GASTROENTEROLOGY. (9 cr per period; offered all periods) Levitt
Students carry on an active research program under the direction of a staff member in the Gastroenterology Section.

5512. RESEARCH IN HEMATOLOGY. (9 cr; offered all periods) Jacob
Research on a problem or problems currently under investigation in hematology.

5518. RESEARCH IN ENDOCRINOLOGY. (9 cr per period; offered all periods) Oppenheimer
Students plan and execute a research project under the supervision of a faculty member in the Endocrinology Section.

5520. INFECTIOUS DISEASE, ALLERGY, AND CLINICAL IMMUNOLOGY. (9 cr per period; offered period 7 only) Sabath
Didactic instruction in the major infectious and allergic diseases, their clinical recognition, and management pertaining to all of the specialties and subspecialties. Students should acquire a basic and practical working knowledge of immunobiology.

5521. INFECTIOUS DISEASE, CLINICAL ASPECTS, AT THE UNIVERSITY HOSPITALS. (9 cr per period; offered all periods) Sabath
Students participate in clinical evaluation and management of inpatient problems, attend formal conferences, and observe the role of the clinical microbiology laboratory in investigation of infectious disease.

5522. MEDICAL GASTROENTEROLOGY. (9 cr per period; offered all periods) Olson
Students do workups and attend teaching rounds dealing with patients with gastrointestinal disease. Includes conferences and outpatient clinical experience.

5523. MEDICAL ENDOCRINOLOGY AND METABOLISM. (9 cr per period; offered all periods) Barbosa
Introductory experience in clinical endocrinology and metabolic disease. Emphasis on clinical diagnosis, efficient and incisive workups, and clinical management in both inpatient and outpatient settings.

5525. CARDIOVASCULAR MEDICINE. (9 cr per period) Bache
Introduction to the diagnosis and management of cardiovascular disease occurring in adult patients.

5527. CONTEMPORARY PROBLEMS IN INVESTIGATIVE CARDIOLOGY. (9 cr per period; offered all periods) Bache
Acquaints students with investigative activities currently under way in several areas of cardiovascular medicine in which important gaps of knowledge presently exist.

5528. CLINICAL HEMATOLOGY. (9 cr per period; offered all periods) Howe
Clinical and research aspects of hematology. Course is structured to the student's specific goals, but generally the student is given initial responsibility for proposing diagnosis and treatment plans for patients with hematologic illnesses.

5531. CLINICAL RHEUMATOLOGY. (9 cr per period; offered all periods) Hathaway
Emphasis on clinical aspects of diseases of rheumatic and immunologic nature including the broad areas of collagen disease, autoimmune disease, and all types of arthritic and musculoskeletal disease.

5532. PULMONARY DISEASE. (9 cr per period; offered all periods) Kronenberg
Emphasis on evaluation of clinical pulmonary problems and pathophysiology of pulmonary disease. Pulmonary physiology is taught in the pulmonary function laboratories and correlated with clinical data and chest X-rays.

5533. CLINICAL ALLERGY AT UNIVERSITY HOSPITALS. (4.5 or 9 cr; offered all periods; hrs ar) Blumenthal
Emphasis on the practical features of doing an allergic and immunologic workup and of treating patients in a safe and medically acceptable fashion.

5542. RESEARCH IN PULMONARY DISEASE. (9 cr per period; offered all periods) Kronenberg
Opportunity to pursue a clinical or laboratory problem related to pulmonary disease. Students learn how to appropriately select a problem for study, formulate a hypothesis, acquire data, and develop appropriate conclusions.

5548. CLINICAL GENETICS. (9 cr per period; offered all periods) King
Students learn the fundamentals of clinical genetics including cytogenetics, biochemical genetics, and genetic counseling and develop an understanding of the application of genetic principles to clinical medicine.

5554. FLUID ELECTROLYTE AND ACID-BASE METABOLISM. (9 cr per period; offered all periods) Ma
Prevention, diagnosis, and treatment of acid-base (A/B) and fluid and electrolyte (F/E) disorders. Evaluation of acute and chronic renal failure. Students will be members of a consulting team that evaluates patients with A/B and F/E abnormalities associated with a variety of medical and surgical diseases.

5556. MEDICAL NEPHROLOGY AT UNIVERSITY HOSPITALS. (9 cr per period; offered all periods) Ferris
Students gain proficiency in the diagnostic workup, treatment, and management of kidney patients.

5557. RESEARCH IN NEPHROLOGY. (18 cr; offered all periods) Francisco
Research, particularly clinical research, in nephrology.

5562. MEDICAL NEPHROLOGY. (9 cr per period; offered all periods) Rao
Clinical problems in the diagnosis and management of patients with renal disease.

5570. CLINICAL MEDICINE ON THE GENERAL CLINICAL RESEARCH CENTER. (9 cr per period; offered all periods) Bantle
Students learn accepted methods of clinical research involving human subjects and share in primary care of adult and pediatric patients with a variety of disorders.

5572. AMBULATORY MEDICINE AT ST. PAUL-RAMSEY MEDICAL CENTER. (9 cr per period; offered all periods) Spilane
Training in the ambulatory care of patients with health care problems in the areas of general internal medicine and subspecialty internal medicine.

5573. EXTERNSHIP IN GERIATRIC MEDICINE AT ST. PAUL-RAMSEY MEDICAL CENTER. (9 cr per period: offered all periods) Irvine
Students learn the general principles of geriatric medicine and apply these principles to primary health care for older adults in multiple health care settings.

5574. CRITICAL CARE IN INTERNAL MEDICINE AT HENNEPIN COUNTY MEDICAL CENTER. (9 cr per period; offered all periods) Schultz
Provides students with a broad and comprehensive experience in the management of critically ill patients on the Medical Intensive Care Services.

5575. AMBULATORY CARE MEDICINE AT HENNEPIN COUNTY MEDICAL CENTER. (9 cr per period; offered all periods) Bloss
Provides students with experience in the management of ambulatory patients with general internal medical problems.

5583. DIAGNOSIS, EVALUATION, AND CARE OF ADULTS AND CHILDREN WITH CANCER. (9 cr per period; offered all periods) Ramsay
Current concepts of management and the results of therapy for common malignancies. The cooperative role of various disciplines in the management of the cancer patient.

5589. MEDICINE EXTERNSHIP II. (9 cr per period; offered all periods) Goldish
Provides students with experience in the diagnosis and management of hospitalized internal medicine patients at St. Luke's Hospital in Duluth.

5590. PRECEPTORSHIP IN INTERNAL MEDICINE. (9 cr per period; offered all periods) Murray
Students examine and participate in medical practices in a setting different from the large institution, working with physicians by arrangement in either rural or city practices.

5592. RURAL PHYSICIAN ASSOCIATE PROGRAM IN INTERNAL MEDICINE. (Cr ar; offered 9 or 12 months) Howe
Provides students with experience as a full-time associate to practicing physicians and preceptors who provide primary care in a rural clinic setting.

5594. PSYCHIATRY IN MEDICINE: CONSULTATION-LIAISON. (9 cr per period; offered all periods) Popkin
Psychiatric knowledge and skills integral to the holistic practice of medicine. Emphasis on the practical benefits and utility of psychiatric perspectives and interventions in the general medical setting.

5595. PSYCHOLOGICAL ASPECTS OF MEDICAL PRACTICE. (Cr ar; offered all periods) Nesheim
Designed to provide a bridge linking medical diagnosis and treatment as well as psychological evaluation with the goals of teaching and improving comprehensive medical care.

5596. OCCUPATIONAL HEALTH. (4.5 cr per period; offered fall quarter [period 4A] Johnson
Provides students with the rudimentary skills necessary for the recognition, evaluation, and treatment of occupationally related injury and illness.

5597. RESEARCH IN OCCUPATIONAL HEALTH. (9 cr per period; offered all periods) Johnson
Opportunity to develop research interests and acquire special knowledge and skills in occupational medicine.

Microbiology (MicB)

Dennis W. Watson, Ph.D., regents' professor and head

Professor

Arthur Johnson, M.D., *head, UMD*[1]
Roy E. Ritts, Jr., M.D., *chairman, Mayo Graduate School of Medicine*[2]
Dwight L. Anderson, Ph.D.
K. Gerhard Brand, M.D.
Francis Busta, Ph.D.
Peter Chapman, Ph.D.
Martin Dworkin, Ph.D.
David P. Fan, Ph.D.
Anthony J. Faras, Ph.D.
V. W. Greene, Ph.D.
W. H. Hall, M.D., Ph.D.
Thomas Hamilton, M.D.
Alan B. Hooper, Ph.D.
Howard M. Jenkin, Ph.D.[3]
Russell C. Johnson, Ph.D.
Frederic C. McDuffie, M.D.[2]
Gerald M. Needham, Ph.D.[2]
Peter G. W. Plagemann, Ph.D.
Paul Quie, M.D.
Palmer Rogers, Ph.D.
Charles Schachtele, Ph.D.
Edwin L. Schmidt, Ph.D.
Richard L. Simmons, M.D.
Henry M. Tsuchiya, Ph.D.
Lewis W. Wannamaker, M.D.
John A. Washington II, M.D.

Associate Professor

Peter Chapman, Ph.D.
P. Patrick Cleary, Ph.D.
Ronald Crawford, Ph.D.
Gregory Germaine, Ph.D.
Gerald Gleich, M.D.[2]
Beulah H. Gray, Ph.D.
Bruce Kline, Ph.D.[2]
Omelan Lukasewycz, Ph.D.[1]
Harold Markowitz, M.D., Ph.D.[2]
Gary Pearson, Ph.D.[2]
James T. Prince, M.S.
Bernard E. Reilly, Ph.D.
Richard J. Ziegler, Ph.D.[1]
James F. Zissler, Ph.D.

Assistant Professor

Russell F. Bey, Ph.D.
Robert Click, Ph.D.
Thomas Fitzgerald, Ph.D.
Barry Handwerger, Ph.D.
Robert Nelson, Ph.D.
Patrick Schlieret, Ph.D.
H. C. Tsien, Ph.D.
Robert Wonlheuter, Ph.D.

Lecturer

Donna J. Blazevic, M.P.H.
William Campbell, Ph.D.[2]
Grace Mary Ederer, M.P.H.
William Liljemark, D.D.S., Ph.D.
Larry McKay, Ph.D.
Charles Muscoplat, Ph.D.

Microbiology for freshman medical students covers the principles and techniques necessary to understand host-parasite relationships and the pathogenesis of infectious diseases. The application of microbiology to medical diagnosis guides the future physician in the treatment and prevention of infectious diseases and in the use of chemotherapeutic and antibiotic agents. In the lecture portion of the course, basic principles in medical immunology, parasitology, mycology, bacteriology, and virology are reviewed. Through laboratory experience the future clinician learns to interpret laboratory results as well as to appreciate the need for cooperation between the physician and the diagnostic laboratory.

[1]University of Minnesota, Duluth
[2]Mayo Graduate School of Medicine
[3]Hormel Institute

Elective courses are offered to medical students during their second through fourth years of school. These courses present advanced studies and in-depth treatment of such topics as basic microbiology, immunobiology, immunochemistry, virology, microbial physiology, and mechanisms of pathogenicity.

REQUIRED COURSES

5205s.[1] **BASIC AND MEDICAL ASPECTS OF MICROBIOLOGY FOR MEDICAL STUDENTS.** (6 cr; prereq regis med fr) Brand and staff
Basic and medical aspects of immunology, parasitology, mycology, medical bacteriology, and virology with emphasis on pathogenesis. Principles and techniques for diagnosis, treatment (especially chemotherapy), and prevention of infectious disease.

5206su.[1] **BASIC AND MEDICAL ASPECTS OF MICROBIOLOGY FOR MEDICAL STUDENTS.** (4 cr)
(Continuation of 5205) Lecture and laboratory.

ELECTIVE COURSES

The following microbiology courses are available on a quarterly basis to medical students.

5105f.[1] **BIOLOGY OF MICROORGANISMS.** (4 cr, §3103, §Biol 3013; prereq 5 cr biological sciences, Biol 3021 or #) Dworkin
Lectures, demonstrations, and laboratory exercises in taxonomy, anatomy, physiology, biochemistry, and ecology of microbes. Molecular structure in relation to bacterial function.

5106s. ADVANCED GENERAL MICROBIOLOGY LABORATORY. (3 cr; prereq 5105 or equiv) Dworkin
Emphasizes the isolation from natural sources of a variety of microorganisms such as *Clostridium*, yeast, *Caulobacter*, Myxobacteria, *Leptospira*, photosynthetic bacteria, *Bdellovibrio*, luminescent bacteria, and others. Laboratory only.

5216f. IMMUNOLOGY. (4 cr; prereq Biol 3021) Schlievert
Nature of antigens and antibodies; chemical basis of serologic specificity; qualitative and quantitative aspects of antigen-antibody reactions; theories of antibody production; cellular antigens and blood grouping; nature of complement and its role in immunologic phenomena; mechanisms of hypersensitivity; hypersensitivity-like states and immunologic diseases; transplantation and tumor immunity; host-parasite interactions. Includes laboratory.

5218f. IMMUNOLOGY. (3 cr; prereq Biol 3021) Schlievert
Same as 5216 without laboratory.

5233f.[1] **MICROORGANISMS AND DISEASE.** (7 cr; not open to microbiology majors; prereq 10 cr chemistry and 5 cr biological sciences or #) Johnson
Nature of microorganisms, immunology, medical bacteriology, virology, mycology, parasitology, and principles of disease control.

5235f. MICROORGANISMS AND DISEASE. (4 cr; prereq 10 credits in chemistry and 5 credits in biological sciences or #; not open to microbiology majors) Johnson
same as 5233 without laboratory.

5321w. PHYSIOLOGY OF BACTERIA. (3 cr; prereq 3103 or 5105 or Biol 3013...10 cr organic chemistry or biochemistry...3 cr genetics) Rogers
Chemical and physical organization of bacteria as related to function; growth; energy metabolism including oxidations and fermentations; nutritional requirements; antimicrobial agents; autotrophic mechanisms; microbial differentiation.

5322w. PHYSIOLOGY OF BACTERIA LABORATORY. (2 cr; prereq 5321 or ¶5321 and a lab course in basic bacteriology) Rogers
Techniques employed in the study of bacterial physiology and metabolism.

5424s. BIOLOGY OF VIRUSES. (4 cr; prereq 5321 or Biol 3021 and #) Plagemann
Structure, composition, and properties of bacterial, plant, and animal viruses; their interaction with cells and effects on host cell metabolism; biochemistry of viral replication; techniques used in study of viruses and viral infections; viral tumorigenesis. Includes laboratory.

5611f. MICROBIAL ECOLOGY. (4 cr; prereq general microbiology course, Biol 3021 or #) Crawford
Microbial adaptation and diversity; role of microorganisms in natural processes; methods in microbial ecology; other topics of interest to microbial ecologists.

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[1]Microscope required. Students may obtain use of microscope by purchasing a $3 microscope card from the bursar.

ADVANCED CREDIT COURSES

(For a description and complete list of 8000-level courses, see the *Graduate School Bulletin* or *Graduate Programs in the Health Sciences Bulletin*)

8110f. BIOLOGY OF MICROORGANISMS

8112s. MICROBIAL GENETICS

8121f. ADVANCED IMMUNOLOGY LABORATORY

8122. ADVANCED MICROBIOLOGY

8202w. ORAL MICROBIOLOGY

8218s. IMMUNOCHEMISTRY AND IMMUNOBIOLOGY

8234. ADVANCED MEDICAL MICROBIOLOGY

8242f,w,s. DIAGNOSTIC MICROBIOLOGY

8320w. IMMUNOGENETICS

8323. REGULATION OF METABOLISM

8421f. MOLECULAR BIOLOGY OF CANCER

8910f,w,s. SEMINAR

8911f,w,s. COLLOQUIUM IN MICROBIOLOGY

8990f,w,s,su. RESEARCH IN MICROBIOLOGY

Neurology (Neur)

Joseph A. Resch, M.D., professor and head

Regents' Professor Emeritus

Abe B. Baker, M.D.

Professor

James Berry, Ph.D.
Milton G. Ettinger, M.D.
Robert J. Gumnit, M.D.
William R. Kennedy, M.D.
Arthur C. Klassen, M.D.
Maurice Meyer, Ph.D.
Joo Ho Sung, M.D.
Kenneth F. Swaiman, M.D.
Fernando Torres, M.D.
David Webster, M.D.
Jonathan D. Wirtschafter, M.D.

Clinical Professor

Lowell Baker, M.D.
William Chalgren, M.D.
Paul M. Elwood, Jr., M.D.
Lawrence Farber, M.D.
Richard F. Galbraith, M.D.
Ernest M. Hammes, Jr., M.D.
Andrew Leemhuis, M.D.
Robert L. Meller, M.D., M.S.
Zondal R. Miller, M.D.
Harold Noran, M.D., Ph.D.
Lawrence Schut, M.D.
Irving Shapiro, M.D.
Sidney K. Shapiro, M.D.
Paul Silverstein, M.D.
Robert K. Stoltz, M.D.
V. Richard Zarling, M.D.

Associate Professor

Khurshed A. Ansari, M.D.
Gary Birnbaum, M.D.
Harold P. Cohen, Ph.D.
Robert Kriel, M.D.
Myoung C. Lee, M.D.
Ilo Leppik, M.D.
Sping Lin, Ph.D.
Lawrence Lockman, M.D.
Ruth Loewenson, Ph.D.
Angeline Mastri, M.D.
Manuel Ramirez-Lassepas, M.D.
Robert Roelofs, M.D.
Alan B. Rubens, M.D.
Bruce D. Snyder, M.D.

Clinical Associate Professor

James R. Allen, M.D.
Charles S. Bland, M.D.
Michael Bromer, M.D.
James G. Bruggemann, M.D.
Terrance Capistrant, M.D.
Richard Foreman, M.D.
Richard V. Johnson, M.D.
Brian Krasnow, M.D.
Glenn Sawyer, M.D.
Randall T. Schapiro, M.D.
Gilbert Westreich, M.D.
James Zeese, M.D.

Assistant Professor

David C. Anderson, M.D.
Tsing Yun Chiang, M.D.
Ronald E. Cranford, M.D.
Anna Ellington, M.D.
John R. Gates, M.D.
Kathryn Green, M.D., Ph.D.
Elsa S. Greenberg, Ph.D.
J. Thomas Hutton, M.D., Ph.D.
David Knopman, M.D.
Michael F. Lubozynski, M.D.
Sandra Lundgren, Ph.D.
Mark W. Mahowald, M.D.
Gabe J. Maletta, M.D.
James A. Moriarty, M.D.
Gerald K. Morley, M.D.
James Mortimer, M.D.
Donald L. Pastor, Ph.D.
Barbara Patrick, M.D.
Francis J. Pirozzolo, M.D.
Donald Quick, Ph.D.
Winfried Raabe, M.D.
Venkat Ramani, M.D.
Gail L. Risse, Ph.D.
Leon Rosenberg, M.D.
Ola Selness, M.D.
Gerald Slater, M.D.
Stephen A. Smith, M.D.
Ronald H. Spiegel, M.D.
John W. Tulloch, M.D.
Govin T. Vatassery, Ph.D.

Clinical Assistant Professor

C. Camak Baker, M.D.
Ivan Brodsky, M.D.
Roger E. Farber, M.D.
Miguel E. Fiol, M.D.
Maland C. Hurr, M.D.
Bruce I. Idelkope, M.D.
Steven S. Lebow, M.D.
Thomas H. McPartlin, M.D.
Bruce A. Norback, M.D.
Daniel C. Randa, M.D.
Crispin E. See, M.D.
Bruce M. Tennebaum, M.D.
Louise Town, M.D.
Thomas M. Wilson, M.D.

Instructor

Margaret Clipper
Kathleen Johnston

Clinical Instructor

Hsien-Hwa Hsieh Lee, M.D.

The Department of Neurology provides in the second year training in clinical neurology as well as an interface with other departments in presenting an interdisciplinary approach to the neurosciences. These contributions include clinical correlations, lectures and demonstrations on techniques of the neurological examination, and a series of clinical demonstrations that provide a didactic approach to the field of clinical neurology. The department also offers the opportunity for externships in neurology that offer supervised clinical experience with inpatients and outpatients suffering from neurological disorders.

ELECTIVE COURSES

5120. SELECTED PROBLEMS IN NEUROLOGY. (Cr and hrs ar; prereq regis med) Staff

5510. EXTERNSHIP IN CLINICAL NEUROLOGY AT THE UNIVERSITY AND AFFILIATED HOSPITALS. (Cr and hrs ar; prereq regis med) Staff

5541. PEDIATRIC NEUROLOGY-NEUROCHEMISTRY. (Cr and hrs ar; prereq regis med) Swaiman

5542. PEDIATRIC NEUROLOGY. (Cr and hrs ar; prereq regis med) Swaiman

5544. CLINICAL ELECTROENCEPHALOGRAPHY. (Cr and hrs ar; prereq regis med) Torres

5545. ELECTROMYOGRAPHY. (Cr and hrs ar; prereq regis med) Kennedy

5570. IMMUNOLOGY—VETERANS ADMINISTRATION HOSPITAL. (Cr and hrs ar; prereq regis med) Ansari

ADVANCED CREDIT COURSES

(For a description of 8000-level courses, see the *Graduate Programs in the Health Sciences Bulletin*)

5121. DESCRIPTIVE NEUROLOGY. (2 cr; hrs ar; prereq regis occupational or physical therapy) Moriarty

8200. CLINICAL NEUROLOGY

8201. CLINICAL PEDIATRIC NEUROLOGY

8202. RESEARCH IN NEUROLOGY

8203. APPLIED ELECTROENCEPHALOGRAPHY

8204. APPLIED ELECTROMYOGRAPHY

8205. APPLIED NEUROPATHOLOGY

8220. NEUROPHARMACOLOGY

8221. NEUROCHEMICAL ASPECTS OF SELECTED CLINICAL DISORDERS

8222. APPLIED NEUROPHYSIOLOGY

8226. NEUROMUSCULAR DISEASE

8227. NEUROLOGICAL SPEECH DISORDERS

8229. CLINICAL CORRELATIVE NEUROANATOMY

8233. NEUROLOGICAL CLINICAL PATHOLOGICAL CONFERENCE

8234. NEUROPSYCHOLOGY CONFERENCE

8235. ADVANCED NEUROPSYCHOLOGY

8236. RESEARCH IN NEUROPATHOLOGY

8244. NEUROEPIDEMIOLOGY

8245. DEVELOPMENTAL NEUROSCIENCES

8701. NEUROOPHTHALMOLOGY

8702. NEURORADIOLOGY

8703. ADVANCED NEUROPATHOLOGY

8704. SURVEY OF NEUROPATHOLOGY

8705. NEUROLOGICAL-NEUROSURGICAL CONFERENCE

Neurosurgery (NSu)

Shelley N. Chou, M.D., Ph.D., professor and head

Professor

James R. Bloedel, M.D., Ph.D.
Lyle A. French, M.D., Ph.D.
Manfred J. Meier, Ph.D.
Edward L. Seljeskog, M.D., Ph.D.

Clinical Professor

Leonard Titrud, M.D., Ph.D.

Associate Professor

Donald L. Erickson, M.D.
Gaylan L. Rockswold, M.D., Ph.D.

Clinical Associate Professor

Paul S. Blake, M.D.
Charles D. Ray, M.D.
Erich S. Wisiol, M.D.

Assistant Professor

Timothy J. Ebner, M.D., Ph.D.
Robert E. Maxwell, M.D., Ph.D.
Phudhiphorn Thienprasit, M.D., Ph.D.

Clinical Assistant Professor

Heinrich Bantli, Ph.D.
David Danoff, M.D.
Stephen H. Martin, M.D.

Instructor

John R. Mawk, M.D.

Clinical Instructor

Walter Bailey, M.D.
Richard S. Gregory, M.D.
Marshall Pedersen, M.D.
Harry Rogers, M.D.
John L. Seymour, M.D.
Andrew J. K. Smith, M.D., Ph.D.
Max Zarling, M.D.

The courses in neurological surgery are designed to introduce medical students to the theory, philosophy, and treatment of the surgical diseases of the nervous system. The primary emphasis is on the recognition of neurological problems, with special emphasis on the broad scope of methodology used in diagnosis. Experience in methods of treatment is obtained through a close working relationship with the staff. The program is designed to provide a broad base of experience for the individual interested in general medicine but may, in certain instances, be adapted for the individual specifically interested in the neurological sciences.

ELECTIVE COURSES

5500. EXTERNSHIP AT THE UNIVERSITY HOSPITALS. (4.5 or 9 cr; prereq regis med)

5510. EXTERNSHIP AT VETERANS HOSPITAL. (4.5 or 9 cr; prereq regis med)

5511. EXTERNSHIP AT HENNEPIN COUNTY MEDICAL CENTER. (4.5 or 9 cr; prereq regis med)

5512. EXTERNSHIP AT ST. PAUL-RAMSEY MEDICAL CENTER. (4.5 or 9 cr; prereq regis med)

5520. NEUROSURGICAL INVESTIGATION. (9 cr; prereq regis med)

5530. NEUROPSYCHOLOGY. (9 cr; prereq regis med)

5550. NEUROPHYSIOLOGICAL LITERATURE SEMINAR. (1 cr; prereq med school course in physiology, #)

ADVANCED CREDIT COURSES

8305. NEUROSURGICAL DIAGNOSIS

8308. NEUROSURGICAL PROBLEMS, MANAGEMENT

8311. OPERATIVE NEUROSURGERY

8316. NEUROSURGICAL RESEARCH

8318. NEURORADIOLOGICAL CONFERENCE

8320. NEUROSURGICAL CONFERENCE

8322. SEMINAR: NEUROSURGERY-OPHTHALMOLOGY—PART I

8323. SEMINAR: NEUROSURGERY-OPHTHALMOLOGY—PART II

8324. READINGS IN NEUROBIOLOGY

8325. ADVANCED READINGS IN NEUROBIOLOGY

8330. NEUROSURGERY LITERATURE SEMINAR

Obstetrics and Gynecology (Obst)

Konald A. Prem, M.D., professor and head

Professor Emeritus

John L. McKelvey, M.D.

Professor

Harry Foreman, M.D., Ph.D.
Donald W. Freeman, M.D.
Robert J. Gorlin, D.D.S.
Erick Y. Hakanson, M.D.
Takashi Okagaki, M.D., Ph.D.
George E. Tagatz, M.D.

Clinical Professor

Milton Baker, M.D.
Alex Barno, M.D.
Irving C. Bernstein, M.D.

Associate Professor

Leon L. Adcock, M.D.
Richard P. Bendel, M.D.
Julius C. Butler, Jr., M.D.
Laura E. Edwards, M.D.
Edward C. Hanisch, Jr., M.D.
Benjamin S. Leung, Ph.D.
Theodore C. Nagel, M.D.
Preston P. Williams, M.D.

Clinical Associate Professor

Melvin P. Baken, Jr., M.D.
Maxwell M. Barr, M.D.
M. Ismail Barrada, M.D.
James R. Bergquist, M.D.
Dorothy M. Bernstein, M.D.
Thomas C. Carrier, M.D.
Joseph A. Cella, M.D.
Charles E. Crutchfield, M.D.
Robert A. Diamond, M.D.
John D. Farr, M.D.
Peter E. Fehr, M.D.
Joseph I. Hamel, M.D.
Edward M. Hanton, M.D.
Jane E. Hodgson, M.D.
George W. Janda, M.D.
G. Eric Knox, M.D.
David C. Lees, M.D.
Fred A. Lyon, M.D.
Anatol Lysyj, M.D.
Edward C. Maeder, Jr., M.D.
Peter M. Mark, M.D.
F. J. McCaffrey, M.D.
Charles J. McCarthy, M.D.
Fred E. Mecklenburg, M.D.
Henry C. Meeker, M.D.
Edward H. Neira, M.D.
Gunard A. Nelson, M.D.
Bruce J. O'Brien, M.D.
Jay R. Olsen, M.D.
Hardin E. Olson, M.D.
Oliver H. Peterson, M.D.
Mitchell Pincus, M.D.
Jerome J. Scherek, M.D.
Clark A. Shattuck, M.D.
Gaius J. Slosser, M.D.
Loren A. Smeby, M.D.
Samuel B. Solhaug, M.D.
Anton F. Spraitz, Jr., M.D.
Arthur R. Thelemann, M.D.
Robert N. Wagner, M.D.
John W. Warren, M.D.
John D. Watson, M.D.
P. Theodore Watson, M.D.
Martin G. Weisberg, M.D.
Earl V. Wetzel, M.D.

Assistant Professor

Doris C. Brooker, M.D.
Marilyn S. Joseph, M.D.
Michael Koszalka, M.D.
Gary T. Lundborg, M.D.
Paul L. Ogburn, M.D.
Leo B. Twiggs, M.D.

Clinical Assistant Professor

Andrew R. Agee, M.D.
M. M. Aksoy, M.D.
Neil I. Arnold, M.D.
Robert L. Barricks, M.D.
Arthur H. Bearon, M.D.
John A. Beeman, M.D.
Stephen J. Berestka, M.D.
Robert A. Braun, M.D.
James A. Brockberg, M.D.
John M. Brown, M.D.
Glenn C. Buchanan, M.D.
Lawrence C. Cairns, M.D.
Joseph G. Capecchi, M.D.
John C. Ellis, Jr., M.D.
Harry F. Farb, M.D.
Howard W. Fisher, M.D.
Melvin J. Frisch, M.D.
Russell N. Frys, M.D.
Emanuel P. Gaziano, M.D.
Eric J. Gilster, M.D.
Ernest Goodman, M.D.
Carlos A. Grados, M.D.
John J. Graham, M.D.
Richard C. Graham, M.D.
Arlyn A. Hamann, M.D.
David L. Hill, M.D.
Arthur J. Horowitz, M.D.
Richard L. Jackson, M.D.
Loren Jacobson, M.D.
Alec L. Janes, M.D.
David W. Johnson, M.D.
Donald A. Johnson, M.D.
M.F. Kamsheh, M.D.
Robert H. Kaplan, M.D.
Beni Katz, M.D.
Frederick H. Kravitz, M.D.
Thomas K. Krezowski, M.D.
Stephen L. Larson, M.D.
Jack R. Lees, M.D.
Howard M. Levine, M.D.
Joan E. Madden, M.D.
Philip Marcus, M.D.
Joseph S. Massee, M.D.
Miriam K. McCreary, M.D.
Stephen A. McCue, M.D.
Nicholas M. Mensheha, M.D.
Pamela A. Morford, M.D.
Robert A. Nordland, M.D.
Gerald O'Brien, M.D.
William J. O'Hanlon, M.D.
David J. Olson, M.D.
Robert A. Olson, M.D.
Dwain J. Paal, M.D.
Ronald J. Peterson, M.D.
Peter Popadiuk, M.D.
Philip S. Randall, M.D.
John A. Reichert, M.D.
George E. Schaffhausen, M.D.
Richard C. Schissel, M.D.
Richard L. Schroeder, M.D.
Leslie A. Sharpe, M.D.
Norman S. Solberg, M.D.
Michael W. Spence, M.D.
Mark L. Tanz, M.D.
Dirk J. A. Van Oppen, M.D.
James O. Wall, M.D.
David I. Wigren, M.D.
Ernest C. Wynne III, M.D.

Clinical Instructor

Gordon Alexander, M.D.
Bruce F. Campbell, M.D.
Kenneth W. Crabb, M.D.
Richard Kadue, M.D.
James B. Lannon, M.D.
Robert P. Miller, M.D.
Raymond D. Nelson, M.D.
Divina J. Santos, M.D.
Charles A. Stegeman, M.D.

The field of obstetrics and gynecology encompasses all aspects of human reproduction. The course of study in the Medical School provides the student with a basic understanding of the reproductive process and of the function of the female reproductive system, especially during pregnancy and childbirth. At University Hospitals, practical obstetrical experience is gained in the management of normal pregnancy, evaluation of the status of the fetus *in utero*, supervision of labor, and conduct of delivery. The clinical experience in obstetrics and gynecology is expanded at affiliated community hospitals. Experience in gynecology includes a systematic study of the diagnosis and therapy of diseases of the female reproductive system, gynecological endocrinology, and clinical gynecological cytology and pathology. In seminars and small group discussions, problems of current importance in human reproductive biology are discussed, ranging from the broad social problems of fertility regulation to the specific medical problems of the infertile couple.

The primary aim of the Department of Obstetrics and Gynecology is to provide a basic foundation that will enable the student to understand human reproductive process at a level consistent with his or her ultimate career goals. The department offers a series of clinical and investigative elective courses designed to fit the varied interests of students.

ELECTIVE COURSES

5500. EXTERNSHIP IN OBSTETRICS AND GYNECOLOGY. (Cr ar; prereq regis med) Foreman, staff
Six-week experience in clinical obstetrics and gynecology spent in one of seven hospitals: Hennepin County Medical Center, North Memorial, St. Joseph's, St. Mary's, St. Paul-Ramsey, United, University, or St. Luke's (Duluth). Students may express hospital preference, but final assignments will be made by course coordinator. This is the core clinical course in obstetrics and gynecology for Phase D students selecting tracts in medicine, surgery, pediatrics, family practice, or obstetrics. Graded responsibility assigned so that, by end of externship, student will be able to manage and deliver normal pregnancies, perform minor gynecological procedures, and be familiar with and have observed most common obstetrical and gynecological problems. All students meet at University Hospitals Tuesday, Wednesday, and Thursday of first week and each Wednesday afternoon thereafter for didactic presentations.

5520. OBSTETRICS AND GYNECOLOGY EXTERNSHIP IN CLINICAL PRACTICE. (Course and cr ar) Foreman, staff
Practical community experience in obstetrics and gynecology under preceptorship of one or more practicing members of clinical staff. Both office and hospital practice included. In order to devote full energy to association with a busy specialist, student will have no other assignments during this time. To be arranged individually with course coordinator.

5540. ADVANCED EXTERNSHIP IN OBSTETRICS AND GYNECOLOGY. (Cr ar; prereq 5500) Foreman, staff
Full-time clinical experience on obstetrical and gynecological service at one of three hospitals: Hennepin County Medical Center, St. Paul-Ramsey, or University. Students may express hospital preference, but final assignments will be made by course coordinator. Emphasis is on total care of obstetrical patients and on management of major gynecological conditions. Students who have been in Rural Physician Associate Program may take this course without having taken 5500.

5550. PSYCHIATRIC ASPECTS OF OBSTETRICS AND GYNECOLOGY. (Cr ar; prereq regis med) Foreman, I Bernstein, D Bernstein
Experience in diagnosis and treatment of patients who come to a psychiatrist either directly or on request for consultation from a medical colleague, particularly an obstetrician-gynecologist. Primarily directed to management of female patients, including adolescents.

5560. RESEARCH IN REPRODUCTION. (Cr and hrs ar) Foreman, staff
Topics selected for each student.

5575. GYNECOLOGICAL PATHOLOGY AND DIAGNOSTIC CYTOLOGY. (Cr ar; prereq 5500) Foreman, Okagaki, Brooker
Review of daily gynecological histopathology material of surgical and clinical cases from Ob-Gyn Service. Includes diagnostic cytology of Pap smears encountered in actual practice.

5590. PRECEPTORSHIP IN OBSTETRICS AND GYNECOLOGY. (Course and cr ar; prereq 5500) Foreman
Full-time preceptorship in clinical obstetrics and gynecology offered in outstate Minnesota by the Area Health Education Center (AHEC). Student receives per diem expenses. Similar to experience in 5520, but in smaller community.

ADVANCED CREDIT COURSES

8201. ADVANCED OBSTETRICS AND GYNECOLOGY

8202. ADVANCED OBSTETRICS AND GYNECOLOGY

8203. ADVANCED OBSTETRICS AND GYNECOLOGY

8204. ADVANCED OBSTETRICS AND GYNECOLOGY

8205. ADVANCED OBSTETRICS AND GYNECOLOGY

8206. ADVANCED OBSTETRICS AND GYNECOLOGY

8207. ADVANCED OBSTETRICS AND GYNECOLOGY

8208. ADVANCED OBSTETRICS AND GYNECOLOGY

8209. ADVANCED OBSTETRICS AND GYNECOLOGY

8210. ADVANCED OBSTETRICS AND GYNECOLOGY

8211. ADVANCED OBSTETRICS AND GYNECOLOGY

8212. ADVANCED OBSTETRICS AND GYNECOLOGY

8213. ADVANCED OBSTETRICS AND GYNECOLOGY

8214. ADVANCED OBSTETRICS AND GYNECOLOGY

8215. ADVANCED OBSTETRICS AND GYNECOLOGY

8216. ADVANCED OBSTETRICS AND GYNECOLOGY
8217. SEMINAR: OBSTETRICS AND GYNECOLOGY
8218. SEMINAR: OBSTETRICS AND GYNECOLOGY
8219. SEMINAR: OBSTETRICS AND GYNECOLOGY
8221. SEMINAR: OBSTETRICS AND GYNECOLOGY
8222. GYNECOLOGICAL ONCOLOGY
8223. GYNECOLOGICAL ONCOLOGY
8224. GYNECOLOGICAL ENDOCRINOLOGY—Part I
8225. GYNECOLOGICAL ENDOCRINOLOGY—Part II
8226. OBSTETRICAL PHYSIOLOGY AND ANESTHESIOLOGY
8227. PRECEPTORSHIP IN CLINICAL PRACTICE
8228. SELECTED ASPECTS OF RADIATION THERAPY
8229. SELECTED ASPECTS OF MEDICAL ONCOLOGY
8230. RESEARCH IN REPRODUCTION

Ophthalmology (Oph)

Donald J. Doughman, M.D., professor and head

Professor Emeritus

John E. Harris, M.D.

Professor

William H. Knobloch, M.D.
Jonathan D. Wirtschafter, M.D.

Clinical Professor

W. Bruce Clark, M.D.
Harry Friedman, M.D.
Charlotte Hill, M.D.
Malcolm McCannel, M.D.
Harry Plotke, M.D.
Irving Shapiro, M.D.
Howard Shaw, M.D.
George Tani, M.D.

Associate Professor

William L. Fowlks, Ph.D.
Robert D. Letson, M.D.
Robert C. Ramsay, M.D.
William R. Rathbun, Ph.D.

Clinical Associate Professor Emeritus

Douglas Johnson, M.D.
Karl Sandt, M.D.

Clinical Associate Professor

Bud Appleton, M.D.
Richard Carroll, M.D.
Llewellyn Christensen, M.D.
Robert Fink, M.D.
Richard Horns, M.D.
Leslie Jacobson, M.D.
Yale Kanter, M.D.
Richard Leavenworth, M.D.
Vernon Lindberg, M.D.
Winston Lindberg, M.D.
Sidney Nerenberg, M.D.
Charles Ostrov, M.D.
Brooks Poley, M.D.
John Riley, M.D.
Robert Rocknem, M.D.
Thomas Rucker, M.D.
James Standefer, M.D.
Donald Sterner, M.D.
Richard Student, M.D.
Jon Tierney, M.D.
Frederic Wipperman, M.D.
Robert Wohlrabe, M.D.
Frederick Wuest, M.D.

Assistant Professor

Douglas Cameron, M.D.
Herbert Cantrill, M.D.
Richard Lindstrom, M.D.
Jonathan Pederson, M.D.

Clinical Assistant Professor

Frank Adair, M.D.
James Allen, M.D.
Christopher Brown, M.D.
James Brown, M.D.
Martin Bruhl, M.D.
Emmett Carpell, M.D.
Robert Cooper, M.D.
Theodore Fritsche, M.D.
Howard Gilbert, M.D.
Nicholas Haddad, M.D.
Martin Kaplan, M.D.
Jerry Kobrin, M.D.
Allen Larsen, M.D.
Ernest Larson, M.D.
James Layer, M.D.
Murray Lufkin, M.D.
John McNeill, M.D.
Aaron Nathenson, M.D.
Lydia Neibergs, M.D.
Mark Norman, M.D.
Thomas O'Kane, M.D.
Richard Olson, M.D.
Rene Pelletier, M.D.

Jerome Poland, M.D.
Thomas Purcell, M.D.
Charles Roach, M.D.
Neal Sher, M.D.
Robert Sigelman, M.D.
Wesley Sondreal, M.D.
Alfred Steldt, M.D.
Joseph Terry, M.D.
Byron Teska, M.D.
James Thompson, M.D.
Elliott Troup, M.D.
Robert Warshawsky, M.D.
Paul Wicklund, M.D.

Clinical Instructor

Peter Arny, M.D.
Charles Barer, M.D.
Robert Campbell, M.D.
Timothy Gess, M.D.
David Hendrickson, M.D.
Donald Herrick, M.D.
George Hilgerman, M.D.
Herbert Hobday, M.D.
Douglas Holmen, M.D.
James Householder, M.D.
Robert Ostrow, M.D.
Carroll Rund, M.D.
Paul Sanderson, M.D.
David Simundson, M.D.

ELECTIVE COURSE

5100. INTRODUCTION TO OPHTHALMIC PATHOLOGY. (1 cr; prereq #) Cameron

ADVANCED CREDIT COURSES

8101f,w,s,su. CLINICAL OPHTHALMOLOGY. (8 cr) Doughman and staff

8106f,w,s. BINOCULAR VISION AND OCULAR MOTILITY. (1 cr) Letson

8131f,w,s,su. PRACTICAL OCULAR SURGERY. (3 cr) Doughman and staff

8142f,w,s,su. OPHTHALMIC PATHOLOGY LABORATORY. (2 cr) Cameron

8152. OPHTHALMOLOGY LABORATORY. (15 cr) Staff

8153. RESEARCH IN OPHTHALMOLOGY. (Cr ar) Staff

8154. SEMINAR: OPHTHALMOLOGY. (Cr ar) Staff

8155. SPECIAL TOPICS IN OPHTHALMOLOGY. (Cr ar) Staff

8218f. VISUAL SYSTEMS. (Cr ar) Purple

Orthopaedic Surgery (OrSu)

Roby C. Thompson, Jr., M.D., professor and head

Professor Emeritus

John H Moe, M.D.

Professor

David S. Bradford, M.D.
James H. House, M.D.
Robert B. Winter, M.D.

Clinical Professor

Frederick E. Drill, M.D.
Ramon B. Gustilo, M.D.
Sheldon M. Lagaard, M.D.

Associate Professor

Thomas H. Comfort, M.D.
Jack K. Mayfield, M.D.
Theodore R. Oegema, Ph.D.
Robert F. Premer, M.D.

Clinical Associate Professor

Richard J. Aadalen, M.D.
Robert M. Barnett, M.D.
Lester W. Carlander, M.D.
Arnold L. Hamel, M.D.
Richard H. Jones, M.D.
Edward H. Kelly, M.D.
Lowell Kleven, M.D.
Lowell Lutter, M.D.
Edward C. McElfresh, M.D.
E. Harvey O'Phelan, M.D.
Wayne W. Thompson, M.D.
Francis J. Trost, M.D.

Assistant Professor

Alfred F. Behrens, M.D.
Robert E. Hunter, M.D.
John E. Lonstein, M.D.
Harry J. Robinson, M.D.
Keith D. Vanden Brink, M.D.

Clinical Assistant Professor

Gordon Aamoth, M.D.
Roland Birkebak, M.D.
Wesley H. Burnham, M.D.
Leo J. DeSousa, M.D.
Vincent E. Eilers, M.D.
David A. Fischer, M.D.
David W. Florence, M.D.
John A. Hartwig, M.D.
Stephen D. Kuslich, M.D.
Richard F. Kyle, M.D.
Charles C. Lai, M.D.
Donald R. Lannin, M.D., M.S.
Lloyd Leider, M.D.
John E. McMahon, M.D.
Richard D. Schmidt, M.D.
Joseph M. Tambornino, M.D

Instructor

Francis Denis, M.D.

Clinical Instructor

John T. Anderson, M.D.
Jonathan H. Biebl, M.D.
John W. Benton, M.D.
G. Peter Boyum, M.D.
F. Dixon Conlin, M.D.
Charles J. Cooley, M.D.
Michael W. Davis, M.D.
Richard B. Edwards, M.D.
Robert Fielden, M.D.
Lewis J. Gramer, M.D.
Richard N. Hadley, M.D.
Christopher V. Horn, M.D.
James E. Johanson, M.D.
Lyle O. Johnson, M.D.
Richard J. Johnson, M.D.
John Larkin, M.D.
Thomas Litman, M.D.
Donald Madsen, M.D.
Robert C. Meisterling, M.D.
David H. Palmer, M.D.
Hanabyul W. Park, M.D.
James D. Priest, M.D.
Thomas Raih, M.D.
Jerry Reese, M.D.
George E. Reisdorf, M.D.
J. Howard Ritchie, M.D.
Ivan Schloff, M.D.
Peter Strand, M.D.
Marlen S. Strefling, M.D.
Thomas Varecka, M.D.
John Wilson, M.D.
James T. Young, M.D.

The major goals of the courses in orthopedic surgery are to provide the medical student with the foundation necessary for performing a basic neuromusculoskeletal examination of the patient, for correlating the clinical expressions of disease with a knowledge of basic science, and for recognizing those patient problems that require immediate appraisal and resolution. In a number of clinical electives, the student has the option of participating in the diagnostic and therapeutic management of patients with orthopedic and traumatic disabilities; this advanced experience provides an understanding of fundamental orthopedic principles, the scope of orthopedic surgery, and the opportunities for both clinical and basic investigation in orthopedic surgery.

ELECTIVE COURSES

5180. ORTHOPEDICS I. (Cr ar; prereq regis med)

5185. ORTHOPEDICS II—EXTERNSHIP IN ORTHOPEDIC SURGERY. (Cr ar; prereq regis med)

5186. RESEARCH PROBLEMS IN ORTHOPEDIC SURGERY. (Cr ar; prereq regis med)

5187. EXTERNSHIP IN ORTHOPEDIC SURGERY AND FRACTURES—St. Paul-Ramsey Medical Center. (Cr ar; prereq regis med)

5188. EXTERNSHIP IN ORTHOPEDIC SURGERY AND FRACTURES—Gillette Children's Hospital, St. Paul. (Cr ar; prereq regis med)

5189. EXTERNSHIP IN ORTHOPEDIC SURGERY AND FRACTURES—St. Luke's Hospital, Duluth. (Cr ar; prereq regis med)

5190. EXTERNSHIP IN ORTHOPEDIC SURGERY AND FRACTURES—Veterans Hospital. (Cr ar; prereq regis med)

5191. ORTHOPEDIC EXTERNSHIP AT HENNEPIN COUNTY MEDICAL CENTER. (Cr ar; prereq regis med)

ADVANCED CREDIT COURSES

8401. ORTHOPEDIC CONFERENCE

8403. FRACTURES

8404. FRACTURES

8405. ORTHOPEDIC DIAGNOSIS

8407. PEDIATRIC ORTHOPEDICS

8408. ORTHOPEDIC PROBLEMS AND MANAGEMENT

8409. ORTHOPEDIC PROBLEMS AND MANAGEMENT

8410. ORTHOPEDIC PATHOLOGY

8411. ORTHOPEDIC OPERATIVE SURGERY

8412. ORTHOPEDIC ANATOMY

8416. ORTHOPEDIC RESEARCH

Otolaryngology (Otol)

Michael M. Paparella, M.D., professor and chairman

Professor

Arndt J. Duvall III, M.D.
Earl Harford, Ph.D.
S. K. Juhn, M.D.
Frank Lassman, Ph.D.
William L. Meyerhoff, M.D., Ph.D.
W. Dixon Ward, Ph.D.

Clinical Professor

Ernest Anderson, M.D.
Robert Gorlin, M.D., D.D.S.
Jerome A. Hilger, M.D.
Albert Hohmann, M.D.
Melvin E. Sigel, M.D.

Associate Professor

George L. Adams, M.D.
Lawrence Boies, Jr., M.D.
David A. Nelson, Ph.D.
Kurt Pollak, M.D.
Donald W. Robertson, Ph.D.

Clinical Associate Professor

John D. Banovetz, M.D.
David Buran, M.D.
John S. Huff, M.D.
Severin Koop, M.D.
Joseph Leek, M.D.
Cheng-en Lu, M.D.
Hyman Paisner, M.D.
Robert Richardson, M.D.
George V. Tangen, M.D.

Assistant Professor

John H. Anderson, M.D., Ph.D.
Norman Berlingerr, M.D., Ph.D.
Timothy Doyle, Ph.D.
Peter Hilger, M.D.
Richard L. Hoel, M.A.
Timothy T. K. Jung, M.D., Ph.D.
Stephen Liston, M.D.
Robert H. Maisel, M.D.
Tetsuo Morizono, M.D.
Mario Ruggero, Ph.D.
Peter Santi, Ph.D.

Clinical Assistant Professor

Dennis Brady, M.D.
Thomas G. Bunker, M.D.
Richard B. Carley, M.D.
Thomas A. Christiansen, M.D.
Barclay Cram, M.D.
James Dunn, M.D.
Gary Garvis, M.D.
Neill Goltz, M.D.
Ekrem Gozum, M.D.
Gerald Jurgens, M.D.
Morton Kane, M.D.
Robert Koller, M.D.
Bradley Kusske, M.D.
Douglas Kusske, M.D.
Richard M. Levinson, M.D.
Richard Lund, M.D.
Gerald McCoid, M.D.
C. Randall Nelms, M.D.
Evan Nelson, Jr., M.D.
Winston Odland, M.D.
Jerome O'Hearn, M.D.
Elizabeth Payne, M.D.
Robert Rosenberg, M.D.
Mark Satz, M.D.
Richard Schlorf, M.D.
Leighton Siegel, M.D.
Graham Smith, M.D.
Harold Ulvestad, M.D.
Kent Wilson, M.D.

Instructor

David W. Johnson, M.D.

Clinical Instructor

Richard Dobbs, M.D.
Thomas Englund, M.D.
Douglas Smith, M.D.
Laurence Winter, M.D.
John Youngs, M.D.

The medical student is introduced to otolaryngology through a series of didactic lectures that emphasize broad aspects of the field and discussions of basic principles when applicable. The course work in the Department of Otolaryngology involves student participation in the clinical examination of patients with otolaryngological disorders. During this time, the student develops skills in examination (especially indirect laryngoscopy) and in interpretation of findings. The practical work is supplemented by discussions and seminars with the faculty. The student is encouraged to spend additional elective time in clinical, surgical, and research services in the department.

ELECTIVE COURSES

5500. GENERAL ENT ELECTIVE

5501. ACTING INTERNSHIP IN ENT

5503. RESEARCH: BASIC SCIENCE ENT ELECTIVE

ADVANCED CREDIT COURSES

8220. RESEARCH IN OTOLARYNGOLOGY

8230. CLINICAL OTORHINOLARYNGOLOGY

8231. SURGERY OF EAR, NOSE, AND THROAT

8232. MAXILLOFACIAL SURGERY

8233. PLASTIC AND RECONSTRUCTIVE SURGERY: HEAD, NECK

8234. ANATOMY OF THE HEAD AND NECK AND TEMPORAL BONE DISSECTION

8235. ROENTGENOLOGY OF THE HEAD AND NECK

8236. PHARMACOLOGY IN ENT

8237. ENDOSCOPY

8238. PATHOLOGY OF THE EAR, NOSE, AND THROAT

8239. OTONEUROLOGY

8240. ALLERGY

8241. TUMOR CLINIC

8242. AUDIOLOGY AND SPEECH PATHOLOGY

8243. INTRODUCTION: RESEARCH METHODOLOGY

8244. SEMINAR: CURRENT LITERATURE

8245. M.S. THESIS RESEARCH

8246. PH.D. THESIS RESEARCH

8247. PHYSIOLOGY OF HEARING

8248. RESEARCH

Pediatrics (Ped)

William Krivit, M.D., Ph.D, professor and head

Professor Emeritus

John A. Anderson, M.D.
Gerald T. Evans, M.D.

Professor

Henry Balfour, M.D.
Eldon Berglund, M.D.
David M. Brown, M.D.
Barbara Burke, M.D.
C. Carlyle Clawson, M.D.
Patricia Ferrieri, M.D.
Robert Fisch, M.D.
Alfred Fish, M.D.
Edward Kaplan, M.D.

John Kersey, M.D.
William Krivit, M.D.
Russell Lucas, M.D.
S. Michael Mauer, M.D.
Alfred Michael, M.D.
Bernard Mirkin, M.D., Ph.D.
James Moller, M.D.
Mark Nesbit, M.D.
Arthur Page, M.D.
Paul Quie, M.D.
Richard Raile, M.D.
Harvey Sharp, M.D.
Kenneth Swaiman, M.D.
Robert ten Bensel, M.D.
Robert Ulstrom, M.D.
Homer Venters, M.D.
Robert Vernier, M.D.
Lewis Wannamaker, M.D.
Warren Warwick, M.D.
James White, M.D.
Francis Wright, M.D.

Clinical Professor Emeritus

Ray C. Anderson, M.D.
Stuart L. Arey, M.D.
Paul Dwan, M.D.
Lawrence Richdorf, M.D.
Albert Stoesser, M.D.
Mildred Ziegler, M.D.

Clinical Professor

Donald Amren, M.D.
Arnold Anderson, M.D.
William Bevis, M.D.
Paul Ellwood, M.D.
Donnell D. Etzwiler, M.D.
Stanley Leonard, M.D.

Associate Professor

Stephen Boros, M.D.
Amos Deinard, M.D.
Rolf Engel, M.D.
Richard Gehrz, M.D.
G. Scott Giebink, M.D.
Ernest Gray, Ph.D.
Young Ki Kim, M.D.
Robert Kriel, M.D.
Lawrence Lockman, M.D.
George Noren, M.D.
Karen Olness, M.D.
Norma Ramsay, M.D.
Krishna Saxena, M.D.
Jon Scheinman, M.D.
Alan Sinaiko, M.D.
Theodore Thompson, M.D.

Clinical Associate Professor Emeritus

Wallace Lueck, M.D.
Everett Perlman, M.D.
Edwin Robb, M.D.
Robert Rosenthal, M.D.

Clinical Associate Professor

Northrup Beach, M.D.
David Bloom, M.D.
John Cich, M.D.
Robert T. Dooley, M.D.
George W. Lund, M.D.
Edward Nelson, M.D.
John C. O'Brien, M.D.
Albert Schroeder, M.D.
Lawrence Singher, M.D.
Theodore Smith, M.D.
Edward Strem, M.D.
John D. Tobin, M.D.

Assistant Professor

John Bass, M.D.
Robert Blum, M.D.
Pi-Nian Chang, Ph.D.
Raul Cifuentes, M.D.
Eunice Davis, M.D.
Stanley Einzig, M.D.
Ralph Faville, M.D.
Bradley Fuhrman, M.D.
Thomas Green, M.D.
Bo Hedlund, Ph.D.
Dana Johnson, M.D.
Carolyn Levitt, M.D.
James Lock, M.D.
Carolyn McKay, M.D.
Thomas Nevins, M.D.
Robert O'Dea, M.D., Ph.D.
Mary Ella Pierpont, M.D., Ph.D.
John Priest, M.D.
Thomas Rolewicz, M.D.
Leon Satran, M.D.
Charles Sklar, M.D.
Gerald Slater, M.D.
Jean Smelker, M.D.
Clark Smith, M.D.
Stephen Smith, M.D.
Ronald Spiegel, M.D.
John Tobin, M.D.
Rachel Trockman, M.D.
Norman Virnig, M.D.
William Woods, M.D.
James Zavoral, M.D.

Clinical Assistant Professor Emeritus

Richard J. Lien, M.D.

Clinical Assistant Professor

Sol Austrian, M.D.
Patricia Baker, M.D.
John Balfanz, M.D.
Paul B. Batalden, M.D.
F. Blanton Bessinger, M.D.
David R. Brown, M.D.
Robert Bugenstein, M.D.
Edwin Burklund, M.D.
Marilyn Campbell, M.D.
Lawrence Condon, M.D.

E. Dale Cumming, M.D.
Mitchell Einzig, M.D.
Laurence Erickson, M.D.
John Galligan, M.D.
Gary Geller, M.D.
Robert Gibbs, M.D.
Ronald Glasser, M.D.
Mace Goldfarb, M.D.
Clayton Green, M.D.
John Harkness, M.D.
Albert Heimel, M.D.
Elizabeth Jerome, M.D.
Byron Johnson, M.D.
Harold Katkov, M.D.
Jeffrey Liebo, M.D.
Arnold London, M.D.
Raymond Lynch, M.D.
Jack Markovitz, M.D.
Lloyd Nelson, M.D.
Gerardo Neuwirth, M.D.
Mildred Norval, M.D.
Theodore Papermaster, M.D.
Charles Pitzele, M.D.
Laura Saliterman, M.D.
Richard Sand, M.D.
Robert Schulenberg, M.D.
Lewis Sher, M.D.
Paul Singh, M.D.
Norman Sterrie, M.D.
Frederic Stone, M.D.
Jack Strobel, M.D.
Edward Walsh, M.D.
Paul Wernick, M.D.
Walter Wilder, M.D.

Instructor

Charles Alward, M.D.
Diane Arthur, M.D.
Pakshir Athinarayanan, M.D.
John Coleman, M.D.
Mary M. Conroy, M.D.
Edward Ehlinger, M.D.
Gary Fifield, M.D.
Alexandra Filipovich, M.D.
Duane Hasegawa, M.D.
Daniel Kohen, M.D.
Paul Kubic, M.D.
Kenneth McClain, M.D., Ph.D.
David Munson, M.D.
Andre Nelson, M.D.
Richard Nelson, M.D.
James Nettleton, M.D.
Tom Nevins, M.D.
Thomas Newman, M.D.
Warren Regelmann, M.D.
Gerald Rosen, M.D.
Linda Thompson, M.D.

Clinical Instructor

Hreidar Agustsson, M.D.
Michael Ainslie, M.D.
Renner Anderson, M.D.
Sigrid Bachman, M.D.
Theresa Baker, M.D.
Lowell Becker, M.D.
Mary Biery, M.D.
Paul Blum, M.D.
James Cardle, M.D.
Terrence Coyne, M.D.
M. Elizabeth Craig, M.D.
Richard Cushing, M.D.
Joan Delahay, M.D.
Dale Dobrin, M.D.
Colleen Dooley, M.D.
Julius Edlavitch, M.D.
Abigail Farber, M.D.
Theodore Hajek, M.D.
Terril Hart, M.D.
C. Sherman Hoyt, M.D.
Renu Jain, M.D.
Robert Jensen, M.D.
Patricia Johnson, R.N.
Arthur Kaemmer, M.D.
Radmilla Klashnya, M.D.
Allen Kuperman, M.D.
Robert Larson, M.D.
Russell LeBeau, M.D.
Thomas LeFevere, M.D.
Richard Matus, M.D.
Katherine Mauer, M.D.
Mary Meland, M.D.
David Murdock, M.D.
Mark Nammacher, M.D.
James Nordlin, M.D.
Daniel Nussbaum, M.D.
John O'Connell, M.D.
Elizabeth Perkett, M.D.
Mark Rabinovitch, M.D.
Joseph Rigatuso, M.D.
Manoochehr Saadat, M.D.
Sandra Sackett, M.D.
Kumud Sane, M.D.
Sylvester Sanfilippo, M.D.
Othild M. Schwartzkopff, M.D.
Thomas Scott, M.D.
Lawrence Sholler, M.D.
Amarjit Singh, M.D.
Jeffrey Smith, M.D.
Thomas Stealey, M.D.
Donald Stemmle, M.D.
Ernest Swihart, M.D.
Andrew Thomas, M.D.
Richard B. Tudor, M.D.
James Vaccarella, M.D.
Loren Vorlicky, M.D.
Richard Waeschle, M.D.
Mark Warnken, M.D.
Richard Wyatt, M.D.

Pediatrics is concerned with the basic aspects of human developmental biology, both in the prenatal period and in postnatal life. The application of the knowledge of growth and development is of paramount importance to the study of diseases in the interdisciplinary organ system courses offered during Phase B. The application of this knowledge to pediatric patients and the acquisition of skills in assessing and applying growth and developmental aspects are learned through the pediatric tutorials in the Student as Physician tutorials. The student examines, studies, and discusses, with the faculty tutor, children

with the following pediatric conditions and problems: normal newborn, sick infant, respiratory disease, genetic disease, congenital malformation, fluid and electrolyte imbalance, failure to thrive, neurologic disorder, and adolescent.

In Phase D, students may choose several types of pediatric experience. They may participate in the care of children in the inpatient and outpatient services of the University Hospitals and affiliated community hospitals. In these experiences, emphasis is placed on the diagnosis and management of pediatric disorders and on the effect of illness on the child's growth and development. Students may choose to observe and participate in diagnostic and care programs concerned with specific aspects of the field pediatrics: the premature and newborn, development, endocrinology, allergy, cardiology, psychiatry, nephrology, and communicable diseases. Finally, students may elect a research experience or other opportunity in an area of special interest in selected basic areas of pediatrics.

To reinforce fundamental concepts in the clinical programs, emphasis is placed on the application of basic knowledge in the prevention, diagnosis, and management of diseases of infants and children.

ELECTIVE COURSES

5501. PEDIATRIC EXTERNSHIP. (Cr ar)

5503. PEDIATRIC EXTERNSHIP WITH OUTSTATE CLINICIANS. (Cr ar)

5507. SEMINARS IN DIAGNOSTIC PEDIATRIC HEMATOLOGY. (Cr ar)

5508. BASIC AND CLINICAL NUTRITION OF CHILDREN. (Cr ar)

5512. PEDIATRIC ACTING INTERNSHIP. (Cr ar)

5514. CHILD CARE CLINIC PROGRAM. (Cr ar)

5515. CHILD DEVELOPMENT AT ST. PAUL-RAMSEY MEDICAL CENTER. (Cr ar)

5517. PRECEPTORSHIP IN CLINICAL PEDIATRICS. (Cr ar)

5520. PEDIATRIC OUTPATIENT—UNIVERSITY HOSPITALS. (Cr ar)

5521. AMBULATORY PEDIATRICS AT ST. PAUL CHILDREN'S HOSPITAL. (Cr ar)

5522. AMBULATORY PEDIATRICS AT HENNEPIN COUNTY MEDICAL CENTER. (Cr ar)

5523. OUTPATIENT EXTERNSHIP AT COMMUNITY UNIVERSITY HEALTH CARE CENTER. (Cr ar)

5525. INTERNATIONAL HEALTH. (Cr ar)

5532. CLINICAL ALLERGY AND IMMUNOLOGY AT UNIVERSITY HOSPITALS. (Cr ar)

5534. PEDIATRIC CARDIOLOGY AT THE UNIVERSITY. (Cr ar)

5535. PEDIATRIC INFECTIOUS DISEASES. (Cr ar)

5536. PEDIATRIC HEMATOLOGY/ONCOLOGY AT UNIVERSITY HOSPITALS. (Cr ar)

5537. PEDIATRIC ENDOCRINOLOGY AND METABOLISM AT THE UNIVERSITY. (Cr ar)

5538. PEDIATRIC GASTROENTEROLOGY. (Cr ar)

5539. NEONATAL MEDICINE EXTERNSHIP. (Cr ar)

5540. PEDIATRIC NEUROLOGY. (Cr ar)

5541. CLINICAL PHARMACOLOGY: FACTORS INFLUENCING THE RATIONAL USE OF DRUGS IN MAN. (Cr ar)

5542. CLINICAL PHARMACOLOGY AT THE UNIVERSITY. (Cr ar)

5543. PEDIATRIC NEPHROLOGY AT THE UNIVERSITY. (Cr ar)

5544. PULMONARY DISEASE IN PEDIATRICS. (Cr ar)

5545. DIAGNOSIS, EVALUATION, AND CARE OF ADULTS AND CHILDREN WITH CANCER. (Cr ar)

5547. TOPICS IN MATERNAL AND CHILD HEALTH. (Cr ar)

5548. PEDIATRIC GENETICS AT THE UNIVERSITY. (Cr ar)

Pharmacology (Phcl)

Frederick E. Shideman, M.D., Ph.D., professor and head

Professor

Marion W. Anders, D.V.M., Ph.D.
Nelson D. Goldberg, Ph.D.
Norman O. Holte, D.D.S.
Gilbert J. Mannering, Ph.D.
Jack W. Miller, Ph.D.
Bernard L. Mirkin, M.D., Ph.D.
Norman E. Sladek, Ph.D.
Sheldon B. Sparber, Ph.D.
Akira E. Takemori, Ph.D.
Ben G. Zimmerman, Ph.D.

Associate Professor

James F. Cumming, M.D., Ph.D.
Earl W. Dunham, Ph.D.
Patrick E. Hanna, Ph.D.
Jordan L. Holtzman, M.D., Ph.D.
Donald B. Hunninghake, M.D.
Richard J. Meisch, M.D., Ph.D.
Aloysius J. Quebbemann, Ph.D.

Assistant Professor

Thomas P. Green, M.D.
Elizabeth Jeffrey, Ph.D.
Robert F. O'Dea, M.D., Ph.D.
Alan R. Sinaiko, M.D.
George L. Wilcox, Ph.D.

Lecturer

Faruk S. Abuzzabab, M.D., Ph.D.
Jonathan S. Bishop, M.D.

The courses in pharmacology are designed to provide students with an in-depth understanding of the fundamental principles upon which rational therapy is based. Emphasis is placed on the mechanisms of action, absorption, distribution, biotransformation, excretion, and clinical use of drugs, both in general and specific terms. Work in laboratories and therapeutic conferences supplements the lectures to illustrate the actions of drugs in health and disease. Clinical pharmacologists attempt to show, by means of ward rounds and clinical conferences, how principles of pharmacology are applied to treatment of disease. Through elective courses, opportunity is provided to explore various specialized areas of pharmacology.

REQUIRED COURSE

5110s. PHARMACOLOGY. (8 cr; prereq regis med or #)

ELECTIVE COURSES

5109. PROBLEMS IN PHARMACOLOGY. (Cr and hrs ar; prereq #)

5502. MECHANISMS OF HORMONE ACTION. (1 cr)
Lectures on the mechanisms by which hormones influence metabolic and functional cellular events. Steroid hormone actions and the role of cyclic AMP and cyclic GMP in the expression of polypeptide and neurohormone actions emphasized.

5503. BASIC PSYCHOPHARMACOLOGY. (1 cr)
Discussions of biochemical mechanisms and behavioral correlates of psychotropic compounds. Emphasis on experimental design and interpretation of data as they relate to normal and abnormal CNS function.

5504. NEUROPHARMACOLOGY. (1 cr)
Discussions of neurophysiological mechanisms by which drugs alter CNS function. Students help select course topics and papers to be discussed.

5505. CLINICAL PHARMACOLOGY AND THERAPEUTICS: RATIONAL USE OF DRUGS. (4.5 cr) Mirkin
Course consists of 15 sessions organized into formal lectures, clinical correlation (10 students per group), and independent study using slide shows, films, computer-based programs, and demonstrations. The lectures emphasize basic principles of clinical pharmacology. Therapeutic applications are discussed in the clinical sessions, and the study groups allow intensive, in-depth consideration of important subject areas pertaining to clinical therapeutics. Emphasis is on problem solving and on understanding how specific human pathophysiologic conditions may alter drug disposition and action. Each session runs from 9 a.m. to 12 p.m. daily. Films, when scheduled, are shown from 1 to 2 p.m. Individual student use of slide shows or computer-based programs is encouraged. Selected reading materials are provided in advance so that students can prepare for each session.

5507. DRUG INTERACTIONS. (1 cr)
Lectures on how drugs can interact to enhance or diminish their individual pharmacologic effects.

5508. SEDATIVES AND ANALGESICS IN THE PRACTICE OF MEDICINE. (1 cr)
The pharmacology and toxicology of sedatives and analgesics are considered as the basis for intelligent clinical use of these agents.

5511. TOXICOLOGY. (1 cr)
Lectures on the toxicity and therapy of intoxications of drugs and environmental chemicals.

5512. RENAL PHARMACOLOGY REVIEW. (1 cr)
Drugs that affect kidney function and metabolism.

5513. CONCEPTS INVOLVED IN CARDIOVASCULAR PHARMACOLOGY. (1 cr)
Mechanisms of action of drugs employed to treat hypertension and to modify the renin-angiotensin system and other topics.

5515. CLINICAL PHARMACOLOGY AT THE UNIVERSITY HOSPITALS. (9 cr)
The clinical application of therapeutic agents in pathophysiologic states. Correlations between basic pharmacologic knowledge and its utilization at the bedside emphasized. Each student involved in the management of inpatients and outpatients experiencing therapeutic problems. Opportunity to participate in ongoing clinical research programs within the Division of Clinical Pharmacology. Regularly scheduled activities include:

Monday afternoon—Clinical pharmacology rounds, University Hospitals (inpatients)
Tuesday afternoon—Hypertension-renal clinic (outpatients); drug therapy studies
Thursday afternoon—Clinical pharmacology walking rounds; seminar or journal club
Friday—Tutorial with Dr. Mirkin or staff (seminar, inpatient/outpatient activity)

ADVANCED CREDIT COURSES

8203. RESEARCH IN PHARMACOLOGY

8204. SEMINAR: SELECTED TOPICS IN PHARMACOLOGY

8206. SEMINAR: MICROASSAY OF DRUGS

8207. SEMINAR: PSYCHOPHARMACOLOGY

8208. NEUROPSYCHOPHARMACOLOGY

8209. NEUROHORMONES AND NEUROPHARMACOLOGICAL AGENTS

8211. PHYSIOLOGICAL DISPOSITION OF DRUGS

8212. PHARMACODYNAMICS

8214. TOXICOLOGY

8215. CANCER CHEMOTHERAPY

8217. CARDIOVASCULAR-RENAL PHARMACOLOGY

8219. ADVANCED TOXICOLOGY

Physical Medicine and Rehabilitation (PMed)

Frederic J. Kottke, M.D., Ph.D., professor and head

Professor

Thomas P. Anderson, M.D.
Gary T. Athelstan, Ph.D.
Glenn Gullickson, Jr., M.D., Ph.D.
William G. Kubicek, Ph.D.
Frank M. Lassman, Ph.D.

Clinical Professor Emeritus

Miland E. Knapp, M.D.

Clinical Professor

Paul M. Ellwood, Jr., M.D.

Associate Professor

John Allison, M.S.
Nancy M. Crew, Ph.D.
Helen Dahlstrom, B.A.
Dortha L. Esch, B.S.
A. Joy Huss, M.S.
Marvin G. Lepley, B.S.
Martin O. Mundale, M.S.
Robert Patterson, Ph.D.
James F. Pohtilla, M.S.
Mary Price, M.D.
Pearl Rosenberg, Ph.D.

Clinical Associate Professor

Alan Bensman, M.D.
Richard R. Owen, M.D.

Assistant Professor

Louis Amundsen, Ph.D.
Louvain G. Arndts, B.A.
Warren Bilkey, M.D.
Joseph Bohlen, M.D., Ph.D.
Robert Bollinger, B.S.
Geraldine Dickinson, M.D.
Marian Eliason, B.S.
Corinne Ellingham, M.S.
Steven Fisher, M.D., M.S.
Sarah Gault, M.D.
Michael Kosiak, M.D.
Loren Leslie, M.D.

Marvin Logel, Ph.D.
John Magness, M.D.
Dennis Matthews, M.D.
Garland K. Meadows, M.Ed.
Kevin Murphy, Ph.D.
Marianne O'Carroll, M.D.
Donna Pauley, B.S.
Glenn Scudder, M.S.
Clarence Sicard, B.S.

Clinical Assistant Professor

Matthew Eckmann, M.D.
Roger P. Hallin, M.D.
John E. Quast, M.D.
Herbert A. Schoening, M.D.

Instructor

James Agre, M.D.
Rondall Berkeland, M.P.H.
James Carey, M.S.
Ann L. Charness, M.S.
Dennis Dykstra, M.D.
Marguerite Gardner, M.S.
Linda Krach, M.D.
Jean Magney, M.S.
Keith Sperling, M.D.

Clinical Instructor

Sunada Apte, M.D.
Ronald Batemen, D.O.
John Bower, M.D.
Joseph P. Engel, M.D.
Gail Gregor, M.D.

Adjunct Instructor

Cornelia A. Burrill, B.S.

Care of patients with physical disabilities or chronic diseases has become an important part of medical practice. Comprehensive medical management of such patients requires that the physician evaluate those abilities of the patient that may be utilized to restore the individual to useful function. Rehabilitation may require the use of multiple types of therapy. The allied health professions participate with the physician in a coordinated rehabilitation program. In the Rehabilitation Center, this multidisciplinary approach is used in the treatment of patients. The student learns about the comprehensive care of disabled patients and participates in the program of rehabilitation. By active involvement in the management of patients, the student learns the methods of coordination of care, communication, leadership, and administration necessary for professional practice. There is also opportunity to participate in research related to neuromuscular and circulatory functions, techniques of therapy, programs for management of patients, and methods of education in the health professions.

ELECTIVE COURSES

5410. ADULT REHABILITATION MEDICINE. (Cr ar; prereq regis med)

5411. PEDIATRIC REHABILITATION MEDICINE. (Cr ar; prereq regis med)

5414. PHYSICAL MEDICINE AND REHABILITATION FOR THE FAMILY PHYSICIAN. (Cr ar; prereq regis med)

5420. HISTOPATHOLOGY, ELECTRODIAGNOSIS, AND KINESIOLOGY. (Cr ar; prereq regis med)

5430. RESEARCH IN PHYSICAL MEDICINE AND REHABILITATION. (Cr ar; prereq regis med)

5440. BEHAVIOR MODIFICATION IN HEALTH CARE. (2 cr; prereq 8 cr psychology or #)
Theoretical and practical applications of the principles of behavioral psychology to physiological, neurological, and behavioral dysfunctions of patients. Problem-oriented approach to patient management stressed.

ADVANCED CREDIT COURSES

8200. PHYSICAL MEDICINE AND REHABILITATION SERVICE

8205. PHYSICAL MEDICINE AND REHABILITATION LITERATURE

8206. PHYSICAL MEDICINE AND REHABILITATION CONFERENCE

8207. BASIC AND APPLIED PHYSIATRY

8210. RESEARCH IN PHYSICAL MEDICINE AND REHABILITATION

8211. ELECTRONICS IN PHYSICAL MEDICINE AND REHABILITATION

8212. ELECTRODIAGNOSIS AND ELECTROMYOGRAPHY

8220. SEMINAR: PHYSICAL MEDICINE AND REHABILITATION

8230. LEADERSHIP TRAINING FOR INTERDISCIPLINARY SETTINGS

Physiology (Phsl)

Eugene Grim, Ph.D., professor and head

Professor

Marvin Bacaner, M.D.
James Bloedel, M.D., Ph.D.
H. Mead Cavert, M.D., Ph.D.
Irwin J. Fox, M.D., Ph.D.
Rodney B. Harvey, M.D., Ph.D.
John A. Johnson, M.D., Ph.D.
David Levitt, M.D., Ph.D.
Nathan Lifson, M.D., Ph.D.
Maurice Meyer, D.D.S., Ph.D.
Jack H. Oppenheimer, M.D.
Richard Poppele, Ph.D.
Richard Purple, Ph.D.
Carlo Terzuolo, M.D.
Maurice B. Visscher, M.D., Ph.D.
Esmail D. Zanjani, Ph.D.

Associate Professor

Charles Knox, Ph.D.
Chiung P. Lee, Ph.D.
Jui S. Lee, Ph.D.
John Soechting, Ph.D.
O. Douglas Wangensteen, Ph.D.

Assistant Professor

John H. Anderson, M.D., Ph.D.
Jurgen F. Fohlmeister, Ph.D.
Gordon Kepner, Ph.D.
Hon Cheung Lee, Ph.D.
Lester Michels, Ph.D.
Richard Stish, B.E.E.

Instructor

Gertrude Blackshear, M.D., Ph.D.
George Bloom

Lecturer

Richard Kronenberg, M.D.
John K. Love, Ph.D.
Ida M. Martinson, Ph.D.
Fernando Vargas, D.D.S, Ph.D.
Clyde Wilkes, Ph.D.

REQUIRED COURSES

5110w. HUMAN PHYSIOLOGY. (5 cr; prereq anatomy, biochemistry)

5111s. HUMAN PHYSIOLOGY. (6 cr; prereq 5110)

ELECTIVE COURSES

5103f. GENERAL PHYSIOLOGY. (3 cr; prereq physical chemistry, #; offered 1982 and alt yrs)

5104w. NEUROPHYSIOLOGY. (4 cr; prereq neuroanatomy and #; offered 1983 and alt yrs)

5105s. CARDIOVASCULAR PHYSIOLOGY. (4 cr; prereq #; offered 1983 and alt yrs)

5106f. RESPIRATORY PHYSIOLOGY. (3 or 4 cr; prereq #; offered 1981 and alt yrs)

5107w. ALIMENTARY PHYSIOLOGY. (3 cr; prereq #; offered 1982 and alt yrs)

5108s. NEPHROLOGY. (4 cr; prereq #; offered 1982 and alt yrs)

5113f,w,s. PROBLEMS IN PHYSIOLOGY. (Cr and hrs ar; prereq 5111 or #)
Topics assigned for readings or lab study; conferences.

5114f. BIOPHYSICS OF NERVE CELLS. (3 cr; prereq #; offered 1981 and alt yrs)

5116s. BIOPHYSICAL APPROACHES TO PHYSIOLOGY. (4 cr; prereq 3055 or #)

ADVANCED CREDIT COURSES

5115w. MATHEMATICAL NEUROPHYSIOLOGY. (4 cr; prereq calculus through ordinary differential equations, Stat 8501 or #; offered 1982 and alt yrs)

5551f,w,s. LITERATURE SEMINAR. (1 or 2 cr; hrs ar)

5552f,w,s. READINGS IN PHYSIOLOGY. (Cr and hrs ar)
Topics selected for each student; written reviews prepared and discussed.

5553f,w,s. RESEARCH IN PHYSIOLOGY. (Cr and hrs ar)

5554.[1] HISTORY OF PHYSIOLOGY. (Cr and hrs ar)

5560.[1] SELECTED TOPICS IN PERMEABILITY. (Cr and hrs ar; prereq 5103 or equiv, #)
Advanced seminar.

5561.[1] SELECTED TOPICS IN HEART AND CIRCULATION. (Cr and hrs ar; prereq 5105 or equiv, #)
One or more seminars in the advanced physiology of the heart and circulation.

5562.[1] SELECTED TOPICS IN RESPIRATION. (Cr and hrs ar; prereq 5106 or equiv, #)
Advanced seminar.

[1]Students should consult the department for offerings during any specific quarter.

5563.[1] **SELECTED TOPICS IN ALIMENTARY PHYSIOLOGY.** (Cr and hrs ar; prereq 5107 or equiv, #)

5564.[1] **SELECTED TOPICS IN NEPHROLOGY.** (3 cr; prereq 5108 or equiv)

5566.[1] **SELECTED TOPICS IN NEUROPHYSIOLOGY.** (Cr and hrs ar; prereq 5104 or equiv, #)
Advanced seminar.

5567s. PROPERTIES OF RECEPTOR SYSTEMS. (3 cr; prereq #; offered 1982 and alt yrs)

5568f. PHYSIOLOGY OF VISUAL SYSTEMS. (3 cr; prereq #; offered 1982 and alt yrs)

5569s. SPINAL CORD PHYSIOLOGY AND MOTOR CONTROL. (3 cr; prereq #; offered 1983 and alt yrs)

5570.[1] **METHODS OF ANALYSIS.** (3 cr; prereq calculus through introduction to differential equations, physical chemistry or #)
Topics selected from the following: control theory, compartmental analysis, tracer analysis, thermodynamics of irreversible processes, construction and use of models. Applications in physiology.

5577s.[1] **METHODS IN PHYSIOLOGY.** (3 cr; prereq #)

5580, 5581.[1] **TRANSPORT PROCESS IN BIOLOGY.** (3 cr per qtr; prereq 5103 or equiv)
Relatively systematic coverage of biological transport processes.

5584.[1] **RESPIRATION, ACID-BASE CHEMISTRY, AND ELECTROLYTE METABOLISM.** (3 cr; prereq 5106 or equiv)

5585.[1] **BIOENERGETICS OF CARDIAC CONTRACTION.** (3 cr; prereq 5105 or equiv)

5588.[1] **NEURAL AND HUMORAL CONTROL OF CIRCULATION.** (3 cr; prereq 5105 or equiv)

5589.[1] **PHYSIOLOGY OF LYMPHATIC SYSTEM AND MICROCIRCULATION.** (Cr ar)

Psychiatry

Paula J. Clayton, M.D., professor and head

The program in psychiatry is designed to train students to understand normal growth and development and to recognize abnormal behavior. They are to learn how to assess patients seeking psychiatric care and to assimilate assessment information into a working psychiatric diagnosis and treatment plan. This requires learning the common language that describes psychiatric patients, learning interviewing skills, learning about psychiatric disorders, and learning something about various psychological and somatic treatments. Both child and adult problems are covered.

The first-year course in human behavior introduces the student to fundamental determinants of human behavior as they relate to the physician-patient relationship and to the adaptive patterns available to patients in coping with illness. Normal development from infancy through adolescence as well as the biological bases of behavior are reviewed. Problem areas of special psychological importance, including chemical dependency, pain, aging, dying, and death, are included.

The Phase B course deals with a range of approaches, both developmental and descriptive, to the understanding of psychopathology and of the psychological, biological, and social bases for therapeutic approaches to the treatment of psychiatric disorders. It also deals with problems of the doctor-patient relationship and with psychological testing procedures. During the Phase B year, each medical student completes a tutorial in psychiatry, meeting with a psychiatrist and, under this tutelage, evaluating psychiatric patients. The student is expected to take a general history, do a physical examination and mental status examination, and formulate a diagnosis and a therapeutic program. During this time the student learns about the management of various chemical dependencies. The student also gains experience in working with professionals in allied health care fields in addition to physicians. Small group seminars are conducted for discussion of interviewing techniques, psychotherapy, psychopathology, and communication patterns. This tutorial experience is part of the Student as Physician course.

[1]Students should consult the department for offerings during any specific quarter.

In Phase D, the student is offered supervised clinical experience, which may be selected from a variety of different settings. The student can work on various psychiatric inpatient services, in an outpatient clinic, or on a child or adult consultation-liaison service. These last services are unique because they can be the one place the physician, rather than the patient, defines the problem. In that way they approximate the situation of family practice.

In addition to the formal Phase D electives, other elective and free-time programs are available during each of the phases to meet the interests of the individual student and to augment the medical education with the study of specific issues in the field.

Adult Psychiatry (AdPy)

Professor

John Brantner, Ph.D.
Paula J. Clayton, M.D.
Floyd K. Garetz, M.D.
Lawrence Greenberg, M.D.
William Hausman, M.D.
Gordon Heistad, M.D.
Leonard L. Heston, M.D.
John T. Kelly, M.D.
Thomas Kiresuk, Ph.D.
David Lykken, Ph.D.
Manfred Meier, Ph.D.
Roy Pickens, Ph.D.
William Schofield, Ph.D.
Lloyd Sines, Ph.D.
Vicente B. Tuason, M.D.
Joseph J. Westermeyer, M.D.

Clinical Professor

Faruk S. Abuzzahab, M.D.
Marvin Ack, Ph.D.
Irving C. Bernstein, M.D.
Donald Daggett, M.D.
Philip Feinberg, M.D.
James Garvey, M.D.
Frank Kiesler, M.D.
James J. Lawton, M.D.
Nathaniel J. London, M.D.
Richard M. Magraw, M.D.
Donald Mayberg, M.D.
Robert L. Meller, M.D.
John J. Regan, M.D.
Clarence J. Rowe, M.D.
Werner Simon, M.D.
Daniel Wiener, Ph.D.

Associate Professor

David Cline, M.D.
Elke Eckert, M.D.
Harold Ireton, Ph.D.
William W. Jepson, M.D.
Jerome L. Kroll, M.D.
Thomas B. Mackenzie, M.D.
Richard Meisch, M.D.
Michael K. Popkin, M.D.
Pearl Rosenberg, Ph.D.
George Williams, M.D.
Absalom Yellin, Ph.D.
Ronald C. Young, M.D.

Clinical Associate Professor

Dorothy Bernstein, M.D.
Robert Bush, M.D.
Robert Clark, M.D.
Willem Dieperink, M.D.
Seymour Gross, Ph.D.
Charles Haberle, M.D.
Leo Hanvik, M.D.
Michael Hong, M.D.
Keith Horton, M.D.
James Janecek, M.D.
James Kincannon, Ph.D.
Glenn J. Lewis, M.D.
Timothy Magee, M.D.
Charles McCafferty, M.D.
W. Wyatt Moe, M.D.
Ilgvars Nagobads, M.D.
Mary Pennington, M.D.
Myron Stocking, M.D.
Frederic Wilson, M.D.

Assistant Professor

Edward J. Bardon, M.D.
Steven Butzer, M.D.
Marilyn Carroll, Ph.D.
Pi-Nian Chang, Ph.D.
Ray Conroe, M.D.
Nancy Crewe, M.D.
Larry Dailey, M.D.
Charles E. Dean, M.D.
Vernon Devine, Ph.D.
Philip Edwardson, M.D.
Edward Ells, Ph.D.
Susan Erbaugh, Ph.D.
William Erickson, M.D.
David Faust, Ph.D.
Daniel Ferguson, M.D.
Michael Garvey, M.D.
Dorothy Hatsukami, Ph.D.
John Heefner, M.D.
Richard O. Heilman, M.D.
Steven Hollon, Ph.D.
John Hughes, M.D.
Thomas Hurwitz, M.D.
Sutaeg Hwang, M.D.
Jonathan Jensen, M.D.
Roger Johnson, M.D.
Young-Ho Kang, M.D.
Suck Won Kim, M.D.
John C. Kluznik, M.D.
Michael Koch, M.D.
Daniel Larson, M.D.
Gabe Maletta, M.D.
Garland Meadows, M.D.
Manuel Mejia, M.D.
William Miller, M.D.
Richard Miner, M.D.
James Mitchell, M.D.

Michael Moore, M.D.
Robert Murtaugh, M.D.
Joanne Pearson, M.D.
Francis J. Pirozzolo, Ph.D.
Anthony J. Pollock, M.D.
Edward W. Posey, M.D.
Richard Pyle, M.D.
George Realmuto, M.D.
Nicholas Rogers, M.D.
Sharon Satterfield, M.D.
John M. Scanlan, M.D.
Gary Tollefson, M.D.
Thomas Weier, M.D.
Marlin Wiemer, Ph.D.
Janet Zander, M.D.

Clinical Assistant Professor

Burton Abramson, M.D.
David Auran, M.D.
Lee Beecher, M.D.
William Brauer, M.D.
William A. Callahan, Jr., M.D.
Curtis Carlson, M.D.
George Dorsey, M.D.
John Druker, M.D.
Michael Feldman, M.D.
Joel Finkelstein, M.D.
Howard Fisher, M.D.
Joseph Gendron, M.D.
Leonard Goldman, M.D.
William Goodchild, M.D.
Malka Goodman, M.D.
Deborah Gould, M.D.
Ron Groat, M.D.
James Guerrero, M.D.
Douglas Hedlund, M.D.
Bruce Hiller, M.D.
Norman Hoffman, M.D.
Rodger C. Kollmorgen, M.D.
Harold Lawn, M.D.
Richard Lentz, M.D.
Murray Locke, M.D.
Richard G. Lunzer, M.D.
Deane Manolis, M.D.
Mary Ann Mattoon, Ph.D.
John Michelman, M.D.
Robert Nesheim, M.D.
Kenneth Nimlos, M.D.
Clyde Olson, M.D.
Martin Orbuch, M.D.
Henry Osekowsky, M.D.
Jennings Peteler, M.D.
Loran Pilling, M.D.
Nancy Rains, Ph.D.
John Rauenhorst, M.D.
Murray Reed, Ph.D.
Gerald Ronning, M.D.
A. Lee Sandler, Ph.D.
David Schalker, M.D.
Alan Serpess, M.D.
Thomas Stapleton, M.D.
Patrick Stokes, M.D.
James Swenson, M.D.
Lowell C. Wigdahl, M.D.
Thomas Wittkopp, M.D.

Instructor

Dorothy Cahill, M.S.
Donna Gedo, M.A.
Brian Guidera, M.A.
Charlotte Milstead, M.D.
Donald Pastor, M.D.

Clinical Instructor

Suzanne Albrecht, M.D.
Floyd O. Anderson, M.D.
Steve Doheny, M.D.
Frederick Engstrom, M.D.
Eric Errickson, M.D.
Roy Hankins, M.D.
James Jordan, M.D.
Steven Keller, M.D.
Ann Lumry, Ph.D.
Sushila Mohan, M.D.
Lenore A. Nimlos, M.D.
David Paulson, M.D.
Lawrence Peterson, M.D.
James Pullen, M.D.
Fatma Reda, M.D.

REQUIRED COURSE

5107, 5108. HUMAN BEHAVIOR

ELECTIVE COURSES

5109. EXTERNSHIP IN CLINICAL PSYCHIATRY—Duluth Hospital. (9 cr; prereq regis med) Olson

5110. CONTEMPORARY HOSPITAL PSYCHIATRY—St. Luke's Hospital, Duluth. (9 cr; prereq regis med) Cowan

5120. CLINICAL EXPERIENCE IN INTERVIEWING AND DIAGNOSTIC SKILLS—Veterans Administration Hospital. (9 cr; prereq regis med) Magraw

5222. PRECEPTORSHIPS IN PSYCHIATRY (location by arrangement). (Cr ar) Hausman, Erickson, Tuason

5500. COMBINED INPATIENT AND CRISIS INTERVENTION CENTER—Hennepin County Medical Center. (9 cr; prereq regis med) Dean

5501. CLINICAL PSYCHIATRY—St. Paul-Ramsey Medical Center. (9 cr; prereq regis med) Tuason

5506. ADULT OUTPATIENT PSYCHIATRY—University Hospitals. (9 cr; prereq regis med) Pyle, Mitchell

5507. CLINICAL RESEARCH IN PSYCHIATRY—University Hospitals, Station 61. (9 cr; prereq regis med) Heston

5508. ADULT GENERAL PSYCHIATRY—University Hospitals, Station 60. (9 cr; prereq regis med) Kroll

5509w. HEALTH CARE FOR THE ELDERLY—University Hospitals. (Cr ar; prereq regis med) Garetz, Meier

5510. INTERDISCIPLINARY CLINICAL TEAM SERVICES FOR THE AGING—University Hospitals. (Cr ar; prereq regis med) Meier, Garetz

5511. PSYCHIATRY IN MEDICINE: CONSULTATION-LIAISON—University Hospitals. (9 cr; prereq regis med) Popkin, Mackenzie

5512. PSYCHOLOGIC ASPECTS OF MEDICAL PRACTICE—Veterans Administration Hospital. (9 cr; prereq regis med) Nesheim

5513. ST. MARY'S EXTENDED CARE CENTER: CHEMICAL DEPENDENCY CENTER—St. Mary's ECC. (4.5 or 9 cr; prereq regis med) Mann

5515. NEUROPSYCHOLOGY—University Hospitals. (9 cr; prereq regis med) Meier

5516. ST. MARY'S EXTENDED CARE CENTER: ALCOHOLIC TREATMENT UNIT—St. Mary's ECC. (4.5 or 9 cr; prereq regis med) Mann

5518. COMMUNITY PSYCHIATRY—Five-County Human Development Program, Braham, Minnesota. (9 cr; prereq regis med) Kollmorgen

5519. CLINICAL PSYCHIATRY—Abbott Division of Abbott-Northwestern Hospital. (9 cr; prereq regis med) Mayberg

5521. COMMUNITY PSYCHIATRY—Dakota County Mental Health Center. (9 cr; prereq regis med) Nagobads

5530. INDEPENDENT STUDY. (Cr ar; prereq regis med) Heston

5602. CLINICAL PSYCHOPHARMACOLOGY SEMINAR—University Hospitals. (Cr ar; prereq regis med) Abuzzahab

5604w,s. BIOLOGICAL BASES OF BEHAVIOR—University Hospitals. (3 cr; prereq regis med) Heston

ADVANCED CREDIT COURSES

5800. CASE CONFERENCE: PSYCHIATRY IN MEDICINE

5801. CONSULTATION-LIAISON PSYCHIATRY

5810. ALCOHOL AND DRUG DEPENDENCY

5811. APPLIED BEHAVIORAL ANALYSIS

5825. PSYCHIATRIC INTERVIEWING

8201. CLINICAL PSYCHIATRY

8203. ADVANCED CLINICAL PSYCHIATRY

8205. SPECIAL ASSIGNMENTS

8206. RESEARCH

8208. SURVEY OF PHYSIOLOGICAL TREATMENTS IN PSYCHIATRY

8209. DESCRIPTIVE PSYCHOPATHOLOGY

8221. SEMINAR: CURRENT LITERATURE

8226. BIOLOGICAL PSYCHIATRY

8238. CASE CONFERENCE: PSYCHOLOGICAL MEDICINE

8239. CONTINUOUS CASE SEMINAR: PSYCHOANALYTICALLY ORIENTED PSYCHOTHERAPY

8243. ESSENTIALS OF PSYCHODYNAMIC PSYCHOTHERAPY

8249. CLINICAL NEUROPSYCHOPHARMACOLOGY

8264. PRESENTATIONS ON CURRENT LITERATURE

8265. READINGS: PSYCHOSOMATIC MEDICINE CONSULTATION-LIAISON PSYCHIATRY

8970. DIRECTED STUDIES

Child and Adolescent Psychiatry (CAPy)

Lawrence M. Greenberg, M.D., professor and director

Clinical Professor

Marvin Ack, Ph.D.
James J. Lawton, Jr., M.D.

Associate Professor

David W. Cline, M.D.
Absalom Yellin, Ph.D.

Clinical Associate Professor

Dorothy Bernstein, M.D.
K. Michael Hong, M.D.
Myron Stocking, M.D.
Jack Wallinga, M.D.

Assistant Professor

Larry Dailey, M.D.
Susan Erbaugh, Ph.D.
William Erickson, M.D.
David Faust, Ph.D.
Jonathan Jensen, M.D.
Michael Koch, M.D.
Richard Miner, M.D.
Michael Moore, M.D.
Joanne Pearson, M.D.
George Realmuto, M.D.

Clinical Assistant Professor

John Michelman, M.D.
A. Lee Sandler, Ph.D.

Instructor

Dorothy Cahill, M.S.N.
Donna Gedo, M.A.
Brian Guidera, M.A.
Hert Self, Ph.D.

ELECTIVE COURSES

5203. CHILD AND ADOLESCENT PSYCHIATRY FOR PSYCHOLOGY INTERNS. (Cr ar; prereq #) Erbaugh
Experience in assessment and therapeutic interventions with children, adolescents, and families in child and adolescent psychiatric setting.

5204. DIAGNOSTIC METHODS IN CHILD, ADOLESCENT, AND FAMILY PSYCHIATRY. (1 cr; prereq med student, #) Greenberg and staff
Multidisciplinary evaluations of children, adolescents, and their families are presented for discussion, dynamic and diagnostic formulations, and disposition planning in a conference setting.

5206f,w,s,su. THERAPEUTIC METHODS IN CHILD, ADOLESCENT, AND FAMILY PSYCHIATRY. (1 cr; prereq med student, #; Wednesdays 10-11 am) Greenberg and staff.
Therapeutic techniques utilized in child, adolescent, and family psychiatry are reviewed through presentation and discussion of ongoing cases.

5221f,w,s. INPATIENT CLINICAL ADOLESCENT PSYCHIATRY FOR PRIMARY CARE PHYSICIANS. (Cr and hrs ar; prereq med student, #) Erickson and staff
Supervised diagnostic and therapeutic experiences in an inpatient, multidisciplinary adolescent psychiatric unit with an emphasis on group and milieu therapies.

5500. PEDIATRIC PSYCHIATRY LIAISON. (Cr and hrs ar; prereq med student, #; not offered period 5) Pearson, Jensen
Supervised consultation, diagnostic and short-term therapy experience in pediatrics and pediatric neurology.

5520f,w,s. OUTPATIENT CLINICAL CHILD AND ADOLESCENT PSYCHIATRY FOR PRIMARY CARE PHYSICIANS. (Cr and hrs ar; prereq med student, #; not offered period 5) Greenberg, Erbaugh
Supervised diagnostic and therapeutic experiences in an outpatient setting.

5602f,w,su. INTRODUCTORY READING IN CHILD, ADOLESCENT, AND FAMILY PSYCHIATRY. (1 cr; hrs ar; prereq med student, #) Erickson and staff
Assigned readings and discussions with faculty members. Topics include child development, diagnostic and therapeutic techniques, and psychopathology.

5603f,w,s. INPATIENT CLINICAL CHILD PSYCHIATRY FOR PRIMARY CARE PHYSICIANS. (Cr and hrs ar; prereq med student, #) Moore and staff
Supervised diagnostic and therapeutic experiences in an inpatient, multidisciplinary child psychiatric unit with an emphasis on group and milieu therapies.

5608. INTRODUCTION TO FAMILY THERAPY: THEORY AND PRACTICE. (1 cr; 1 hr ar; prereq MD, course in basic psychopathology or equiv, current supervision of treatment cases, and #) Miner and staff
Introduction to the ideas and treatment approaches of some major figures in the current clinical practice of psychotherapy with families: Carl Whitaker, Salvador Minuchin, Lyman Wynne, Jay Haley, Murray Bowen, Virginia Satir, and others. Exposure to the problems of and techniques used by beginning family therapists through review and discussion of videotapes of current treatment cases of course participants.

5609. CHILD DEVELOPMENT PRACTICUM. (Cr ar; 2½ hrs ar; prereq MD and/or #) Erbaugh and staff
Observation at the University Child Care Center consisting of three sessions with infants, three sessions with toddlers, and four sessions with preschoolers. Each session consists of one hour of observation of unstructured activities under the guidance of faculty members, one hour of group discussion with child psychiatry and child development faculty members, and one hour of demonstration illustrating the characteristic behaviors of each age group.

5610s. BIOMEDICAL RESEARCH: PRINCIPLES AND DESIGN. (2 cr; prereq introductory statistics, #) Yellin
Basic knowledge and skills necessary to plan and carry out biomedical research and to critically read research reports and articles. Topics will include theoretical models, generation of research hypotheses, selection of appropriate research strategies, determination of appropriate statistical analyses, interpretation of results, issues related to research with human subjects, the relationship between research and clinical work, the computer as a research tool, and resources available for literature searches.

ADVANCED CREDIT COURSES

8100f,w,s,su. READINGS IN CHILD, ADOLESCENT, AND FAMILY PSYCHIATRY. (1 cr; prereq #; hrs ar) Greenberg and staff
Comprehensive review of the classical and contemporary literature in the field, including the topics growth and development, diagnostic and therapeutic techniques, and psychopathology. Supplemental course work in other departments and schools.

8110f,w,s,su. DIAGNOSTIC METHODS IN CHILD, ADOLESCENT, AND FAMILY PSYCHIATRY. (1 cr; prereq #; hrs ar) Greenberg and Erbaugh
For a description, see 5204.

8120f,w,s,su. THERAPEUTIC METHODS IN CHILD, ADOLESCENT, AND FAMILY PSYCHIATRY. (1 cr; prereq #; hrs ar) Greenberg, Stocking
For a description, see 5206.

8200f,w,s,su. OUTPATIENT CLINICAL CHILD AND ADOLESCENT PSYCHIATRY. (3 cr; prereq #;15-30 hrs per wk) Greenberg, Erbaugh
For a description, see 5520.

8212f,w,s,su. INPATIENT CLINICAL CHILD PSYCHIATRY. (3 cr; prereq #;15-30 hrs per wk) Moore and staff
For a description, see 5603.

8214f,w,s,su. INPATIENT CLINICAL ADOLESCENT PSYCHIATRY. (3 cr; prereq #; hrs ar) Erickson and staff
For a description, see 5221.

8216. PEDIATRIC-PSYCHIATRY LIAISON. (3 cr; hrs ar; prereq MD, #) Pearson and staff
Supervised consultation, diagnostic, and short-term therapy experience in pediatrics and pediatric neurology.

8218. GROUP THERAPY. (1 cr; hrs ar; prereq MD, #) Greenberg
Readings and group therapy examples are reviewed to complement the clinical experiences being taken concurrently.

8223. FAMILY THERAPY. (1 cr; hrs ar; prereq MD, #) Miner
Readings and family therapy examples are reviewed to complement the clinical experiences being taken concurrently.

8228. RESEARCH IN CHILD AND ADOLESCENT PSYCHIATRY. (1 cr; prereq MD, #) Greenberg, Yellin
Research design and methodology as well as current research projects are reviewed with faculty members and invited guests.

8243. SCHOOL CONSULTATION. (2 cr; 10 hrs per wk; prereq MD, #) Gedo and staff
Supervised clinical and consultative experiences in a school setting with literature and clinical seminars.

8301f,w,s,su. SEMINAR IN CHILD, ADOLESCENT, AND FAMILY PSYCHIATRY. (1 cr; Wednesdays 8:30-10am; C-608 Mayo) Greenberg and staff
Through clinical and didactic presentations and discussions by students, faculty members, and invited guests, current diagnostic, therapeutic, and theoretical issues in child, adolescent, and family psychiatry are reviewed.

8302. BIOMEDICAL RESEARCH: PRINCIPLES AND DESIGN. (2 cr; prereq introductory statistics, #) Yellin
For a description, see 5610.

8233. MENTAL HEALTH ADMINISTRATION AND TRAINING SEMINAR. (1 cr; prereq med regis, #) Greenberg
Review of styles of mental health administration and role of the child psychiatrist as well as ongoing evaluation of the child psychiatry residency program.

Public Health, School of

Lee D. Stauffer, M.P.H., associate professor and dean

Professor

Robert K. Anderson, D.V.M.
Donald Barber, Ph.D.
Henry Blackburn, M.D.
James Boen, Ph.D.
John Brantner, Ph.D.
Bright Dornblaser, M.H.A.
Velvl Greene, Ph.D.
A. Jack Hafner, Ph.D.
Eugene A. Johnson, Ph.D.

Marcus Kjelsberg, Ph.D.
Arthur S. Leon, M.D.
Theodore Litman, Ph.D.
Richard B. McHugh, Ph.D.
Manfred J. Meier, Ph.D.
Ronald Prineas, M.D., Ph.D.
Wentworth Quast, Ph.D.
William Schofield, Ph.D.
Leonard Schuman, M.D.
Lloyd K. Sines, Ph.D.
Henry Taylor, Ph.D.
Robert W. ten Bensel, M.D., M.P.H.
Donald Vesley, Ph.D.
Vernon Weckwerth, Ph.D.

Associate Professor

Mila Aroskar, Ed.D.
Glenn Bartsch, Sc.D.
Lester Block, D.D.S.
Robert Blum, M.D., Ph.D., M.P.H.
Mario F. Bognanno. Ph.D.
Judith Brown, Ph.D.
Richard Crow, M.D.
Judith Garrard, Ph.D.
Robert Gibson, Ph.D.
Richard Gillum, M.D.
Anne Goldman, Ph.D.
George K. Gordon, Ed.D.
George Johnson, Ph.D.
James C. Kincannon, Ph.D.
Russell Luepker, M.D.
Jack Mandel, Ph.D.
James M. Schaefer, Ph.D.
Robert Schwanke, M.P.H.
Rexford D. Singer, M.S.
Robert Veninga, Ph.D.

Adjunct Associate Professor

Richard Culbertson, M.H.A.
Lee Schacht, Ph.D.

Assistant Professor

Eric Anderson, Ph.D.
James L. Ayers, Ph.D.
Thomas Beniak, Ph.D.
Janet Kempf Berkseth, M.S.
Raymond Carlaw, Dr.P.H.
Phyllis Fleming, Ph.D.
John Hung, Ph.D.
Robert Jeffery, Ph.D.
Dorothy Jeffries, M.S.
Walter H. Jopke, M.P.H.
Chap Le, Ph.D.
Edith Leyasmeyer, Ph.D.
Athena Linos, M.D.
Daniel J. McInerney, M.P.H.
Charles E. McJilton, Ph.D.
Maurice Mittlemark, Ph.D.
Terry Pechacek, Ph.D.
Cheryl Perry, Ph.D.
Sue V. Petzel, Ph.D.
E. Charlotte Pflug, M.P.H.
Barbara Reynolds, M.P.H.
Elaine Richard, M.S.
Orlando R. Ruschmeyer, Ph.D.
Jeffrey B. Stevens, Ph.D.
Robert S. Thomas, Ph.D.
Fay M. Thompson, Ph.D.
Marla Salmon White, Sc.D.
Ralph O. Wollan, M.P.H.

Instructor

Patricia Lentsch, M.P.H.
Barbara Leonard, M.S.
Joseph McLaughlin, M.P.H.
Patricia Splett, M.P.H.

For descriptions of the following courses, see the *School of Public Health Bulletin.*

Biometry

ELECTIVE COURSES

5400. INTRODUCTION TO QUANTITATIVE METHODS IN THE HEALTH AND LIFE SCIENCES. (4 cr; for students majoring in biological and health sciences; prereq Biol 1011, Chem 1004-1005, Math 1231 or equiv or #)

5403. COMPUTER APPLICATION IN HEALTH SERVICES ADMINISTRATION. (4 cr; prereq nonbiometry major, health sciences regis or #)

5409-5410. BIOMETRY IN CLINICAL STUDIES I, II. (3 cr per qtr; prereq DDS, MD, DVM, PharmD, or clinical nursing student or #)

5413. VITAL AND HEALTH STATISTICS. (1 cr)

5415. MATHEMATICAL MODELS IN THE HEALTH SCIENCES I: DETERMINISTIC MODELS IN PHYSIOLOGY AND CHEMISTRY. (3 cr; prereq 5432, calculus and biology)

5430-5431-5432. BIOMEDICAL COMPUTING I, II, III. (4 cr; prereq algebra or #)

5436. ANALYTICAL TECHNIQUES FOR HEALTH DELIVERY SYSTEMS. (3 cr; prereq calculus, 5452 and FORTRAN)

5450. BIOMETRY I. (3 cr; prereq ¶5451, familiarity with basic concepts of calculus)

5451. BIOMETRY LABORATORY I. (2 cr; prereq ¶5450)

Dental Public Health

5651. PHILOSOPHY AND CONCEPTS OF PREVENTIVE DENTISTRY. (Cr ar; prereq dental public health student or #)

5659. ANALYSIS OF DENTAL HEALTH EDUCATION. (Cr ar; prereq 5652 or #)

5662. COMMUNAL WATER FLUORIDATION: EFFICACY AND SAFETY. (3 cr; prereq 5330, 5361, 5414 or #)

Environmental Health

ELECTIVE COURSES

5152. ENVIRONMENTAL HEALTH. (2 cr)

5171. ENVIRONMENTAL MICROBIOLOGY. (3 cr; prereq MicB 3103 or #)

5177. PUBLIC HEALTH BIOLOGY. (3 cr; prereq environmental health student or #)

5181. INTRODUCTION TO THE AIR POLLUTION PROBLEM. (3 cr)

5201. MEASUREMENT AND APPLICATION OF IONIZING RADIATION. (3 cr lect and lab, 2 cr lect only)

5207. RADIATION PROTECTION CRITERIA FOR HOSPITALS. (2 cr)

5211. INDUSTRIAL HYGIENE ENGINEERING. (3 cr)

5212. VENTILATION CONTROL OF ENVIRONMENTAL HAZARDS. (3 cr; prereq 5211, #)

5218. FIELD PROBLEMS IN OCCUPATIONAL HEALTH. (3 cr; prereq 5211, 5212 or ¶5213, #)

5221. INSTITUTIONAL FOOD PROTECTION PROGRAMS. (3 cr)

5241. ENVIRONMENTAL HEALTH ASPECTS OF WATER SUPPLY. (3 cr)

5253. INTRODUCTION TO HAZARDOUS WASTE MANAGEMENT. (3 cr)

5261. GENERAL ENVIRONMENTAL TOXICOLOGY. (3 cr)

8201. RADIATION DOSIMETRY. (3 cr; prereq #)

8202. RADIATION DOSIMETRY LABORATORY. (1 cr; prereq ¶8201)

Epidemiology

ELECTIVE COURSES

5330. EPIDEMIOLOGY I. (5 cr; prereq course in microbiology 5405-5406 or 5413-5414 or 5450-5451 or #)

5332. FUNDAMENTALS OF EPIDEMIOLOGY. (3 cr)

5335. EPIDEMIOLOGY II. (3 cr; prereq 5330)

5336. INFECTIOUS DISEASE EPIDEMIOLOGY. (3 cr; prereq basic epidemiology and biostatistics)

5338. HOSPITAL EPIDEMIOLOGY AND INFECTION CONTROL. (2 cr; prereq basic epidemiology)

5339. EPIDEMIOLOGY OF DISEASES DUE TO DRUGS AND OTHER THERAPIES. (2 cr; prereq basic epidemiology and biostatistics)

5340. EPIDEMIOLOGY: STRATEGIES AND METHODS. (3 cr; prereq 5330, 5413 and 5414 or equiv or #)

5343. SURVEILLANCE AND CONTROL OF COMMUNICABLE DISEASES. (3 cr; prereq basic epidemiology)

5344. CLINICAL TRIALS: DESIGN, OPERATION, AND ANALYSIS. (2 cr; prereq basic epidemiology and biostatistics)

5345. EPIDEMIOLOGY OF CANCER. (3 cr; prereq basic epidemiology and biostatistics and 5357 or ¶5357)

5346. EPIDEMIOLOGY OF CARDIOVASCULAR DISEASE. (3 cr; prereq basic epidemiology and biostatistics and 5357 or ¶5357)

5350. EPIDEMIOLOGIC BASIS FOR HEALTH SERVICES PLANNING AND EVALUATION. (2 cr; prereq 5330, 5332 or equiv, 5407, 5331 or equiv)

5355. GENETICS AND EPIDEMIOLOGY. (3 cr; prereq basic epidemiology and biostatistics)

5360. EPIDEMIOLOGY OF INJURIES. (3 cr; prereq basic epidemiology and biostatistics)

5362. EPIDEMIOLOGY OF OCCUPATIONAL HAZARDS. (3 cr; prereq 5330 and 5450-5451 or 5413-5414 or equiv, #)

5363. ENVIRONMENTAL EPIDEMIOLOGY. (3 cr; prereq basic epidemiology and biostatistics or #)

5364. EPIDEMIOLOGY IN SOCIETAL DECISION MAKING. (3 cr; prereq 5362 or 5363 or #)

5378. DEVELOPMENT OF AND PERSPECTIVES IN EPIDEMIOLOGY. (2 cr; prereq basic epidemiology and basic biostatistics)

8340. CHRONIC DISEASE EPIDEMIOLOGY. (3 cr; prereq 5330, basic statistics, #)

8342. ADVANCED STATISTICAL METHODS IN EPIDEMIOLOGY. (3 cr; prereq 5331, 5332 or #)

Health Care Psychology

ELECTIVE COURSES

5800f,w,s,su. RESEARCH PROJECT IN HEALTH CARE PSYCHOLOGY. (Cr ar [max 6 per qtr])

5802f,w,s,su. SPECIAL TOPICS IN HEALTH CARE PSYCHOLOGY. (Cr ar; prereq #)

5813. FIELDWORK EXPERIENCE IN HEALTH CARE PSYCHOLOGY. (Cr ar [max 4 per qtr]; prereq clinical psychology intern or #; observed by staff)

5814. CASE CONFERENCE IN HEALTH CARE PSYCHOLOGY. (1 cr; prereq clinical psychology intern or #)

5815. CASE CONFERENCE IN NEUROPSYCHOLOGY. (1 cr; prereq clinical psychology intern or #)

5841. SUPERVISED PSYCHOLOGICAL THERAPY. (Cr ar [max 4 per qtr]; prereq #)

5850s. HEALTH SCIENCES EDUCATION IN THE 20TH CENTURY. (3 cr, §HSU 5022) Garrard, Eyler, Harris, Loupe

5851f,w,s. HUMAN INTERACTION LABORATORY. (4 cr, §HSU 5024) Ayers

5852. PROGRAM EVALUATION IN HEALTH AND MENTAL HEALTH SETTINGS. (3 cr, §HSU 5026; prereq 5414 or equiv basic statistics course)

5853. BEHAVIORAL MEDICINE I: THEORY, RESEARCH, AND PRACTICE. (3 cr; prereq psychology grad student, public health student or professional in health-related discipline)

5854. BEHAVIORAL MEDICINE II: SELECTED TOPICS. (3 cr; prereq 5853 or #)

5855. COMMON PROBLEMS OF LIVING: A SURVEY. (4 cr)

5857. PSYCHOLOGICAL PROBLEMS IN APPLIED GERONTOLOGY. (2 cr; prereq #)

5858. ELEMENTARY HUMAN NEUROPSYCHOLOGY. (4 cr; prereq Psy 5061 or #)

8801. DESCRIPTIVE PSYCHOPATHOLOGY. (3 or 4 cr; prereq #)

8802. PROFESSIONAL PROBLEMS IN APPLIED PSYCHOLOGY. (1 cr; prereq #)

8803. GROUP SUPERVISION OF PSYCHOTHERAPY I. (2 cr; prereq psychiatry resident or psychology intern)

8804. GROUP SUPERVISION OF PSYCHOTHERAPY II. (2 cr; prereq psychiatry resident or psychology intern)

8805. GROUP SUPERVISION OF PSYCHOTHERAPY III. (2 cr; prereq psychiatry resident or psychology intern)

Health Education

ELECTIVE COURSES

5061. BEHAVIORAL COMPONENTS OF HEALTH PROBLEMS—PROCESSES OF DIAGNOSIS AND CHANGE. (2 or 3 cr; prereq health sciences student or grad student or #)

5063. PATIENT EDUCATION IN REPRESENTATIVE HEALTH CARE SETTINGS. (3 cr; prereq #)

5065. HEALTH IN THE WORKPLACE: A HEALTH EDUCATION PERSPECTIVE. (3 cr; prereq #)

Hospital and Health Care Administration

ELECTIVE COURSES

5751. PRINCIPLES OF MANAGEMENT IN HEALTH SERVICES ORGANIZATIONS. (3 cr; prereq grad student)

5768. ADMINISTRATION OF SERVICES TO AN AGING CLIENTELE. (4 cr)

5769. CORPORATE PLANNING IN HEALTH CARE ORGANIZATIONS. (3 cr)

5790. SOCIOLOGY OF MEDICINE AND HEALTH CARE: AN INTRODUCTION TO MEDICAL SOCIOLOGY. (4 cr)

8750-8751. SEMINAR: ALTERNATIVE PATTERNS OF HEALTH CARE. (3 cr per qtr [grade assigned upon completion of both qtrs]; prereq #)

8752. SEMINAR: COMPARATIVE HEALTH CARE SYSTEMS. (3 cr; prereq #)

8762. CONTEMPORARY PROBLEMS OF HOSPITAL AND RELATED HEALTH SERVICES. (3 cr)

8770. SEMINAR: HEALTH AND HUMAN BEHAVIOR. (3 cr; prereq #)

8781. SEMINAR: RESEARCH STUDIES IN HEALTH CARE. (3 cr; prereq PhD student in hospital adminstration or #)

8790. SEMINAR: POLITICAL ASPECTS OF HEALTH CARE. (3 cr; prereq PhD student in hospital adminstration or #)

Interdisciplinary Studies

ELECTIVE COURSES

5001. PHILOSOPHICAL AND CONCEPTUAL BASES OF PUBLIC HEALTH PRACTICE. (2 cr; prereq public health grad student or #)

5002. PUBLIC HEALTH ISSUES IN HISTORICAL PERSPECTIVE. (3 cr, §HMed 5002)

5003. INTERDISCIPLINARY TEAM BUILDING IN PUBLIC HEALTH PRACTICE. (2 cr, 5003-5004†, §5013; prereq #)

5004. FIELD INSTRUCTION IN PUBLIC HEALTH. (Cr ar, 5003-5004†; prereq #)

5005. TOPICS IN PUBLIC HEALTH. (Cr ar; prereq advance proposal #)

5006. INTRODUCTION TO COMMUNITY HEALTH. (5 cr, §5016; prereq pharmacy student, nursing student, or nursing health professional or #)

5007. HEALTH LEADERSHIP AND EFFECTING CHANGE. (4 cr, §HSU 5007; prereq sr or grad student)

5009. HONORS COURSE: ISSUES AND CONTROVERSIES IN CONTEMPORARY COMMUNITY HEALTH. (3 cr; prereq 3001, 3004, 5006, 5016, or equiv, advance application, #)

5013. INTERDISCIPLINARY TEAM TRAINING IN HEALTH SERVICE DELIVERY. (3 cr, §HSU 5001, §HSU 5300; prereq #)

5015. TOPICS IN INTERDISCIPLINARY STUDIES. (Cr ar; prereq #)

5016. INTRODUCTION TO PUBLIC AND COMMUNITY HEALTH. (3 cr, §5006, §SW 5131; prereq pharmacy, dental hygiene or public health grad student or #)

5021. HUMAN SEXUALITY FOR HEALTH AND HELPING PROFESSIONALS I. (2-4 cr, §HSU 5025, §FSoS 5240, §SW5010; prereq enrollment in health sciences, public health, grad program in FSoS or social work or #)

5022. HUMAN SEXUALITY FOR HEALTH AND HELPING PROFESSIONALS II. (3 cr, §HSU 5027, §FSoS 5240; prereq 5021 or #)

5023. HUMAN SEXUALITY FOR HEALTH AND HELPING PROFESSIONALS III. (3 cr, §HSU 5028, §FSoS 5240; prereq 5022 or #)

5024. HEALTH ASPECTS OF AGING. (3 cr)

5033. FUNDAMENTALS OF ALCOHOL AND DRUG PROBLEMS. (3 cr, §HSU 5033)

5035. CONTRIBUTORS TO ALCOHOL AND DRUG PROBLEMS. (3 cr, §HSU 5035)

5036. INTRODUCTION TO SELF-HELP GROUPS IN CHEMICAL DEPENDENCY. (3 cr; prereq #)

5037. SEMINAR IN PREVENTION OF ALCOHOL AND DRUG PROBLEMS. (3 cr, §HSU 5037; prereq 5035 or #)

5039. ALCOHOL AND DRUG PROBLEMS: ASSESSMENT AND RESPONSE. (3 cr, §HSU 5039; prereq 5033 or #)

5040. DYING AND DEATH IN CONTEMPORARY SOCIETY. (3 cr, §Hlth 5402, §Mort 5040, §HSU 5040; prereq health science major, public health grad student, education sr, certified teacher, mort sci major or #)

5042. GROUP THERAPY: THEORY AND PRACTICE. (3 cr)

8001. SEMINAR: PUBLIC HEALTH. (Cr ar)

8002. FIELD OBSERVATION OF SELECTED PUBLIC HEALTH PRACTICES. (Cr ar)

8003. RESEARCH. (Cr ar)

Maternal and Child Health

ELECTIVE COURSES

5610. PRINCIPLES, PROBLEMS, AND ISSUES IN MATERNAL AND CHILD HEALTH. (3 cr; prereq grad student or #)

5611. PROGRAMS IN MATERNAL AND CHILD HEALTH. (3 cr; prereq 5610 or #)

5612. HUMAN GENETICS AND PUBLIC HEALTH. (3 cr; prereq #)

5613. CHRONIC AND HANDICAPPING CONDITIONS OF CHILDREN. (3 cr; prereq 5610 or #)

5614. FIELD EXPERIENCE IN MATERNAL AND CHILD HEALTH. (Cr ar; prereq 5610, 5611 or #)

5615. HEALTH OF THE SCHOOL-AGE CHILD. (3 cr; prereq 5610, grad student or #)

5616. THE RIGHTS OF CHILDREN AND YOUTH: ABUSE AND NEGLECT. (4 cr; §HSU 5019)

5618. YOUTH AND HEALTH: AN INTRODUCTION. (3 cr, §YoSt 5133)

5619. SOCIAL WORK ASPECTS OF MATERNAL AND CHILD HEALTH PROGRAMS. (2 cr; prereq 5611 or #)

5620. FAMILY STRESS, COPING AND ADAPTATION. (3 cr, §SW 8023, §FSoS 8257)

5621. MATERNAL AND CHILD HEALTH STUDENT SEMINAR. (1 cr; prereq MCH grad student)

5622. WOMEN'S HEALTH: ISSUES AND CONTROVERSIES. (4 cr; prereq #)

5624. INTERNATIONAL HEALTH. (Cr ar, §Ped 5525; prereq #)

5629. HELPING DEVELOPMENTALLY DELAYED CHILDREN AND THEIR FAMILIES. (3 cr, §SW 0544C)

5630. FAMILY PLANNING ISSUES IN MATERNAL, CHILD HEALTH. (3 cr; prereq #)

5631. HEALTH NEEDS AND PROBLEMS OF ADOLESCENT WOMEN. (4 cr)

5639. PREVENTION: THEORY, PRACTICE, AND APPLICATION IN PUBLIC HEALTH SERVICES. (4 cr)

5649. TOPICS: MATERNAL AND CHILD HEALTH. (Cr ar; prereq #)

Physiological Hygiene

ELECTIVE COURSES

5380. APPLIED HUMAN NUTRITION. (5 cr; prereq biochemistry or #)

5386. PUBLIC HEALTH ASPECTS OF CARDIOVASCULAR DISEASE. (3 cr; prereq basic epidemiology and biostatistics)

Public Health Administration

ELECTIVE COURSES

5700. PUBLIC HEALTH ADMINISTRATION I. (Cr ar; prereq public health admin student or #)

5701. PUBLIC HEALTH ADMINISTRATION II. (Cr ar; prereq 5700 or #)

5702. PUBLIC HEALTH ADMINISTRATION III. (Cr ar; prereq 5701 or #)

5703. PUBLIC HEALTH ADMINISTRATION CLERKSHIP. (Cr ar; prereq public health administration student or #)

5704. FIELD EXPERIENCE IN PUBLIC HEALTH ADMINISTRATION. (Cr ar; prereq public health admin student or #)

5711. PUBLIC HEALTH LAW. (4 cr; prereq public health admin student or #)

5712. PRINCIPLES OF ORGANIZATION AND MANAGEMENT OF HEALTH MAINTENANCE ORGANIZATIONS I. (2 cr; prereq public health admin student or #)

5713. PRINCIPLES OF ORGANIZATION AND MANAGEMENT OF HEALTH MAINTENANCE ORGANIZATIONS II. (2 cr; prereq 5712 or #)

5715. ADMINISTRATIVE DECISION MAKING IN PUBLIC HEALTH AGENCIES. (2 cr; prereq public health admin student or #)

5720. INTERPERSONAL EFFECTIVENESS IN HEALTH ADMINISTRATION. (2 cr; prereq public health admin student or #)

Public Health Nursing

ELECTIVE COURSES

5500. PUBLIC HEALTH: NORMAL GROWTH AND DEVELOPMENT. (4 cr)

5502. NEEDS ASSESSMENT FOR COMMUNITY HEALTH PROMOTION. (4 cr; prereq grad student, course in principles of research course or #)

5576. THE POLITICAL PROCESS IN PUBLIC HEALTH. (4 cr)

Public Health Nutrition

ELECTIVE COURSES

5602. MATERNAL AND CHILD NUTRITION. (3 cr; prereq 3xxx-level nutrition course or equiv or #)

5603. NUTRITIONAL ASSESSMENT. (2 cr; prereq 3xxx-level nutrition course or equiv or #)

5604. FACTORS AFFECTING NUTRITION BEHAVIOR. (2 cr; prereq Soc 3201 or equiv or #)

5605. PRINCIPLES OF PUBLIC HEALTH RESEARCH. (3 cr; prereq grad student, completion of or concurrent regis in course in statistics or vital statistics)

5608. CURRENT NUTRITION ISSUES IN PUBLIC HEALTH. (3 cr; prereq FScN 5622 or #)

5609. TOPICS: PUBLIC HEALTH NUTRITION. (Cr ar; prereq public health nutrition student or #)

Veterinary Public Health

ELECTIVE COURSES

5300. COMPARATIVE MEDICINE AND PUBLIC HEALTH. (2 cr)

5303. PERSPECTIVES: ANIMAL-HUMAN RELATIONSHIPS AND COMMUNITY HEALTH. (2 cr)

5310. DISEASES TRANSMITTED BETWEEN ANIMALS AND MAN. (4 cr; prereq DVM or #)

Radiology (Rad)

Eugene Gedgaudas, M.D., professor and head

Division of Roentgen Diagnosis

Eugene Gedgaudas, M.D., professor and director

Professor Emeritus

Harold O. Peterson, M.D.

Professor

Kurt Amplatz, M.D.
Samuel B. Feinberg, M.D.

Associate Professor

Wilfrido Castaneda, M.D.
Lawrence Harvey A. Gold, M.D.
Marvin E. Goldberg, M.D.
Philippe R. L'Heureux, M.D.
Richard Moore, Ph.D.
Donovan B. Reinke, M.D.
Shih Hao Tsai, M.D.

Clinical Associate Professor

Daniel L. Fink, M.D.
Sewell Gordon, M.D.
Hugh Jones Williams, M.D.

Assistant Professor

Howard Ansel, M.D.
Adolfo Chuy, M.D.
Anthony M. Cook, M.D.
Helmut Diefenthal, M.D.
Ronald Draege, Ph.D.
Mathis Frick, M.D.
Walter Hildebrandt, M.D.
Alan Hill, M.D.
J. Paul Leonard, M.D.
Robert McGeachie, M.D.
Robert Miller, M.D.
Frederick Olson, M.D.
Mario Pliego, M.D.
Suzanne Smith, M.D.
Robert Stenlund, M.D.
Saul Taylor, M.D.
Joaquim Vieira, M.D.
H. Charles Walker, M.D.
Neil Wasserman, M.D.

Clinical Assistant Professor

Heino Alari, M.D.
O. J. Baggenstoss, M.D.
Stanford Calin, M.D.
John B. Coleman, M.D.
Gerald A. Gretsch, M.D.
Barnard Hall, M.D.
Donald Charles Hauser, M.D.
Harlan Hawkinson, M.D.
Carroll N. Hess, M.D.
Dominic Korbuly, M.D.
Donald Gene Marsh, M.D.
Thomas B. Merner, M.D.
Harry W. Mixer, M.D.
David L. Moody, M.D.
James Stuart Moore, M.D.
S. Murthy Tadavarthy, M.D.
John A. Tobin, M.D.

Instructor

A. Samuel Baumel, M.D.
Carol Coleman, M.D.
Morteza Jahangir, M.D.
Richard Johnson, M.D.
Eul-Suk Kang, M.D.
Christos Karabinas, M.D.
Paul Kollitz, M.D.
Kurt Scheurer, M.D.
Cary Stolar, M.D.
Joseph Tashjian, M.D.

Clinical Instructor

Quentin N. Anderson, M.D.
Robert D. Bugby, M.D.
Sheldon W. Damberg, M.D.
Joseph F. Eckert, M.D.
Herman H. Eelkema, M.D.
Robert J. Foley, M.D.
Jule Jerome Hopperstad, M.D.
Thomas E. Johnson, M.D.
Warren L. Kump, M.D.
Leonard H. Levitan, M.D.
James L. Purdie, M.D.
Arnold O. Rholl, M.D.
Richard C. Tucker, M.D.
Peter Helmuth Ullrich, M.D.
Stanley C. Von Drashek, M.D.

Division of Nuclear Medicine

Merle K. Loken, M.D., Ph.D., professor and director

Associate Professor

Rex B. Shafer, M.D.

Assistant Professor

LeRoy Arthur Forstrom, M.D., Ph.D.
Richard L. Morin, Ph.D.
John M. Wolff, M.D.

Clinical Assistant Professor

William A. Wilcox, M.D.

Clinical Instructor

John B. Marta, M.D.

ELECTIVE COURSES

5101. EXTERNSHIP: DIAGNOSTIC RADIOLOGY—University Hospitals. (Cr ar; prereq regis med)

5102. EXTERNSHIP: DIAGNOSTIC RADIOLOGY—Veterans Administration Hospital. (Cr ar; prereq regis med)

5103. EXTERNSHIP: DIAGNOSTIC RADIOLOGY—Hennepin County Medical Center. (Cr ar; prereq regis med)

5104. EXTERNSHIP: DIAGNOSTIC RADIOLOGY—St. Paul-Ramsey Medical Center. (Cr ar; prereq regis med)

5105. EXTERNSHIP: NUCLEAR MEDICINE. (Cr ar; prereq regis med)

5140. SPECIAL PROBLEMS: ROENTGENOLOGY. (Cr ar; prereq regis med)

5240. SPECIAL PROBLEMS: NUCLEAR MEDICINE. (Cr ar; prereq regis med)

ADVANCED CREDIT COURSES

5511. ROENTGEN TECHNIQUE. (1 cr)

5512. DOSIMETRY OF INTERNAL-EXTERNAL RADIATION EMITTERS. (1 cr)

5530. SPECIAL PROBLEMS: RADIATION BIOLOGY. (Cr ar; prereq regis med)

5540. SPECIAL PROBLEMS: RADIOLOGICAL PHYSICS. (Cr ar; prereq regis med)

5570, 5571, 5572. RADIATION PHYSICS. (3 cr per qtr; prereq #)

8100. GASTROINTESTINAL ROENTGENOLOGY

8101. UROLOGIC ROENTGENOLOGY

8102. NEUROLOGIC ROENTGENOLOGY

8103. CARDIOVASCULAR ROENTGENOLOGY

8104. PEDIATRIC ROENTGENOLOGY

8105. PULMONARY ROENTGENOLOGY

8110. NEURORADIOLOGY

8150. RESEARCH: ROENTGENOLOGY

8200. NUCLEAR MEDICINE

8210. FUNDAMENTALS OF NUCLEAR MEDICINE

8410. SEMINAR: RADIATION BIOLOGY

8450. RESEARCH: RADIATION BIOLOGY

8550. RESEARCH: RADIOLOGICAL PHYSICS

Surgery (Surg)

John S. Najarian, M.D., professor and head

Regents' Professor Emeritus

Richard L. Varco, M.D.

Professor

Robert W. Anderson, M.D.
Fritz H. Bach, M.D.
Henry Buchwald, M.D.
John P. Delaney, M.D.
John J. Haglin, M.D.
Claude R. Hitchcock, M.D.
Edward W. Humphrey, M.D.
Arnold S. Leonard, M.D.
Donald G. McQuarrie, M.D.
John F. Perry, M.D.
Yoshio Sako, M.D.
Richard L. Simmons, M.D.

Clinical Professor

John F. Alden, M.D.
Tague C. Chisholm, M.D.
John A. Culligan, M.D.
Ronald H. Dietzman, M.D.
Cassius M. C. Ellis, M.D.
Harrison H. Farley, M.D.
Davitt A. Felder, M.D.
William G. Gamble, M.D.
Paul G. Gannon, M.D.
David Gaviser, M.D.
Bernard Goott, M.D.
Frank E. Johnson, M.D.
William D. Kelly, M.D.
Arnold J. Kremen M.D.
James W. LaFave, M.D.
John G. Linner, M.D.
Stanley R. Maxeiner, Jr., M.D.
Felix A. McParland, M.D.
Fletcher A. Miller, M.D.
Glen D. Nelson, M.D.
William R. Scott, M.D.
Bernard J. Spencer, M.D.
Neil A. Trotman, M.D.
Earl G. Yonehiro, M.D.

Associate Professor

Robert C. Andersen, M.D.
Frank B. Cerra, M.D.
Martin Finch, M.D.
John E. Foker, M.D.
Robert L. Goodale, M.D.
Theodor B. Grage, M.D.
Hovald Helseth, M.D.
John Long, Ph.D.
J. Ernesto Molina, M.D.
Richard Moore, M.D.
Frank Quattlebaum, M.D.
Alan R. Shons, M.D.
W. Albert Sullivan, M.D.
David E. R. Sutherland, M.D.

Clinical Associate Professor

Gordon Addington M.D.
Gary Baab, M.D.
Daniel R. Baker, M.D.
Robert B. Benjamin, M.D.
Dorothy M. Bernstein, M.D.
Manuel R. Binder, M.D.
Raymond C. Bonnabeau, M.D.
John B. Brainard, M.D.
Brooks A. Butler, M.D.
Coleman J. Connolly, M.D.
Bart S. Cuderman, M.D.
David E. Culligan, M.D.
Orest N. Filipovich, M.D.
Robert S. Flom, M.D.
Charles W. Hauser, M.D.
David F. Hickok, M.D.
Samuel W. Hunter, M.D.
Thomas L. Huseby, M.D.
Lyle V. Kragh, M.D.
Bernard G. Lannin, M.D.
Richard E. Larson, M.D.

Louis C. Lick, M.D.
Evan F. Lindberg, M.D.
John B. Lunseth, M.D.
Charles H. Manlove, M.D.
Harvey M. Moral, M.D.
Neil M. Palm, M.D.
Theodore A. Peterson, M.D.
David E. Raab, M.D.
Stacy A. Roback, M.D.
Lee A. Simso, M.D.
Joseph L. Sprafka, M.D.
Farrell S. Steigler, M.D.
John F. Waldron, M.D.
George Werner, M.D.
Darrell E. Westover, M.D.
William C. Woyda, M.D.
Richard E. YaDeau, M.D.

Assistant Professor

Melvin Bubrick, M.D.
David Fryd, Ph.D.
Ciril J. Godec, M.D.
John Matts, Ph.D.
Bjorn K. Monson, M.D.
Albert Mowlem, M.D.
Robert Nelson, Ph.D.
Timothy J. O'Brien, M.D.
Ernest Ruiz, M.D.
Micheal L. Schwartz, M.D.
Lynn D. Solem, M.D.
Richard Strate, M.D.
Tingchung Wang, Ph.D.
Per H. Wickstrom, M.D.

Clinical Assistant Professor

Dale L. Anderson, M.D.
David C. Anderson, M.D.
Orn Arnar, M.D.
Daryl J. Batalden, M.D.
Aydin M. Bilgutay, M.D.
Norman B. Bloom, M.D.
William S. Brennon, M.D.
Donald L. Foss, M.D.
Joseph J. Garamella, M.D.
James Gaviser, M.D.
Harold W. Hansen, M.D.
Max E. Harris, M.D.
Alan C. Hymes, M.D.
Joseph Kiser, M.D.
Harvey Knaack, M.D.
Clarence V. Kucz, M.D.
Michael Lynch, M.D.
Elmer J. Martinson, M.D.
Michael A. Messenger, M.D.
John Parrott, M.D.
Clifford M. Phibbs, M.D.
Martin Rosenstein, M.D.
Philemon Roy, M.D.
Abe M. Sborov, M.D.
Leonard S. Schultz, M.D.
Abbott Skinner, M.D.
William E. Stephens, M.D.
Sheridan S. H. Stevens, M.D.
Robert A. VanTyn, M.D.
Richard J. Webber, M.D.

Instructor

Richard Condie
Bruce L. Cunningham, M.D.
Ronald M. Ferguson, M.D.
Elmer H. Kasperson, M.D.
Stanley Williams, Ph.D.

Clinical Instructor

Robert D. Christensen, M.D.
Rosalie Dodd, M.D.
Carter W. Howell, M.D.
Bryan Hubble, M.D.
David Joesting, M.D.
Richard W. Masur, M.D.
George Peltier, M.D.
Michael Pliam, M.D.
John Satterfield, M.D.
James T. Sturm, M.D.
Allen L. Van Beek, M.D.
Peter Vogt, M.D.
Frederick Washburn, M.D.

Special Lecturer

Victor A. Gilbertsen, M.D.
Darwin E. Zaske, Pharm.D.

Elective courses are offered in general surgery and in all surgical subspecialties, primarily to increase the scope of clinical exposure and to give the student an opportunity to participate in a wide variety of surgical problems including surgical research.

5500. EXTERNSHIP IN GENERAL SURGERY—University Hospitals and affiliated hospitals. (Cr ar; prereq regis med) Najarian and staff

An opportunity to acquire competence in initial history and physical examination of the surgical patient; systematic approach to diagnosis and treatment; preoperative preparation of the surgical patient; the function of the O.R. and the surgeon's role; operative procedures used in treatment of surgical diseases; management of the postoperative patient; techniques of follow-ups and long-term postoperative care; published literature on surgical diseases; oral presentation of surgical problems with which the student has dealt. Students attend conferences, animal laboratory sessions, team discussions, and group seminars, and familiarize themselves with pertinent surgical literature in preparation for the didactic aspects of the rotation.

5501. EMERGENCY ROOM EXTERNSHIP. (9 cr) Najarian and staff

Colon and Rectal Surgery

Stanley M. Goldberg, M.D., clinical professor and director

Professor Emeritus

William C. Bernstein, M.D.

Clinical Associate Professor

Emmanuel G. Balcos, M.D.
Carl E. Christenson, M.D.
Loren E. Nelson, M.D.
Jerry L. Schottler, M.D.
William T. Smith, M.D.

Assistant Professor

Santhat Nivatvongs, M.D.

Clinical Assistant Professor

Emerson E. Hoppes, M.D.
George C. Hottinger, M.D.
David A. Rothenberger, M.D.

Clinical Instructor

Frederic D. Nemer, M.D.
Paul E. Schultz, M.D.

5523. EXTERNSHIP IN COLON AND RECTAL SURGERY—Veterans Administration Hospital. (Cr ar; prereq regis med) Goldberg and staff

Practical experience in the management of common anorectal problems. The student acts as an intern on a surgical service with a busy clinic, "first assists" with surgical procedures, and attends the colon and rectal seminars and presents cases. The student becomes adept in the use of the sigmoidoscope and is exposed to colonoscopy.

Therapeutic Radiology (TRad)

Seymour H. Levitt, M.D., professor and head

Professor

Faiz M. Kahn, Ph.D.
John H. Kersey, M.D.
Seymour H. Levitt, M.D.
Mark E. Nesbit, M.D.
Chang W. Song, Ph.D.

Clinical Professor

Donn G. Mosser, M.D., M.S.

Associate Professor

Tae H. Kim, M.D.

Assistant Professor

Donald J. Buchsbaum, Ph.D.
Edmund P. Cytacki, Ph.D.
Firmin C. Deibel, Ph.D.
Robert E. Haselow, M.D.
Chung Kyu Kim Lee, M.D.
Eitan Medini, M.D.
Roger A. Potish, M.D.
Yashoda T. Rao, M.D.
Daniel S. Rappaport, Ph.D.
Subhash C. Sharma, Ph.D.
Barry L. Werner, Ph.D.

Clinical Assistant Professor

Manouchehr Azad, M.D.
David G. Smith, M.D.
Duane O. Ytredal, M.D.

Instructor

Virgil T. Fallon, M.D.
John W. Karrow, M.D.

ELECTIVE COURSES

5505f,w,s,su. EXTERNSHIP IN RADIATION THERAPY. (Cr ar; prereq regis med)

5506f,w,s,su. CANCER DIAGNOSIS AND TREATMENT. (Cr ar; prereq regis med)

5507f,w,s,su. ADVANCED EXTERNSHIP IN RADIATION THERAPY. (Cr ar; prereq regis med)

5508f,w,s,su. SPECIAL PROBLEMS IN RADIATION BIOLOGY. (Cr ar)

5583. DIAGNOSIS, EVALUATION, AND CARE OF ADULTS AND CHILDREN WITH CANCER. (9 cr)

ADVANCED CREDIT COURSES

5170f. RADIOLOGICAL PHYSICS. (3 cr)

5171w. MEDICAL NUCLEAR PHYSICS. (3 cr)

5172s. RADIATION BIOLOGY. (3 cr)

5173w. PHYSICS OF RADIATION THERAPY. (3 cr)

5174s. PHYSICS OF DIAGNOSTIC RADIOLOGY. (3 cr)

5340f,w,s,su. SPECIAL PROBLEMS IN RADIATION THERAPY. (Cr ar)

5512f,w,s,su. DOSIMETRY OF INTERNAL AND EXTERNAL RADIATION. (1 cr)

5540f,w,s,su. SPECIAL PROBLEMS IN RADIOLOGICAL PHYSICS. (Cr ar)

5800. RADIATION ONCOLOGY PATHOLOGY. (Cr ar)

8300f,w,s,su. RADIATION THERAPY. (Cr ar)

8310f,w,s,su. FUNDAMENTALS OF RADIATION THERAPY. (1 cr)

8315f,w,s,su. RADIATION THERAPY PATHOLOGY. (1 cr)

8320f,w,s,su. RADIATION THERAPY TREATMENT PLANNING PROBLEMS. (1 cr)

8325f,w,s,su. RADIATION THERAPY PEDIATRICS ONCOLOGY. (1 cr)

8350f,w,s,su. RESEARCH IN RADIATION THERAPY. (Cr ar)

8410f,w,s,su. SEMINAR: RADIATION BIOLOGY. (1 cr)

8450f,w,s,su. RESEARCH IN RADIATION BIOLOGY. (Cr ar)

8550f,w,s,su. RESEARCH IN RADIOLOGICAL PHYSICS. (Cr ar)

Urology (Urol)

Elwin E. Fraley, M.D., professor and head

Professor

Paul Lange, M.D.

Clinical Professor

Clyde Blackard, M.D.
George L. Garske, M.D.
Baxter A. Smith, M.D., M.S.

Associate Professor

Alexander Cass, M.D.
Ricardo Gonzalez, M.D.

Clinical Associate Professor

David M. Anderson, M.D.

Assistant Professor

David Bronson, Ph.D.
Ralph V. Clayman, M.D.
Jonathan Li, M.D.
Arthur Smith, M.D.
Robert Vessella, Jr., Ph.D.

Clinical Assistant Professor

Robert Geist, M.D.
Paul Hartig, M.D.
Ranjit Jain, M.D.
Gerald Koos, M.D.
Bruce E. Linderholm, M.D.
William E. Price, M.D.

Instructor

Keith Kaye, M.D.

Clinical Instructor

Stanley Antolak, M.D.
William H. Card, M.D.
John P. Cooper, M.D.
Everette Duthoy, M.D.
Kiumars Hekmat, M.D.
Dexter Jeffords, M.D.
Rodger R. Lundblad, M.D.
Gerald D. McEllistrem, M.D.
C. Richard McKinley, M.D.
Alaeddin Moghaddam, M.D.
Michael Pergament, M.D.
John A. Soucheray, M.D.
Theodore H. Sweetser, M.D.
Shin Tanaka, M.D.
Joseph Twidwell, M.D.
Albert L. Walonick, M.D.

Research Associate

Sara Li, Ph.D.

ELECTIVE COURSE

5180. EXTERNSHIP IN UROLOGY. (Cr ar; prereq regis med)

ADVANCED CREDIT COURSES

8250. UROLOGICAL SURGERY

8251. CYSTOSCOPY AND UROLOGY DIAGNOSIS

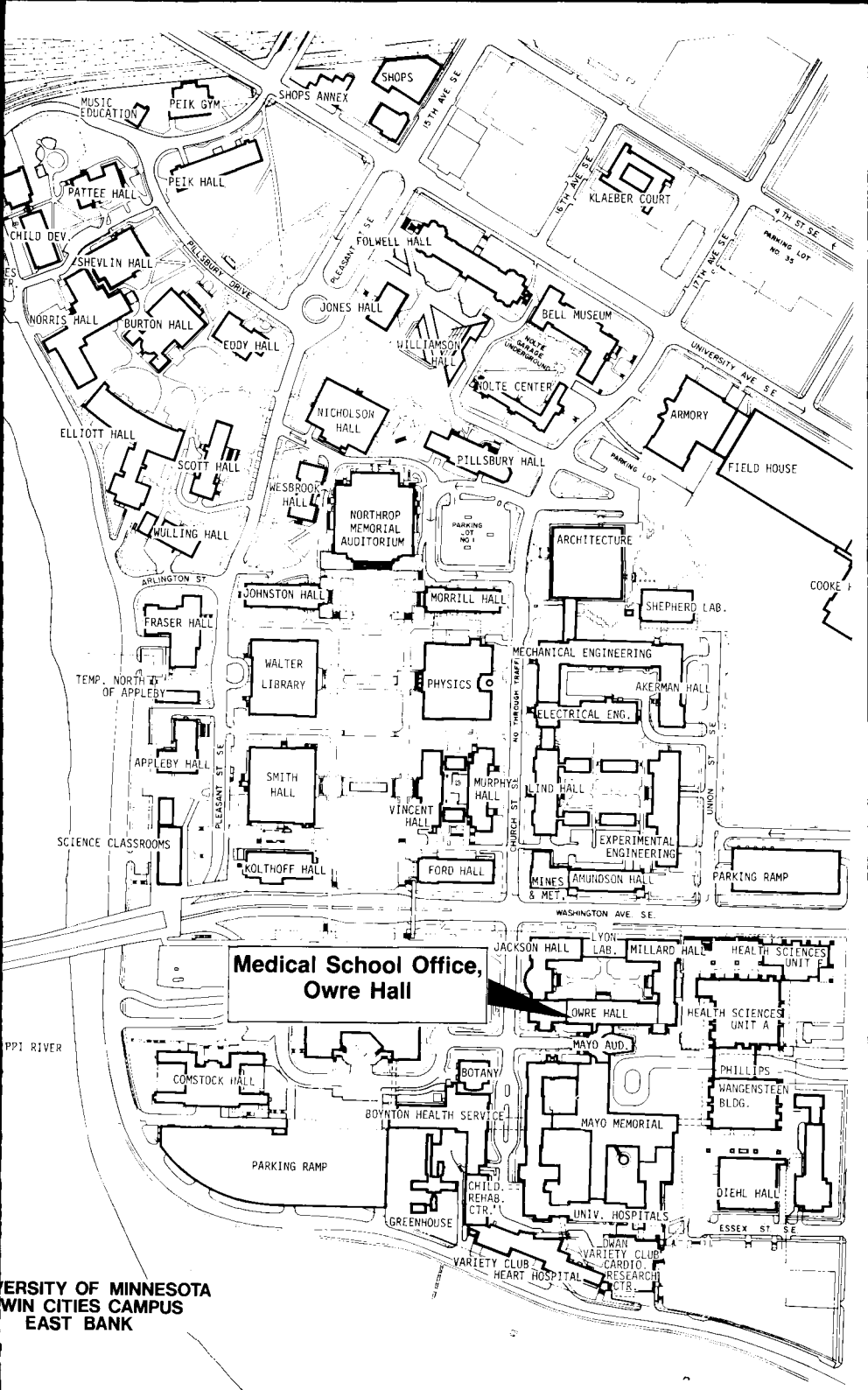
8252. UROLOGICAL CONFERENCE

8253. RESEARCH: UROLOGY

8254. UROLOGICAL SEMINAR

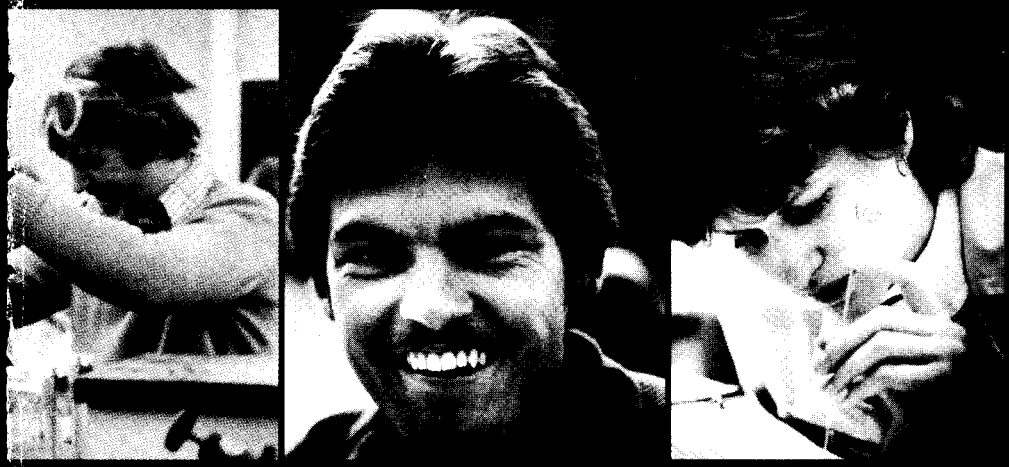
8255. UROLOGICAL-RADIOLOGICAL CONFERENCE

8256. UROLOGICAL-PATHOLOGICAL CONFERENCE



VERSITY OF MINNESOTA
WIN CITIES CAMPUS
EAST BANK





Baccalaureate Programs in Medical Technology Mortuary Science Nursing Occupational Therapy Physical Therapy and Related Health Science Disciplines

UNIVERSITY OF MINNESOTA

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UNIVERSITY OF MINNESOTA BULLETIN
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Baccalaureate Programs in Medical Technology Mortuary Science Nursing Occupational Therapy Physical Therapy and Related Health Science Disciplines

UNIVERSITY OF MINNESOTA

TABLE OF CONTENTS

General Introduction

Overview of the Health Sciences at the University

The University of Minnesota health sciences are academic and service units including the Schools of Dentistry, Medicine, Nursing, and Public Health; the Colleges of Pharmacy and Veterinary Medicine; University Hospitals and Clinics; and numerous programs within these schools. The health sciences units share a three-fold mission of service, education, and research.

The health sciences units are dedicated to providing the best possible professional training to people planning to enter a wide variety of health-related fields, as well as specialty training and continuing education for health professionals. To carry out this purpose, approximately 1400 full-time faculty instruct more than 5500 students each year on the Twin Cities and Duluth campuses of the University.

Health sciences facilities include University Hospitals and Clinics, dental clinics, the Veterinary Hospital, and the massive University Health Sciences Center. These facilities provide clinical learning, research, and internship sites for many students. The hospitals are excellent research centers, not only for studying diseases, healthy physiological processes, and environmental health problems, but also for developing new procedures and delivering high acuity health care. Other University resources include the extensive collections in the Bio-Medical Library, where traditional library resources—books, journals, and other print materials—are supplemented by three-dimensional models, videotapes, slides, films, and other resources that may be used to supplement classroom learning.

This bulletin contains information about the following baccalaureate (bachelor's) programs in the health sciences at the University: medical technology, mortuary science, nursing, occupational therapy, and physical therapy. Also included is information about several related baccalaureate health science programs within the School of Dentistry, College of Pharmacy, Colleges of Agriculture and Home Economics, and Medical School. Programs in most of these fields are described elsewhere, in college bulletins. Post-baccalaureate programs are described in the *Graduate Programs in the Health Sciences Bulletin.*

Admission to the Baccalaureate Programs

Each health science unit sets its own standards and requirements for admission to its programs. All units, however, require a strong background in the natural sciences (specifically, biology and chemistry), as well as in the social and behavioral sciences. They also strongly recommend that applicants be keenly and genuinely interested in human services and that they be sincerely committed to promoting the health and general welfare of the community as well as of individual people.

Students generally enter the programs described in this bulletin at the beginning of either their sophomore or junior year, after they have completed the required preprofessional courses. To discourage students from focusing too narrowly on a field of specialization and to ensure that all students will receive a broad general education in the liberal arts, the Council on Liberal Education has established certain minimum requirements in several liberal arts categories. To qualify for admission to most of the professional programs, students are expected to complete these group distribution requirements as specified in the individual program sections of this bulletin. In addition, they must complete specified preprofessional courses, some of which fulfill group distribution requirements.

Students already enrolled at the University and seeking admission to one of these programs should obtain a Request for Change of College Within the University from the

Office of Admissions, 240 Williamson Hall. Students from outside the University should obtain an Application for Admission with Advanced Standing from the Office of Admissions, 240 Williamson Hall, 231 Pillsbury Drive S.E., University of Minnesota, Minneapolis, Minnesota 55455. Application procedures and admission standards for individual units are described in the individual program sections of this bulletin.

Students planning to enroll in one of the baccalaureate programs described in this bulletin should begin their planning early. Advisers are available in the College of Liberal Arts Pre-Health Sciences Advising Office to help students plan their preprofessional programs. Information and assistance are also available at the following addresses:

Course in Medical Technology: Professor Ruth F. Hovde, Box 198 Mayo Memorial Building, 420 Delaware Street S.E., University of Minnesota, Minneapolis, Minnesota 55455; telephone (612) 373-9670

Department of Mortuary Science: Professor Robert C. Slater, 114 Vincent Hall, 206 Church Street S.E., University of Minnesota, Minneapolis, Minnesota 55455; telephone (612) 373-3879

School of Nursing: Professor Frances Dunning, 5-140 Health Sciences Unit F, 308 Harvard Street S.E., University of Minnesota, Minneapolis, Minnesota 55455; telephone (612) 373-3462

Course in Occupational Therapy: Professor Marvin Lepley, 378 Children's Rehabilitation Center, 426 Church Street S.E., University of Minnesota, Minneapolis, Minnesota 55455; telephone (612) 373-9041 or 9034

Course in Physical Therapy: Professor John D. Allison, 377 Children's Rehabilitation Center, 426 Church Street S.E., University of Minnesota, Minneapolis, Minnesota 55455; telephone (612) 373-9041 or 9034

Expenses

Tuition assessed at the University generally changes annually, subject to approval by the regents. The most up-to-date information about tuition and other fees, including the student services fee, appears in the *General Information Bulletin* and the quarterly *Class Schedule*. All tuition and fee charges are subject to change.

Students in some programs should plan for additional expenses, such as charges for uniforms, special equipment, and insurance. These program-related expenses are described in the individual program sections of this bulletin.

Residency and Reciprocity

If you have not had a permanent home in Minnesota for at least one calendar year, you must pay nonresident tuition rates. To qualify for resident rates, you must demonstrate your eligibility by fulfilling residency requirements as spelled out under the heading Residence Regulations and Review Procedures in the *General Information Bulletin*.

To request consideration of a change in your residency status, you must contact the residency counselor in the Office of Admissions and Records, 260 Williamson Hall, 231 Pillsbury Drive S.E., University of Minnesota, Minneapolis, Minnesota 55455 (telephone (612) 373-0378). All reclassification requests must be made in writing.

Under the terms of reciprocity agreements between Minnesota and Wisconsin, North Dakota, and South Dakota, residents of these neighboring states may pay resident tuition rates at the University of Minnesota and at other public educational institutions in the state. To qualify for reciprocity privileges, students must apply prior to each academic year they are enrolled. Reciprocity agreements are not an assurance that nonresident applicants will be accepted for admission. Some programs, such as occupational and physical therapy, limit nonresident enrollment.

Health Sciences Student Services

Academic Advising Services

Health Sciences Student Affairs Office—For those not presently attending the University, this office (W61 Centennial Hall, 614 Delaware Street S.E., Minneapolis, Minnesota 55455) has staff available to evaluate transcripts; discuss educational options; provide information about licensure, salaries, job descriptions, and employment opportunities; recommend resource materials; and refer students with special needs to tutorial and other services. The office has national directories of health-related training, study guides for admission tests, and catalogues from other schools in the state offering health science training.

Students may call (612) 376-7564 or 376-7565 for an appointment. Students who live outside the metropolitan area may call (612) 376-1449 collect for information or consult a copy of *Health Careers in Minnesota* in their local library.

College of Liberal Arts Pre-Health Sciences Advising Office—This office, in 30 Johnston Hall, offers a range of services for currently enrolled University students and individuals interested in learning more about health science programs offered by the University. In addition to assisting students with course planning and registration, advisers in this office provide assistance with application and test procedures for various professional programs in the health sciences as well as general help with choosing majors and/or vocations. The office library contains bulletins from schools throughout the country that offer health-related programs. It also contains general reference materials relating to careers in the health sciences, and a list of persons in health fields willing to talk to students about their careers. For an appointment with an adviser in 30 Johnston Hall, students may call (612) 373-2912.

Minority Services

A very important function of the Health Sciences Student Affairs Office is to recruit and retain minority students interested in careers in the health sciences. The office offers special programming and one-on-one advising for minority students.

Whether you are a University student or not, you may use the services of this office. The office provides information on a variety of careers in the health sciences and their admission requirements, tutoring or referrals to tutoring sources, assistance in finding part-time or summer employment in the health field, text loan library services, peer counseling, tours, special seminars on health, and opportunities to meet practicing minority health professionals.

For information about special events, call (612) 376-7564 or 7565; or come to W61 Centennial Hall (entrance is 425 Harvard Street) to register with the office. Advisers from this office also are available to address community groups on topics such as health career opportunities and the need for minority health professionals.

Placement Services

The National Health Professions Placement Network (NHPPN) provides computerized job placement services for the following health sciences professions: dentistry, dental hygiene, dietetics, medical technology, medicine, nursing, occupational therapy, pharmacy, and physical therapy. The service operates as a clearinghouse, matching job applicants with employment opportunities. Applicants are matched with jobs according to selection criteria specified by the user (e.g., job type, geographic location, population of community). Both the job applicant and the employer/community representative receive a computerized listing of matching entries. NHPPN users pay the following processing fees to use the service:

1) Job applicants seeking employment opportunities: $15. This includes University of Minnesota health sciences students and alumni who have graduated within the last three months.
2) Employers/community representatives for each unique employment opportunity listed: $35. Employers/community representatives will be assessed an additional $15 per position to remain active in the system after each successive six-month period.

For more information, contact the National Health Professions Placement Network, 3014 University Avenue, University of Minnesota, Minneapolis, Minnesota 55414; telephone (612) 373-0082.

Health Careers Information by Phone

The University's DIAL (Digital Information Access Line) system consists of taped telephone messages that answer questions about a variety of topics. DIAL provides descriptions of some careers in the health sciences, listed below by DIAL number. To use DIAL: (1) Select the tape you want to hear; (2) call 373-1857; (3) request the tape by number. Only one tape may be requested per call. Hours for DIAL tapes are Monday through Friday, 8 a.m. to 5 p.m. Available tapes include:

4108 Pre-Med Information
4109 Pre-Health Science Information
4119 Pre-Dentistry Information
4120 Nursing: Three Ways to Become a Registered Nurse
6021 The Mortuary Science Program
6043 Physician Assistant Training
6044 Health Careers in Minnesota
6045 A Career in Optometry
6046 A Career in Chiropractic
6098 Medical Technology: Admission Procedures
6099 Medical Technology: Career Opportunities
6109 Programs for RNs Who Want the B.S.N.
6110 Rumors of Changes in Nursing
6131 Occupational Therapy: Admission Procedures
6132 Occupation Therapy: Career Opportunities
6141 Alternatives to Physical and Occupational Therapy
6158 The Field of Physical Therapy
6168 Environmental Health
6169 Hospital and Health Care Administration
6170 Dental Public Health
6171 Public Health Administration

Council for Health Interdisciplinary Participation

The Council for Health Interdisciplinary Participation (CHIP) is a student-managed organization that represents and sponsors programs for students in the health sciences. The CHIP council, which includes representatives from all of the health science schools and programs, plans and organizes workshops, noontime lectures, conferences, and other programs throughout the academic year. The council also publishes a newsletter that features announcements of upcoming events and articles about topics of current interest to students.

CHIP headquarters in 1-425 Health Sciences Unit A includes a lounge, a typing room, and the Humanistic Health Library. For more information, come to this office or call 373-8969.

Physical Facilities

University health sciences units are located in a complex of buildings on the East Bank of the Minneapolis campus, including the Mayo Memorial Building, Health Sciences Unit A, Health Sciences Unit F, the Dwan Variety Club, and the Phillips-Wangensteen Building. Within Unit A are health science classrooms and seminar rooms, health science student areas, and some basic medical science laboratories, as well as Medical School, School of Public Health, and School of Dentistry departmental space. In the Phillips-Wangensteen Building are medical center outpatient clinics, a large clinical amphitheater, and audiovisual support units, as well as several Medical School clinical departmental offices and laboratories. Unit F houses the School of Nursing and College of Pharmacy. Other units, each close to and connected with the complex, include the several buildings of University Hospitals and Clinics, Variety Club Heart Hospital, Masonic Cancer Center, Cardiovascular Research Center, Veterans of Foreign Wars Cancer Research Center, and Children's Rehabilitation Center. The Jackson-Owre-Millard-Lyon quadrangle houses five departments in the basic health sciences, several classrooms, teaching laboratories, research laboratories, faculty offices, and the administrative offices of the Medical School.

Resources and services of the Bio-Medical Library are spaciously housed on three floors of Diehl Hall, which is located immediately adjacent to the Phillips-Wangensteen Building and the University Hospitals. The library contains extensive collections of periodical reference materials and subscribes to more than 2500 periodicals. There are more than 270,000 volumes in the library, almost all of which are shelved on open stacks. Photoduplication services, computer-assisted literature searches, and interlibrary loans are available.

In the Learning Resources Center, which is located in the Bio-Medical Library, students may use learning carrels, equipped with audiotape players and slide or filmstrip projectors. A growing collection of audiovisual instructional resources is housed in this center, which is open more than 90 hours per week. Other learning resources include models, videotapes, texts, test files, and a variety of print materials organized to serve the several instructional programs. Terminals with access to a number of computer-assisted instructional programs are also available for use.

The close physical proximity of the health sciences units to each other and to the rest of the campus facilitates professional and scientific communication across departmental and collegiate lines and underscores the interdisciplinary nature of the health professions. The health sciences units also maintain affiliate relationships with many hospitals and other health care facilities in the Twin Cities metropolitan area. These affiliations provide resources that afford students access to a wide spectrum of health care institutions and, through them, to patients with a variety of health problems.

All-University Student Services

A variety of student services are provided by the University. Among them are the following:

Activities—Student Organization Development Center, 340 Coffman Memorial Union (373-3955); Student Activities Office, 107 Temporary North of Appleby (376-1685); CHIP (Council for Health Interdisciplinary Participation), 1-425 Health Sciences Unit A (373-8969)

Admission or Change of College—Office of Admissions, 240 Williamson Hall (373-2154/55)

Bookstores—2-554 Health Sciences Unit A (Health Sciences); Williamson Hall; and others

Cafeterias—Health Sciences Unit A, 1st and 5th floors; Phillips-Wangensteen Building, 2nd floor; Coffman Memorial Union

Counseling—University Student Counseling Bureau, 101 Eddy Hall (373-4193); Campus Assistance Center, 209 Eddy Hall (373-1234); Boynton Health Service Mental Health Clinic, 400 Boynton Health Service (373-4022)

Emergencies—See listings in the introductory pages of *Student-Staff Directory*. Some offices answer telephones 24 hours a day.

Employment—Student Employment Service, 6 Morrill Hall (373-3674)

Financial Aid—Office of Student Financial Aid, 210 Fraser Hall (376-8686)

Handicapped Services—Handicapped Resource Office, 7 Morrill Hall (376-2727); Unicorns, 235 Coffman Memorial Union (376-3042)

Health—Boynton Health Service (373-3141)

Housing—Housing Office (on-campus and off-campus housing), Comstock Hall (373-7542)

Library—Bio-Medical Library, Diehl Hall; Walter Library; Wilson Library

Minority Services—Office for Minority and Special Student Affairs (OMSSA), 12 Morrill Hall (376-1235)

Placement—National Health Professions Placement Network, 3014 University Avenue S.E. (373-0082)

Registration, Student Record Problems and Questions—Student Relations, 150 Williamson Hall (376-1680)

Transcripts—155 Williamson Hall

Women's Center—306 Walter Library (373-3850)

For information about any of these services, contact the appropriate office or consult the *General Information Bulletin*. For the addresses and telephone numbers of other offices, call University Information, (612) 373-2851.

Financial Aid

The Office of Student Financial Aid on the Twin Cities campus offers financial assistance and financial counseling for students who need help meeting their educational and living expenses. Regularly enrolled students are eligible to apply for three types of financial aid, which are granted on the basis of need and availability of funds: scholarships and grants, student loans, and college work/study. For information about these types of aid, see the current *General Information Bulletin* or contact the Office of Student Financial Aid, 210 Fraser Hall, 106 Pleasant Street S.E., University of Minnesota, Minneapolis, Minnesota 55455; telephone (612) 376-8686.

Some loans and scholarships are awarded only to students in designated degree programs. For information about loans and scholarships available to students in a particular health sciences baccalaureate program, see the appropriate program section of this bulletin or contact the college office.

As the cost of living rises and the cost of education rises along with it, more and more students are seeking financial aid. As a consequence, the application and review process for some of the more limited funds is very competitive. Students who do not qualify for financial aid or who need to supplement their loans or scholarships may need to seek part-time employment. These students should visit the Student Employment Office, 6 Morrill Hall, for assistance.

Housing

Housing is available for University students both on and off campus. University-owned housing includes eight residence halls as well as many off-campus rental units. Both University-owned and private rental units in the vicinity of campus are listed in the Housing

Office, Comstock Hall, 210 Delaware Street S.E., University of Minnesota, Minneapolis, Minnesota 55455; telephone (612) 373-7542. The eight residence halls owned and operated by the University are described in *Living In,* a brochure available from the Housing Office.

Because of its central urban location, the Twin Cities campus is easily accessible by car, bus, or other means of transportation from most off-campus locations. Nevertheless, many students prefer living on or within walking distance of campus. Because of the heavy demand for housing on and immediately adjacent to campus, these students should begin making arrangements for housing at least a few months before the beginning of classes, if possible. Residence halls, particularly, fill up early. Students may apply for residence hall accommodations before they are admitted to the University; they do not need to wait for their letter of acceptance.

For more information, consult the *General Information Bulletin,* and contact the Housing Office.

Boynton Health Service

Outpatient services are provided at the Boynton Health Service for all eligible students. Students who have paid the student services fee or the fee for extended health service benefits are eligible for general medical care or for consultation with specialists about physical or mental health problems without charge.

Students who drop out of school for a quarter during the regular academic year or who register without paying the student services fee may arrange at the health service to pay a fee for extended health service benefits. Students who are enrolled during the regular academic year but not during the summer months may also pay this fee for summer coverage. This extended coverage may not exceed two quarters in any calendar year. Additional information is available from the cashier, room 220 of the Boynton Health Service (telephone 612-373-3780), and in the *General Information Bulletin.*

Hospitalization

The student services fee does not include hospitalization benefits, coverage for services related to hospitalization, or coverage for inpatient or outpatient surgery. Every student who pays the student services fee must have such coverage. Those who do not must purchase University-sponsored Blue Cross-Blue Shield coverage at the time of registration. Only students who pay the student services fee or the fee for extended health service benefits are eligible to purchase the University-sponsored coverage.

Academic Policies and Regulations

Grading

Students have a choice of two grading systems: A-B-C-D-No Credit (A-N) or Satisfactory-No Credit (S-N). Each academic unit determines which courses, and what percentage of courses, its students can take under the S-N system. Some courses, usually required preprofessional and professional courses, may be taken A-N only; others may be taken under either system. See the appropriate program section of this bulletin for grading regulations governing students in your program.

Achievement Symbols—The following achievement symbols are used at the University of Minnesota:

A Represents achievement considered outstanding relative to course standards.

B Represents achievement significantly above the level necessary to meet minimum course requirements.

C Represents achievement that fully meets but does not exceed minimum course standards.

D Represents achievement that is worthy of credit but does not fully meet minimum course requirements.

S Represents achievement that is deemed by the instructor to be satisfactory for the course. Standards for S may vary from course to course.

N Represents no credit, signifying that the objectives of a course have not been accomplished; assigned when a student does not earn an S, a D, or a higher grade.

I Incomplete, a temporary grade assigned when the instructor expects that a student can successfully complete unfinished work in a course. If the course is not completed by the end of the student's next quarter of enrollment, the I becomes an N. The instructor may require a written contract with the student specifying work remaining to be completed and a required completion date. Instructors are not obliged to grant incompletes.

For all achievement symbols, instructors are expected to define to a class in its early meetings the performance standards necessary to earn each symbol.

Additional Symbols

V Represents registration as a visitor or an auditor. Auditors do not earn credits or grades, but they are expected to pay regular tuition and fees.

T Represents a grade transferred from another institution or from one college to another within the University and is posted on the transcript in front of the original letter grade.

W Recorded when a student officially withdraws from a course in accordance with procedures established by the student's academic unit.

X Recorded in a continuation course in which grades are not assigned until the entire sequence is completed. The instructor submits a grade for each course when the student has completed the sequence.

Grade Point Average—A student's grade point average (GPA) is determined by adding all grade points earned and dividing by the sum of all credits for which the grade points were earned. Grade points are not granted for courses in which a grade of S or N was received; thus credits of S and N are not included in the calculation of the official University GPA. Grade points are awarded according to the following system:

A = 4 grade points per credit
B = 3 grade points per credit
C = 2 grade points per credit
D = 1 grade point per credit

$$\text{GPA} = \frac{\text{Total Grade Points}}{\text{Total Credits}}$$

Repeating a Course—If a student is permitted to repeat a course for which credit was already earned, both grades are reported on the official transcript in the respective quarters earned.

Student Grade Reports and Transcripts

The academic records of all health sciences students on the Twin Cities campus are maintained by the Office of Registration, Student Records, and Scheduling. These records

show all courses for which students were registered as of the second week of each quarter (the end of the first week for summer terms) and the grades or symbols earned for those courses.

Transcripts are mailed to students in July, after the end of each academic year. They are also available on request from the Transcript Service, 155 Williamson Hall, 231 Pillsbury Drive S.E., University of Minnesota, Minneapolis, Minnesota 55455. Transcripts will be released only to students who appear in person or submit a written request; no telephone requests will be honored. Grades for fall and winter quarters are available on quarterly grade slips that must be picked up from designated locations; they are not mailed. See the Official Daily Bulletin column of the Minnesota *Daily* for locations and times for distribution of these grade slips.

Students with questions about their transcripts should address their inquiries to Student Relations, 150 Williamson Hall (telephone 376-1680). Because of privacy laws, most problems cannot be handled on the phone; students should try to visit the office in person if they wish to inquire about their academic records.

Academic Standing

Each academic unit establishes its own criteria and procedures for monitoring students' academic progress and determining whether students are progressing satisfactorily towards a degree. In most units, students must maintain a 2.00 grade point average as well as satisfying certain other criteria. For information about the policies and procedures of the individual units, see the program sections of this bulletin.

Access to Student Educational Records

In accordance with regents' policy on access to student records, information about a student generally may not be released to a third party without the student's permission. The policy also permits students to review their educational records and to challenge the contents of those records.

Some student information—name, address, telephone number, dates of attendance, college and class, major, adviser, and degrees earned—is considered public or directory information. To prevent release of such information outside the University while in attendance at the University, a student must notify the records office on his or her campus.

Students are notified annually of their right to review their educational records. The regents' policy, including a directory of student records, is available for review at the information booth in Williamson Hall, Minneapolis, and at the records offices on other campuses of the University. Questions may be directed to the Office of the Coordinator of Student Support Services, 260E Williamson Hall, (612) 373-2106.

Using the Bulletin Course Descriptions

The course descriptions in this bulletin are primarily for courses offered by the health sciences academic units and taught by members of the program faculty or by cooperating faculty members from other educational units of the University. Descriptions of courses offered by the individual units appear at the end of the program sections of this bulletin. Descriptions of courses offered by other academic units and either required or recommended for the programs described in this bulletin appear in a separate section at the end of the bulletin. Meeting hours, days, and rooms for these courses are listed in the quarterly *Class Schedule.* For the summer class schedule, see the *Summer Session Bulletin.*

For complete listings and descriptions of courses taught by other educational units of the University, see the bulletins of those units.

Course Numbering—A course is designated by an abbreviated departmental prefix and a number. Each course bears a single assigned number regardless of the quarter in which it is offered. Minimum class standing required for registration, unless otherwise notified, is indicated by the course number as follows:

0000 to 0998—noncredit courses
1000 to 1998—for lower division students
3000 to 3998—for upper division students
5000 to 5998—for upper division, graduate, or professional students
8000 to 8998—for graduate students only

Course Symbols—The following standard symbols are used throughout the course descriptions in lieu of page footnotes:

† All the courses preceding the dagger must be completed before credit will be granted for any quarter of the sequence.
§ Credit will not be granted if the equivalent course listed after the section mark has been taken for credit.
¶ Concurrent registration is allowed (or required) in the course listed after the paragraph mark.
# Consent of the instructor is required prior to registration.
△ Consent of the division, department, or school offering the course is required prior to registration.

A hyphen between course numbers (e.g., 3142-3143-3144) indicates a sequence of courses that must be taken in the order listed.

A comma between course numbers (e.g., 1234, 1235, 1236) indicates a series of courses that may be entered any quarter.

Program in Medical Technology

TABLE OF CONTENTS

For information about programs and careers in medical technology, contact the Director, Division of Medical Technology, Box 198 Mayo Memorial Building, 420 Delaware Street S.E., University of Minnesota, Minneapolis, Minnesota 55455, (612) 373-9670.

Program in Medical Technology

I. GENERAL INFORMATION

Development and Objectives

The course in medical technology was established at the University of Minnesota in 1923 to prepare men and women for professional work in clinical laboratory procedures and for advanced study in the basic sciences and in medical technology. This course attempts to provide both a strong foundation in basic sciences and experience in the clinical laboratory.

A medical technologist performs various diagnostic procedures used by physicians. The work requires a background in hematology, urinalysis, bacteriology, serology, parasitology, blood group serology, and the chemical analysis of body fluids. As a general rule, a student who has excelled in scientific subjects in high school will succeed in medical technology.

The broad training obtained in these fields enables the graduate to qualify for positions requiring general or specialized laboratory experience in hospital laboratories, clinics, and physicians' offices. In larger hospitals where there are several technologists, one may be occupied principally or entirely with work in hematology, bacteriology, or chemistry. There are opportunities for qualified graduates to work in research and teaching laboratories associated with larger clinics, foundations, and universities.

Admission

The curriculum in medical technology consists of the preprofessional program in the College of Liberal Arts or its equivalent at some other accredited institution and the professional program in the Division of Medical Technology, which is part of the Department of Laboratory Medicine and Pathology of the Medical School.

Admission to the Preprofessional Program—The student in the preprofessional program must meet the admission criteria and is subject to the academic regulations of the College of Liberal Arts (or their equivalent at another institution). For complete information, consult the *General Information Bulletin* and the *College of Liberal Arts Bulletin*.

Qualified applicants may enter the College of Liberal Arts at the beginning of any quarter, but the preprofessional sequence outlined is based on entrance in the fall quarter. If a student enters after fall quarter, summer session attendance may be necessary to make up program deficiencies.

Admission to the preprofessional program does not assure admission to the professional program.

It is recommended that prospective students take mathematics, physics, chemistry, and biology in high school.

Admission to the Professional Program—For admission to the Division of Medical Technology, the student must have completed 90 quarter credits, including the required courses. The major criterion for admission is satisfactory academic performance as judged by the student's grade point average in required courses. Students are admitted only once a year for the fall quarter. Admission to the professional program is competitive, because of the limited number of students that can be accommodated in the teaching and clinical facilities.

Students in residence at the University of Minnesota who expect to complete the requirements for admission to the professional program must file a Request for Change of College Within the University with the Office of Admissions by April 15. Those who have sufficient credits but have course deficiencies should consult with advisers in the Medical Technology Office regarding their status.

Students from other accredited colleges and universities may transfer to the University of Minnesota to complete the program in medical technology. Courses completed that are equivalent to those offered at the University of Minnesota are accepted to satisfy the requirements for admission to the Division of Medical Technology. Students transferring from other colleges may obtain the Application for Admission with Advanced Standing from the Office of Admissions. These applications must be filed with the Office of Admissions by April 15. It is strongly advised that transfer students ascertain their status by writing to the Director, Division of Medical Technology, Box 198 Mayo Memorial Building, 420 Delaware Street S.E., University of Minnesota, Minneapolis, Minnesota 55455, so that, if necessary, they may complete required courses during the summer session.

Immunizations—All students in the medical technology program are expected to arrange appointments at the Boynton Health Service for necessary immunizations before assignment to the clinical courses of the professional program. This procedure is required as a protection for students.

Registration Procedures and Advisers

Students registering for the first time at the University of Minnesota, as new freshmen in the preprofessional program or as transfer students with less than two full years of previous college work, are expected to participate in a special two-day orientation-registration program. (See the *General Information Bulletin* for a description of this program.) As part of this two-day program, students consult with an adviser in the Medical Technology Office for selection of courses and approval of their registration.

Students admitted to the professional program will receive instructions and information about registration procedures from the Medical Technology Office in advance of the fall quarter registration period.

All students, whether in the preprofessional curriculum in the College of Liberal Arts or in the professional curriculum in the Division of Medical Technology, are expected to plan their class schedule each quarter with an adviser in the Medical Technology Office.

Satisfactory Progress

Students in the professional program are subject to the regulations established by the Division of Medical Technology.

Students are expected to maintain satisfactory academic progress in the medical technology program. Any student not making satisfactory progress may be placed on scholastic probation upon recommendation of the Student Concerns Committee. This committee is composed of members of the faculty of the Division of Medical Technology and student representatives.

Students who fail to earn satisfactory grades after being on probation for one quarter may be dropped from the program. If a student fails to maintain satisfactory performance in any course or in any laboratory area while registered in this division, the student's record will be reviewed by the Student Concerns Committee for recommendation for action. If, after investigation and conference with the student, the committee judges it inadvisable for the student to continue in the curriculum, the student will be discontinued.

A student's work is considered unsatisfactory when she or he earns less than a C grade average (2.00 grade points for each credit) for all credits earned in a given year or a

given quarter. In addition, a student must earn a minimum grade of C in selected courses in the curriculum in order to enroll in related clinical practice.

If a student receives an unsatisfactory grade in one course, remedial work in the course may be provided, if possible; if not, the student must repeat the course the next time it is offered. If a student receives unsatisfactory grades in more than one course, either concurrently or in different quarters, the matter will be referred to the Student Concerns Committee for investigation and action. Ordinarily, unsatisfactory grades in two courses will be sufficient basis for discontinuation.

Satisfactory performance is considered to be not only a passing level in technical skill and theoretical knowledge, but also complete personal integrity and honesty.

Graduation

The minimum requirements for graduation are completion of the curriculum requirements and a total of 180 credits with 360 grade points, an average of 2.00 grade points per credit.

Upon satisfactory completion of the prescribed course of study, the bachelor of science degree will be conferred by the Board of Regents. Students completing the courses in the professional program with a grade point average of 3.00 may graduate "with distinction," and those with a grade point average of 3.50 may graduate "with high distinction."

Application for a degree must be filed with the Office of Registration, Student Records, and Scheduling three quarters before the time of graduation. Students completing the hospital clinical courses any time after the June graduation date and before the December graduation date will be eligible to apply for June graduation. Students completing requirements at other times will be eligible for graduation in December or August, as determined by the date they complete the requirements.

Professional Certification

Graduates from the Division of Medical Technology of the University of Minnesota are eligible to take national examinations for certification as medical technologists; these examinations are conducted by national certifying agencies. Many hospitals require this certification for employment.

Placement

Graduates of this program are assisted in finding employment by advisers in the Medical Technology Office. Notices of employment opportunities in the field are received from all parts of the United States and are posted in this office as an aid to students. The National Health Professions Placement Network also offers help to graduates of this program. For information, see the general introduction to this bulletin.

Student Organizations

For information on the various student organizations and activities available for all students, consult the *General Information Bulletin.* In addition, certain student organizations are open only to students in medical technology or to students in health sciences fields.

Students in the professional or preprofessional program are represented on the Medical Technology Council by elected members from each class. The purpose of the

Medical Technology Council is to promote student-faculty relationships, to stimulate social and educational activities, and to consider matters affecting students in the program.

Students in the undergraduate program in medical technology are eligible for student membership in the American Society for Medical Technology. Students in medical technology are also eligible to participate in the activities of the Council for Health Interdisciplinary Participation (CHIP). For information about this organization, see the general introduction to this bulletin.

II. CURRICULAR REQUIREMENTS

Bachelor of Science Program

To help students achieve the goals of a liberal education, the Division of Medical Technology expects each student to distribute some part of his or her course work in areas of study outside of the major or other related areas of study. To integrate the goals of both a liberal and a professional education in a manner appropriate to a baccalaureate curriculum in medical technology, the program stresses vigorous training in the physical and biological sciences, with special emphasis on acquiring a knowledge of chemistry that is basic to all facets of laboratory medicine. The program is designed to include not only factual information but also thorough instruction in scientific attitudes and methods. Training in technical skills augments the broad base of knowledge in both general and specific areas of the natural sciences.

In addition to specific required courses, general education requirements include a minimum of 8 to 10 credits selected from each of the three liberal education categories listed below. The distribution requirements may be fulfilled at any time before graduation. The credits in each category must be earned in courses in at least two different departments. They do not have to be completed during the preprofessional years. Consult the *College of Liberal Arts Bulletin* for a complete listing of courses commonly used to meet distribution requirements.

Students should be aware that they must take elective credits in addition to the minimum distribution requirements to complete the 180 credits required for graduation.

Communication, Language, and Symbolic Systems

Foreign Language	Mathematics
Linguistics	Speech

The Individual and Society

Anthropology	Humanities
Classics	Philosophy
Economics	Psychology
History	Sociology

Literary and Artistic Expression

Art History	Humanities
Arts, Studio	Music
English Literature	Theatre Arts

Preprofessional Program—Students register in the College of Liberal Arts (CLA) or another comparable college for the preprofessional program. The following courses or their equivalents must be completed before admission to the professional program. (Quarter credits are indicated in parentheses.)

Anat 1004—Elementary Anatomy (4)
Biol 1011—General Biology (5)
Biol 1106—General Zoology (5)
Chem 1004-1005—General Principles (10)
Chem 1006—Principles of Solution Chemistry (4)
Chem 3100—Quantitative Analysis (3)
Chem 3101—Quantitative Analysis Laboratory (2)
Chem 3301-3302—Organic Chemistry (8)
Chem 3305-3306—Organic Chemistry Laboratory (4)
Completion of the freshman composition requirement as defined by CLA
Math 1111 or Math 1201—College Algebra or Pre-Calculus (5)
MedT 1010—Orientation in Medical Technology (1)
MedT 1030-1031-1032—Introduction to Clinical Medicine (3)
Phys 1031-1032—Introductory Physics (8)
Phys 1035-1036—Physics Laboratory (2)
Electives satisfying distribution requirements to make a total of 90 credits.

Other courses that are equivalent or more comprehensive may be substituted for the required courses. Students planning to pursue graduate programs should take Math 1211-1221-1231 and Phys 1104-1105-1106 or Phys 1271-1281-1291. Students should complete the freshman composition requirement immediately upon entering the University.

Students who transfer into the preprofessional program after the freshman year are exempted from the MedT 1010 requirement. Students who transfer into the medical technology program after the sophomore year are exempted from both the MedT 1010 and 1030-1031-1032 requirements. Credits earned in these courses do not count toward a B.S. degree.

The following program schedule is suggested for the preprofessional years:

FIRST YEAR

Fall[1]	*Winter*[1]	*Spring*
Math 1111 or Math 1201	Biol 1011	Biol 1106
Chem 1004	Chem 1005	Chem 1006
MedT 1010	Electives	Electives

SECOND YEAR

Fall	*Winter*	*Spring*
Chem 3301	Chem 3302	Chem 3100
Chem 3305	Chem 3306	Chem 3101
Phys 1031	Phys 1032	Anat 1004
Phys 1035	Phys 1036	MedT 1032
MedT 1030	MedT 1031	Electives
Electives	Electives	

Professional Program—Students register in the Division of Medical Technology for the professional program. The following courses must be completed to satisfy requirements for graduation. (Quarter credits are indicated in parentheses.)

Anat 5765—Hematology (4)
LaMP 5173—Pathology and Clinical Medicine (5)
MdBc 5300, 5301—Biochemistry (9)
MedT 5063—Introduction to Urinalysis (3)
MedT 5075-5076—Principles of Clinical Hematology I and II (5)
MedT 5066—Introduction to Clinical Immunohematology (5)
MedT 5067—Hemostasis (2)

[1]In addition to the courses listed, students must complete the freshman composition requirement, preferably during their first academic year of enrollment.

MedT 5082—Applied Clinical Chemistry (4)
MedT 5085—Applied Clinical Hematology (4)
MedT 5086—Applied Clinical Immunohematology (4)
MedT 5088—Applied Diagnostic Microbiology (4)
MedT 5095—Professional Aspects of Medical Technology (1)
MedT 5102—Diagnostic Microbiology (4)
MedT 5110-5111—Principles of Clinical Chemistry (10)
MicB 5233—Microorganisms and Disease (7)

In addition to the above courses, an upper division course in biological sciences is required. Courses suggested to fulfill this requirement are:

Anat 5766—Hematology (4)
Biol 3041—Ecology (4)
Biol 3051—Biology and the Future of Man (4)
Biol 3112—Biological Rhythms (4)
EBB 3004—Fundamentals of Ecology (4)
EBB 5116—Introduction to Animal Parasitology (5)
GCB 3008—The Biology of Cancer (3)
GCB 3011—General and Comparative Embryology (5)
GCB 3022—Genetics (4)
GCB 5015—Histology (5)
MicB 5218—Immunology (3)
Phsl 3051—Human Physiology (5)

Elective courses:

MedT 5070—Laboratory Instrumentation (3)
MedT 5090—Special Laboratory Methods (2)
MedT 5092—Honors Program in Laboratory Methods (5)

The clinical courses (MedT 5082, 5085, 5086, and 5088) consist of application of basic methods and techniques in chemistry, hematology, immunohematology, and microbiology in the clinical laboratories of the University of Minnesota Hospitals and other affiliated institutions. These courses are offered each quarter and each summer term. Assignment to these courses is made on an individual basis and is contingent upon the availability of space in the clinical facilities as well as satisfactory completion of prerequisite course work and elective course work required for graduation.

A minimum grade of C is required in each introductory course in order to enroll in each related clinical course. The introductory and related clinical courses are:

Introductory Courses	*Related Clinical Courses*
MedT 5063, MedT 5110-5111	MedT 5082
Anat 5765, MedT 5067, MedT 5075-5076	MedT 5085
MedT 5066	MedT 5086
MicB 5233, MedT 5102	MedT 5088

Registration in courses in Continuing Education and Extension (CEE) concurrently with registration in clinical courses requires the consent of the director of the Division of Medical Technology. A maximum of five quarter/semester credits may be taken in CEE concurrently with the clinical courses.

The following program schedule is suggested for the professional years:

THIRD YEAR

Fall	*Winter*	*Spring*
MdBc 5300	MdBc 5301	MedT 5066
MedT 5063	MedT 5075	MedT 5076
MedT 5095	MedT 5102	MedT 5111
MicB 5233	MedT 5110	

FOURTH YEAR

Fall	*Winter*	*Spring*	*Summer*
Anat 5765	Clinical courses	Clinical courses	Clinical courses
Biological science	(or) Electives	(or) Electives	
LaMP 5173			
MedT 5067			

Master of Science Program

Graduate work in the field of medical technology is available for the qualified candidate who wishes to prepare for a career of investigation and teaching in the area of clinical laboratory methods. A master of science degree program with a major in medical technology is offered by the Graduate School. The program is offered only under Graduate School Plan A (master's degree with thesis). Each student is required to complete a thesis involving independent research in one of the subareas of this field under the direction of the adviser.

Admission requirements include certification as a medical technologist or eligibility for such certification, and a bachelor's degree from an accredited institution of higher learning with sufficient scholarly attainment in chemistry and the biological sciences to justify graduate work in these areas. Previous experience in a clinical laboratory is required.

More information about the program is available in the *Graduate Programs in the Health Sciences Bulletin.*

III. COURSES IN MEDICAL TECHNOLOGY

Medical Technology (MedT)

1010. ORIENTATION IN MEDICAL TECHNOLOGY. (1 cr [no cr toward degree]; prereq fr only)
Orientation to the principles and practices of medical technology.

1030-1031-1032. INTRODUCTION TO CLINICAL MEDICINE. (1 cr per qtr [no cr toward degree]; prereq soph only)
Survey of the basic anatomy, physiology, and pathology of selected disease states, with illustrative clinical material.

5063. INTRODUCTION TO URINALYSIS. (3 cr)
Lectures and laboratory exercises in basic techniques in the chemical and microscopic study of urine.

5066. INTRODUCTION TO CLINICAL IMMUNOHEMATOLOGY. (5 cr; prereq MicB 5233)
Fundamental principles and laboratory techniques in blood grouping, compatibility testing, and immunologic procedures.

5067. HEMOSTASIS. (2 cr)
Lectures and laboratory exercises in basic theory and techniques of hemostasis, including platelet function and disorders, plasma coagulation system, inherited and acquired hemostatic disorders.

5070. LABORATORY INSTRUMENTATION. (3 cr; prereq Phys 1031-1032)
Lectures and laboratory exercises in fundamentals of instrumentation utilized in the clinical laboratory.

5075. PRINCIPLES OF CLINICAL HEMATOLOGY I. (3 cr; prereq △)
Theory and application of principles in hematology with emphasis on erythrocytes and their disorders. Lecture and laboratory.

5076. PRINCIPLES OF CLINICAL HEMATOLOGY II. (2 cr; prereq 5075)
Theory and application of principles in hematology with emphasis on leukocytes and their disorders. Lecture and laboratory.

5082. APPLIED CLINICAL CHEMISTRY. (4 cr; prereq 5111)
Application of basic methods and techniques in chemistry in the clinical laboratory.

5085. APPLIED CLINICAL HEMATOLOGY. (4 cr; prereq 5067, 5076)
Application of basic methods and techniques in hematology in the clinical laboratory, morphology of blood cells, application of techniques in hemostasis.

5086. APPLIED CLINICAL IMMUNOHEMATOLOGY. (4 cr; prereq 5066)
Application of basic techniques and methods in serology and immunology in the clinical laboratory. Blood grouping, compatibility testing, and immunologic procedures.

5088. APPLIED DIAGNOSTIC MICROBIOLOGY. (4 cr; prereq 5102)
Identification of bacteria by microscopic techniques. Correlation with clinical cases. Identification of parasites and fungi.

5090. SPECIAL LABORATORY METHODS. (2 cr)
Assignment on an individual basis to one of a wide variety of special areas of experience in the clinical laboratory; field experience.

5092. HONORS PROGRAM IN LABORATORY METHODS. (5 cr)
Individual assignment to special projects or research with more intensive treatment in theory in one of the clinical areas of chemistry, hematology, immunohematology, or microbiology.

5095. PROFESSIONAL ASPECTS OF MEDICAL TECHNOLOGY. (1 cr)
Overview of the profession of medical technology; history, current status, certification, and accreditation. Demonstration of the interrelationships of medical technology with patients and other health professionals.

5102. PRINCIPLES OF DIAGNOSTIC MICROBIOLOGY. (4 cr; prereq MicB 5233)
An independent study course covering current techniques used in the laboratory diagnosis of infectious disease; isolation and identification of bacteria and yeast; antibiotic sensitivity testing.

5110. INTRODUCTION TO CLINICAL CHEMISTRY. (4 cr; prereq Chem 3100-3101, MdBc 5300, and △)
Lecture and laboratory course in basic concepts and techniques in clinical chemistry. Study of such topics as quality control, approaches to methods comparison, spectrophotometry and fluorometry, and chromatography techniques such as electrophoresis, ion exchange, and thin layer gas chromatography. A section on principles of automation includes work with AutoAnalyzers.

5111. PRINCIPLES OF CLINICAL CHEMISTRY. (6 cr; prereq 5110)
Lecture and laboratory course emphasizing measurement and physiological relevance of various serum constituents. Includes discussion of electrolytes, proteins, enzymes, steroids, lipids, toxicology, and RIA. Laboratory exercises involving relevant techniques, both manual and instrumental.

Graduate Courses in Medical Technology (MedT)

5120. SEMINAR: MEDICAL TECHNOLOGY

5125. PRACTICUM: TEACHING

5128. ELEMENTS OF LABORATORY ADMINISTRATION

5130. PRACTICUM IN LABORATORY ADMINISTRATION

5133. MEDICAL MYCOLOGY

5135. ADVANCED CLINICAL MICROBIOLOGY

5136. ANAEROBIC BACTERIOLOGY

5138. CLINICAL MICROBIOLOGY SEMINAR

5140-5141. TECHNIQUES FOR TEACHING

5145. DEVELOPMENT OF MEDICAL TECHNOLOGY

5155. ADVANCED CLINICAL HEMATOLOGY

5165. ADVANCED CLINICAL IMMUNOHEMATOLOGY

5173. ANALYTIC TECHNIQUES IN LABORATORY MEDICINE

5175. ADVANCED CLINICAL CHEMISTRY

5179. CHEMISTRY SEMINAR

8176. ADVANCED TOPICS IN CLINICAL CHEMISTRY

8178. PRINCIPLES OF DIAGNOSTIC ENZYMOLOGY

8230. ADVANCED MEDICAL BACTERIOLOGY

8240. EDUCATIONAL ADMINISTRATION IN MEDICAL TECHNOLOGY

IV. FACULTY AND STAFF

Administration

Ellis S. Benson, M.D., Professor and Head, Department of Laboratory Medicine and Pathology
Ruth F. Hovde, M.S., Professor and Director, Division of Medical Technology, and Director, Graduate Studies in Medical Technology
Verna L. Rausch, M.S., Professor and Associate Director, Division of Medical Technology
Karen Karni, Ed.M., Assistant Professor, and Director, Continuing Education, Division of Medical Technology

Faculty

Donna Blazevic, M.P.H., Professor, Microbiology
Larry Bowers, Ph.D., Assistant Professor, Chemistry
Sandra Carter, M.S., Assistant Professor, Immunohematology
Grace Mary Ederer, M.P.H., Professor, Microbiology
Edward Finnerty, Ph.D., Assistant Professor, Chemistry
Esther Freier, M.S., Professor, Chemistry
Ben Hallaway, M.S., Associate Professor, Chemistry
Helen Hallgren, M.S., Assistant Professor, Immunology
Dolores Harvey, B.S., Assistant Professor, Chemistry
Karen Lofsness, M.S., Assistant Professor, Hematology
Lorraine Stewart, M.S., Associate Professor, Immunochemistry
Carol Wells, Ph.D., Assistant Professor, Microbiology
Kathryn Zieske, M.S., Assistant Professor, Hematology

Teaching Specialists

Sally Clysdale, B.S.
Stella Cook, B.S.
Marilyn Koepke, B.S.
Andy Otness, B.S.
Maureen Scaglia, B.A.
Joan Schmidt, B.S.
Regina Vijums, B.S.

Laboratory Directors

Henry Balfour, M.D., Professor, Medical Microbiology
G. Mary Bradley, M.D., Associate Professor, Medical Microscopy
David M. Brown, M.D., Professor, Clinical Laboratories
Richard Brunning, M.D., Professor, Hematology
J. Roger Edson, M.D., Professor, Coagulation
Jeffrey McCullough, M.D., Professor, Immunohematology
Michael Steffes, M.D., Ph.D., Associate Professor, Clinical Chemistry
R. Dorothy Sundberg, M.D., Ph.D., Professor, Hematology

Clinical Staff

Frances Anderson, B.S., Fairview Hospital
Miguel Azar, M.D., Veterans Administration Hospital
Michael Burke, M.D., Mt. Sinai Hospital
Irven Dahl, B.S., Veterans Administration Hospital
Agustin Dalmasso, M.D., Veterans Administration Hospital
Gerald Davies, B.S., Veterans Administration Hospital
Margaret Gabrik, B.S., Veterans Administration Hospital
Seymour Handler, M.D., North Memorial Hospital
Norman Horns, M.D., Fairview-Southdale Hospital
Charles Horwitz, M.D., Mt. Sinai Hospital
William Kline, M.S., S.B.B., Red Cross Blood Center
Donald Koehler, M.S., Veterans Administration Hospital
Carol Olson, B.S., SB.B., Red Cross Blood Center

Dorothy Peterson, B.S., Fairview-Southdale Hospital
Herbert Polesky, M.D., War Memorial Blood Bank
John Raich, M.D., Fairview-Southdale Hospital
Donna H. Ripley, B.S., Veterans Administration Hospital
Edward Segal, M.D., Methodist Hospital
Martin Segal, M.D., Methodist Hospital
Doris Serstock, B.A., Veterans Administration Hospital
Patrick Ward, M.D., Mt. Sinai Hospital
Robert Wilfer, B.S., St. John's Hospital

Laboratory Staff: Principal and Senior Medical Technologists

Patricia Brennecke, B.S., Teaching Laboratories Manager
Donna Wieb, B.S., Hospital Laboratories Manager

Administration

Terence Duffy, M.S.
Susan Preston, B.S.
Kathleen White, B.S.

Blood Bank Laboratory

Nancy Koenker, B.S., S.B.B.
Clareyse Nelson, B.S., S.B.B.
Marylee Rogers, B.S.
Nancy Ward, B.S., B.A.

Chemistry Laboratory

Mary Berry, B.S.
Priscilla Bormann, B.S.
Lindsay Cowles, B.S.
E. Mary Damron, B.S.
Cynthia Dean, B.S.
Catherine Foster, M.S.
Mary Fowler, B.S.
Kathleen Hansen, B.S.
Mavis Hawkinson, B.S.
Lynn King, B.S.
Cora Lueben, B.S.
Arlene Meadows, B.S.
Kay Nelson, B.S.
Alice Reinecke, B.S.
Christine Senn, B.S.
Linda Wessels, B.S.

Coagulation Laboratory

Ardella Bennett, B.S.
Karen Meyer, B.S.
Cheryl Swinehart, M.S.

Hematology

Audrey Christenson, B.S.
Ruth Rosendahl, B.S.
Ella Spanjers, B.S.
Elizabeth Stone, B.S.
Aija Vikmanis, B.S.
Betty Weisel, B.S.

Immunology

Linda Edwins, B.S.
Harriet Noreen, B.S.
Nancy Reinsmoen, M.S.
Elizabeth Van Der Hagen, B.S.

Microbiology

Evelyn Busch, B.S.
Barbara Chinnock, B.S.
Billie Juni, M.S.
Karin Libby, B.S.
Nettie Warwood, B.S.
Marcia Weber, M.S.

Serology

Colleen Lamb, B.S.

Department of Mortuary Science

TABLE OF CONTENTS

For information about the Department of Mortuary Science or career opportunities in funeral service, contact Professor Robert C. Slater, Director, Department of Mortuary Science, 114 Vincent Hall, 206 Church Street S.E., University of Minnesota, Minneapolis, Minnesota 55455; telephone (612) 373-3870.

Department of Mortuary Science

I. GENERAL INFORMATION AND ADMISSION

Development and Purpose

The mortuary science program at the University of Minnesota, established in 1908, was the first program of its kind in this country to be organized at a state university. During the first almost 50 years of its existence, the program grew from a six-week session to a 36-week course of study. In 1951, a two-year curriculum leading to the associate in mortuary science degree was approved. The course of study for the associate degree was expanded to three years in 1955. The bachelor of science degree with a major in mortuary science, granted upon satisfactory completion of a four-year curriculum, was approved by the Board of Regents in 1968. In 1978, a master of education degree program in school health education for mortuary science students was begun. Impetus for the changes in program length and academic credentials resulted from changes in the philosophy and needs of the funeral service profession.

Since 1970, the department has come under the administrative supervision of the vice president for health sciences.

To insure each student that the curriculum meets the criteria set forth by the profession, the program is accredited by the American Board of Funeral Service Education, an agency recognized by the United States Commissioner of Education, and the Conference of Funeral Service Examining Boards of the United States, Inc.

While funeral service provides care for the dead that reflects the dignity of human life, it is best characterized by direct care for the living. Bereavement and grief are part of the continuum of life experiences. The faculty believes that helping individuals to adapt to these changes is a principal aim of funeral service.

Mortuary science students pursue a course of study that is designed to prepare them to accept their obligations to the community, both as professionals and as citizens. The faculty attempts to provide graduates with a solid academic foundation and professional guidance in order to encourage continued professional growth, ethical business practices, supportive and tactful relationships with the bereaved, and respect for public health laws and regulations. Such ethical and professional conduct can promote fuller public acceptance of funeral service and recognition of its contribution to our society.

The baccalaureate program in mortuary science is designed for those who want a broad college experience along with the required professional training. The curriculum combines instruction in the basic sciences and the liberal arts with training in mortuary arts and sciences. The total credits required for the bachelor of science degree maintain a balance between general education, mortuary science, and related requirements. There is ample opportunity for students to pursue individual interests by completing electives in other disciplines. A practicum experience gives students the opportunity to develop the first-hand knowledge, skills, and understanding essential for the practice of funeral service. Many states now require such educational background, plus internship experience, for licensure. Through a problem-solving approach, students learn to evaluate funeral service, identify funeral service problems, and develop appropriate methods of intervention.

Admission Requirements

Students usually enter the Department of Mortuary Science at the start of their junior year. Freshmen and sophomores interested in a mortuary science major are urged to contact the department office at 114 Vincent Hall early for counsel in planning an appropriate preprofessional program. On the Twin Cities campus, students usually register in the College of Liberal Arts or the General College for their pre-mortuary-science work. The *College of Liberal Arts Bulletin* and the *General College Bulletin* contain admission criteria and other information about these units. The Department of Mortuary Science accepts students transferring from any accredited college.

Applicants seeking admission to the program must have completed a total of 90 quarter credits, as outlined below, with grades of A, B, C, or S. Credits of D may be used to satisfy the distribution and prerequisite requirements but may not be applied to the 90-credit total. At the discretion of the Admissions Committee, a student may be allowed to make up certain deficiencies after admission if doing so facilitates the program schedule of the individual.

The required 90 quarter credits must include 67 credits distributed to fulfill the University-wide Council on Liberal Education (CLE) requirements plus 23 additional credits of elective course work. The CLE group distribution requirements are detailed below.

Group A. Communication, Language, and Symbolic Systems—15 credits

a. English (satisfy College of Liberal Arts freshman composition requirement)
b. Speech
c. Accounting—a minimum of 3 credits
d. Electives—foreign language, philosophy, mathematics, statistics, journalism

Group B. The Physical and Biological Sciences—23 credits

A general course in subject areas a,b,c,d,e with laboratory in at least two of the areas.

a. Biology
b. Chemistry
c. Human anatomy
d. Microbiology
e. Public health
f. Electives—physics, physiology, astronomy, geology

Group C. The Individual and Society—20 credits

A minimum of 16 credits in subject areas a,b,c, including a general course in areas a and b.

a. Psychology
b. Sociology
c. Anthropology
d. Electives—history, political science, economics, geography, management

Group D. Literary and Artistic Expression—9 credits

a. Electives—art, music, literature, theatre arts, humanities

Application Procedures

Transfer Within the University—Students already admitted to one college or campus of the University of Minnesota must submit a Request for Change of College Within

the University, available from the Office of Admissions on any campus. Application deadlines for internal transfer are July 15 for fall quarter admission, November 15 for winter quarter admission, and February 15 for spring quarter admission.

Transfer From Outside the University—Those who have completed their preprofessional work at another university must apply for admission to the University of Minnesota. Transfer students should obtain the Application for Admission With Advanced Standing from the Office of Admissions, 240 Williamson Hall, 231 Pillsbury Drive S.E., University of Minnesota, Minneapolis, Minnesota 55455; complete the form; and return it to that office. An official transcript from each institution outside the University where college work was attempted or completed must accompany the application. A $10 nonrefundable credentials examination fee is also required.

Admission—The Admissions Committee, composed of departmental faculty members, selects students according to scholastic standing as well as character and personal fitness as disclosed by the application and/or personal interview. Applicants seeking fall quarter admission are notified of acceptance or rejection by July 1. Instructions for registration are mailed about one month before the opening of the initial quarter of enrollment.

Financial Aids and Awards

For information concerning financial aids available to all University students, refer to the general introduction to this bulletin.

The following funds are available to aid mortuary science students:

The **American Board of Funeral Service Education** administers a scholarship fund available to students nationwide. Students interested in determining their eligibility should contact the board at 201 Columbia Street, Fairmont, West Virginia 26554.

The **Mortuary Science Emergency Loan Fund** was established to assist those students who, because of emergencies, need small amounts of cash for a short (30 to 60 day) period of time. For this type of assistance, students should apply to the director.

The **Past Presidents Fund**, established by former presidents of the Minnesota Funeral Directors Association, provides for annual scholarship grants in varying amounts.

The **Silver Anniversary Fund** is maintained by classes celebrating the 25th anniversary of their graduation with a reunion. Several quarterly tuition grants are awarded to students nominated by faculty members on the basis of need and scholarship.

The following awards are presented annually at spring quarter graduation:

Award of Merit—The Minnesota Funeral Directors Association awards a certificate of merit to an outstanding student in mortuary science. After nomination by the graduating class, a student is selected by a committee composed of members from the association, the Minnesota State Department of Health Committee of Examiners in Mortuary Science, and the faculty. The recipient is chosen on the basis of scholarship, citizenship, professional attitude, and personality.

DIF Award—Since 1951 this award has been given to the graduating mortuary science student who best exemplifies the qualities of perseverance, diligence, and cooperation, and who shows the greatest academic improvement regardless of final grade point average. A gold key inscribed with the sentence *Diligentissime Incubuit Fortiterque*—He has applied himself with the greatest diligence and vigor—is presented.

Director's Service Award—The director of the department presents a service award to the student who has contributed the most to his or her class and to the department. In addition to service, the award takes into consideration attitude, leadership ability, and consciousness of citizenship responsibility. The award is a gold key appropriately inscribed.

The **J. M. Nolte Scholar Award** was established by the University Mortuary Science Education Association in honor of Julius M. Nolte, former dean of the General Extension Division of the University of Minnesota, to recognize his contribution to the organization of the association and his dedication to the advancement of funeral service education at the university level. The award is given to recognize academic and other achievement of graduating students in funeral service.

Student Personnel Services

Orientation—To help students get acquainted with one another, the campus, and the department, a variety of orientation activities are offered by the Department of Mortuary Science. These activities usually last for one or two days and include individual and group meetings for testing, program planning, presentations about University resources and regulations, and socializing. Students are notified of orientation dates at the time they receive registration information.

Faculty Advisers—Each student in the Department of Mortuary Science is assigned a faculty adviser. This staff member assists the student with program and career planning, financial planning, and other concerns the student may have. The adviser may also refer the student to another University agency for assistance. Each quarter the adviser must approve the student's registration.

Freshman and sophomore pre-mortuary science students in the College of Liberal Arts are assigned advisers from the Department of Mortuary Science.

Self-Support—The department assists in locating part-time work for its students in funeral homes in Minneapolis and St. Paul. However, the program in mortuary science is a full one, and students may find it difficult to devote time to outside employment.

Placement Service—The department maintains a placement service for its students and alumni. Referrals for services of licensed professionals are often requested, and the department endeavors to fill these requests with names from its files of graduates. Instructions for using placement services are given to students upon graduation.

National Certification—Graduates of the Department of Mortuary Science are eligible to take the National Board Examination for Proficiency in Mortuary Science. The department arranges to have the test given on campus by the Conference of Funeral Service Examining Boards of the United States, Inc.

Student Activities

Student Association of the Department of Mortuary Science—Each student enrolled in the department automatically becomes a member of this association. The association serves as a forum for expressing student opinion about mortuary science education, a liaison between students and faculty, and an organization to foster and support mortuary science education.

University Organizations—A variety of student organizations, reflecting recreational, social, political, vocational, and service interests, are open for student participation. Interested students should contact the Student Organization Development Center, 340 Coffman Memorial Union (373-3955).

II. CURRICULUM AND ACADEMIC REGULATIONS

Curriculum for the Bachelor of Science Degree

JUNIOR YEAR

Fall Quarter		*Winter Quarter*		*Spring Quarter*	
Mort 3001	4	Mort 3040	3	Mort 3010	3
Anat 1004[1] or elective	4	MicB 1101[1] or elective	4	Mort 3030	4
Electives	6	Electives	7	LaMP 3050	4
	14		14	Elective	4
					15

SENIOR YEAR

Mort 3050	4	Mort 3070	8	Mort 3080	15
Mort 3060	8	Mort 3071	2		15
Mort 3061	3	Mort 3271	1		
Mort 3270	2	Elective	4		
	17		15		

Graduation Requirements

To be recommended for the bachelor of science degree with a major in mortuary science, students must:

1. Complete a minimum of 180 credits with A, B, C, and S grades. Credits of D may be used to satisfy the distribution and prerequisite requirements but may not be applied to the 180-credit total. Of the 180 credits required, 90 must be in the courses required for the junior and senior year curriculum in mortuary science, and a minimum of 15 must be in upper division courses exclusive of prerequisite and elective courses in mortuary science.

2. Complete the 90 credits of freshman and sophomore liberal education distribution requirements. The distribution of these credits and categories of study required are detailed under the heading Admission Requirements in part I of this section of the bulletin.

3. Present at least one-half of the degree credits earned while a student at the University of Minnesota with grades of A, B, or C.

4. Present at least 30 of the last 45 credits earned prior to graduation in course work completed at the University of Minnesota.

Students planning to practice in a state other than Minnesota should determine the qualifications for licensure by writing to either the State Board of Health or the State Board of Embalmers and Funeral Directors in the capitol city of the state in which they intend to practice. These regulations are frequently changed, and students should make certain they have current information.

[1]For students unable to complete elementary human anatomy and elementary microbiology before admission.

Honors

Students may qualify for graduation "with high distinction" if they earn a minimum of 40 upper division credits of A while registered in the department, or "with distinction" if they earn a minimum of 30 upper division credits of A while registered in the department.

Registration

Students are notified of either a special registration appointment or the specified days set aside for registration. When students report for registration they are given a set of detailed instructions and a suggested program plan for the completion of all degree requirements. These make the process of registration relatively simple. The department director, advisers, and office staff assist with registration.

Credit Load

Most students take about 15 credits of course work each quarter. To take fewer than 12 credits a quarter requires permission from the Student Scholastic Standing Committee. Registration for more than 18 credits a quarter must also be approved by the Student Scholastic Standing Committee.

Scholastic Progress

The scholastic probation system is designed to identify, warn, and ultimately exclude from the department students who are unable to meet scholastic standards.

A student who receives two N's, two D's, or one N and one D within one quarter is placed on probation. The student is then required to make a contract with the Student Scholastic Standing Committee agreeing to complete a specified number of credits during the following quarter with grades of C or better. If the terms of the contract are not fulfilled, the student may be dropped from the program. If the terms of the contract are fulfilled, the student will be removed from probation.

Students who have accumulated more than three N's or a combination of four N's and D's may be excluded from the department for one of the following reasons:

Dropped for Low Scholarship—Students who fail to meet the terms of their probation.

Hold for Committee Clearance—Students who have scholastic difficulties that indicate they should interrupt their studies for the time being even though their record may not require official drop action. The Student Scholastic Standing Committee must approve a subsequent return to the department in such cases.

A student admitted to the department on probation must achieve satisfactory academic status during the first quarter of enrollment.

Graduate Study

The College of Education offers a master of education degree program in school health education for mortuary science students. Requirements for admission to this program include completion of a bachelor's degree program and a course in mortuary science accredited by the American Board of Funeral Service Education, completion of an internship, and licensure to practice funeral service. The student's scholastic record should demonstrate high academic ability and potential to pursue advanced study.

The objective of the master of education program is to prepare qualified teachers for college programs in funeral service education. The curriculum includes course work in death education, aspects of aging, psychological foundations, counseling and guidance, curriculum development, and foundations of education, as well as research and a practicum in teaching.

Students interested in further information about this program should write to the director of the Department of Mortuary Science.

III. COURSES IN MORTUARY SCIENCE

Mortuary Science (Mort)

3001. ORIENTATION IN FUNERAL SERVICE. (4 cr)
Overview of the funeral service profession, including history, vocabulary, and professional experiences in technical and management areas.

3010. MORTUARY LAW. (3 cr)
Licensing; restrictions on mortuary sites; business organization; duties, rights, and liability regarding final disposition; tort liability; cemetery law; wills and administration of estates; business law.

3030. EMBALMING CHEMISTRY. (4 cr; prereq introductory course in general chemistry, regis in mortuary science)
Fundamentals of organic chemistry and biochemistry. Chemical changes in the human body during life, after death, and during chemical preservation. Disinfection, solutions, toxicology, and embalming fluids.

3040. PSYCHOLOGY OF FUNERAL SERVICE. (3 cr; prereq introductory course in general psychology)
Applied psychological principles helpful in dealing with clients, especially those experiencing emotional crisis.

3050. RESTORATIVE ART. (4 cr; prereq regis in mortuary science)
Basic drawing, design, and color theory. Anatomical drawing and modeling. Use of color in cosmetics and interior decoration; physical effect of colors on forms; psychological effect of colors on people. Special laboratory skills.

3060. EMBALMING. (8 cr; prereq biology, human anatomy, regis in mortuary science or #)
Theory and procedures of embalming.

3061. GROSS HUMAN ANATOMY. (3 cr; prereq biology, human anatomy, regis in mortuary science)
Gross human anatomy with emphasis on the vascular system.

3070. FUNERAL MANAGEMENT (8 cr; prereq regis in mortuary science)
Professional overview and image; current practices and procedures; funeral direction; professional regulations; funeral home operations; records and forms. Role of the funeral licensee in public health, regulatory procedures. Field trips.

3071. FUNERAL MANAGEMENT. (2 cr; prereq regis in mortuary science)
Principles, techniques, and basic helping skills of counseling as applied to the funeral arrangement conference.

3080. PRACTICUM IN FUNERAL SERVICE. (15 cr; prereq 3001, 3010, 3030, 3040, 3050, 3060, 3061, 3070, 3071, 3270, 3271, LaMP 3050, minimum of 8 nondepartmental upper divison cr, △; S-N grading)
Practical experience during one quarter in a funeral home as assigned by the department; reports and assigned readings in funeral service literature.

3090. INDEPENDENT STUDY. (1 cr; prereq sr)
A report based on study and research in an area of the student's interest in funeral service.

3210. SEMINAR: FUNERAL LAW. (2 cr; prereq #)

3240. SEMINAR: PSYCHOLOGY. (2 cr; prereq #)

3250. SEMINAR: RESTORATIVE ART. (2 cr; prereq #)

3260. SEMINAR: EMBALMING. (2 cr; prereq #)

3270. FUNERAL MANAGEMENT. (2 cr; prereq regis mortuary science; S-N grading)

3271. FUNERAL MANAGEMENT (1 cr; prereq regis mortuary science; S-N grading)

3275. SEMINAR: FUNERAL SERVICE. (2 cr; prereq #)

3980. DIRECTED INSTRUCTION. (Cr ar; prereq #)

5040. DYING AND DEATH IN CONTEMPORARY SOCIETY. (3 cr, §Hlth 5402, §PubH 5040, §HSU 5040; prereq health sciences student, public health grad student, education sr, certified teacher, mortuary science student or #)
Basic introduction to concepts, attitudes, ethics, and life-style management in relation to dying, death, grief, and bereavement. Emphasis on educational aspects for community health and helping professionals and educators.

IV. FACULTY AND ADMINISTRATION

Robert C. Slater, B.S., Director and Professor of Mortuary Management
Earl L. Burger, M.A., B.S., A.M.S., Assistant Professor of Restorative Art
Richard A. Grayson, J.D., B.A., Assistant Professor of Funeral Law
F. Phil Iacovino, B.S., Instructor in Funeral Service Management
Eugene M. Larson, B.S., Instructor in Public Health Laws and Regulations
David A. Lee, B.S., Instructor in Embalming
Michael C. Mathews, B.S., A.M.S., Instructor in Mortuary Management
Dale E. Stroud, B.S., A.M.S., Assistant Professor of Embalming

All other appointees are full-time staff members of the cooperating colleges and departments.

School of Nursing

TABLE OF CONTENTS

For academic and career counseling, prenursing CLA students should contact the pre-nursing counselor in the College of Liberal Arts, 30 Johnston Hall, (612) 373-2912. Others should contact the Health Sciences Student Affairs Office, W61 Centennial Hall, 614 Delaware Street S.E., University of Minnesota, Minneapolis, Minnesota 55455; (612) 376-7564. For more information about the School of Nursing, contact the dean's office of the School of Nursing, 5-140 Health Sciences Unit F, 308 Harvard Street S.E., University of Minnesota, Minneapolis, Minnesota 55455; (612) 373-3462.

School of Nursing

I. GENERAL INFORMATION

Development of the School

The University of Minnesota School of Nursing is the oldest nursing school on a university campus in the United States. The school opened in March 1909, offering a three-year program in which four students were enrolled. In 1919, a five-year program leading to a baccalaureate degree in nursing was begun. The shorter nondegree program continued until 1947. In response to the need for more prepared teachers and supervisors, specialized baccalaureate programs for RNs were established in the fields of nursing education (1922) and nursing administration (1955). These specialized programs were phased out in the early 1960s with the establishment of a general nursing program for RNs with many requirements identical to those of the generic baccalaureate program. Beginning in 1968, all undergraduate students were admitted to a single baccalaureate program. There have been some modifications since then in programming for RNs, but all undergraduate students pursue the same program objectives and complete the same curriculum.

The first post-baccalaureate programs in nursing were initiated in 1951 and 1952. These programs were phased out between 1965 and 1968 as master's degree programs in nursing were developed and offered through the Graduate School. Graduate programs in nursing have undergone considerable change over the last 15 years, and the curriculum core has evolved to offer a variety of focuses to accommodate the diverse interests of students. The programs are described in the *Graduate Programs in the Health Sciences Bulletin.*

The School of Nursing assumes responsibility for the improvement of nursing care through its programs in nursing education, research, and service. Statements of philosophies of nursing and missions of the school guide the faculty in the development of programs and activities. These statements are printed elsewhere and are available upon request. The responsibilities related to research and service are fulfilled through activities such as continuing education programs for a variety of groups within the field of nursing, consultation services for individuals and agencies, and ongoing research in nursing. In 1958, the University of Minnesota School of Nursing Foundation was established. Its purpose is to improve patient care through appropriate assistance to the school in carrying forward programs of nursing education, research, and community service. This evidence of public interest and support indicates concern for the quality of preparation of professional practitioners for the vital service of nursing.

Philosophy of Nursing Education

Nursing education at the University of Minnesota is directed toward maturation of the student as a fully sensitive human being with an investigative orientation, and achievement of competencies as a developing professional.

Nursing education is a process involving a relationship between student and teacher that fosters independence on the part of the learner. This process occurs in a milieu that encourages intellectual curiosity and mutual respect. It involves a progression of contemporary, challenging, and flexible learning experiences that make use of a wide variety of academic, professional, and community resources.

The student is an active participant with teachers, peers, and others involved in the learning process. The student is involved in establishing a personal identity as a nurse and human being. The student learns to exercise rights and responsibilities through challenging and questioning the educational process, and to be self-directive through utilizing resources, seeking educational experiences, and developing an ability for self-evaluation. The teacher guides the student throughout this process.

Governance

The faculty of the School of Nursing is responsible for making decisions about goals and priorities as well as for planning programs to carry out the education, research, and service missions of the school and the University. Committees of the faculty are concerned with curriculum; admission and progression of students; faculty development, promotion, and tenure; and long-range planning. The Consultative Committee, elected by the faculty, advises the dean on matters relating to the budget, school activities, and directions. Students and civil service staff members are represented on committees, and consultants are brought in when appropriate. The committees recommend major policies to the General Assembly of the School of Nursing, which acts as the governing body of the school.

Program Leading to the Degree of Bachelor of Science in Nursing

The undergraduate curriculum in its present form was introduced in 1973. The program is approved by the Minnesota Board of Nursing and is accredited by the National League for Nursing. Students complete one year of prenursing college work and then enroll in the School of Nursing for three additional years of professional study. Upon satisfactory completion of all requirements, they are awarded the bachelor of science in nursing degree and are then eligible to take the registered nurse licensure examination. The nurse who completes the baccalaureate program is a generalist, prepared for professional nursing practice in entry-level positions in hospitals, clinics, community health organizations, and other agencies in the health care delivery system. The baccalaureate degree in nursing is the recommended academic preparation for those interested in graduate study in nursing.

School of Nursing faculty members who teach courses in the baccalaureate program represent a wide spectrum of clinical experience and areas of professional knowledge and interest. Students in nursing also take courses in basic sciences taught by faculty members in other science areas. Students also select elective (nonrequired) courses from among the many liberal arts courses offered by the large and distinguished faculty of the University.

Objectives of the Baccalaureate Program

The purpose of the baccalaureate program is to provide opportunities for the student to learn the skills of professional nursing and achieve the following objectives:

—an ability to apply synthesized principles and theoretical concepts from the natural and behavioral sciences to nursing;

—an ability to utilize an adaptation frame of reference as a basis for interpreting and influencing human behavior in health care situations;

—an ability to think critically and analytically in the formulation of nursing judgments;

—an ability to effectively implement the various dimensions of the systematic process—assessment, planning, intervention, and evaluation—in providing nursing care to individuals and groups;

—an ability to establish, maintain, and terminate collaborative and/or helping interpersonal relationships with a variety of individuals and groups to accomplish the goals of nursing;
—competence in utilizing selected technical and other tools to accomplish the goals of nursing;
—an ability to carry out clinical study to answer questions arising from nursing practice and to determine implications for nursing practice and further study;
—an ability and commitment to influence health care through utilization of principles of change, leadership, and teaching;
—a commitment to development of her or his potential as an individual and as a responsible member of society;

The conceptual framework of the program is based, in part, on the assumption that nursing has something in common with all helping professions and, at the same time, something that is uniquely its own. The areas of knowledge identified as common to all helping professions include knowledge about human beings, interpersonal relationships, tools, and process.

The goal of nursing as defined by the faculty is based on the assumption that the human being is an integrated whole and on the belief that the nurse must have a holistic perspective in viewing the human being. Adaptation theories provide this holistic perspective. Process is seen as a systematic, conscious way of achieving a goal. The establishment of a helping relationship is seen as a way of using oneself to assist others. Tools are viewed as instruments utilized to perform nursing assessments, interventions, and evaluations, and are exclusive of those skills that are primarily relationship oriented or cognitive.

These areas of knowledge are synthesized in a unique way so that the resultant product is identified as the practice of nursing, as differentiated from other helping professions.

Using adaptation theory, a systematic process, selected tools, and knowledge of helping relationship processes, the student learns to assess the health status of the patient/client, to establish a nursing diagnosis, and to formulate, implement, and evaluate a plan of nursing care based on the unique health requirements of the patient/client. The program is designed to help students develop the skills and the competence in their application that will enable them, upon completion of the program, to function effectively in entry-level positions in nursing.

Throughout the program, the student has the opportunity to pursue and develop individual interests and potentials through elective study in behavioral and natural sciences and nursing. Studies of progressive complexity are planned, and they provide a good foundation for graduate study.

The requirements of the program include general as well as professional education course work. It is the student's responsibility, in consultation with an adviser, to satisfy the liberal arts distribution requirements by choosing courses that will complement his or her interests and abilities. The total credit requirement maintains a balance between courses in general education and courses in the nursing major and in related areas.

Degree Requirements

Degrees from the University of Minnesota are granted by the Board of Regents on recommendation of the faculty. The degree of bachelor of science in nursing will be recommended for students who have satisfactorily completed all required courses, have fulfilled the group distribution and upper division elective requirements, and have completed a mimimum of 180 credits.

Undergraduate students must present 45 credits awarded by the University of Minnesota. Of the last 45 credits earned prior to graduation, 30 must be awarded by this University. All acceptable credits awarded by this University, including those earned through Continuing Education and Extension and special examination, will count toward the total credit requirement for the degree.

Credits for Equivalent Courses—Credits for courses in excess of the 45-credit minimum required for admission may be applied toward fulfillment of requirements for the baccalaureate degree. When such credits have been taken elsewhere, the Office of Admissions determines their transferability after applicants have been accepted for admission by the School of Nursing. In general, credits for liberal arts courses taken at other schools are accepted for transfer, but credits for nursing courses generally are not accepted for transfer and must be evaluated individually for suitability to this program.

Any courses accepted by the College of Liberal Arts to satisfy group distribution requirements are accepted by the School of Nursing for credit toward the baccalaureate degree in nursing. General College courses will be accepted only if taken before enrollment in CLA or the School of Nursing. Credits earned through extension classes (evening school) or independent study (correspondence) at this University, CLEP examinations, special departmental examinations, or challenge examinations will also be accepted.

The equivalency of a course taken elsewhere to a course required for the degree in nursing is determined by the instructor in the appropriate department. The student must secure a statement of equivalency, which is submitted to the Progression Committee for final decision.

To request approval to use courses not listed in the *CLA Bulletin* to satisfy group distribution or upper division requirements, a student must petition the Progression Committee. Exceptions to this policy are Phar 5210/HSU 5210, Terminology of Health Sciences; these courses may not be used to meet group distribution or upper division requirements, although they may be applied toward the total credit requirement.

If the student has completed the required 48 credits of liberal education group distribution course work, 20 credits of upper division liberal arts elective course work, and supportive and nursing course work and has not earned 180 credits, the remaining credits may be completed by taking any courses carrying degree credit.

Admission to the Baccalaureate Program

Admission Requirements

Before entering the School of Nursing, students must complete 45 quarter credits of acceptable liberal arts courses. Usually this requirement can be fulfilled during the first year of study at any accredited institution of higher education (including community or junior colleges). Those who attend the University of Minnesota for the freshman year usually enroll in the College of Liberal Arts as prenursing majors.

Prerequisites for admission include the following:

English Composition	6 quarter credits
General Chemistry	8 quarter credits
General Biology	4 quarter credits
Introduction to Sociology	3 quarter credits
Cultural Anthropology	3 quarter credits

The remaining required credits must be chosen from liberal arts elective courses. Particularly recommended are courses in groups A and D (see Liberal Education Distribution Plan in this section of the bulletin). Credits for courses in general psychology, growth and development, and abnormal psychology may be included in the required 45

credits if they fall in one of the grade point average computation categories. (see Selection for Admission below). Credits for certain courses required as part of the School of Nursing curriculum (anatomy, physiology, microbiology, medical biochemistry, pharmacology, pathophysiology, nutrition, group theory, and PubH 5006) and for courses that focus on studies in another professional or vocational major will not be computed in the grade point average used to determine admissibility.

All required prenursing courses must be completed by June 30 to enter the nursing program the following fall.

Selection for Admission

The baccalaureate program serves two populations. For admission purposes they are considered as separate groups:

1. Students in their first year of college and advanced students with more than the minimum 45 credits.
2. Registered nurses.

Selection is competitive because enrollment is limited. When the number of qualified applicants exceeds the number that can be admitted, preference is given to applicants according to their residency status, as follows:

1. Minnesota residents and residents of states with tuition reciprocity agreements.
2. Non-Minnesota residents enrolled at University of Minnesota campuses.
3. Others.

To be considered for admission an applicant must have a minimum grade point average of 2.50. The grade point average will be computed as follows:

1. For applicants in their first year of college: The GPA calculation will include all required prenursing and liberal arts elective credits presented. Admission will be granted pending completion of all requirements. Two-thirds of all credits must be completed on an A-N grading basis. A GPA of at least 2.50 must be maintained through spring quarter.
2. For applicants presenting 45 or more credits at the time of application who have completed all prenursing requirements: The GPA calculation will include all required courses and the most recently completed liberal arts elective credits to meet the total of 45 credits. Two-thirds of these credits must be completed on an A-N grading basis. The admission decision is final, since these applicants have completed all requirements for admission.
3. For applicants presenting 45 or more credits at the time of application who have *not* completed all prenursing requirements: The GPA calculation will include all required courses completed and the most recently completed liberal arts elective credits to meet the total of 45 credits. Admission is granted pending completion of all requirements. Two-thirds of these credits must be completed on an A-N grading basis. A GPA of at least 2.50 must be maintained through spring quarter.

   In determining the most recently completed 45 credits, if the number 45 is reached within a quarter or semester, the GPA for that quarter or semester will be assigned to the exact number of credits needed to reach 45.

Grades from only those General College courses that are accepted by CLA and taken before enrollment in CLA may be included in the calculation of the GPA. The following grade point system will be used to evaluate these courses: the A range will be assigned 4.00 grade points, the B range will be assigned 3.00 grade points, and C(7) will be assigned 2.00 grade points. No grade below a C(7) will be acceptable.

All applicants are required to take a scholastic aptitude test (ACT) and to submit a Personal Information Form. Applicants will be ranked according to a combined score of GPA and ACT plus points allotted to previous experiences and characteristics reported on the Personal Information Form. From this total score, applicants will be selected according to ranking.

Application Procedures

Application forms are available at the Office of Admissions, 240 Williamson Hall, 231 Pillsbury Drive S.E., University of Minnesota, Minneapolis, Minnesota 55455.

Applicants enrolled in other educational institutions must complete an Application for Admission With Advanced Standing form and return it to the above office, together with one transcript from each college previously attended and the required credentials examination fee.

Students currently enrolled in another unit of the University of Minnesota should complete a Request for Change of College at the University form and file it at the above office. The form should indicate that transfer to the School of Nursing is to be effective fall quarter.

The application deadline is March 1.

After initial processing of applications, applicants receive memoranda to acknowledge receipt of their applications by the School of Nursing, explain admission criteria and selection procedures, and solicit information on their progress in completing courses required for admission. Applicants who have any deficiencies in their background must notify the school to explain how they plan to remove them. All entrance requirements must be met by June 30.

Evaluation of applicants by the admissions committee begins about April 15, following receipt by the School of Nursing of winter quarter or fall semester grades from applicants. Each applicant is responsible for ensuring that all materials required for application are received by the School of Nursing.

Acceptance

The School of Nursing will notify applicants of the admission decision as soon as all records are processed. A decision of acceptance is provisional, pending satisfactory completion of all entrance requirements.

Registration materials for fall quarter will be sent to newly admitted students during the summer by the Office of Admissions. Students must register during the scheduled orientation-registration period, or they must secure permission in writing before that date to register later.

Placement in the Program

Tracking—In order to provide the most appropriate sequence of progression, students are assigned to predetermined tracks at the time of entry. The track assignment for non-RN students is based on the number of credits earned and which of the psychology requirements are completed prior to admission. For RN students the track assignment is based on the number of credits presented, the individual's preference for a more accelerated or regularly paced program, successful completion of challenge examinations in specified nursing and supportive courses, and consideration of special needs of these students.

Special Placement and Advanced Standing

Each person accepted for admission to the School of Nursing baccalaureate program is classified initially as a sophomore.

There are six ways for incoming students to reduce the number of credits they must complete while enrolled in the school. These may or may not reduce the total length of time needed to complete the degree, but they will lighten the credit load during some quarters of registration.

1. **Elective Credits in Excess of Those Needed for Admission**—Credits earned in liberal arts courses in excess of the total needed for admission can be applied toward fulfillment of the group distribution and upper division elective requirements for the nursing degree. After the student has been accepted for admission by the School of Nursing, the student's transcript is evaluated by the Office of Admissions in Williamson Hall to determine which courses may transfer for credit; the student receives a copy of that evaluation.

2. **Credit by Examination**—Students can earn credit by examination for many of the prerequisite freshman year courses, for several elective courses, and for some of the required courses in the baccalaureate program through examinations offered by the appropriate departments. These examinations may make it possible for students to gain college credit for past noncollegiate study or experiences. Examinations for the following basic science courses are usually offered during the summer:

   Anat 1004—Elementary Anatomy (4 cr)
   FScN 3602—Nutrition in Professional Health Care (4 cr)
   LaMP 5170-5171—Pathophysiology: Disease I-II (6 cr)
   Phsl 3051—Human Physiology (5 cr)

3. **CLEP Examinations**—The College Level Examination Program (CLEP) sponsored by the College Entrance Examination Board is a national program that offers the opportunity to obtain recognition for college level achievement no matter when, where, or how material was learned. CLEP offers general examinations in five liberal arts areas and subject examinations in chemistry, biology, psychology, sociology, and human growth and development. Credits earned through the general examinations may be used to meet group distribution requirements. Credits earned through the subject examinations may be used to gain exemption from taking specified required courses. One need not be a student at the University to take these examinations.

4. **Courses Normally Required of Nursing Students in Their Sophomore Year That Have Been Completed Prior to Admission to the School**—When the student has already satisfactorily completed a required course at the University of Minnesota prior to admission to the School of Nursing, credits for the course will count towards the school's degree requirement. If a similar course was taken at the University or at another school, applicability of credits toward the degree requirement is determined after admission to the School of Nursing.

5. **Nursing Challenge Exams**—Challenge exams provide a means for students admitted to the School of Nursing to demonstrate that they already have learned the material covered in a specific course and to gain credit for that course without enrolling in it. Many students pass challenge exams based on knowledge gained through work experience, reading or self-study, or noncredit course work. While the exams are available to anyone, they are most suitable for students who are already RNs or who have taken some courses in nursing elsewhere. Students without prior experience or education in nursing are advised to consider carefully the value of enrolling in the nursing courses rather than seeking exemption from them, since the

beginning courses provide the foundation upon which the more advanced courses are built.

Although challenge exams may be scheduled throughout the year, exams for the following nursing courses are usually offered during the summer so that students admitted for enrollment in the fall may better plan their programs:

Nurs 5201—Role of Nursing Within Health Care (2 cr)
Nurs 5202—Systematic Process I (2 cr)
Nurs 5203—Adaptation I (2 cr)
Nurs 5204—Helping Relationships I (2 cr)
Nurs 5205—Tools I (1 cr)
Nurs 5206—Tools I (1 cr)
Nurs 5404—Tools II (2 cr)
Nurs 5405—Tools II (1 cr)

All of these exams are at least the equivalent of a final exam in a course. Challenge exams may become available for additional courses. Current information will be available from advisers.

6. **Junior Year Status**—Those who have completed at least 84 quarter credits at an accredited college or university *may* qualify for placement in the junior year of the program if they have completed both the prerequisite courses for admission to the School of Nursing and the required courses for the sophomore year. After being accepted for admission to the school, such students should inquire about how they can acquire junior year status. This option for advanced placement is available only when faculty and clinical resources are adequate to accommodate additional students in the junior-level courses.

Optional Registrations

Adult Special Status—Selected individuals may be admitted to the School of Nursing as adult special students, a category reserved for those who have particular professional needs that cannot be met through one of the regular program offerings. Generally, adult special students are not permitted to complete major course sequences.

Applicants should consult the School of Nursing about special needs prior to submitting their applications. Applicants will be considered individually on the basis of their academic records and work experience.

Summer Session—The School of Nursing usually offers some required nursing courses during both terms of the summer session. The school may also offer courses of special interest to practicing nurses that are not usually available during the academic year. A special summer bulletin describing these courses is available upon request to the Summer Session Office, 135 Johnston Hall, 101 Pleasant Street S.E., University of Minnesota, Minneapolis, Minnesota 55455. Course offerings during the summer terms are contingent upon availability of resources, scheduling requirements, and sufficient student interest.

Many courses required by the school that are offered by other departments within the University and courses that meet liberal arts elective requirements are offered during the summer. Since summer offerings change from year to year, the appropriate departments should be consulted regarding the availability of particular courses.

Students in the School of Nursing are encouraged to seek the counsel of an adviser if they plan to take summer study as a means of meeting degree requirements for any of the school's programs.

Preparation for entry-level positions in public health nursing may be offered during the summer when sufficient resources are available within the School of Nursing and when student demand warrants. (See Nurs 5635-5636 in this bulletin and PubH 5006 in the *School of Pubic Health Bulletin*.) For further information, write to the School of Nursing.

Continuing Education and Extension—Sophomore-level nursing courses and selected nursing elective courses are offered periodically through Continuing Education and Extension. For information about these courses, see the *Extension Classes Bulletin* and the *Extension Independent Study Bulletin.*

International Students

Applicants who are neither citizens of the United States nor permanent resident aliens should secure an application form from the Office of Admissions (see Application Procedures above) and return the completed form to that office, together with required credentials, transcripts of college course work completed, and the required credentials examination fee.

International students must complete the same prerequisite courses and credits as other students. They are reminded that selection criteria give priority to Minnesota residents and to students transferring to the School of Nursing from another unit of the University of Minnesota.

Selection of international students is based on (a) evidence of superior previous academic achievement; (b) the ability to read, write, speak, and understand English; (c) a certificate of good health; and (d) possession of a student or other appropriate visa.

Students from other countries may find it necessary to spend more than the minimum time in residence in order to complete degree requirements.

Expenses

For tuition and fees, students should consult the current *General Information Bulletin.*

With an ever-increasing number of clinical assignments at off-campus locations, students should include transportation costs in their educational planning.

Uniforms, laboratory coat, name pins, a watch with a second hand, and a stethoscope are essential items and must be considered in educational costs. Purchase of additional equipment/instruments may be recommended as clinical experiences and placements warrant. Although there is considerable variation in the price of these items, they are likely to cost $75 or more.

Financial Aid

Loans and Scholarships

Federal Loan and Scholarship Program—When federal funds are available, undergraduate or graduate students enrolled halftime or more in the School of Nursing are eligible for a maximum of $2,500 in federal loan money and $2,000 in federal scholarship money per school year. It is likely that only a minimal amount of the scholarship money will be available in 1981-83. Students are expected to begin repaying the loan, at an interest rate of three percent, beginning nine months after they leave the School of Nursing. Cancellation of as much as 85 percent of a loan may be granted for practicing nursing full time in a public or nonprofit private agency, institution, or organization for five years or, in some special cases, for three years.

Current information and applications are available at the Office of Student Financial Aid.

State Scholarships for Nursing Students—Through Minnesota law, scholarship funds are available for state residents enrolled in nursing programs. Students accepting scholarships must agree to practice in the field of nursing in Minnesota for at least one year

immediately after graduation. Students may apply for scholarship funds at any time during their nursing programs. The scholarship program is administered by the Minnesota Higher Education Coordinating Board. Information about scholarships and application procedures is assembled in the Application Packet for Minnesota State Scholarship and Grant-In-Aid Program, which is available from the University Office of Student Financial Aid, from most college financial aid offices, and from many high school counseling offices. The application deadline for priority consideration is March 1.

University Scholarship Funds—University scholarship funds for School of Nursing students are administered by the Office of Student Financial Aid. For scholarships to be awarded for the following year, students may apply after completing one quarter in the School of Nursing. Applications should be submitted before March 1. To be eligible, students must show financial need and have a minimum cumulative grade point average of 3.00. Information concerning application for these scholarships appears in the Official Daily Bulletin column of the *Minnesota Daily* during winter quarter.

The School of Nursing extends appreciation to all who donate funds for scholarships and wishes to acknowledge the assistance of many individuals and groups for their contributions to the support of ongoing scholarship awards, especially the School of Nursing Foundation, which aids in the collection and handling of many of the following funds:

Ruth Thomas Brinker Scholarship in Nursing
Margaret Caldwell Memorial Scholarship
Grace B. Dayton Scholarship Fund
Katharine J. Densford Scholarship
Suzanne J. Doehring Memorial Scholarship in Nursing
Anna and Ottilie Eisenmenger Scholarship
School of Nursing Scholarship
Alice and Gale Perry Scholarship Fund
Jennie Siebold Memorial Scholarship Fund
Margaret Wahlquist Memorial Scholarship—Women's Auxiliary of the Minnesota State Medical Association

Applications for these awards are available at the Office of Student Financial Aid.

Nurses Educational Funds—A limited number of scholarships, fellowships, and loans are available to registered nurses enrolled in baccalaureate and master's degree programs. Applicants must be members of the American Nurses' Association and must have had at least one year of successful nursing experience. For application information write to Nurses Educational Funds, Inc., 2420 Pershing Road, Kansas City, Missouri 64108.

Sarah T. Colvin Loan Fund—This fund is administered by the Minnesota Nurses' Association to aid members of the association who are enrolled in bachelor's or master's degree programs or specialized short courses. For application information write to the Minnesota Nurses' Association, 1821 University Avenue, St. Paul, Minnesota 55104.

Other Sources of Financial Aid

In many communities, some financial aid is available to students through churches, clubs, medical and medical auxiliary groups, the American Legion, and service groups such as the Rotary, Kiwanis, and Zonta. Many district and state nursing associations have established scholarship and loan funds for registered nurses interested in further education. Students should explore these resources.

The ROTC program on campus provides another source of financial aid. For information about its benefits and obligations, consult the ROTC office in the Armory Building.

As additional sources of financial aid become available, information will be published in the student newsletter, *Progress Notes*, of the School of Nursing.

Facilities

To provide opportunities for all students to acquire essential skills, the School of Nursing contracts with a variety of agencies, including the University of Minnesota Hospitals and Hennepin County Medical Center, for use of their facilities for planned clinical experiences. Faculty members of the school are responsible for planning and supervising the clinical experiences. The types of facilities used include acute care hospitals, public health agencies, residence facilities, long-term care homes, clinics, child care centers, and schools. While most of the agencies are located in areas serviced by the metropolitan transit system, students should be prepared to arrange transportation if assigned to a more distant site.

Student Welfare and Services

Orientation

The School of Nursing offers orientation activities for new undergraduate and graduate students. Several one-day programs are scheduled during late summer, and every new student is expected to attend one of them. For information about all-University orientation activities, see the *General Information Bulletin*.

Health

After acceptance for admission and before enrollment, new students must provide evidence that they have completed the following health requirements:

1. A physical examination including a tuberculin test or chest X-ray to provide a basic health assessment. Examinations may be performed by the Boynton Health Service at the student's expense, or by the student's private physician with review by Boynton Health Service personnel.
2. Immunizations to include:
   a. Diptheria-tetanus booster every 10 years.
   b. Oral poliomyelitis—basic series if not taken previously.
   c. Measles and mumps vaccine if need indicated by student's history.
   d. Rubella titre with immunization if indicated.

An annual tuberculin test and/or chest X-ray is required. Those with positive reactions will be evaluated for treatment.

During the course of enrollment, the faculty believes that students should assume responsibility for their own health surveillance. Additional documentation of health status is required only when a clinical agency requires it or when a problem situation arises.

Although not required, a physical examination prior to graduation is highly recommended.

Grievances

The Grievance Committee of the School of Nursing handles grievances within the school according to policies and procedures adopted by the faculty. The school's policies and procedures conform to those adopted by the University Senate. Faculty members, staff members, and students are elected to the Grievance Committee by the groups they represent. A grievance officer, appointed by the dean, is also available for consultation.

Organizations

Nursing College Board

The Nursing College Board (NCB) is the official student organization within the School of Nursing. All students majoring in nursing are members of the organization. The purposes of the board are to promote unity among nursing students and to increase communication between nursing students and the faculty and administration of the School of Nursing and between nursing students and other members of the University community. Activities of the board include student representation on school committees, planning of recognition and graduation ceremonies, publication of the student newsletter, *Progress Notes*, and planning and involvement in orientation and registration for new students. The Nursing College Board is a part of the Twin Cities Student Association.

Alpha Tau Delta

This professional nursing fraternity was founded in 1921 on the campus of the University of California at Berkeley. The Beta Chapter at the University of Minnesota was chartered in 1927. Alpha Tau Delta is dedicated to developing leadership, maintaining high professional educational standards, providing service to the community, and encouraging mutual helpfulness and understanding among students in the profession. Membership is open to all students in the School of Nursing.

Sigma Theta Tau

The national honor society of nursing, Sigma Theta Tau, has a chapter at the University of Minnesota. Installed in 1934, Zeta Chapter is one of the oldest chapters in the country. The purposes of the society are to recognize superior achievement and leadership qualities, foster high professional standards, encourage creative work, and strengthen commitment to the ideals and purposes of the profession. Zeta Chapter sponsors an annual research seminar, provides grants for research, and presents a variety of programs of interest to its members. New members are selected by current members from among the undergraduate and graduate nursing students at the University of Minnesota and professional nurses in the community who meet eligibility criteria.

School of Nursing Alumni Association

All graduates of the School of Nursing are encouraged to become members of the School of Nursing Alumni Society, a division of the Minnesota Alumni Association. The purposes of the society are:

—to stimulate the continued interest of graduates and other nurses in the community in the University of Minnesota School of Nursing;

—to support and assist fund raising efforts for the School of Nursing;

—to promote the continued emphasis on high standards in the education, research, and service functions of the school;

—to promote the professional interests of nurses and to cooperate with other professional nursing organizations in promoting a high standard of professional practice through such means as newsletters, educational functions, and social functions; and

—to provide an opportunity for communication between alumni, faculty members, and students of the School of Nursing about educational trends and developments in nursing.

Letters of Reference

Students who anticipate the need for letters of reference for future applications for employment, graduate study, or similar uses should secure such letters from the instructors who know them best. Each letter must bear the student's signature authorizing the school to send it when references are requested. These letters will be kept in the student's file for future use. In the absence of such letters, the school will respond to a reference request with a general statement that a student has completed a program preparing for the practice of professional nursing.

II. NURSING CURRICULA, POLICIES, AND REQUIREMENTS

Course of Study for the Baccalaureate Program

The baccalaureate program is organized into three distinct levels of study, progressively offering increasing levels of complexity and responsibility. In nursing level I, students acquire knowledge and skills for dealing with normal life events and interactions. In level II, the focus is on disruptive life events, barriers to interactions, and health problems. Level III provides experiences with more complex patient/client situations and leadership/management concepts as they relate to health care personnel. Nursing electives provide students with the opportunity to gain additional depth and breadth in an area of interest. At least one nursing elective must have a clinical component.

In nursing courses students encounter a variety of learning situations, including lecture/seminar, class and clinical laboratories, and independent assignments. The program includes planned experiences in hospitals, clinics, homes, and other health care settings, where students apply their knowledge and skills in caring for patients/clients with a wide variety of health problems. These life situations let the student not only develop skills but realize the effect of their nursing care.

The diagram on page 50 shows the relationship between nursing courses, supportive requirements, and liberal arts.

Curricular Requirements

Freshman Year—Qualified students are admitted to the baccalaureate program after completing the first-year prenursing requirements. The minimum quarter-credit requirement for the freshman year is 45. For information about admission requirements and a list of the courses required, see the Admission Requirements section.

Sophomore, Junior, and Senior Years—Levels I, II, and III approximate the sophomore, junior, and senior years. The required courses, with the minimum credits in parentheses, are as follows:

General Psychology (4)
Human Growth and Development (3)
Abnormal Psychology (4)
Elementary Anatomy (4)
Microbiology (4)
Human Physiology (4)
MdBc 3050—Physiological Chemistry (4)
Phcl 1009—Pharmacology (3)
FScN 3602—Nutrition in Professional Health Care (4)

LaMP 5170-5171—Pathophysiology: Disease I-II (6)

PubH 5006—Introduction to Community Health (5)

Nurs 5201—Role of Nursing Within Health Care (2)

Nurs 5202—Systematic Process I (2)

Nurs 5203—Adaptation I (2)

Nurs 5204—Helping Relationships I (2)

Nurs 5205-5206—Tools I (2)

Nurs 5207—Synthesis (2)

Nurs 5208—Small Group Analysis (3)

Nurs 5209—Application Tools I (1)

Nurs 5404-5405—Tools II (3)

Nurs 5407—Systematic Process II (2)

Nurs 5408—Adaptation II (2)

Nurs 5409—Helping Relationships II (2)

Nurs 5611—Synthesis Incorporating Concepts of Chronicity (4)

Nurs 5612—Synthesis Incorporating Concepts of Stress and Crisis (4)

Nurs 5613—Synthesis Incorporating Concepts of Loss (4)

Nurs 5614—Synthesis Incorporating Concepts of Health (3)

Nurs 5615—Synthesis in Complex Nursing Situations (5)

Nurs 5816—Leadership, Management (6)

Nurs 57xx—Electives in Nursing (10)

Nurs 5999—Clinical Study (1)

Liberal Education Distribution Requirements

To carry out the University's commitment to a liberal education for all students, the School of Nursing expects every undergraduate to complete course work in areas of study outside of nursing. All undergraduate students must complete the following requirements:

1. English Composition—6 credits minimum[1]
2. 48 elective CLA credits distributed as indicated among the following four groups:

   Group A. Communication, Language, Symbolic Systems—8 to 10 credits (normally two courses)

   Group B. Physical and Biological Sciences—12 to 15 credits (normally three courses)

   Group C. The Individual and Society—16 to 20 credits (normally four courses)

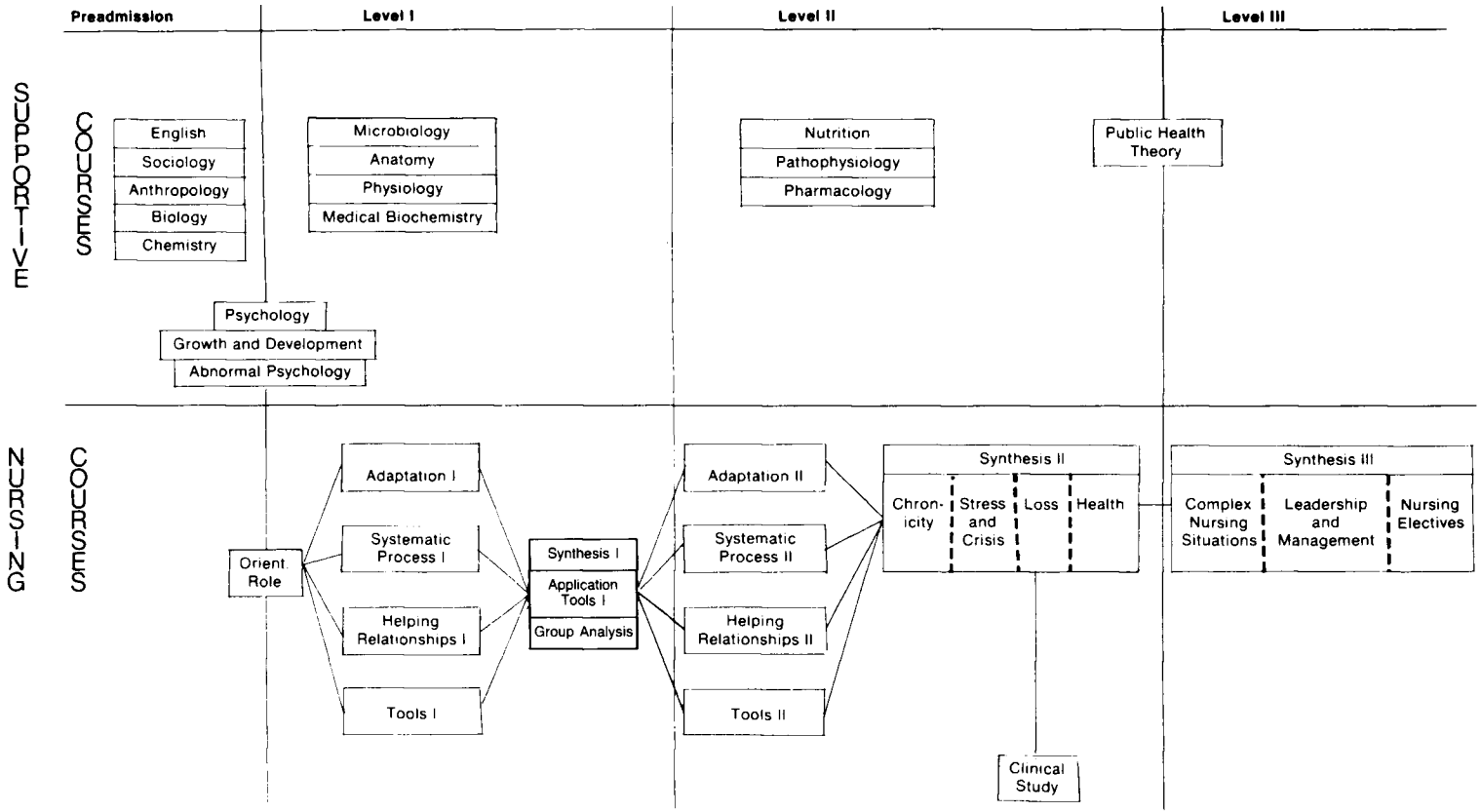
   Group D. Literary and Artistic Expression—12 to 15 credits (normally three courses)
3. 20 elective liberal arts credits in upper division courses (3000 or 5000 level)

A 3000- or 5000-level course may be used to fulfill both the distribution requirements for a specific group and the upper division elective credit requirement. Exceptions to this rule are those CLA courses required by the School of Nursing for the baccalaureate degree. Those required courses may be used to fulfill the appropriate group distribution credit requirement but not the upper division elective credit requirement.

Any course accepted by the College of Liberal Arts to meet the group distribution or upper division elective credit requirement is accepted by the School of Nursing. Other courses may be used to meet group distribution or upper division requirements only with the approval of the Progression Committee.

[1]The University's freshman composition requirement is exepcted to change effective fall quarter 1982. Consult an adviser for information.

Curriculum Plan



Progression in the Baccalaureate Program

Registration

All students entering the School of Nursing for the first time are requested to attend the orientation-registration program scheduled in August. The program includes an overview of the curriculum, tours of facilities, and assistance from advisers with program planning for the fall quarter.

Each quarter the schedule of registration dates for students in the School of Nursing is published in the Official Daily Bulletin column of the *Minnesota Daily*. Registration instructions appear in the quarterly *Class Schedule*. Additional information is distributed to students via the student newsletter of the School of Nursing.

Registration dates are assigned on a schedule that rotates alphabetically by last name, giving first choice for classes to a different group of students each quarter.

Students enrolled in the school are responsible for making an appointment with an adviser to complete registration during the scheduled registration period.

Change of Registration—The Cancel/Add form is used to add or drop courses and to change grading systems. Courses may be added through the first week of a quarter. Changes of registration for non-nursing courses—including cancellations, additions, and changes in grading system—must be approved by an adviser. To drop a non-nursing course after the second week, the instructor's permission is required before the adviser's approval. No change in grading system is allowed after the second week of a course.

To cancel, add, or change a section in a professional nursing course, a student must have both the instructor and adviser sign the Cancel/Add form. If a student cancels one nursing course and adds another, the instructors of both courses must sign the form. The change must be made before the end of the first week of the course.

Cancel/Add forms are available at the School of Nursing Records Office. After the necessary signatures have been secured, students should return the form to this office.

Advising

Academic advising is carried out by a core group of advisers who assist students in planning their academic program. The names and office hours of these advisers are available in the School of Nursing Records Office, 5-160 Health Sciences Unit F. Advisers help students with academic concerns as well as with decisions concerning nursing careers and graduate study. They also assist students in orientation to the school and in determining how to apply their credits to meet the requirements for graduation from the school.

Educational, psychological, and career counseling by trained specialists is available through campus and community resources. Students who have problems in these areas may be referred to specific resources.

Academic Regulations and Requirements

Grading

Nursing students may choose between two grading systems: A-B-C-D-No Credit (A-N) or Satisfactory-No Credit (S-N). These two systems are described in the general introduction to this bulletin. Students may elect to take up to 40 percent of their nursing course credits and up to 50 percent of their total credits on an S-N basis. All nursing courses are offered on both the A-N and S-N grading systems.

C is the lowest acceptable grade in nursing courses, designated *Nurs* in this bulletin and class schedules. An S indicates a grade of C or higher. No D grade is given in professional nursing courses. Any student who does not earn a C in a nursing course will receive an N (No Credit).

A student who receives an N in a course may proceed in nursing, but the course in which the N was received must be satisfactorily completed before courses for which it is prerequisite may be taken. A student who receives an N in a nursing course may retake the course only once. If the student again receives an N (and if the course is required), the student must withdraw from the school.

A student who receives an incomplete (I) must arrange with the instructor to make up the unfinished course work. The instructor may require a written contract with the student specifying work remaining to be completed and a required completion date. The deadline for completion of makeup work is the end of the student's next quarter of enrollment. An incomplete in a prerequisite course must be completed by the end of the third week of the quarter of registration in the course for which it is prerequisite.

Attendance

School of Nursing instructors determine and inform students of their own policies and procedures regarding absence from class, laboratory, and examinations. They also determine whether or not a student may make up work missed because of absence. Instructors are required to provide makeup opportunities only in cases where absence is due to the following circumstances: (a) participation in formally approved and scheduled University activities; (b) performance of military or civil duty (such as jury duty) that cannot be deferred; (c) illness or family emergency for which acceptable evidence is available. Instructors are not required to permit makeup of laboratory experiences or examinations to suit a student's personal convenience.

Satisfactory Progress

Students are expected to complete 50 percent or more of the credits for which they register each quarter and 75 percent or more of the credits for which they register each year with grades of A, B, C, or S. These percentages apply to credits for which students are registered beyond the tenth day of classes each quarter. A student must maintain a minimum grade point average of 2.00 in (a) all courses completed, (b) all courses in nursing, and (c) each quarter of study.

All courses prerequisite to nursing courses must be successfully completed before the student can proceed in the program. Students may not take nursing courses out of sequence.

It is the responsibility of students to be aware of their academic standing and to see their instructor or adviser immediately if problems arise.

When an undergraduate student's grade point average (overall, in nursing courses, or in a given quarter) falls below 2.00, or when the student receives an N grade in a required course, the individual's case is referred to the Progression Committee for appropriate action.

Probation—Students who fail to complete the required percentages of courses or whose grades fall below the acceptable level are subject to probation—the signal that academic progress is not satisfactory. Students on probation who do not improve their academic record the following quarter may be required to adjust their program plans, withdraw from the school, or take other appropriate action.

Students are taken off probation when academic work has improved enough to indicate potential for continuous progress toward the degree. Notation of probationary status is removed from the official transcript when a student is taken off probation.

Credit Loads

Classification of Students—Students who have completed all prenursing requirements on entering the School of Nursing are classified as sophomores. Students who have completed all first-level nursing courses are classified as juniors. Students who have completed second-level synthesis courses are classified as seniors.

Ratio of Credits to Work—The amount of work expected for a course is expressed in credits. Each credit demands an average of three hours per week of a student's time; e.g., one class hour with two hours of preparation, or three hours of laboratory work.

Credit Limitations—The usual number of credits taken per quarter is 16. If a student wishes to register for more than 19 credits in a given quarter, she or he must consult an adviser and must file a petition with the Progression Committee in sufficient time to be acted upon prior to registration for that quarter.

Access to Student Educational Records—Students may inspect their nursing program records in the School of Nursing Records Office, 5-160 Health Sciences Unit F. While students are reviewing their records, a faculty or staff member will be present.

Petitions

The faculty has established certain regulations to assist students in acquiring a sound professional education in nursing and to facilitate the operations of the school. These rules are believed to be in the best interests of the majority of students, but occasionally they may not suit the educational needs of a particular individual. In this event, students may ask for exemption from a regulation through petition to the Progression Committee.

Petitions concerned with exceptions to course and school regulations should be submitted in the quarter preceding the quarter for which the action is needed. Petitions concerning a course to be taken should be submitted before registering for the course. Petitions from seniors regarding a graduation requirement must be submitted at least four months before graduation. Dates for submitting petitions in order to meet these requirements are published quarterly in the student newsletter, *Progress Notes*.

Regular petition blanks are available in the School of Nursing Records Office. A petition should be reviewed and signed by an adviser and submitted to the Progression Committee. If the student desires, an opportunity to discuss the request with a committee representative will be made available. When the committee has taken action, the student and the adviser will be informed of the decision.

Withdrawal or Leave of Absence

To withdraw from a single course, a student follows the change of registration procedure already described.

Students who want to drop all of their courses after having registered should:

1. Complete a Cancel/Add form.
2. Have an adviser sign the form.
3. File at the School of Nursing Records Office a written statement of the reasons for the withdrawal and plans, if any, for continuing their education.
4. Petition for a leave of absence if they plan to return the following quarter.

Students who officially cancel after the second week of a quarter receive withdrawal (W) grades for all courses identified on the Cancel/Add form. Students who do not register for the following quarter will be considered to have withdrawn from the School of Nursing.

Students in good standing who voluntarily withdraw may later apply for reentry to the School of Nursing. The decision on granting permission to reenter will depend upon several factors (see Reentry below).

Students may be required to withdraw from the School of Nursing under one of the following circumstances:

1. *Academic*—Students who fail to make satisfactory progress may not continue in the program. Students who receive a second N when repeating a nursing course in which the previous grade was N will be required to withdraw from the school.
2. *Nonacademic*—The nature of a nurse's responsibilities to patients and others requires certain personal and behavioral characteristics suitable to the discharge of these responsibilities. Students who do not display these characteristics may be required to withdraw from the School of Nursing. If progress is handicapped by conditions other than scholastic ability (such as ill health, personal or family circumstances), the student may be required to withdraw.

Reentry

Students who have withdrawn from the nursing program, for whatever reason, and later wish to reenter must seek prior authorization from the school. A letter requesting permission to reenter the baccalaureate program must be submitted to the chairperson of the Progression Committee *at least three months* in advance of the quarter for which registration is desired. Each applicant must provide information necessary to support the request.

Committee action is required on reentry petitions from individuals who previously withdrew in good standing, were required to withdraw, or voluntarily withdrew because of limited academic progress. The decision on reentry will take into account current availability of needed learning opportunities and of the school's resources for serving additional students. Placement upon reentry will be determined by the assistant dean for undergraduate studies.

In view of possible changes in the curriculum, students must understand that they may be asked to update their knowledge in some areas to meet new requirements, and this may result in additional course work.

Graduation and Recognition

Students may complete degree requirements in any term of the academic year or summer session. Prospective graduates must submit a report of progress toward completion of degree requirements at the School of Nursing Records Office and file an Application for Degree in the Registration Center, 202 Fraser Hall (150 Williamson Hall for students with mobility impairments), at least two quarters prior to the expected graduation date. The graduation and diploma fee should be paid one quarter prior to graduation, or by the date indicated on the graduation fee statement.

School of Nursing commencement programs are scheduled at the end of fall, winter, and spring quarters.

Graduation with honors is conferred upon eligible students on recommendation of the faculty.

Two Baccalaureate Degrees

Students may earn the B.S.N. and a bachelor's degree from another University unit concurrently. To do so, they must meet all requirements for both degrees, which may involve additional time for study. Students wishing to complete two baccalaureate degrees should consult with an adviser in the other unit as well as in the School of Nursing.

Program Leading to the Master of Science Degree

The master of science degree with a major in nursing is offered through the Graduate School under two programs: Plan A, which requires a thesis; and Plan B, which requires additional course work and a special project. See the *Graduate Programs in the Health Sciences Bulletin* for a complete description of the program, and the *Graduate School Bulletin* for requirements of the Graduate School.

Minor in Nursing for Doctoral Students

Nurses who are doctoral students majoring in another discipline may choose nursing either as a minor or as a part of a supporting field. Further information may be obtained from the Director of Graduate Studies, School of Nursing, 5-140 Health Sciences Unit F, 308 Harvard Street S.E., University of Minnesota, Minneapolis, Minnesota 55455.

Continuing Education

Continuing education course work in nursing is designed to foster intellectual curiosity and growth. A progression of contemporary, challenging, and flexible learning experiences that make use of a wide variety of academic, professional, and community resources is offered. The courses are presented throughout the state to help maintain and improve the quality of professional practice statewide, carrying out a mission of the school and of the other University health sciences. The emphasis of these offerings is on the further development of professional practice.

Continuing education offerings of the School of Nursing presently include:

1. Degree credit courses offered through Continuing Education and Extension in evening school, off campus, or through independent study.
2. Seminars, workshops, and conferences offered through the Department of Continuing Nursing Education, for which continuing education units (CEUs) are granted.
3. Offerings through cooperative efforts with other University divisions or departments or with professional organizations, institutions, or groups.

For information about these offerings, contact the Director of Continuing Education, School of Nursing, 5-140 Health Sciences Unit F, 308 Harvard Street S.E., University of Minnesota, Minneapolis, Minnesota 55455.

Some courses that are prerequisites for admission to School of Nursing programs may be offered by Continuing Education and Extension through evening classes or correspondence study. Prospective students who plan to take such courses are urged to consult with the prenursing adviser in CLA or with a graduate adviser in the School of Nursing. See the *Continuing Education and Extension Bulletin* and the *Extension Independent Study Bulletin* for course offerings.

III. COURSES IN NURSING

The following courses are taught by members of the School of Nursing faculty or by cooperating faculty members from other educational units of the University. Meeting hours, days, and rooms for these courses are listed in the quarterly *Class Schedule* or are announced to students by the School of Nursing faculty. For the summer class schedule, see the *Summer Session Bulletin.* For an explanation of the symbols used in the course descriptions, see Using the Bulletin Course Descriptions in the General Introduction to this bulletin.

Descriptions of the required courses that are taught by other educational units of the University are found at the end of this bulletin and in the bulletins of those units.

Nursing (Nurs)

For Baccalaureate Students

5201. ROLE OF NURSING WITHIN HEALTH CARE. (2 cr; 5 wks)
Introduction to nursing within the context of health and health care delivery systems. Philosophies of nursing and their implications for nursing practice and nursing education.

5202. SYSTEMATIC PROCESS I. (2 cr; 5 wks; prereq 5201)
Introduction to the basic concepts essential to understanding the systematic process utilized in achieving the goal of nursing.

5203. ADAPTATION I. (2 cr; 10 wks; prereq 5201)
Introduction to basic concepts about human adaptation and views of humankind that can be utilized in achieving the goal of nursing. Factors influencing adaptation, adaptive responses, levels of adaptation, components of adaptation and their relationship to concepts of holism and health.

5204. HELPING RELATIONSHIPS I. (2 cr; 10 wks; prereq 5201, psychology, growth and development or ¶growth and development)
Introduces factors related to interpersonal relationships and is designed to increase students' competence in utilizing such relationships to help patient/clients. Includes study of the contractual agreement and its use in interpersonal relationships.

5205-5206. TOOLS I. (1 cr each; 10 wks each; prereq admission to nursing, 5201, microbiology, physiology or ¶physiology for 5205...5205, anatomy or ¶anatomy for 5206)
Focuses on selected principles from the biological, physiological, and behavioral sciences that contribute to the development of knowledge and skills related to tools of assessment and maintenance of health. Opportunity for students to begin to develop skill in utilizing selected tools.

5207. SYNTHESIS. (2 cr; 5 wks; prereq 5202, 5203, 5204, growth and development, and 5206 or ¶5206)
Clinical course that focuses on the synthesis of first-level systematic process, adaptation, helping relationships, and tools to provide nursing care for healthy patient/clients.

5208. SMALL GROUP ANALYSIS, NURSING PRACTICE. (3 cr)
Analysis and experiential application of basic concepts related to dynamics of task-oriented groups. Potential applications to nursing.

5209. CLINICAL APPLICATION OF NURSING TOOLS—LEVEL I. (1 cr; 5 wks; prereq 5202, 5203, 5204, 5205, 5206 or ¶5206)
Clinical application of first-level knowledge and skills related to tools. Incorporation of relevant concepts from previous courses to facilitate application of tools. Designed to develop students' confidence in the practice of basic nursing assessment and intervention skills and to acclimatize students to a hospital environment.

5404-5405. TOOLS II. (2/1 cr; 10 wks each; prereq 5206, LaMP 5170 or ¶LaMP 5170, anatomy, MdBc 3050, Phcl 1009 or ¶Phcl 1009 for 5404...5404, LaMP 5171 or ¶LaMP 5171 for 5405)
Designed to prepare students to correctly practice skills required to care for patient/clients with health problems. Builds on Tools I and incorporates principles from the biological, physiological, and physical sciences.

5407. SYSTEMATIC PROCESS II. (2 cr; 5 wks; prereq 5207)
Compares the problem-solving process utilized in Systematic Process I with the systematic process used in research. Opportunity to develop confidence in using problem solving and research as tools for working toward nursing care goals and conducting clinical studies.

5408. ADAPTATION II. (2 cr; 5 wks; prereq 5207, LaMP 5170 or ¶LaMP 5170)
The adaptive process of humankind in the context of disruptive life events. Incorporates concepts of stress, crisis, loss, chronicity, and health to identify generalizations about the human adaptive process. The influence of this knowledge and data on the selection of possible nursing interventions.

5409. HELPING RELATIONSHIPS II. (2 cr; 10 wks; prereq 5208 or ¶5208, 5207, abnormal psychology or ¶abnormal psychology)
Designed to increase students' competence in utilizing interpersonal skills in relating to individuals who have difficulty in communication or relationships.

5611. SYNTHESIS INCORPORATING CONCEPTS OF CHRONICITY. (4 cr; 10 wks; prereq 5407, 5408, 5409, 5404, 5405 or ¶5405, abnormal psychology, Phcl 1009, LaMP 5171 or ¶LaMP 5171)
Clinical course that focuses on the synthesis of systematic process, adaptation, helping relationships, and tools in nursing care of patient/clients experiencing conditions of long-term nature.

5612. SYNTHESIS INCORPORATING CONCEPTS OF STRESS AND CRISIS. (4 cr; 10 wks; prereq 5407, 5408, 5409, 5404, 5405 or ¶5405, abnormal psychology, Phcl 1009, LaMP 5171 or ¶LaMP 5171)
Clinical course that focuses on the synthesis of systematic process, adaptation, helping relationships, and tools in care of patient/clients experiencing stress or crisis. Examines dimensions of the stress experience exemplified in patient/clients experiencing various types of crises. Emphasizes priority setting and nursing interventions for acute situations.

5613. SYNTHESIS INCORPORATING CONCEPTS OF LOSS. (4 cr; 10 wks; prereq 5407, 5408, 5409, 5404, 5405 or ¶5405, abnormal psychology, Phcl 1009, LaMP 5171 or ¶LaMP 5171)
Clinical course that focuses on the synthesis of systematic process, adaptation, helping relationships, and tools in care of patient/clients experiencing loss. The experience of loss from the perspective of both the patient/client and the student and coping mechanisms employed to deal with loss.

5614. SYNTHESIS INCORPORATING CONCEPTS OF HEALTH. (3 cr; 10 wks; prereq 5404, 5405 or ¶5405, 5407, 5408, 5409, abnormal psychology, Phcl 1009, LaMP 5171 or ¶LaMP 5171)
Clinical course that focuses on the synthesis of systematic process, adaptation, helping relationships, and tools in the care of patient/clients who are not experiencing any major disruptive life event. Some constructs used in conceptualizing health and their relationship to individual and family development. Emphasis on goals and nursing interventions aimed at promotion of health and prevention of disease.

5615. SYNTHESIS IN COMPLEX NURSING SITUATIONS. (5 cr; 10 wks; prereq 5611, 5612, 5613, 5614, FScN 3602)
Clinical course designed to allow students to synthesize the knowledge and skills acquired in the four prerequisite synthesis courses into comprehensive and effective care of individuals and groups experiencing complex disruptive life events.

5620. INDEPENDENT STUDY IN NURSING TOPICS. (1-9 cr; prereq #)
Opportunity for students to develop and engage in learning experiences beyond those required in the program. A contract with a faculty adviser is required.

5635-5636. INSTRUCTION AND SUPERVISED EXPERIENCE IN COMMUNITY HEALTH NURSING. (3 cr each; prereq RN with BS degree, △)
Offering of course contingent on sufficient need and availability of resources. Family-oriented care with focus on nursing assessments and intervention, community health care, and promotion of health.

5816. LEADERSHIP MANAGEMENT. (6 cr; 10 wks; prereq 5611, 5612, 5613, 5614, FScN 3602...5615 in summer 1982)
Clinical course introducing basic management and change theory and practice. Provides students with experience in functioning as a first-level manager within a peer group in a clinical setting.

5999. CLINICAL STUDY. (1 cr; prereq any two of the following: 5611, 5612, 5613, 5614)
Opportunity to utilize the research process in the design and implementation of a limited study that focuses on implications for nursing practice.

Nursing Electives—The following are nursing elective courses that are currently offered. Due to the uniqueness of these courses and the resources required to offer them, others may be added and some of those now offered dropped.

5700. CRITICAL CARE NURSING. (5 cr; prereq 5611, 5612, 5613, 5614)
Group presentations and discussions, individualized instruction, and supervised clinical experience focusing on care of acutely ill patient/clients at the primary nurse level.

5701. NURSING CARE OF THE EXPANDING FAMILY. (6 cr; prereq 5611, 5612, 5613, 5614)
Application of previous studies and the concept of primary prevention in the nursing care of families during the reproductive process. Opportunity to work with families both within and outside of the hospital.

5702. NURSING AND THE CHANGING ROLES OF WOMEN AND MEN. (3 cr; prereq any two of the following: 5611, 5612, 5613, 5614)
Comparison of the historical and current nature of the nursing profession with that of the women's movement. Application of the nursing process to problem solving in the area of changing male-female roles.

5703. THE FUTURE IS NOW. (2 or 3 cr; prereq any two of the following: 5611, 5612, 5613, 5614)
Designed to increase students' awareness of controversial views regarding the future. Interrelationships of the individual with the environment with emphasis on aspects that will influence health care needs in the next quarter century.

5704. HUMAN SEXUALITY: SIGNIFICANCE FOR NURSING. (2 cr; prereq any two of the following: 5611, 5612, 5613, 5614)
The meaning of sexuality. Sexuality throughout the life cycle and the impact of hospitalization and effects of the disease process on sexuality. Alternate forms of sexual expression.

5705. CORONARY CARE NURSING. (6 cr; prereq 5615 or 5816)
Designed to increase the student's ability to assume responsibility for the nursing care of a patient/client who has experienced a recent cardiac problem.

5706. NURSING OF THE PERSON WITH CANCER. (6 cr, §5727; prereq 5611, 5612, 5613, 5614, #)
Designed to enable the student to gain added knowledge and experience in facilitating both the individual's and family's adaptation to cancer.

5707. ORGANIZATIONAL CHANGE. (5 cr; prereq 5611, 5612, 5613, 5614, RN student)
Major forces affecting the nature of an organization as well as the phenomenon of change and the role of power. Includes a planned change project in an organization.

5708. PHILOSOPHY AND VALUES AS APPLIED TO NURSING PRACTICE. (2 cr; prereq any two of the following: 5611, 5612, 5613, 5614)
Seminar course designed to assist students in clarifying their values as a prelude to defining and articulating a personal philosophy and recognizing its impact on nursing care. Values/philosophies held by individuals and groups such as existentialists, Easterners, and various nursing leaders. Exercises in value clarification.

5709. NURSING CARE OF THE PERSON IN PAIN. (5 cr; prereq 5611, 5612, 5613, 5614)
Factors involved in an individual's adaptation to pain. Analysis of nursing interventions that facilitate alleviation of pain for the individual and promote health for the individual, his or her family, and the community. Clinical experience in providing nursing care to individuals experiencing pain.

5710. CONTINUITY OF NURSING CARE DURING HOSPITALIZATION AND AFTER. (6 cr; prereq 5611, 5612, 5613, 5614)
Utilizing the conceptual framework, students provide nursing care to individuals and their families during hospitalization and, after discharge, in their homes. Emphasis is on discharge preparation, understanding how present health problems affect the patient/client's meaning in life, and facilitation of the patient/client's transition back into her or his home life. Includes evaluation of the effectiveness of nursing care provided during hospitalization.

5711. MAN AS A SPIRITUAL BEING. (2 or 3 cr; prereq any two of the following: 5611, 5612, 5613, 5614)
Designed to focus on the individual as a spiritual being and the relationship of this quality to the nursing process.

5712. NURSING THE PERSON WITH NEUROLOGICAL PROBLEMS. (5 cr; prereq 5611, 5612, 5613, 5614)
Analysis of and experience in providing nursing care to patient/clients who are in the acute and chronic phases of complex neurological and neurosurgical conditions.

5713. PHYSIOLOGICAL ADAPTATION. (2 cr; prereq LaMP 5171, any two of the following: 5611, 5612, 5613, 5614)
Utilizing a systematic approach, students identify subjective and objective data that indicate physiological disruptions of adaptation. Focus is on the relationship of physiological data to the patient/client's total stimulus configuration and the development of nursing diagnoses and interventions. Emphasizes the phenomena of hydration, ventilation, elimination, sleep patterns, pain, mobility, skin integrity, and temperature regulation.

5715. PRIMARY NURSING. (7 cr; prereq 5611, 5612, 5613, 5614, 5816)
Primary nursing as a system of nursing care delivery. The student will function as a primary agent and will assess, plan, implement or delegate, evaluate, and coordinate care for patient/clients over a 24-hour period throughout their stay in the hospital. The nursing care plan will focus on an adaptation framework with the components of energy, perception, and integration leading to a nursing summary statement. Identification of problems and their priorities will be based on an assessment of the stimulus configuration.

5716. SYNTHESIS—NURSING PHILOSOPHY, PROCESS, AND ROLE. (3 cr; prereq 5611, 5612, 5613, 5614 or RN in practice)
Designed to build upon participants' knowledge and beliefs about nursing and its clinical practice. The major concepts to be explored, individually defined, and synthesized are: nursing philosophy, nursing process, nursing roles, future directions of nursing, and patient/clients receiving nursing services.

5717. HEALTH ASSESSMENT. (5 or 6 cr; prereq 5611, 5612, 5613, 5614, or RN and 5716, #)
Preparation for systematic collection of subjective and objective data in a nursing assessment. Emphasis on normal health to distinguish abnormal from normal findings, and on incorporation of assessment skills into the student's nursing conceptual framework.

5718. CONTEMPORARY PUBLIC HEALTH NURSING. (6 cr; prereq 5611, 5612, 5613, 5614, PubH 5006 or ¶PubH 5006)
Opportunity for student to refine and broaden skills in meeting identified health needs of a specified community. Focus on health promotion concepts, family-centered nursing, community assessment skills, helping relationship skills and peer review.

5719. SYNTHESIS OF NURSING CONCEPTS IN METROPOLITAN MEDICAL CENTER EMERGENCY ROOM. (5 cr; prereq 5611, 5612, 5613, 5614)
Emergency nursing interventions for the patient/client experiencing acute stress and/or crisis. Practice making rapid and accurate physical and psychological assessments. Referral of patient/client to appropriate health team member. Experience with community agencies providing continuity of care.

5720. NURSING CARE IN AN EMERGENCY SETTING. (4 cr; prereq 5612 or RN)
Focus on the nurse's role of assessment and intervention with patient/clients with a life-threatening condition and patient/clients requiring immediate nursing intervention.

5721. NURSING CHALLENGES IN GERONTOLOGY. (6 cr; 10 wks; prereq 5611, 5612, 5613, 5614)
Clinical course designed to enable the student to gain added knowledge about and experience in providing health care to elderly patient/clients. Emphasis on assessment of needs of elderly, interventions that facilitate adaptation, and evaluation.

5722. AN INTRODUCTION TO THE NURSE AS A LEADER FOR CHANGE THROUGH PARTICIPATION IN THE LEGISLATIVE PROCESS. (5 cr; 10 wks; prereq any two of the following: 5611, 5612, 5613, 5614...or #... or grad student)
Participation in the legislative process through attending committee and subcommittee hearings on specific health bills of major concern to nurses. Contact with legislators and other key people in state government.

5723. NURSING CARE OF THE PATIENT EXPERIENCING SURGICAL INTERVENTION: THE PERIOPERATIVE ROLE OF THE NURSE. (5 cr; 105 hrs of continuing education through Nursing CEE; prereq completion of four level II synthesis courses, RN or #)
Focus on application of principles and concepts underlying patient care activities performed by the professional operating room nurse. Emphasis on the basic patterns of total care of the surgical patient during the pre-, intra-, and post-operative phases and on the knowledge and skills needed by the nurse to deliver that care and to progress further in operating room nursing or generalize to other areas of practice.

5724. ACTION- AND PLAY-ORIENTED THERAPIES FOR CHILDREN AND ADOLESCENTS. (2-4 cr; prereq #)
Designed to assist students to develop knowledge and skill in the use of action- and play-oriented therapies with children who are experiencing maturational or situational stress and crisis. Emphasis on employment of action- or play-oriented assessments, interventions, and treatments for children and adolescents without known mental illness in a pediatric hospital or community setting. Students develop insights into themselves as therapists in relation to specific clients.

5725. LEGAL PARAMETERS OF NURSING PRACTICE. (2 cr; prereq completion of two level II synthesis courses or RN with abnormal psychology, 5409)
Designed to increase the learner's knowledge of legal terminology and the ability to provide high quality nursing care while helping to prevent malpractice suits, especially in suit-prone clients. Content applicable to normal and emergency situations and to employers as well as employees. Use of programmed instruction activities at the time and speed best for the individual. Students meet as a group twice, at the beginning and end of the quarter.

5726. SOCIAL AND PSYCHOLOGICAL ASPECTS OF DEATH AND DYING. (2 cr; prereq completion of two level II synthesis courses)
Seminar focusing on the multiple aspects of death and dying. Exploration of cultural influences on the feelings and practices surrounding death and grief, and the roles of the various professions involved. Meetings with health care professionals to identify some of the ways these professionals are involved in death and dying.

5727. NURSING AND CANCER. (2 cr, §5706; prereq any two of the following: 5611, 5612, 5613, 5614)
Designed to enable the student to facilitate client and family adaptation to cancer. Focus on the role of the professional nurse in the field of oncology nursing.

5728. FACILITATING PARENTHOOD: A NURSING ROLE IN HEALTH PROMOTION. (3 cr; 10 wks; prereq 5611, 5612, 5613, 5614)
Designed to provide students with a theoretical base for facilitating the adaptation of individuals involved in the role transition to parenthood, and individuals adapting to various developmental levels of their children. Focus on parenthood in families without major disruptions, and on the potential for a major nursing role in health promotion for such families.

5729. CARE OF THE PERSON WITH EPILEPSY: A NURSING PERSPECTIVE. (5 cr; prereq 5611, 5612, 5613, 5614 or RN with #)
Designed to provide students with basic knowledge and skills for providing care to persons with epilepsy. Students will incorporate this knowledge into their conceptual framework for providing nursing care to persons in the acute and/or community setting. Emphasis on an interdisciplinary approach to care.

5730. NURSING AND DRUG THERAPY I. (3 cr; prereq any two of the following: 5611, 5612, 5613, 5614 or RN)
Designed to enhance the student's ability to synthesize pharmacological knowledge into providing holistic nursing care. Emphasis on assessing the desired effects, side effects, and interactions of common drugs affecting the cardiovascular, renal, endocrine, and autonomic nervous systems; determining appropriate nursing intervention related to these drugs; and using nursing process and helping relationships in teaching clients what they need to know about their drugs. Discussion of the hospitalized as well as the discharged client.

5731. TOPICS IN EMERGENCY NURSING. (5 cr; prereq RN, current or recent employment in an emergency department, current basic life support certification, successful completion of a basic electrocardiography pretest)
Designed to increase the knowledge and skills of registered nurses currently working in emergency departments. Emphasis on the integration of physiology with assessment, priority setting, and initiation and evaluation of nursing actions.

5799. SELF-DIRECTED STUDY. (Cr ar; prereq any two of the following: 5611, 5612, 5613, 5614...written contract with instructor, #; may be used to meet any portion of nursing elective cr requirement)
Opportunity for students to engage in learning experiences not provided for in established nursing elective courses.

5801. GERONTOLOGICAL NURSING SEMINAR. (2 cr; prereq ¶8014, ¶8030 and #)
Theories of aging, age-related issues with impact on health care of aging persons; designing nursing interventions specific to elderly clients.

For Graduate Students

CORE COURSES

8010. STRUCTURE OF THE DISCIPLINE OF NURSING

8011. MORAL AND ETHICAL POSITIONS IN NURSING

8012. CONCEPTUAL FRAMEWORK FOR NURSING PRACTICE

8014. RESEARCH IN NURSING

8030. NURSING INTERVENTION MODELS

FOCUS I COURSES

8314. NURSE-MIDWIFERY MANAGEMENT DURING CHILDBEARING

8411. KNOWLEDGE DEVELOPMENT UNDERLYING NURSING THERAPY

8421. PSYCHIATRIC-MENTAL HEALTH NURSING: GROUP DYNAMICS AND LEADERSHIP

8422. PSYCHIATRIC-MENTAL HEALTH NURSING: FAMILY DYNAMICS AND THERAPY

8431. CHILDBEARING-CHILDREARING FAMILY NURSING I

8451. TEACHING LEARNING PROCESS IN NURSING

8701. NURSING ADMINISTRATION I

FOCUS II COURSES

8315. NURSE MIDWIFERY MANAGEMENT: INTRAPARTAL; POSTPARTAL

8415. NURSE CLINICIAN ROLE DEVELOPMENT

8425. PSYCHIATRIC-MENTAL HEALTH NURSING: ROLE DEVELOPMENT

8435. CHILDBEARING-CHILDREARING FAMILY NURSING II

8455. NURSE EDUCATOR IN HIGHER EDUCATION

8702. NURSING ADMINISTRATION II

OTHER NURSING COURSES

8001. SPECIAL EDUCATIONAL EXPERIENCES IN NURSING

8003. HEALTH ASSESSMENT

8009. SPECIAL TOPICS IN NURSING

8050. PROBLEMS IN NURSING

8051. SPECIAL TOPICS IN NURSING RESEARCH

8060. ADVANCED CLINICAL NURSING

8063. NURSING CONSULTATION

8313. CARE OF THE CHILDBEARING FAMILY IN RISK

8509. SPECIAL TOPICS IN NURSING EDUCATION

8600. HEALTH CARE INSTITUTIONS AND NURSING LEADERSHIP

8601. CLINICAL NURSING LEADERSHIP I

8609. SPECIAL TOPICS IN NURSING SUPERVISION

IV. FACULTY

School of Nursing

Professor

Ellen T. Fahy, Ed.D., *dean*
Mitzi L. Duxbury, Ph.D., *assistant dean for graduate studies*
Inez G. Hinsvark, Ed.D., *associate dean*
Ida M. Martinson, Ph.D., *director of research*
Floris E. King, Ph.D.
Elaine R. Mansfield, D.N.Sc.
Catherine M. Norris, Ph.D.

Emeritus Professor

M. Isabel Harris, Ph.D.

Associate Professor

Frances E. Dunning, M.Ed., *assistant dean for student affairs*
Judith A. Plawecke, Ph.D., *assistant dean for undergraduate studies*
A. Marilyn Sime, Ph.D., *director of graduate studies*
Jean Kintgen-Andrews, Ph.D.
Sheila A. Corcoran, M.Ed.
Ellen C. Egan, Ph.D.
Bernadine Feldman, Ph.D.
Verona Gordon, Ph.D.
Florence R. Ruhland, M.Ed.
Mariah Snyder, Ph.D.
Eugenia E. Taylor, M.A.
Ann Voda, Ph.D.

Assistant Professor

Sharon E. Hoffman, Ph.D., *director of continuing education*
Kathleen M. Accola, M.S.N.
Marie E. Albrecht, M.S.
Mary Ann Anglim, M.Ed.
Janis Beckstrand, Ph.D.
Monica M. Bossenmaier, M.A.
Kenneth R. Burns, M.S.
Margaret L. Carolan, M.S.N.
Elaine Carty, M.S.N. (visiting)
Elizabeth Colloton, M.S.
Patricia Crisham, Ph.D.
Kathleen G. Dineen, M.S.N.
Sandra Edwardson, Ph.D.
Dorothy M. Fairbanks, M.Ed.
Evangeline C. Gronseth, Ph.D.
Marilyne R. Gustafson, M.S.
Helen B. Hansen, M.Ed.
Diane K. Kjervik, M.S.
Kathleen A. Maykoski, M.S.N.
Laura Newton, M.S.
Carol A. Reese, M.S.
Sara S. Rode, Ph.D.
Teresa Rothweiler, Ph.D.
Muriel B. Ryden, M.A.
Romana Urueta, M.S.
Ruth D. Weise, M.A.
Mary G. Weisensee, Ph.D.
Susan J. Wold, M.P.H.

Instructor

Karen Alaniz, M.S.
Janice M. Anderson, M.S.
Janet Braun, M.S.
Karen L. Brand, M.S.
Brenda H. Canedy, M.S.
Jessie Daniels, M.A.
Carol Diemert, M.S.N.
Ruth Enestvedt, M.S.
Catherine Fant, M.S.N.
Karen Hangsleban, M.S.
Kathleen Hunter, M.S.
Lois J. Jones, M.A.
Carol P. Jorgens, M.S.
Delores Kannas, M.S.
Elizabeth LaVelle, M.S.
Marsha Lewis, M.S.
Sandra Lindell, M.S.
Carol Pederson, M.S.
Mary Ruegg, M.S.
Mary Schmid, M.S.
Joan D. Stenberg, M.S.
Diane Stevens, M.S.

Research Associate

Gordon Armstrong, Ph.D.
Delores Krause, M.S.
Delores Schumann, M.S.
Mary Libera, M.Ed.

Teaching Specialist

Lois E. Freeberg, B.S.N.

Lecturer

Nancy Wyatt, M.A.

Adjunct Faculty

Assistant Professor

Mary Broderick, Ph.D.
Barbara Moulton, M.S.N.Ed.
Jane Phillips, M.N.A.
Barbara Tebbitt, M.S.N.

Instructor

Marilyn Bergstrom, M.S.
Deborah Boehm, M.P.H.
Julie Boran, B.S.N.
Ann Bradford, M.S.N.
Susan Branch, M.S.
Mildred Caspersen, M.S.N.
Cherie Clausen, M.S.N.
Ruth Dannehl, M.Ed.
Marlys Friederichs, M.S.
Mary Gehrke, M.S.N.
Irene Grossbach, M.S.N.
Karen Grosscup, M.S.
Marjorie Habenicht, M.S.N.
Margaret Hewitt, M.S.
Mary Jackle, M.S.
Florence Keller, B.S.N.E.
Marcea Kjervik-Doremus, M.S.
Marylee Kordosky, M.S.
Sister Chanel Kotewa, M.S.
Sofia Landry, M.S.

Paula Latz, M.S.
Linda Ledray, M.A.
Becky Lekander, M.S.
Jacqueline Lesniewski, M.S.
Pamela Lesser, M.S.
Audrey Logsdon, M.S.
Monica McCleary, M.S.
Anne McFarland, M.S.N.
Isabel McGarry, M.S.
Sally Mather, M.S.
Sister Mary Meyer, M.S.N.
Elizabeth Mullin, M.Ed.
Claire Nelson, M.S.N.
Anne Nettles, B.S.
Carol Nordgaard, M.S.N.
Ellen O'Neal, M.S.
Nancy Pederson, M.S.N.
Joanne Pierce, M.S.
Margaret Plumbo, M.S.
Rosalyn Podratz, M.A.
Sonja Poppe, M.S.
Ruth Rabenhorst, C.N.M.
Nancy Schamber, M.S.
Carol Smith, M.S.N.
Bonnie Stickles, M.S.
Margaret Taylor, M.S.
Georgeann H. Trojan, M.S.
Karen VonRuden, M.S.
Bonnie Westra, M.S.
Shirley Williams, M.S.N.
Karen Wilson, M.P.H.
Linda Wollery, M.S.

Courses in Occupational Therapy Physical Therapy

TABLE OF CONTENTS

For information about the occupational therapy course, contact Marvin Lepley, 378 Children's Rehabilitation Center, 426 Church Street S.E., University of Minnesota, Minneapolis, Minnesota 55455. For information about the physical therapy course, contact John Allison, 377 Children's Rehabilitation Center, 426 Church Street S.E., University of Minnesota, Minneapolis, Minnesota 55455. For an appointment with either director, call (612) 373-9034.

Occupational and Physical Therapy

I. GENERAL INFORMATION

Objectives of the Program

In accordance with the University of Minnesota's commitment to providing a liberal education for all of its students, the programs in occupational therapy and physical therapy offered by the Department of Physical Medicine and Rehabilitation, a part of the Medical School, provide students with a strong foundation in biological and physical sciences as well as an opportunity to take liberal arts and other courses that serve to develop individual interests and abilities.

Because the nation's health care needs can be met only by multidisciplinary teams of specialists, it is essential that the training of students in occupational therapy and physical therapy reflect an integrated approach to comprehensive health care. The Department of Physical Medicine and Rehabilitation offers its students the opportunity to work with and learn from other health professionals and thus to achieve an integrated perspective.

Occupational therapy and physical therapy students must have a knowledge of medical conditions and must understand psychology, physiological processes, and social theories. With this background they can acquire the skills and develop the ability to make the decisions required in the treatment process.

Upon completion of the professional program the student should be able to:

—Determine the stage of growth and development at which the patient or client is functioning and make adjustments that demonstrate an awareness of the physical and psychological effects of an interruption of the normal process.

—Select, administer, and interpret the tests and procedures necessary to evaluate the physical and emotional problems that forms of therapy may remedy.

—Develop a plan of therapy and select and administer the treatment procedures indicated by the physical, emotional, economic, and social needs of the patient or client.

—Evaluate the effectiveness of a treatment regimen and make appropriate adjustments in the treatment plan.

—Effectively communicate, orally or in writing, with patients or clients, the health care team, the family, and others responsible for and interested in the patient's or client's welfare.

—Respond professionally to the patient's or client's illness, disability, and problems.

—Use the scientific method for solving treatment problems.

—Work closely with other people, and be aware of his or her own feelings and sensitive to the impact of his or her behavior on others.

—Determine her or his individual need for personal and professional growth and accept the responsibility for continuing to improve her or his abilities.

The therapist in rehabilitation provides specialized services that require high moral standards, optimum mental and physical well-being, and an understanding of the nature of the therapist's own life and the world in which he or she lives.

Admission

Students must complete two years of preprofessional study in liberal arts before applying for admission to the professional programs, which begin in the junior year. Requirements for preprofessional curricula are detailed in sections II and III of this part of the bulletin.

For detailed information about application procedures for the courses in occupational therapy and physical therapy, refer to sections II and III. Because enrollment in both of these professional programs is limited, it is suggested that all students intending to pursue these majors consider applying to other universities and colleges as well as to the University of Minnesota.

New Students—Students who have not completed any college work should apply for admission to the College of Liberal Arts and declare a major in occupational or physical therapy. Students already enrolled at the University of Minnesota who wish to change majors should see an adviser as early as possible (refer to the section on advisers).

Students With Advanced Standing—Students transferring from other colleges or universities may be admitted with advanced standing by applying to the University and having their credits evaluated. Students who have satisfied all preprofessional requirements (see sections II and III) may apply directly to the Course in Occupational Therapy or the Course in Physical Therapy. Advanced standing students who have not satisfied preprofessional requirements will usually enroll in the College of Liberal Arts until they are eligible to apply for the professional curriculum. Those who transfer to the University of Minnesota to make up deficiencies in their educational background cannot be assured of being admitted to one of the professional programs and should always consider alternate goals. Students with degrees in other majors may seek admission to one of the undergraduate professional programs on the same basis as other students, or they may want to consider one of the programs offered at other universities that offer basic professional preparation at the graduate level.

Facilities and Resources

Most of the professional courses are taught in the classrooms located on the second floor of the Children's Rehabilitation Center, 426 Church Street S.E., Minneapolis. The offices of the occupational and physical therapy faculty are on the second and third floors. The secretaries are in room 271; call them at 373-9024 to make appointments. The directors of the two courses have their offices in the Children's Rehabilitation Center and may be reached at 373-9034.

Students learn occupational and physical therapy concepts in seminars, lectures, recitations, and group discussions, and through group assignments. Professional skills are taught in laboratory sessions. Videotape and many other audiovisual aids are used in classroom teaching, and in some courses programmed textbooks are used. Open communication between students and teachers is encouraged.

Advisers

Preprofessional Program—College of Liberal Arts students should seek assistance in program planning at the Pre-Health Sciences Advising Office, 30 Johnston Hall. Advisers in this office are also able to provide information about other health science programs.

Freshman and sophomore students attending other colleges or universities should contact the appropriate health sciences adviser on their campus or write to the occupational therapy or physical therapy program director for advice on program planning.

Professional Program—Students in the professional programs will be assigned to faculty advisers in the Department of Physical Medicine and Rehabilitation. These advisers are available to assist students in professional development as well as in scholastic or personal matters. Advisers also can direct students to other sources of assistance.

Expenses

Fees—Tuition and incidental fees are subject to change; refer to the *General Information Bulletin* for current information.

Other Expenses—The following is an estimate of special yearly expenses for the professional programs:

Locker Fee—$10

Uniforms—$60

Books and Laboratory Manuals—$500 (Books may be purchased at the Health Sciences Bookstore, 2-554 Health Sciences Unit A.)

Clinical Education—Some additional travel expenses may be incurred during clinical education; these expenses will vary according to individual plans. Students do not have to leave the Twin Cities area. Some fieldwork education centers for occupational therapy provide students with small stipends or maintenance expenses, but these cannot be guaranteed, and students should not make plans that depend on such support. Occupational therapy students are required to pay the same tuition during the summer session as they do during the academic year, because summer fieldwork in occupational therapy involves a full 12-week period. Physical therapy students pay regular tuition and fees during clinical education.

Financial Aid

Students needing financial assistance should apply as soon as possible after January 1 but before March 1 for priority consideration for the following academic year. Applications should be filed with the Office of Student Financial Aid, 210 Fraser Hall.

Some financial assistance is available for students in the junior and senior years of professional school. For information about any of the following awards, students should see an adviser or the director of the Course in Occupational Therapy or Physical Therapy.

Crippled Child Relief, Inc., Loan Fund—Short-term interest-free loans are provided in emergency situations.

Crippled Child Relief, Inc., Scholarship

Sponsor: Members of Crippled Child Relief, Inc., Minneapolis, Minnesota.

Basis of Award: Awarded to a student in the field of physical medicine and rehabilitation who shows scholarly excellence and dedication and a special interest in helping crippled children.

Eleanore Funk Memorial Scholarship

Sponsor: Mrs. Clarice N. Lundby, Ventura, California.

Basis for Award: Awarded annually to a senior occupational therapy student who demonstrates professional promise and high academic standing.

Borghild Hansen Occupational Therapy Memorial Scholarship

Sponsor: Individuals or groups making contributions in memory of Borghild Hansen or in honor of other persons and seeking to promote the growth of the profession of occupational therapy.

Basis of Award: For a junior or senior occupational therapy student selected on the basis of high academic standing and professional promise.

Mary McMillan Scholarship

Sponsor: McMillan Scholarship Program.

Basis of Award: Scholarships of $500 awarded to outstanding physical therapy students. Only one candidate may be recommended by an institution. Awards are made on a competitive basis; consideration is given to superior scholastic ability and evidence of potential for professional contributions.

Minnesota Chapter, APTA, Scholarship

Sponsor: Minnesota Chapter, American Physical Therapy Association.

Basis of Award: An annual award of $150 made to an outstanding University of Minnesota physical therapy student on the basis of academic standing and professional promise.

Minnesota Occupational Therapy Association Scholarship

Sponsor: Members of the state professional association for occupational therapists.

Basis of Award: Awarded annually to a junior or senior in occupational therapy on the basis of scholastic standing, financial need, and professional promise.

Rehabilitation Services Administration Traineeship—For one or two years. For information, write or call one of the program directors.

In addition, the armed services have professional programs that offer academic preparation. Information may be obtained from local Air Force, Army, and Navy recruiting offices.

Academic Regulations

S-N Grading System—A student may elect to take courses outside of the major field on the S-N (Satisfactory-No Credit) grading system. The credits earned in this manner are not used in computing the student's grade point average. During the first two years, certain prerequisite courses for the professional programs may not be taken S-N. Certain professional level courses may be taken S-N with instructor and department approval

Symbols—A temporary symbol I (incomplete) is assigned when the instructor has insufficient information to assign a permanent grade. To remove an incomplete the student must complete the course work by the end of the next quarter, unless special permission is obtained in writing from the instructor. If course work is not completed within the specified time limit, the I becomes a permanent grade of N, subject to review by the Scholastic Standing Committee.

Attendance—Students are expected to be regular and punctual in class attendance and in clinical work. They are asked to notify instructors in advance, whenever possible, if they do not expect to be present. It is the student's responsibility to make up work missed. Students who fail to appear for an examination without previous permission from the instructor will usually not be allowed to make up the examination.

Satisfactory Progress and Probation—Students are expected to maintain satisfactory progress in the professional programs. The courses in physical and occupational therapy each have a Student Progress Committee that reviews the progress of each student at regular intervals. Students must maintain a quarterly grade point average of at least 2.00 and earn no grade lower than a C. When a student does not meet these standards, the Student Progress Committee may take several actions, which may include placing the student on probation or dismissing the student from the program. Violations of the conduct code of the University or unsatisfactory classroom/clinical behavior may also

be grounds for committee action. See *Policies and Procedures of the Student Progress Committee* approved by the faculties of the courses in occupational and physical therapy in January, 1981.

Students should see their instructors or advisers early for help with courses in which they are having difficulty or with problems that are interfering with their progress.

Discontinuation—Students whose academic progress is hampered by poor health or personal or family problems may be asked to discontinue their academic work until these conditions have improved.

Canceling Out—Students who are considering canceling out of school should discuss these plans with their adviser or with the course director.

Readmission—Students who have left the program in good standing and wish to return to school should discuss their plans with the course director during the quarter before that in which they wish to return.

Graduation—The bachelor of science degree will be recommended for students who have successfully completed their course of study with a minimum grade point average of 2.00 overall and in the courses of the professional curriculum. In addition, they must have satisfied the liberal education distribution requirements as established by the Council on Liberal Education.

In compliance with University guidelines, graduation with honors is limited to 10 percent of the graduating class. Honors graduates are screened and selected by the Student Progress Committee, with final approval by the faculty. Criteria include a specified grade point average in the professional program and superior performance during the full-time clinical placement. To graduate "with distinction," students must earn a grade point average of 3.50 to 3.75. To graduate "with high distinction," students must earn a grade point average of 3.76 to 4.00.

It is the responsibility of the student to file an application for graduation at the Registration Center, 202 Fraser Hall (for mobility impaired students, the Office of Registration and Student Records, 150 Williamson Hall).

Student Activities

In addition to social events available to all students at the University, there are many informal activities arranged by students and faculty members in the occupational and physical therapy professional programs.

Occupational and physical therapy students are encouraged to participate in program planning and decision making. For example, students serve on the occupational therapy and physical therapy curriculum committees.

Students are also encouraged to become members of professional organizations. Student memberships are available in the American Occupational Therapy Association, the American Physical Therapy Association, and the Minnesota Occupational Therapy Association. Students may also join the Student Occupational Therapy Association at the University.

Continuing Education and Graduate Study

Graduates in occupational and physical therapy, and others with proper educational qualifications, may be allowed to take professional courses to update their knowledge and skills. Those interested must receive permission from the course director, who determines student eligibility and availability of space. Occupational therapy graduates are encouraged to request the Continuing Education Policy Statement, which is available from the

Director's Office, 378 Children's Rehabilitation Center, 426 Church Street S.E., University of Minnesota, Minneapolis, Minnesota 55455. Some continuing education courses are offered through the Department of Extension Classes. The Health Sciences Continuing Education brochure, published twice each year, lists all of the continuing education offerings of the University of Minnesota health sciences units. Information about continuing education offerings may be obtained from the coordinators of these activities: for occupational therapy, Kirsten Krauss, OTR, 376-1590; for physical therapy, Margie Gardner, RPT, 376-8390.

A master of science degree program for physical therapists is offered by the Graduate School. Requirements for admission include a bachelor's degree and completion of an accredited course in physical therapy. The student's record should provide evidence of academic ability and potential to pursue advanced study. Previous clinical experience in the practice of physical therapy is required. For the M.S. program the student may select either a Plan A (with thesis) or a Plan B (without thesis) curriculum. Further details regarding the program and application procedures are available in the *Graduate School Bulletin* and the *Graduate Programs in the Health Sciences Bulletin.* Information about the graduate program in physical therapy may also be obtained from Louis Amundsen, director of graduate study in physical therapy, 376-4680.

II. OCCUPATIONAL THERAPY

Professor

Frederic J. Kottke, M.D., Ph.D., *head, Department of Physical Medicine and Rehabilitation*

Associate Professor

Marvin G. Lepley, B.S., *director*
Dortha L. Esch, B.S., *assistant director*
Helen M. Dahlstrom, B.S.
A. Joy Huss, M.S.

Assistant Professor

Louvain G. Arndts, B.S., M.P.H.
Robert L. Bollinger, B.S.
Marian L. Eliason, B.S.
Clarence A. Sicard, B.S.

Instructor

Kirsten E. Krauss, B.S., M.A.,*coordinator, continuing education*
Rondell S. Berkeland, B.S., M.P.H.
Jean E. Magney, B.S., M.S.

Clinical Instructor

Terry K. Bergstrom, B.S.
Mary I. Brambilla-Tuinenga, B.S.
Catherine C. Brennan, B.S., M.A.
Marion A. Calph, B.S., M.B.A.
Kathryn N. Dole, B.S.
Nancy D. Enselein-Larkin, B.S., M.P.H.
Beverly P. Evans, B.S.
Anita A. Folch, B.S.
Karen L. Kendrick, B.S.
Carol J. Kohner, B.S.
Vernette E. McCombs, B.S.
Sandra L. Peterson, B.S.
Elizabeth Rivers, B.S.
Donna M. Rodel, B.S., M.Ed.
Karen Rudeen, B.S.
Jacqueline V. Zschokke, B.S., M.P.H.

Overview

History—During World War I, the University of Minnesota offered a short training course for what were then called "reconstruction aides." These people, mostly artists, were given instruction in activities that were thought to be useful in the rehabilitation of soldiers returning from the front. In 1924 the College of Education organized a course in occupational therapy, but it was discontinued during the early 1930s. In 1946, because of a renewed interest in occupational therapy following World War II, the present Course in Occupational Therapy was established in the College of Medical Sciences. Borghild Hansen was appointed director and remained in that position until her death in 1966. Marvin G. Lepley has been director of the program since that time.

The Course in Occupational Therapy is approved by the Council on Medical Education of the American Medical Association and by the American Occupational Therapy Association.

Philosophy and Objectives—Occupational therapy is a human service profession that focuses on individual needs and goals. The occupational therapist assesses needs, establishes goals, and develops treatment programs for individuals whose abilities to cope with the tasks of living are threatened or impaired by congenital or developmental disability, the aging process, physical injury or illness, or psychological and social disability. An occupational therapist uses task-oriented activities to prevent, minimize, or correct disabling emotional, behavioral, or physical handicaps.

Specific occupational therapy services include providing evaluation of and training in performance of life tasks (including activities of daily living and homemaking); use of adapted equipment and hand splints; use of therapeutic activities to enhance physical, emotional, perceptual-motor, and sensory integrative skills; development of prevocational skills; and removal of architectural barriers. Occupational therapists serve as vital members of a treatment team, consulting with physicians, physical and speech therapists, nurses, social workers, psychologists, vocational counselors, teachers, and other specialists.

Professional Employment—There is a wide variety of employment opportunities for qualified therapists. Graduates are employed in rehabilitation centers, hospitals and outpatient clinics, psychiatric facilities, sheltered workshops, public and special schools, nursing homes, home health programs, day care centers, and community health agencies. Therapists may receive commissions in the armed forces or may find employment with the U.S. Public Health Service.

Program of Study—Students spend the first two years of study in the College of Liberal Arts at the University of Minnesota or at any other approved college or university. During this time course emphasis is on the biological sciences, behavioral sciences, and artistic expression. Although there are prerequisite courses, the first two years provide reasonable flexibility for students to use elective courses to broaden their education. At the end of the sophomore year, students apply on a competitive basis for admission to the professional program. The last 2¼ years include academic work combined with part-time fieldwork and a minimum of six months of full-time fieldwork. When they complete the prescribed course of study, students receive the bachelor of science degree. Graduates are eligible to become registered occupational therapists by successfully completing the national certification examination of the American Occupational Therapy Association.

Admission

Admission Requirements—A student applying for admission to the professional program must satisfy the residency regulations of the University of Minnesota (see the *General Information Bulletin*), or be a resident of a state bordering Minnesota that does not have an occupational therapy program, or meet the University's requirements as a qualified minority applicant. Wisconsin residents will also be considered for admission if they are attending the University at the time of application and if their permanent residence is geographically closer to the University of Minnesota than to any of Wisconsin's occupational therapy basic professional education programs. Only those students with a grade point average of C + or higher overall and in the required biological sciences and courses in the individual and society will be considered. Applicants must have completed some successful work or volunteer experience. It is highly desirable that part of this experience have been in a health care or related facility that provided the applicant an opportunity to evaluate his or her potential for working with persons who are sick or who have physical disabilities or psychosocial dysfunctions. Applicants should assess their interest in the profession by visiting, volunteering, or working in an occupational therapy department. They should be in good health and have the physical capacity to do the work of a therapist. It is particularly important that they have sufficient maturity for and be sincerely interested in

working closely with people and dealing with their problems. Because of limitations in space and facilities, admission is currently restricted to 30 students each year. Selection is made on a competitive basis. It is expected that students entering the course intend to complete the program.

Application Procedure—University students who have satisfactorily completed the prerequisite courses and have accumulated 85 to 90 credits may apply in 240 Williamson Hall for transfer to the Course in Occupational Therapy. Students attending other colleges may request an Application for Admission With Advanced Standing from the Admissions Office, 240 Williamson Hall, 230 Pillsbury Drive S.E., University of Minnesota, Minneapolis, Minnesota 55455. Applications and related materials should be submitted as soon as possible after January 1 and no later than April 1 for the professional program that begins each fall quarter. Additional materials that should be submitted to the director of the occupational therapy program are:

Form A-1, Fact Sheet

Personal Data form

Check list of course requirements and grade point averages

Evaluations of work and volunteer experience

Profile of Minnesota Multiphasic Personality Inventory

Profile of Strong-Campbell Interest Inventory

Transcript that includes sophomore fall quarter grades

Transcript or grade report of winter quarter grades (as soon as available)

List of courses to be taken during spring quarter and the summer session (if applicable)

Forms for and information regarding the above items are available from the Course in Occupational Therapy, 382 Children's Rehabilitation Center, 426 Church Street S.E., University of Minnesota, Minneapolis, Minnesota 55455.

Qualified applicants will be requested to attend a group meeting. A notice of the meeting date is mailed to applicants after materials have been received and processed.

American Occupational Therapy Association—For further information regarding other universities and colleges offering courses in occupational therapy, career opportunities, and sources of financial aid, write to the American Occupational Therapy Association, Inc., 1383 Piccard Drive, Suite 300, Rockville, Maryland 20850.

Preprofessional Curriculum

The preprofessional program is continuously being reviewed and is subject to change. For current program information, contact the Pre-Health Sciences Advising Office, 30 Johnston Hall, 373-2912.

Liberal Education Group Distribution Requirements—The prerequisite courses are listed below under the liberal education group distribution categories along with the *minimum* number of credits required for each category. The required courses are listed by name and number. In most categories some additional credits are required. Students should use the group distribution course list in the *College of Liberal Arts Bulletin* for selection of these additional courses. Courses may be taken S-N unless otherwise indicated. See the Credits and Grade Standards section of the *College of Liberal Arts Bulletin* regarding S-N registration restrictions. A total of 85 to 90 credits are required.

Communication, Language, and Symbolic Systems—14 credits
Comp 1001, 1002—Introductory Composition (8)
(or) Comm 1001-1002—Communication (8)
Phar 5210—Terminology of Health Sciences (2)
Additional courses (4-6)
If students have not had a good public speaking course before entering the University, a speech course is highly recommended.

Physical and Biological Sciences—17 credits (All required courses in this category must be taken A-N.)
Biol 1011—General Biology (5)
MdBc 1030—Physiological Chemistry (4)
(or) Chem 1004—General Principles of Chemistry (5)
Anat 1004—Elementary Anatomy (4)
Phsl 1002—Human Physiology (4)

The Individual and Society—21 credits (All required psychology courses must be taken A-N.)
Psy 1001—General Psychology (5)
Psy 3604—Introduction to Abnormal Psychology (4)
CPsy 1301—Introductory Child Psychology (4)
Additional courses (8) (These additional credits should be in anthropology, psychology, sociology, or a combination of these fields.)

Literary and Artistic Expression—12 credits
A course in weaving with a loom is required. A course in ceramics is highly recommended. The majority of these credits should be taken in studio or applied arts.
ArEd 3010—Introduction to Weaving (3)
ArEd 3020—Contemporary Crafts (3)
ArtS 1101—Drawing I (4)
ArtS 1801—Ceramic Processes (4)
GC 3616—Creativity: Crafts (4)
Ind 1490—Elementary Handcrafts (3)
Any additional applied arts courses taken outside of a college or university are considered advantageous but will not apply to the 12-credit requirement. Such courses, however, will be considered during the admission process.

Public Health—5 credits (Must be taken A-N.)
PubH 3004—Basic Concepts in Personal and Community Health (5)

Suggested Program

Students attending the University of Minnesota should plan their quarterly registration carefully because some courses are offered only once during the academic year.

Students attending other colleges should select equivalent courses carrying comparable credit.

FRESHMAN YEAR

	Approx. Qtr. Cr.
Composition or Communication	8
Biology	5
Public Health	5
Elementary Anatomy	4
Chemistry	5
General Psychology	5
Art courses	6
Orientation to Occupational Therapy[1]	2
Electives	5
	45

SOPHOMORE YEAR

	Approx. Qtr. Cr.
Human Physiology	4
Child Psychology or Human Development	4
Abnormal Psychology	4
Additional Individual and Society Course	8
Speech or Language	4
Art courses	6
Medical Terminology[2]	2
Electives	13
	45

[1]PMed 1003, Orientation to Occupational Therapy, is highly recommended for students attending the University of Minnesota, Twin Cities campus.
[2]A medical terminology course may not be available at other colleges. Students admitted to the professional program will be able to complete this requirement during the junior year.

Professional Curriculum

JUNIOR YEAR

Fall	Credits	Winter	Credits	Spring	Credits
PMed 5100	3	LaMP 5171	1	PMed 5161	5
PMed 5330	6	PMed 5182	5	PMed 5393	3
PMed 5340	4	AdPy 5121	2	PMed 5312[1]	3
LaMP 5170	3	PMed 5311	4	PMed 5342[1]	6
		PMed 5341	2		
		Neur 5121	2		

SENIOR YEAR

PMed 5370	4	PMed 5344	3	PMed 5396	ar
PMed 5392	4	PMed 5375	4		
PMed 5343[1]	7	PMed 5380	3		
PMed 5360[1]	3	PMed 5391	1		
		PMed 5394	4		

SUMMER SESSION (BOTH TERMS) OR FALL QUARTER

PMed 5397 ..... ar

Fieldwork Education

(PMed 5396-5397)

A minimum of six months of fieldwork is required. During this period the student works with patients with both physical and psychosocial dysfunctions; some students may elect optional experience in a community setting.

Students are individually assigned to cooperating hospitals and community agencies within the limitations of available openings. There is a signed agreement between the University and the cooperating center as well as between the student and the center. Students must agree to abide by the center's code of conduct and to dress in accordance with its rules.

III. PHYSICAL THERAPY

Professor

Frederic J. Kottke, M.D., Ph.D., *head, Department of Physical Medicine and Rehabilitation*

Associate Professor

John D. Allison, M.S., *director*
Louis Amundsen, Ph.D. *director of graduate study*
Martin O. Mundale, M.S.
James F. Pohtilla, M.S.

Assistant Professor

Glenn N. Scudder, M.S., *assistant director*
Corinne T. Ellingham, M.S.
Donna L. Pauley, B.S.

Instructor

Marguerite Gardner, M.S., *coordinator, continuing education*
James Carey, M.S.
Ann Charness, B.S.

Clinical Instructor

Patricia Anderson, B.S.
JoAnn Battaglia, B.S.
Eugene Connolly, B.S.
Thomas Coplin, B.S.
Kathleen Fleischaker, B.S.
Faye Garlough, B.S.
James Gealow, B.S.
Donabelle Hansen, B.S.
Joyce Jensen, B.S.
Sue Johnson, B.S.
Barbara Linderman, B.S.
Susan Love, B.S.
Dennis Lutterman, B.S.
Annette Marshall, B.S.

[1]These courses are offered spring and fall quarters with half of the class taking PMed 5312 and PMed 5342 spring quarter and the other half taking PMed 5343 and PMed 5360. The sequence is reversed fall quarter.

Ellamae McGarry, B.S.
Bruce Miller, B.S.
Virginia Peulen, B.S
Peter Polga, B.S.
Dale Schibonski, B.S.
Bill Schwartz, B.S.
Sue Siaola, B.S.
Martha Talmage, B.S.
Henry Tamminen, B.S.
Judy Taplin, B.S.
Linda Weber, B.S.

Adjunct Instructor

Cornelia A. Burrill, B.S.

Overview

History—The Course in Physical Therapy at the University of Minnesota began in 1942 as a 12-month certificate program under the direction of Miland E. Knapp, M.D. In 1948 it became a 4-year degree program and was placed under the direction of Ruby Green Overmann, education director, and Frederic J. Kottke, M.D., medical director. After Ruby Green Overmann's retirement in 1957, Wilbur L. Moen became educational director. In 1978 John D. Allison became educational director.

Throughout its history, the Course in Physical Therapy has been approved by the American Physical Therapy Association and by the Council on Medical Education of the American Medical Association.

Philosophy and Objectives—Physical therapy is concerned with the prevention of disability and the restoration of function following disease, injury, or loss of bodily part. Its goal is to help patients reach their maximum performance potentials and asssume their places in society while learning to live within the limits of their capabilities. Physical therapy involves interpretation of orders from physicians, evaluation, treatment planning, performance of tests and measurements, instruction, consultative services, and supervision of support personnel. The therapeutic properties of exercise, heat, cold, electricity, ultrasound, massage, and other rehabilitative procedures are used during treatment. In order to adapt treatment to the patient's reactions, the therapist must have a thorough background in the biological and physical sciences and pathology.

Program of Study—The educational program in physical therapy requires four years of study and leads to a bachelor of science degree with a major in physical therapy. A minimum of 180 quarter credits are required for the degree. The student spends the first two years in a pre-physical therapy program that emphasizes liberal education studies and includes a foundation in the behavioral, biological, and physical sciences. At the end of the sophomore year, students apply for admission to the professional program, which takes two academic years and one summer term to complete. Graduates of the program are eligible for state registration or licensure according to the laws of various states.

Admission

Admission Requirements—A student planning to enter a health profession such as physical therapy should seriously consider whether she or he has the necessary personal qualifications for working closely with people and for dealing with their problems. Exposure to the health care delivery system through employment or volunteer work is considered an essential prerequisite. The student must be in good physical and mental health to achieve success in physical therapy; a physical examination by a physician is required prior to beginning the professional program.

Because of limitations in space and facilities, enrollment is restricted. Applicants are selected on a competitive basis. To be eligible for admission, the student should complete a minimum of 86 quarter credits including the required courses or their equivalents. A grade point average above 2.50 (C+) in course work in the physical, biological, and behavioral sciences is required as an indication of probable success in the program. In selecting students, applicants who meet University requirements for Minnesota residency are given

priority. Consideration will be given to minority applicants, regardless of their state of residence, and nonresident applicants who reside in neighboring states that do not have physical therapy educational programs or who have special reasons to attend the University of Minnesota.

Application Procedure—Applicants are requested to take the Minnesota Multiphasic Personality Inventory and the Strong-Campbell Interest Inventory. The Student Counseling Bureau (101 Eddy Hall, 373-4193) charges a fee for administering these tests.

Applications for admission are available from the Office of Admissions, 240 Williamson Hall, 231 Pillsbury Drive S.E., University of Minnesota, Minneapolis, Minnesota 55455. Once the application is reviewed, applicants are sent guidelines for submitting a résumé of their background, training, experience, and accomplishments—especially examples that contributed or demonstrate their knowledge and understanding of physical therapy. A personal interview may be requested by the Admissions Committee.

Deadline for application is March 1 for the class beginning professional study in September. To allow ample time for review of applications, students are urged to file their applications with the director in January or upon completion of the fall quarter.

American Physical Therapy Association—For information about admission to other colleges and universities offering professional programs in physical therapy, about career opportunities, and about other sources of financial aid, write to the American Physical Therapy Association, 1156 15th Street N.W., Washington, D.C. 20005.

Preprofessional Curriculum

Required and elective courses to be taken in the first two years are listed below. Courses may be taken S-N unless otherwise indicated. Courses are listed under the liberal education group distribution categories along with the *minimum* number of quarter credits required for each category.

Communication, Language, and Symbolic Systems—16 credits

Comp 1001,1002—Introductory Composition (8)[1]
(or) Comm 1001-1002—Communication (8)
(or) exemption from requirement
Phar 5210—Terminology of Health Sciences (2)
(or) Clas 1048—Technical Terms of the Medical and Biological Sciences (2) (also offered through extension classes or independent study)
Elective courses from foreign language, philosophy (logic), mathematics, speech, or statistics (8)

Physical and Biological Sciences—38 credits (All courses in this category must be taken A-N.)

Biol 1011— General Biology (5)
Biol 1106—General Zoology (5)
Anat 1004—Elementary Anatomy (4)
Phsl 3051—Human Physiology (5)
Chem 1001-1002—Chemical Principles and Covalent Systems (10)
(or) Chem 1004-1005—General Principles of Chemistry (10)
Phys 1031-1032—Introductory Physics: Measurement and Applications (8)
Phys 1035-1036—Introductory Physics Laboratory (2)

[1]The University's freshman composition requirement is expected to change effective fall quarter 1982. Check with the program director for information.

The Individual and Society—8 credits (Both courses in this category must be taken A-N.)
Psy 1001—General Psychology (5)
Psy 3604—Introduction to Abnormal Psychology (4)

Literary and Artistic Expression—8 credits
Elective courses from art, music, theatre arts, literature, classics, humanities (8)

Since the professional program in physical therapy has a heavy concentration in science and medical courses, the prospective applicant is encouraged to select electives in the Communication, Language, and Symbolic Systems; Individual and Society; and Literary and Artistic Expression categories to complete the 86 to 90 credits required for admission.

Suggested Program

Students attending other colleges should select equivalent courses carrying comparable credit.

FRESHMAN YEAR

	Approx. Qtr. Cr.
Composition or Communication	8
General Biology	9
Elementary Anatomy	4
General Chemistry	10
Electives	14
	45

SOPHOMORE YEAR

	Approx. Qtr. Cr.
Introductory Physics	8-10
General Psychology	5
Abnormal Psychology	4
Human Physiology	5
Medical Terminology	2
Electives	21-23
	45-49

Students at the University of Minnesota are encouraged to take PMed 1002, Orientation to Physical Therapy, in the freshman year. It is offered fall and winter quarters only.

All required physical, biological, and behavioral science courses must be completed before the student enters the professional program. If more than one course (maximum of five quarter credits) remains to be completed after the spring term of the sophomore year, the student will usually be asked to wait until the following year to apply for admission. Professional courses are offered only once a year and must be completed in sequence. It is very difficult to complete additional courses or group distribution requirements during the junior and senior years.

Professional Curriculum

A Mantoux test or chest X-ray, or both, is required during each year of the professional program.

JUNIOR YEAR

Fall	Credits	Winter	Credits	Spring	Credits
LaMP 5170	3	LaMP 5171	1	PMed 5161	5
Anat 3058	5	PMed 5221	4	PMed 5222	4
PMed 5100	2	PMed 5230	5	PMed 5281	4
PMed 5215	1	PMed 5182	5	PMed 5283	4
PMed 5220	3	Neur 5121	2	PMed 5292	2
PMed 5340	4				

SUMMER SESSION

PMed 5255 3

SENIOR YEAR

PMed 5275	3	PMed 5270	3	PMed 5295	15
PMed 5282	4	PMed 5289	3		
PMed 5288	4	PMed 5290	ar		
PMed 5255	2	PMed 5293	3		
PMed 5284	4	AdPy 5121	2		

Clinical Education

(PMed 5215, 5255, 5295)

Each student in physical therapy is required to complete a minimum of 15 weeks of clinical education. Clinical experience is divided into three periods of 5 weeks each, chosen from the following areas: general (hospital acute care), pediatrics, geriatrics, and rehabilitation. A supervised 2- or 3-week interim affiliation is scheduled fall quarter of the senior year. Clinical experience is scheduled in conjunction with selected laboratory courses.

Within the limits of availability of assignments, students are allowed some choice in planning their clinical education experiences. Assignments are arranged by the coordinator for clinical education and the supervisor of the clinical center. Once a student has accepted an assignment, she or he agrees to abide by the policies, procedures, and regulations of enter. The clinical center's primary responsibility is to provide health care services, and on-site clinical experiences are a privilege. Written agreements of affiliation between the University and the clinical training center are reviewed by the student before the clinical assignment begins. Individual centers may have special requirements such as liability insurance or specific physical examinations.

Requirements of clinical centers include compliance with a dress code. Generally, students are expected to wear a white opaque top, navy blue slacks, and white duty or dress shoes. Blue jeans, cords, and tennis shoes are not acceptable, unless stipulated otherwise.

During clinical education students will be responsible for their own insurance, transportation, board and room, unless stated otherwise by the clinical center.

A student may miss one full day of clinical education for a legitimate reason without having to make it up; any additional absence, for whatever reason, must be made up. The clinical instructor at the center will decide what constitutes a legitimate absence. Physical therapy departments may be open seven days per week and 10 to 12 hours per day. Thus students may be required to work extended hours or weekends, and they should plan accordingly to avoid scheduling conflicts and absences.

Clinical education courses (PMed 5215, 5255, and 5295) carry academic credit and are graded S-N. Students pay regular tuition and fees during clinical education. They may, however, be exempted from paying the student services fee if their clinical assignment is outside the nine-county Twin Cities metropolitan area (Hennepin, Ramsey, Dakota, Washington, Scott, Carver, Chisago, Anoka, and Wright counties). If the exemption is allowed, students will be expected to pay for their own health care and arrange for their own insurance. Some clinical facilities require that students have health coverage before starting their clinical education. If so, students may elect to purchase outpatient coverage and University-sponsored hospital coverage directly from the Boynton Health Service. Further information about the fee exemption and health coverage is available from the director of the program.

Clinical practice performance is reviewed and evaluated by the student and the clinical instructor. Students are responsible for keeping records of the variety and number of patients treated. Unsatisfactory performance in the clinical setting may be grounds for academic probation or dismissal from the program. Students who receive a grade of N in a clinical education course are required to repeat the course before graduation.

Students may appeal any policies or decisions made by a clinical center or the University by following the appeals procedure outlined by the University Senate and available to all students through the University appeals committees.

IV. COURSES IN OCCUPATIONAL AND PHYSICAL THERAPY

Physical Medicine and Rehabilitation (PMed)[1]

1002. ORIENTATION TO PHYSICAL THERAPY. (1 cr; offered fall and winter only; S-N only)
An overview of the profession through lectures, demonstrations, films, and tours. Designed to provide factual information and guidance for students planning to enter professional training in physical therapy.

1003. ORIENTATION TO OCCUPATIONAL THERAPY. (1 cr; offered fall and spring only; S-N only)
Survey of the profession through lectures, films, demonstrations, and tours. For students investigating the field of occupational therapy.

5100. ORIENTATION TO REHABILITATION. (Cr ar; prereq regis OT or PT)
Orientation to health care and members of the health care team; medical communications, scientific literature, professional attitudes and behavior. Introduction to hospital organization and environment.

5161. THEORY OF PHYSICAL MEDICINE AND REHABILITATION APPLIED TO MEDICAL SCIENCES. (5 cr; prereq regis OT or PT)
Lectures focusing on such related fields as surgery, orthopedics, pediatrics, dermatology, medicine, neurology and speech. Correlation clinic includes presentation of patients and discussion of treatment problems.

5182. FUNCTIONAL NEUROANATOMY AND NEUROPHYSIOLOGY. (5 cr; prereq regis OT or PT)
Neuroanatomic structures as functional systems and basic neurophysiologic concepts with emphasis on applications for understanding and treating physical dysfunctions.

5215. INTRODUCTION TO PHYSICAL THERAPY CLINICAL EDUCATION. (1 cr; prereq regis PT)
An attitudinal approach to health care using exposure to the affective domain of patient care. Development of communication and observational skills. Periods of supervised clinical education followed by group discussion. Tours, lectures, and discussions used to develop professional attitudes toward death and dying, the aging process, and medical ethics.

5220. THERAPEUTIC PROCEDURES I. (3 cr; prereq regis PT)
Basic principles of body mechanics and skills for positioning and draping patients in preparation for treatment. Theory and techniques of asepsis and isolation, thermotherapy, hydrotherapy, and cryotherapy. The physiologic bases for treatment with heat, cold, diathermy, and ultrasound. Includes four half-days of practical work with patients in the clinic.

5221. THERAPEUTIC PROCEDURES II. (3 cr; prereq regis PT)
The theory, rationale, physiologic effects, and technique of application of therapeutic massage. Application of ultraviolet radiation. Theory and techniques of medical and athletic bandaging. Introduction to Mennell's techniques of small joint manipulation. Application of Jobst intermittent compression units, measurement of Jobst compression garments, and volumetric measurement of the extremities. Includes four half-days of practical work with patients in the clinic.

5222. THERAPEUTIC PROCEDURES III. (4 cr; prereq regis PT)
Theory and technique of electrotherapy. Methodology used in measuring patients' responses to treatment. Utilization of goniometry, sensory testing, and muscle testing procedures with patients. Problems in evaluation, introduction to quantitative muscle testing, and ambulation training.

5230. THEORY AND TECHNIQUE OF MUSCLE FUNCTION, TESTS, AND MEASUREMENTS. (5 cr; prereq regis PT)
Review of muscles and joints with regard to anatomical and physiological functions; analysis of body mechanics, coordinated movement, and strength. Procedures in assessment of body function.

5255. CLINICAL EDUCATION IN PHYSICAL THERAPY. (Cr ar; prereq regis PT; offered either summer term)
Supervised clinical practice at affiliated hospitals.

5270. REHABILITATION PROCEDURES. (3 cr; prereq regis PT)
Theoretical and practical application of principles used in activities of daily living, ambulation, and functional activities as they relate to the patient and his or her disability.

5275. APPLIED ANATOMY. (3 cr; prereq regis PT)
Review of joint structures, muscles, nerves, and function. Diseases and injuries causing impairment of function and deformities.

5281-5282. THEORY OF THERAPEUTIC EXERCISE. (4 cr per qtr; prereq regis PT)
Fundamental principles of physiology, physics, and neurology as a basis for therapeutic exercise.

5283-5284. TECHNIQUES OF THERAPEUTIC EXERCISE. (4 cr per qtr; prereq regis PT)
Application of the principles and techniques of therapeutic exercise.

[1]For descriptions of courses offered by other academic units, see the last section of this bulletin.

5288. EVALUATION PROCEDURES II. (4 cr; prereq regis PT)
Techniques of electrodiagnosis, gait analysis, posture evaluation, motor and perceptual testing. Principles of orthotics.

5289. PATIENT ASSESSMENT. (3 cr; prereq regis PT)
Assessment of clinical patients and rationale of treatment to attain rehabilitation goals.

5290. ADMINISTRATION. (2 cr; prereq regis PT)
Physical therapy administration and management. Field experience with physical therapy consultants, teaching practicum, individual student projects, and pilot research studies designed to illustrate the role of the practicing physical therapist in the areas of education, research, and consultation with professional colleagues.

5292. INTRODUCTION TO RESEARCH. (2 cr; prereq regis PT)
Fundamentals of research design; elementary statistical concepts; techniques of scientific writing.

5293. INTRODUCTION TO RESEARCH DESIGN. (3 cr; prereq 5292, regis PT)
Elements of research design, sources of invalidity; appraisal of designs.

5295. CLINICAL EDUCATION IN PHYSICAL THERAPY. (15 cr; prereq regis PT)
Supervised clinical practice at affiliated hospitals.

5311. THERAPEUTIC ACTIVITIES. (4 cr; prereq regis OT)
Lecture, small group demonstration, and laboratory instruction in minor crafts. Includes teaching techniques and the therapeutic aspects of craft activities.

5312. WOOD PROCESSING. (3 cr; prereq regis OT)
Laboratory instruction in the use of hand tools and power woodworking equipment, safety precautions, and maintenance of tools and equipment.

5330. FUNCTIONAL ANATOMY. (6 cr; prereq regis OT)
Structure and function of the musculoskeletal, peripheral nervous, and vascular systems. Analysis of body mechanics and coordinated movement. Includes anatomy laboratory, kinesiology laboratory, lecture, and demonstration.

5340. HUMAN DEVELOPMENT. (4 cr; prereq regis OT or PT)
Human physiological, psychological, and social development. A basis for understanding future study of evaluation procedures and treatment.

5341. THEORY: PSYCHOSOCIAL DYSFUNCTION I. (2 cr; prereq regis OT)
Fundamental concepts of working with psychosocial problems.

5342. THEORY: PSYCHOSOCIAL DYSFUNCTION II. (6 cr; prereq regis OT)
Evaluation and treatment techniques for the psychiatric patient. Application of theory through case examples, group discussion, and clinical experience.

5343. THEORY: PHYSICAL DYSFUNCTION I. (7 cr; prereq regis OT)
Techniques of evaluation and treatment of patients with physical disabilities. Lecture, laboratory, and clinical experience.

5344. THEORY: PHYSICAL DYSFUNCTION II. (3 cr; prereq regis OT)
Presentation and discussion of specialized topics and treatment programs for patients with physical disabilities and general medical problems.

5360. GROUP PROCESS SEMINAR. (3 cr; prereq regis OT)
Experience in group development; analysis of group behavior and member roles.

5370. REHABILITATION PROCEDURES. (4 cr; prereq regis OT)
Theoretical and practical knowledge of activities of daily living as they apply to occupational therapy. Lectures, demonstrations, and practice.

5375. COMMUNITY RESOURCES AND HEALTH CARE ISSUES. (4 cr; prereq regis OT)
The role of community agencies, legislation, and related health care issues in the rehabilitation process. Introduction to the concepts of prevention and intervention in the well community.

5380. ADMINISTRATION AND SUPERVISION. (3 cr; prereq regis OT)
Principles of administration, supervision, and organization of the occupational therapy department. Interdepartmental relationships.

5391. ORIENTATION TO WORK EVALUATION. (1 cr; prereq regis OT)
Lecture and slide presentation of types and systems of work evaluation used in vocational rehabilitation settings. Brief practicum in the Tower System of Vocational Assessment.

5392. METHODS OF SCIENTIFIC RESEARCH. (4 cr; prereq regis OT)
Fundamentals of research design; evaluation and presentation of data; preparation of manuscript.

5393. EVALUATION TECHNIQUES. (3 cr; prereq regis OT)
Introduction to the evaluation process. Techniques for evaluation of reflexes, muscle strength, range of motion, and sensation.

5394. EVALUATION AND TREATMENT OF SENSORY INTEGRATIVE DYSFUNCTION. (4 cr; prereq regis OT)
Theories of sensory integration and identification of dysfunction; practice in assessment procedures and program planning.

5395. INDEPENDENT STUDY IN OCCUPATIONAL THERAPY. (Cr ar; prereq regis OT)
Individual study in areas related to occupational therapy.

5396-5397. FIELDWORK EDUCATION IN OCCUPATIONAL THERAPY. (Cr ar; prereq regis OT)
A total of 6 to 8 months of supervised training in affiliated hospitals and community agencies.

Related Baccalaureate Programs

TABLE OF CONTENTS

Related Baccalaureate Programs

Dental Hygiene Program

The dental hygiene program consists of two academic years of study in the School of Dentistry after prerequisites are completed. The degree of graduate dental hygienist (G.D.H.) is granted upon completion of the prescribed course of study. Upon receipt of the G.D.H. degree, the graduate must obtain a license to practice by passing a regional and national board examination. Dental hygiene graduates may provide preventive dental hygiene services or dental health education services in public schools, health departments, hospitals, industrial institutions, and private dental offices.

To qualify for admission to the G.D.H. program, you should be in the upper 25 percent of your high school class. A high school transcript with PSAT, SAT, or ACT scores and your Dental Hygiene Aptitude Test score must be submitted with your application. Any other required application materials will be sent to you after your application is received. High school chemistry or its equivalent and the following college courses are required for entry: Biol 1011, General Biology; Comp 1001 and 1002, Introductory Composition; Anat 1004, Elementary Anatomy; Psy 1001, General Psychology; Soc 1001, Introduction to Sociology, and Spch 1101, Fundamentals of Speech Communication: Oral Communication. To apply to the program with advanced standing, you should have at least a 2.00 (C) grade point average. Applications for the G.D.H. program are accepted through April 15 of each year.

Graduates of the G.D.H. program or other accredited dental hygiene programs may apply for entry to the bachelor's degree program in dental hygiene, which offers majors in dental hygiene education or dental hygiene public health. Applicants must be licensed as dental hygienists, have a minimum grade point average of 2.50 (C+), and present national and state/regional examination scores. A high school transcript with PSAT and/or ACT scores must be submitted with each application. Application deadline for this program is June 15.

For more information about the program, consult the *School of Dentistry Bulletin* or contact Donna Aker, Director, Program in Dental Hygiene, 5-164 Health Sciences Unit A, 515 Delaware Street S.E., University of Minnesota, Minneapolis, Minnesota 55455, (612) 373-3271.

Nurse Anesthesia Program

The nurse anesthesia program offered by the Medical School through the Department of Anesthesiology is designed to train nurses to be educators and managers in nurse anesthesia and to enhance the technical competencies of nurses who are licensed anesthetists.

To be admitted to the program, applicants must be nurses who are certified as anesthetists. After admission to the program, students are given 150 "blanket credits" based on previous academic and professional work. To complete the program, students complete 60 more academic credits: 15 credits of clinical work, 25 credits of course work in the Medical School, and 20 credits of electives. Students who complete the program will be granted a bachelor of science in nurse anesthesia (B.S.N.A.) by the Medical School.

Detailed information about the program is available from Professor Shirley Bell, Director, Nurse Anesthesia Program, Box 294 Mayo Memorial Building, 420 Delaware Street, University of Minnesota, Minneapolis, Minnesota 55455, (612) 373-8181.

Nutrition and Dietetics Program

This program is intended for those interested in the field of nutrition and its various applications in dietetics, public health, and nutrition science. The options offered in dietetics and community nutrition meet the requirements of the American Dietetic Association for membership and for internship. Students completing either option and a 6- to 12-month hospital or public health internship may seek employment in hospitals or community agencies.

Students must complete the prerequisite courses in organic chemistry by the end of their sophomore year in order to enter courses normally scheduled in the junior year, or they may be delayed in completing the program. Transfer students who have completed organic chemistry or biochemistry courses that are not as extensive as those listed below are required to take additional courses in both fields.

The American Dietetic Association has accredited a coordinated undergraduate program in dietetics at the University. With the cooperation of Twin Cities area hospitals, this program enables qualified students to integrate an internship experience with the final two years of undergraduate study. Upon completing the program students are assured membership in the American Dietetic Association. Enrollment is limited, and interested students should apply to the program director early in their sophomore year.

This program is open to students registered in either the College of Agriculture or the College of Home Economics. Faculty advisers are normally from the Department of Food Science and Nutrition, which is jointly administered by the two colleges. For more information, see the bulletin of the College of Home Economics or the College of Agriculture, or contact Lura Morse, Department of Food Science and Nutrition, 168 Food Science and Nutrition Building, 1334 Eckles Avenue, University of Minnesota, St. Paul, Minnesota 55108, (612) 373-1542.

Bachelor of Science in Pharmacy Program

The College of Pharmacy offers the bachelor of science in pharmacy degree as a traditional alternative to the more advanced doctor of pharmacy program, which is considered the optimal preparation for innovative career opportunities in entry-level pharmacy practice. The B.S. in pharmacy degree is awarded to students in the College of Pharmacy who have satisfactorily completed a two-year prepharmacy curriculum, the first two years of the doctor of pharmacy curriculum, and a third professional year, which includes a community pharmacy clerkship and a hospital practice clerkship.

Graduates of the program are eligible to complete the examination for licensure as registered pharmacists by the Minnesota State Board of Pharmacy and to practice pharmacy in the state of Minnesota. Qualified recipients of the bachelor's degree may be eligible to continue their studies and be admitted to the Pharm.D. program.

For more information, see the *College of Pharmacy Bulletin* or contact the Office of Student Affairs, College of Pharmacy, 5-110 Health Sciences Unit F, 308 Harvard Street S.E., University of Minnesota, Minneapolis, Minnesota 55455, (612) 373-7997.

Radiologic Technology Program

Students who complete the radiologic technology program are qualified to assist radiologists with patient preparation, adjustment and use of x-ray equipment, laboratory procedures, and exposure and processing of x-ray films, as well as performing other clinical supportive functions.

Students in the radiologic technology program combine 45 credits of radiologic technology course work and experience with 45 credits of general education course work

through the General College. All students accepted into the program are eligible for a stipend after their seventh month in the program. Students who successfully complete the 90-credit program earn an associate in arts degree from the General College. They are eligible to register with and receive certification from the American Registry of Radiologic Technologists, and to join the American Society of Radiologic Technologists.

Radiologic technology courses include orientation to radiologic technology, medical terminology, related ethics, darkroom chemistry and techniques, nursing procedures, medical and surgical diseases, radiographic positioning, principles of radiographic exposure, radiographic anatomy, fundamental electricity, radiological physics, special radiographic programs, basics of nuclear medicine, basics of radiation therapy, radiographic equipment, and systems analysis.

For more information, contact Patricia Skundberg, Coordinator, Department of Radiology, 412 Union Street, University of Minnesota, Minneapolis, Minnesota 55455, (612) 373-8604; or the General College Division of Counseling and Student Development, 106 Nicholson Hall, 216 Pillsbury Drive S.E., University of Minnesota, Minneapolis, Minnesota 55455, (612) 376-2950.

Required and Elective Courses Offered by Other Units

Required and Elective Courses Offered by Other Units

The courses listed below are required or recommended for one or more of the programs described in this bulletin. For an explanation of the symbols used in the course descriptions, see the General Introduction to this bulletin.

Adult Psychiatry (AdPy)

5121. DESCRIPTIVE PSYCHIATRY. (2 cr; prereq regis OT or PT)
Etiology of mental illness including dynamic concepts, personality development, symptom formation, classification of mental illness, treatment presentation. Case presentation.

Anatomy (Anat)

1004. ELEMENTARY ANATOMY. (4 cr; prereq regis paramed fields, 1 qtr college biology)
A general survey of human anatomy including histology, embryology, gross anatomy, and neuroanatomy, with some clinical and physiological correlations.

3058. ANATOMY OF THE EXTREMITIES. (5 cr; prereq 1004, regis PT)
A regional approach to gross human anatomy emphasizing the skeletal, muscular, circulatory, and peripheral nervous systems of the extremities and trunk. Includes lecture, prosection, and laboratory with dissection of cadavers.

5765. HEMATOLOGY. (4 cr)
Blood and blood-forming organs; emphasis on blood and bone marrow from standpoint of diagnosis and prognosis.

5766. HEMATOLOGY. (4 cr; prereq Anat 5765)
Blood and bone marrow from standpoint of diagnosis and prognosis.

Anthropology (Anth)

1102. INTRODUCTION TO SOCIAL AND CULTURAL ANTHROPOLOGY. (5 cr. §1115, §5102)
Varieties and range of human behavior as revealed through comparative study of cultures in all parts of the world.

Biochemistry (MdBc)

1030. PHYSIOLOGICAL CHEMISTRY FOR DENTAL HYGIENE AND NURSING STUDENTS. (4 cr, §3050)

3050. PHYSIOLOGICAL CHEMISTRY FOR NURSES. (4 cr, §1030)

5300, 5301. BIOCHEMISTRY. (5, 4 cr; prereq organic chemistry and physics)

Biology (Biol)

1011. GENERAL BIOLOGY. (5 cr)
Introduction to the principles of biology. The cell, metabolism, heredity, reproduction, ecology, and evolution.

1106. GENERAL ZOOLOGY. (5 cr; prereq Biol 1011)
Survey of animal phyla: considerations of structure, function, behavior, adaptation, and evolutionary relationships.

3011. ANIMAL BIOLOGY. (5 cr; prereq 1011, Chem 1005)
Comparison of ways different phyla have solved similar physiological problems. Laboratory includes survey of major animal groups and physiological experiments.

3041. ECOLOGY. (4 cr; prereq biology major, Math 1231 or #, △)
Interactions of plant and animal populations and their environments. Organization, functioning, and development of ecological systems; population growth and regulation. Human impact on the biosphere in modern times.

3051. BIOLOGY AND THE FUTURE OF MAN. (4 cr; S-N only)
Nontechnical discussion of biological factors affecting the quality of life; e.g., pollution, chemical and biological warfare, population growth, food supply, resource sufficiency, value of wilderness, genetics and eugenics, public health, aging, behavior control, and biological aspects of ethics, morals, and societal organization.

3112. BIOLOGICAL RHYTHMS. (4 cr, §5112; prereq 1011 or #)
Timing mechanisms and rhythms of organisms in physiological processes, ecological adaptation, and health; current hypotheses concerning their cellular and molecular nature.

5001. BIOCHEMISTRY. (4 cr, §3021, §BioC 5001; prereq 1011, 12 cr organic chemistry)
Biochemistry and biophysics of cells; emphasis on enzyme catalysis, cellular energetics, biosynthesis of cellular constituents, and cellular regulatory mechanisms.

Chemistry (Chem)

1001-1002†. CHEMICAL PRINCIPLES AND COVALENT SYSTEMS. (5 cr per qtr, §1003, §1004-1005, §1008, §1014, §1031-1032; primarily for forestry and nursing students; a terminal course; prereq 2 yrs high school mathematics. . . high school chemistry recommended)
Principles of chemical change; structural concepts of nuclei, atoms, molecules; laws of dynamic behavior of matter; equilibrium concepts, especially those relevant to living systems; application of principles with emphasis on organic and biological species.

1004-1005†. GENERAL PRINCIPLES OF CHEMISTRY. (5 cr per qtr, §1001-1002, §1003, §1008, §1014, §1031-1032; primarily for non-chemistry majors; prereq placement index of Y or predicted mathematics GPA of 1.90 on ACT or Math 0009 or college course in algebra, high school chemistry. . . high school physics and 4 yrs high school mathematics recommended)
Introduction to chemistry from standpoint of atomic structure; periodic properties of elements and compounds derivable from structural considerations; laws governing behavior of matter, theories of solutions, acids, bases, and equilbrium.

1006. PRINCIPLES OF SOLUTION CHEMISTRY. (4 cr; prereq 1005 or 1032)
The chemistry of selected cations and anions. Spectrophotometric, potentiometric, and chromatographic detection methods. Metal ion studies, including systematics; acid-base principles; influence on the environment; importance in biological systems; formation and stereochemistry of complexes. Lectures and laboratory.

1031-1032†. CHEMICAL PRINCIPLES I AND II. (5 cr per qtr, §1001-1002, §1003, §1004-1005, §1008, §1014; prereq chemistry or chemical engineering major or #, 4 yrs high school mathematics, high school chemistry, placement index of Y or predicted mathematics GPA of 1.90 on ACT or Math 0009 or college course in algebra. . . 1 yr high school physics recommended)
Stoichiometry, development and use of structural concepts, energetics, geometry of molecules, bonding, behavior of gaseous and liquid states. The solid state, theory of solutions, equilibrium, gas and condensed phases, behavior and the nature of the solution process, acids and bases.

3100. QUANTITATIVE ANALYSIS LECTURE. (3 cr, 3100-3101†; for non-chemistry majors; prereq 1005 or 1032)
Introduction to the theory of quantitative chemical analysis.

3101. QUANTITATIVE ANALYSIS LABORATORY. (2 cr, 3100-3101†; prereq 3100 or ¶3100)
Introductory laboratory in quantitative chemical analysis.

3301-3302. ELEMENTARY ORGANIC CHEMISTRY I-II. (4 cr per qtr; prereq 1005 or 1032 or equiv)
Important classes of organic compounds, both aliphatic and aromatic, together with some heterocyclic compounds. Laboratory work includes the preparation of typical substances.

3305. ELEMENTARY ORGANIC CHEMISTRY LABORATORY I. (2 cr; prereq 3301 or ¶3301)

3306. ELEMENTARY ORGANIC CHEMISTRY LABORATORY II. (2 cr; prereq 3302 or ¶3302)

Child Psychology (CPsy)

1301. INTRODUCTORY CHILD PSYCHOLOGY. (4 cr; prereq 5 cr introductory psychology)
Science of child behavior; review of theories and research.

Ecology and Behavioral Biology (EBB)

3004. FUNDAMENTALS OF ECOLOGY. (4 cr; not open to biology majors; prereq Biol 1011, college algebra)
Relationships between organisms and their environment; ecosystem structure and function emphasizing energy flow, biogeochemical cycling and succession; population dynamics; regional biotic communities.

5116. INTRODUCTION TO ANIMAL PARASITOLOGY. (5 cr; prereq Biol 1106 or 3011)
Elementary course dealing with parasitic protozoa, worms, and arthropods and their relation to diseases of humans and animals.

English Composition (Comp)

For the current requirement, check the *College of Liberal Arts Bulletin* or the CLA Pre-Health Sciences Advising Office.

Food Science and Nutrition (FScN)

3602. NUTRITION IN PROFESSIONAL HEALTH CARE. (4 cr, §1602; prereq chemistry, human physiology, pharmacology, pathophysiology, regis in a professional health discipline)
General principles of nutrition in professional health care. Nutrition as a factor in attaining and maintaining health. The role of the health practitioner in nutrition education.

Genetics and Cell Biology (GCB)

3008. THE BIOLOGY OF CANCER. (3 cr; prereq Biol 1011)
Biological aspects of etiology, phylogeny, and cellular processes involved in neoplasia. Growth and differentiation of normal and cancer cells. The history of cancer research.

3011. GENERAL AND COMPARATIVE EMBRYOLOGY. (5 cr, §5011; prereq Biol 1106 or 3011)
Embryological development of vertebrates.

3022. GENETICS. (4 cr; prereq Biol 1011)
Mechanisms of heredity, their implications for biological populations and applications to practical problems.

5015. HISTOLOGY: CELL AND TISSUE ORGANIZATION. (5 cr; prereq Biol 1106 or 3011 plus 4 addtl cr in biological sciences)
Cellular orientation to explore organization of differentiated cells and tissues (epithelia, connective, muscle, and nerve) as they facilitate specialized functions. Combines experience with techniques (phase and fluorescent microscopy, autoradiography, and paraffin sectioning), EM demonstrations, and studies of prepared microscope slides.

Laboratory Medicine and Pathology (LaMP)

3050. PATHOLOGY FOR MORTUARY SCIENCE. (4 cr; prereq human anatomy, microbiology, regis mortuary science)

5170. PATHOPHYSIOLOGY OF DISEASE I. (3 cr; prereq nursing, OT, PT or #)
Understanding of basic pathological disease processes, terminology.

5171. PATHOPHYSIOLOGY OF DISEASE II. (cr ar; prereq 5170)
Diseases by organ system, clinical and laboratory manifestation.

5173. PATHOLOGY AND CLINICAL MEDICINE. (5 cr)
General and system pathology with clinical correlations using audiovisual material and tutorial sessions.

Mathematics (Math)

1111. COLLEGE ALGEBRA AND ANALYTIC GEOMETRY. (5 cr, §1201; prereq plane geometry, 2 yrs high school algebra...or plane geometry, grade of C or better in 0009)
Functions, graphs, quadratic equations, progressions, inequalities, complex numbers, theory of equations, permutations and combinations, probability, systems of equations, determinants, graphing of linear and quadratic equations, conics and standard position, logarithms.

1201. PRE-CALCULUS. (5 cr, §1111; for students who need to review high school higher algebra and trigonometry before taking a calculus sequence; prereq 4 yrs high school math including trigonometry)
Inequalities, analytical geometry; complex numbers, binomial theorem; mathematical induction; functions and graphs; trigonometric, exponential, and logarithmic functions.

Microbiology (MicB)

1101. ELEMENTARY MICROBIOLOGY. (4 cr; prereq regis DH, PT, Mort Sci or #)
Principles of microbiology; a general survey of pathogenic bacteria, molds, protozoa, and viruses; elements of immunity, sanitary analysis of water and milk, disinfectants and sterilants.

5218. IMMUNOLOGY. (3 cr; prereq Biol 5001)
Nature of antigens and antibodies; chemical basis of serologic specificity; qualitative and quantitative aspects of antigen-antibody reactions; theories of antibody production; cellular antigens and blood grouping; nature of complement and its role in immunologic phenomena; mechanisms of hypersensitivity; hypersensitivity-like states and immunologic diseases; transplantation and tumor immunity; host-parasite interactions.

5233. MICROORGANISMS AND DISEASE. (7 cr; prereq 10 cr in chemistry and 5 cr in biological sciences or #)
The nature of microorganisms, immunology, medical bacteriology, virology, mycology, parasitology, and principles of disease control. Laboratory.

Neurology (Neur)

5121. DESCRIPTIVE NEUROLOGY. (2 cr; prereq regis OT or PT)
The central and peripheral nervous system. Correlation of neuroanatomy, neurophysiology, clinical neurology, and pathology of the nervous system.

Pharmacology (Phcl)

1009. PHARMACOLOGY FOR NURSING STUDENTS. (3 cr)

Pharmacy (Phar)

5210. TERMINOLOGY OF THE HEALTH SCIENCES. (2 cr, §HSU 5210)
Survey of the language of the health sciences using a programmed learning format.

Physics (Phys)

1031-1032. INTRODUCTORY PHYSICS: MEASUREMENT AND APPLICATIONS. (4 cr per qtr, §other introductory physics courses; prereq high school algebra and plane geometry)
Lectures and problem sessions. Application of physics emphasized. Primarily for students interested in topics useful in technical areas. 1031: Electricity and magnetism, electric circuits, feedback and control, waves, light, optical instruments. 1032: Mechanics, fluids and gases, heat, random processes, atoms and spectra, nuclei, radioactivity.

1035-1036. INTRODUCTORY PHYSICS LABORATORY. (1 cr per qtr; S-N only; prereq 1031 or ¶1031 for 1035...1032 or ¶1032 for 1036)
Laboratory experiments offered in conjunction with Phys 1031-1032.

Physiology (Phsl)

1002. HUMAN PHYSIOLOGY. (4 cr; prereq 1 qtr biology, 1 qtr chemistry, human anatomy or #)
Introductory survey for allied health sciences.

3051. HUMAN PHYSIOLOGY. (5 cr; primarily for nursing and PT students; prereq 1 yr chemistry, biology)

Psychology (Psy)

1001. GENERAL PSYCHOLOGY. (5 cr)
Introduction to study of human behavior. Prerequisite for all advanced courses in psychology.

3604. INTRODUCTION TO ABNORMAL PSYCHOLOGY. (4 cr, §5604; prereq 1001)
Abnormal psychology. Etiologies of behavioral disorders; available treatments.

Public Health (PubH)

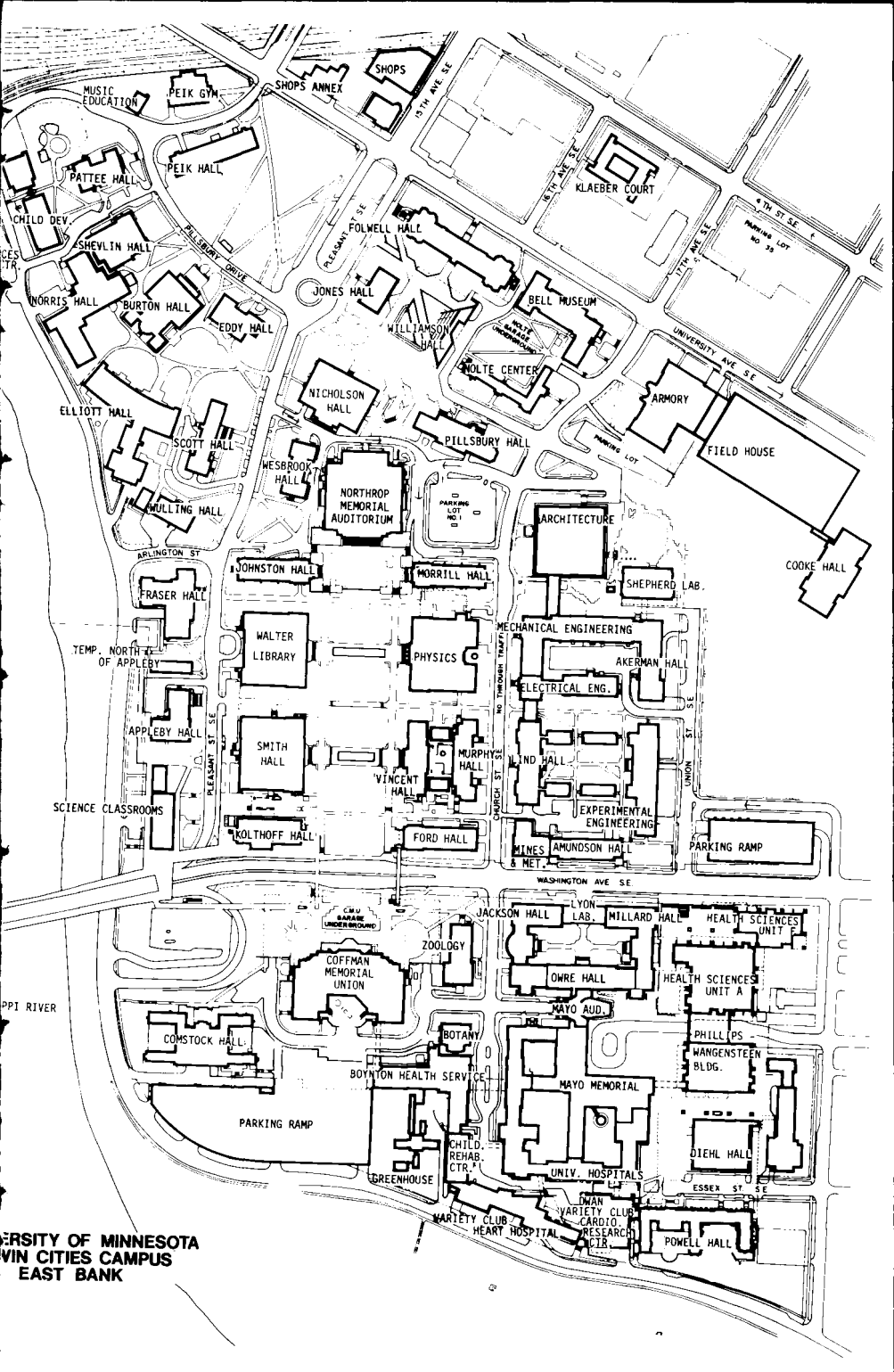
3004. BASIC CONCEPTS IN PERSONAL AND COMMUNITY HEALTH. (5 cr, §3001, §3033, §GC 3114)
Introduction to scientific, sociocultural, and attitudinal aspects of communicable and degenerative diseases, environmental and occupational health hazards, and alcohol and drug problems. Emphasis on role of education in health conservation, disease control, and drug abuse.

5006. INTRODUCTION TO COMMUNITY HEALTH. (5 cr, §5016; prereq nursing student, pharmacy student, other health professional or #)
Lectures, discussions, seminars, and readings on critical and current issues in community health, emphasizing public health programs and controversies.

Sociology (Soc)

1001. INTRODUCTION TO SOCIOLOGY. (4 cr)
The main fields of sociology and current social problems.

INDEX



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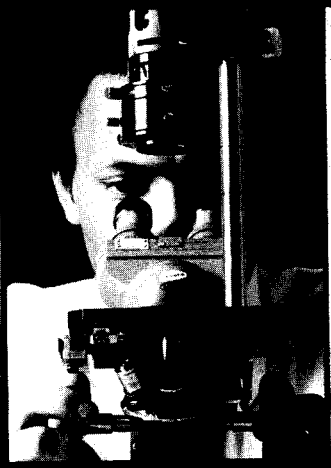


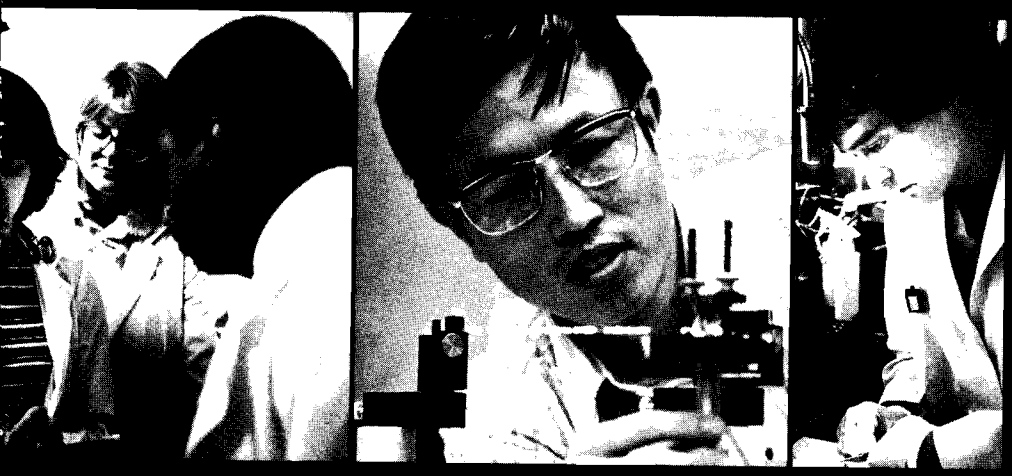

Graduate Programs in the Health Sciences

UNIVERSITY OF MINNESOTA

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Graduate Programs in the Health Sciences

UNIVERSITY OF MINNESOTA

How to Use This Bulletin

Graduate students are responsible for all information contained in this bulletin that is pertinent to graduate study and to their specific field of study.

The General Information section of this bulletin is your official source of information about the policies of the Graduate School and about procedures for earning graduate degrees.

The Fields of Instruction section of this bulletin contains statements of the policies and requirements of the various departments offering graduate degrees and listings of the graduate-level course offerings of these departments.

The rules and regulations detailed in this bulletin are subject to change without notification. Information about changes in requirements and regulations that occur between editions of the bulletin will be disseminated by the Graduate School.

The offices of the Graduate School are located in Johnston Hall.

Services for the Handicapped

There are a number of University offices that provide information or services for the handicapped. The most important of these are: the Rehabilitation Services Office, N-105 Elliott Hall, Minneapolis campus (376-3143); the Division of Vocational Rehabilitation Liaison Office, 7 Morrill Hall, Minneapolis campus (376-2728 TTY or voice); and the Handicapped Resource Office, also in 7 Morrill Hall (376-2727 TTY or voice).

Graduate Programs in the Health Sciences

GENERAL INFORMATION

Purpose and Organization—The central purposes of the Graduate School are the advanced training of men and women in a wide variety of fields and the promotion of research in an atmosphere of freedom of inquiry.

The Graduate School administrative structure includes six policy and review councils, consisting of faculty and students, in the areas of education and psychology; health sciences; language, literature, and arts; physical sciences; plant and animal sciences; and social sciences. These councils, together with an Executive Committee, are responsible for making general policy for the Graduate School. The Executive Committee is composed of the dean of the Graduate School; chairpersons of the policy and review councils, the Graduate Research and Advisory Committee, and the Fellowship Committee; and representatives from the Mayo Graduate School of Medicine, the Duluth Graduate Faculty Committee, the Graduate School administration and staff, and the graduate student body.

PHYSICAL FACILITIES

The University and the University of Minnesota Hospitals own and operate a broad range of clinical and research facilities that are used extensively for the entire spectrum of health sciences educational programs, especially for graduate training and investigation. These facilities, located at the University of Minnesota health sciences center, include the Health Sciences Unit A, Health Sciences Unit F, Phillips-Wangensteen Building, Mayo Memorial complex, Variety Club Heart Hospital, Masonic Cancer Center, Dwan Variety Club Cardiovascular Research Center, Veterans of Foreign Wars Cancer Research Center, and Children's Rehabilitation Center.

Also available for clinical graduate work, and closely affiliated with the University health sciences center in training programs, are the Hennepin County Medical Center and the Veterans Administration Hospital in Minneapolis, the St. Paul-Ramsey Medical Center and the Gillette Children's Hospital in St. Paul, as well as several private community hospitals in the Minneapolis-St. Paul metropolitan area.

In Rochester, facilities, materials, and records at the Mayo Clinic, St. Mary's Hospital and Methodist Hospital are available for use by Mayo Graduate School degree candidates.

LIBRARIES

The biomedical collections are housed in Diehl Hall, located adjacent to the University Hospitals. Also at the disposal of the student are the main University library, the departmental libraries, and the collections of other city and hospital libraries. The medical library of the Mayo Graduate School of Medicine at Rochester consists of more than 226,000 bound volumes and receives some 3,300 medical journals; a general reading room, reading tables in the stacks, and special rooms for study are also available. Current issues and complete files of the most important health science periodicals are available in both Minneapolis and Rochester.

ADMISSION

Any student with a bachelor's degree or its foreign equivalent from a recognized college or university may apply to the dean of the Graduate School for admission. Applicants with the necessary background for their chosen major field, an excellent scholastic record from an approved college or university, and appropriate professional qualifications may be admitted for graduate work on recommendation of the graduate faculty in the proposed major field and approval of the dean of the Graduate School.

The faculty and staff of the Graduate School encourage applications from persons belonging to minority or other groups that have been underrepresented in the student body. The Graduate School is committed to providing equal opportunity to all who seek access to its programs, facilities, and services; establishing fair educational standards and applying them equitably in making decisions about admission and academic standing; and helping to compensate for inequities in society.

University of Minnesota undergraduates who have no more than nine quarter credits or two courses to complete for their bachelor's degree (including both distribution and total credit requirements), if they are admitted, may register in the Graduate School to begin a graduate program while simultaneously completing their baccalaureate work.

Clinical Medical Majors—Entrance to work for advanced degrees in the clinical medical fields is limited to those who have the M.D. degree from an acceptable institution.

Dentistry Majors—Applicants must have a D.D.S. degree from a recognized school of dentistry.

Credentials Examination Fee

The University requires a credentials examination fee of each applicant. Detailed information about the fee is included in the instructions that accompany the Graduate School Application for Admission form.

Test Data

Miller Analogies Test—A graduate-level form of the Miller Analogies Test is required of applicants for the majors in hospital and health care administration, and public health (when emphasis is public health nursing).

Those on or near a college or university campus should contact the student counseling center, testing service, or similar office on that campus to arrange for testing. Those not near a college or university campus should write to the Psychological Corporation, 304 East 45th Street, New York, New York 10017, for a list of testing centers.

Graduate Record Examination (GRE)—Students who submit undergraduate narrative transcripts or transcripts containing "pass-no credit (P-N)," "credit," or other ungraded notations for a substantial number of courses taken during the junior and senior years must submit the results of the GRE aptitude test and, if available, an advanced test that is appropriate for the proposed major in the Graduate School.

The GRE is also often requested by individual major fields. It would be wise, therefore, for applicants to complete this test either in the senior year of undergraduate work or before filing an application for admission.

For information about the test, applicants should write to the Educational Testing Service, Box 955-R, Princeton, New Jersey 08541. Official scores must be sent to the Graduate School office from the testing service.

Test of English as a Foreign Language (TOEFL)—This test is required of all foreign applicants whose native language is not English, except those who will have completed an academic year in residence as a full-time student at a recognized institution of higher learning in the United States prior to entering the University of Minnesota. The Graduate School Application for Admission form includes more detailed information about this requirement.

Educational Council for Foreign Medical Graduates (ECFMG) Examination—Applicants seeking admission to graduate study in clinical medical fields whose medical degrees or qualifications were conferred by medical schools outside the United States, Puerto Rico, or Canada must submit certification by the Educational Council for Foreign Medical Graduates or evidence of a full and unrestricted license to practice medicine issued by a state or other territory under United States jurisdiction that is authorized to license physicians. A passing grade on the Visa Qualifying Exam (VQE) may be required in addition to or in substitution for the above. For information concerning the ECFMG and VQE examinations, applicants should write directly to the Educational Council for Foreign Medical Graduates, 3930 Chestnut Street, Philadelphia, Pennsylvania 19104, U.S.A.

Licensure

Mayo Graduate School students who will be working in any field of clinical medicine for more than one year are required to obtain a Minnesota medical license as soon as they are eligible.

Additional Information

The Graduate School reserves the right to request additional information in any case in which it is believed necessary.

Application Procedure

Requests for application materials must be sent to the Graduate School, 307 Johnston Hall, 101 Pleasant Street S.E., University of Minnesota, Minneapolis, Minnesota 55455, and should specify the applicant's proposed major field, degree objective, and date of entry.

Applicants are encouraged to apply for admission well in advance of the term in which they wish to enter the Graduate School (but no more than one year in advance of the proposed entry date). The Graduate School application, complete with all required materials, must be submitted by the following deadlines:

Fall quarter—August 15
Winter quarter—November 25
Spring quarter—February 25
Summer session, first term—May 15
Summer session, second term—June 15

Deadlines that fall on a holiday or weekend will be extended through the next regular workday. Many major fields have established deadlines earlier than those listed above and also require additional application and supporting materials. It is the applicant's responsibility to obtain information about those deadlines and requirements from the program description in this bulletin and from the director of graduate study for the proposed major.

Applicants seeking admission to clinical medical fields should contact their department directly for instructions about application procedures.

Foreign Applicants

All foreign applicants who have attended universities that issue official, original transcripts of records upon request must submit such credentials. Attested true copies of such records are not accepted. Those foreign applicants who have attended universities that issue original transcripts or mark sheets only once to the student must submit attested or certified true copies of academic records. If the grading system employed by the university is not shown in the credentials, a separate official statement from the university detailing this information is required. If an applicant is uncertain about what documents are required, early inquiry is recommended.

Experience at the University of Minnesota has been that often during the course of the program of study a student has need of a complete set of official credentials covering previous college and university training. Applicants are urged to request two sets of official credentials when preparing their application for admission—one to be submitted for permanent filing in the Graduate School and the other for personal use.

Transient Graduate Students

Students who have registered within the last year in a graduate degree program at another recognized graduate school in the United States and wish to enroll for a summer session or single quarter in the Graduate School of the University of Minnesota to earn credits to apply toward their degree program may be admitted as a transient graduate student. They will not be required to submit a transcript of credits but may ask the dean of their graduate school to complete the Transient Application form (G.S. Form 57) and return it to the Graduate School, 316 Johnston Hall, 101 Pleasant Street S.E., University of Minnesota, Minneapolis, Minnesota 55455.

Under no circumstances will students be permitted to register for more than one quarter or summer session as a transient student. Persons originally registering under this status who wish to apply for regular admission must follow the application procedures outlined above.

Readmission, Change of Major or Degree Objective, or Change of Campus

Requests for readmission, change of major or degree objective, or change of campus should be made on the Change of Status form (G.S. Form 72). This form may be obtained from the Graduate School office, 316 Johnston Hall. Processing of these requests requires a minimum of one month.

Readmission—Persons who have not registered in the Graduate School of the University of Minnesota for two consecutive years will be considered to have withdrawn. Students who subsequently wish to resume graduate work must request readmission on the Change of Status form.

Change of Major or Degree Objective—Students currently enrolled in the Graduate School who intend to change either their major or their degree objective from that originally approved by the Graduate School should request this change on the Change of Status form.

Change of Campus—Students currently enrolled in the Graduate School on one campus who wish to continue their studies on another campus should initiate this request through the Change of Status form. Graduate study is currently available on the Twin Cities campus, on the Duluth campus, and at the Mayo Graduate School of Medicine, Rochester.

ORIENTATION TO THE TWIN CITIES CAMPUS

Information about the resources and services of the University are available to all incoming graduate students. Orientation programs introduce students to University policies and procedures, facilities and services, the Twin Cities community, career workshops (writing résumés, job interviews), financing a dissertation, and social events. Students may obtain a brochure about orientation events in the Graduate School office after registration opens for fall quarter. Fall quarter programs will begin the week prior to the start of classes; some programs continue during the quarter. Winter and spring quarter programs will be held on the Saturday following the first week of classes.

ACADEMIC RANK AND PURSUIT OF A GRADUATE DEGREE

Members of the University of Minnesota staff holding academic appointments above the rank of instructor or research fellow are normally not permitted to complete a graduate degree at the University. If admitted to the Graduate School, they may register for graduate work, and the credits they earn may be presented for transfer to a graduate program at another college or university.

TRANSFER OF CREDITS

For the Master's Degree

Unless otherwise specified in the departmental section, the following rules apply to transfer of credits.

Master's degree students are required by the Graduate School to complete at least 60 percent of the course work for their official degree programs (see section on the Master's Degree, page 13) as registered Graduate School students. With the approval of the adviser and director of graduate study of the major (and the director of graduate study in the minor if the courses are for a designated minor), the transfer of up to 40 percent of the degree course work from any desired combination of the following is permitted:

1. Other recognized graduate schools.
2. Adult special, summer session, and Continuing Education and Extension status at the University of Minnesota.

Individual graduate programs may, at their option, specify a lower percentage of course work for transfer.

The work to be transferred must be graduate level, must have been taken for graduate credit, and must have been taught by faculty members authorized to teach graduate courses. Continuing Education and Extension courses must bear the special CEE transcript entry verifying that they were completed for graduate credit. Credits transferred from other institutions must appear on official graduate school transcripts of the institutions. Credit for courses completed through independent (correspondence) study, and credit for courses completed through extension or special categories at other institutions, may not be transferred.

The transfer of credits is accomplished by the inclusion of the courses on the proposed degree program.

For the Doctoral Degree

In the following cases, transfer of credits is accomplished by inclusion of the courses on the proposed degree program; official transcripts of the work must be attached.

Note: Graduate credit is *not* allowed for courses completed through independent (correspondence) study.

From Adult Special or Summer Special Status—Students admitted to and registered in the Graduate School may transfer to their graduate programs the graduate-level credits earned in their first academic quarter as adult special students, or in their first summer session (both terms in the same calendar year) as summer special students at the University of Minnesota. Such work must be graduate level and must be offered by members of the faculty approved to teach graduate courses, and students must complete the work required of graduate students in the courses.

From Continuing Education and Extension—A maximum of 12 credits of graduate-level work completed in Continuing Education and Extension (CEE) may be transferred to the graduate program. This applies only to credits earned in CEE at the University of Minnesota; graduate-level extension credits earned at other institutions may not be transferred. University extension courses must bear the special CEE transcript entry showing they were completed for graduate credit.

From Other Graduate Institutions—Graduate credit earned at other recognized graduate institutions may be applied to doctoral degrees if credits appear on official graduate school transcripts.

USE OF HUMAN SUBJECTS IN RESEARCH

All Twin Cities campus research that involves the use of human subjects must be reviewed and approved by the University Committee on the Use of Human Subjects in Research. This policy, approved by the University Senate and Board of Regents, applies to both funded and nonfunded faculty and student research. Any individual student research project (e.g., Plan B project, thesis, dissertation) that involves human subjects must be approved by this committee prior to initiation of the research. For additional information, visit or contact the committee office at 1919 University Avenue, St. Paul, Minnesota 55104, telephone 373-9895.

A similar policy prevails at the Mayo Graduate School of Medicine, where the Mayo Foundation Human Studies Committee must review and approve all research involving the use of human subjects.

REGISTRATION[1]

The Graduate School operates on a quarter system, and registration ordinarily begins about six weeks before the opening of the term and closes at the end of the first week of classes. Work is also offered in a variety of fields during two summer terms of five weeks each. For the University calendar and registration information, refer to the University's current *General Information Bulletin* or *Summer Session Bulletin*.

Students must receive notification of admission to the Graduate School before registration is permitted.

[1]The University is preparing to computerize its registration system. The computerized system may be operative as early as spring 1982. The registration procedures and calendar will change at that time.

Registration Requirements—Registration requirements for the various graduate degrees are specified below in the sections on degree requirements (for the master's degree, see page 13; for the doctor's degree, page 15). In addition, the following requirements apply as appropriate.

1. The Graduate School requires that graduate students holding appointments as teaching, research or project assistants, teaching associates, and administrative fellows register each term that an appointment is held. This does not apply to summer terms.
2. All persons appointed under trainee programs must register as full-time students during the tenure of their appointments. Each individual enrolled in a clinical residency or post-M.D. graduate training program sponsored by the University of Minnesota and directed by a clinical department of the Medical School is required to register either as a medical fellow in the Graduate School or as a medical fellow specialist in the Medical School.
3. Students receiving other types of financial aid from the University or other agencies, foreign students with certain types of visas, and students wishing to use various University services and facilities may have to meet specific registration requirements of other agencies or University units; they are responsible for securing information about such requirements from the appropriate offices.

Graduate students need not register for the *sole* purpose of taking final written or oral examinations for the master's degree, or for taking the preliminary written or oral examinations for the doctorate.

Varieties of Registration—There are currently four kinds of registration:

1. *Registration for Course Work*—The maximum number of credits for which a graduate student may register in a single quarter during the academic year is 16; in a single term during the summer session, 10. Exceptions are granted by the Graduate School office only in unusual circumstances.
2. *Thesis-Only Registration*—This type of registration is designed for the convenience of students as a means of registering when they are not taking course work but are required to register for institutional or personal reasons. Eligibility is not confined to students actually working on a thesis (see item 4 below). Students typically using thesis-only registration include those working on Plan A master's theses, teaching or research assistants who are not taking courses but must register as graduate students, and students in the process of changing majors who wish to maintain their registration. Eligible students will need their adviser's signature.
3. *Examination-Only Registration*—This type of registration is open only to doctoral students who have completed language requirements and all course work on their *officially approved* doctoral programs but who have not yet passed their preliminary oral examinations. Examination-only registration must be approved by the Graduate School office and may be used only twice. Eligible students may use this registration as a matter of convenience, but are not required to do so since it is acceptable not to register while studying for the preliminary oral examination. This registration bears a special tuition rate. *Late registration in this category is not allowed.*
4. *Doctoral Candidate (Continuous) Registration*—This option is restricted to doctoral students who have passed their preliminary oral examinations. *It is required* and bears a special tuition rate. Students must begin this registration in the quarter following the successful completion of their preliminary oral examinations. (Eligibility must be established prior to the official opening of the quarter or term in which the student proposes to register in this category.) Doctoral students in their final quarter

of registration are required to register for thesis-only to take the final oral examination. If the student does not graduate in the quarter or term in which the final oral examination is passed, he or she must resume doctoral candidate registration at the special tuition rate.

Changes in Registration—The addition, deletion, or change of a course registration up to midterm requires the approval of only the adviser. Any change between midterm and the last day of classes of a term requires approval of the adviser and the instructor. Students are not permitted to register or to change their registration after the last day of classes of a term.

Registration Holds—The Graduate School student data base is the fundamental component of the Graduate School's registration system. Reminders to students to file official programs and thesis proposals at appropriate times are generated as a part of this system, as are warnings and registration holds when students fail to meet Graduate School and major field standards for scholastic achievement and progress. The system is dependent upon the student's continuous and timely registration each quarter. If a student registers late or not at all, a notice will not be generated. However, this does not absolve the student from responsibility for complying with these requirements.

TUITION AND FEES

For academic year tuition and fees, see the current *General Information Bulletin.* For summer session tuition and fees, see the current *Summer Session Bulletin.*

GRADING SYSTEM

The Graduate School uses two grading systems, A-B-C-D-N and S-N. Except in courses in which grading has been restricted to one system or the other with approval of the Graduate School, students have the option of choosing the system under which they will be graded. Arrangements for the grading system to be used must be made with the instructor *within the first two weeks of the term.* When the University computerizes its registration system (see footnote, page 8), students will be required to declare their chosen grading system at the time of registration. For information about courses in which grading is restricted, students should consult the department offering the course (see also Minimum Grade Requirements below).

Incomplete Grades—Course instructors may, at their discretion, place a time limit for the removal of incomplete grades. The maximum number of credits of incompletes allowable at any given time is established by each department for its majors.

Retaking Courses—The Graduate School discourages the retaking of courses to improve grades. Permission of the course instructor and the major adviser is required. If a course is retaken, all registrations for the course will remain on the student's record.

CREDIT HOUR DEFINITION

The credit hour, as defined by the University of Minnesota Senate, is equivalent to three hours of work by the student per week. In the case of lecture or discussion courses, two hours of outside preparation for each hour of classroom instruction are normally assumed. Other types of courses, such as independent study courses, workshops, clinics, and practicums, are also assigned credit on the basis of three hours of student work per week for each credit. Thus one quarter credit involves three hours of student work per week for 10 weeks, or 30 hours for one quarter credit.

GRIEVANCE PROCEDURES

Academic Freedom and Responsibility

Grievance procedures relating to academic freedom and responsibility are governed by the University Senate statement on Academic Freedom and Responsibility of December 17, 1970, and the Revised Report of the University Appeals Committee on Academic Freedom and Responsibility of April 18, 1974. As a consequence of these policies, each department or program has available a set of operating procedures to deal with both the formal and informal aspects of possible grievance matters; often these procedures are spelled out in a department's or program's handbook for graduate students or are available upon request in the department or program office. Also as a consequence of the two senate policies, each department or program has established a standing committee on grievances to conduct hearings and make recommendations in those cases that reach the formal grievance stage. In general, it is best for graduate students with a potential grievance to seek the advice and assistance of their adviser or director of graduate study and the department or program chairperson. In the event that the nature of the potential grievance precludes such inquiry and discussion, graduate students may wish to seek advice from the Graduate School grievance officer by contacting the Graduate School dean's office. There is a Graduate School Grievance Committee, but its function is essentially limited to hearing appeals from department or program grievance committees.

Sexual Harassment

Policies and procedures pertaining to sexual harassment are governed by the Senate Committee on Faculty Affairs/Senate Consultative Committee Statement on Sexual Harassment of April 16, 1981. As the introduction to the statement notes, sexual harassment undermines the mission of the University and jeopardizes the careers of students, faculty, and staff. The statement defines sexual harassment in this manner:

> Unwelcome sexual advances, requests for sexual favors, and other verbal or physical conduct of a sexual nature constitute sexual harassment when (1) submission to such conduct is made either explicitly or implicitly a term or condition of an individual's employment or academic advancement, (2) submission to or rejection of such conduct by an individual is used as the basis for employment decisions or academic decisions affecting such individual, or (3) such conduct has the purpose or effect of unreasonably interfering with an individual's work or academic performance or creating an intimidating, hostile, or offensive working or academic environment.

Individuals seeking information and guidance in matters involving sexual harassment should contact the Graduate School dean's office or the academic affairs vice president's office. All inquiries will be held in strictest confidence.

STUDENT RECORDS

The Office of Registration, Student Records, and Scheduling of the University maintains and releases the official student transcripts.

For a five-year period from fall 1972 through summer 1977, the official transcript included only positive academic achievements. Courses in which the student received a grade of N (no credit) or a registration symbol of I (incomplete) or W (withdrawal) were recorded on an operational record, which was used only within the University. Beginning in fall 1977, a single record system was again instituted. This record contains grades and registration symbols for all courses for which a student registered beyond the second week of a quarter.

Both transcripts and operational records (for those students who were registered during the period from fall 1972 through summer 1977) may be obtained from the Certification Service, Office of Registration, Student Records, and Scheduling, 155 Williamson Hall. Requests must be made in person or in writing.

Access to Student Educational Records

In accordance with regents' policy on access to student records, information about a student generally may not be released to a third party without the student's permission. The policy also permits students to review their educational records and to challenge the contents of those records.

Some student information—name, address, telephone number, dates of attendance, college and class, major, adviser, and degrees earned—is considered public or directory information. To prevent release of such information outside the University while in attendance at the University, a student must notify the records office on his or her campus.

Students are notified annually of their right to review their educational records. The regents' policy, including a directory of student records, is available for review at the information booth in Williamson Hall, Twin Cities campus/Minneapolis, and at the records offices on other campuses of the University. Questions may be directed to the Office of the Coordinator of Student Support Services, 260E Williamson Hall, telephone (612) 373-2106.

TERMINATION OF GRADUATE STUDENT STATUS

When performance is unsatisfactory in terms of grades or normal progress, as established and promulgated by the graduate faculty in the major field, graduate student status may be terminated. All guidelines stated in this bulletin are minimal requirements, and each program is free to set more specific terms by which progress will be measured for purposes of continuation. Students are encouraged to check with their major departments for complete information about these procedures and requirements.

COUNCIL OF GRADUATE STUDENTS

The Council of Graduate Students (COGS) is the official body that represents all students within the Graduate School. Graduate students in each degree-granting program are entitled to one representative to serve on the council. Through COGS these representatives assimilate, coordinate, and disseminate pertinent information; provide student members for Graduate School and University committees; and deal with problems and issues that affect graduate students. COGS publishes *The Gradletter*, a newsletter distributed to all graduate students through their departments, which attempts to keep students informed of Graduate School and University affairs; the *Handbook for Graduate Students*, which provides useful information about academic life, student services, and the community; and *Housing in the Twin Cities: A Guide for University of Minnesota Students*, which covers both on- and off-campus housing. COGS also sponsors an information and referral service for child care.

The council office is located in 409 Johnston Hall (373-7909). Students with questions, problems, or suggestions should contact the council.

MASTER'S DEGREE

Two Plans for the Master's Degree—The Graduate School offers the master's degree under two plans: Plan A, involving a thesis, and Plan B, which substitutes additional course work and special projects for the thesis. For plans offered in each major, consult the departmental sections of this bulletin.

Registration Requirement for the Nonclinical Health Science Fields—At least 60 percent of the course work for the master's degree must be completed in the Graduate School; individual programs may require a higher percentage.

Registration Requirement for the Clinical Medical Fields—For the master's degree in a clinical subject with designated field, (e.g., M.S. in medicine), a minimum of three calendar years are required. For the master's degree in a clinical subject without a designated field, a minimum of two calendar years are required. Registration requirements for each clinical medical field appear in the departmental sections of this bulletin.

Time Requirement for the Master's Degree—All requirements for the master's degree must be completed within seven years. The seven-year period begins with the earliest work included on the official degree program, including any transfer work applied. The graduate faculty in a specific program may set more stringent time requirements.

Official Program for the Degree in the Nonclinical Health Science Fields—After completing 15 credits, and ordinarily not later than the third quarter of registration (the second year for the longer programs), students must file with the Graduate School an official proposed program for the degree. The program form is available in the Graduate School office. On it students list all course work, completed and proposed, that will be offered in fulfillment of degree requirements; this includes transfer work (see section on Transfer of Credits). If a foreign language is required, the one to be offered is specified. If the degree is being completed under Plan A, students also include the thesis proposal. *On the basis of this program, the members of students' final examining committees, and the thesis readers for Plan A, are appointed.*

The minimum credit requirements for the program are specified below under the two plans for the degree.

Official Program for the Degree in the Clinical Medical Fields—Students are encouraged to submit their programs and thesis titles before the end of the second year of registration. Approval by the program faculty and the Graduate School indicates a student's admission to candidacy for the degree. Students should include on the official program forms only the minimum number of credits actually required for the award of the degree, rather than the full complement of credits taken during the course of the residency program.

Changes in the Approved Program—Once approved, the program must be fulfilled in every detail to meet graduation requirements. Alterations in the program that are found necessary or desirable should be requested by General Petition form.

Minimum Grade Requirements—The minimum grade point average required by the Graduate School for courses included on the official program for any master's degree is 2.80 (on a 4.00 scale). Grades of A, B, C, and S are acceptable, but grades of S are not calculated in the grade point average. *At least two-thirds of the credits taken in this Graduate School and included on any degree program must be taken under the A-N system.*

Individual major fields may set higher grade requirements, and students should be familiar with special requirements in their major field.

Language Requirement for the Master's Degree—See the appropriate major field section to determine the language requirement, if any, for a specific field. The Graduate

School monitors the fulfillment of language study when a department requires a language. Information about how to demonstrate proficiency and the conditions under which proficiency will be recorded on the official transcript is available from the Graduate School office.

Clearance for Graduation—To qualify for graduation in a particular quarter, students must complete the examination and all other requirements, including submission of required forms and fees, by a specified date (*approximately* five weeks before the graduation date). The deadlines are published in the quarterly *Class Schedule*; they are also available from the Graduate School office.

Plan A: Master's Degree With Thesis

Minimum Credit Requirements—Students must complete a minimum of 20 quarter credits in the major field and a minimum of 8 quarter credits in one or more related fields outside the major to constitute the minimum of 28 quarter credits required for the degree.

Students who wish to complete a designated minor (which will be certified on the transcript—unlike the related fields option, which will not be) must complete 9 or more quarter credits in a single field (making the minimum requirement for a Plan A degree with a designated minor 29 credits). A designated minor must be approved by the director of graduate study in the field.

For majors in clinical branches the minor or related fields must be in nonclinical fields that will serve as a basis for the proposed clinical specialization. This fundamental work should be concentrated in the first part of the program. Familiarity with those phases of the nonclinical disciplines essential to proficiency in the major specialty is required.

At the Mayo Graduate School of Medicine, candidates must complete a minimum of six months of work (or its equivalent) in a related laboratory field for the minor.

Master's Thesis—The thesis title is submitted for approval as a part of the student's official degree program. Instructions for preparation of the thesis should be obtained from the Graduate School office.

Registration of the Thesis With the Graduate School—A complete, clean, typed draft of the thesis, with title page, table of contents, and bibliography, must be registered in the Graduate School office at least nine weeks before the commencement at which a candidate expects to receive the degree. The draft will be returned to the candidate immediately, together with the readers' report form and other forms necessary for graduation. When the signed thesis report form is returned, a final examination report form will be issued to the student. The members of the student's examining committee may, at their discretion, require a 30-day interval between the registration of the thesis and the date of the final examination.

Thesis Readers—The thesis will be read by a committee of at least three members, as appointed by the dean of the Graduate School on recommendation of the program faculty at the time of approval of the student's official degree program. The examining committee will ordinarily include at least two representatives from the major field and one from the minor or a related field. *This committee must be unanimous* in certifying that the thesis is ready for defense.

Thesis Binding—Two copies of the thesis must be bound and submitted to the Graduate School office. For the deadline for a particular commencement, consult the Graduate School office or the quarterly *Class Schedule*.

Final Examinations—Candidates for the master's degree, Plan A, must pass a final oral examination; a final written examination may also be required at the discretion of the graduate faculty in the major field.

The final examination covers the major and minor or related fields and may include any work fundamental thereto. This examination is coordinated by the chairperson of the student's examining committee. *A majority vote* of the committee, all members present and voting, is required for a pass. Results are reported to the Graduate School on a Final Examination Report form, which is issued to the student when the form certifying that the thesis is ready for defense is submitted. In case of failure, unanimous consent of the examining committee is required to retake the examination.

Plan B: Master's Degree Without Thesis

Minimum Credit Requirements—Students must complete a minimum of 20 quarter credits in the major field and a minimum of 8 quarter credits in one or more related fields outside the major. The balance of the credits to be completed to meet the 44-credit minimum requirement for the degree will be chosen by agreement between the adviser and the student, subject to whatever restrictions the graduate faculty in the major field may place on that choice.

Students who wish to complete a designated minor (which will be certified on the transcript—unlike the related fields option, which will not be), must complete 9 or more quarter credits in a single field. A designated minor must be approved by the director of graduate study in the field.

Plan B Project(s)—Students must demonstrate familiarity with the tools of research or scholarship in their field, the ability to work independently, and the ability to present the results of their investigation effectively, by completing at least one Plan B project. The graduate faculty in each major field may require as many as three such projects.

The Plan B project(s) should involve approximately three nominal weeks or 120 hours of work. The graduate faculty in each major field specifies both the nature and extent of the options available to satisfy this requirement and whether the requirement is to be satisfied in conjunction with or independent of the courses in the student's program.

Final Examinations—The Graduate School requires a final examination for Plan B candidates; this may be written, oral, or both, at the discretion of the graduate faculty in the major field. A committee of at least three examiners is appointed by the dean of the Graduate School upon recommendation of the program faculty at the time of the approval of the official degree program. The committee will include one member from outside the major field. Students will make the Plan B project(s) available to the examining committee for its review. *A majority vote* of the committee, all members present and voting, is required to pass . The vote is reported to the Graduate School on a form the student must obtain from the Graduate School office before taking the examination. In the case of failure, unanimous consent of the examining committee is required to retake the master's final examination.

DOCTOR OF PHILOSOPHY DEGREE

The doctor of philosophy degree is granted chiefly in recognition of high attainment and ability in a special subject field as demonstrated, first, by passing the required examinations covering both a candidate's general and special subject fields and, second, by the preparation of a thesis.

Registration Requirement for the Doctoral Degree—Registration in the Graduate School for at least nine quarters is required. Students who transfer work for the degree from other graduate schools must spend the first two years or the last year in residence at the University of Minnesota. There is also a continuous registration requirement (see below).

Official Program for the Degree—Students are expected to file their official programs for the degree in the second year of their programs; the specific quarter depends upon individual major field requirements. Students should submit their programs at least two quarters prior to the term in which they plan to take the preliminary oral examination. The program form is available in the Graduate School office. It should contain all course work, completed and proposed, that will be offered in fulfillment of degree requirements in the major field and in the minor or supporting program fields; this includes transfer work (see section on Transfer of Credits). Students should also specify the foreign languages, if any, that will be offered in fulfillment of the departmental requirement. *On the basis of the program, the members of the students' preliminary oral examining committees will be appointed.*

Minimum Grade Requirements—Grades of A, B, C, and S are acceptable. *At least two-thirds of the credits completed in this Graduate School and included on any degree program must be taken under the A-N system.*

Major Work—There is no minimum number of credits specified for the major by the Graduate School, and frequently, depending upon previous preparation, the length of programs for individual students, even within the same field, may vary considerably. In the clinical fields, the Ph.D. is always a degree with designation. In pathology (offered only at Mayo), the Ph.D. may be earned either with or without designation.

Minor or Supporting Program Work—At least 18 quarter credits must be offered in the minor or supporting program. With a traditional minor, this work will be in a single field related to the major. If the student is offering a supporting program, it must be composed of a coherent pattern of courses possibly embracing several disciplines. Students electing the supporting program option may be required to take written preliminary examinations in the fields included, but will not be expected to have competency in each of the fields comparable to that of a person with a traditional minor.

For majors in clinical branches, the minor or supporting programs must be in nonclinical fields that will serve as a basis for the proposed clinical specialization. This fundamental work should be concentrated in the first part of the program. Familiarity with those phases of the nonclinical disciplines essential to proficiency in the major specialty is required.

Language Requirement—See the major field section to determine the language requirement, if any, for a specific program. The Graduate School monitors the fulfillment of language study when a department requires a language. Information about how to demonstrate proficiency and the conditions under which proficiency will be recorded on the official transcript is available from the Graduate School office.

Changes in the Approved Program—Once approved, the program must be fulfilled in every detail to meet graduation requirements. Changes that are found necessary or desirable should be requested by General Petition form.

Official Doctoral Candidacy—Candidacy is established when students have passed the preliminary oral examination. The Graduate School issues a Candidate in Philosophy certificate to all students passing the preliminary oral examination without reservation.

Time Limit for Earning the Doctoral Degree and Continuous Registration Requirement—To maintain candidacy for the degree, effective with the quarter immediately following the passing of the preliminary oral examination for the doctorate, students must:

1. Complete all requirements and receive the degree within a maximum of five calendar years. This time period begins the quarter following the passing of the preliminary oral examination. Petitions for extension of the time limit must be

submitted before the expiration of the five years. Failure to receive the Ph.D. within the five-year period may necessitate retaking the preliminary oral examination. The graduate faculty in the degree programs may establish more stringent time limitations.

2. Register continuously and pay candidacy fees during the academic year (fall, winter, spring quarters) until the doctorate is awarded. Registration for the first or second summer term (or both) may be made in lieu of registration for the academic quarter or quarters immediately following. (See Doctoral Candidate Registration, page 9.)
3. In the term in which the final oral examination is taken, register and pay the doctoral candidate final quarter fee.

Written and Preliminary Oral Examinations

Written Examination—A written examination in the major subject will be given by the graduate faculty in the major field, generally before the preliminary oral examination is given. This examination covers all work completed in the major field and may include any work fundamental thereto. It is the student's responsibility to ensure that the results of the written examination are reported immediately to the Graduate School office. A form for this purpose, available in the Graduate School office, requires the signatures of the adviser and the director of graduate study in the major field.

Preliminary Oral Examination—After completing a substantial part of the course work and passing the preliminary written examination (except in those instances where the written follows the oral), but prior to writing the dissertation, the student will take the preliminary oral examination. The examination will be administered by the committee appointed by the dean, upon recommendation of the program faculty, on the basis of the official doctoral program.

Preliminary Oral Examining Committee—The examining committee will include a minimum of five members, three from the field of the major and two from the field of the minor or supporting program.

Changes in the Preliminary Oral Examining Committee—Substitutions on the examining committee, which may be necessitated, for example, by the departure or absence on leave of a faculty member, must be requested by the adviser or the director of graduate study through the Graduate School office *well in advance* of the examination.

Scheduling the Preliminary Oral Examination—It is the responsibility of the student to schedule the preliminary oral with the examiners *and with the Graduate School office* at least one week in advance. *In certain of the health science areas, however, one month's notice must be given.* The Graduate School must have on file a report that the student passed the preliminary written examination before the oral examination can be scheduled.

The Graduate School issues the report form for the preliminary oral examination to the student's adviser, and informs both the student and the adviser if the language requirement or course work on the official program has not yet been completed. The preliminary oral will be authorized in spite of such deficiencies, but deficiencies must be completed before the final oral may be scheduled.

Preliminary oral examinations will not be scheduled from the beginning of the second term of summer session to the opening of the fall quarter, unless the members of the assigned committee can be assembled without substitution.

Preliminary Oral Examination Content and Outcome—The preliminary oral examination covers the major field, the minor field or supporting program, and any work fundamental thereto, including possible plans for thesis research.

The outcome of the examination, with all committee members present and voting, will be recorded in one of three possible ways: passed, passed with reservations, or failed. The voting proportions necessary for these decisions are as follows: if the committee consists of five members, a favorable verdict for passing will consist of either a unanimous vote or a vote of 4-1; if the committee consists of six members, a favorable vote for passing will consist of a unanimous vote or a vote of 5-1 or 4-2; and if the committee consists of seven members, a favorable vote for passing will consist of a unanimous vote or a vote of 6-1 or 5-2. Candidates who do not earn committee votes in these proportions will fail. If, in order to achieve the *minimum* number of votes to reach a verdict of pass, any vote of pass with reservations is included, then the outcome is recorded as a pass with reservations.

Reporting the Results—The examining committee will report the results of the preliminary oral to the Graduate School office, stating clearly, in the case of a pass with reservations, what additional requirements must be met by a candidate to remove the reservations. The removal of the reservations must be reported in writing to the Graduate School with signatures of those members of the examining committee who voted to pass the candidate with reservations.

Failure of the Examination—Students failing the preliminary oral (a) may be allowed, on unanimous recommendation of the examining committee, to retake the examination or (b) may be excluded from candidacy for the degree. In no case may the reexamination take place until at least one full academic quarter has passed. No more than two preliminary oral examinations are allowed.

Ph.D. Thesis

The thesis must demonstrate originality and ability for independent investigation, and the results of the research must constitute a contribution to knowledge. The thesis must exhibit mastery of the literature of the subject and familiarity with the sources. The subject matter must be presented with a satisfactory degree of literary skill.

Thesis Proposal—At the time of submission of the doctoral program, or not later than the first quarter after passing the preliminary oral examination, students must file the thesis title form and statement in the Graduate School office. The thesis title form is available from that office. The statement, approximately 250 words in length, must describe the research to be undertaken and the methods to be employed in carrying it out.

On the basis of the thesis proposal, the thesis readers and other members of the final oral examining committee will be appointed by the dean of the Graduate School upon recommendation of the program faculty.

Changes in the Thesis Title—Changes in the wording of the thesis title may be made without special approval, but changes should not be made after the thesis is registered (see Registration of the Thesis With the Graduate School below). If the substance of the proposal should change markedly in the course of the research, a revised proposal should be submitted immediately.

Language of the Thesis—Theses must normally be written in English, the language of instruction. However, in some fields of study, a language other than English may be used provided there is a scholarly reason for its use. When the thesis statement is submitted, a justification for the use of a foreign language, signed by the adviser and director of graduate study, should be attached. The statement should attest that the recommended thesis readers (including the outside reader) are qualified to read, comprehend, and criticize a thesis in the foreign language.

Preparation of the Thesis—Instructions for the preparation of the thesis should be obtained from the Graduate School office.

Registration of the Thesis With the Graduate School—A complete, clean, typed draft of the thesis, with title page, table of contents, and bibliography, must be registered in the Graduate School office and copies distributed to the thesis committee at least nine weeks before the commencement at which a candidate expects to receive the degree. This draft will be returned to the student immediately, together with the report form on which readers certify that the thesis is ready for defense. Other forms required for graduation are issued at the same time.

To allow readers ample time to evaluate the thesis, 30 days should be allowed between the registration of the thesis and the planned date of the final oral examination. However, the final oral examination may be scheduled anytime (allowing at least one week before the examination) after the signed readers' report form has been submitted to the Graduate School office.

Thesis Readers—The thesis must be read by a committee of not less than three members (see Thesis Proposal above). As a rule, the student's major adviser will be the chairperson of the committee, and the field of the minor or the supporting program will be represented by at least one committee member. The committee *must be unanimous* in certifying that the thesis is ready for defense before the final oral examination will be authorized by the Graduate School (see Registration of the Thesis With the Graduate School above).

Final Oral Examination

To be eligible for the final oral examination, the student must have completed all work on the official doctoral program including the language requirement (if any) and must have passed both the written and oral preliminary examinations. In addition, the thesis must have been certified by the readers as ready for defense. The examination will be conducted by a committee appointed at the time of approval of the thesis proposal and consisting minimally of the adviser, two additional readers, and two other members of the graduate faculty. The examination covers the candidate's thesis and special field of study. It will not exceed three hours.

Scheduling the Final Oral With the Graduate School—*The examination must be scheduled by the student one week in advance* (see Clearance for Graduation below) *with the committee and with the Graduate School. In certain of the health science fields the faculty requires 30 days' notice of the date of the final oral.*

When the examination is scheduled the file will be checked to determine that the student is clear to take the examination as stipulated above, and, if so, the report form for the final oral examination will be forwarded to the adviser.

If time permits, the date of the examination will be publicly announced, and any member of the graduate faculty may attend.

The final oral cannot be scheduled during the same quarter in which the student takes the preliminary oral, or from the beginning of the second summer term to the opening of the fall quarter unless the committee members can be assembled without substitution.

Changes in the Final Oral Examining Committee—See Changes in the Preliminary Oral Examining Committee, page 17.

Reporting the Results of the Final Oral—Upon completion of the examination, a formal vote of the committee is taken. *To be recommended for the award of the doctoral degree, candidates must receive a vote with no more than one dissenting member of the total examining committee.* The results must be reported to the Graduate School on the Final Oral Examination Report form.

Clearance for Graduation—In addition to the forms mentioned above, students must complete all other requirements including the filing of forms issued when the thesis was registered. *All forms and fees must be submitted by the published deadlines.* For the deadline for a particular commencement, students should consult the Memorandum for Candidates issued at the time the thesis was registered.

COMMITTEE ON INSTITUTIONAL COOPERATION TRAVELING SCHOLAR PROGRAM

The University of Minnesota is a participant in the Traveling Scholar Program for graduate students enrolled in CIC (Committee on Institutional Cooperation) institutions. The 11 participating universities are the members of the "Big Ten" and the University of Chicago.

The program enables doctoral students at any CIC university to take advantage of educational opportunities—specialized courses, unique library collections, unusual laboratories—at any other CIC university without change in registration or increase in fees. Students may take advantage of these educational opportunities for three quarters or two semesters.

Graduate students interested in graduate course offerings not available at the University of Minnesota should confer first with their major department and major adviser concerning which of the cooperating institutions to select for program enrichment and diversification. Information regarding the procedure to be followed in seeking admission to another CIC institution is available at the Graduate School Fellowship Office.

FELLOWSHIPS AND ASSISTANTSHIPS

Graduate Fellowships

Graduate fellowships, awards based on academic merit, are available to new and currently enrolled and registered graduate students at the University of Minnesota. The Graduate School Fellowship Office, 422 Johnston Hall, administers several fellowship programs; a number of individual academic departments also administer field-specific fellowships. Entering students must file their fellowship application with their prospective graduate program. Currently enrolled students should consult with staff at the Graduate School Fellowship Office and at their graduate program office for current information about fellowship opportunities.

The following policies govern all awards administered by the Graduate School:

Duplicate Awards—Recipients of a Graduate School award may not hold concurrently a second Graduate School fellowship, scholarship, or similar award (with the exception of a Tuition Scholarship, which may be held with a non-tuition-granting fellowship); nor may they hold concurrently a similar award from a non-Graduate-School source (e.g., a National Science Foundation Fellowship) that duplicates the benefits of the Graduate School award.

Supplementation—Recipients of any Graduate School administered award of $3,500 or more plus tuition may hold concurrently a graduate assistantship of up to 25 percent time during any quarter. Likewise, recipients may hold concurrently a non-Graduate-School administered fellowship, scholarship, or similar award, provided it does not exceed the equivalent of a 25 percent time assistantship during any quarter (if the supplementation exceeds that amount, the Graduate School administered award will be reduced accordingly).

Terms of Award—Graduate School awards may not be renewed, used for summer study, or deferred for use in another academic year.

Medical Fellowships

Medical fellowships at Minneapolis are full-time appointments with stipends determined annually by the Council of Clinical Sciences of the Medical School, in most cases including payment of tuition and fees. Students interested in medical fellowships should contact their major departments for additional information.

Graduate Assistantships

Graduate assistantships are academic appointments that are reserved for graduate students. Appointments to teaching assistantships or associateships, research or project assistantships, or administrative fellow positions are offered through various departments. A teaching assistant or associate helps in teaching students in a specified course or courses under the general supervision of the academic staff. A research or project assistant carries out activities connected with research studies that are assigned by the supporting department or principal research investigator. An administrative fellow performs duties of a specialized nature connected with administration.

To be eligible to hold one of these appointments, a student must have been admitted to the Graduate School and must be registered in the Graduate School each quarter the appointment is held during the academic year. Registration during the summer session is not required. A student may be appointed for 75 percent time or less per academic quarter (students may work up to 100 percent time during the summer).

Students registered in the Graduate School and holding appointments as teaching assistants, research assistants, project assistants, teaching associates, and administrative fellows at 25 percent time or more pay resident tuition rates. This same privilege applies to members of their immediate families. These same privileges have been extended beyond the term of qualifying appointment, subject to the following rules:

1. The qualifying appointee must have held one of the above appointments for a minimum of three academic quarters, at 25 percent time or more, in one of the specific positions listed above. Two summer terms will count as one academic-year quarter.
2. After completion of the qualifying three quarters of appointment, on a quarter-for-quarter basis up to a maximum of six quarters of use, the use of the privileges is extended.
3. The entitlement of the qualifying appointee and members of her or his immediate family to this privilege will not extend beyond three years from the termination of the last or most recent qualifying appointment.

Each department sets its own application deadline. Unless otherwise noted, applications must be received by February 15 for appointments for the ensuing academic year; applications received at other times will be considered for any available vacancies. All applications for staff appointments should be returned to the head of the appropriate department — *not to the Graduate School.*

Application forms and further information may be obtained from either the head of the department offering the appointment or from the Graduate Assistants Information and Assistance Office. This office provides ombudsman services for and handles problems and information requests of graduate assistants. An administrative arm of the Office of the Vice President for Academic Affairs, it distributes *The Handbook for Graduate Assistants* and the *Grapevine*, a quarterly newsletter for graduate assistants. Copies of the handbook and further information about the assistantship program at the University may be obtained from the Graduate Assistants Information and Assistance Office, 411 Johnston Hall, 101 Pleasant Street S.E., University of Minnesota, Minneapolis, Minnesota 55455 (376-3644).

General College Assistantships

Graduate students are eligible to apply for teaching assistantships and associateships in the General College. The General College program consists of general education courses in such areas as natural science, social science, communications, and the humanities, as well as specialized courses in such career areas as business, health, and law. Graduate students may also be interested in the college teaching/counseling internship program for graduate assistants. Graduate assistants in the General College may participate in the internship program and earn credit (but not degree credit) by registering for GC 5001: General College Teaching Internship or GC 5002: General College Counseling Internship the first year, and GC 5005: General College Supervised Teaching Projects or GC 5006: General College Supervised Counseling Projects the second year. Inquiries about assistantships and the teaching/counseling internship program should be directed to the Office of the Dean, General College, 106 Nicholson Hall, 216 Pillsbury Drive S.E., University of Minnesota, Minneapolis, Minnesota 55455.

COUNCIL OF GRADUATE SCHOOLS IN THE UNITED STATES

Resolution Regarding Graduate Scholars, Fellows, Trainees, and Assistants

Acceptance of an offer of financial aid (such as a graduate scholarship, fellowship, traineeship, or assistantship) for the next academic year by an enrolled or prospective graduate student completes an agreement that both student and graduate school expect to honor. When a student accepts an offer before April 15 and subsequently desires to withdraw, the student may submit a written resignation for the appointment at any time through April 15. However, an acceptance given or left in force after April 15 commits the student not to accept another offer without first obtaining a written release from the institution to which a commitment was made. Similarly, an offer made by an institution after April 15 is conditional on presentation by the student of a written release from any previously accepted offer. It is further agreed by the institutions and organizations subscribing to this resolution that a copy of the resolution should accompany every scholarship, fellowship, traineeship, and assistantship offer.

MISCELLANEOUS ASSISTANCE

Honorary Fellowships

Professors or other eminent scholars who are not candidates for degrees and who desire temporarily the privileges of using library or research facilities or attending seminars of the University may, upon recommendation of the dean of the Graduate School and approval of the president of the University, be appointed honorary fellows without stipend.

Honorary fellows are not required to pay any fees but are responsible for the cost of unusually expensive supplies or equipment.

Postdoctoral Associates

Postdoctoral fellows who are not already entitled to normal faculty privileges can be appointed by the Graduate School as postdoctoral associates. These positions carry no

stipend from the Graduate School but do entitle associates to use University facilities, to purchase athletic tickets at the staff rate, and, if they have private health insurance, to join the Health Service plan for outpatient care.

Nomination forms for this appointment are available from the Office of the Dean, Graduate School, 321 Johnston Hall.

Visiting Scholar Program

Regular faculty members of Minnesota public and private colleges who are not studying for advanced degrees and who desire temporarily the privileges of using library facilities or attending day school courses (as auditors) can be appointed by the Graduate School as visiting scholars without stipend. Interested individuals will be granted appointments on receipt of a letter to the dean of the Graduate School from their academic dean or vice president verifying their faculty status and field of specialization.

Possibilities for Employment

The Student Employment Service of the University, 6 Morrill Hall, 100 Church Street S.E., University of Minnesota, Minneapolis, Minnesota 55455, maintains a file of available jobs on the Twin Cities campus and in the Twin Cities area for students and their spouses. Further information about this service may be found in the *General Information Bulletin*.

Students in the Graduate School may also find it advantageous to explore through other channels the possibility of part-time employment in the Twin Cities area in business, professional, or other fields.

Services of the Office of Student Financial Aid

Financial assistance available to graduate students from the Office of Student Financial Aid includes University Trust Fund loans, National Direct Student Loans, federally insured loans, and the work-study program.

The United States Steel Foundation Loan Fund also offers loans to graduate students. Contact the Graduate Fellowship Office, 422 Johnston Hall, for details.

Awards from these loan programs are made on the basis of financial need to students who maintain at least a half-time or equivalent enrollment status. Applications may be obtained from the Office of Student Financial Aid, 210 Fraser Hall, 106 Pleasant Street S.E., University of Minnesota, Minneapolis, Minnesota 55455 (376-8686).

Financial aid counselors are available to assist students in planning their finances and to advise them on financial problems. Students are encouraged to contact the Office of Financial Aid, either in person or by mail, if they need financial assistance.

Services for International Students

Counseling and advising services are provided for students from other countries by the International Student Adviser's Office. Assistance is given to those seeking information about English language requirements; visa requirements; federal, state, and local regulations governing foreign nationals; and educational, social, personal, and financial matters. This office also sponsors orientation programs and, when necessary, directs students to the Program in English as a Second Language for English language instruction. All foreign students are invited to address inquiries to the International Student Adviser's Office, 717 East River Road, University of Minnesota, Minneapolis, Minnesota 55455.

Placement of Graduate Students

Graduate students seeking placement in college, university, or other positions may obtain aid and counsel from advisers and departments, from the deans of various colleges of the University, and through the placement section of the Education Career Development Office. This last office receives reports of vacancies for college teaching positions in all fields as well as for positions in counseling, administration, and research. The address of the Education Career Development Office is 1425 University Avenue S.E., University of Minnesota, Minneapolis, Minnesota 55414 (373-2266).

Health science graduate students seeking employment in fields other than teaching may wish to contact the National Health Professions Placement Network, 3014 University Avenue S.E., P.O. Box 14767, University of Minnesota, Minneapolis, Minnesota 55414 (373-0082).

Housing Facilities

Students interested in living in a residence hall on campus should contact the Housing Office in Comstock Hall. Students interested in off-campus housing in Minneapolis or St. Paul should contact the Housing Office on the appropriate campus for listings of apartments, duplexes, houses, sleeping rooms, shared units, and sublets. Information about temporary housing, public housing, living costs, transportation, and day care centers in the Twin Cities area is also available at the housing offices. On the Twin Cities campus/Minneapolis, the Housing Office is located in Comstock Hall (373-7542). On the Twin Cities campus/St. Paul, the Housing Office is located in Coffey Hall (373-0822).

Army and Air Force ROTC Programs

Students in the Graduate School may pursue a two-year Army or Air Force ROTC program. To be eligible, applicants must have six quarters of academic work remaining after successful completion of a required six-week summer encampment. Transportation, meals, lodging, and a salary are furnished during the summer encampment. All ROTC textbooks and uniforms are loaned to the student without cost, and all cadets receive a tax-free stipend of $100 per month during the school year. Students successfully completing the program are commissioned as second lieutenants in the Army or Air Force. Further information is available in the University's *Army, Navy, Air Force ROTC Bulletin.*

GRADUATE MAJOR FIELDS AND DEGREES OFFERED IN THE HEALTH SCIENCES

Twin Cities Campus

MAJOR	DEGREES OFFERED
Anatomy	M.S., Ph.D.
Anesthesiology	M.S., M.S.Anes.
Biochemistry[1]	M.S., Ph.D.
Biomedical Engineering	Ph.D.
Biometry and Health Information Systems[1]	M.S., Ph.D.
Biophysical Sciences[1]	M.S., Ph.D.
Dentistry	M.S.
Dermatology	M.S., M.S.Derm., Ph.D.Derm.
Environmental Health[1]	M.S., Ph.D.
Epidemiology[1]	M.S., Ph.D.
Experimental Surgery	M.S.Exp.Surg.
Family Planning Administration	M.S.
Family Practice and Community Health	M.S.
History of Medicine and Biological Sciences	Ph.D.
Hospital and Health Care Administration	Ph.D.
Hospital Pharmacy	M.S.
Laboratory Medicine	M.S.
Medical Microbiology	M.S.
Medical Technology	M.S.
Medicinal Chemistry	M.S., Ph.D.
Medicine	M.S., M.S.Med., Ph.D.Med.
Microbiology[1]	M.S., Ph.D.
Neurology	M.S., M.S.Neur., Ph.D.Neur.
Neurosurgery	M.S., M.S.Nsurg., Ph.D.Nsurg.
Nursing	M.S.
Nutrition[1]	M.S., Ph.D.
Obstetrics and Gynecology	M.S., M.S.Obs.&Gyn., Ph.D.Obs.&Gyn.
Ophthalmology	M.S., M.S. Ophthal.
Oral Biology	M.S., Ph.D.
Orthopedic Surgery	M.S., M.S. Orth.Surg, Ph.D.Orth.Surg.
Otolaryngology	M.S., M.S.Otol., Ph.D.Otol.
Pathobiology	Ph.D.
Pediatrics	M.S., M.S.Ped., Ph.D.Ped.
Pharmaceutics	M.S., Ph.D.
Pharmacognosy	M.S., Ph.D.
Pharmacology[1]	M.S., Ph.D.
Physical Medicine and Rehabilitation	M.S., M.S.P.M&Rehab., Ph.D.P.M.&Rehab.
Physical Therapy	M.S.
Physiological Hygiene	M.S., Ph.D.
Physiology	M.S., Ph.D.
Psychiatry	M.S.Psychiat., Ph.D.Psychiat.
Public Health	M.S.
Radiology	M.S., M.S.Rad., Ph.D.Rad.
Social and Administrative Pharmacy	M.S., Ph.D.
Surgery	M.S.Surg., Ph.D.Surg.
Therapeutic Radiology	M.S.Ther.Rad.
Urology	M.S., M.S.Urol., Ph.D.Urol.

[1]Includes participation of one or more faculty members located at the Mayo Graduate School of Medicine.

Mayo Graduate School of Medicine, Rochester

MAJOR	DEGREES OFFERED
Anesthesiology	M.S., M.S.Anes.
Biophysical Sciences[1]	M.S.
Dentistry	M.S.D.
Dermatology	M.S., M.S. Derm., Ph.D.Derm.
Medical Microbiology	M.S.
Medicine	M.S., M.S.Med., Ph.D.Med.
Neurology	M.S., M.S.Neur., Ph.D.Neur.
Neurosurgery	M.S., M.S.Nsurg., Ph.D.Nsurg.
Obstetrics and Gynecology	M.S., M.S.Obs.&Gyn., Ph.D.Obs.&Gyn.
Ophthalmology	M.S., M.S.Ophthal., Ph.D.Ophthal.
Orthopedic Surgery	M.S., M.S.Orth.Surg., Ph.D.Orth.Surg.
Otolaryngology	M.S., M.S.Otol., Ph.D.Otol.
Pathology	M.S., M.S.Path., Ph.D., Ph.D.Path.
Pediatrics	M.S., M.S.Ped., Ph.D.Ped.
Physical Medicine and Rehabilitation	M.S., M.S.P.M.&Rehab., Ph.D.P.M.&Rehab.
Physiology	M.S., Ph.D.
Plastic Surgery	M.S., M.S.Plas.Surg.
Proctology	M.S., M.S.Proct.
Psychiatry	M.S., M.S.Psychiat., Ph.D.Psychiat.
Radiology	M.S., M.S.Rad., Ph.D.Rad.
Surgery	M.S., M.S.Surg., Ph.D.Surg.
Urology	M.S., M.S.Urol., Ph.D.Urol.

[1]Includes participation of one or more faculty members located on the Twin Cities campus.

FIELDS OF INSTRUCTION

For information about course listings and course symbols, see the inside back cover of this bulletin.

ANATOMY (Anat)

OFFERED AT MINNEAPOLIS

Professor

David W. Hamilton, Ph.D., *head, director of graduate study*
G. Eric Bauer, Ph.D.
Anna-Mary Carpenter, M.D., Ph.D.
Padmakar K. Dixit, Ph.D.
Stanley L. Erlandsen, Ph.D.
Carl B. Heggestad, M.D., Ph.D.
Judson D. Sheridan, Ph.D.
Morris Smithberg, Ph.D.
R. Dorothy Sundberg, M.D., Ph.D.

Associate Professor

Robert P. Elde, Ph.D.
Orion D. Hegre, Ph.D.
Jonathan A. Parsons, Ph.D.
Donald W. Robertson, Ph.D.
Robert L. Sorenson, Ph.D.

Assistant Professor

Matthew L. Bjerknes, Ph.D.
Glenn J. Giesler, Ph.D.
Paul C. Letourneau, Ph.D.
Donald C. Quick, Ph.D.
Virginia S. Seybold, Ph.D.

Degrees offered include the Ph.D; a few candidates for the M.S. degree are accepted only under special circumstances and under Plan A. Consult the director of graduate study before applying.

Prerequisites—Prerequisite work for a major or minor in the field of anatomy includes nine credits of general biology.

Departmental applications for admission must be filed in addition to those required by the Graduate School; they can be obtained from the director of graduate study. The departmental application must be returned to the Department of Anatomy, 4-135 Jackson Hall, 321 Church Street S.E., University of Minnesota, Minneapolis, Minnesota 55455.

Major and Minor, for the Ph.D.—All majors in anatomy must have had or must take the basic 8000-level courses in anatomy (embryology, gross anatomy, histology, and human neuroanatomy). Majors in clinical subjects who desire a minor in anatomy must have had, as prerequisites, the courses in anatomy usually required of medical students, including Anat 5100, 5103, 5106, and 5111.

Language Requirement—For the master's degree, none. For the Ph.D. degree, reading knowledge of one language—French, German, Italian, Spanish, or Russian. Other requirements may be specified at the discretion of the adviser.

5102. HUMAN EVOLUTIONARY BIOLOGY. (Cr ar; prereq #) Suzman
Examination of human origins and phylogeny, fossil evidence of human evolution. Geochronological, paleoecological, functional, and comparative anatomical issues.

5105. DENTAL MICROSCOPIC ANATOMY. (8 cr; prereq #) Bauer and staff
Structure of cells, tissues, and organs of the human body.

5108. GROSS ANATOMY FOR DENTAL STUDENTS. (7 cr; prereq #) Bauer and staff
Lectures and dissection; thorax, extremities; abdomen and pelvis.

5109. GROSS ANATOMY FOR DENTAL STUDENTS. (7 cr; prereq #) Sorenson and staff
Lectures and dissection; head and neck.

5110. NEUROSCIENCE FOR DENTAL STUDENTS. (4 cr; prereq ¶Phsl 5100, regis dentistry fr or #) Elde and staff
Introduction to structure and function of central nervous system. Correlation between morphology and physiology emphasized.

5121. FUNCTIONAL MORPHOLOGY. (4 cr; prereq knowledge of gross human or animal anatomy, #) Suzman and staff
Fundamentals of static and dynamic characteristics of bone, muscles, joints, and the circulatory system. Applications of these to bioengineering, orthopedics, physical therapy and rehabilitation, human and vertebrate paleontology, veterinary biology, and mammalogy.

5122. PRIMATE ANATOMY. (3 cr; prereq 5100, 5101, 5102, 5108, 5109, 5121 ... Anth 3386, 3387 or 5920, #) Suzman
Research and dissection projects in primate anatomy with emphasis on biomechanical and evolutionary problems.

5127. PROBLEMS IN MODERN DEVELOPMENTAL BIOLOGY. (2 cr; prereq 5106 or #) Hegre and staff
Fundamental principles of vertebrate developmental biology from fertilization through establishment of tissue and organs. Focus on the cellular processes involved. Emphasis varies.

5190. ADVANCED ANATOMY. (2 cr; prereq regis med, 5103) Staff
Teaching methods, supervision of student's original research, or combination of both.

5211. BIOLOGY OF NERVE CELLS. (3 or 4 cr; prereq GCB 5049 and any of the following: Phsl 3053, 3056, 5103, 5104, 5111, GCB 5114, VB 5312 or #) Quick and staff
Anatomical basis of nerve cell function with emphasis on excitable membranes, interactions among neurons and other cells, and current topics and technology.

5301. SURGICAL ANATOMY FOR ORAL SURGEONS. (5 cr; prereq participation in the oral surgery residency program) Robertson and oral surgery staff
Detailed examination of normal and variant anatomy encountered in various surgical procedures; step-by-step analysis of procedures and underlying rationale. Performance of selected procedures in the laboratory required.

5304. HEAD AND NECK ANATOMY FOR MEDICAL/DENTAL RESIDENTS. (5 cr; prereq participation in a residency program within the medical or dental school) Robertson and staff
Detailed examination of head and neck anatomy from the gross morphological, functional, developmental, and radiographic aspects, with emphasis on areas of interest by specialty. Laboratory participation is required.

5765-5766. HEMATOLOGY. (4 cr per qtr; prereq 5103 or Zool 5066 or #) Sundberg
Blood and blood-forming organs; blood and bone marrow from standpoint of diagnosis and prognosis.

5767. SEMINAR: HEMATOLOGY. (1 cr; prereq 5766) Sundberg

8101. ADVANCED GROSS HUMAN ANATOMY. (3 cr; prereq ¶5100, grad student with #) Parsons and staff
Detailed dissection and discussion of human gross anatomy to provide in-depth understanding of the three-dimensional structure of the human body.

8104. ADVANCED HISTOLOGY. (2 cr; prereq ¶5103, grad student with #) Sheridan and staff
Organization of basic tissues and of organs using the light microscope and electron microscope. Literature analysis.

8111. HUMAN NEUROANATOMY. (4 cr; prereq #) Smithberg and staff
Structure and function of nervous system including organs of special sense.

8114. ORAL ANATOMY AND EMBRYOLOGY. (1 cr; prereq #) Bevis
Lectures reviewing anatomy and embryology of the oral cavity as well as adjacent head and neck structures. Emphasis on growth, development, and cephalometric landmarks.

8115. ADVANCED DENTAL MICROSCOPIC ANATOMY. (3 cr; prereq #) Bevis
Microscopic structure of cells, tissue, and organs related to dentistry. Demonstrations and laboratory exercises with electron microscope and associated technics.

8116. ADVANCED DENTAL HISTOLOGY. (1 cr; prereq 8115 and #) Bevis
Complete review of the literature on collagen breakdown and renewal, bone healing, and related dental topics. Lecture only.

8135. BIOLOGICAL ELECTRON MICROSCOPY: TECHNICS. (1-5 cr; prereq #; offered 1981-82 and alt yrs) Erlandsen
Introduction to principles and technics of electron microscopy. Laboratory emphasis on acquisition of skills in tissue preparation, photography, use of electron microscope, and ancillary equipment.

8136. BIOLOGICAL ELECTRON MICROSCOPY: TECHNICS. (1-5 cr; prereq #; offered 1981-82 and alt yrs) Erlandsen
Specialized ultrastructural technics and their application to biologic problems. Laboratory emphasis on high resolution microscopy and use of scanning electron microscope.

8137. BIOLOGICAL ELECTRON MICROSCOPY: INTERPRETATION. (1-5 cr; prereq ¶5103, ¶8135-8136, and #; offered 1981-82 and alt yrs) Erlandsen
Structure and function of cell organelles. Individual projects using advanced technics for both transmission and scanning electron microscopy.

8141. NEUROANATOMICAL METHODS. (2 cr; prereq #) Elde
Introduction to contemporary morphological technics applicable to investigation of the nervous system. Theoretical basis of these technics as well as practical aspects related to their use. Laboratory experience with selected technics.

8153, 8154, 8155, 8156. ADVANCED ANATOMY. (2-6 cr per qtr; prereq #) Bauer, Bjerknes, Carpenter, Dixit, Elde, Erlandsen, Giesler, Hamilton, Heggestad, Hegre, Letourneau, Parsons, Quick, Robertson, Seybold, Sheridan, Smithberg, Sorenson, Sundberg
Cytochemistry, embryology, gross anatomy, hematology, histology, neurology, or experimental morphology

8161-8162-8163. METHODS IN ANATOMICAL RESEARCH. (2 cr per qtr; primarily for 1st-yr grad students; prereq 5100 or #; offered 1982-83 and alt yrs) Bauer and staff
Introduction to instrumentation, technics, and experimental approaches in fields of cell physiology, microchemistry, radioautography, quantitative histochemistry, tissue culture, etc.

8166. SEMINAR: CYTOLOGICAL ASPECTS OF PROTEIN SYNTHESIS AND SECRETION. (3 cr; prereq 5100 or #; offered winter 1982 and alt yrs) Bauer
Protein synthesis, storage, and secretion in mammalian tissues, with emphasis on hormone production. Correlation of structure and function of subcellular organelles and current ideas on regulation of synthesis and secretion.

8201, 8202, 8203, 8204. RESEARCH IN ANATOMY. (2-10 cr per qtr; prereq #) Bauer, Bjerknes, Carpenter, Dixit, Elde, Erlandsen, Giesler, Hamilton, Heggestad, Hegre, Letourneau, Parsons, Quick, Robertson, Seybold, Sheridan, Smithberg, Sorenson, Sundberg
Cytochemistry, embryology, gross anatomy, histology, hematology, or neurology. Special facilities offered to graduate students in clinical departments for work on problems in applied anatomy.

8205, 8206, 8207. SEMINAR: ANATOMY. (1 cr per qtr; prereq #) Hamilton
Reviews of current literature and discussion of research work being carried on in the department.

ANATOMY

OFFERED AT ROCHESTER[1]

Professor
Frederick W. L. Kerr, M.D.
Richard K. Winkelmann, M.D., Ph.D.

Associate Professor
Bruce W. Pearson, M.D.
Duane K. Rorie, M.D., Ph.D.

In cooperation with other departments at the Mayo Graduate School of Medicine, there is opportunity for study and research leading to a minor in anatomy.

M 5801. GROSS HUMAN ANATOMY. (3 cr; prereq #) Rorie
Dissection of human body and discussion in small groups to understand relationships and the clinical importance of selected areas.

M 8851f,s. ANATOMY FOR GENERAL SURGEONS. (3 cr) Staff
Fundamental anatomical facts and relations, especially of the neck and trunk; details of special surgical interest, not generally acquired in undergraduate anatomy, studied in lectures, discussions, and by dissection.

M 8852f,s. SURGICAL ANATOMY OF HEAD AND NECK. (3 cr; prereq grad student in surgical field) Pearson
Cadaver dissection and lecture demonstration. Only those taking laboratory will receive credit.

M 8854. CLINICAL NEUROSCIENCE. (4 cr) Kerr
Ultrastructure of the nervous system.

M 8855s. ORTHOPEDIC ANATOMY. (1 cr) Staff
Lectures and laboratory work on the limbs and back.

ANESTHESIOLOGY (Anes)

OFFERED AT MINNEAPOLIS

Professor
Joseph J. Buckley, M.D., M.S., *head*
John R. Gordon, M.D., M.S.

Associate Professor
James F. Cumming, M.D., Ph.D.
Edward C. Hanisch, Jr., M.D.
Ji-Chia Liao, M.D., Ph.D.

Graduate work in anesthesiology offers a number of fellows superior training with opportunity for large clinical experience and investigative work in all types of general and regional anesthesia.

In addition, work in cooperation with other departments is available. The standards of the certifying specialty boards must be fully met.

Master's Degree—The M.S. degree is offered in anesthesiology under Plan A, with the major in anesthesiology and the minor in one of the laboratory sciences.

[1]Enrollment in these courses is limited.

8265f,w,s,su. GENERAL ANESTHESIA. (12 cr)
Instruction and experience in general anesthesia.

8266f,w,s,su. REGIONAL ANESTHESIA. (4 cr)
Observation, instruction, and administration of all types of local, regional, and spinal anesthesia.

8267f,w,s,su. PRE- AND POST-ANESTHETIC EVALUATION. (2 cr)
Selection of proper anesthetic agent and technique, premedication, and observation of recovery from anesthesia.

8268f,w,s,su. SEMINAR: ANESTHESIOLOGY. (2 cr)
Review of literature, report of case problems, and discussion of research work in progress within the department.

8269f,w,s,su. RESEARCH IN ANESTHESIA. (Cr ar)
Anesthesia problems in experimental laboratory or in hospital.

It is recommended that fellows in anesthesiology also register for courses in other departments selected from the following offerings:

MdBc 5053. PROBLEMS IN BIOCHEMISTRY

MdBc 5100. BIOCHEMISTRY

MdBc 8150. SEMINAR: BIOCHEMISTRY

Med 8202. CLINICAL CONFERENCE

Phcl 5109. PHARMACOLOGICAL PROBLEMS

Phcl 8203. RESEARCH IN PHARMACOLOGY

PubH 5450. BIOMETRY I

PubH 5451. BIOMETRY LABORATORY I

ANESTHESIOLOGY

OFFERED AT ROCHESTER

Professor

Alan D. Sessler, M.D., *chairman*
Gerald A. Gronert, M.D.
John D. Michenfelder, M.D.
Kai Rehder, M.D.
Sait Tarhan, M.D.
Russell A. Van Dyke, Ph.D.

Associate Professor

Roy F. Cucchiara, M.D.
Edward P. Didier, M.D.
Allan B. Gould, Jr., M.D., M.S.
Virginia B. Hartridge, M.D.
Paul F. Leonard, M.D.
Harold M. Marsh, M.B.B.S.
Joseph M. Messick, Jr., M.D., M.S.
Duane K. Rorie, M.D., Ph.D.
Jonn H. Tinker, M.D.
Josef K. Wang, M.D.
Roger D. White, M.D.

Assistant Professor

Thomas J. Knopp, B.A.
Lawrence B. Perry, M.D.
Norbert Schnelle, M.D., M.S.

Graduate training in anesthesiology at the Mayo Graduate School of Medicine combines practical training with opportunity for an advanced degree. The educational program fulfills all training requirements of both Plan 1 and Plan 2 of the American Board of Anesthesiology. Residents have the opportunity to earn the M.S. degree in anesthesiology (or a related science) with a minor in physiology, biophysics, biochemistry, or pharmacology.

The didactic program includes a weekly departmental conference, a series of core lectures by consultants, and daily respiratory and intensive care conferences. Morbidity and mortality conferences and presentations of scientific data from ongoing departmental research are held biweekly.

Residents who are particularly interested in study of certain specialized fields of anesthesiology may arrange to concentrate on those areas. Excellent opportunities are available to qualified individuals for advanced training in cardiovascular anesthesiology, neuroanesthesiology, respiratory intensive care, and research related to anesthesia.

M 5850. BASIC PRINCIPLES FOR ANESTHETIC PRACTICE. (3 cr) Cucchiara, Gould, Marsh, Rorie, Sessler, Tinker, Van Dyke

Basic physical, physiological, pharmacological, and medical principles relevant to the clinical practice of anesthesiology.

M 8851f,w,s,su. INTRODUCTION TO GENERAL ANESTHESIA. (6 cr) Gould, Hartridge, Leonard, Perry, Schnelle, Sessler, Tarhan

Observation and instruction in all types of general anesthesia and simple regional anesthesia, administration under supervision, and responsible administration.

M 8852f,w,s,su. ADVANCED TECHNIQUES IN ANESTHESIA. (6 cr) Didier, Gould, Gronert, Marsh, Messick, Michenfelder, Perry, Sessler, Tarhan, Tinker, White

Anesthesia for pediatric surgery, cardiovascular surgery, neurosurgery, ENT and ophthalmological surgery, and obstetrics including general and advanced regional techniques, respiratory intensive care.

M 8853f,w,s,su. ANESTHESIA AS APPLIED TO ALL TYPES OF ORAL SURGERY. (6 cr) Gould, Perry, and staff

M 8854f,w,s,su. NEUROSURGICAL ANESTHESIA. (6 cr; prereq 2 yrs basic clinical anesthesia training) Cucchiara, Gronert, Messick, Michenfelder, and staff

Twelve months of experience with increasing responsibility. Intensive clinical experience. Several months available for work in related fields: neuroanatomy, neuropathology, neurophysiology, electroencephalography, electromyography, and intensive care.

M 8855f,w,s,su. CARDIOVASCULAR ANESTHESIA. (6 cr; prereq 2 yrs basic clinical anesthesia background) Tarhan, Tinker, White

Twelve months devoted to anesthesia for patients undergoing surgery for cardiovascular disease. Increasing responsibility for patient care as experience warrants. Several months devoted to studies in related fields: cardiac catheterization, pulmonary and cardiovascular physiology, association with clinical research problems in cardiovascular surgical field. Extensive experience in management of cardiopulmonary bypass patients.

M 8856f,w,s,su. RESPIRATORY INTENSIVE CARE. (6 cr; prereq 2 yrs approved residency in allied clinical field) Didier, Marsh

Twelve or 24 months of training in all phases of management of patients with respiratory problems, including mechanical ventilation, respiratory physiology, pulmonary function evaluation, and general intensive care. Experience in the function of hospital respiratory therapy service; participation in directing a respiratory intensive care unit, and instruction and direction of respiratory paramedical personnel.

M 8890. RESEARCH IN ANESTHESIOLOGY. (6 cr) Gronert, Knopp, Michenfelder, Rehder, Rorie, Tinker, Van Dyke

BIOCHEMISTRY

OFFERED AT MINNEAPOLIS AND ST. PAUL

Graduate training leading to the M.S. and Ph.D. degrees in biochemistry is offered in each of two biochemistry departments, one in the College of Biological Sciences and the other in the Medical School. The two departmental programs are closely coordinated through an interdepartmental committee, and, except for minor differences in detail, the graduate program in biochemistry can be considered to be a single entity.

Prerequisites—Applicants are screened by a single, interdepartmental admissions committee. For major work, candidates must have completed courses in analytical, organic, and physical chemistry equivalent to those contained in an American Chemical Society approved curriculum. In addition, students are required to have completed at least one year of college physics, mathematics through integral calculus, and one year of biology (general, botany, zoology, microbiology, and genetics). Students may be permitted to make up deficiencies in these requirements during the course of completing their graduate programs. Candidates for the master's degree in biochemistry and those seeking a Ph.D. degree with a minor in biochemistry may be admitted with less rigorous requirements. While most admissions will be for fall quarter, applications are also invited for admission in other terms. Applications must include GRE scores (verbal, quantitative, analytical, and, preferably, advanced test in chemistry or biology).

Master's Degree—Offered only under Plan A. The student must satisfactorily complete one year of general biochemistry courses (5751-5752-5753 and laboratory courses) plus two advanced biochemistry courses, participate in seminars, and take nine credits of graduate-level courses in a minor field of study. A final oral examination covering the student's research and other topics in biochemistry will be given.

Ph.D. Degree—In addition to the examination and thesis requirements of the Graduate School, completion of the core biochemistry courses (5751-5752-5753) or their equivalent is required, accompanied by an appropriate laboratory program. Additional advanced courses in chemistry, biochemistry, and biology are also required. With the approval of the adviser, courses in various fields of mathematics, physics, agricultural sciences, and medical sciences may be included as part of the major course of study. Students must participate in the graduate seminar programs of their respective departments.

The Ph.D. degree also requires a minor field of study that may be chosen from biophysics, botany, cell biology, chemistry, genetics, microbiology, physiology, plant physiology, zoology, or other suitable fields, or a supporting program generally composed of more than one discipline. Approximately 20 credits of course work are required for a supporting program. The number of credits in the minor program is established by the minor department or program.

Language Requirement—There is no language requirement for either the M.S. or Ph.D. degree; however, competency obtained at the high school or undergraduate level in a language is highly desirable.

Minor in Biochemistry—The requirements for a minor in biochemistry include a basic biochemistry sequence (5751-5752-5753 is recommended; MdBc 5100[1] or Biol 5001, BioC 5002 is also accepted) with laboratory, and advanced courses in biochemistry to total approximately 20 credits. A minimum of two quarters of physical chemistry (Chem 5520-5521, 5533-5534, 5534-5535, or their equivalent) are also required, but will not be counted as part of the 20 credits.

Note—Graduate study in biochemistry is also offered at the Mayo Graduate School of Medicine of the University of Minnesota in Rochester, Minnesota. The requirements outlined above also apply to this program. Students usually spend three quarters in residence on the Twin Cities campus.

Biochemistry (BioC)

(College of Biological Sciences)

Regents' Professor

Stanley Dagley, D.Sc.

Professor

Victor A. Bloomfield, Ph.D., *head*
Peter J. Chapman, Ph.D., *associate director of graduate study*
John E. Gander, Ph.D.
Robert L. Glass, Ph.D.
LaVell M. Henderson, Ph.D.
Robert Jenness, Ph.D.
Samuel Kirkwood, Ph.D.
Irvin E. Liener, Ph.D.
Rex E. Lovrien, Ph.D.
Kenneth G. Mann, Ph.D.[2]
Eckard Muenck, Ph.D.[3]
Gary L. Nelsestuen, Ph.D.
Palmer Rogers, Ph.D.[4]
Hermann Schlenk, Ph.D.[5]
Ulysses S. Seal, Ph.D.[6]
Huber R. Warner, Ph.D.
Finn Wold, Ph.D.
John M. Wood, Ph.D.[3]
Clare K. Woodward, Ph.D.

Associate Professor

John S. Anderson, Ph.D.
James A. Fuchs, Ph.D.
Gary R. Gray, Ph.D.[7]
Thomas Guilfoyle, Ph.D.[8]
Charles Louis, Ph.D.[9]

Assistant Professor

Joachim Messing, Ph.D.
Janet Schottel, Ph.D.

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[1]Offered on the Medical School calendar, which is different from the regular University calendar. Fall classes may start as much as one month ahead of other courses.

[2]Member of Mayo Clinic, Rochester

[3]Member of Gray Freshwater Biological Institute

[4]Primary appointment in Department of Microbiology

[5]Member of the Hormel Institute staff

[6]Member of Veterans Administration Hospital staff

[7]Primary appointment in Department of Chemistry

[8]Primary appointment in Department of Botany

[9]Primary appointment in Department of Veterinary Biology

Biol 5001f,w,s,su. BIOCHEMISTRY. (4 cr; prereq Biol 1011, 12 cr organic chemistry)
Biochemistry and biophysics of cells: enzyme catalysis, cellular constituents, and cellular regulatory mechanisms.

5002w,s. BIOCHEMISTRY TOPICS. (3 cr; prereq Biol 3021 or 5001)
Topics not covered in Biol 5001. Biol 5001, BioC 5002 constitute a 2-quarter sequence for undergraduate and graduate students lacking physical chemistry and serve as a prerequisite for certain advanced courses.

5025f,w,s. LABORATORY IN BIOCHEMISTRY. (2 cr; prereq Biol 3021 or 5001 or ¶Biol 5001)
Discussion of techniques and problem-solving approaches. Illustrated with laboratory experiments and demonstrations.

5271f. VITAMINS. (3 cr; prereq 5753, 5002 or #; offered 1981-82 and alt yrs)
Lectures and assigned readings on biochemistry of vitamins and their physiological action.

5522f. PHYSICAL BIOCHEMISTRY OF SOLUTIONS. (4 cr, §Chem 5522; prereq 2 qtrs physical chemistry...Biol 3021 or 5001 desirable)
Physical chemistry of equilibrium and transport of phenomena in solution, with application to biochemical systems. Macromolecular solutions and phase transitions, protein polymerization, micelle formation, sedimentation equilibrium and velocity, translational and rotational diffusion, viscosity.

5523w. PHYSICAL BIOCHEMISTRY: STRUCTURE AND INTERMOLECULAR FORCES. (4 cr, §Chem 5523; prereq 2 qtrs physical chemistry...Biol 5001 desirable)
Methods of structure determination of biological macromolecules. Scattering and diffraction, optical and magnetic resonance spectroscopy. Application to proteins, nucleic acids, and synthetic analogs.

5524s. PHYSICAL BIOCHEMISTRY: DYNAMICS. (4 cr, §Chem 5524; prereq 2 qtrs physical chemistry...Biol 5001 desirable)
Application of thermodynamics, statistical mechanics, and chemical kinetics; solvent effect, structure-function relation.

5744f. BIOCHEMISTRY LABORATORY: THEORY AND PRACTICE. (4 cr; prereq lab work in analytical and organic chemistry, #)
Principal techniques of biochemistry experimental work; instrumentation and methods for isolation and characterization of proteins, lipids, and carbohydrates. Chromatography, electrophoresis, spectrophotometry, potentiometry, and fluorimetry.

5751f-5752w-5753s. GENERAL BIOCHEMISTRY. (4 cr per qtr, §MdBc 5751-5752-5753; prereq 3 qtrs organic chemistry, 2 qtrs physical chemistry, 1 qtr biochemistry or #)
Structure, function, metabolism, and metabolic regulation of components in biological systems.

5950f,w,s. SPECIAL TOPICS. (1-5 cr; prereq #, △)

5970. DIRECTED STUDIES. (1-3 cr; prereq #, △) Staff
Offered to enable students to make up certain deficiencies in background course work.

8094. RESEARCH AND LITERATURE REPORTS. (1 cr) Staff
Consideration of current developments in biochemistry.

8194. GRADUATE SEMINAR. (1 cr; prereq △) Staff
Reports on recent developments in biochemistry and on research projects in department.

8211s. CARBOHYDRATES. (2 cr; prereq 5002 or 5753 or #; offered 1981-82 and alt yrs)
Lectures and assigned readings on composition, structure, chemical and physical properties, and biochemical functions of carbohydrates.

8221s. ENZYMES. (3 cr; prereq 5753 or #; offered 1981-82 and alt yrs)
Lectures and assigned readings on nature and function of enzymes.

8225s. TRACER TECHNIQUES. (1 or 3 cr; prereq 5002 or 5753 and 5744 or MdBc 5750, #)
Laboratory work on application of radioisotopes to study of metabolic processes.

8231. LIPIDS. (3 cr, §MdBc 8215; prereq 5002 or 5753 or #; offered 1981-82 and alt yrs)
Lectures and assigned readings on composition, structure, chemical and physical properties, and biochemical functions of fats and fat-like compounds.

8250. SPECIAL TOPICS IN BIOCHEMISTRY. (1-3 cr; prereq 5002) Staff
Lectures and discussions varying from quarter to quarter according to staff availability and needs of department.

8260. ADVANCED PHYSICAL BIOCHEMISTRY. (2 cr per qtr [may be repeated for cr 1 or more qtrs in different topic areas]; prereq 5523 and #) Bloomfield, Muenck
Theory, methodology, and applications of biophysical chemistry techniques: fluorescence spectroscopy.

8261w. PROTEINS. (3 cr; prereq 5002 or 5753 or #; offered 1982-83 and alt yrs)
Lectures and assigned readings on composition, structure, chemical and physical properties, and biochemical functions of proteins and amino acids.

8290f,w,s,su. CURRENT RESEARCH TECHNIQUES. (1-3 cr per qtr; prereq grad major in biochemistry, #)
Research projects in biochemistry, each one to be carried out in the research laboratory of an individual staff member. Satisfies all or part of the laboratory requirements for Ph.D. degree.

8501s. BIOCHEMICAL EVOLUTION. (3 cr; prereq 5002 or 5753 or #; offered 1982-83 and alt yrs) Jenness, Kirkwood
Lectures and assigned readings on prebiotic chemical evolution and Darwinian evolution of important biochemical molecules and processes.

8746s. BIOCHEMISTRY LABORATORY PROJECTS AND ADVANCED TECHNIQUES. (1-3 cr; prereq 5744 or MdBc 5750... 5753 or ¶5753 or 5002)
Special projects and techniques in isolation and characterization of biomolecules, ligand binding, enzyme kinetics, hydrodynamics, spectrophotometry, chromatography, and electrophoresis. Each project or exercise corresponds to 1 credit.

8764f. METALLOPROTEINS: STRUCTURE AND FUNCTION. (3 cr; prereq 5002 or 5753 or #... 5523 recommended; offered 1982-83 and alt yrs) Muenck, Wood
Magnetic resonance techniques. Transition metals in enzyme-catalyzed reactions.

8990. GRADUATE RESEARCH. (2-5 cr; prereq #) Staff
Research problems in various fields in biochemistry represented by staff interests.

Biochemistry (MdBc)

(Medical School)

Professor

Henricus P.C. Hogenkamp, Ph.D., *head*
Charles W. Carr, Ph.D., *associate head*
James W. Bodley, Ph.D., *director of graduate study*
Mary E. Dempsey, Ph.D.
Ivan D. Frantz, M.D.[1]
Helmut R. Gutmann, Ph.D.[2]
Ralph T. Holman, Ph.D.[3]
James F. Koerner, Ph.D.
Andreas Rosenberg, Ph.D.[4]
Leon Singer, Ph.D.[5]
Frank Ungar, Ph.D.
John F. Van Pilsum, Ph.D.

Adjunct Professor

Quenton T. Smith, Ph.D.[5]

Associate Professor

Ronald D. Edstrom, Ph.D.
Ernest D. Gray, Ph.D.
James B. Howard, Ph.D.
Theodore R. Oegema, Ph.D.
Robert J. Roon, Ph.D.

Assistant Professor

Kenneth W. Adolph, Ph.D.
John D. Lipscomb, Ph.D.
Dennis M. Livingston, Ph.D.
David D. Thomas, Ph.D.
Howard C. Towle, Ph.D.

5053f,w,s. PROBLEMS IN BIOCHEMISTRY. (Cr ar [may be repeated 1 or more qtrs for cr]; prereq 5753 or 5100) Bodley and staff

5100. BIOCHEMISTRY. (10 cr; primarily for medical students; prereq physics and organic chemistry) Ungar and staff

5522f. PHYSICAL BIOCHEMISTRY OF SOLUTIONS. (4 cr, §BioC 5522, §Chem 5522; prereq 2 qtrs physical chemistry... Biol 5001 or Biol 3021 desirable) Staff
Physical chemistry of equilibrium and transport phenomena in solution, with application to biochemical systems. Macromolecular solutions, phase transitions, cooperative binding, conformational transitions, protein polymerization, micelle formation, sedimentation equilibrium and velocity, translational and rotational diffusion, viscosity.

5523w. PHYSICAL BIOCHEMISTRY: STRUCTURE AND INTRAMOLECULAR FORCES. (4 cr, §BioC 5523, §Chem 5523; prereq 5522 or 2 qtrs physical chemistry plus #... some biochemistry desirable) Staff
Scattering and diffraction, optical and magnetic resonance spectroscopy. Application to proteins, nucleic acids, and synthetic analogs.

5524s. BIOPHYSICAL CHEMISTRY: DYNAMICS. (4 cr, §BioC 5524, §Chem 5524; prereq 2 qtrs of physical chemistry... BioC 5741, 5002 or equiv desirable) Staff
Application of thermodynamics, statistical mechanics, and chemical kinetics to biological systems. Theoretical and experimental enzyme kinetics, solvent effect, structure-function relation.

5750s. BIOCHEMISTRY LABORATORY. (4 cr; prereq 5751) Adolph, Livingston
General experimental techniques and biochemical instrumentation; individual projects.

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[1]Primary appointment in the Department of Medicine

[2]Located at Minneapolis Veterans Hospital

[3]Member of the Hormel Institute staff

[4]Primary appointment in Department of Laboratory Medicine and Pathology

[5]Primary appointment in School of Dentistry

5751f-5752w-5753s. GENERAL BIOCHEMISTRY. (4 cr per qtr, §BioC 5751-5752-5753; prereq Biol 5001 or equiv, 2 qtrs physical chemistry) Staff
Comprehensive discussion of structure, function, metabolism, and metabolic regulation of components in biological systems.

8150f,w,s. SEMINAR: BIOCHEMISTRY. (1 cr) Staff

8206f. ADVANCED ENDOCRINOLOGY AND STEROID CHEMISTRY. (3 cr; prereq 5753 or 5100; offered 1981-82 and alt yrs) Ungar and staff
Control mechanisms for hormone-regulated molecular events; action of peptide and steroid hormones.

8211s. NUCLEIC ACID STRUCTURE AND FUNCTION. (3 cr; prereq 5753 or 5100; offered 1981-82 and alt yrs) Bodley and staff
Lectures and readings on current topics in DNA and RNA structure, synthesis, and function.

8215s. LIPIDS. (3 cr, §BioC 8231; prereq 5753 or #; offered 1981-82 and alt yrs) Frantz and staff
Lectures and assigned readings on composition, structure, chemical and physical properties, and biochemical functions of fats and fat-like compounds.

8217w. PROTEIN BIOCHEMISTRY. (3 cr; prereq 5753 or 5100, Chem 5504 or #; offered 1982-83 and alt yrs) Howard
Structure of proteins as revealed by chemical and physical investigations; selected examples of correlation between protein structure and function.

8218s. STRUCTURE AND MECHANISM IN ENZYME CATALYSIS. (3 cr; prereq 5753 or 5100 or #; offered 1981-82 and alt yrs) Howard
Lectures and readings on enzyme catalysis as elucidated through enzyme structure studies, kinetics, and protein modification.

8219s. BIOCHEMISTRY OF SPECIALIZED TISSUES. (3 cr; prereq 5753 or 5100; offered 1982-83 and alt yrs) Van Pilsum
Biochemical and physiological functions and metabolism of adipose, nervous, muscle, liver, kidney, and other tissues in mammals.

8220w. CARBOHYDRATE METABOLISM. (3 cr; prereq 5753 or 5100; offered 1981-82 and alt yrs) Edstrom
Lectures and readings on carbohydrate metabolism in mammalian systems. Emphasis on biosynthesis and degradation of polysaccharides, glycoproteins, and glycolipids. Metabolic diseases of carbohydrate metabolism involving storage of polymeric products.

8230w. MEMBRANE BIOCHEMISTRY. (3 cr; prereq 5753 or 5100 or #; offered 1982-83 and alt yrs) Carr and staff
Lectures and readings on membrane structure and function, with emphasis on structural models, biosynthesis, transport mechanisms, hormone receptors, neurotransmitters, and excitable membranes.

8290f,w,s. CURRENT RESEARCH TECHNIQUES. (1-3 cr per qtr; prereq grad major in biochemistry, #) Bodley and staff

8300. RESEARCH. (Cr ar) Staff

BIOCHEMISTRY

OFFERED AT ROCHESTER

Professor

M. Zouhair Atassi, Ph.D.
Nai-Siang Jiang, Ph.D.
James D. Jones, Ph.D.
Kenneth G. Mann, Ph.D.
Vernon R. Mattox, Ph.D.
John T. McCall, Ph.D.
John T. Penniston, Ph.D.
Thomas C. Spelsberg, Ph.D.
David O. Toft, Ph.D.
Russell A. Van Dyke, Ph.D.
Carlo M. Veneziale, M.D., Ph.D.

Associate Professor

Ralph D. Ellefson, Ph.D.

Graduate training in biochemistry leading to the M.S. and Ph.D. degrees may be arranged through a didactic program offered jointly by the biochemistry department at Rochester and by the two biochemistry departments in the Twin Cities. Thesis work for graduate degrees may be undertaken at Rochester.

M 5852-5853f,w. BIOCHEMISTRY LECTURE. (6 cr) Mattox
Structure, function, metabolism, and regulation of major cellular constituents, including carbohydrates, amino acids, lipids, nucleic acids, proteins, enzymes, hormones, etc.

M 5854f,w,s. BIOCHEMISTRY SEMINAR. (1 cr) Staff
Student discussion of current topics in biochemistry.

M 5855w. ENDOCRINOLOGY AND METABOLISM. (3 cr) Staff
Structure, function, regulation, and mode of action of hormones.

M 5856. REGULATION OF CARBOHYDRATE AND FAT METABOLISM. (2 cr; prereq M 5852 or M 5853 or equiv) Veneziale
Metabolism in brain, liver, kidney, and muscle are primary topics; mechanisms of various control processes emphasized.

M 5857w. CONCEPTS OF PROTEIN CHEMISTRY. (3 cr; prereq 2 qtrs organic chemistry, 2 qtrs physical chemistry or #; offered even yrs) Mann
Lectures and assigned readings in the area of protein chemistry. Concepts in protein structure and function introduced at the experimental level and developed with respect to theoretical basis. Primarily intended for students with a limited amount of specific background in biochemistry; i.e., medical students and residents.

M 5858. LABORATORY TECHNIQUES IN BIOCHEMISTRY. (6 cr) Mattox and staff
Tutorial course involving methods of isolation, characterization, and assay of subcellular particles, proteins, nucleic acids, lipids, steroids, and carbohydrates. General techniques, instrumental analyses, and special procedures emphasized.

M 8859. BIOCHEMISTRY OF LIPIDS. (2 cr; prereq M 5852-5853 or equiv) Ellefson, Mattox
Interrelated, topical lectures to include occurrence, analysis, normal and abnormal metabolism, and biological functions of lipids.

M 8860. METHODS OF BIOCHEMICAL ANALYSIS I. (1 cr; prereq M 5852-5853 or equiv) Spelsberg
Lectures on various chemical, physical, optical, and instrumental methods of analysis; demonstrations of various biochemical techniques and interpretation of laboratory data.

M 8861. METHODS IN BIOCHEMICAL ANALYSIS II. (2 cr; prereq physical chemistry, organic chemistry, M 8860 or lab experience and #) Spelsberg
In-depth discussion of major techniques such as mass spectrometry, fluorescent spectrometry, high pressure liquid chromatography, and nucleic acid sequence analysis in cloning.

M 8890. RESEARCH IN BIOCHEMISTRY. (6 cr)
Graduate thesis research under supervision of staff.

BIOMEDICAL ENGINEERING

OFFERED AT MINNEAPOLIS

Professor

J. N. Cohn (cardiovascular division), *head*
Richard E. Poppele (neurophysiology), *director*
Perry L. Blackshear, Jr. (mechanical engineering), *director of graduate study*
Eugene Ackerman (biometry and health information systems)
Robert J. Bache (medicine)
Victor A. Bloomfield (biochemistry)
Henry Buchwald (surgery)
Arthur G. Erdman (mechanical engineering)
Thomas F. Fletcher (veterinary anatomy)
Arnold G. Fredrickson (chemical engineering and materials science)
Darrell A. Frohrib (mechanical engineering)
Russell K. Hobbie (physics)
John A. Johnson (physiology)
Kenneth H. Keller (chemical engineering and materials science)
Rex E. Lovrien (biochemistry)
Rufus W. Lumry (chemistry)
Wilmer G. Miller (chemistry)
Otto H. Schmitt (biophysical sciences)
Henry M. Tsuchiya (chemical engineering and materials science)
Theodore A. Wilson (aerospace engineering and mechanics)
Yang Wang (medicine)

Associate Professor

Robert G. Bryant (chemistry)
Stanley Finkelstein (laboratory medicine and pathology)
Jack K. Mayfield (orthopedic surgery)
Richard Moore (radiology)
Robert Patterson (physical medicine and rehabilitation)
Naip Tuna (medicine)

Assistant Professor

Max Donath (mechanical engineering)
Malur K. Sundareshan (electrical engineering)

Degrees—The program in biomedical engineering leads to the Ph.D. degree only. However, work in biomedical engineering can be taken as a minor for either a master's or Ph.D. program.

Emphases Available Within the Major—Biomedical engineering is an interdisciplinary program designed to provide the student with a broad familiarity with the interactions among the engineering sciences, the biological sciences, and the medical sciences, and in-depth training in at least one of these disciplines. Thesis research topics, which provide the focus for a student's training, may be chosen from among the many areas of biomedical engineering research being conducted at the University. For example, research is currently

under way in blood fluid mechanics and its application to cardiovascular problems and to the design of artificial internal organs; organ preservation; chemotaxis; modeling of lung dynamics and the study of pathological pulmonary conditions; microbial population dynamics; intestinal mass transfer; the development of instrumentation and control devices to correct neurological defects; the application of computer science to a wide variety of problems in physiological simulation, diagnosis, and medical data recording; mechanics of movement; design of prosthetic joints; and the mechanics of the lung.

Prerequisites—Candidates for the Ph.D. degree should have completed undergraduate work in an engineering, physical science, or biological science field. They must have sufficient breadth of training to allow them to undertake graduate-level course work in the several fields that constitute the Ph.D. program. Usually, this is interpreted to mean *at least* the following: two years of college-level mathematics; one year of physics; one year of chemistry; one year of biological science. Where deficiencies exist, candidates may be accepted into the program contingent upon the successful completion of certain preliminary courses designed to correct those deficiencies. In most cases, such preliminary courses would not be part of the Ph.D. program.

Three letters of recommendation should be submitted in conjunction with the candidate's application. In evaluating applications and supporting materials, consideration is given to the likelihood that an appropriate focus exists within the program to match the candidate's interest.

Approval of Program—The candidate's tentative program will be planned with the aid of an adviser and a three-member subcommittee selected jointly by the candidate and the director of graduate study from the above list of departmental faculty members, or otherwise approved by the Biomedical Engineering Graduate Program Review Committee. The committee will consider the suitability of the program and thesis topic and will take appropriate action, and will also be responsible for the appointment of examination committees.

Major Program—The purpose of the major program is to provide students with comprehensive training in both the engineering and biomedical aspects of at least one area of biomedical engineering. To accomplish this, students will normally take a broad but cohesive program consisting of at least nine credits in each of three departments. Two of these departments should be in a college other than that of the minor. In addition, students will normally register in one of the ongoing biomedical engineering seminar series for at least six quarters.

Minor Program—The minor program is intended to insure that the emphasis on breadth in the major is complemented by the development of specialized proficiency in at least one subdiscipline of this inherently interdisciplinary field. To accomplish this, the student will be required to complete at least 18 credits in the department offering the minor, with at least nine of these credits in 8000-level courses. The minor department will normally be the one most closely related to undergraduate training or the one in which the student's adviser holds an appointment.

Language Requirement—Students will be required to demonstrate proficiency in French, German, or Russian or to complete an alternative program.

Minor Requirements for Students Majoring in Other Fields—For an M.S. degree, students are required to take 12 credits in two departments other than that of their major. The particular courses are approved by the director of graduate study based upon discussions with the student. Students must also register for three quarters of an approved one-year biomedical engineering seminar series.

For a Ph.D. minor program, 18 credits outside the major are required. The particular program is approved on an individual basis by the director of graduate study in consultation with the student. Three quarters of registration in an approved biomedical seminar series are also required.

BIOMETRY AND HEALTH INFORMATION SYSTEMS (PubH)

OFFERED AT MINNEAPOLIS

Professor

Marcus O. Kjelsberg, Ph.D., *head*
Eugene Ackerman, Ph.D.
James R. Boen, Ph.D.
Lila R. Elveback, Ph.D.
Lael C. Gatewood, Ph.D.
Eugene A. Johnson, Ph.D.
Richard B. McHugh, Ph.D.
Donald G. McQuarrie, M.D., Ph.D.
William F. Taylor, Ph.D.
Vernon E. Weckwerth, Ph.D.

Associate Professor

Anne I. Goldman, Ph.D., *director of graduate study*
Glenn E. Bartsch, Sc.D.
Lynda B. Ellis, Ph.D.
Stanley M. Finkelstein, Ph.D.
Kathleen M. Keenan, Ph.D.
Ruth B. Loewenson, Ph.D.
William M. O'Fallon, Ph.D.

Assistant Professor

Chap T. Le, Ph.D.
Peter C. O'Brien, Ph.D.
Steven S. Rich, Ph.D.

Program of Study—Biometry and health information systems is the study of analytical and quantitative aspects of biology, medicine, public health, and health care systems. Possible areas of emphasis include measurement problems, model building, evaluation of health programs, experimental design and analysis, systems monitoring and control, health computer sciences, demography, and health statistics. To complement biometry course offerings, students may elect courses from such fields as computer science, hospital and health care administration, epidemiology, mathematics, and statistics. Advanced work in the social, biological, or medical sciences is usually taken as part of a minor or supporting program, but with special justification may be taken as part of the major.

Prerequisites—Two years of college mathematics with an undergraduate major in one of the social, biological, mathematical, or physical sciences.

Admission Date—Entry into the program in the fall quarter is strongly recommended.

Master's Degree—Plan A and Plan B programs leading to the M.S. degree are available. Most students would be expected to enroll in the Plan B program. The Plan A program is usually restricted to those with an undergraduate major in biometry, a D.D.S., D.V.M., or M.D. degree, or a Ph.D. degree in a bioscience. Candidates must pass a final oral examination.

Doctor's Degree—Work for the Ph.D. degree is offered.

Language Requirement—None.

Note—A master of public health degree with special emphasis on biometry is offered by the School of Public Health. Consult the *School of Public Health Bulletin*.

The courses below are described in the Public Health section of this bulletin.

5400. INTRODUCTION TO QUANTITATIVE METHODS IN THE HEALTH AND LIFE SCIENCES. (4 cr; for students majoring in biological and health sciences; prereq Biol 1011, Chem 1004-1005, Math 1231 or equiv, #) Le

5403. COMPUTER APPLICATIONS IN HEALTH SERVICES ADMINISTRATION. (4 cr; prereq non-biometry major, health science regis or #) Gatewood

5404. INTRODUCTION TO BIOSTATISTICS AND STATISTICAL DECISION. (4 cr) Weckwerth

5408. BIOMETRIC METHODS II. (3 cr; prereq 5414 with grade B or #) Le

5409-5410. BIOMETRY IN CLINICAL STUDIES I, II. (3 cr per qtr; prereq DDS, MD, DVM, PharmD or clinical nursing student or #)

5413. VITAL AND HEALTH STATISTICS. (1 cr) Kjelsberg

5414. BIOMETRIC METHODS I. (3 cr; prereq public health regis or #) Staff

5430. BIOMEDICAL COMPUTING I. (4 cr; prereq algebra or #) Gatewood and staff

5431. BIOMEDICAL COMPUTING II. (4 cr; prereq 5430 or #) Ellis

5432. BIOMEDICAL COMPUTING III. (4 cr; prereq 5431 or #) Ellis

5433. COMPUTER METHODOLOGY IN THE DELIVERY OF HEALTH CARE I: PHYSIOLOGICAL MONITORING AND TESTING. (3 cr; prereq 5432 or #) Finkelstein

5434. COMPUTER METHODOLOGY IN THE DELIVERY OF HEALTH CARE II: INTRODUCTION TO MEDICAL DECISION-MAKING TECHNIQUES. (3 cr; prereq 5432 and 5452 or #)

5435. COMPUTER METHODOLOGY IN THE DELIVERY OF HEALTH CARE III: HEALTH INFORMATION SYSTEMS. (3 cr; prereq 5432 or #) Ellis

5436. ANALYTICAL TECHNIQUES FOR HEALTH DELIVERY SYSTEMS. (3 cr: prereq 5452 and FORTRAN or #) Gatewood

5440-5441. QUANTITATIVE PHYSIOLOGY I, II. (3 cr per qtr, §Phsl 3052-3053; prereq 1-yr sequences in mathematics, physics, chemistry, and biology or #)

5446. BIOCOMPUTING CONSULTING SEMINAR. (3 cr, prereq biometry major, 5432, 5452 or #) Gatewood

5450. BIOMETRY I. (3 cr; prereq ‡5451 . . . familiarity with basic concepts of calculus desirable) Jeffries

5451. BIOMETRY LABORATORY I. (2 cr; prereq ‡5450) Jeffries

5452. BIOMETRY II. (3 cr; prereq 5450, ‡5453) Jeffries

5453. BIOMETRY LABORATORY II. (2 cr; prereq ‡5452) Jeffries

5454. BIOMETRY III. (3 cr; prereq 5452, knowledge of SPSS equiv to a UCC short course) Goldman

5455. BIOMETRY LABORATORY III. (2 cr: prereq 5452 or #) Le

5456. BIOMETRY CONSULTING SEMINAR. (Cr ar; prereq biometry major) Boen and staff

5459. INTRODUCTION TO MATHEMATICAL THEORY IN BIOMETRY. (3 cr per qtr [may be repeated for cr]; prereq 5452 or ‡5452, 2 qtrs calculus or #) Jeffries

5460. DEMOGRAPHY AND HEALTH. (3 cr, §Soc 5561; prereq biometry major . . . others #) McHugh

5461. BIOMETRIC TOPICS IN EPIDEMIOLOGY. (3 cr: prereq biometry major . . . others #) McHugh

5462. CLINICAL TRIALS AND LIFE TABLE TECHNIQUES. (3 cr: prereq biometry major . . . others #) Kjelsberg

5470. TOPICS IN BIOMETRY. (Cr ar; prereq #)

8400. SEMINAR IN BIOMETRY. (Cr ar) Staff

8405-8406-8407. ADVANCED TOPICS IN HEALTH COMPUTER SCIENCE I, II, III. (3 cr per qtr; prereq 5432 or #) Staff

8420. ADVANCED BIOMETRIC METHODS I. (3 cr; prereq 5455, 5459 or equiv, knowledge of FORTRAN) Johnson

8421. ADVANCED BIOMETRIC METHODS II. (3 cr; prereq 8420 or #) Johnson

8422. ADVANCED BIOMETRIC METHODS III. (3 cr; prereq 5455, 5459 or equiv, knowledge of FORTRAN) Staff

8430-8431-8432. ADVANCED BIOMETRIC ANALYSIS I, II, III. (3 cr per qtr; prereq 8422, advanced calculus, theoretical statistics) McHugh

8449. TOPICS IN BIOMETRY. (Cr ar; prereq 5450 and #) Staff

8450. RESEARCH IN BIOMETRY. (Cr ar) Staff

BIOMETRY AND HEALTH INFORMATION SYSTEMS

OFFERED AT ROCHESTER

Professor

Lila R. Elveback, Ph.D.
William F. Taylor, Ph.D.

Associate Professor

William M. O'Fallon, Ph.D.

Assistant Professor

Peter C. O'Brien, M.S., Ph.D.

Graduate work in this field at the Mayo Graduate School of Medicine is offered in the Department of Medical Statistics and Epidemiology at the Mayo Clinic.

M 5823f. INTRODUCTORY STATISTICS I. (3 cr) Staff
Role of statistics in evaluation of evidence. Estimation and comparisons in clinical and experimental research. Basic considerations in experimental design: populations and samples. Statistical methodology: binomial, normal, and skewed distributions, t, χ^2, and introduction to correlation and regression in the two-variable case.

M 5824w. INTRODUCTORY STATISTICS II. (3 cr) Staff
Further considerations of experimental design. Additional applications of χ^2. Analysis of variance. Multivariate regression. Survivorship in chronic disease.

M 5825s. INTRODUCTORY STATISTICS III. (3 cr) Staff
Poisson distribution, normal values in clinical medicine, nonparametric methods, clinical trials, introduction to sequential methods, bioassay, and analysis of covariance.

M 8826. PROBABILITY THEORY. (3 cr)
Introduction to concepts and facts in both discrete and continuous cases. Probability distributions, random variables, expectation, the law of large numbers.

BIOPHYSICAL SCIENCES (BPhy)

OFFERED AT MINNEAPOLIS

Professor

Eugene Ackerman, Ph.D., *director of graduate study*
Dean E. Abrahamson, M.D., Ph.D.
Victor A. Bloomfield, Ph.D.
Russell K. Hobbie, Ph.D.
Faiz M. Khan, Ph.D.
Merle K. Loken, M.D., Ph.D.
Rex E. Lovrien, Ph.D.
Rufus W. Lumry, Ph.D.
Richard Poppele, Ph.D.
Murray D. Rosenberg, M.D., Ph.D.
Andreas Rosenberg, M.D., Ph.D.
Otto H. Schmitt, Ph.D.
Chang W. Song, Ph.D.
Joseph H. Szurszewski, Ph.D.[1]
Earl H. Wood, M.D., Ph.D.[1]

Associate Professor

George W. Beeler, Ph.D.[1]
James F. Greenleaf, Ph.D.[1]
Edwin C. McCullough, Ph.D.[1]
Richard Moore, Ph.D., D.Sc.[1]
Alan L. Orvis, Ph.D.[1]
Erik L. Ritman, M.D., Ph.D.[1]

Assistant Professor

Ronald T. Droege, Ph.D.
Barry K. Gilbert, Ph.D.[1]
Lowell D. Harris, Ph.D.[1]
James H. Kinsey, Ph.D.[1]
Richard A. Robb, Ph.D.[1]
Subhash Sharma, Ph.D.

Degrees Offered—M.S. and Ph.D.

Program of Study—Degree programs in biophysical sciences should include a concentration in one or more of the following six areas: molecular and cellular biophysics, medical biophysics, mathematical biophysics, physiological biophysics, engineering biophysics, and biophysics-environment and society. Students may complete M.S. or Ph.D. thesis research or design Plan B master's programs emphasizing these areas.

All students should have some familiarity with physical chemistry, intermediate physics, intermediate mathematics, biostatistics, computer programming, biology, physiology, and biochemistry. This may be demonstrated by course work completed at the undergraduate level or as part of the graduate program; by reading or practical experience; or by informal competency examinations.

For the M.S. degree, a special three-person committee, chaired by the adviser, will be responsible for assuring that the student's program of study includes broad training in the biophysical sciences. This committee normally will be recommended to the Graduate School to administer the oral examination for the M.S. degree.

Ph.D. candidates must complete at least one three-credit course in four of the areas of concentration listed above. A significant portion of their course work should be relevant to the area of the thesis research. Programs should also include an area of specialization outside of the thesis area. Candidates are required to take a written preliminary examination as soon as possible after completion of one year of postbaccalaureate study. This examination is prepared by a special committee, which is also responsible for approving the student's program of study. The committee may be recommended to the Graduate School to administer the Ph.D. oral preliminary examination.

[1]Mayo Graduate School, Rochester

Since the biophysical sciences cover such a wide range of disciplines, students are permitted the option of selecting courses in related fields rather than completing a traditional minor.

Language Requirements—For the master's degree, none. For the Ph.D., candidates must demonstrate competence in reading scientific literature in at least one foreign language. Foreign students may submit evidence of competence in their native language if significant, relevant publications exist in that language. All other students must meet the requirements of the Graduate School for the language selected. A technique may *not* be substituted for a foreign language.

Course Availability—A list of more than 50 courses in biophysical sciences acceptable for major credit is available upon request from the director of graduate study. These courses are offered by a variety of departments. Other pertinent courses may also be used as part of the program.

The following courses are offered in biophysical sciences. Those numbered 5170 through 5174 are taught concurrently with courses in radiology and/or in therapeutic radiology that bear the same course numbers.

5138. SEMINAR: BIOPHYSICAL SCIENCES. (Cr ar) Staff

5155, 5156, 5157.* BIOPHYSICS. (3 cr per qtr; prereq basic preparation in biological sciences, physical sciences, mathematics, #) Schmitt
Selected topics in theoretical, experimental, and technical areas of biophysical science where quantitative methods of the physical sciences are especially applicable. 5155: Basic principles of biophysical analysis and experimentation. Biostatics; structure of biological systems, especially as revealed by electronic, optical, and ionizing radiation imaging techniques; hypermicroscopy, birefringence, colloidal and micellar systems. 5156: Biophysical function; dynamics of biophysical systems, excitatory state in nerve and muscle, contractility, secretion, synthesis, sensory and motor transducers. 5157: Organization of biological systems for communication and control; stability of feedback and feed-ahead systems; biocommunication theory, computer aspects of living systems, biomimetics.

5170. BASIC RADIOLOGICAL PHYSICS. (3 cr, §Rad 5170, §TRad 5170; prereq #) Staff
Theoretical and experimental aspects of radiological physics. Physical properties of various ionizing radiations; interactions of ionizing radiations with matter; methods of radiation dose measurement.

5171. PHYSICS OF NUCLEAR MEDICINE. (3 cr, §Rad 5171, §TRad 5171; prereq 5170 or #) Staff
Theoretical and experimental applications of radionuclides in medicine and biology. Imaging devices and techniques; dynamic tracer analysis; internal emitter dosimetry. Radioimmunoassay and statistics of counting.

5172. RADIATION BIOLOGY. (3 cr, §Rad 5172, §TRad 5172; prereq 5170 or #) Song
Effects of ionizing radiation on cells, tissues, and organisms; biochemical and physiological bases of radiation effects; biological rationale for radiation therapy practices.

5173. PHYSICS OF RADIATION THERAPY. (3 cr, §Rad 5173, §TRad 5173; prereq 5170 or #)
High energy and teletherapy machines. Measurements of radiation quality, output, and depth dose distributions for clinical use. Calculation of treatment parameters. Beam modification and shaping. Treatment planning for fixed field and rotational therapy. Physics of intracavitary and interstitial therapy. Computer applications in treatment planning. Principles and criteria for radiation protection.

5174. PHYSICS OF DIAGNOSTIC RADIOLOGY. (3 cr, §Rad 5174, §TRad 5174; prereq 5170 or #)
Physics of diagnostic imaging; includes CAT scanning and ultrasound, X-ray production, image receptors, radiation exposure and protection. Special imaging modes including computerized tomographic scanning and electron radiography.

8204.* RESEARCH IN BIOPHYSICS AND RADIATION BIOLOGY. (Cr ar) Loken

8218. SEMINAR: RADIOBIOLOGY. (1 cr; prereq #)
Biological effects of ionizing radiations. Discussion of research problems and current literature.

8221, 8222, 8223.* RESEARCH IN BIOPHYSICS. (Cr ar) Staff

8296, 8297, 8298.* SEMINAR: BIOPHYSICS. (Cr ar) Schmitt

See also Phys 5551, 5552, and 5553 listed in the *Graduate School Bulletin.*

BIOPHYSICAL SCIENCES

OFFERED AT ROCHESTER

Professor

Erik L. Ritman, M.D., Ph.D.
Joseph H. Szurszewski, Ph.D.
Earl H. Wood, M.D., Ph.D.

Associate Professor

George W. Beeler, Ph.D.
Barry K. Gilbert, Ph.D.
Joel E. Gray, Ph.D.
James F. Greenleaf, Ph.D.
Edwin C. McCullough, Ph.D.
Alan L. Orvis, Ph.D.
Richard A. Robb, Ph.D.

Within the Mayo Graduate School of Medicine, biophysical sciences is a program staffed by members of the Department of Physiology and Biophysical Sciences. The biophysical sciences program is, therefore, highly interrelated with the physiology program, and listings under physiology may be found to be pertinent to the interests of biophysical sciences students. The major opportunities in biophysical sciences available in Rochester are in research for the Ph.D. dissertation. Much of the course work necessary for completing the requirements for the Ph.D. degree is taken on the Twin Cities campus.

Prerequisites—A bachelor's degree and a superior undergraduate record are required. Undergraduate college courses should include basic training in biological, medical, or appropriate physical science areas at a level equivalent to undergraduate major, and the candidate should have completed at least introductory courses in biology, physics, chemistry, mathematics, and computer science. Some prerequisite course work may be completed with the regular graduate work under certain circumstances.

Opportunities for research leading to a dissertation in biophysical sciences are available in areas including development of high-speed computers for biomedical image processing and computed tomography, biological imaging, advanced applications of computer-assisted tomography, multidimensional image analysis, automated computer pattern recognition for disease detection and diagnosis, advanced ultrasonic imaging techniques, measurement of biophysical properties of smooth muscle synctium and of noradrenergic neurons, and cellular and molecular basis of muscle cell function.

M 5881. BIOPHYSICAL SCIENCES I. (3 cr; prereq knowledge of calculus) Greenleaf
Overview of biophysics as applied to optical radiation, sound, membranes, heart, computed tomography, computer methods, ionizing radiation, and synaptic transmission.

M 8851. BIOPHYSICAL SCIENCES SEMINARS. (1 cr; prereq M 8853 or #)

M 8852f,w,s,su. SEMINARS IN BIOPHYSICAL SPECIALTIES. (1 cr) Staff
Specialized area of biophysical sciences reviewed in depth. Research papers presented by students and staff with active discussion.

M 8853f,w,s,su. READINGS IN BIOPHYSICAL SCIENCES. (Cr ar) Staff

M 8857, 8858, 8859. RADIOLOGIC PHYSICS. (3 cr per qtr [1st qtr not available for biophysical sciences cr]; prereq #) Staff
Physical basis of radiology, radiologic equipment, dosimetry, radiation safety.

M 8871. MATHEMATICAL CONCEPTS AND APPLICATIONS IN BIOMEDICINE I. (3 cr; prereq #) Greenleaf, Gilbert, and staff
Introduction to methods used to describe systems and signals, including differential equations, time domain response, Fourier and Laplace transforms; supporting numerical methods are integrated with subject matter.

M 8872. MATHEMATICAL CONCEPTS AND APPLICATIONS IN BIOMEDICINE II. (3 cr; prereq M 8871 or #) Greenleaf, Gilbert, and staff
Methods of system description and analysis; equations of state, matrix methods of system reduction and solution; filter theory, auto- and cross-correlation analysis; supporting numerical methods.

M 8873. MATHEMATICAL CONCEPTS AND APPLICATIONS IN BIOMEDICINE III. (3 cr; prereq M 8872 or #) Greenleaf, Gilbert, and staff
Large array methods; image synthesis and processing; multidimensional filtering; feature extraction.

M 8890. RESEARCH IN BIOPHYSICAL SCIENCES. (6 cr; prereq △)
Opportunities in research to be arranged with individual staff members, subject to departmental approval.

M 8896. RADIOISOTOPE RESEARCH TECHNIQUES. (3 cr) Orvis
Basic principles of effective, safe handling of radioisotopes in research and clinical situations. Theory of atomic decay, qualitative and quantitative measurements of radioactivity, basic radiation safety considerations. Techniques of liquid scintillation counting and sample preparation, gamma counting, autoradiography, radioimmune assay, radio-labeling.

DENTISTRY

OFFERED AT MINNEAPOLIS

Regents' Professor

Robert J. Gorlin, D.D.S., M.S.

Professor

Richard C. Oliver, D.D.S., *dean*
Mellor R. Holland, D.D.S., M.S.D., *associate dean*
James R. Jensen, D.D.S., M.S.D., *associate dean*
Dwight L. Anderson, Ph.D.
Carl L. Bandt, D.D.S., M.S.D.
Richard R. Bevis, D.D.S., Ph.D.
Jaroslav Cervenka, M.D.
Richard J. Goodkind, D.M.D., M.S.
Norman O. Holte, D.D.S., M.S.D.
Lawrence Meskin, D.D.S., Ph.D.
Louise B. Messer, B.D.Sc., M.D.Sc.
Andrew T. Morstad, D.D.S., M.S.
John J. Sauk, D.D.S., M.S.
Heddie O. Sedano, D.D.S., Dr.O.
Burton L. Shapiro, D.D.S., M.S.D., Ph.D.
Leon Singer, Ph.D.
Quenton T. Smith, Ph.D.
Thomas M. Speidel, D.D.S., M.S.D.
Michael J. Till, D.D.S., M.S.D., Ph.D.
Robert A. Vickers, D.D.S., M.S.D.
Daniel E. Waite, D.D.S., M.S.
Carl J. Witkop, D.D.S., M.S.
Frank W. Worms, D.D.S., M.S.D.
Douglas H. Yock, D.D.S., M.S.

Associate Professor

Bashar M. Bakdash, D.D.S., M.P.H., M.S.D.
James L. Baker, D.D.S., M.S.D.
William H. Douglas, Ph.D.
Ralph V. Katz, D.M.D., M.P.H., Ph.D.
Ramesh K. Kuba, B.D.S., M.S.D.
William F. Liljemark, D.D.S., Ph.D.
Michael J. Loupe, Ph.D.
Paul O. Walker, D.D.S., M.S.D.

Assistant Professor

Robert J. Feigal, D.D.S., Ph.D.
Mark C. Herzberg, D.D.S., Ph.D.
Kenneth T. Meyer, D.D.S., M.S.D.
Bruce L. Pihlstrom, D.D.S., M.S.
Chester J. Schultz, Jr., D.D.S., M.Sc.D., M.A.

Graduate work in dentistry is offered to meet needs in two areas—the training of well-qualified teachers and investigators in the various branches of dentistry and the preparation of fully trained specialists for the various fields of dentistry. The course of study which leads to the degree of master of science combines the normal work for the master's degree plus achievement of proficiency in some phase of clinical dentistry. Hence, a minimum of two academic years in residence are required, though some students will need three years.

Graduate study related to dentistry and leading to the M.S. and Ph.D. degrees may also be pursued through majors in such allied sciences as anatomy, biochemistry, microbiology, oral biology, pathobiology, pharmacology, and physiology. A program leading to the Ph.D degree with a major in one of the above-mentioned basic sciences and a minor in dentistry is offered to qualified dental graduates. A postgraduate program with a major in cariology is also available. The program combines work in a basic science laboratory with applied clinical problems.

Graduate courses in dentistry are offered in the fields of endodontics, oral pathology, oral radiology, oral surgery, orthodontics, pediatric dentistry, periodontics, prosthodontics, and restorative dentistry.

Prerequisites—A degree from an accredited school of dentistry with an average of B or better or an academic standing in the top fourth of the applicant's graduating class.

Major or Minor Work—The aim of the program of study is mastery of the major subject, in which a minimum of 18 credits must be earned with a grade of B or better. The minimum acceptable grade in the minor field is C.

Language Requirement—Although reading knowledge of German is highly desirable, candidates for the master's degree in dentistry are exempted from the language requirement. The program in oral pathology, however, requires German.

Master of Science Degree—Offered only under Plan A.

Dentistry (Dent)

5995. ADVANCED CLINICAL RESTORATIVE DENTISTRY. (Cr ar)
Application of advanced technical and clinical procedures with emphasis on the more complex problems in operative dentistry; diagnosis and treatment planning, management of patients, and dental auxiliary utilization.

8126. TEACHING AND EVALUATION IN DENTISTRY I. (3 cr; prereq #) Lange, Loupe
Application of educational and psychological principles to professional dental education. Theoretical principles of behavioral and cognitive psychology applied to topics appropriate to dental education. Students apply these principles to concrete instructional situations in their own areas of interest and become familiar with instructional practice in both traditional and new instructional settings.

8127. TEACHING AND EVALUATION IN DENTISTRY II. (3 cr; prereq 8126) Lange
Application of evaluation and measurement theory to higher education, specifically dental education. Objectives for teaching and evaluation, construction of tests and measurement instruments, analysis of tests, interpretation of test results, principles of marking.

8128. DENTAL EDUCATION AND ADMINISTRATION. (3 cr; prereq #) Loupe, Lange
Lectures, seminars, and individualized learning experiences in topics of educational administration in a dental school setting; organizational principles, critical path management, personnel administration and budgetary concepts at the administrative level.

8129. TOPICS AND PROBLEMS IN DENTAL EDUCATION. (Cr ar; prereq #) Loupe, Lange
Independent study arranged for individual student to pursue advanced work in student learning, instructional development, curriculum planning, student testing and evaluation, and academic administration, where these areas and their interfaces are applied directly to professional dental education. Provides opportunity for applying and extending concepts learned in 8126, 8127, 8128.

8140. TOPICS IN RESTORATIVE DENTISTRY. (Cr ar)
Literature review and discussion of past and current philosophies and research.

8150. RESEARCH IN RESTORATIVE DENTISTRY. (Cr ar)
Organized literature review in area of specific interest to student, selection of thesis project, and completion of research and thesis.

8400. OCCLUSION. (1 cr)

8401. OCCLUSION. (1 cr)

8402. LITERATURE REVIEW IN OCCLUSION. (1 cr)
Related to topics covered in 8400 and 8401.

8500. SEMINAR: RESEARCH DESIGN. (3 cr; prereq introductory course in statistics and #)
Critical appraisal of current dental literature, fundamentals of research design and analysis, individualized projects (designing a study).

Endodontics (Endo)

5300f, 5301w, 5302s, 5303su, 5304f, 5305w, 5306s. ADVANCED CLINICAL ENDODONTICS. (Cr ar) Jensen
Diagnosis and treatment of clinical cases. Students are assigned complex cases and explore new and unique techniques.

5310f, 5311w, 5312s, 5313su, 5314f, 5315w, 5316s. ENDODONTIC EMERGENCY PROBLEMS. (1 cr per qtr) Jensen
Each student is assigned a 1-week period (8 hours per day) and is responsible for all emergencies in the Endodontic Clinic during this time.

5320f, 5321w, 5322s, 5323su, 5324f, 5325w. TREATMENT PLANNING. (1 cr per qtr) Jensen
Students share in decisions of treatment planning of clinical cases as they are processed in the School of Dentistry and observe how other disciplines function in this capacity.

5330f, 5331w, 5332s, 5333su, 5334f, 5335w, 5336s. REVIEW OF CASES. (1 cr per qtr) Jensen
Students present cases for review by endodontic faculty and other graduate students.

8001f, 8002w, 8003s, 8004su, 8005f, 8006w. RESEARCH IN ENDODONTICS. (Cr ar) Jensen
Organized literature review in area of specific interest of student, selection of thesis project, and completion of research and thesis.

8310f, 8311w, 8312s, 8313su, 8314f, 8315w, 8316s. SEMINAR: ENDODONTICS. (2 cr per qtr; 1st 4 qtrs for 1st-yr grad students, last 2 qtrs for 2nd-yr grad students) Jensen
Review of current literature, research, and clinical cases. Sessions assigned to student.

8320f, 8321w, 8322s, 8323su, 8324f, 8325w, 8326s. ADVANCED ENDODONTIC LECTURES. (1 cr per qtr) Jensen
Pulpal and periapical pathology, diagnosis, and treatment planning in endodontics.

8330f,w,s. ENDODONTIC DIAGNOSIS AND TREATMENT PLANNING. (Cr ar) Jensen
Etiology, treatment, and prognosis of clinical endodontic patients.

8331f, 8332w, 8333s. TOPICS IN ENDODONTICS. (Cr ar) Jensen
Special topics for advanced students.

8335. ENDODONTIC-PERIODONTIC SEMINAR. (1 cr) Jensen
Discussions of endodontic-periodontic problems for all graduate dental students.

Oral Biology (OBio)

Course listings may be found in the separate Oral Biology section of this bulletin.

Oral Pathology (OPat)

8001. RESEARCH IN ORAL PATHOLOGY. (Cr ar) Cervenka, Gorlin, King, Sauk, Sedano, Vickers, Witkop

8002, 8003. ORAL PATHOLOGY. (Cr ar; prereq 5251, 5252 or equiv) Gorlin, Vickers, Witkop
Lectures, laboratory, and clinical demonstrations. Histology of teeth and related oral tissues, including embryologic considerations. Special pathology of the oral regions as well as relation of local pathologic findings to systemic conditions and to general pathology. Experience in educational methods; lecture, seminar, laboratory preparation, development of programmed learning materials, and evaluation of examinations.

8004. HISTOPATHOLOGY. (1 cr) Vickers
Weekly presentation of currently encountered diagnostic material. Evaluation and interpretation by trainees of individual and representative material. Additional diagnostic information, such as clinical and radiologic information, is collated as an introduction to the individual problem of diagnosis when possible. Cases chosen in advance and made available for individual study.

8005. ADVANCED ORAL PATHOLOGY. (3 cr; offered semiannually) Gorlin, Vickers, Witkop
The nature of diseases encountered in head and neck regions including laboratory sessions on histopathologic interpretations. Pathology of salivary glands, odontogenesis (with odontogenic tumors), diseases of facial bones, soft tissue diseases, lymph nodes, mucosal disorder, and other topics.

8006. CURRENT LITERATURE REVIEW. (1 cr) Vickers
Seminars on a variety of research problems, topics, and areas of special interest between graduate students and oral pathology faculty. Students expected to determine both subjects for discussion and nature of discussions.

8007. SPECIAL ORAL PATHOLOGY. (2 cr)
Review of the clinical, radiographic, and treatment aspects of oral disease and oral manifestations of systemic disease. For residents and graduate students in disciplines other than oral pathology.

8008. CLINICAL ORAL PATHOLOGY CONFERENCE. (1 cr) Staff
Weekly "rounds" of patient presentation by division staff of dental school and health sciences center. Symptomatology, diagnosis, prognosis, and treatment.

8009. EMBRYOLOGY OF THE HEAD AND NECK. (1 cr)

8010. CURRENT LITERATURE REVIEW. (1 cr)
See 8006.

8011. SURGICAL ORAL PATHOLOGY. (Cr ar) Vickers
Residents and graduate students participate as staff assistants in diagnosis of oral diseases. Histopathologic, frozen section, clinical, cytologic, cytogenetic, microbiologic, hematologic, radiologic, and other diagnostic means are utilized.

8012. HUMAN AND MEDICAL CYTOGENETICS. (4 cr) Cervenka
Methodology of tissue culture, identification of chromosomes, chromosomal structure, phylogenetic evolution of chromosomes, sex chromatin analysis, use of cell hybridization, chromosomes in human cancer, action of mutagenic agents, and genetic counseling in autosomal and sex chromosome syndromes. Mechanism of chromosomal aberrations. Procedures of genetic counseling and prenatal cytogenetics.

8013. PHYSICAL DIAGNOSIS AND THE MEDICAL EVALUATION OF THE PATIENT. (1 cr) King
Lectures and patient demonstrations to elucidate importance of medical history, physical examination, and diagnostic, clinical, and laboratory procedures, etc., used in treating the whole patient.

8014. EXFOLIATIVE CYTOLOGY OF THE ORAL MUCOSA. (2 cr) Witkop
Comparative histology of skin and normal mucosa; cytology maturation of oral mucosa compared to vaginal mucosa; sex differences in mucosa, techniques, stains and smears, menstrual cycle; benign lesions of oral mucosa, toothbrushing effects; introduction to grading system for malignant lesions; X-ray and drug effects on oral mucosa; oral squamous cell carcinoma; in situ and basal cell carcinoma.

8015. METHODS OF GENETIC COUNSELING AND TREATMENT. (1 cr) Cervenka
Preventive genetics, counseling in mental retardation, counseling in chromosomal aberrations, counseling in congenital malformations, consanguineous marriage and incest, genetic considerations in human malignancy, counseling and genetic treatment of inborn errors of metabolism, ethical and social aspects of eugenics and genetic counseling, prenatal diagnosis.

8016f,w,s,su. HISTOPATHOLOGY. (2 cr) Sedano
Designed exclusively for graduate students and residents not specializing in oral pathology but wishing additional information concerning causes, diagnosis, or cellular basis of oral diseases. Histologic aspects of various oral and paraoral diseases demonstrated and clinical and radiologic information utilized.

8300f. HUMAN DEVELOPMENT GENETICS I. (2 cr; prereq GCB 3022, BioC 5970, Path 5101 or #) Witkop
Genetic and genetic-environmental interactions in development of normal and abnormal human traits. Genetic control of prenatal and postnatal differentiation at the cellular tissue level. Morphological and functional (behavioral) human traits, especially those affecting the face and oral structures.

8301w. HUMAN DEVELOPMENT GENETICS II. (2 cr; prereq 8300) Witkop
Continuation of 8300.

See also GCB 8190 listed in the *Graduate School Bulletin*.

Oral Radiology (ORad)

8100. ORAL RADIOLOGY SEMINAR. (1 cr; prereq #) Kuba

8200. ADVANCED ORAL ROENTGENOGRAPHIC TECHNIQUE. (2 cr; prereq #) Kuba
Theory and principles involved in intraoral and dentally significant extraoral roentgenographic techniques, including temporomandibular joint roentgenography, sialography, panoramic roentgenography, laminography, cineroentgenography, and cephalometric roentgenography, according to needs and interests of students.

8300. ADVANCED ORAL ROENTGENOGRAPHIC INTERPRETATION. (2 cr; prereq #) Kuba
Theory, principles, and practice of roentgenographic interpretation of intraoral and extraoral roentgenograms. Normal roentgenographic anatomy and roentgenographic evidence of the presence of pathology and anomalies integrated with relevant anatomical, pathological, clinical, and statistical data in establishing differential, provisional and final diagnoses, prognoses, treatment plans, and treatment.

8400. ADVANCED STUDIES IN THEORY AND PRINCIPLES OF ORAL RADIOLOGY. (3 cr; prereq #) Kuba
Theory and principles involved in atomic structure, atomic radiations, X-ray production and control, roentgenographic films, mathematics of exposure and chemistry of processing.

8500. FUNDAMENTALS OF RADIATION BIOLOGY. (3 cr; prereq 8400) Kuba
Effects of ionizing radiations on biological systems. Theories on the mechanisms of action and effects at the molecular, cellular, organ, and total body levels considered and related to radiation biological problems in dentistry.

8600. RADIOLOGICAL HEALTH, HYGIENE, AND PROTECTION. (1-3 cr; prereq 8400) Kuba
Theoretical, practical, philosophical, and legal aspects of patient, operator, and general population exposure to and protection from diagnostic, therapeutic, industrial, experimental, and environmental ionizing radiations. Emphasis on significance and role of radiology in dentistry.

8700. RADIOLOGY LITERATURE EVALUATION. (1 or 2 cr; prereq 8400) Kuba
Principles of sound research and scientific writing; detailed evaluation of scientific literature in general emphasizing radiology literature relevant to dentistry. Critical consideration of papers in the dental literature dealing with radiology subjects.

8800. TEACHING ORAL RADIOLOGY. (4 cr; prereq 8400) Kuba
Challenge and problems of teaching oral radiology to dental auxiliaries, dental students, and graduate and postgraduate students. Development and evaluation of oral radiology curricula, development of course objectives, teaching methods, and testing and evaluation. University of Minnesota oral radiology program and traditional undergraduate programs analyzed.

8900. ORAL RADIOLOGY RESEARCH. (Cr ar; prereq #) Kuba

Oral Surgery (OSur)

5257. AMBULATORY GENERAL ANESTHESIA. (1 cr) Gatto and staff
A clinical rotation involving experience in outpatient management and utilizing intravenous sedation and general anesthesia.

8250. ADVANCED ORAL SURGERY. (Cr ar) Waite
Assigned clinics in University and Veterans Administration Hospitals, Hennepin County Medical Center, and School of Dentistry.

8251. SEMINAR: ORAL SURGERY. (1 cr) Lehnert
Oral surgical subjects.

8252. RESEARCH IN ORAL SURGERY. (Cr ar) Leonard
Research in fields related to oral surgery.

8253. PROBLEMS IN ORAL SURGERY. (Cr ar) Waite
Current literature review; experience in surgical techniques.

8254. TOPICS. (1 cr) Bevis, Lehnert
Surgical orthodontic techniques and seminar.

8255. GENERAL SURGERY. (Cr ar) Najarian and staff
Clinical rotation on the general surgical service at University Hospitals, Minneapolis. Includes seminars, clinics, and operating room experience.

8256. ANESTHESIA AND PAIN CONTROL. (Cr ar) Holte, Gatto, and staff
Anatomical aspects, instrumentation, and types of local and general anesthesia and analgesia.

8258. ANESTHESIA II SEMINAR. (1 cr) Gatto and staff
Outpatient general anesthesia topics and related subjects covered on seminar basis.

Orthodontics (Otho)

5001, 5002, 5003, 5004. CLINICAL ORTHODONTICS. (Cr ar) Worms and staff
Students assigned patients for complete management of orthodontic and orthodontically related occlusal problems under direct staff supervision.

8001. RESEARCH IN ORTHODONTICS. (Cr ar) Bevis, Speidel, Worms

8200, 8201, 8202, 8203. GROWTH AND DEVELOPMENT. (Cr ar) Bevis, Holmberg, Speidel, Worms
Head growth, development, osteology, and myology. Includes both normal and abnormal morphology and function with emphasis on cephalometric methods.

8204, 8205, 8206, 8207. ORTHODONTIC DIAGNOSIS AND TREATMENT PLANNING. (Cr ar) Bevis, Cavanaugh, Speidel, Worms
Etiology, treatment, and prognosis of clinical orthodontic patients.

8208, 8209, 8210, 8211. ORTHODONTIC SEMINAR. (Cr ar) Bevis, Speidel, Worms
Review of current literature and discussion of current research and its implications.

8216f, 8217w, 8218s, 8219su. TOPICS IN ORTHODONTICS. (Cr ar) Worms and staff

Pediatric Dentistry (Pedo)

5414. ADVANCED CLINICAL PEDODONTICS. (Cr ar; prereq #) Staff
Assignment of patients for treatment of difficult or unusual pedodontic problems under direct faculty supervision.

8001. RESEARCH IN PEDIATRIC DENTISTRY. (Cr ar; prereq #) Staff

8290. HOSPITAL PEDODONTICS I. (Cr ar; prereq #) Staff
Diagnosis and treatment, under direct faculty supervision, of difficult and unusual problems in children with various handicaps at the Children's Rehabilitation Center. Includes preoperative and postoperative discussion of general anesthetic cases and seminar discussion of operating room techniques and procedures, pharmaceutical adjuncts for dental procedures.

8291. HOSPITAL PEDODONTICS II. (Cr ar; prereq #) Staff
Diagnosis and treatment of pedodontic problems under direct faculty supervision at Hennepin County Medical Center. Includes participation on a rotation basis in seminars in pediatrics and anesthesia conducted by staff faculty. Preoperative and postoperative seminar discussion and evaluation of treatment plans.

8292. PEDODONTIC LITERATURE. (Cr ar; prereq #) Staff
In-depth literature review and seminar discussion of specific pedodontic topics.

8293. ADVANCED PEDODONTIC TECHNIQUES. (Cr ar; prereq #) Staff
Description of and exercises in advanced pedodontic skills and techniques.

8294. PEDODONTIC DIAGNOSIS AND TREATMENT PLANNING. (Cr ar; prereq #) Staff
Systematic approach to diagnosis of and treatment planning for various pedodontic problems.

8295. INDEPENDENT PEDODONTIC STUDY. (Cr ar; prereq #) Staff
Preparation of a position paper on assigned topic, including review of pertinent literature.

Periodontics (Pero)

8000f,w,s,su. ADVANCED CLINICAL PERIODONTOLOGY. (Cr ar) Pihlstrom and staff
Clinical training in examination, diagnosis, treatment planning, and various phases of prevention and treatment of patients with periodontal disease.

8100f,w,s,su. RESEARCH IN PERIODONTOLOGY. (Cr ar) Bandt and staff
Opportunity to take part in various phases of periodontal research being conducted in laboratories and clinic.

8200f,w,s,su. CLINICAL SEMINARS IN PERIODONTOLOGY. (Cr ar) Pihlstrom, Schaffer
Clinical cases are discussed from a diagnostic, treatment planning, and therapeutic viewpoint.

8250w,s. SUPPORTING STRUCTURES OF THE TEETH. (Cr ar) Pihlstrom, Schaffer
Gingival tissues, cementum, periodontal ligament, and alveolar bone discussed from a histological, physiological, and pathological point of view.

8300f,w,s,su. SEMINAR: PERIODONTOLOGY. (Cr ar) Pihlstrom, Schaffer
Discussion of assigned weekly literature reviews. Preparation of assigned formal literature reviews.

8305. PERIODONTIC-PROSTHODONTIC SEMINAR. (1 cr) Goodkind, Pihlstrom
Discussions of periodontal-prosthodontic problems for all graduate dental students.

8400. ANATOMY OF THE NORMAL AND OBSERVED PERIODONTIUM. (2 cr) Pihlstrom, Schaffer

8450. BACTERIOLOGY AND IMMUNOLOGY OF PERIODONTAL DISEASES. (1 cr) Herzberg, Wolfe

Prosthodontics (Pros)

8001. RESEARCH IN PROSTHODONTICS. (Cr ar [may be repeated for cr]) Goodkind
Arranged with individual students upon application after a critical review of current and historical literature pertaining to the research problem.

8003. ADVANCED TECHNICAL RESTORATIVE DENTISTRY. (Cr ar [may be repeated for cr]) Goodkind
Clinical and technological theories and practices interrelated in an effort to solve more complex problems in restorative therapy.

8005. ADVANCED CLINICAL PROSTHODONTICS I. (Cr ar [may be repeated for cr]) Goodkind
Practical clinical experience in examination, diagnosis, treatment planning, and various phases of treatment of patients with restorative dental problems. New and/or unfamiliar concepts and techniques stressed.

8006. ADVANCED CLINICAL PROSTHODONTICS II. (Cr ar [may be repeated for cr]; prereq #) Goodkind
Experience in prosthodontic treatment of patients having systemic complications. Patient therapy coordinated in a hospital environment as well as in graduate clinic of dental school.

8010. SEMINAR: ADVANCED RESTORATIVE DENTISTRY. (Cr ar [may be repeated for cr]) Goodkind
Review of current and selected historical literature with discussion of current research and its implication for restorative dental therapy.

8012. TOPICS IN PROSTHODONTICS. (Cr ar [may be repeated for cr]; prereq #) Goodkind
Special topics for advanced students.

8015. SEMINAR: PROSTHODONTICS I. (Cr ar [may be repeated for cr]; prereq #) Goodkind
Current concepts and practices related to treatment of the partially edentulous patient by means of fixed and removable partial prosthetic restorations. Based upon application of related sciences with emphasis on prevention.

8016. SEMINAR: PROSTHODONTICS II. (Cr ar [may be repeated for cr]; prereq #) Goodkind
Tissues involved and treatment of the completely edentulous patient.

8017. SEMINAR: ADVANCED PROSTHODONTICS. (Cr ar [may be repeated for cr]; prereq #) Goodkind
Treatment planning for the partially edentulous patient.

8018. SEMINAR: ADVANCED PROSTHODONTICS. (Cr ar [may be repeated for cr]; prereq #) Goodkind
Treatment planning for the completely edentulous patient.

8020. APPLIED GNATHOLOGY. (Cr ar [may be repeated for cr]; prereq #) Staff
Seminar and clinical experience involving concepts and philosophies of jaw function. Emphasis on application of kinematics in the development of a dental occlusion.

8025. SEMINAR: APPLIED BIOMATERIALS I. (Cr ar; prereq #) Douglas
Principles that govern manipulation of materials used in restorative dental practice. Physical properties and dimensional changes stressed.

8030. INTRODUCTION TO COMPREHENSIVE MAXILLOFACIAL CARE. (Cr ar; prereq #) Staff
Milestones in development of maxillofacial prosthetics and interdisciplinary relationships in treatment of maxillofacial patient.

8032. PRINCIPLES OF MAXILLOFACIAL CARE. (Cr ar [may be repeated for cr]; prereq #) Staff
Treatment biomechanics and technical procedures associated with fabrication, fitting, and servicing of various types of oral and facial restorations.

8034. ADVANCED CLINICAL MAXILLOFACIAL PROSTHETICS. (Cr ar [may be repeated for cr]; prereq 8030, 8032, #) Goodkind
Factors involved in diagnosis and organization of a treatment plan for maxillofacial patient and practical experience in associated clinical and laboratory procedures.

DENTISTRY

OFFERED AT ROCHESTER

Professor

William R. Laney, D.M.D., M.S., *chairman*
Joseph A. Gibilisco, D.D.S., M.S.D.

Associate Professor

Bruce A. Lund, D.D.S., M.S.D.
Charles M. Reeve, D.D.S., M.S.D.
A. Howard Sather, D.D.S., M.S.D.
Dan E. Tolman, D.D.S., M.S.D.

Assistant Professor

Ronald P. Desjardins, D.M.D., M.S.
Eugene E. Keller, D.D.S., M.S.D.
Phillip J. Sheridan, D.D.S., M.S.
Eastwood G. Turlington, D.D.S., M.S.D.

The Department of Dentistry is composed of four closely integrated dental disciplines: oral surgery-oral diagnosis, orthodontics, periodontics, and prosthodontics. Advanced training programs in these areas are interrelated with those of all medical and surgical departments associated with the Mayo Graduate School of Medicine. To enter the master of science in dentistry program, applicants must have the approval of the respective faculties. A minimum of three calendar years in residence are required. While the clinical field of interest constitutes the major in the thesis program, the minor requirement must be completed in one of the basic sciences.

To supplement extensive clinical training in the specialty area, regular conferences, lectures, and seminars are scheduled within each section. Joint educational activities are arranged and conducted with other sections of the Graduate School. All educational programs are accredited by the American Dental Association Council on Dental Education, Commission on Accreditation, and the related experiences are directed toward the fulfillment of requirements for certification by the American boards in the various special areas of dental practice.

Oral and Maxillofacial Surgery (OrSu)

The residency in oral and maxillofacial surgery is a 48-month program. Clinical quarters are devoted to oral and maxillofacial surgery, plastic surgery, emergency room surgery, anesthesiology, and medicine rotations. Facilities for teaching oral and maxillofacial surgery are located at the Mayo Clinic, Rochester Methodist Hospital, and St. Mary's Hospital.

M 8850. ORAL AND MAXILLOFACIAL SURGERY. (3 cr per half qtr; 4 qtrs required) Staff
Includes service on all oral and maxillofacial surgery problems in outpatient clinic and hospitals.

M 8851. ORAL AND MAXILLOFACIAL DENTAL ROENTGENOLOGY. (1 cr) Staff
Includes X-ray diagnosis and techniques.

M 8852. ORAL DIAGNOSIS. (6 cr) Staff
Clinical diagnosis relating to oral and maxillofacial surgery problems.

M 8853. ORAL AND MAXILLOFACIAL SURGERY SEMINAR: CURRENT LITERATURE. (1 cr) Turlington and staff
Literature review from current journals.

M 8854. SEMINAR: ORAL AND MAXILLOFACIAL SURGERY. (1 cr) Lund and staff
Weekly review of case histories, academic presentation, discussion of oral and maxillofacial surgery subjects.

M 8855. ORAL REHABILITATION CLINIC. (2 cr per yr) Lund, Sather
Case presentations, illustrations, and treatment procedures emphasizing corrections of orofacial deformities.

M 8856. ADVANCED ORAL SURGERY. (6 cr per qtr; 4 qtrs required) Staff
Includes senior resident and first assistant status.

M 8857. RESEARCH ON SELECTED PROBLEMS. (2 cr) Laney and staff

M 8859. PRINCIPLES OF ORAL SURGERY. (1 cr) Staff
Lecture presentation of the principles involved in surgical problems.

M 8860. MEDICAL SEMINAR FOR ORAL AND MAXILLOFACIAL SURGERY. (1 cr) Staff
Medical problems related to oral and maxillofacial surgery.

Orthodontics (Otho)

The residency in orthodontics is a 36-month program. One appointment is made each year to a qualified graduate of an approved dental school.

The clinical training is primarily in the edgewise technique, with a review of other major techniques, and is integrated with services providing experiences in oral roentgenology, oral diagnosis, oral surgery, and speech pathology.

Coordinated treatment care with other dental areas (oral diagnosis, oral surgery, prosthodontics, periodontics) as well as with medical specialties is stressed.

Work in the clinical facilities at the Mayo Clinic may be supplemented by selected patient care experience at St. Mary's and Methodist Hospitals.

The usual program combines a minor in anatomy or biostatistics with the major in orthodontics. However, the minor may be arranged in other basic science areas to meet special interests.

M 8800. ADVANCED ORTHODONTIC TECHNIQUES. (3 cr) Staff
Initial technical procedures in preparation for clinical patient care. Technical procedures on the typodont, model preparation, photography, metallurgy, and cephalometrics.

M 8802. ORTHODONTIC CASE ANALYSIS. (6 cr) Staff
First phase involves complete review of previously treated cases. Second phase is application of basic analytic principles to clinical patients.

M 8803. ORTHODONTIC TREATMENT PLANNING. (6 cr) Staff
Mechanical principles coordinated with case analyses to provide the treatment plan. Force analysis and biomechanics of tooth movement.

M 8804. CLINICAL ORTHODONTICS. (6 cr per qtr; 5 qtrs required) Staff
Individual treatment care and clinical observation. Treatment care coordinated with other services in selected instances in the hospital.

M 8805. ADVANCED CLINICAL ORTHODONTICS. (6 cr per qtr; 4 qtrs required) Staff
Final treatment care of individual patients.

M 8806. ORTHODONTIC SEMINAR: TECHNIQUE. (1 cr) Staff
Seminar on technical orthodontic procedures.

M 8807. ORTHODONTIC SEMINAR: LITERATURE REVIEW. (1 cr) Staff
Classical orthodontic literature as well as current literature review.

M 8808. ORTHODONTIC SEMINAR: CASE PRESENTATION. (1 cr)
Cases with complete records reviewed and new patient treatment plans discussed.

M 8809. SURGICAL ORTHODONTIC SEMINAR. (1½ cr) Lund, Sather
Case presentation, illustration, diagnostic and treatment procedures that encompass the various dental specialties.

M 8851. DENTAL ROENTGENOLOGY. (1 cr) Gibilisco, Tolman
Includes X-ray diagnosis and techniques.

M 8852. ORAL DIAGNOSIS. (5 cr) Gibilisco, Tolman
Clinical course in diagnosis related to dental problems.

M 8857. RESEARCH IN SELECTED PROBLEMS. (2 cr) Laney and staff
Arrangements for research in selected areas related to minor.

M 8861. SPEECH PATHOLOGY. (2 cr) Aronson, Darley, and staff

Prosthodontics (Pros)

Residency appointments to qualified graduates of approved dental schools are made approximately once a year. Matriculation usually begins in the summer or fall quarter. Service experiences include clinical and laboratory prosthodontics (fixed, removable, and maxillofacial), oral diagnosis and roentgenographic interpretation, surgical pathology, therapeutic radiology, otolaryngology, anatomy and physiology, speech pathology, hospital procedure and practice, and related dental specialties. Under staff supervision, residents care for patients at Methodist and St. Mary's Hospitals. Elective assignments can be made to accommodate individual interests and may include practice teaching in the undergraduate program at the University of Minnesota School of Dentistry. Seminars and conferences in prosthodontics are held regularly, and residents are expected to attend all seminars related to quarterly assignments in other fields.

M 8840. CLINICAL PROSTHODONTICS: COMPLETE DENTURES. (6 cr per qtr; 2 qtrs required) Laney, Desjardins
Orientation and introduction to clinical and laboratory phases of prosthodontics in the medical center with emphasis on principles, concepts, and practices related to complete denture prosthesis.

M 8841. PROSTHODONTIC SEMINAR. (1 cr per qtr; 3 qtrs required) Laney, Desjardins
Literature review and discussion of past and current concepts and practices of complete denture prosthesis.

M 8842. CLINICAL PROSTHODONTICS: PARTIAL DENTURES. (6 cr per qtr; 3 qtrs required)) Laney, Desjardins
Orientation and introduction to clinical and laboratory phases of prosthodontics in the medical center with emphasis on principles, concepts, and practices related to removable and fixed partial denture prosthesis.

M 8843. PROSTHODONTIC SEMINAR. (1 cr per qtr; 2 qtrs required) Laney, Desjardins
Literature review and discussion of past and current concepts and practices of partial denture prosthesis.

M 8844. MAXILLOFACIAL PROSTHETICS (INTRAORAL)—ADVANCED PROSTHODONTICS. (6 cr per qtr; 3 qtrs required) Laney, Desjardins
Clinical and laboratory procedures involved in management of patients with acquired, congenital, and developmental intraoral defects.

M 8845. PROSTHODONTIC SEMINAR. (2 cr) Laney, Desjardins
Clinical and laboratory phases of prosthodontics; principles, practices, and concepts related to fixed prosthodontics and occlusion.

M 8846. MAXILLOFACIAL PROSTHETICS (EXTRAORAL)—ADVANCED PROSTHODONTICS. (6 cr per qtr) Desjardins
Clinical and laboratory procedures involved in management of patients with acquired and congenital extraoral defects.

M 8847. SEMINAR: MAXILLOFACIAL PROSTHETICS (INTRAORAL)—ADVANCED PROSTHODONTICS. (1 cr per qtr; 2 qtrs required) Laney, Desjardins
Literature review and discussion of past and present concepts and practices related to maxillofacial prosthetics.

M 8848. SEMINAR: CURRENT LITERATURE. (1 cr per qtr; 9 qtrs required) Laney, Desjardins
Review and discussion of practical, clinical, or laboratory applications.

M 8849. SEMINAR: MAXILLOFACIAL PROSTHETICS (EXTRAORAL) AND ADVANCED PROSTHODONTICS. (1 cr) Desjardins
Lectures and discussions on clinical and laboratory procedures involved in fabrication of extraoral prostheses.

M 8851. DENTAL ROENTGENOLOGY. (1 cr) Gibilisco, Tolman
X-ray diagnosis and technique.

M 8852. ORAL DIAGNOSIS. (5 cr) Gibilisco, Tolman
Clinical diagnosis related to dental problems.

M 8857. RESEARCH IN SELECTED PROBLEMS. (2 cr) Laney and staff

M 8861. SPEECH PATHOLOGY. (2 cr) Aronson, Darley

M 8862. DENTAL MATERIALS. (1 cr) Desjardins, Laney
Discussion of physical properties, mechanical properties, and technical procedures related to dental materials most commonly used in prosthodontics.

Periodontics (Pero)

The Mayo Graduate School of Medicine residency in periodontics is a 36-month program. All phases of clinical periodontics are included, and facilities are available for research.

The program is designed to permit close liaison with various medical and dental specialties. Hospital service experience is available at St. Mary's and Rochester Methodist Hospitals. Seminars and lectures are held in various nonclinical fields; viz., pathology, microbiology, and immunology.

M 8851. DENTAL ROENTGENOLOGY. (1 cr) Gibilisco, Tolman
X-ray diagnosis and technique.

M 8852. ORAL DIAGNOSIS. (5 cr) Gibilisco, Tolman
Clinical diagnosis related to dental problems.

M 8857. RESEARCH IN SELECTED PROBLEMS. (2 cr) Laney and staff

M 8880. CLINICAL PERIODONTICS. (6 cr per qtr; 2 qtrs required) Reeve, Sheridan
Etiology, diagnosis, and treatment of periodontal disease.

M 8881. ADVANCED CLINICAL PERIODONTICS. (6 cr per qtr; 2 qtrs required) Reeve, Sheridan
Case presentation and treatment of difficult periodontal problems.

M 8883. PERIODONTIC SEMINAR. (1 cr) Reeve, Sheridan
Literature review and discussion.

M 8884. PATHOLOGY OF PERIODONTAL DISEASE. (1 cr per qtr; 3 qtrs required) Reeve, Sheridan
Histopathology of periodontal disease. Oral mucous membrane; calcified tissues.

DERMATOLOGY (Derm)

OFFERED AT MINNEAPOLIS

Professor

Robert W. Goltz, M.D. *chairman*
Kenneth P. Manick, M.D.

Clinical Professor

Bruce J. Bart, M.D.
H. Irving Katz, M.D.
Sheldon Mandel, M.D.
Milton Orkin, M.D.
Franklin Pass, M.D.
Willard C. Peterson, Jr., M.D.
Harold G. Ravits, M.D.
Alvin S. Zelickson, M.D.

Associate Professor

Mark V. Dahl, M.D.
William C. Gentry, Jr., M.D.

Master's and Doctor's Degrees—Instruction in dermatology leading to the M.S. or Ph.D. degree is offered at University Hospitals, Hennepin County Medical Center, and Veterans Hospital in Minneapolis, and at St. Paul-Ramsey Medical Center in St. Paul. The courses of study include attendance at the clinics at the four hospitals. A limited number of graduate students are appointed as fellows in dermatology, rotating in these hospitals. Students devote full time to graduate study and may not carry on outside practice. All graduate students majoring in dermatology and working toward advanced degrees are required to carry on independent research under the direction of the dermatology staff and the heads of the basic science department or division in which they wish to do special research.

A three-year master's degree program emphasizes clinical training in dermatology with the minor subject in a basic science field. The Ph.D. program, which ordinarily takes five years to complete, focuses on greater competence in the major field and on increased knowledge, experience, and research in the minor field.

Language Requirement—For the Ph.D. degree, this requirement may be fulfilled by either (a) two languages or (b) one language and the option of a collateral field of knowledge. French and German are routinely acceptable.

8225f,w,s,su. CLINICAL DERMATOLOGY. (Cr ar) Goltz and staff
Wards and outpatient departments of University Hospitals, Veterans Hospital, Hennepin County Medical Center, and St. Paul-Ramsey Medical Center.

8226f,w,s,su. CLINICAL SEMINAR: DERMATOLOGY. (Cr ar) Goltz and staff
Conference twice weekly on diagnosis and treatment of skin conditions.

8227f,w,s,su. HISTOLOGY OF THE SKIN. (Cr ar) Orkin and staff
Includes histopathology, histochemistry, and fluorescent microscopy.

8228f,w,s,su. RESEARCH IN DERMATOLOGY. (Cr ar) Goltz and staff

8229f,w,s,su. ELECTRON MICROSCOPY IN DERMATOLOGY. (Cr ar) Zelickson and staff

8230f,w,s,su. FUNCTIONAL BIOLOGY OF THE SKIN. (Cr ar) Goltz and staff

DERMATOLOGY

OFFERED AT ROCHESTER

Professor
Harold O. Perry, M.D., M.S., *chairman*
Sigfrid A. Muller, M.D., M.S.
Richard K. Winkelmann, M.D., Ph.D.

Associate Professor
Roy S. Rogers III, M.D., M.S.
Arnold L. Schroeter, M.D.

Assistant Professor
Daniel W. Su, M.D.

The Department of Dermatology at the Mayo Graduate School of Medicine affords opportunity for instruction in dermatology leading to the M.S. or Ph.D. degree. Graduate students pursuing advanced degrees are appointed on approval of their programs by the Department of Dermatology Research and Education Committees. These students may not carry on outside practice.

All candidates for advanced degrees are required to conduct independent research under direction of the staff of the Department of Dermatology and the staff of the basic science discipline when pertinent. Candidates may be selected for clinician-investigator positions, which provide an additional two years of research training and experience.

The three-year M.S. program emphasizes clinical training in dermatology with a minor area of interest from a field of basic science. The master's degree is awarded only under Plan A. Additional study time may be required for completion of the research project, and it is anticipated that this time will be supported by the Department of Dermatology. The five-year Ph.D. program emphasizes the continued development of knowledge, experience, and expertise in clinical dermatology.

Master's Degree—Offered only under Plan A.

Doctor's Degree—Work leading to the Ph.D. degree is offered.

M 8841f,w,s,su. DIAGNOSTIC DERMATOLOGY. (2 cr) Perry and staff
Diagnostic dermatology and dermatologic manifestations of systemic diseases.

M 8842f,w,s,su. HOSPITAL RESIDENCE. (6 cr) Perry and staff
Care of hospitalized patients.

M 8843f,w,s,su. ADVANCED DIAGNOSTIC DERMATOLOGY. (2 cr) Perry and staff
Responsibility for outpatient diagnosis and treatment of dermatologic disease.

M 8844. SYPHILOLOGY AND VENEREAL DISEASE. (1 cr per qtr; 2 qtrs required) Schroeter and staff

M 8845f,w,s,su. DERMATOPATHOLOGY. (6 cr) Muller, Perry, Schroeter, Su, Winkelmann
Microscopic anatomy, pathology, histopathology; introduction to cutaneous immunopathology and electronmicroscopy.

M 8846f,w,s,su. ADVANCED DERMATOLOGIC DIAGNOSIS AND THERAPEUTICS. (2 cr) Perry and staff
Outpatient diagnostic and therapeutic management of dermatologic diseases as a senior resident associate.

M 8847. CUTANEOUS PHOTOBIOLOGY. (1 cr) Su and staff
Lectures on the science of photobiology as related to the skin.

M 8848f,w,s,su. PHOTOBIOLOGIC THERAPEUTICS. (1 cr) Muller
Fundamentals of the science of photochemotherapy.

M 8849. THERAPEUTICS AND PHARMACOLOGY. (1 cr per qtr; 2 qtrs required) Rogers and staff
Lectures on the pharmacology of drugs used in dermatology.

M 8853. ANATOMY AND PHYSIOLOGY OF THE SKIN. (1 cr) Perry and staff
Lectures on the anatomy, physiology, and biochemistry of the skin as related to pathology.

M 8855. EXPERIMENTAL PATHOLOGIC ANATOMY OF THE SKIN. (1 cr) Perry and staff

M 8890. GRADUATE RESEARCH. (6 cr) Perry and staff

ENVIRONMENTAL HEALTH (PubH)

OFFERED AT MINNEAPOLIS

Professor

Donald E. Barber, Ph.D., *director of graduate study*
Velvl W. Greene, Ph.D.
Harold J. Paulus, Ph.D.
Irving Pflug, Ph.D.
Conrad P. Straub, Ph.D.
Donald Vesley, Ph.D.
W. Dixon Ward, Ph.D., Sc.D.

Associate Professor

Rexford Singer, M.S., *interim head*
Alan L. Orvis, Ph.D. (Mayo Graduate School, Rochester)
Lee D. Stauffer, M.P.H.

Assistant Professor

Walter H. Jopke, M.P.H.
Charles E. McJilton, Ph.D.
Orlando R. Ruschmeyer, Ph.D.
Jeffrey B. Stevens, Ph.D.

Degrees Offered—M.S. (offered under both Plan A and Plan B), and Ph.D.

Emphases Available Within the Major—Air pollution, environmental biology, institutional environmental health, occupational health and safety, radiological health, water hygiene.

Prerequisites—A bachelor's degree from a recognized college or university, preferably with a major in engineering or in one of the biological or physical sciences, although students from other backgrounds may be considered. If preparation appears to be inadequate, certain additional courses may be required.

Master's Degree Program Requirements—The program requires a minimum of 11 months of study. Candidates are expected to complete required core courses as a part of the major and are expected to include courses in administration, biometry, epidemiology, and toxicology either in their major or as one of their related fields.

Final Examination for the Master's Degree—Candidates are examined orally unless otherwise specified by the examining committee and the director of graduate study.

Ph.D. Degree Program Requirements—Candidacy for the Ph.D. degree implies prior completion of a master's degree or equivalent in environmental health.

Language Requirement—For the master's degree, none. For the doctorate, at the discretion of the adviser, the requirement may be met by reading knowledge of two languages, one language and additional course work, or no language and additional defined course work.

The courses below are described in the Public Health section of this bulletin.

5150. TOPICS IN ENVIRONMENTAL HEALTH. (Cr ar; prereq #) Staff

5152. ENVIRONMENTAL HEALTH. (2 cr) Vesley

5156. ENVIRONMENTAL HEALTH I. (2 cr; prereq environmental health student or #) Staff

5157. ENVIRONMENTAL HEALTH II. (2 cr; prereq environmental health student or #) Staff

5159. SEMINAR: ENVIRONMENTAL HEALTH. (Cr ar; prereq environmental health student or #) Staff

5161. ADMINISTRATION OF ENVIRONMENTAL HEALTH PROGRAMS. (3 cr; prereq environmental health student or #)

5169. SEMINAR: ENVIRONMENTAL HEALTH ADMINISTRATION. (Cr ar; prereq #)

5170. TOPICS IN ENVIRONMENTAL BIOLOGY. (Cr ar; prereq #) Staff

5171. ENVIRONMENTAL MICROBIOLOGY. (3 cr; prereq MicB 3103 or #) Greene, Vesley, Ruschmeyer

5172. ENVIRONMENTAL MICROBIOLOGY LABORATORY. (2 cr; prereq 5171, #) Greene, Vesley

5177. PUBLIC HEALTH BIOLOGY. (3 cr; prereq environmental health student or #) Ruschmeyer

5180. TOPICS IN AIR POLLUTION. (Cr ar; prereq #) Staff

5181. INTRODUCTION TO THE AIR POLLUTION PROBLEM. (3 cr)

5182. AIR POLLUTION CONTROLS AND SURVEYS. (3 cr; prereq 5181 or #)

5183. PROBLEMS OF AIR POLLUTION CONTROL. (Cr ar; prereq 5181, #)

5184. AIR ANALYSIS I. (3 cr; prereq 5181, 5183 or 5211, #) McJilton and staff

5185. AIR ANALYSIS II. (3 cr; prereq 5184, #) McJilton and staff

5190. TOPICS: INJURY CONTROL. (Cr ar; prereq #) Staff

5193. CHEMICAL LABORATORY SAFETY. (1 cr)

5194. OCCUPATIONAL SAFETY. (2 cr)

5200. TOPICS IN RADIOLOGICAL HEALTH. (Cr ar; prereq #) Staff

5201. MEASUREMENT AND APPLICATION OF IONIZING RADIATION. (3 cr [lect and lab], 2 cr [lect only]) Barber

5202. ENVIRONMENTAL RADIOACTIVITY. (2 or 3 cr; prereq 5201 or #) Barber

5207. RADIATION PROTECTION CRITERIA FOR HOSPITALS. (2 cr) Barber

5209. SEMINAR: HEALTH PHYSICS. (1 cr) Barber

5210. TOPICS IN OCCUPATIONAL HEALTH. (Cr ar; prereq #) Staff

5211. INDUSTRIAL HYGIENE ENGINEERING. (3 cr) McJilton

5212. VENTILATION CONTROL OF ENVIRONMENTAL HAZARDS. (3 cr; prereq 5211, #) McJilton

5214. AGRICULTURAL OCCUPATIONAL HEALTH. (3 cr; prereq 5211 or #) McJilton

5215. APPLIED OCCUPATIONAL TOXICOLOGY. (3 cr; prereq #) Stevens

5218. FIELD PROBLEMS IN OCCUPATIONAL HEALTH. (3 cr; prereq 5211, 5212, #) McJilton

5219. SEMINAR: OCCUPATIONAL HEALTH. (1 cr; prereq occupational health student, #) Johnson, McJilton, Richard

5220. TOPICS IN FOOD SANITATION. (Cr ar; prereq #) Staff

5221. INSTITUTIONAL FOOD PROTECTION PROGRAMS. (3 cr) Jopke

5222. FOOD SANITATION. (3 cr) Jopke

5230. TOPICS IN INSTITUTIONAL ENVIRONMENTAL HEALTH. (Cr ar; prereq #) Staff

5231. ENVIRONMENTAL HEALTH AND SAFETY IN HEALTH CARE FACILITIES I. (4 cr; prereq #) Greene

5232. ENVIRONMENTAL HEALTH AND SAFETY IN HEALTH CARE FACILITIES II. (4 cr; prereq #)

5233. BIOHAZARD CONTROL IN BIOMEDICAL LABORATORIES. (2 cr; prereq #) Vesley

5240. TOPICS IN WATER HYGIENE. (Cr ar; prereq #) Staff

5241. ENVIRONMENTAL HEALTH ASPECTS OF WATER SUPPLY. (3 cr) Straub, Singer

5242. ENVIRONMENTAL HEALTH ASPECTS OF GROUNDWATER SYSTEMS. (2 cr) Singer

5244. ENVIRONMENTAL HEALTH ASPECTS OF WASTEWATER SYSTEMS. (3 cr) Straub, Singer

5246. MICROBIOLOGY OF WATER AND WASTEWATER. (3 cr) Straub and staff

5247. ENVIRONMENTAL ANALYSES. (3 cr) Goppers, Straub

5249. SEMINAR: WATER HYGIENE. (1 cr; prereq #) Straub, Singer

5253. INTRODUCTION TO HAZARDOUS WASTE MANAGEMENT. (3 cr) Thompson

5260. TOPICS IN ENVIRONMENTAL AND OCCUPATIONAL TOXICOLOGY. (Cr ar; prereq #) Stevens

5261. GENERAL ENVIRONMENTAL TOXICOLOGY. (3 cr) Stevens

5262. BASIC TOXICOLOGY FOR THE ENVIRONMENTAL SCIENTIST. (3 cr; prereq #) Stevens

5263. PATHOPHYSIOLOGY FOR THE ENVIRONMENTAL SCIENTIST. (3 cr; prereq 5262 or #) Stevens, Garry

5264. ANALYTICAL METHODS IN ENVIRONMENTAL TOXICOLOGY. (3 cr; prereq 5262 or #) Stevens, Goppers

5265. APPLIED ENVIRONMENTAL TOXICOLOGY. (3 cr; prereq #) Stevens

5269. SEMINAR: ENVIRONMENTAL AND OCCUPATIONAL TOXICOLOGY. (1 cr; prereq #) Stevens

8002. FIELD OBSERVATION OF SELECTED PUBLIC HEALTH PRACTICES. (Cr ar; prereq #) Staff

8150. RESEARCH: ENVIRONMENTAL HEALTH. (Cr ar) Staff

8170. RESEARCH: ENVIRONMENTAL BIOLOGY. (Cr ar; prereq #) Ruschmeyer

8180. RESEARCH: AIR POLLUTION. (Cr ar; prereq #) McJilton

8190. RESEARCH: INJURY CONTROL. (Cr ar; prereq #) McJilton

8200. RESEARCH: RADIOLOGICAL HEALTH. (Cr ar; prereq #) Barber

8201. RADIATION DOSIMETRY. (3 cr; prereq #) Barber

8202. RADIATION DOSIMETRY LABORATORY. (1 cr; prereq ¶8201) Barber

8208. FIELD PRACTICE IN RADIOLOGICAL HEALTH. (Cr ar; prereq #) Barber

8210. RESEARCH: OCCUPATIONAL HEALTH. (Cr ar; prereq #) McJilton

8211. HEALTH SURVEY OF MANUFACTURING PROCESSES. (2 cr; prereq 5211, #) McJilton

8220. RESEARCH: FOOD SANITATION. (Cr ar; prereq #) Pflug

8230. RESEARCH: INSTITUTIONAL ENVIRONMENTAL HEALTH. (Cr ar; prereq #) Vesley

8240. RESEARCH: WATER HYGIENE. (Cr ar; prereq #) Straub

8260. RESEARCH: ENVIRONMENTAL TOXICOLOGY. (Cr ar; prereq #) Stevens

EPIDEMIOLOGY (PubH)

OFFERED AT MINNEAPOLIS

Professor

Leonard M. Schuman, M.D., M.S., *chairman, director of graduate study*
R.K. Anderson, D.V.M., M.P.H.
Lawrence H. Meskin, D.D.S., M.S.D., M.P.H., Ph.D.

Associate Professor

Stanley L. Diesch, D.V.M., M.P.H.
Jack Mandel, M.P.H., Ph.D.

Epidemiology is the scientific study of disease occurrence in populations, the identification of factors that cause or contribute to this occurrence, and the evaluation of strategies to control these factors. The department offers basic and advanced instruction for students who plan teaching, research, or administrative careers in epidemiology, and for other students in public health and health-related programs.

Degrees Offered—M.S. under Plan A and Plan B, and Ph.D.

Emphases Available Within the Major—Candidates may select areas of concentration appropriate to their academic interests and career objectives. Among the areas of concentration available are the epidemiology of cancer; the epidemiology of infectious disease; the epidemiology of reproductive outcomes; nutritional epidemiology; psychiatric epidemiology; occupational and environmental epidemiology; and epidemiologic approaches to health services research and evaluation. In addition to public health courses, students may select courses from a wide range of areas such as anthropology, biochemis-

try, computer science, genetics, microbiology, pathology, physiology, political science, and sociology. A detailed description of the course of study and a more comprehensive list of acceptable elective courses may be obtained by writing to the director of graduate study.

Prerequisites—The M.S. program is open to qualified individuals with a minimum of a bacclaureate degree from an accredited institution. The two-year program includes advanced course work in the basic medical sciences and field experience in an approved health agency. Students who have graduate degrees in health-related fields, or professional degrees such as the M.D., D.D.S., or D.V.M., may complete the program in one year.

Applicants to the Ph.D. program usually present master's degrees (M.P.H. or M.S.) in epidemiology from accredited schools of public health. Others who lack formal degrees but who can demonstrate competence in epidemiologic research may also be accepted.

Since positions in the program are relatively limited, selection of candidates is competitive with respect to background of instruction and experience presented.

Application Deadline—It is advisable that applicants to both the M.S. and Ph.D. degree programs plan to begin their studies in the fall quarter of the academic year. Under special circumstances this requirement may be waived and entry permitted in other quarters, particularly for the Ph.D. applicant with a graduate background in epidemiology or a closely related field. Applications must generally be *completed by March 31.*

Special Major Field Requirements—All applicants to the M.S. and Ph.D. degree programs must submit to the director of graduate study of the department a résumé of their educational and work experiences, particularly those that are health related; two official copies of all academic transcripts; a one- to two-page statement of their purpose or objectives for obtaining instruction and experience in epidemiology; a minimum of three letters of recommendation from individuals familiar with their scholastic achievements and/or professional experience; and scores from the Graduate Record Examination (GRE).

Master's Degree—The M.S. degree program is designed to prepare students for careers in teaching, research and program development, administration, and evaluation in health agencies, medical institutions, regulatory agencies, and industry. Candidates usually complete the curriculum under Plan B (master's degree without thesis) and are required to present a minimum of 44 quarter credits. A Plan A program may be authorized, depending upon the availability of research material and the feasibility of completing the research in the time available.

Final Examination for the Master's Degree—Candidates will take an oral examination.

Doctor's Degree—Applicants will usually present a degree in medicine, dentistry, or veterinary medicine; others with adequate background in the biological or physical sciences or with demonstrated competence in investigative work may be accepted. Students majoring in epidemiology will offer a minor in a related field.

The doctoral program in epidemiology is designed to help students develop proficiency in epidemiologic investigation requisite for careers in service, research, or teaching in health agencies and institutions. It includes instruction in scheduled courses, with latitude in electives suitable to the student's background, interests, and needs. This is supplemented with participation in ongoing field research designed to provide increasingly complex experiences commensurate with the student's development. For successful completion of the thesis requirements, the candidate will design and execute an original field investigation of acceptable complexity and sophistication.

Language Requirement—Reading knowledge of languages is advised but not required for either the master's or the Ph.D. degree. However, a reading knowledge of languages must be acquired as part of a major program for the Ph.D. degree when such skill is needed to support the student's research objectives.

Minor Requirements for Students Majoring in Other Fields—Master's degree: 9 credits selected by the minor adviser on the basis of the candidate's major field of study. Doctor's degree: 24 credits selected by the minor adviser on the basis of the candidate's major field of study.

The courses below are described in the Public Health section of this bulletin.

5300. COMPARATIVE MEDICINE AND PUBLIC HEALTH. (2 cr; prereq #) Anderson, Diesch

5330.* EPIDEMIOLOGY I. (5 cr; prereq course in microbiology or # and 3-cr course in biostatistics or #) Schuman, Anderson, Mandel

5331. FUNDAMENTALS OF BIOSTATISTICS. (3 cr) Visiting lecturers

5332. FUNDAMENTALS OF EPIDEMIOLOGY. (3 cr) Visiting lecturers

5333. BIOLOGICAL BASES AND EPIDEMIOLOGY OF HEALTH AND DISEASE. (4 cr; prereq course in microbiology, 3-cr course in biostatistics or #) Mandel, Anderson

5335.* EPIDEMIOLOGY II. (3 cr; prereq 5330) Schuman

5336. INFECTIOUS DISEASE EPIDEMIOLOGY. (3 cr; prereq basic epidemiology and biostatistics) Visiting lecturers

5337. SEROLOGIC EPIDEMIOLOGY. (3 cr; prereq basic epidemiology and biostatistics) Visiting lecturers

5338. HOSPITAL EPIDEMIOLOGY AND INFECTION CONTROL. (2 cr; prereq basic epidemiology) Visiting lecturers

5339. EPIDEMIOLOGY OF DISEASES DUE TO DRUGS AND OTHER THERAPIES. (2 cr; prereq basic epidemiology and biostatistics) Visiting lecturers

5340. EPIDEMIOLOGY: STRATEGIES AND METHODS. (3 cr; prereq 5330, 5413 and 5414 or equiv, #) Mandel

5341. HEALTH SURVEY METHODS. (2 cr; prereq basic epidemiology and biostatistics) Visiting lecturers

5342. PUBLIC HEALTH BACTERIOLOGY. (Cr ar; prereq MicB 5216, 5232, 5234, #) Stickles

5343. SURVEILLANCE AND CONTROL OF COMMUNICABLE DISEASES. (3 cr; prereq basic epidemiology and biostatistics) Visiting lecturers

5344. CLINICAL TRIALS—DESIGN, OPERATION, AND ANALYSIS. (2 cr; prereq basic epidemiology and biostatistics) Visiting lecturers

5345. EPIDEMIOLOGY OF CANCER. (3 cr; prereq basic epidemiology and biostatistics, 5357 or *5357) Visiting lecturers

5346. EPIDEMIOLOGY OF CARDIOVASCULAR DISEASES. (3 cr; prereq basic epidemiology and biostatistics, 5357 or *5357) Visiting lecturers

5347. EPIDEMIOLOGY OF MENTAL DISORDERS. (2 cr; prereq basic epidemiology and biostatistics) Visiting lecturers

5348. EPIDEMIOLOGY OF NEUROLOGIC DISEASES. (2 cr; prereq basic epidemiology and biostatistics) Visiting lecturers

5349. EPIDEMIOLOGY OF CHRONIC RESPIRATORY DISEASE. (Cr ar; prereq #) Visiting lecturers

5350. EPIDEMIOLOGIC BASIS FOR HEALTH SERVICES PLANNING AND EVALUATION. (2 cr; prereq 5330, 5332 or equiv, 5331 or equiv) Visiting lecturers

5352. EPIDEMIOLOGIC METHODS IN NUTRITION. (2 cr; prereq 5330 or 5333 or #) McLaughlin

5353. EPIDEMIOLOGY OF NUTRITIONAL DISEASES AND ABNORMALITIES. (3 cr; prereq basic epidemiology and biostatistics) Visiting lecturers

5354su. ENVIRONMENTAL EPIDEMIOLOGY. (2 cr; prereq basic epidemiology and biostatistics) Visiting lecturers

5355. GENETICS AND EPIDEMIOLOGY. (3 cr; prereq basic epidemiology and biostatistics) Visiting lecturers

5356. POPULATION DYNAMICS. (2 cr; prereq basic epidemiology and biostatistics) Visiting lecturers

5357. SELECTED STATISTICAL TOPICS IN EPIDEMIOLOGY. (3 cr; prereq basic epidemiology and biostatistics) Visiting lecturers

5358. RADIATION EPIDEMIOLOGY. (2 cr; prereq basic epidemiology, biostatistics, advanced statistics)

5359su. EPIDEMIOLOGY OF OCCUPATIONAL HAZARDS. (3 cr; prereq basic epidemiology and biostatistics) Visiting lecturers

5360. EPIDEMIOLOGY OF INJURIES. (3 cr; prereq basic epidemiology and biostatistics) Visiting lecturers

5361. EPIDEMIOLOGIC METHODS IN ORAL DISEASE RESEARCH. (3 cr; prereq regis dental public health) Katz

5362. EPIDEMIOLOGY OF OCCUPATIONAL HAZARDS. (3 cr; prereq 5330, and 5450-5451 or 5413-5414 or equiv, #)

5363. ENVIRONMENTAL EPIDEMIOLOGY. (3 cr; prereq basic epidemiology and biostatistics or #) Staff

5364. EPIDEMIOLOGY IN SOCIETAL DECISION MAKING. (3 cr; prereq 5362 or 5363 or #) Staff

5365. EXPERIMENTAL EPIDEMIOLOGY. (Cr ar; prereq 5335 or 5450 or equiv and #) Anderson, Diesch

5370. APPLIED EPIDEMIOLOGY. (Cr ar; prereq 5330 or 5450 or equiv and #) Anderson, Diesch

5375. BIOLOGICAL BASES OF HEALTH AND DISEASE. (3 cr; prereq course in microbiology or #) Schuman

5378. DEVELOPMENT OF AND PERSPECTIVES IN EPIDEMIOLOGY. (2 cr; prereq basic epidemiology and biostatistics) Visiting lecturers

5379.* TOPICS IN EPIDEMIOLOGY. (Cr ar; prereq #) Staff

5380. APPLIED HUMAN NUTRITION. (3 cr; prereq biochemistry or #) Leon

5385. PHYSIOLOGY OF EXERCISE. (Cr ar; prereq Phsl 5101 or equiv and #) Leon, Taylor

5386. PUBLIC HEALTH ASPECTS OF CARDIOVASCULAR DISEASE. (3 cr; prereq basic epidemiology and biostatistics) Blackburn, Gillum, and staff

5450. BIOMETRY I. (3 cr; prereq ¶5451...familiarity with basic concepts of calculus desirable) Jeffries

5451. BIOMETRY LABORATORY I. (2 cr; prereq ¶5450) Jeffries

5452. BIOMETRY II. (3 cr; prereq 5450, ¶5453) Jeffries

5453. BIOMETRY LABORATORY II. (2 cr; prereq ¶5452) Jeffries

5454. BIOMETRY III. (3 cr; prereq 5452, knowledge of SPSS equiv to UCC short course or #) Goldman

5455. BIOMETRY LABORATORY III. (2 cr; prereq 5452 or #) Jeffries

5612. HUMAN GENETICS AND PUBLIC HEALTH. (3 cr; prereq #) Schacht

5651. PHILOSOPHY AND CONCEPTS OF PREVENTIVE DENTISTRY. (Cr ar; prereq #) Block and staff

8330. RESEARCH EPIDEMIOLOGY. (Cr ar) Staff

8331. FIELD PRACTICE IN EPIDEMIOLOGIC INVESTIGATIONS. (Cr ar; prereq epidemiology major, #) Schuman, Mandel

8340. EPIDEMIOLOGIC ASPECTS OF CANCER. (3 cr; prereq 5330) Schuman, Mandel

8341. EPIDEMIOLOGY OF SELECTED CHRONIC DISEASES. (2 cr; prereq basic epidemiology and biostatistics) Visiting lecturers

8342. ADVANCED STATISTICAL METHODS IN EPIDEMIOLOGY. (3 cr; prereq 5331, 5332 or #) Visiting lecturers

8345. EPIDEMIOLOGIC BASIS FOR CANCER CONTROL. (2 cr; prereq basic epidemiology and biostatistics, 5357 or ¶5357) Visiting lecturers

8346. EPIDEMIOLOGY OF CARDIOVASCULAR DISEASE AND CANCER. (3 cr; prereq basic epidemiology and biostatistics) Visiting lecturers

8356. EPIDEMIOLOGIC ASPECTS OF POPULATION CHANGE. (2 cr; prereq basic epidemiology and biostatistics) Visiting lecturers

8378. ADVANCED SEMINAR IN EPIDEMIOLOGY. (1 or 2 cr per qtr [3 cr max]; prereq #) Staff

8379. SEMINAR: EPIDEMIOLOGY. (Cr ar; prereq #) Schuman, Mandel

EPIDEMIOLOGY

OFFERED AT ROCHESTER

Professor

Leonard T. Kurland, M.D., *chairman*

Graduate work in epidemiology at the Mayo Graduate School of Medicine is offered in the Department of Medical Statistics and Epidemiology of the Mayo Clinic. Investigations of an epidemiologic nature, and particularly population studies in chronic diseases, are offered in conjunction with staff of clinical and laboratory sections of the Mayo Clinic.

M 5801. PRINCIPLES OF EPIDEMIOLOGY. (3 cr; prereq #)
General principles of epidemiologic method in studies of chronic and infectious disease covered by lectures and problem exercises with student participation. Problems of etiology and of prevention and control of disease considered in terms of the contributing role of descriptive, analytic (retrospective and prospective), and experimental studies with examples from chronic and infectious disease. Design of epidemiologic investigations, in terms of single factor and multifactor studies, illustrated in terms of current national cooperative studies in diabetes, cancer, and heart disease.

M 8801. EPIDEMIOLOGY SEMINAR. (1 cr)
Presentation, analysis, and discussion of proposed investigative work, research developments, and results by members of the department and guest lecturers. Research methods and statistical evaluation of data.

M 8802. EPIDEMIOLOGY JOURNAL CLUB
Students and faculty report on articles from current journals in epidemiology and statistics. Emphasis on methodologic papers. Both infectious and chronic disease subjects covered. Presentation and group discussions.

M 8890f,w,s. RESEARCH PROBLEMS IN EPIDEMIOLOGY. (6 cr)

EXPERIMENTAL SURGERY

See Surgery.

FAMILY PLANNING ADMINISTRATION (FPAd)

OFFERED AT MINNEAPOLIS

Professor
Harry Foreman, M.D., Ph.D., *director of graduate study*
Ira L. Reiss, Ph.D.

Associate Professor
James R. Boen, Ph.D.
Robert E. Kennedy, Jr., Ph.D.

Prerequisites—An undergraduate degree in either the social or biological sciences is required. Special consideration will be given to individuals who after graduation will be working in programs for their own ethnic and cultural groups.

Language Requirement—None.

Master's Degree—The M.S. is offered under both Plan A and Plan B. Knowledge and skills necessary for family planning administration are drawn from diverse disciplines, e.g., medicine, public health, sociology. Depending upon background and objectives, each student, with the counsel of the adviser, may select from a wide choice of courses that are offered in a number of departments at the University.

5241. FAMILY PLANNING ADMINISTRATION. (3 cr; prereq #) Foreman
Planning, operations, and administration of publicly funded family planning programs.

5243. TOPICS IN FAMILY PLANNING. (3-12 cr; prereq #) Foreman, others
Flexible course to meet individual needs and interests; includes thesis preparation, research projects, field training.

5245. HISTORY AND DEVELOPMENT OF FAMILY PLANNING. (3 cr; prereq #) Foreman
Family planning programs over the world (including the United States) instituted to meet health needs as well as to alleviate population pressures.

5248. DEVELOPMENTS IN CONTRACEPTIVE TECHNOLOGY. (3 cr; prereq #) Foreman
Review of principles, efficiency, and side effects of currently used contraceptives and consideration of contraceptives in investigative stages.

FAMILY PRACTICE AND COMMUNITY HEALTH (FPCH)

OFFERED AT MINNEAPOLIS

Professor

Edward W. Ciriacy, M.D., *head*
Eldon B. Berglund, M.D.
John T. Kelly, M.D.
John B. O'Leary, M.D.
John E. Verby, M.D.
Vernon E. Weckwerth, Ph.D.

Associate Professor

Carole J. Bland, Ph.D.
Vincent R. Hunt, M.D.
Harold R. Ireton, Ph.D.

Assistant Professor

Ray M. Conroe, Ph.D.
Richard L. Holloway, Ph.D.
Leon J. Nesvacil, M.D.

Lecturer

Faruk Abuzzahab, M.D., Ph.D.

The master of science degree program in family practice and community health is an academic program, distinct from the residency training program in family practice and community health. Broadly stated, the objectives of the master's program are the following.

1. To teach physicians approaches to investigating areas that relate to the discipline of family practice. These approaches may not be directly related to the immediate needs of clinical problem solving.
2. To enable physicians to acquire skills appropriate to academic responsibilities.

Studies focus on the discipline of family medicine and on academic skills, rather than on the body of clinical skills necessary for family practice.

Prerequisites—Before applying to the M.S. program, the medical fellow must (1) have completed an M.D. or D.O. degree (foreign graduates are required to pass the Educational Council for Foreign Medical Graduates [ECFMG] examination also); (2) meet with an adviser in the department to obtain a letter of endorsement, which must be submitted with the formal application; and (3) meet Graduate School requirements for admission.

Master's Program—The master's degree is offered under Plan B. Each student selects a major and a minor or related field option. The major is family practice; the minor or related fields supporting program varies with the interests of each student. The program must include a minimum of 44 graduate credits and must meet the requirements specified below.

A minimum grade point average of 2.80 (on a 4.00 scale) is required in courses submitted on the official degree program. Of the credits included on the program, at least two thirds must be taken on the A-N grading system.

Major—A minimum of 20 credits from the major field are required. Courses designated nonclinical in the following listing must make up at least 50 percent of the credits in the major. However, if the total number of credits presented in the major is 30 or fewer, a minimum of 16 credits in nonclinical courses from the following list are required. Courses may be taken from outside the Department of Family Practice and Community Health if they form a coherent sequence related to the major.

Minor—A minimum of nine credits are required. Courses may be taken from more than one department if they are relevant to the major and form a coherent sequence related to the minor subject. All courses included in the minor must be nonclinical, and they *all must be taken on the A-N grading system.*

Related Fields—In lieu of choosing a minor, students may elect to present a minimum of eight credits in a number of related fields outside the major. This option requires approval of the student's adviser and the director of graduate study.

Remaining Credits—Chosen according to the needs of the student and the requirements of cohesion and relevance as stated above.

Language Requirement—None.

The courses listed below are described in the broadest outline to convey the character of the work. Course work in fields related to family practice and community health is also available in other departments of the University. Additional course offerings are listed in this bulletin and in the *Graduate School Bulletin*.

0555f-0556w-5557s†.[1] **SPECIAL TOPICS IN PSYCHOLOGICAL MEDICINE.** (2 cr per yr; prereq #) Ciriacy and staff
New applications of behavioral science to clinical practice. Lectures, workshops, and conferences.

5504.[1] **MEDICAL ETHICS.** (2 cr) Ciriacy and staff
Reading and discussion of major ethical issues relevant to the practice of medicine. Critical review of case studies to gain experience in solving medical ethics problems.

5563.[1] **CLINICAL NEUROPSYCHOPHARMACOLOGY.** (2 cr; prereq FPCH residency) Abuzzahab
Identification, diagnosis, treatment, and follow-up of major psychiatric disorders. Emphasis on the neuro-psychopharmacological approach, identification of psychoactive drugs, contraindications, side effects, and long-term management of patients.

5567. COMMUNICATIONS. (1 cr; prereq #) Conroe
Videotaping to record and feed back to medical fellows their communicative behavior and skills in patient interaction and examination. Communication specialist and M.D. faculty review and discuss tapes made when medical fellows see patients on hospital rounds and in office or clinic examinations and consultations.

5570. PRACTICUM IN COUNSELING. (1 cr; prereq completion of 1st-yr residency) Conroe, Kelly
Basic techniques of short-term counseling. Lectures, classroom exercises, and actual counseling contact.

5581.[1] **PRACTICE MANAGEMENT.** (2 cr; prereq completion of 1st-yr residency or #) Ciriacy and staff
Business aspects of medical practice. Includes site selection for practice, office layout, personnel management, legal entities, financing mechanisms for ambulatory health care, financial and medical record systems required in medical practice, and physician's responsibilities as the owner, shareholder, employee, or partner in medical practice. Students work together on a final project to analyze a system or process in their model clinic or examine a practice management topic.

5583.[1] **PERSONAL AND FINANCIAL PLANNING.** (2 cr) Ciriacy and staff
Personal and financial planning. Includes an overview of life insurance, equity investments, and real estate. Pros and cons of these methods of personal investments, sources of information about them, and their history.

5598. INTRODUCTION TO PHYSICIAN'S ROLE IN NURSING HOMES. (2 cr) Ciriacy and staff
Roles of nursing home staff. Helps medical fellows become comfortable in nursing homes.

5903. COMMUNITY HEALTH. (Cr ar; prereq #) Ciriacy and staff
Practical experience in delivery of health care in urban or rural communities.

5904.[1] **COMMUNITY HEALTH.** (2 cr; prereq 2nd-yr residency or #) O'Leary
Introduction to concepts of community health. In-depth look at community health activities in Minnesota. Tools and techniques for the study of contemporary health problems in the state. Strategies to meet community health needs.

5950.[1] **SEXUAL HEALTH SEMINAR.** (3 cr; prereq MD or #) Staff
Methods of intervention into sex-related problems of individuals, couples, and families.

5951.[1] **RESEARCH IN HUMAN SEXUALITY.** (Cr ar; prereq #) Staff
Clinical and/or laboratory research related to human sexuality. Flexible according to specific interests of the student and availability of faculty. Contact director of the Program in Human Sexuality to discuss possible topics and to make course arrangements.

5952-5953-5954.[1] **PRACTICUM IN SEXUAL COUNSELING.** (3-6 cr per qtr; prereq #) Staff
Supervised experience in sex-related counseling of individuals, couples, and groups. Work with problems of sexual adjustment, dysfunction, and couple conflict.

5955.[1] **DIRECTED STUDY.** (1-15 cr; prereq #...qualified students may register with # for work on a tutorial basis) Staff

5956.[1] **HUMAN SEXUALITY IN THE LIFE CYCLE.** (3 cr; prereq MD or #)
Psychosocial aspects of sex throughout the life cycle, with emphasis on the development of role-related behaviors and patterns of erotic attachment.

5957.[1] **FEMALE SEXUALITY.** (3 cr) Staff
Lectures and discussions on basic aspects of the female experience of sexuality.

5958.[1] **SMALL GROUP PROCESS.** (3 cr; prereq #) Staff
Group dynamics; various schools of group process and therapy active today. Experiential and cognitive methods used.

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[1]Nonclinical course.

8201. CLINICAL FAMILY MEDICINE. (Cr ar) Ciriacy and staff
Supervised care for patients of all ages on a continuous, primary, preventive, and general diagnostic basis. Diagnosis, methods of treatment, and problem-solving devices for the benefit of the patient and family are emphasized with particular stress on health hazard appraisal. New and refined methods of recording, documentation, and retrieval of clinical data.

8202.[1] DYNAMICS OF MARRIAGE AND FAMILY. (2 cr; prereq #) Ciriacy and staff
Marital and family health understood in a broader context than provided by episodic medicine and disease orientation. Promotes awareness that patients' life-styles and interactions, when impaired, contribute to organic, social, and spiritual breakdown.

8204.[1] SEMINAR: QUANTITATIVE STRATEGIES IN HEALTH CARE PRACTICE AND RESEARCH. (2 cr; prereq #) Weckwerth
Review of elementary statistical methods for both description and inference. Use of workbooks to identify and sharpen skills. Application of elementary decision making with emphasis on sensitivity/ specificity and decision errors. Elementary literature critiques. Students make presentation and write paper, based on one or more journal articles, explaining an application to patient care of a strategy.

8205.[1] MEDICAL RECORDS SYSTEMS. (2 cr) Ciriacy and staff
Introduction to the problem-oriented medical record. Emphasis on forms analysis, tabulation systems, and the use of a structured medical record in health services research.

8207. SEMINAR: COMMON DISEASES SEEN IN FAMILY PRACTICE. (1 cr) Ciriacy and staff

8208. FAMILY MEDICINE CONFERENCES. (1 cr) Ciriacy and staff
Problem cases from the Family Practice Service. Diagnosis, treatment, and consideration of relevant current literature.

8209. FAMILY MEDICINE X-RAY CONFERENCE. (1 cr) Ciriacy and staff

8210. FAMILY MEDICINE GRAND ROUNDS. (1 cr) Ciriacy and staff
Monthly conference with each institution presenting topics.

8212. CLINICAL PSYCHIATRY ROUNDS. (1 cr; prereq 1st-yr FPCH resident) Kelly
Medical fellows meet with a teaching psychiatrist to review cases, preferably from among patients. Topics of high clinical relevance presented and discussed.

8215.[1] SEMINAR: PSYCHOSOMATIC MEDICINE. (2 cr; prereq completion of 1st-yr residency or #) Kelly
Concept of multicausality of disease including biologic, psychologic, and social factors that may predispose, precipitate, or aggravate disease. Theoretical models of psychosomatic disease and concept of "symptom choice" by patients. Methods of recognition, quantification, and treatment including pharmacal therapy and psychotherapy.

8216.[1] PEDIATRIC PSYCHOLOGY. (2 cr; prereq 2nd-yr residency or #) Ireton
Diagnosis and management of psychological disorders in children. Evaluation in context of normal development, family dynamics, and the impact of illness. Stresses coping through interdisciplinary cooperation of physicians, nurses, psychologists, social workers, and other allied professionals.

8217.[1] SEMINAR IN COUNSELING. (2 cr; prereq 5567, 8215 or #) Conroe
Skills and strategies for performing short-term supportive counseling in family practice setting. Patient selection. Skills applicable to beginning, middle, and end of counseling. Strategies for working with patients presenting different types of problems seen by the family physician.

8223.[1] INTRODUCTION TO GERONTOLOGY AND GERIATRIC MEDICINE. (2 cr; prereq completion of 1st-yr residency or #) Ciriacy and staff
Introduction to human aging; social, biological, and psychological aspects. Programs and policies dealing with aging. Developmental and holistic approaches to the aging process and health care emphasized.

8224.[1] COMMUNITY MENTAL HEALTH SEMINAR. (1 cr; required for 3rd-yr residents; prereq completion of 2nd-yr residency) Kelly
Background material in a given area of community mental health followed by a community experience in that particular area and sharing of experiences with other residents at the training center. Split-time experience for the resident during which experience in medical sociology is made available.

8225.[1] MEDICAL SOCIOLOGY. (3 cr; prereq #) Ciriacy and staff
Critical review of sociological research in medical areas. Topics include illness behavior, the sick role, sociological aspects of the doctor-patient relationship, the problem of delay in seeking treatment, and differential reactions to pain.

8226.[1] MEDICAL SOCIOLOGY SEMINAR. (2 cr; prereq #) Ciriacy and staff
Problems in comprehensive health care delivery.

8228.[1] SEMINAR: INTERDISCIPLINARY HEALTH. (2 cr; prereq #) Kelly

[1]Nonclinical course.

8240.[1] **COMMUNITY RESOURCES.** (2 cr) Kelly
Discussions with representatives of selected community agencies.

8243. FAMILY MEDICINE IN THE RURAL AREA. (Cr ar; prereq #) Ciriacy and staff
Problems specific to rural areas such as physician distribution, use of allied health personnel, initial emergency treatment, referral patterns.

8245.[1] **ANALYSIS OF INSTRUCTION AND EDUCATIONAL EVALUATION.** (Cr ar; prereq #) Bland, Houge
Psychology of learning, preparation of instructional objectives, educational evaluation, uses of instructional media, and educational methodology.

8250.[1] **QUANTITATIVE STRATEGIES IN HEALTH CARE PRACTICE AND RESEARCH II.** (2 cr [1 addtl cr available]; prereq 8204) Weckwerth
Presumptive review of elementary descriptive and inferential quantitative methods; models for decision making; evaluation; logic trees; critique of literature. Students design an inpractice study of a test, treatment, service, or method of choice to show outcome effect on patients.

8253.[1] **RESEARCH PROBLEMS.** (Cr ar; prereq #) Ciriacy and staff
Under supervision of faculty member.

8582.[1] **ADVANCED PRACTICE MANAGEMENT.** (2 cr; prereq 5581 and 3rd-yr residency) Ciriacy and staff
Case studies in health care delivery; films developed by Peter Drucker, international business consultant; and topics suggested by medical fellows. Topics include motivation, leadership, time management, evolving cultural position of individuals and their interface with organizations, the medical economy, consumerism in health care, decision-making process, effective decisions, and staffing requirements in organizations.

HISTORY OF MEDICINE AND BIOLOGICAL SCIENCES (HMed)

OFFERED AT MINNEAPOLIS

Professor
Leonard G. Wilson, Ph.D., *director of graduate study*

Associate Professor
John M. Eyler, Ph.D.

The program is designed to allow students to proceed to the Ph.D. degree with specialization in either the history of medicine or the history of the biological sciences. The programs in these areas are designed to prepare students for careers of academic scholarship and teaching in the history of biology and medicine.

Prerequisites—Students intending to specialize in the history of medicine should preferably have received the M.D. degree, or have extensive training in the biological sciences or in public health. Students intending to specialize in the history of the biological sciences should have an undergraduate major in biology or biochemistry and preferably some graduate training in these subjects.

Special Requirements—Applicants to the program should ask three of their teachers to send letters of recommendation. The Graduate Record Examination, both aptitude and advanced sections, is requested but not required.

Language Requirement—Students will be required to demonstrate competence in two languages, preferably French and German. They must pass the examination in one language before the end of their first academic year and in both languages before the end of their second year. For students interested in a historical period before 1800, Latin will be a third required language.

During their first two years, students will complete approximately 54 credits of courses in the history of medicine, history of science, history, and science. At the beginning or during the first quarter of their third year, they will take a comprehensive oral examination in their fields of interest. Students who pass the comprehensive examination successfully may begin work on a thesis.

[1]Nonclinical course.

5035. THE GERM THEORY AND THE MEDICAL PROFESSION. (4 cr)
Analysis of the formulation of the germ theory of disease and of its consequences for medical procedures (therapeutics, surgery, management of hospitals), public health programs, and the structure and prestige of the medical profession.

5045. MEDICAL PROFESSION IN AMERICA. (4 cr)
Historical analysis of the American medical profession in the 19th and 20th centuries; the role of institutions, influence of social and moral values, and consequences of specialization and scientific innovation.

5102. MEDICINE AND SOCIETY IN THE ENLIGHTENMENT. (3 cr; prereq #)
Readings and research seminar dealing with the interrelations of medicine and society from the late 17th to the early 19th centuries. Emphasis on methods and materials used by medical historians.

5120-5130. HISTORICAL TOPICS: MEDICINE AND THE MODERN STATE. (4 cr per qtr [sequence may be repeated for max 16 cr]; prereq #) Eyler
Topics vary from year to year. Emphasis on mid-18th century to the present.

5400. EARLY HISTORY OF MEDICINE TO 1650. (4 cr) Wilson
Paleopathology, primitive medicine, medicine in ancient Egypt and Mesopotamia, Greek medicine in classical times and under the Roman Empire, transmission of Greek medicine through the Arabs to the Latin West, medieval medicine, Andreas Vesalius and the revival of anatomy in the Renaissance, William Harvey and the discovery of circulation of the blood.

5401. MEDICINE DURING THE SCIENTIFIC REVOLUTION 1650-1830. (4 cr) Wilson
Thomas Sydenham and the concept of distinct diseases, new chemical and mechanical theories of medicine, founding of hospitals and rise of medical teaching, inoculation for smallpox and discovery of vaccination, pathological anatomy and definition of new diseases.

5402. MEDICINE SINCE 1830. (4 cr) Wilson
Impact of chemistry and physics on medicine in early 19th century, the cell theory, rise of medical schools in the United States, discovery of anesthesia, controversy over spontaneous generation and germ theory of disease, development of antiseptic surgery, the public health movement, revolution in the basic medical sciences, reform of medical education and growth of medical specialties.

5410, 5411, 5412. SEMINAR: EMERGENCE OF MODERN MEDICINE, 1750-1900. (3 cr per qtr; prereq #)

8220, 8221, 8222. HISTORY OF THE BIOLOGICAL SCIENCES. (3 cr per qtr) Wilson
Survey of the history of biology tracing development of biological concepts from ancient Greece to early 20th century.

8230, 8231, 8232. READINGS: HISTORY OF SCIENCE. (3 cr per qtr) Wilson
Introduction to serious scholarly literature in history of science, focusing on a limited number of key historical problems and persons, e.g., Ptolemaic astronomy, Aristotle's physics and biology, Galenic physiology, the Copernican revolution, Kepler, Galileo, Newton, Harvey, Lavoisier, Lyell, Darwin.

8240f, 8241w, 8242s. SEMINAR: HISTORY OF EVOLUTIONARY BIOLOGY. (3 cr per qtr) Wilson
8240: History of scientific thought and discovery leading up to 1859 publication of Darwin's *On the Origin of Species*, which students will read. 8241, 8242: Historical impact of evolutionary theory on biological sciences, including medicine, and on religious and social thought.

8260f. SEMINAR: PROBLEM OF MAN IN BRITISH NATURAL HISTORY, 1800-1863. (3 cr; prereq △)
History of British thought from 1800 to 1863. Place of humans in the order of nature—contributions of scientists, theologians, philologists, archaeologists, and historians.

8630, 8631, 8632f,w,s. DIRECTED STUDY. (3 cr per qtr [max 15 cr]; grad students may register on a tutorial basis; prereq #)

HOSPITAL AND HEALTH CARE ADMINISTRATION (PubH)[1]

OFFERED AT MINNEAPOLIS

Professor

Bright M. Dornblaser, M.H.A., *division director*
Theodor J. Litman, Ph.D., *coordinator of doctoral studies*
Vernon E. Weckwerth, Ph.D., *associate coordinator*

Associate Professor

George O. Johnson, Ph.D., *program director*
Mario F. Bognanno, Ph.D.
N. Tor Dahl, M.B.A.
Willy DeGeyndt, Ph.D.
Roger Feldman, Ph.D.

[1]Inquiries concerning courses of study leading to the Ph.D. degree in hospital and health care administration should be addressed to: Coordinator of Doctoral Studies Program in Hospital and Health Care Administration, School of Public Health, Box 97, 1260 Mayo Memorial Building, 420 Delaware Street S.E., University of Minnesota, Minneapolis, Minnesota 55455. Inquiries concerning the master of hospital administration (M.H.A.) degree program, offered through the School of Public Health, should be sent to the Director, Program in Hospital and Health Care Administration, same address.

Degree Offered—Ph.D.

Prerequisites—Applicants are expected to have demonstrated high scholastic ability as well as potential for independent study and research in the course of their previous academic training. While attainment of a master's degree in either hospital or health care administration is normally considered to be the first step in the acquisition of the doctoral degree, students with advanced degrees in such allied fields as business administration, industrial relations, medical sociology, public administration, comprehensive planning, public health, medical care, nursing, and medicine are encouraged to apply as well. Graduate work satisfactorily completed prior to admission may be applied for credit where appropriate and in accordance with the regulations of the Graduate School. An acceptable score on the Miller Analogies Test (graduate level) is required for admission. Additionally, three letters of reference attesting to the applicant's academic ability and capacity for independent research must be submitted.

Doctor's Degree—In contrast to the professional master's degree program offered by the School of Public Health, the doctoral program offered by the Graduate School is designed for those interested in careers in teaching, research, or planning in the field of health care. Emphasis in the curriculum is more upon depth and breadth of learning than upon the acquisition of technical and management skills. Although completion of the academic program normally requires three years, a somewhat longer period of study may be required, depending on the individual's background and the type of program pursued. Each student's course of study will be developed with the guidance of an adviser to satisfy the individual's background and interests. The candidate will be expected to demonstrate proficiency in the following core areas:

1. organization and administration of health care services.
2. social, political, and economic aspects of health care.
3. research and methodology in health care.

In addition to the work in the major field, the student must complete a supporting program of 24 credits involving two or more related areas, such as business administration, economics, sociology, industrial relations, public administration, or other areas of public health. The program must be approved by the major adviser.

Language and Collateral Field Requirement—A reading knowledge of one language or working knowledge of one computer language plus at least nine credits of advanced statistics (courses at the 5000 level or higher).

Thesis—The dissertation must deal with a significant problem in the area of health care.

Minor—A minor in this field is also available subject to approval of the minor adviser.

Note—For a more complete statement of admission requirements and related information, see the *Program in Hospital and Health Care Administration Bulletin* of the School of Public Health.

The courses below are described in the Public Health section of this bulletin.

5404. INTRODUCTION TO BIOSTATISTICS AND STATISTICAL DECISION. (4 cr; prereq #) Weckwerth

5744 (formerly 5750). PRINCIPLES OF PROBLEM SOLVING IN HEALTH SERVICES. (3 cr; prereq hospital administration student or #) Dornblaser and staff

5751. PRINCIPLES OF MANAGEMENT IN HEALTH SERVICES ORGANIZATIONS. (3 cr; prereq grad student) Culbertson

5761 (formerly 5785). QUANTITATIVE METHODS APPLIED TO HEALTH ADMINISTRATION PROBLEMS. (4 cr; prereq basic statistics) Weckwerth

5790 (formerly 5795). SOCIOLOGY OF MEDICINE AND HEALTH CARE: AN INTRODUCTION TO MEDICAL SOCIOLOGY. (4 cr, §Soc 5855) Litman

5793 (formerly 8795). ECONOMIC ASPECTS OF HEALTH CARE. (3 cr; prereq #) Bognanno, Feldman

8750-8751†. SEMINAR: ALTERNATIVE PATTERNS OF HEALTH CARE. (3 cr per qtr; prereq #; offered 1982-83 and alt yrs) Litman

8752. SEMINAR: COMPARATIVE HEALTH CARE SYSTEMS. (3 cr; prereq #; offered fall 1981 and alt yrs) Litman

8760. TOPICS IN HOSPITAL AND HEALTH CARE ADMINISTRATION. (3 cr; prereq PhD student in hospital administration) Weckwerth

8761. READINGS IN THEORY AND PRINCIPLES OF HOSPITAL AND HEALTH CARE ADMINISTRATION. (3 cr; prereq 8760) Weckwerth

8762. CONTEMPORARY PROBLEMS OF HOSPITAL AND RELATED HEALTH SERVICES. (3 cr; offered winter 1982 and alt yrs) Weckwerth

8770. SEMINAR: HEALTH AND HUMAN BEHAVIOR. (3 cr; prereq 5790 (formerly 5795) or Soc 5855; offered spring 1982 and alt yrs) Litman

8780. ADVANCED STATISTICAL METHODS IN HEALTH CARE RESEARCH. (3 cr; prereq one qtr each of applied and theoretical statistics) Weckwerth

8781. SEMINAR: RESEARCH STUDIES IN HEALTH CARE. (3 cr; prereq PhD student in hospital administration or #; offered spring 1983 and alt yrs) Litman

8782. RESEARCH PRACTICUM. (6 cr; prereq PhD student in hospital administration) Litman, Weckwerth, and staff

8790.* SEMINAR: POLITICAL ASPECTS OF HEALTH CARE. (3 cr; prereq PhD student in hospital administration or #; offered winter 1983 and alt yrs) Litman

8796. TOPICS IN HEALTH ECONOMICS. (3 cr; prereq at least one economics course and #) Dahl

HOSPITAL PHARMACY

See Social and Administrative Pharmacy.

LABORATORY MEDICINE (LMed)

OFFERED AT MINNEAPOLIS

Professor

Ellis S. Benson, M.D., *head*
Eugene Ackerman, Ph.D.
Khalil Ahmed, Ph.D.
Miguel Azar, M.D., Ph.D.
Henry Balfour, Jr., M.D.
David M. Brown, M.D.
Richard Brunning, M.D.
Agustin P. Dalmasso, M.D.
Mary E. Dempsey, Ph.D.
Grace M. Ederer, M.S.
J. Roger Edson, M.D.
Jesse Edwards, M.D.
Richard D. Estensen, M.D.
Esther F. Freier, M.S.
Laël Gatewood, Ph.D.
Leonard Greenberg, Ph.D.
John H. Kersey, M.D.
J. Jeffrey McCullough, M.D.
Herbert F. Polesky, M.D.
Paul G. Quie, M.D.
Andreas Rosenberg, Ph.D.
Michael W. Steffes, M.D., Ph.D.
R. Dorothy Sundberg, M.D., Ph.D.
Jorge J. Yunis, M.D.

Associate Professor

Walid Yasmineh, Ph.D., *director of graduate study*
G. Mary Bradley, M.D.
John T. Crosson, M.D.
Ben Hallaway, M.S.
Robert W. McKenna, M.D.
Lorraine G. Stewart, M.S.
William R. Swaim, M.D.

Assistant Professor

Silvia H. Azar, M.D.
Larry D. Bowers, Ph.D.
Connie Clark, Ph.D.
John H. Eckfeldt, M.D., Ph.D.
Bo Hedlund, Ph.D.
Lance R. Peterson, M.D.
Jane L. Swanson, M.S.
Michael Y. Tsai, Ph.D.
Nancy Wang, Ph.D.
Michael J. Wilson, Ph.D.

Graduate work in laboratory medicine offers opportunities to physicians, medical technologists, and other qualified students to prepare for careers in teaching and research. Only the M.S. degree under Plan A (master's degree with thesis) is available to students in this program.

Academic Requirements—The program requires a minimum of 20 credits with emphasis in one area of laboratory medicine (chemistry, genetics, hematology, immunology, or microbiology). The minor subject (9 credits) may be chosen from among the basic fields of science such as anatomy, biochemistry, or pathology. The student is expected to maintain a B average in courses for both the major and minor. There is no language requirement. Original investigative work in one major area is essential.

Admission Requirements—Admission requirements include either an M.D. degree or a bachelor's degree from an accredited institution of higher learning, with adequate background in the biological sciences to justify graduate work in this specialty. Previous experience in laboratory medicine is desirable.

Special Major Field Requirements—The following information must be sent to the Department of Laboratory Medicine and Pathology before an application will be evaluated: three letters of recommendation; the Test of English as a Foreign Language (for foreign students); a brief autobiographical sketch including such information as reasons for seeking a degree in laboratory medicine, career objectives, and areas of special interest.

Student Progress and Examination—Students are encouraged to file their program by the end of their first quarter of graduate work in order to be reviewed by the departmental graduate committee. Student progress is reviewed at regular intervals by the graduate committee in laboratory medicine. Failure to maintain satisfactory progress may be cause for discontinuance in this program.

In addition to the usual course examinations, candidates must pass a preliminary written examination at the end of the first year of course work and a final oral examination that will cover the conceptual aspects of the thesis subject and the graduate courses taken. The latter examination will be conducted by a committee appointed by the Graduate School to examine the thesis.

5101f. PRINCIPLES OF LABORATORY MEDICINE I. (4 cr) Yasmineh, Dalmasso, Swaim
Basic concepts in laboratory medicine, including computer applications, instrumentation, quality control, and clinical chemistry.

5102w. PRINCIPLES OF LABORATORY MEDICINE II. (4 cr) Yasmineh, Dalmasso, Swaim
Basic concepts in genetics, coagulation, hematology, immunology, and microbiology.

5103w. PRINCIPLES OF DIAGNOSTIC MICROBIOLOGY. (3 cr; prereq MicB 3103, 5232 or #) Ederer

5110f. HOSPITAL INFECTIONS CONTROL. (2 cr; prereq #) Rhame
Nosocomial infections, transmission of hospital infections, surveillance and general methods of infection control.

5133s. MEDICAL MYCOLOGY. (3 cr; prereq medical microbiology, diagnostic microbiology or #; offered spring 1983 and alt yrs) Ederer
Laboratory diagnosis of infections caused by yeasts, dermatophytes, and systemic fungi.

5136s. ANAEROBIC BACTERIOLOGY. (4 cr; prereq biochemistry, medical microbiology, diagnostic microbiology or #; offered spring 1983 and alt yrs) Blazevic
Anaerobic respiration in bacteria. Methods of anaerobic culture. Taxonomy and classification of anaerobes. Biochemical and gas chromatographic differentiation of anaerobes. Role of anaerobes in disease.

5138f,w,s. CLINICAL MICROBIOLOGY SEMINAR. (1 cr; prereq #) Balfour, Blazevic. Ederer

5139f,w,s,su. ADVANCED MICROBIOLOGY. (Cr ar; prereq #) Staff

5160s. HUMAN CYTOGENETICS. (3 cr; prereq #; offered 1983 and alt yrs) Yunis
Chromosome structure and function; genetic and clinical problems associated with study of human chromosomes.

5161s. HUMAN CYTOGENETICS LABORATORY. (2 cr; prereq #; offered 1983 and alt yrs) Lindquist, Yunis
Techniques for study of mammalian and human chromosomes; cell culture, autoradiography, new techniques for chromosome identification, and chromosome isolation techniques.

5162s. HUMAN BIOCHEMICAL GENETICS. (3 cr; prereq #; offered 1982 and alt yrs) Eaton
Molecular and genetic basis of human genetic traits.

5163s. HUMAN BIOCHEMICAL GENETICS LABORATORY. (2 cr; prereq #; offered 1982 and alt yrs) Eaton
Biochemical techniques used in study of human genetic traits.

5168f,w,s. GENETICS SEMINAR. (1 cr; prereq #) Yunis and staff

5169. RESEARCH IN HUMAN GENETICS. (Cr ar; prereq #) Eaton

5170. ADVANCED PROBLEMS IN MEDICAL GENETICS. (Cr ar; prereq #) Yunis and staff

5172f. HUMAN GENETIC TRAITS INCLUDING BLOOD GROUPS AND SERUM PROTEIN POLYMORPHISM. (3 cr; prereq #) Polesky

5178s. INTRODUCTION TO CLINICAL CHEMISTRY. (10 cr; prereq MdBc 5300-5301, Chem 3100-3101) Bowers
Lecture and laboratory in basic techniques and methods in clinical chemistry. Topics include spectrophotometry, electrolytes, proteins, enzymes, toxicology, and quality control. Both manual and instrumental methods in clinical chemistry.

5179f,w,s,su. CHEMISTRY SEMINAR. (1 cr; prereq #) Steffes

5180f,w,s,su. ADVANCED CHEMISTRY. (Cr ar; prereq #) Benson, Brown, Dempsey, Freier, Hallaway, Rosenberg, Stewart

5194f,w,s. COMPUTER APPLICATIONS IN MEDICINE. (4 cr; prereq #) Ellis
Readings, discussions, seminars, and programming assignments to introduce students to current and anticipated uses of computers as part of health care delivery systems.

5195f,w,s. COMPUTER APPLICATIONS IN MEDICAL RESEARCH. (Cr ar; prereq #) Ellis
Readings, discussions, seminars, and programming assignments to introduce students to current and anticipated uses of computers as part of health care delivery systems.

5270f. IMMUNOHEMATOLOGY. (3 cr; prereq #; offered 1982 and alt yrs) Azar
Immune response. Blood cells as antigens. Antibodies in blood groups. Mechanisms of their reactions. White cells as antigens and antibodies. Autoimmune hemolysis. Humoral and cellular factors in immunohematology.

5271f. IMMUNOHEMATOLOGY LABORATORY. (2 cr; prereq 5270; offered 1982 and alt yrs) Azar

5272f,s,su. IMMUNOLOGY SEMINAR. (1 cr; prereq #) Azar, McCullough

5273f,s. ADVANCED IMMUNOLOGY. (Cr ar; prereq #; offered 1981 and alt yrs) Azar, McCullough

5274s. MOLECULAR ASPECTS OF IMMUNOLOGY. (3 cr; prereq #; offered 1983 and alt yrs) Dalmasso
Chemistry and pathobiology of immunoglobulins, complement, cell membrane, and mediators of anaphylaxis and cellular immunity.

5346w. COMPUTER APPLICATIONS FOR HEALTH CARE PROVIDERS. (3 cr; prereq health science regis or #) Gatewood
Survey of current roles of digital computers and associated technical staff in health care areas, both in the hospital and in the community.

5765f, 5766w. HEMATOLOGY. (4 cr per qtr, §Anat 5765, 5766; prereq #) Sundberg and staff
Blood and blood-forming organs; blood and bone marrow from the standpoint of diagnosis and prognosis.

5767s. SEMINAR: HEMATOLOGY. (1 cr, §Anat 5767; prereq #) Brunning, Edson, Sundberg

5768f,w,s,su. ADVANCED HEMATOLOGY. (Cr ar; prereq #) Brunning, Edson, Sundberg

5864f,w,s. RESEARCH SEMINAR. (1 cr; prereq #) Benson and staff

5865f,w,s. DEPARTMENTAL SEMINAR. (1 cr; prereq #) Benson and staff

8105f. PRINCIPLES OF DIAGNOSTIC ENZYMOLOGY. (3 cr; prereq 5101, 5102 or #; offered 1981-82 and alt yrs) Yasmineh
Enzymes of diagnostic interest, their biological and biochemical aspects, and their usefulness in understanding the etiology of disease and its diagnosis, treatment, and prevention.

8230f. ADVANCED MEDICAL BACTERIOLOGY. (3 cr; prereq 5103 or #) Blazevic

8235f,w,s,su. ADVANCED CLINICAL LABORATORY MEDICINE. (Cr ar) Benson and staff

8236f,w,s,su. RESEARCH ON CLINICAL LABORATORY PROBLEMS. (Cr ar) Benson and staff

8920f,w,s. ADVANCES IN IMMUNOLOGY. (1 cr; prereq #) Kersey and staff
Presentation of research or literature seminar required for credit.

LABORATORY MEDICINE

OFFERED AT ROCHESTER

Professor

Paul Didisheim, M.D.
Virgil F. Fairbanks, M.D.
Nai-Siang Jiang, Ph.D.
James D. Jones, Ph.D.
W. Eugene Mayberry, M.D., M.S.
John T. McCall, Ph.D.
Robert V. Pierre, M.D.
James S. Robertson, M.D., Ph.D.
Jon E. Rosenblatt, M.D.
Howard F. Taswell, M.D., M.S.
John H. Thompson, Jr., Ph.D.
Heinz W. Wahner, M.D., M.S.
John A. Washington II, M.D.

Associate Professor

Michael B. O'Sullivan, M.B.B.Ch., *chairman*
John P. Anhalt, M.D., Ph.D.
Mrinal K. Dewanjee, Ph.D.
Ralph D. Ellefson, Ph.D.
Harold Markowitz, M.D., Ph.D.
Glenn D. Roberts, Ph.D.
Thomas F. Smith, Ph.D.

Assistant Professor

Henry A. Homburger, M.D.
Alvaro A. Pineda, M.D.

Three programs in laboratory medicine are offered: (a) a two-year program, part of a four-year course in pathology, leading to eligibility for examination and certification by the American Board of Pathology in the combined fields of anatomic and clinical pathology; (b) a three-year program in laboratory medicine leading to eligibility for examination and certification by the American Board of Pathology in the field of clinical pathology; and (c) an arranged program composed of courses in specific fields of laboratory medicine available to residents in any specialty of medicine and other postdoctoral students.

These programs consist of lectures, seminars, demonstrations, and performance of tests in the laboratories of blood bank and transfusion services as well as in clinical chemistry, clinical microbiology, diagnostic nuclear medicine, laboratory hematology, laboratory nephrology, and regional laboratory services.

Graduate students may be assigned to one or all of these laboratories to learn the methods used as aids in clinical diagnoses. Original projects in research may be conducted in most of the laboratories.

M 5800f,w,s,su. PARASITOLOGY. (2 cr) Thompson

M 5801w. LECTURES IN CLINICAL MICROBIOLOGY. (1 cr) Roberts, Smith, Washington

M 5802w. CLINICAL MICROBIOLOGY. (6 cr) Roberts, Smith, Washington
Experience in routine and special diagnostic laboratories in bacteriology, mycology, and virology.

M 5803-5804f,w,s,su. LABORATORY HEMATOLOGY. (6 cr per qtr) Bowie, Didisheim, Fairbanks, O'Sullivan, Pierre
Experience, lectures, and seminars in routine and special diagnostic laboratories in blood and marrow morphology, instrumentation, coagulation, hematologic enzymology and genetics, and routine analytical techniques. Two quarters required.

M 5805-5806f,w,s,su. IMMUNOHEMATOLOGY AND BLOOD BANKING. (8 cr per qtr) Taswell, Pineda
Experience and training in practical blood bank, immunohematology, and histocompatibility testing with responsibility for management of clinical transfusion service and aphaeresis service. Emphasis on practical problem solving.

M 5807f,w,s,su. NUCLEAR MEDICINE. (4 cr) Wahner

M 5808f,w,s,su. CLINICAL PHYSIOLOGY. (2 cr) Pierre, Wahner
Experience and lectures in special patient procedures involving studies of function of kidney, liver, and endocrine organs and in analysis of gastric contents, urine, and cerebrospinal fluid.

M 5809f. CLINICAL CHEMISTRY. (6 cr) Ellefson, Jiang, Jones, Markowitz, Mayberry, McCall
Lectures, seminars, and experience in general clinical chemistry, analysis of amino acids, enzymology, lipid chemistry, analysis of metals, toxicology, hormonal analysis, immunochemistry, protein chemistry, and serology.

M 8890f,w,s,su. RESEARCH PROBLEMS. (6 cr) O'Sullivan and staff

MEDICAL TECHNOLOGY (MedT)

OFFERED AT MINNEAPOLIS

Professor

Ellis S. Benson, M.D., *head*
Ruth F. Hovde, M.S., *director of graduate study*
Miguel M. Azar, M.D., Ph.D.
Henry H. Balfour, Jr., M.D.
Donna Blazevic, M.P.H.
Richard D. Brunning, M.D.
Agustin P. Dalmasso, M.D.
Mary E. Dempsey, Ph.D.
Grace M. Ederer, M.P.H.
J. Roger Edson, M.D.
Esther F. Freier, M.S.
John H. Kersey, M.D.
J. Jeffrey McCullough, M.D.
Herbert F. Polesky, M.D.
Verna L. Rausch, M.S.
Andreas Rosenberg, Ph.D.
R. Dorothy Sundberg, M.D., Ph.D.
Jorge J. Yunis, M.D.

Associate Professor

Gloria M. Bradley, M.D.
Leo T. Furcht, M.D.
Ben Hallaway, M.S.
Robert W. McKenna, M.D.
Michael W. Steffes, M.D., Ph.D.
Lorraine G. Stewart, M.S.
Walid Yasmineh, Ph.D.

Assistant Professor

Larry D. Bowers, Ph.D.
Helen M. Hallgren, M.S.

Graduate work in medical technology leading to the M.S. degree is available for qualified candidates who wish to prepare themselves for careers of teaching and investigation in the clinical laboratory area. Regardless of career goal, all students spend a period of time in the clinical and teaching laboratories to familiarize themselves with the aspects of methodology, teaching, and research.

Prerequisites—For a major in medical technology, certification as a medical technologist or eligibility for such certification is required in addition to a bachelor's degree from an accredited institution with sufficient prerequisite work and scholarly attainment in chemistry and biological sciences to justify graduate work in these areas. Previous experience in a clinical laboratory is required. Three letters of reference from employers or teachers must be submitted; these should be sent to the Director of Graduate Study, Division of Medical Technology, Box 198, Mayo Memorial Building, 420 Delaware Street S.E., University of Minnesota, Minneapolis, Minnesota 55455.

Minor—It is suggested that students who major in medical technology present a minor in one of the following fields: hematology, biochemistry, microbiology, immunohematology, or immunology.

Master's Degree—Offered only under Plan A. The work leading to a master's degree includes (a) 3 quarter credits in MedT 5120 in addition to a minimum of 20 quarter credits in graduate-level courses in the major department with grades not lower than B; (b) a minimum of 9 quarter credits in graduate-level courses in the minor department relating to the thesis problem with grades not lower than B; (c) a substantial thesis based upon independent research; and (d) a final oral examination. There is no language requirement.

The thesis should be on a topic within the minor or related field: chemistry, microbiology, hematology, immunohematology, or immunology. The thesis must demonstrate ability to work independently and evidence of power of independent thought both in perceiving problems and in making satisfactory progress toward their solution. Familiarity with the bibliography of the special area and correct citation of authorities are expected. The thesis must be finished and registered in the office of the Graduate School at least nine weeks before the end of the quarter in which the student earns the degree.

In addition to the usual course examinations, the candidate must pass a final oral examination that will cover the exposition of the thesis problem and subject matter or theory fundamental to the thesis topic. This examination must be held at least five weeks before the end of the quarter in which the student earns the degree. This examination will be conducted by the committee (which the student's adviser chairs) appointed by the Graduate School to examine the thesis.

The student's progress is reviewed at regular intervals by the graduate faculty in medical technology. Continuance in the program is dependent upon maintaining a satisfactory scholastic average in required courses and satisfactory progress in developing the thesis problem. Failure to maintain satisfactory progress and levels of achievement may be cause for recommendation for discontinuance in this program.

Minor in Medical Technology—Work for a minor is offered to students in allied sciences. Choice of particular courses to be presented in fulfillment of requirements will be made after consultation with the student's adviser.

5120. SEMINAR: MEDICAL TECHNOLOGY. (1-3 cr; may be taken one or more qtrs)
Review and discussion of current literature; presentation and discussion of research being carried on in the department.

5125. PRACTICUM: TEACHING. (Cr ar [max 3 cr]; prereq △)
Supervised experience in teaching; development of skills in effective use of instructional materials, tests and measurements.

5128. ELEMENTS OF LABORATORY ADMINISTRATION. (3 cr; prereq △)
Introduction to laboratory administration. Topics include leadership styles, employee selection and evaluation, communications, motivation, morale, discipline, job descriptions, record keeping, budgets, cost accounting, purchasing, laboratory safety, labor relations, and governmental regulations.

5130. PRACTICUM IN LABORATORY ADMINISTRATION. (3 cr)
Supervised experience and assignment of specific problems related to laboratory service and management in hospitals.

5133. MEDICAL MYCOLOGY. (3 cr; prereq 5102 or MicB 5232 or #)
Laboratory diagnosis of infections caused by yeasts, dermatophytes, and systemic fungi.

5135. ADVANCED CLINICAL MICROBIOLOGY. (5 cr; prereq #; may be taken one or more qtrs)
Observation, study, and practice in special problems, advanced techniques, and methodology in clinical microbiology.

5136. ANAEROBIC BACTERIOLOGY. (2-4 cr; prereq biochemistry, medical microbiology, diagnostic microbiology or #)
Lecture and laboratory. Anaerobic respiration in bacteria. Methods of anaerobic culture. Taxonomy and classification of anaerobes. Biochemical and gas chromatographic differentiation of anaerobes. Role of anaerobes in disease.

5138. CLINICAL MICROBIOLOGY SEMINAR. (Cr ar; may be taken one or more qtrs)
Advanced seminar; topics assigned for conferences and reading.

5140-5141. TECHNIQUES FOR TEACHING. (3 cr per qtr; prereq △)
Development of objectives, classroom activities, and measurement parameters for medical technology education.

5145. DEVELOPMENT OF MEDICAL TECHNOLOGY. (3 cr)
Current problems; topics and research.

5155. ADVANCED CLINICAL HEMATOLOGY. (5 cr; prereq #; may be taken one or more qtrs)
Observation, study, and practice in special problems, advanced techniques, and methodology in clinical hematology.

5165. ADVANCED CLINICAL IMMUNOHEMATOLOGY. (5 cr; prereq #; may be taken one or more qtrs)
Observation, study, and practice in special problems, advanced techniques, and methodology in clinical immunohematology.

5173. ANALYTIC TECHNIQUES IN LABORATORY MEDICINE. (2 cr).

5175. ADVANCED CLINICAL CHEMISTRY. (5 cr; prereq #; may be taken one or more qtrs)
Observation, study, and practice in special problems, advanced techniques, and methodology in clinical chemistry.

5179. CHEMISTRY SEMINAR. (1 cr; prereq #)

8176. ADVANCED TOPICS IN CLINICAL CHEMISTRY. (3 cr; prereq 5108, #)
External and internal factors affecting the clinical chemistry laboratory. External factors include use of statistics, predictive value of tests, and effect of biological and analytical factors in laboratory results. Internal factors include new concepts in methodology and automation such as chromatography and immunoassay techniques. Principles and advantages of kinetic and equilibrium assays.

8178. PRINCIPLES OF DIAGNOSTIC ENZYMOLOGY. (3 cr, §LMed 8105; prereq 5108, #)
Enzymes of diagnostic interest, their biological and biochemical aspects, and their usefulness in understanding the etiology of disease and its diagnosis, treatment, and prevention. Emphasis on factors that affect the interpretation of enzyme results, including localization of enzymes and/or isoenzymes in various tissues and subcellular organelles; kinetics of enzyme release from damaged tissues; biological half-lives of enzymes in plasma; and induction of enzyme synthesis.

8230. ADVANCED MEDICAL BACTERIOLOGY. (4 cr, §LMed 8230; prereq 5102 or LMed 5103, #)
Unusual bacteria of medical importance, including nonfermentative, gram-negative bacilli, and gram-positive bacilli that may cause disease. Metabolism, biochemical characteristics, disease states, treatment.

8240. EDUCATIONAL ADMINISTRATION IN MEDICAL TECHNOLOGY. (3 cr; prereq #)
Responsibilities of administration to students, faculty, and educational community. Topics include curriculum planning, accreditation, staffing, student selection, finances. Sample administrative problems and decisions used as practice vehicles.

MEDICINAL CHEMISTRY (MedC)

OFFERED AT MINNEAPOLIS

Professor

Philip S. Portoghese, Ph.D., *head, director of graduate study*
Mahmond M. Abdel-Monem, Ph.D.
Frank E. DiGangi, Ph.D.
Herbert T. Nagasawa, Ph.D.
Robert Vince, Ph.D.

Associate Professor

Patrick E. Hanna, Ph.D.
Rodney L. Johnson, Ph.D.

Medicinal chemistry involves application of the principles of the chemical and biological sciences to the study of relationships between molecular structure and biological activity. It deals with all chemically oriented studies that might lead to the development of new biologically active substances as well as those that contribute to an understanding of their modes of action.

Prerequisites—Applicants for graduate study in medicinal chemistry should possess a B.S. or M.S. degree in an appropriate related science field such as pharmacy, chemistry, or biology. All applicants should have completed undergraduate chemistry through the level of elementary organic chemistry. Biologically oriented undergraduate course work is desirable but is not a prerequisite.

Language Requirement—For the master's degree, no language is required. For the Ph.D. degree, one language is required (German is routinely acceptable, but other languages pertinent to the field of study will be considered by the staff on petition).

Students may fulfill the language requirement by completing an approved course in a field of study that will contribute to the development of their research capabilities and that would not normally be included in a medicinal chemistry academic program.

Master's Degree—Generally offered under Plan A. Plan B may be followed by petition. Candidates for the master's degree take a final oral examination.

Doctor's Degree—Graduate work leading to the Ph.D. degree is offered to students prepared for advanced work in medicinal chemistry.

5320-5330-5340-5350. THERAPEUTIC AGENTS I-IV. (4/5/5/3 cr) Staff
Factors involved in drug absorption, distribution, excretion, metabolism, mechanism of action, receptor interaction, and rational drug design; therapeutic properties and uses of individual pharmacological drug categories from structure-activity standpoint. Agents used as pharmaceutical aids and adjuncts.

8100.* MEDICINAL CHEMISTRY SEMINAR. (Cr ar; required of all majors in medicinal chemistry) Staff

8200. SELECTED TOPICS. (1 cr per qtr) Staff
In-depth discussion of selected topics in medicinal chemistry.

8300. GENERAL PRINCIPLES OF MEDICINAL CHEMISTRY. (2 cr; prereq 5320, Chem 3303 or #; offered 1982-83 and alt yrs) Portoghese
General principles of drug design and molecular bases of biological responses to medicinal agents.

8400. NEUROHORMONES AND NEUROPHARMACOLOGICAL AGENTS. (2 cr; prereq 5320 or #; offered 1981-82 and alt yrs) Hanna and staff
Selected topics concerning the molecular aspects of neurotransmitter function and effects of neuroactive chemicals and drugs on nerve function.

8500. DESIGN OF CHEMOTHERAPEUTIC AGENTS. (2 cr; prereq 5320 or #; offered 1981-82 and alt yrs) Vince
Modern methods in design and evaluation of chemotherapeutic agents including enzyme inhibitors and metabolic blockers.

8600. CHEMICAL ASPECTS OF DRUG METABOLISM. (2 cr; prereq 5320; offered 1982-83 and alt yrs) Abdel-Monem and staff
Chemical aspects of drug metabolism including mechanisms of chemical biotransformations of drugs, and methods of identification of their metabolites in biological materials.

8800. MEDICINAL CHEMISTRY LABORATORY TECHNIQUES. (Cr ar; prereq Chem 3303 or #) Staff

8900. RESEARCH IN MEDICINAL CHEMISTRY. (Cr ar; prereq Chem 3303 or #) Staff
Study and experimental investigation of topics in the area of natural products and synthetic organic medicinal agents.

MEDICINE (Med)

OFFERED AT MINNEAPOLIS

Professor

Thomas F. Ferris, M.D., *chairman, director of graduate study*
Henry W. Blackburn, Jr., M.D., Ph.D.
Charles W. Drage, M.D.
Ivan D. Frantz, Jr., M.D.
Frederick C. Goetz, M.D.
Robert B. Howard, M.D., Ph.D.
Harry S. Jacob, M.D.
Manuel E. Kaplan, M.D.
B. J. Kennedy, M.D., M.Sc.
Carl M. Kjellstrand, M.D.
Michael D. Levitt, M.D.
Robert O. Mulhausen, M.D.
M. John Murray, M.D., D.Sc.
Frank Q. Nuttall, M.D.
Jack H. Oppenheimer, M.D.
George A. Sarosi, M.D
Alvin L. Schultz, M.D., M.S.
Athanasios Theologides. M.D., Ph.D.
Louis Tobian, Jr., M.D.
Yang Wang, M.D.
C. Paul Winchell, M.D.
Leslie Zieve, M.D., Ph.D.

Associate Professor

Jonathan S. Bishop, M.D., Ph.D.
John W. Eaton, Ph.D.
Russell F. Hanson, M.D., Ph.D.
Richard S. Kronenberg, M.D.
Charles F. Moldow, M.D.
Naip Tuna, M.D., Ph.D.

Graduate work in the Department of Medicine offers opportunities for physicians with outstanding undergraduate scholastic records or other evidence of promise to prepare for careers of teaching, research, or practice in internal medicine or any of its specialty areas. Programs are organized to provide graduate education in clinical medicine and related preclinical areas. Medical fellowships are offered in general internal medicine, or at the advanced level in specialties of internal medicine, to students with evidence of scholarly promise.

A wide range of clinical material for graduate work in internal medicine is available in the wards and outpatient departments of University Hospitals, Hennepin County Medical Center, Northwestern Hospital, St. Paul-Ramsey Medical Center, and Veterans Administration Hospital. These institutions are the primary resources for graduate education in clinical medicine. Opportunities for research in the laboratories in all of the hospitals are open to members of the Department of Medicine.

The pursuit of a minor subject may be carried on simultaneously and in close relation with clinical studies. Anatomy, biochemistry, microbiology, pathology, pharmacology, and physiology departments all have their laboratories and teaching centers on the campus; work in any of these subjects may be developed to meet the minor field requirements for a degree program.

In general, fellowships for an advanced degree program are planned for a four-year period, of which two and one-half to three years are devoted to clinical medicine and research and one to one and one-half years to basic sciences and research. During the greater part of the first period, the individual acts as a resident physician in one of the

hospitals. In this position he or she assumes increasing clinical responsibilities in patient care as a part of the clinical medicine experience. In addition, the fellow in medicine is expected to participate in the teaching program.

An advanced degree program must include research directed toward preparation of an acceptable thesis. For the M.S. degree, this research may be a scholarly clinical project. For the Ph.D. degree, the research must be a scholarly, original investigation on a topic that has implications for clinical medicine.

Language Requirement—For the master's degree, no language is required. For the Ph.D. degree, a language or special research technique may be required at the discretion of the adviser.

Master's Degree—Offered only under Plan A.

Doctor's Degree—Work leading to the Ph.D. degree is offered. The minor field must be logically related to medicine and must be composed of graduate-level courses, preferably in the major basic sciences.

The courses listed below are described in the broadest outline to convey the character of the work. No hard-and-fast program is required, so that the individual capabilities and goals of the fellow can be accommodated.

8201f,w,s,su. CLINICAL MEDICINE. (Cr ar) Ferris, Howard, Mulhausen, Sarosi, Schultz, and staff
General diagnosis and methods of investigation; recording of clinical data. Emphasis on methods of treatment and primary patient care.

8202f,w,s,su. CLINICAL CONFERENCE. (1 cr) Staff
Presentation of problem cases from the Medical Service. Discussion of diagnosis and treatment and consideration of pertinent literature.

8203f,w,s,su. CLINICAL RADIOLOGY CONFERENCE. (1 cr) Gedgaudas and staff
Presentation and discussion of X-ray films from the Medical Service, with clinical correlation.

8204f,w,s,su. PATHOLOGICAL CONFERENCE. (1 cr) Staff
Presentation of clinical features, necropsy findings, and discussion. Medical and surgical cases.

8205f,w,s,su. ELECTROCARDIOGRAPHIC CONFERENCE. (1 cr) Tuna

8206f,w,s,su. NEPHROLOGY SEMINAR. (3 cr) Ferris
Lecture and discussion of clinical nephrology with emphasis on acute and chronic renal failure, underlying pathophysiology, differential diagnosis, immunology, and glomerular processes.

8209f,w,s,su. TUMOR CLINICAL CONFERENCE. (1 cr) Kennedy and staff

8210f,w,s,su. INFECTIOUS DISEASE SEMINAR. (Cr ar) Hall, Sabath, and staff

8211f,w,s,su. DISEASES OF THE CARDIOVASCULAR SYSTEM. (Cr ar) Cohn, Wang, and staff
Clinical and special laboratory aspects of diseases related to the cardiovascular system with emphasis on consultative and special laboratory skills.

8212f,w,s,su. DISEASES OF THE CHEST. (Cr ar) Kronenberg and staff
Opportunities to study problems relating to the chest from both clinical and laboratory standpoints.

8213f,w,s,su. DISEASES OF THE KIDNEY. (Cr ar) Ferris and staff
Clinical and laboratory aspects of renal disease and hypertension with emphasis on consultative, renal dialysis, and laboratory skills.

8214f,w,s,su. DISEASES OF DIABETES, ENDOCRINOLOGY, AND METABOLISM. (Cr ar) Oppenheimer, Goetz, and staff
Clinical and laboratory aspects of diseases of endocrinology and metabolism with emphasis on consultative, special testing, and laboratory skills.

8215f,w,s,su. DISEASES OF HEMATOLOGY. (Cr ar) Jacob and staff
Clinical and special laboratory aspects of hematology with emphasis on consultative and special laboratory skills.

8216f,w,s,su. DISEASES OF GASTROENTEROLOGY. (Cr ar) Wilson and staff
Clinical and special procedure aspects of diseases of gastroenterology with emphasis on consultative, endoscopy, and laboratory skills.

8217f,w,s,su. DISEASES OF ONCOLOGY. (Cr ar) Kennedy and staff
Clinical and laboratory aspects of cancer and tumor chemotherapy with emphasis on methods of treatment and consultative and laboratory skills.

8220f,w,s,su. RESEARCH IN MEDICINE. (Cr ar) Ferris, Howard, Mulhausen, Sarosi, Schultz, and staff

8221f,w,s,su. TOPICS IN MEDICINE. (Cr ar) Staff

8223f,w,s,su. TOPICS IN RELATED BASIC SCIENCE. (Cr ar) Staff

MEDICINE

OFFERED AT ROCHESTER

Professor

Richard E. Weeks, M.D., M.S., *chairman*
David L. Ahmann, M.D., M.S.
Howard A. Andersen, M.D., M.S.
Milton W. Anderson, M.D., M.S.
Lloyd G. Bartholomew, M.D., M.S.
Edwin D. Bayrd, M.D., M.S.
Kenneth G. Berge, M.D., M.S.
Harry F. Bisel, M.D.
Leo F. Black, M.D., M.S.
E. J. Walter Bowie, M.B.B.Ch., M.S.
Robert O. Brandenburg, M.D., M.S.
Earl T. Carter, M.D., Ph.D.
Daniel C. Connolly, M.D., Ph.D.
Guy W. Daugherty, M.D., M.S.
E. Rolland Dickson, M.D., M.S.
Eugene P. DiMagno, M.D.
David E. Dines, M.D., M.S.
Matthew B. Divertie, M.D., M.S.
James V. Donadio, Jr., M.D.
Thomas P. Dousa, M.D., Ph.D.
Virgil F. Fairbanks, M.D.
Richard H. Ferguson, M.D.
Robert S. Fontana, M.D., M.S.
William T. Foulk, Jr., M.D., M.S.
Robert L. Frye, M.D.
Valentin D. Fuster, M.D.
Clifford F. Gastineau, M.D., Ph.D.
Joseph E. Geraci, M.D., M.S.
John E. Gerich, M.D.
Emilio R. Giuliani, M.D.
Gerald J. Gleich, M.D.
Vay L. W. Go, M.D.
Hymie Gordon, M.B.B.Ch., M.D.
Colum A. Gorman, M.B.B.Ch., Ph.D.
John B. Gross, M.D., M.S.
Albert B. Hagedorn, M.D., M.S.
Richard G. Hahn, M.D.
Carlos E. Harrison, Jr., M.D., M.S.
Lowell L. Henderson, M.D., M.S.
Norman G. G. Hepper, M.D., M.S.
Paul E. Hermans, M.D., M.S.
Harry N. Hoffman II, M.D., M.S.
Kenneth A. Huizenga, M.D., M.S.
Gene G. Hunder, M.D., M.S.
Robert E. Hyatt, M.D.
William J. Johnson, M.D.
John L. Juergens, M.D., M.S.
Joseph M. Kiely, M.D., M.S.
Franklyn G. Knox, M.D., Ph.D.
Bruce A. Kottke, M.D., Ph.D.
John S. Kovach, M.D.
Robert A. Kyle, M.D., M.S.
Juan R. Malagelada, M.D.
W. Eugene Mayberry, M.D., M.S.
William M. McConahey, M.D., M.S.
Douglas B. McGill, M.D., M.S.
James R. McPherson, M.D., M.S.
R. Drew Miller, M.D., M.S.
Charles G. Moertel, M.D., M.S.
Albert D. Newcomer, M.D.
Pasquale J. Palumbo, M.D., M.S.
Sidney F. Phillips, M.B.B.S
Robert V. Pierre, M.D.
Howard F. Polley, M.D., M.S.
Raymond V. Randall, M.D., M.S.
Charles E. Reed, M.D.
Richard J. Reitemeier, M.D., M.S.
B. Lawrence Riggs, M.D., M.S.
Erik L. Ritman, M.D., Ph.D.
Joseph R. Rodarte, M.D.
Juan C. Romero, M.D.
Edward C. Rosenow III, M.D., M.S.
Robert J. Ryan, M.D.
Robert M. Salassa, M.D., M.S.
Donald A. Scholz, M.D., M.S.
Sheldon G. Sheps, M.D.
Murray N. Silverstein, M.D., M.S.
Lynwood H. Smith, M.D.
Ralph E. Smith, M.D.
John A. Spittell, Jr., M.D., M.S.
Cameron G. Strong, M.D., M.S.
Abdul J. Tajik, M.B.B.S.
Johnson L. Thistle, M.D., M.S.
Heinz W. Wahner, M.D., M.S.
L. Emmerson Ward, M.D., M.S.
Richard M. Weinshilboum, M.D.

Associate Professor

Carl F. Anderson, M.D.
William P. Baldus, M.D., M.S.
James C. Broadbent, M.D., M.S.
Thomas W. Bunch, M.D.
John A. Callahan, M.D., M.S.
Alan J. Cameron, M.D.
Doyt L. Conn, M.D.
Albert J. Czaja, M.D.
Richard A. DeRemee, M.D.
Bruce E. Douglass, M.D., M.S.
Robert T. Eagan, M.D.
John H. Edmonson, M.D.
Titus C. Evans, M.D.
John F. Fairbairn II, M.D.
Peter P. Frohnert, M.D., M.S.
Douglas R. Gracey, M.D., M.S.
Paul A. Green, M.D.
Hunter Heath, M.D.
John A. Higgins, M.D., M.S.
Richard W. Hill, M.D., M.S.
H. Clark Hoagland, M.D., M.S.
David L. Hoffman, M.D.
Edward J. Kamin, M.D.
Francis J. Kazmier, M.D., M.S.
Thomas F. Keys, M.D.
Iqbal Krishan, M.D.
Stephen Lai-Fook, Ph.D.

Nicholas F. J. LaRusso, M.D.
Edward G. Lufkin, M.D.
James D. Maloney, M.D.
John G. Mayne, M.D., M.S.
Charles H. McKenna, M.D.
George W. Morrow, Jr., M.D., M.S.
Fred T. Nobrega, M.D.
Robert C. Northcutt, M.D.
Michael J. O'Connell, M.D.
John D. O'Duffy, M.D.
Philip J. Osmundson, M.D., M.S.
Thomas W. Parkin, M.D., M.S.
Alkis M. Pierides, M.B.B.Ch.
Don C. Purnell, M.D., M.S.
Randolph A. Rovelstad, M.D., Ph.D.
David R. Sanderson, M.D.
Thomas T. Schattenberg, M.D., M.S.
Alexander Schirger, M.D.
Allan J. Schutt, M.D.
Frederick J. Service, M.D., Ph.D.
James B. Seward, M.D., M.S.
Glen W. Sizemore, M.D.
Hugh C. Smith, M.D.
Ralph E. Spiekerman, M.D., M.S.
Robert G. Tancredi, M.D.
Richard G. Van Dellen, M.D.
Robert E. Van Scoy, M.D.
Ronald E. Vlietstra, M.D.
Richard D. Wagoner, M.D.
David M. Wilson, M.D.
Walter R. Wilson, M.D.

Assistant Professor

Leonard A. Brennan, Jr., M.D.
Philip W. Brown, Jr., M.D., Ph.D.
Paul C. Carpenter, M.D.
James H. Chesebro, M.D.
Douglas T. Coles, M.D.
Joseph J. Combs, M.D.
William W. Douglas, M.D.
Stephen B. Erickson, M.D.
C. Richard Fleming, M.D., M.S.
Stephen Frytak, M.D.
Gerald T. Gau, M.D.
Stafford W. Gedge, M.D., M.S.
William W. Ginsburg, M.D.
Philip R. Greipp, M.D.
David G. Hanlon, M.D., M.S.
James N. Ingle, M.D.
Horace K. Ivy, M.D., M.S.
Arthur J. Kennel, M.D., M.S.
John E. King, M.D.
Stephen B. Kurtz, M.D.
Harvinder S. Luthra, M.D.
Harold T. Mankin, M.D., M.S.
John Merideth, M.D.
Robert M. Petitt, M.D.
Dietlind L. Roedler-Wahner, M.D., M.S.
Michael S. Rohrbach, Ph.D.
James V. Ross, Jr., M.D., M.S.
Richard E. Sedlack, M.D., M.S.
Harry A. Swedlund, M.D., M.S.
Richard B. Tompkins, M.D.
Christian J. Van Den Berg, M.D., M.S.
Jorge A. Velosa, M.D.
Philip R. Westbrook, M.D.
Conrad J. Wilkowske, M.D.
Daniel N. Wochos, M.D.

The program in internal medicine offers individualized training with emphasis on helping residents achieve their specific goals in preparing for clinical practice, a research-oriented career, or an academic career.

Applicants may be admitted to enter the medical residency program in the first or second graduate-level or postdoctoral year. Appointments are made through the National Resident Matching Program for candidates requesting entrance at graduate level 1. For those who plan on pursuing training and ultimately practicing in a subspecialty in addition to internal medicine, up to three years of training in the various subspecialties are offered after completing requirements of the American Board of Internal Medicine. Joint training for certification in internal medicine and preventive or occupational medicine is available.

Residents are assigned graduated increases in responsibility in the care of medical patients throughout the training program in internal medicine. During the residency, primary emphasis is placed on developing proficiency in the basic skills of internists and their approach to the clinical problem.

Hospital and outpatient assignments in general internal medicine and in the various internal medicine subspecialty services occupy up to 36 months. Hospital services are organized to reflect both the general and subspecialty aspects of internal medicine including cardiovascular diseases, nephrology, thoracic and allergic diseases, rheumatology, gastroenterology, hematology and oncology, infectious diseases, endocrine diseases, and emergency room care. The practice of general internal medicine is an integral part of every subspeciality rotation. Also available are assignments to neurology, psychiatry, dermatology, clinical nutrition, and the hypertension clinic.

During the first part of each hospital service, residents become familiar with many of the particulars of the subspecialty. In the remaining time, they are given the opportunity to assume increasing responsibility for the total management of each patient they admit. This graduated assumption of patient management is evaluated by the staff member on full-time duty as a hospital consultant. Flexibility in assignments to the various hospital services

permits individualization of the educational program within the general framework of preparing for American Board of Internal Medicine certification.

Hospital rounds with medical students, residents and trainees, and consultants assigned to the service are made daily. Consultants rotate on a three- to four-week schedule, permitting residents to gain experience with several consultants during each assignment. Hospital services usually have three residents so that each resident is on call every third night, allowing for time to study and attend conferences and seminars.

Senior residents in their third year of the program are assigned a minimum of three months of responsibility for patient care in the outpatient clinic. Staff opinions are available to residents from their sections or departments and from other specialty sections from which residents may request consultations.

A staff consultant acts as an adviser to each medical resident. This association provides continuous personal assistance to residents in achieving their educational goals. Quarterly critiques based on evaluations by each staff consultant with whom residents have worked are reviewed with them by their advisers.

The Department of Internal Medicine offers a clinician investigator (C.I.) training track, which leads to board eligibility in internal medicine and a medical subspecialty and provides significant research training. There are a limited number of positions available in this program. Candidates should be recent graduates who have an academic record of high achievement and a strong desire to pursue a career in research.

The C.I. program includes two and one-half years of training in general internal medicine, one and one-half years in a medical subspecialty, and two years in research. Because the program is intensive and demanding, a major and firm commitment is required. Interviews with clinicians and investigators will be arranged for candidates who have an interest in this track. Further details about the clinician investigator training track are available on request.

Many seminars, conferences, lectures, and other forms of teaching bring together residents and staff members from a variety of disciplines to further enrich the knowledge and experience of all. Medical grand rounds are held biweekly throughout the year.

Master's Degree—Offered only under Plan A.

Doctor's Degree—Work leading to the Ph.D. degree is offered.

M 5801. SYSTEMIC ENDOCRINOLOGY. (3 cr; prereq 1 yr organic and inorganic chemistry) Gorman
Lecture and discussion course emphasizing normal and abnormal endocrine physiology and biochemistry. Graduate students required to complete a paper.

M 5802. CELLULAR PHYSIOLOGY INTEGRATIVE METABOLISM. (6 cr; prereq #) Palumbo
To acquaint students with view of nutrition that includes ingestion and digestion of foodstuffs, and cellular nutrition and metabolism.

M 5803. CLINICAL NUTRITION. (1 cr) Gastineau, Anderson, and staff
Lectures on clinical syndromes of malnutrition, principles of enteral and parenteral therapy, assessment of nutritional status, and concepts of energy metabolism.

M 5804. PATHOPHYSIOLOGY OF KIDNEY AND URINARY TRACT. (3 cr; offered yearly) Mitchell and staff
Basic renal pathophysiology. Examination required for credit.

M 5805. GASTROINTESTINAL PHYSIOLOGY. (4 cr; prereq 1 yr general physiology or equiv or #) HN Hoffman
Lecture and discussion emphasizing normal and abnormal gastrointestinal physiology. Graduate students required to complete a paper.

M 5806s. RESPIRATORY PHYSIOLOGY. (6 cr) Gracey
Introductory anatomy and physiology of the respiratory system; basic types of pathologic conditions.

M 5807w. INTRODUCTION TO HEMATOLOGY. (3 cr) Kiely

M 5808w. INTRODUCTION TO INFECTIOUS DISEASES. (2 cr) Van Scoy
Lectures on and review of fundamentals of infectious disease including pathogenesis.

M 5809. INTRODUCTION TO ALLERGY. (1 cr; prereq M 5806) Van Dellen
Lectures on types of immunologic reactions and how these cause disease. The pathophysiology of type 1 allergic reactions and the pathophysiology and pathology of asthma.

M 5810s. CARDIOVASCULAR SYSTEM. (5 cr) Vlietstra
Lectures, seminars, and laboratories on the fundamentals of cardiovascular anatomy, physiology, and biochemistry.

M 8800f,w,s,su. PRINCIPLES OF MEDICAL GENETICS AND CLINICAL APPLICATION. (3 cr) Staff
Preparation of special project and presentation of findings; journal review; patients with genetic problems examined and chromosome techniques demonstrated.

M 8801f. LECTURES AND LABORATORY IN RHEUMATOLOGY. (1 cr; offered 1981 and alt yrs) Hunder
Principles of immunologic tests in rheumatology.

M 8851f,w,s,su. GENERAL MEDICAL AND SURGICAL DIAGNOSIS. (6 cr) Staff

M 8852f,w,s,su. MEDICAL HOSPITAL RESIDENCE. (6 cr) Staff
Junior residency service.

M 8853f,w,s,su. MEDICAL DIAGNOSIS AND HOSPITAL SERVICE. (6 cr) Staff
Senior residency service.

M 8854f,w,s,su. ADVANCED MEDICAL DIAGNOSIS AND MANAGEMENT. (6 cr) Senior resident associate

M 8855f,w,s,su. ALLERGY (SPECIAL CLINICAL AND LABORATORY TECHNIQUES). (6 cr) Staff

M 8856f,w,s,su. CLINICAL HEMATOLOGY (SPECIAL CLINICAL AND LABORATORY TECHNIQUES). (6 cr) Staff

M 8857f,w,s,su. GASTROENTEROLOGY (SPECIAL CLINICAL AND LABORATORY TECHNIQUES). (6 cr) Staff

M 8858f,w,s,su. CARDIOVASCULAR DISEASES (SPECIAL CLINICAL AND LABORATORY TECHNIQUES). (6 cr) Staff

M 8859f,w,s,su. PERIPHERAL VASCULAR DISEASES (SPECIAL CLINICAL AND LABORATORY TECHNIQUES). (6 cr) Staff

M 8860f,w,s,su. NEPHROLOGY (SPECIAL CLINICAL AND LABORATORY TECHNIQUES). (6 cr) Staff

M 8861f,w,s,su. RHEUMATOLOGY (SPECIAL CLINICAL AND LABORATORY TECHNIQUES). (6 cr) Staff

M 8862f,w,s,su. THORACIC DISEASES (SPECIAL CLINICAL AND LABORATORY TECHNIQUES). (6 cr) Staff

M 8863f,w,s,su. INFECTIOUS DISEASES (SPECIAL CLINICAL AND LABORATORY TECHNIQUES). (6 cr) Staff

M 8864f,w,s,su. ENDOCRINOLOGY AND METABOLISM (SPECIAL CLINICAL AND LABORATORY TECHNIQUES). (6 cr) Staff

M 8865. COMMUNITY MEDICINE (SPECIAL CLINICAL AND LABORATORY TECHNIQUES). (6 cr) Staff

M 8866. ONCOLOGY (SPECIAL CLINICAL AND LABORATORY TECHNIQUES). (6 cr) Staff

M 8867. PATHOBIOLOGY OF BILE ACIDS. (1 cr) Staff
Comparative biochemistry, radiochemistry, physical chemistry, and analytical chemistry of bile acids. Enterohepatic circulation; role of bile acids in diarrheal states; diagnostic and therapeutic value of bile acids.

MICROBIOLOGY (MicB)

OFFERED AT MINNEAPOLIS

Microbiology

Regents' Professor

Dennis W. Watson, Ph.D., *head*

Professor

Arthur Johnson, M.D., *head, UMD*[1]
Roy E. Ritts, Jr., M.D., *chairperson, Mayo Graduate School of Medicine*[2]
Dwight L. Anderson, Ph.D.
K. Gerhard Brand, M.D.
Francis Busta, Ph.D.
Martin Dworkin, Ph.D.
Anthony J. Faras, Ph.D.,
V. W. Greene, Ph.D.
W. H. Hall, M.D., Ph.D.
Thomas R. Hamilton, M.D.[1]
Richard Hanson, Ph.D.
Alan B. Hooper, Ph.D.
Howard M. Jenkin, Ph.D.[3]
Russell C. Johnson, Ph.D.
Frederic C. McDuffie, M.D.[2]
Gerald M. Needlam, Ph.D.[2]
Peter G. W. Plagemann, Ph.D.
Paul G. Quie, M.D.
Palmer Rogers, Ph.D.
Charles F. Schachtele, Ph.D.
Edwin L. Schmidt, Ph.D.

[1]University of Minnesota, Duluth
[2]Mayo Graduate School of Medicine, Rochester
[3]Hormel Institute, Austin

Richard Simmons, M.D.
David Steinmuller, Ph.D.
Henry M. Tsuchiya, Ph.D.
Lewis W. Wannamaker, M.D.
John A. Washington II, M.D.[2]
Horace Zinneman, M.D.

Associate Professor

P. Patrick Cleary, Ph.D., *director of graduate study*
Ronald Crawford, Ph.D.
Gerald Gleich, M.D.[2]
Beulah H. Gray, Ph.D.
Bruce Kline, Ph.D.[2]
Harold Markowitz, M.D., Ph.D.[2]
Charles Muscoplat, Ph.D.
Gary Pearson, Ph.D.[2]
James T. Prince, M.S.
Bernard E. Reilly, Ph.D.
Richard J. Ziegler, Ph.D.[1]
James F. Zissler, Ph.D.

Assistant Professor

Russell Bey, Ph.D.
Robert Click, Ph.D.
Marc Collett, Ph.D.
Gregory R. Germaine, Ph.D.
Barry Handwerger, Ph.D.
William F. Liljemark, D.D.S., Ph.D.
Omelan Lukasewycz, Ph.D.[1]
Robert Nelson, Ph.D.
Patrick Schlievert, Ph.D.
Janet Schottel, Ph.D.
Robert Wohlhueter, Ph.D.

Lecturer

Donna J. Blazevic, M.P.H.
William Campbell, Ph.D.[2]
Grace M. Ederer, M.P.H.
Larry McKay, Ph.D.

Graduate degree programs in microbiology may be planned cooperatively with faculty in residence on other campuses.

Degrees Offered—M.S. (Plan A) and Ph.D. See Medical Microbiology section for description of the M.S. (Plan B) program.

Doctor's Degree in Microbiology—No minimum number of credits is specified for the Ph.D.; the sole criterion for the degree is a high level of competence in microbiology. A written qualifying examination is ordinarily taken upon entering the program or one year after completion of residency; the written and oral preliminary examinations are taken two years after completion of residency. There is a recommended core curriculum most students take during their first year of graduate studies that consists of approximately 26 credits in microbiology in addition to a biochemistry sequence.

Emphasis Within the Major—Areas of specialization include general microbiology, microbial ecology, bacterial physiology, bacterial development, bacterial and phage genetics, medical microbiology, immunology, virology, animal cell culture, and cancer biology.

Prerequisites—An appropriate academic background should normally include standard college courses in inorganic chemistry, qualitative and quantitative chemistry, organic chemistry, biochemistry, physics, mathematics through calculus, one academic year or equivalent of biological sciences, preferably physical chemistry, and some reading proficiency in French or German.

Application Deadline—Because the core curriculum begins every fall, it is recommended that students apply for entry in the fall of the preceding year. Applications should be submitted by February 1. Applications for fall quarter received after February 1 will be considered only if space is still available.

Special Major Field Requirements—The following must be sent to the Department of Microbiology before an application will be evaluated: three letters of recommendation; Graduate Record Examination scores (quantitative, analytical, and verbal sections); and a brief autobiographical sketch including such information as reasons for seeking an advanced degree, career objectives, special area(s) of interest in microbiology, and reasons for these interests. Foreign students must submit Test of English as a Foreign Language scores (minimum score of 550 required).

[1]University of Minnesota, Duluth
[2]Mayo Graduate School of Medicine, Rochester

5105f.[1] **BIOLOGY OF MICROORGANISMS.** (5 cr, §3103, §Biol 5013; prereq 5 cr in biological sciences, Biol 5001 or #) Dworkin
Lectures, demonstrations, and laboratory exercises in taxonomy, anatomy, physiology, biochemistry, and ecology of microbes. Some emphasis on molecular structure in relation to bacterial function.

5106. ADVANCED GENERAL MICROBIOLOGY LABORATORY. (3 cr; prereq 5105 or equiv) Dworkin
Isolation from natural sources of a variety of microorganisms such as *Clostridium*, yeast, *Caulobacter*, *Myxobacteria*, *Leptospira*, photosynthetic bacteria, *Bdellovibrio*, luminescent bacteria, and others. Laboratory only.

5201f.[1] **MICROBIOLOGY FOR DENTAL STUDENTS.** (7 cr) Anderson, Liljemark, Reilly
Nature and diversity of microorganisms; bacterial anatomy; nutrition and growth; variation and genetic exchange; fundamentals of immunology; pathogenic bacteria, fungi, and viruses; principles of sterilization and disinfection; chemotherapy; development and ecology of the oral flora; microbiology of dental caries and periodontal disease.

5205s.[1] **MICROBIOLOGY FOR MEDICAL STUDENTS.** (6 cr; prereq regis med fr or grad) Brand and staff
Basic and medical aspects of immunology, parasitology, mycology, bacteriology; and virology with emphasis on pathogenesis. Principles and techniques enabling diagnosis, treatment (especially chemotherapy), and prevention of infectious disease.

5206su.[1] **MICROBIOLOGY FOR MEDICAL STUDENTS.** (4 cr; prereq regis med fr...others #) (Continuation of 5205) Lecture and laboratory.

5216f. IMMUNOLOGY. (4 cr; prereq Biol 5001) Gray, Schlievert
Nature of antigens and antibodies; chemical basis of serologic specificity; qualitative and quantitative aspects of antigen-antibody reactions; theories of antibody production; cellular antigens and blood grouping; nature of complement and its role in immunologic phenomena; mechanisms of hypersensitivity; hypersensitivity-like states and immunologic diseases; transplantation and tumor immunity; host-parasite interactions. Includes laboratory.

5218f. IMMUNOLOGY. (3 cr; prereq Biol 5001) Gray, Schlievert
Same as 5216 without laboratory.

5225s. MICROBIOLOGY FOR MEDICAL STUDENTS. (4 cr; prereq regis microbiology grad student...for others, #) Brand and staff
Basic and medical aspects of immunology, parasitology, mycology, bacteriology, and virology with emphasis on pathogenesis. Principles and techniques enabling diagnosis, treatment (especially chemotherapy), and prevention of infectious disease.

5226su. MICROBIOLOGY FOR MEDICAL STUDENTS. (2 cr)
(Continuation of 5225) Lecture.

5232w.[1] **MEDICAL MICROBIOLOGY.** (3 cr; not open to med students; prereq 5216 or 5218 and 5105 or 3103 or 8110 or Biol 5013) Cleary
Pathogenic bacteria and fungi, mechanisms of pathogenicity and virulence; properties of microorganisms and their animal hosts that influence the outcome of host-parasite relations analyzed from genetic and metabolic view. Includes laboratory.

5233f.[1] **MICROORGANISMS AND DISEASE.** (7 cr; not open to microbiology majors; prereq 10 cr in chemistry and 5 cr in biological sciences or #) Johnson
Lectures, demonstrations, and laboratory instruction on nature of microorganisms, immunology, medical bacteriology, virology, mycology, parasitology, and principles of disease control.

5234w.[1] **MEDICAL MICROBIOLOGY LABORATORY.** (2 cr; prereq 5232 or ¶5232) Cleary
Exercises designed to demonstrate the principles that influence interactions between microorganisms and humans leading to a diseased state.

5235f. MICROORGANISMS AND DISEASE. (4 cr; not open to microbiology majors; prereq 10 cr chemistry and 5 cr biological science or #) Johnson
Same as 5233 but without laboratory.

5321w. PHYSIOLOGY OF BACTERIA. (3 cr; prereq 3103 or 5105 or Biol 5013, 10 cr in organic chemistry or biochemistry, 3 cr in genetics) Rogers
Chemical and physical organization of bacteria as related to function; growth; energy metabolism including oxidations and fermentations; nutritional requirements; antimicrobial agents; autotrophic mechanisms; microbial differentiation.

5322w. PHYSIOLOGY OF BACTERIA LABORATORY. (2 cr; prereq 5321 or ¶5321 and a lab course in basic bacteriology) Rogers
Techniques employed in study of bacterial physiology and metabolism.

5424s. BIOLOGY OF VIRUSES. (4 cr; prereq 5321 or Biol 5001 and #) Plagemann
Structure, composition, and properties of bacterial, plant, and animal viruses; their interaction with cells and effects on host cell metabolism; biochemistry of viral replication; techniques used in study of viruses and viral infections; viral tumorigenesis. Includes laboratory.

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[1]Microscope required. Students may obtain use of microscope by purchasing $3 microscope card from the bursar.

5611f. MICROBIAL ECOLOGY. (4 cr; prereq general microbiology course, Biol 5001 or #) Crawford
Microbial adaptation and diversity; role of microorganisms in natural processes; methods in microbial ecology; other topics of interest to microbial ecologists.

5900f,w,s. TOPICS IN MICROBIOLOGY. (1 cr; offered S-N only; open to microbiology undergrad majors) Rogers
Seminars on research programs, historical perspectives, significant emerging fields, professional societies and publications, and career opportunities.

5912f. INTRODUCTION TO ANALYTICAL METHODS. (2 cr; open to microbiology grad students only; prereq #) Wohlhueter and staff
Basic theory and demonstration of the use of the following methods: radiation counting, centrifugation, chromatography, pH measurements, electrophoresis, and hybridization.

5990f,w,s,su. PRACTICUM: TEACHING. (1 cr; prereq #) Prince and staff
Supervised experience in laboratory instruction: development of skills in effective use of instructional materials, tests, and measurements.

8110f. BIOLOGY OF MICROORGANISMS. (3 cr; prereq organic chemistry, biochemistry, general biology or #) Dworkin
Introductory course in microbiology. Lectures only; emphasizing structure and function, biochemistry, physiology, molecular biology, ecology, and classification of bacteria.

8112s. MICROBIAL GENETICS. (Cr ar; prereq #) Zissler
Lecture, discussion, and laboratory instruction in molecular genetics.

8121f. ADVANCED IMMUNOLOGY LABORATORY. (2 cr; prereq 5216, #) Gray
Current methods and experimentation in immunology.

8122w. ADVANCED MICROBIOLOGY. (3 cr; prereq 5321, 5424 or #)
Experimentation in physiology, genetics, and virology.

8202w. ORAL MICROBIOLOGY. (3 cr; prereq grad student in microbiology or dentistry...others by #) Schachtele and staff
Lectures, assigned readings and discussions on acquisition, distribution, and interactions of the oral flora; mechanisms of dental plaque formation; etiology of dental caries; identification and characterization of cariogenic bacteria; prevention of caries; etiology of periodontal disease; crevicular bacteria and inflammation of the gingiva; other infections of the oral cavity; microbiology in dental specialty areas.

8218s. IMMUNOCHEMISTRY AND IMMUNOBIOLOGY. (3 cr; prereq 5216, #...LMed 5274 recommended) Gray
Limited assigned reading and classroom participation on immunoglobulin structure, complement, immunogenetics, cellular immunology, in vitro antibody formation, delayed hypersensitivity and immunologic disease. Emphasis on discussion of current journal articles.

8234. ADVANCED MEDICAL MICROBIOLOGY. (2 cr; prereq #; offered when feasible) Brand

8239f, 8240w. PRECEPTORSHIP IN MEDICAL MICROBIOLOGY. (Cr ar [max 6 cr per qtr]; prereq #) Prince and staff
Working experience in participating diagnostic laboratories.

8242f,w,s. DIAGNOSTIC MICROBIOLOGY. (Cr ar; prereq grad student in microbiology, #) Blazevic and staff
Laboratory procedures for isolation and identification of microorganisms from patients. Work is carried out in diagnostic microbiology laboratories of the hospital.

8320f. IMMUNOGENETICS. (3 cr; prereq 5216 or #) Click
Use of genetics in understanding immune phenomena.

8323. REGULATION OF METABOLISM. (3 cr; prereq 5321, MdBc 5753 or equiv or #; offered when feasible)
Metabolic pathways of specific bacterial and mammalian cells with emphasis on regulation. Energetics; catabolite repression; enzyme induction, repression and feedback inhibition; transport and pools, turnover, inborn errors of metabolism.

8421f. MOLECULAR BIOLOGY OF CANCER. (3 cr; prereq 2 qtrs biochemistry, 5216, 5424, 8112, #) Faras and staff
Mechanisms of oncogenesis at molecular level; emphasis on pertinent alterations in eukaryotic cell populations that accompany oncogenesis including those induced by viruses and chemicals; differentiation, cell genetics, immunology, epidemiology, and therapy.

8910f,w,s. SEMINAR. (1 cr; prereq #) Cleary and staff

8911f,w,s. COLLOQUIUM IN MICROBIOLOGY. (1 cr) Cleary and staff
Series of independent units, each led by staff member. Several units offered each quarter; students may participate in one or more. Topics include mechanisms of immune response, biochemical aspects of animal virus replication, developmental microbiology, genetics of phage lambda and tumor viruses, comparative metabolism of animal and bacterial cells, epidemiology, mechanisms of pathogenesis, molecular aspects of regulation, carcinogenesis, industrial microbiology, microbial ecology, and regulation of metabolism.

8920f,w,s. ADVANCES IN IMMUNOLOGY. (1 cr; prereq #; offered when feasible)
Research seminars. Presentation of research or literature seminar required for credit.

8990f,w,s,su. RESEARCH IN MICROBIOLOGY. (Cr ar) Cleary and staff
Graduate students with requisite preliminary training may elect research project outside their thesis work.

Medical Microbiology

Regents' Professor

Dennis W. Watson, Ph.D., *head*

Professor

K. Gerhard Brand, M.D.
Martin Dworkin, Ph.D.
Anthony Faras, Ph.D.
Russell C. Johnson, Ph.D.
Peter G. W. Plagemann, Ph.D.
Palmer Rogers, Ph.D.
John Washington II, M.D.

Associate Professor

James T. Prince, M.S., *director of graduate study*
Paul P. Cleary, Ph.D.
Beulah H. Gray, Ph.D.

Assistant Professor

Russell Bey, Ph.D.
Patrick Schlievert, Ph.D.

Lecturer

Henry Bates, Ph.D.
Donna J. Blazevic, M.P.H.
Grace M. Ederer, M.P.H.
Seymour Handler, M.D., Ph.D.

A master's degree program in medical microbiology is offered under Plan B. The program is designed for students interested in training for supervisory careers in clinical diagnostic microbiology. The program includes a major and a minor and a number of preceptorship experiences (see MicB 8239, 8240) in various diagnostic microbiology laboratories of area hospitals affiliated with the Medical School. Satisfactory completion of a project and the written and final oral examinations is required.

Prerequisites—There are no specific prerequisites for admission; however, an appropriate academic background should normally include standard college courses in inorganic and organic chemistry, physics, and mathematics. Strong consideration will be given to applicants with a bachelor's degree in microbiology or the biological sciences and to those with previous experience in a clinical diagnostic or medical microbiology laboratory.

Application Deadline—The core curriculum begins every fall, and it is recommended that students apply for entry approximately a year in advance. Applications should be submitted by February 1; those received after this date will be considered only if space is available.

Special Major Field Requirements—Three letters of recommendation, Graduate Record Examination scores (quantitative, analytical, and verbal sections), and a detailed statement of the applicant's long-range occupational objectives are required before an application is reviewed.

The following core courses are offered by the Department of Microbiology for students majoring in medical microbiology. See the Microbiology section of this bulletin for course descriptions.

5105f.[1] **BIOLOGY OF MICROORGANISMS.** (5 cr, §3103, §Biol 5013; prereq 5 cr in biological sciences, Biol 5001 or #) Dworkin

5106s. ADVANCED GENERAL MICROBIOLOGY. (3 cr; prereq 5105 or equiv) Dworkin

5216f. IMMUNOLOGY. (4 cr; prereq Biol 5001) Gray, Schlievert

5218f. IMMUNOLOGY. (3 cr; prereq Biol 5001) Gray, Schlievert

5225s.[1] **MICROBIOLOGY FOR MEDICAL STUDENTS.** (6 cr; prereq regis med fr or grad student) Brand and staff

5226su.[1] **MICROBIOLOGY FOR MEDICAL STUDENTS.** (4 cr)

5232w.[1] **MEDICAL MICROBIOLOGY.** (3 cr; not open to med students; prereq 5216 or 5218 and 5105 or 3103 or 8110 or Biol 5013) Cleary

5234w.[1] **MEDICAL MICROBIOLOGY LABORATORY.** (2 cr; prereq 5232 or ¶5232) Cleary

[1]Microscope required. Students may obtain use of microscope by purchasing $3 microscope card from the bursar.

5321w. PHYSIOLOGY OF BACTERIA. (3 cr; prereq 3103 or 5105 or Biol 5013, 10 cr in organic chemistry or biochemistry, 3 cr in genetics) Rogers

5322w. PHYSIOLOGY OF BACTERIA LABORATORY. (2 cr; prereq 5321 or ¶5321 and lab course in basic bacteriology) Rogers

5424s. BIOLOGY OF VIRUSES. (4 cr; prereq 5321, Biol 5001 or #) Plagemann

5611f. MICROBIAL ECOLOGY. (4 cr; prereq general microbiology course, Biol 5001 or #) Crawford

5912f. INTRODUCTION TO ANALYTICAL METHODS. (2 cr; prereq #) Wohlhueter

5990f,w,s,su. PRACTICUM: TEACHING. (1 cr) Prince and staff

8110f. BIOLOGY OF MICROORGANISMS. (3 cr; prereq organic chemistry, biochemistry, general biology or #) Dworkin

8112s. MICROBIAL GENETICS. (3 cr; prereq #) Zissler

8121f. ADVANCED IMMUNOLOGY LABORATORY. (2 cr; prereq 5216, #) Gray

8122. ADVANCED MICROBIOLOGY. (3 cr; prereq 5321, 5424 or #; offered when feasible)

8218s. IMMUNOCHEMISTRY AND IMMUNOBIOLOGY. (3 cr; prereq 5216...LMed 5274 recommended, #) Gray

8234. ADVANCED MEDICAL MICROBIOLOGY. (2 cr; prereq #; offered when feasible) Brand

8239f, 8240w. PRECEPTORSHIP IN MEDICAL MICROBIOLOGY. (Cr ar [max 6 cr per qtr]; prereq #) Prince and staff

8242f,w,s. DIAGNOSTIC MICROBIOLOGY. (Cr ar; prereq grad student in microbiology, #) Blazevic and staff

8320f. IMMUNOGENETICS. (3 cr; prereq 5216 or #) Click

8323. REGULATION OF METABOLISM. (3 cr; prereq 5321, MdBc 5753 or equiv or #; offered when feasible)

8421f. MOLECULAR BIOLOGY OF CANCER. (3 cr; prereq 2 qtrs biochemistry, 5216, 5424, 8112, #) Faras and staff

8425s.[1] **ADVANCED LABORATORY IN VIROLOGY AND ANIMAL CELL CULTURE.** (1 cr; prereq ¶5424, #) Plagemann

8910f,w,s. SEMINAR. (1 cr; prereq #) Cleary and staff

8911f,w,s. COLLOQUIUM IN MICROBIOLOGY. (1 cr) Cleary and staff

8920f,w,s. ADVANCES IN IMMUNOLOGY. (1 cr; prereq #; offered when feasible) Gray

8990f,w,s,su. RESEARCH IN MICROBIOLOGY. (Cr ar) Cleary and staff

A partial listing of additional specialized courses suggested for major and supporting fields follows. For course descriptions, see the section for the appropriate field of instruction in this bulletin or in the *Graduate School Bulletin*.

EBB 5116. INTRODUCTION TO ANIMAL PARASITOLOGY

Ent 5275. MEDICAL ENTOMOLOGY

MdBc 5300. BIOCHEMISTRY

MdBc 5301. BIOCHEMISTRY

MedT 5102. PRINCIPLES OF DIAGNOSTIC MICROBIOLOGY

MedT 5110. HOSPITAL INFECTION CONTROL

MedT 5128. ELEMENTS OF LABORATORY ADMINISTRATION

MedT 5133. MEDICAL MYCOLOGY

MedT 5136. ANAEROBIC MICROBIOLOGY

MedT 5138. CLINICAL MICROBIOLOGY SEMINAR

MedT 8230. ADVANCED MEDICAL MICROBIOLOGY

PubH 5171. ENVIRONMENTAL MICROBIOLOGY

PubH 5342. PUBLIC HEALTH BACTERIOLOGY

PubH 5400. INTRODUCTION TO QUANTITATIVE METHODS IN THE HEALTH AND LIFE SCIENCES

PubH 5403. COMPUTER APPLICATIONS IN HEALTH SERVICES ADMINISTRATION

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[1]Microscope required. Students may obtain use of microscope by purchasing $3 microscope card from the bursar.

MICROBIOLOGY

OFFERED AT ROCHESTER

Department of Microbiology

Professor

Gary R. Pearson, Ph.D., *director of graduate study*
Gerald M. Needham, Ph.D.
Roy E. Ritts, Jr., M.D.
Jon E. Rosenblatt, M.D.
John A. Washington II, M.D.

Associate Professor

John P. Anhalt, M.D., Ph.D.

Department of Immunology

Professor

David Steinmuller, Ph.D. *director of graduate study*
Chella S. David, Ph.D.
Gerald J. Gleich, M.D.
Bruce C. Kline, Ph.D.
Harold Markowitz, M.D., Ph.D.
Harry B. Neel III, M.D., Ph.D.
Glenn D. Roberts, Ph.D.
Thomas F. Smith, Ph.D.
Walter R. Wilson, M.D.

Assistant Professor

William L. Anderson, Ph.D.

Assistant Professor

David J. McKean, Ph.D.

Opportunities are available for advanced work in microbiology (bacteriology, mycology, virology, immunology, parasitology, molecular genetics, and plasmids). Courses may be taken separately or in conjunction with minor programs offered to fellows in the Mayo Graduate School of Medicine who are majoring in clinical fields.

A two-year accredited residency/fellowship program in medical microbiology is open to Ph.D.'s in microbiology and to physicians. This program satisfies the American Board of Microbiology requirements for certification. Study leading to the Ph.D. degree is available in conjunction with the Department of Microbiology on the Minneapolis campus.

M 5803. MEDICAL MICROBIOLOGY. (5 cr; prereq #) Ritts and staff

M 5804. CLINICAL IMMUNOLOGY. (1 cr; prereq #) Staff
Lectures in basic immunology and clinical application.

M 5805w,su. MICROBIOLOGY OF MUSCULOSKELETAL SYSTEM. (1 cr) Washington
Lectures in pathophysiology of infections; usage and mechanisms of action of antimicrobials.

M 5806. BASIC GRADUATE IMMUNOLOGY. (3 cr; prereq #) Staff
Structure, genetics, and function of immunoglobulins; biosynthesis of antibody; cellular regulation of immune response; tumor and transplantation immunology; immune response to infectious agents; autoimmunity and immune deficiencies.

M 5807w. LABORATORY METHODS IN CLINICAL MICROBIOLOGY. (5 cr; prereq grad student in microbiology or related field; offered 1982 and alt yrs) Washington
Laboratory exercises and demonstrations with emphasis on diagnostic procedures and principles used in clinical microbiology.

M 8802w. MEDICAL VIROLOGY. (2 cr) Smith and staff

M 8851f,w,s,su. CLINICAL MICROBIOLOGY AND IMMUNOLOGY. (6 cr) Staff
Experience in routine and special diagnostic laboratories of bacteriology, mycology, virology, and immunology.

M 8852f,w,s,su. EXPERIMENTAL MICROBIOLOGY AND IMMUNOLOGY. (6 cr)
Graduate thesis research under supervision of staff.

M 8853. LECTURES IN CLINICAL MICROBIOLOGY. (3 cr; prereq grad student in microbiology or related field and #; offered 1982 and alt yrs) Anhalt, Washington
Didactic presentation of selected topics in bacteriology, mycology, and virology.

M 8854f. IMMUNOLOGY I. (3 cr; offered odd yrs) Staff
Detection and measurement of antibody, separation and structure of antibody, antigen and antigen-antibody interaction, nature of complement and its role in immunologic phenomena, mechanisms of hypersensitivity, theories of antibody production, transplantation and tolerance, autoimmunity.

M 8855w. IMMUNOLOGY II. (3 cr; primarily for advanced students; prereq M 8854 and #; offered 1982 and alt yrs) Tomasi and staff
In-depth study of current topics in the field and evaluation of research publications.

M 8856. SEMINAR: IMMUNOLOGY. (1 cr; offered S-N) Staff
Current research in immunology and immunochemistry.

M 8857. SEMINAR: CLINICAL MICROBIOLOGY. (1 cr) Washington and staff
Seminars on current problems, principles, and methods in clinical microbiology.

M 8860. TUMOR BIOLOGY I. (2 cr; prereq M 8855 and #; offered 1981and alt yrs) Staff
Biology of malignant cells including carcinogenesis, virus tumorigenesis, tumor progression; concept of immunosurveillance; intervention of tumor growth by immunotherapy, chemotherapy, radiation, and surgery.

M 8861. TUMOR BIOLOGY II. (2 cr; prereq M 8860) Staff
Epidemiological patterns, pathology, and behavior of different cell types, use of animal models, radiobiology, strategies for radio/chemo therapy and clinical considerations.

M 8862. READINGS IN CLINICAL IMMUNOGENETICS. (1 cr) Staff
Assigned readings and discussions on nature of major histocompatibility complex and associated immunological phenomena.

M 8863f,w,s,su. SEMINAR IN IMMUNOGENETICS. (1 cr; prereq #) David
Current literature on important areas of immunogenetics. Critical review of methods, results, and findings.

NEUROLOGY (Neur)

OFFERED AT MINNEAPOLIS

Professor

Joseph A. Resch, M.D., *head*
Kenneth F. Swaiman, M.D., *director of graduate study*
James F. Berry, Ph.D.
Robert J. Gumnit, M.D.
William R. Kennedy, M.D., M.S.
Arthur C. Klassen, M.D.
Joo Ho Sung, M.D.
Fernando Torres, M.D.
David D. Webster, M.D.

Clinical Professor

Harold H. Noran, M.D.

Associate Professor

Khurshed A. Ansari, M.D.
Gary Birnbaum, M.D.
Harold P. Cohen, Ph.D.
Myoung C. Lee, M.D.
Ilo E. Leppik, M.D.
Sping Lin, Ph.D.
Robert I. Roelofs, M.D.
Bruce D. Snyder, M.D.

Assistant Professor

John T. Hutton, M.D., Ph.D.

Master's and Doctor's Degrees—Excellent facilities are available for the M.S. (Plan A) and Ph.D. degree programs in neurology. The minor may be elected in anatomy, pathology, physiology, or other laboratory fields.

The master's degree may be earned in three years, but usually requires four years. The Ph.D. degree may be earned in a minimum of five years (six months to one year of which is spent in the basic minor field).

A three-year fellowship in neurology fulfills the requirements of training for the American Board of Psychiatry and Neurology.

Language Requirement—None.

8200f,w,s,su. CLINICAL NEUROLOGY. (Cr ar) Resch and staff

8201f,w,s,su. CLINICAL PEDIATRIC NEUROLOGY. (Cr ar) Swaiman and staff

8202f,w,s,su. RESEARCH IN NEUROLOGY. (Cr ar) Resch and staff

8203f,w,s,su. APPLIED ELECTROENCEPHALOGRAPHY. (Cr ar) Torres

8204f,w,s,su. APPLIED ELECTROMYOGRAPHY. (Cr ar) Kennedy

8205f,w,s,su. APPLIED NEUROPATHOLOGY. (Cr ar) Sung

8220. NEUROPHARMACOLOGY. (1 cr; offered every 3rd yr) Staff

8221w,s. NEUROCHEMICAL ASPECTS OF SELECTED CLINICAL DISORDERS. (2 cr; offered every 3rd yr)

8222f,w. APPLIED NEUROPHYSIOLOGY. (2 cr; offered every 3rd yr)

8226s. NEUROMUSCULAR DISEASES. (1 cr; offered every 3rd yr) Kennedy

8227s. NEUROLOGICAL SPEECH DISORDERS. (1 cr; offered every 3rd yr) Rubens

8229su. CLINICAL CORRELATIVE NEUROANATOMY. (1 cr)

8233f,w,s. NEUROLOGICAL CLINICAL PATHOLOGICAL CONFERENCE. (1 cr) Resch and staff

8234f,w,s. NEUROPSYCHOLOGY CONFERENCE. (1 cr) Meier

8235w. ADVANCED NEUROPSYCHOLOGY. (2 cr) Meier

8236f,w,s,su. RESEARCH IN NEUROPATHOLOGY. (Cr ar) Sung

8244w. NEUROEPIDEMIOLOGY. (1 cr; offered every 3rd yr) Loewenson

8245s. DEVELOPMENTAL NEUROSCIENCES. (1 cr; offered every 3rd year) Swaiman

8701. NEUROOPHTHALMOLOGY. (2 cr; offered every 3rd yr)

8702. NEURORADIOLOGY. (1 cr, §Rad 8110; offered alt yrs)

8703f,w. ADVANCED NEUROPATHOLOGY. (2 cr, §Path 8701; offered alt yrs) Sung

8704f,w,s. SURVEY OF NEUROPATHOLOGY. (1 cr, §Path 8702) Sung and staff

8705f,w,s,su. NEUROLOGICAL-NEUROSURGICAL CONFERENCE. (1 cr, §Rad 0124)

NEUROLOGY

OFFERED AT ROCHESTER

Professor

Jack P. Whisnant, M.D., M.S., *chairman*
Arnold E. Aronson, Ph.D.
Frederic L. Darley, Ph.D.
Peter J. Dyck, M.D.
Andrew G. Engel, M.D.
Norman P. Goldstein, M.D., M.S.
Manuel R. Gomez, M.D., M.S.
Frank M. Howard, Jr., M.D.
Donald W. Klass, M.D.
Edward H. Lambert, M.D., Ph.D.
Donald W. Mulder, M.D., M.S.
Burton A. Sandok, M.D.
Robert G. Siekert, M.D., M.S.
Juergen E. Thomas, M.D., M.S.
Takehiko Yanagihara, M.D.
Robert E. Yoss, M.D., Ph.D.

Associate Professor

James A. Bastron, M.D., M.S.
J. Keith Campbell, M.B.B.Ch.
Allan J. D. Dale, M.D., M.S.
Jasper R. Daube, M.D., M.S.
Drake D. Duane, M.D.
Jack D. Grabow, M.D.
Robert V. Groover, M.D.
William E. Karnes, M.D.
Manfred D. Muenter, M.D.
Frank W. Sharbrough III, M.D.
Barbara F. Westmoreland, M.D.

Assistant Professor

Raymond G. Auger, M.D.
Robert P. Dinapoli, M.D.
Raul E. Espinosa, M.D.
John J. Kelly, M.D.
Emre Kokmen, M.D.
Donald D. Layton, Jr., M.D.
Phillip A. Low, M.D.
James F. Mellinger, M.D.
Bahram Mokri, M.D.
Brian P. O'Neill, M.D.
J. Clarke Stevens, M.D.

Two types of residencies are available in neurology. The four-year program in clinical neurology includes one year of medicine at the G-1 level and three years in neurology and its subspecialties. The program may be entered at the G-2 level, after one or more years of internal medicine at Mayo or elsewhere. The three years beyond the G-1 level include seven quarters of clinical neurology divided between hospital and outpatient experience and five quarters of elective work in the laboratory sciences and other fields related to neurology. A five-year program in academic neurology is similar but includes a full year of research. In both the outpatient department and hospitals, residents work in close collaboration with faculty members, who are available for consultation and guidance at all times. In the laboratory sciences and related fields, residents may obtain experience in neuropathology, neuroanatcmy, electroencephalography, electromyography, neuro-ophthalmology, neuroradiology, psychiatry, and other areas. In addition to practical experience, there are organized series of lectures as well as conferences and seminars in clinical neurology, neuroanatomy, neuropathology, neuroradiology, speech pathology, cerebrovascular disease, neuromuscular disease, pediatric neurology, and selected topics in allied specialties. The Department of Neurology is closely associated with other medical and surgical divisions of the Mayo Clinic as well as with various clinical and research laboratories.

Master's Degree—Offered only under Plan A.

Doctor's Degree—Work leading to the Ph.D. degree is offered.

M 5801. INTRODUCTORY NEUROSCIENCES. (6 cr; prereq #) Daube
Basic neuroanatomy, neurophysiology, and neuropathology as they relate to clinical neurological problems.

M 8850f,w,s,su. DIAGNOSIS IN NEUROLOGY. (6 cr) Staff

M 8851. BASIC CLINICAL NEUROLOGY LECTURES. (2 cr) Karnes
Lectures in basic neurology.

M 8852f,w,s,su. HOSPITAL RESIDENCE IN NEUROLOGY. (6 cr) Staff

M 8857. CLINICAL NEUROLOGY. (6 cr) Staff

M 8858f,w,s,su. BASIC NEUROLOGIC SCIENCES. (6 cr) Staff

M 8859f,w,s,su. NEUROLOGICAL DISEASES OF INFANTS AND CHILDREN. (6 cr) Staff

M 8860. ELECTROMYOGRAPHY. (6 cr) Staff

M 8861, 8862, 8863. NEUROLOGY CONFERENCE ON ELECTROENCEPHALOGRAPHY I, II, III. (6 cr per qtr) Klass
Introductory, intermediate, and advanced electroencephalography.

M 8864. NEUROLOGICAL DIAGNOSTIC ELECTROENCEPHALOGRAPHY. (6 cr) Klass
Continuation of M 8863.

NEUROSURGERY (NSu)

OFFERED AT MINNEAPOLIS

Professor

Shelley N. Chou, M.D., Ph.D., *head*
James R. Bloedel, M.D., Ph.D.
Lyle A. French, M.D., Ph.D.
Edward L. Seljeskog, M.D., Ph.D.

Clinical Professor

Leonard A. Titrud, M.D., Ph.D.

Associate Professor

Donald L. Erickson, M.D.
Gaylan L. Rockswold, M.D., Ph.D.

Clinical Associate Professor

Paul S. Blake, M.D.
Charles D. Ray, M.D.
Erich Wisiol, M.D.

Assistant Professor

Robert E. Maxwell, M.D., Ph.D.
Phudhiporn Thienprasit, M.D., Ph.D.

Clinical Assistant Professor

Heinrich Bantli, Ph.D.
David Danoff, M.D.
Stephen H. Martin, M.D.

Clinical Instructor

Walter L. Bailey, M.D.
Harry M. Rogers, M.D.
John L. Seymour, M.D.
Andrew J. K. Smith, M.D., Ph.D.
Max Zarling, M.D.

Master's and Doctor's Degrees—Facilities are available for work toward M.S. (Plan A) and Ph.D. degrees in neurosurgery. The minor may be elected in anatomy, pathology, physiology, or other laboratory fields. The usual fellowship training period in neurological surgery requires a minimum of five years; many of the trainees who obtain advanced degrees remain longer than this minimal period. The minimal period complies with the requirements for certification by the American Board of Neurological Surgery. At least 36 months are spent on clinical neurological surgery and 6 months on clinical medical neurology and neuropathology. Twelve months are spent in the research laboratories working out, under supervision and guidance, an experimental problem of the trainee's choice; during this period the trainee also takes lecture and laboratory work in neuroanatomy and neurophysiology to obtain reasonable competence in these fields.

More extensive training in basic sciences can be obtained in the fundamental laboratories of the Medical School, which offers numerous graduate courses related to neurological surgery (see statements of the programs in anatomy, physiology, pathobiology, etc.). Special investigative and research work in these departments can readily be arranged in the training program. The proximity of the medical buildings and arrangement of courses afford opportunity for coordination of clinical and laboratory work.

Special courses and conferences in the various clinical departments (pediatrics, psychiatry, neurology, radiology, ophthalmology) are presented so that a well-rounded clinical training is obtained through both didactic course work and practical clinical experience.

Training in the Department of Neurosurgery is closely associated with the programs offered by the Department of Surgery on the Minneapolis campus and by the Section of Neurosurgery at the Mayo Clinic.

8305. NEUROSURGICAL DIAGNOSIS. (4 cr) Chou, French, and staff
The neurosurgical fellow assists in instruction of clinical clerks and interns, and studies problems in diagnosis at University and affiliated hospitals.

8308. NEUROSURGICAL PROBLEMS AND MANAGEMENT. (4 cr) Chou, French, and staff
The neurosurgical fellow acts as house surgeon at University and affiliated hospitals.

8311. OPERATIVE NEUROSURGERY. (4 cr) Chou, French, and staff
The neurosurgical fellow acts as first assistant at operations in University and affiliated hospitals, and later may be permitted to operate.

8316. NEUROSURGICAL RESEARCH. (6 cr) Bloedel, Chou, French, and staff
Problems in experimental or clinical neurosurgical sciences.

8318. NEURORADIOLOGICAL CONFERENCE. (1 cr) Chou, French, Seljeskog, and staff
Review of X-rays and case histories on neurosurgical service.

8320. NEUROSURGICAL CONFERENCE. (2 cr) Chou, French, Seljeskog, and staff
In-depth review of selected topics in basic or clinical neurosurgery.

8322su,w. SEMINAR: NEUROSURGERY-OPHTHALMOLOGY—PART I. (1 cr) Staff
Review and discussion of topics in neuroophthalmology.

8323f,s. SEMINAR: NEUROSURGERY-OPHTHALMOLOGY—PART II. (1 cr; prereq 8322) Staff

8324. READINGS IN NEUROBIOLOGY. (2 cr; prereq Phsl 8104, consent of Medical School) Bloedel, Ebner
Survey of major topics in neurobiology. Specific papers in each area serve as basis for discussion.

8325. ADVANCED READINGS IN NEUROBIOLOGY. (2 cr; prereq 8324) Bloedel, Ebner
(Continuation of 8324) In-depth discussion of fewer topics.

8330. NEUROSURGERY LITERATURE SEMINAR. (2 cr) Staff
Review and discussion of current literature relating to neurosurgery and the neurosciences.

NEUROSURGERY

OFFERED AT ROCHESTER

Professor

Thoralf M. Sundt, Jr., M.D., *chairman*
Frederick W. L. Kerr, M.D.
Edward R. Laws, Jr., M.D.
Ross H. Miller, M.D., M.S.
Burton M. Onofrio, M.D.

Assistant Professor

David G. Piepgras, M.D.

The development of excellence in surgery of the nervous system is the primary goal of this six-year training program. It provides the background in the neurological sciences necessary for the practice of surgical neurology and prepares the graduate to pursue a clinical, academic, or investigative career. This program, which includes 12 months of general surgery, satisfies the requirements of the American Board of Neurological Surgery.

Surgical skill is developed first by assisting, and then operating under the supervision of, the neurosurgical staff. Competence in the evaluation of neurosurgical problems is developed through the care for and evaluation of a wide variety of elective and emergency neurological and neurosurgical problems. The trainee's diagnostic skill is further refined by assignments to diagnostic neurology, neuroophthalmology, electroencephalography, electromyography, and neuroradiology.

During the second year of the residency trainees are assigned to the basic neurosciences departments, including neuroanatomy, neurophysiology, and neuropathology. The opportunity to work on a research problem is available during this year in the neurophysiology laboratory, the cerebrovascular laboratory, or the brain tumor laboratory.

Master's Degree—Offered only under Plan A.

Doctor's Degree—Work leading to the Ph.D. degree is offered.

M 8851f,w,s,su. SURGERY OF THE NERVOUS SYSTEM. (6 cr) Kerr, Laws, MacCarty, Miller, Onofrio, Piepgras, Sundt
Operative technique and study of special problems involved. Seminar. Residence.

M 8858f,w,s,su. BASIC NEUROLOGIC SCIENCES. (6 cr) Staff

NURSING (Nurs)

OFFERED AT MINNEAPOLIS

Professor Emeritus

M. Isabel Harris, Ph.D.

Professor

Mitzi L. Duxbury, Ph.D.
Inez G. Hinzvark, Ed.D.
Floris E. King, Ph.D.
Elaine R. Mansfield, D.N.Sc.
Ida M. Martinson, Ph.D.
Catherine M. Norris, Ph.D.

Associate Professor

A. Marilyn Sime, Ph.D., *director of graduate study*
Jean K. Kintgen Andrews, Ph.D.
Sheila A. Corcoran, M.Ed.
Patricia Crisham, Ph.D.
Ellen C. Egan, Ph.D.
Bernadine M. Feldman, Ph.D.
Verona C. Gordon, Ph.D.
Sara S. Rode, Ph.D.
Mariah Snyder, Ph.D.
Eugenia E. Taylor, M.A.
Ann Voda, Ph.D.

Assistant Professor

Sandra Edwardson, Ph.D., *interim assistant dean for graduate study*
Kenneth R. Burns, M.S.
Kathleen G. Dineen, M.S.N.
Evangeline Gronseth, Ph.D.
Marilyne R. Gustafson, M.S.
Diane K. Kjervik, M.S.
Kathleen A. Maykoski, M.S.N.
Ruth D. Weise, M.A.

Research Associate

Delores M. Schumann, M.S.

Master's Degree Admission Requirements—Prospective master's degree students apply for admission to the Graduate School and designate nursing as their intended major area of study. Requirements for admission are a baccalaureate degree with a strong scholastic record (a minimum grade point average of 3.00, or a B average) from a recognized college or university and licensure as a registered nurse. Students who submit transcripts without grades will be required to take the aptitude portion of the Graduate Record Examination and must earn a minimum score at the 50th percentile. Three letters of reference are required. Each applicant must also submit a goal statement.

Applications are acted upon when they are complete. Quarterly application deadlines are available from the School of Nursing Admissions Office, 5-140 Health Sciences Unit F, 308 Harvard Street. Course sizes are limited, and in areas where admission is competitive (especially midwifery) early application is encouraged.

Master's Degree Program Requirements—For a Plan A major, students select, with the approval of their adviser, a minimum of 20 credits in their major field, and a minimum of 8 credits in related fields or 9 credits in a designated minor field, for a total of at least 28 or 29 credits. With the guidance of a faculty adviser, they complete a thesis.

For a Plan B major, students must complete a minimum of 30 credits in their major field, including 20 credits in core courses, 4 to 6 credits in Focus I courses, and 6 to 9 credits in Focus II courses. Students must also complete a minimum of 8 credits in related fields or 9 credits in a designated minor field and must complete a Plan B project. For a Plan B program, a minimum of 44 credits are required for graduation. Many students need to complete more than 44 credits in order to meet program and personal objectives. Each candidate, with the assistance of a School of Nursing adviser, plans an individual program to meet both personal objectives and those of the M.S. program. Completion of the program usually requires four to six quarters.

GENERAL PLAN OF PROGRAM

NURSING

The major is composed of two parts, core and nursing focus courses. The core courses provide the foundation for nursing as a scholarly discipline and the basis of knowledge and skills for a second-level practitioner. The nursing focus courses provide the opportunity to develop advanced knowledge and skills to serve selected client populations and to assume various nursing roles. Plan A students select course work in the major with the advice of the program adviser. Plan B students are required to complete the core courses (Nurs 8010, 8011, 8012, 8014, and 8030) and to select at least two nursing focus courses (one Focus I course and one Focus II course) in clinical or functional areas of nursing such as childbearing-childrearing, family nursing, health management, medical-surgical nursing, nurse midwifery, psychiatric-mental health nursing, nursing education, nursing leadership, and nursing management.

RESEARCH

The research component includes the core course in nursing research and a Plan A thesis or a Plan B project. A statistics course that includes inferential statistics is prerequisite to the research course and may be taken either before entry or after admission to the program. The School of Nursing has established exiting behaviors required for the Plan A thesis and for the Plan B project. The student contracts with the adviser for guidance with the thesis, or with graduate faculty members for guidance with the Plan B project and final examination of competencies.

Required: Nurs 8014 (or a comparable course), knowledge of statistics, and a Plan A thesis or a Plan B project.

RELATED FIELDS OR MINOR

The School of Nursing graduate faculty places high value on completion of course work outside the major. The requirement for related fields is a minimum of eight credits in one or more fields outside the major (i.e., outside nursing and/or public health nursing). Related field courses may include required nonnursing supportive courses and other elective courses that are related to nursing. The requirement for a minor is a minimum of nine credits in a single field outside the major.

FINAL EXAMINATION

A final oral examination is required of both Plan A and Plan B students.

CORE COURSES

8010. STRUCTURE OF THE DISCIPLINE OF NURSING. (3 cr; prereq △)
Exploration of purposes, characteristics, and kinds of structures with emphasis on theories, models, and conceptual frameworks.

8011. MORAL AND ETHICAL POSITIONS IN NURSING. (3 cr; prereq △)
Influence of moral and ethical positions on behavior and decision making in nursing. Emphasis on bases for positions taken, such as selected moral and ethical theory, rights and responsibilities, and conflict.

8012. CONCEPTUAL FRAMEWORK FOR NURSING PRACTICE. (3 cr; prereq 8010)
Exploration and reconceptualization of assumptions, values, and beliefs underlying learner's view of nursing and nursing practice. Analysis of structure of a nursing conceptual framework and development of personal framework. Concept of intervention model and systematic process that underlies development of such a model.

8014. RESEARCH IN NURSING. (3 cr; prereq inferential statistics. △)
Exploration of research process and research methodologies appropriate to nursing. Analysis of research reports.

8030. NURSING INTERVENTION MODELS. (4-8 cr [8 cr must be completed before cr is granted]; prereq 8011 or ¶8011, 8012, #)
Developing, providing, and evaluating nursing intervention with a specified client population. Students register for a section that focuses on a desired population.

FOCUS I COURSES

8314. NURSE-MIDWIFERY MANAGEMENT DURING CHILDBEARING. (9 or 10 cr; prereq #)
For students wanting to complete requirements for nurse-midwifery certification. Emphasis on labor and delivery management with opportunity to improve skills throughout childbearing period.

8411. KNOWLEDGE DEVELOPMENT UNDERLYING NURSING THERAPY. (4-6 cr; prereq 8030, advanced physiology)
Development of nursing practice for a specified client population. Focus on one element or aspect of an intervention model to expand knowledge in that area. Relevant research literature evaluated.

8421. PSYCHIATRIC-MENTAL HEALTH NURSING: GROUP DYNAMICS AND LEADERSHIP SKILLS. (3 cr; prereq 8030, [Psych-Mental Health section], course in psychopathology)
Group dynamics and process with emphasis on development of leadership skills. Integration and application of mental health concepts, clinical practice in group therapy.

8422. PSYCHIATRIC-MENTAL HEALTH NURSING: FAMILY DYNAMICS AND THERAPY. (3 cr; prereq 8421)
Family dynamics, development, and communication patterns. Relationship of selected family to community using concepts from systems theory. Clinical practice in family therapy.

8431. CHILDBEARING-CHILDREARING FAMILY NURSING I. (4-6 cr; prereq 8030)
Maintenance, promotion, improvement, and restoration of health in the childbearing-childrearing family unit. Theoretical concepts related to women, children and families, and family development.

8451. TEACHING-LEARNING PROCESS IN NURSING. (4 cr; prereq 8030, ¶ course in learning theory and #)
Use of theories of learning to develop an intervention model for teaching nursing. Testing the intervention model in simulated situations.

8701. NURSING ADMINISTRATION I. (6 cr; prereq 8030, #)
Intensive study of role of nursing administrator by application of major concepts in organization and management theories and nursing process to nursing administration. Emphasis on planning for and organizing nursing administration and assembling resources to carry out plans. Experiences planned to meet individual needs and to maximize previous experience and knowledge.

FOCUS II COURSES

8315. NURSE-MIDWIFERY MANAGEMENT: INTRAPARTAL AND POSTPARTAL. (8-10 cr; prereq 8314)
Theory and clinical experience in management and care of the laboring woman/couple through the six-week restorative period. Early care of the newborn is an integrated component.

8415. NURSE CLINICIAN ROLE DEVELOPMENT. (6-9 cr; prereq any nursing Focus I course, a course dealing with the health care delivery system)
Selection and development of a role, either nurse clinican-specialist or nurse clinician-generalist. Aspects of the role may include patient care, consultation, staff development, research, coordination, and collaboration.

8425. PSYCHIATRIC-MENTAL HEALTH NURSING: ROLE DEVELOPMENT. (6 cr; prereq 8422)
Theoretical and clinical components of modalities of psychiatric-mental health nursing intervention. Opportunity to clarify understanding of interdisciplinary roles and relationships in community mental health setting. Concepts from systems theory related to organizational structure of mental health facilities and community.

8435. CHILDBEARING-CHILDREARING FAMILY NURSING II. (6-9 cr; prereq 8431 or #)
Development, synthesis, and utilization of intervention models as applied to a child and his or her family and to a childbearing family unit.

8455. THE NURSE EDUCATOR IN HIGHER EDUCATION. (6 cr; prereq 8451, ¶ course in educational measurement, #)
Analysis of roles and responsibilities of nurse educator in higher education. Data for analysis obtained through review of relevant literature and testing of roles in an academic setting.

8702. NURSING ADMINISTRATION II. (6 cr; prereq 8701, #)
Intensive study of role of nursing administrator by application of major concepts in organization and management theory and nursing process to nursing administration. Emphasis on making operational and evaluating nursing administration goals.

ELECTIVE COURSES

5722. AN INTRODUCTION TO THE NURSE AS A LEADER FOR CHANGE THROUGH PARTICIPATION IN THE LEGISLATIVE PROCESS. (5 cr, 10 wks; prereq any two of the following: 5611, 5612, 5613, 5614...or grad student or #)
Participation in the legislative process through attending committee and subcommittee hearings on specific health bills of major concern to nurses. Contact with legislators and other key people in state government.

5801. GERONTOLOGICAL NURSING SEMINAR. (2 cr; prereq 8014, ¶8030 and #)
Theories of aging, age-related issues with impact on health care of aging persons; designing nursing interventions specific to elderly clients.

8001. SPECIAL EDUCATIONAL EXPERIENCES IN NURSING. (Cr ar; prereq △)
Various learning experiences planned to meet individual needs.

8003. HEALTH ASSESSMENT. (5 or 6 cr; prereq 8012, #)
Preparing the nurse to collect systematically subjective and objective data in a nursing assessment. Emphasis on normal health and distinguishing abnormal from normal findings. Classroom and clinical experience in history taking and physical assessment, organized within a systematic framework. Emphasis on incorporation of assessment skills into the student's nursing framework.

8009. SPECIAL TOPICS IN NURSING. (Cr ar; prereq #)

8050. PROBLEMS IN NURSING. (1-9 cr; prereq #)
Individual study of a problem.

8051. SPECIAL TOPICS IN NURSING RESEARCH. (1-9 cr)
Seminar and/or individual study in nursing research.

8060. ADVANCED CLINICAL NURSING. (3-9 cr; prereq △, #)
Hypothesis generation and testing in general nursing to develop creative and critical approaches to nursing.

8063. NURSING CONSULTATION. (3 cr)
Study and practice in consultation in nursing care.

8313. CARE OF THE CHILDBEARING FAMILY IN RISK. (4-6 cr; prereq physiology, #)
Problems encountered during perinatal period with emphasis on nursing care of mothers with medical complications.

8509. SPECIAL TOPICS IN NURSING EDUCATION. (Cr ar; prereq #)

8600. HEALTH CARE INSTITUTIONS AND NURSING LEADERSHIP. (3 cr)
Some aspects inherent in American society (alienation, productivity, roles, youth emphasis) and their impact on health care institutions; nurse's effects upon individuals involved with these institutions.

8601. CLINICAL NURSING LEADERSHIP I. (6 cr; prereq 8600)
Clinical practice involving extension of patient assessment to various health care institutions; individual employee assessment and work with and through others to achieve patient care goals. Consultation and evaluation processes, individual counseling, and group dynamics used to create more positive approaches to care of individuals.

8609. SPECIAL TOPICS IN NURSING SUPERVISION. (Cr ar)

NUTRITION (Nutr)

OFFERED AT MINNEAPOLIS AND ST. PAUL

Professor

P. Vincent Hegarty (food science and nutrition), *director of graduate study*
C. Eugene Allen (animal science)
Elwood F. Caldwell (food science and nutrition)
Agnes R. Csallany (food science and nutrition)
John D. Donker (animal science)
Clifford F. Gastineau (Mayo Foundation, Rochester)
Richard D. Goodrich (animal science)
Joan Gordon (food science and nutrition)
LaVell M. Henderson (biochemistry, biological sciences)
James D. Jones (Mayo Foundation, Rochester)
Robert M. Jordan (animal science)
Bruce A. Kottke (Mayo Foundation, Rochester)
Theodore P. Labuza (food science and nutrition)
Irvin E. Liener (biochemistry, biological sciences)
John J. McCall (Mayo Foundation, Rochester)
Jay C. Meiske (animal science)
Lura M. Morse (food science and nutrition)
Donald E. Otterby (animal science)
Patricia B. Swan (food science and nutrition)
John F. Van Pilsum (biochemistry, medical sciences)
Paul E. Waibel (animal science)
Jesse B. Williams (animal science)

Associate Professor

Carl F. Anderson (Mayo Foundation, Rochester)
Judith E. Brown (public health)
Annette T. Gormican (food science and nutrition)
Arthur S. Leon (physiological hygiene)
Pasquale J. Palumbo (Mayo Foundation, Rochester)

Assistant Professor

Neil K. Allen (animal science)
Steven G. Cornelius (animal science)
C. Richard Fleming (Mayo Foundation, Rochester)
Craig J. McClain (medicine)

Prerequisites—For admisson to the M.S. or Ph.D. program, a strong foundation in biological sciences and one quarter of microbiology, college mathematics through calculus, the equivalent of one year of general chemistry, one year of organic chemistry, a course in quantitative analysis, and a minimum of two quarters of college physics. Deficiencies in any of these areas must be removed before a student can become a candidate for a degree.

Students interested in the M.S. degree in nutrition with a behavioral science emphasis must offer as prerequisites courses in general biology, human physiology, microbiology, college algebra, one year of general chemistry, one year of organic chemistry, a course in nutrition, a course in food chemistry or its equivalent, and at least 21 credits in the social sciences.

Students interested in the M.S. degree in nutrition with a clinical emphasis must offer as prerequisites courses in general biology, human nutrition, microbiology, college algebra, one year of general chemistry, one year of organic chemistry, 20 to 25 credits in food and nutrition, and a dietetic internship or equivalent.

Scores from the Graduate Record Examination are also required.

Students who complete the M.S. degree with a behavioral science or clinical emphasis and then apply for admission to a Ph.D. program must have completed the entrance requirements indicated in the first paragraph of prerequisites above.

For a minor in nutrition, students must demonstrate to the nutrition graduate faculty that they have an adequate background.

Master's Degree—Offered under Plan A and Plan B. Students take an oral final examination.

Doctor's Degree—For a major, students must develop and demonstrate a general competence in nutrition, including comprehensive knowledge of basic biochemistry and statistics. In addition, students are expected to develop a minor or coherent program in field(s) of study closely allied to nutrition, e.g., biochemistry, histology, embryology, anatomy, microbiology, physiology, and zoology. Thesis work can be conducted in the area of human nutrition, nonruminant nutrition (laboratory rat, swine, and poultry), or ruminant nutrition. General competence in nutrition is required of students with a nutrition minor.

Language Requirement—Language study is not required for the M.S. or Ph.D. program. However, an individual adviser may specify study of one or two languages for an individual student's program. Students wishing to have proficiency in a language recorded on their transcripts must pass the Graduate School Foreign Language Test or be certified as proficient by the appropriate language department.

Note—The following is a list of courses from which selections for major and minor programs are commonly made; other courses are also available. Descriptions of the courses can be found in this bulletin or in the *Graduate School Bulletin.*

AnSc 8420s.* ENERGY IN ANIMAL NUTRITION. (3 cr; prereq 5540, #...Biol 5001 recommended; offered 1983 and alt yrs)

AnSc 8421s.* PROTEIN AND AMINO ACID NUTRITION. (3 cr; prereq BioC 5002 or equiv or #...BioC 5743 recommended; offered 1983 and alt yrs)

AnSc 8423w.* MINERAL NUTRITION. (3 cr; prereq BioC 5002 or #...BioC 5742 recommended; offered 1982 and alt yrs)

AnSc 8440w.* RUMINANT NUTRITION. (3 cr; prereq BioC 5002 or #...MicB 5321 recommended; offered 1982 and alt yrs)

AnSc 8740f. CONCEPTS AND DEVELOPMENTS IN RUMINANT NUTRITION. (2 cr; prereq #)

AnSc 8741f. CONCEPTS AND DEVELOPMENTS IN AVIAN NUTRITION. (2 cr; prereq #; offered 1982 and alt yrs)

AnSc 8742s. CONCEPTS AND DEVELOPMENTS IN SWINE NUTRITION. (2 cr; prereq #; offered 1982 and alt yrs)

AnSc 8840.* RESEARCH IN ANIMAL NUTRITION. (Cr ar; prereq #)

BioC 5271f. VITAMINS. (3 cr; prereq 5753 or 5002 or #; offered 1981 and alt yrs)

BioC 5744f. BIOCHEMISTRY LABORATORY: THEORY AND PRACTICE. (4 cr; prereq lab work in analytical and organic chemistry, #)

BioC 5751f-5752w-5753s. GENERAL BIOCHEMISTRY. (4 cr per qtr, §MdBc 5751-5752-5753; prereq 3 qtrs organic chemistry, 2 qtrs physical chemistry, 1 qtr biochemistry or #)

BioC 8225f. TRACER TECHNIQUES. (1-3 cr; prereq 5002 or 5753 and 5744 or MdBc 5750, #)

FScN 5111. INDEPENDENT STUDY IN FOOD SCIENCE AND NUTRITION. (1-5 cr [may be repeated for cr]; prereq △)

FScN 5404. CURRENT ISSUES IN FOOD AND NUTRITION. (2-4 cr; prereq 15 cr in food science and nutrition or #)

FScN 5622. HUMAN NUTRITION. (5 cr; prereq 3600, Biol 5001, Phsl 3051 or #)

FScN 5642. FIELD EXPERIENCE IN COMMUNITY NUTRITION. (3-18 cr; prereq course in human nutrition and #)

FScN 5643. SEMINAR: WORLD FOOD SUPPLY PROBLEMS. (4 cr, §AgEc 5790, §Agro 5200, §PlPa 5220, §Soc 5675, §LACS 5280; prereq sr or grad student with #)

FScN 5662. CLINICAL NUTRITION. (3 cr; prereq 5622, Biol 5001 or #)

FScN 5663. CLINICAL NUTRITION LABORATORY. (2 cr; offered S-N only; prereq 5662 or ¶5662 or 5665 or ¶5665 or #)

FScN 5664. FIELD EXPERIENCE IN CLINICAL NUTRITION. (3-18 cr; prereq course in human nutrition and #)

FScN 5668. ADVANCED CLINICAL NUTRITION. (2 cr; prereq 5662 or #)

FScN 5694. METABOLIC BASIS FOR THERAPEUTIC NUTRITION. (4 cr; prereq 5664 or #)

FScN 8101. RESEARCH SEMINAR. (1 cr; prereq #)

FScN 8621. INDEPENDENT STUDY: NUTRITION. (1-9 cr; prereq #)

FScN 8622. ADVANCED HUMAN NUTRITION I. (5 cr; prereq 5622, BioC 5002 or equiv and #)

FScN 8623. ADVANCED HUMAN NUTRITION II. (5 cr; prereq 8622, #)

MdBc 8219f. BIOCHEMISTRY OF SPECIALIZED TISSUES. (3 cr; prereq 5753 or 5100)

Nutr 8745. SEMINAR. (1 cr [may be repeated for cr]; prereq #)

PubH 5380. APPLIED HUMAN NUTRITION. (3 cr; prereq #)

NUTRITION (Nu)

OFFERED AT ROCHESTER AND AT MINNEAPOLIS AND ST. PAUL

Professor

Clifford F. Gastineau, M.D., Ph.D., *director*
James D. Jones, Ph.D.
Bruce A. Kottke, M.D., Ph.D.
John T. McCall, Ph.D.
Pasquale J. Palumbo, M.D., M.S.

Associate Professor

Carl F. Anderson, M.D.

Assistant Professor

C. Richard Fleming, M.D., M.S.

The Mayo Foundation offers a program of study in nutrition leading to the M.S. or Ph.D. degree. Degree programs must conform to the general requirements for advanced degrees as stated in this bulletin. Supervision is by the faculty of the Mayo Graduate School of Medicine. The clinical, laboratory, and research facilities of the Mayo Graduate School, Mayo Clinic, and St. Mary's Hospital are available for training and research.

Application to the nutrition program can be made either through the Department of Nutrition, Twin Cities campus, or the Mayo School of Health-Related Sciences. Students are admitted to the graduate program on the Twin Cities campus and complete courses in nutrition, biochemistry, physiology, statistics, and other appropriate subjects for one to two years. Admission to the Rochester program requires the recommendation of the director of graduate study for nutrition on the Twin Cities campus and approval of the appropriate Mayo committees. Selection of students is generally made near the time course work is completed on the Twin Cities campus. Arrangements are then made for the student to work in a research laboratory in Rochester where a nutrition-oriented project suitable for a thesis can be undertaken.

Usually one to two years are required for completion of the project and preparation of the thesis. Students are encouraged to take nutrition courses at the Mayo Medical School. Certain courses in statistics, physiology, and biochemistry are also available for graduate credit. Students are encouraged to attend the seminars and lectures on nutrition-related subjects that are listed in the weekly bulletin of the Mayo Clinic.

M 8851f,w,s,su. RESEARCH IN BASIC NUTRITION OR METABOLISM. (6 cr) Anderson, Gastineau, Hoffman, Jones, Kottke, McCall, Palumbo, Wahner
Research project concerned with a problem in human or animal nutrition or with physiologic or biochemical nutritional problems.

M 8852. CURRENT CONCEPTS IN APPLIED NUTRITION. (Cr ar) Gastineau and staff

OBSTETRICS AND GYNECOLOGY (Obst)

OFFERED AT MINNEAPOLIS

Professor

Konald A. Prem, M.D., *head*
Harry Foreman, M.D., Ph.D.
Takashi Okagaki, M.D., Ph.D.

Associate Professor

Leon L. Adcock, M.D.
Richard P. Bendel, M.D.
Julius C. Butler, Jr., M.D.
Erick Y. Hakanson, M.D.
Edward C. Hanisch, Jr., M.D.
Theodore C. Nagel, M.D.
Preston P. Williams, M.D.

Assistant Professor

Doris C. Brooker, M.D.

Master's Degree—Offered under either Plan A or Plan B.

Doctor's Degree—Work leading to the Ph.D. degree is offered.

Language Requirement—For the Ph.D. degree, either (a) two languages or (b) one language and the option of a collateral field of knowledge. Routinely acceptable languages are French, German, and Spanish.

5241. FAMILY PLANNING ADMINISTRATION. (3 cr; prereq #) Foreman
Planning, operation, and administration of publicly funded family planning programs.

5245. HISTORY AND DEVELOPMENT OF FAMILY PLANNING. (3 cr; prereq #) Foreman
Family planning programs over the world (including the United States) that have been instituted to meet family health needs as well as to alleviate population pressures.

5248. DEVELOPMENTS IN CONTRACEPTIVE TECHNOLOGY. (3 cr; prereq #) Foreman
Review of principles, efficacy, and side effects of currently used birth control methods and consideration of contraceptives in investigative stages.

8201-8202-8203-8204. ADVANCED OBSTETRICS AND GYNECOLOGY I. (Cr ar; required of 1st-yr fellows)
Includes service in the University of Minnesota-affiliated hospitals (University, St. Joseph's, St. Mary's, and Fairview Hospitals, Metropolitan Medical Center, and Hennepin County Medical Center) with ample experience in diagnosis, care, and treatment (operative and nonoperative) of patients.

8205-8206-8207-8208. ADVANCED OBSTETRICS AND GYNECOLOGY II. (Cr ar; required of 2nd-yr fellows)
Similar to Obst 8201-8202-8203-8204 but more advanced, both in clinical and research aspects of the subjects; adapted to increased training and experience of fellows.

8209-8210-8211-8212. ADVANCED OBSTETRICS AND GYNECOLOGY III. (Cr ar; required of 3rd-yr fellows)
Similar to Obst 8205-8206-8207-8208 but more advanced.

8213-8214-8215-8216. ADVANCED OBSTETRICS AND GYNECOLOGY IV. (Cr ar; prereq 8212)

8217-8218-8219-8221. SEMINAR IN OBSTETRICS AND GYNECOLOGY. (Cr ar; prereq 8216)

8222-8223. GYNECOLOGICAL ONCOLOGY. (Cr ar; prereq 8221)

8224. GYNECOLOGICAL ENDOCRINOLOGY I. (Cr ar; prereq 8223)

8225. GYNECOLOGICAL ENDOCRINOLOGY II. (Cr ar; prereq 8224)

8226. OBSTETRICAL PHYSIOLOGY AND ANESTHESIOLOGY. (Cr ar; prereq 8225)

8227. PRECEPTORSHIP IN CLINICAL PRACTICE. (Cr ar; prereq 8226)

8228. SELECTED ASPECTS OF RADIATION THERAPY. (Cr ar; prereq 8227)

8229. SELECTED ASPECTS OF MEDICAL ONCOLOGY. (Cr ar; prereq 8228)

8230. RESEARCH IN REPRODUCTION. (Cr ar; prereq 8229)

8243. TOPICS IN FAMILY PLANNING. (3-12 cr; prereq #) Foreman and staff
Flexible course set up to meet individual student needs and interests. Includes thesis preparation, research projects, and field training.

OBSTETRICS AND GYNECOLOGY

OFFERED AT ROCHESTER

Professor

George D. Malkasian, M.D., M.S., *chairman, obstetrics and medical gynecology*
Richard E. Symmonds, M.D., M.S., *chairman, gynecologic surgery*
Leonard A. Aaro, M.D., M.S.
David G. Decker, M.D., M.S.
Roger D. Kempers, M.D., M.S.
Raymond A. Lee, M.D., M.S.
Tiffany J. Williams, M.D.

Associate Professor

Carolyn B. Coulam, M.D., M.S.
Carl E. Johnson, M.D., M.S.
Kenneth L. Noller, M.D., M.S.

Assistant Professor

Edward O. Jorgensen, M.D.
Richard S. Sheldon, M.D., M.S.

Graduate work in obstetrics and gynecology is offered in Rochester to qualified physicians. Appointments are presently made to a four-year residency program through the National Resident Matching Program. Residents accepted into this program receive intensive clinical training that qualifies them for American Board of Obstetrics and Gynecology certification.

Surgical experience is obtained at St. Mary's and Rochester Methodist Hospitals. Emphasis is placed on routine gynecological surgical procedures, although residents are exposed to a large volume of complicated cancer surgery. After completion of the required time as surgical assistants, senior residents are appointed to the position of chief resident associate for a period of six months. During this time they assume primary responsibility for the care of gynecological surgery cases.

Obstetrical experience is gained at the obstetric facilities at the Rochester Methodist Hospital. As in the surgery training program, residents assume greater responsibility with experience. After completion of the required time of assistantship in obstetrics, they are promoted to the position of chief resident associate in obstetrics for a period of six months. During this time they assume primary responsibility for the care of many obstetrical patients.

Outpatient medical gynecology is strongly emphasized in this residency program. Intensive training in gynecological endocrinology, colposcopy, venereal diseases, and other pelvic pathology is obtained through the outpatient facilities of the Mayo Clinic. Because of the large number of new gynecological oncology patients, residents become familiar with proper workup and diagnostic techniques involved in the care of cancer patients. All residents spend one quarter on the Gynecologic Chemotherapy-Radiation Therapy Service; didactic sessions in both chemotherapy and radiation therapy are held daily.

For physicians who wish to pursue a special interest in gynecologic oncology following the completion of the basic requirements for board certification in obstetrics and gynecology, appointments are made to a gynecologic oncology residency at two-year intervals. Completion of this program fulfills the requirements for certification by the Gynecologic Oncology Subspecialty Board.

A well-structured series of didactic courses is an integral part of the residency in obstetrics and gynecology. Core curricula are presented in obstetrics, general gynecology, gynecologic surgery, and gynecologic pathology. Although primarily designed for the resident in obstetrics and gynecology specialty training, these didactic sessions are open to physicians from other specialties with permission of the director of medical education. Residents in obstetrics and gynecology specialty training are encouraged to attend the didactic sessions offered by other specialties based in Rochester.

Master's Degree—Offered only under Plan A.

Doctor's Degree—Work leading to the Ph.D. degree is offered.

M 5801. INTRODUCTION TO OBSTETRICS. (1 cr) Noller
Didactic sessions presented weekly. Student preparation and participation required.

M 5802. INTRODUCTION TO MEDICAL GYNECOLOGY. (1 cr) Malkasian, Noller
Selected topics in gynecology presented weekly. Student preparation and participation required.

M 5803. INTRODUCTION TO SURGICAL GYNECOLOGY. (1 cr) Lee, Symmonds, Williams
Theoretical and practical basis of gynecologic surgery.

M 5804. GYNECOLOGIC PATHOLOGY. (1 cr per qtr; two qtrs required) Williams
Lectures and clinical correlations of pathologic findings.

M 5805. MEDICAL GYNECOLOGY/ONCOLOGY. (3 cr) Decker, Malkasian
Basic training in gynecological oncology, in-depth work in chemotherapy, and formal lectures in radiation therapy.

M 8851f,w,s,su. DIAGNOSIS. (6 cr) Staff
Principally in relation to obstetric and gynecologic conditions. Research. Seminar.

M 8852f,w,s,su. CLINICAL OBSTETRICS AND GYNECOLOGY. (6 cr) Staff
Diagnosis and treatment with study of selected obstetric and gynecologic cases. Residence. Seminar.

M 8853f,w,s,su. OPERATIVE SURGERY. (6 cr) Lee, Symmonds, Williams

M 8854. SEMINARS IN GYNECOLOGIC ENDOCRINOLOGY. (1 cr) Coulam
Seminars, case presentations, and didactic sessions arranged on an individual basis.

M 8890. RESEARCH IN OBSTETRICS-GYNECOLOGY. (6 cr; prereq △) Staff
Graduate thesis research under supervision of staff.

OPHTHALMOLOGY (Oph)

OFFERED AT MINNEAPOLIS

Professor

Donald J. Doughman, M.D., *head*
William Knobloch, M.D., *director of graduate study*
Jonathan D. Wirtschafter, M.D.

Associate Professor

William L. Fowlks, Ph.D.
Robert D. Letson, M.D.
Robert C. Ramsay, M.D.
William B. Rathbun, Ph.D.

Clinical Associate Professor

Richard C. Horns, M.D., M.S.

Assistant Professor

J. Douglas Cameron, M.D.
Herbert L. Cantrill, M.D.
Richard L. Lindstrom, M.D.
Jonathan E. Pederson, M.D.

Graduate work in the field of ophthalmology is open to qualified physicians who wish to prepare for private practice or for teaching or research in the basic science or clinical aspects of the field. The wide variety of ophthalmologic problems presented at the University Hospitals, Hennepin County Medical Center, St. Paul-Ramsey Medical Center, and Veterans Administration Hospital in Minneapolis provides an excellent core for clinical training and insures adequate surgical experience for each fellow. The department's laboratory facilities and staff are available for research in basic or clinical studies of the specialty. Regardless of career goal, all fellows spend a period of time in the laboratory becoming familiar with the research problems of ophthalmology. Additional opportunities for training are available to those who wish to prepare for teaching and research.

Master's Degree—The master's degree program is offered only under Plan A. The program normally requires three years to complete. Students are encouraged, but not required, to take an additional year of training. Minor fields for the master's degree are completed in one of the basic science disciplines by special arrangement with the department involved. Recommended are such fields as physiology, biophysics, biochemistry, and microbiology.

Doctor's Degree—A Ph.D. degree program is not offered. Individuals who wish to earn the Ph.D. are encouraged to complete a doctoral program in one of the basic science fields, doing their research on some ophthalmologic problem appropriate to their major subject.

The course work listed is required of all graduate students whether they are working toward a degree or not. Oph 8101 is offered on a continuing basis throughout the three-year program. The remainder of the courses (with the exception of Oph 8142, 8153, and 8154) are offered once during the three-year program.

8101f,w,s,su. CLINICAL OPHTHALMOLOGY. (8 cr) Doughman and staff

8131f,w,s,su. PRACTICAL OCULAR SURGERY. (3 cr) Doughman and staff

8142f,w,s,su. OPHTHALMIC PATHOLOGY LABORATORY. (2 cr) Cameron

8152. OPHTHALMOLOGY LABORATORY. (15 cr) Staff

8153. RESEARCH IN OPHTHALMOLOGY. (Cr ar) Staff

8154. SEMINAR: OPHTHALMOLOGY. (Cr ar) Staff

8155. SPECIAL TOPICS IN OPHTHALMOLOGY. (Cr ar) Staff

8701. NEUROOPHTHALMOLOGY. (1 cr per qtr)

OPHTHALMOLOGY

OFFERED AT ROCHESTER

Professor

Robert R. Waller, M.D., *chairman*
Richard F. Brubaker, M.D.
John A. Dyer, M.D., M.S.
Thomas P. Kearns, M.D., M.S.
Dennis M. Robertson, M.D., M.S.

Associate Professor

William M. Bourne, M.D. M.S.
Thomas J. Kirby, Jr., M.D., M.S.

Assistant Professor

Helmut Buettner, M.D.
R. Jean Campbell, M.B.B.Ch.

Residents majoring in ophthalmology receive practical experience in diagnosis and treatment of diseases of the eye under the supervision of full-time staff members. Rotating outpatient assignments include experience in tonography, biomicroscopy, indirect ophthalmoscopy, cryotherapy, office surgery, xenon arc and laser photo coagulation; refraction and ocular motility with experience in contact lens fitting and orthoptics; and medical and neuroophthalmology with experience in perimetry, ophthalmoscopy, and fluorescein angiography.

Courses in surgical technique, ophthalmic pathology, anatomy and neuroanatomy of the eye, orbit, and intracranium are included during the outpatient assignments.

During a 14-month assignment to the ophthalmic surgical services, residents care for hospitalized patients, assist and participate in surgery with the staff surgeons, and assume increasing surgical responsibilities. Third-year residents are assigned either to the Chief Resident Associate Service in Rochester or to the affiliated, supervised Chief Resident Associate Program in Phoenix, Arizona.

Three years of lectures, conferences, and seminars follow the format and subject material of the Home Study Course of the American Academy of Ophthalmology. These presentations usually are given by staff members. Senior resident conferences, resident seminars, and grand rounds are interspersed throughout the three-year period. Interest and experience in clinical research are encouraged.

Oral examinations are conducted at appropriate intervals to evaluate the resident's progress.

Master's Degree—Offered only under Plan A.

Doctor's Degree—Work leading to the Ph.D. degree is offered.

M 8851f,w,s,su. REFRACTION AND STRABISMUS. (6 cr) Dyer
Theory of refraction, retinoscopy, diagnosis of refractive errors of the eye, prescribing of lenses, disturbances of motility of the eyes, orthoptics and strabismus surgery. Prescribing and fitting contact lenses.

M 8852f,w,s,su. OCULAR THERAPY. (6 cr) Bourne, Brubaker, Buettner, Kirby, Robertson, Waller
Diagnosis and treatment of diseases of the eye and its adnexa.

M 8853f,w,s,su. MEDICAL AND NEUROLOGIC OPHTHALMOLOGY. (6 cr) Kearns, Trautmann
Ophthalmology and ophthalmoscopy as they pertain to the fields of internal medicine and neurology.

M 8854f,w,s,su. OPHTHALMIC SURGERY. (6 cr) Bourne, Brubaker, Buettner, Robertson, Waller
A 14-month hospital service.

M 8855f,w,s,su. OPHTHALMIC PATHOLOGY, ANATOMY, AND SURGICAL TECHNIQUE. (6 cr; prereq resident in ophthalmology) Kirby, Campbell

ORAL BIOLOGY (OBio)

OFFERED AT MINNEAPOLIS

Regents' Professor
Robert J. Gorlin, D.D.S., M.S.

Professor
Burton L. Shapiro, D.D.S., Ph.D., *chairperson*
Charles F. Schachtele, Ph.D.
Quenton T. Smith, Ph.D.
Carl J. Witkop, D.D.S., M.S.

Associate Professor
Harold H. Messer, B.D.Sc., M.D.Sc., Ph.D., *director of graduate study*
Gregory R. Germaine, Ph.D.

Assistant Professor
Robert J. Feigal, D.D.S., Ph.D.
Mark C. Herzberg, D.D.S., Ph.D.

Oral biology is the study of the orofacial region, its development (including aging), structure, function, and pathology. Graduate programs in oral biology train individuals for academic and research careers concerned with problems of the mouth and its contained and related tissues, and prepare them for employment in dental schools, oral research centers, and other institutions engaged in similar activities.

Master's Degree—Offered under Plan A and Plan B.

Doctor's Degree—All students are expected to develop and demonstrate a broad knowledge of oral biology and related basic sciences. In addition, individual programs will emphasize, through advanced course work and research, more specialized areas of interest, such as salivary glands and secretions, development of oral structures, oral diseases, mineral metabolism and nutrition, oral microbiology, and secretory and cellular immune factors. A minor in a related discipline is required also. During each quarter of their first year, students will work with a faculty member to acquire research experience. Students must register for and attend the weekly oral biology seminar.

All students are required to pass a written qualifying examination at the beginning of the fall quarter following their first full year in the program. In this examination students must demonstrate general competence in both oral biology and related biological sciences. The written preliminary examination consists of two research proposals, which must be submitted by the end of the second year in residence. The first, developed by the student in consultation with the adviser and the graduate faculty, is intended to serve as the student's thesis research proposal. The second will address a topic assigned by the graduate faculty. The oral preliminary examination focuses on the two proposals and related areas of knowledge. The student must present a seminar describing thesis research progress (which will be attended by the final examination committee) at least six months before defense of the thesis.

Prerequisites—Programs are designed for individuals who have completed requirements for graduation with high standing from dental or medical schools and desire to undertake advanced studies in oral biology. In some cases an individual who has not yet obtained the D.D.S. (D.M.D.) or M.D. degree but who has demonstrated exceptional potential for graduate study may be admitted for a combined program. Individuals with a bachelor's or master's degree who can demonstrate an appropriate background and an interest in oral biology will be considered for admission.

Language Requirement—Determined individually for candidates in consultation with their advisers and the director of graduate study. The need for language proficiency, the level of such proficiency, and the choice of language(s) will depend on the areas in which students expect to concentrate their efforts.

8001. RESEARCH IN ORAL BIOLOGY. (Cr ar) Staff

8002. TUTORIAL IN ORAL BIOLOGY. (Cr ar [2 hrs per wk = 1 cr; may be repeated for cr]) Staff
Quarter-long apprenticeship with faculty members to familiarize students with faculty research interests.

8010. ORAL BIOLOGY. (3 cr) Staff
Basic concepts of cell biology and human biology for dental specialist and/or oral research trainees.

8018. BIOLOGY OF MINERALIZED AND OTHER CONNECTIVE TISSUES. (3 cr; offered spring 1983 and alt yrs) Smith
Lectures and discussions on developmental biology of connective tissues, morphologic and biochemical composition of connective tissue components, structure and biosynthesis of connective tissue components, normal and pathologic mineralization and changes in connective tissue during aging, wound healing, and various disease processes.

8021, 8022, 8023, 8024. TOPICS IN ORAL BIOLOGY. (1-3 cr per qtr [may be repeated for cr]; prereq #) Staff
Different topic or subject area each quarter, announced in advance. May include: saliva and salivary glands; pain and sensation; aging; biomaterials; hard tissue metabolism.

8030. SEMINAR. (1 cr [may be repeated for cr]) Staff
Faculty and student participation in discussion of current topics in oral biology.

Additional major course work may be drawn from basic medical sciences and other areas appropriate to the individual program.

ORTHOPEDIC SURGERY (OrSu)

OFFERED AT MINNEAPOLIS

Professor
Roby C. Thompson, M.D., *head, director of graduate study*
David S. Bradford, M.D.
James H. House, M.D., M.S.
Robert B. Winter, M.D.

Associate Professor
Theodore R. Oegema, Ph.D.

Master's Degree—Four-year fellowships are offered to students working toward graduate degrees in orthopedic surgery. This work is carried on at University Hospitals, Gillette Children's Hospital, Shriners Hospital for Crippled Children, and other Twin Cities hospitals, and there is an interchange with the Department of Orthopedic Surgery at the Mayo Graduate School of Medicine. The master's degree is offered only under Plan A.

Doctor's Degree—Work leading to the Ph.D. degree is offered.

8401. ORTHOPEDIC CONFERENCE. (3 cr) Staff
Review of X-rays and case histories of patients on orthopedic inpatient or outpatient service.

8403. FRACTURES. (5 cr) Staff
The orthopedic fellow acts as house surgeon on fracture service at Hennepin County Medical Center.

8404. FRACTURES. (5 cr) Staff
The orthopedic fellow acts as house surgeon on fracture service at St. Paul-Ramsey Medical Center.

8405. ORTHOPEDIC DIAGNOSIS. (3 cr) Staff
The orthopedic fellow assists in instruction of clinical clerks and interns and studies problems in diagnosis in Outpatient Department at University Hospitals.

8407. PEDIATRIC ORTHOPEDICS. (5 cr) Staff
The orthopedic fellow acts as house surgeon at Gillette Children's Hospital.

8408. ORTHOPEDIC PROBLEMS AND MANAGEMENT. (5 cr) Staff
The orthopedic fellow acts as house surgeon at University and Veterans Hospitals.

8409. ORTHOPEDIC PROBLEMS AND MANAGEMENT. (5 cr) Winter and staff
The orthopedic fellow acts as house surgeon on fracture service at Fairview Hospital.

8410. ORTHOPEDIC PATHOLOGY. (2 cr) Staff
Seminar for systematic review of pathology of ossified tissues and soft tissues of extremities.

8411. ORTHOPEDIC OPERATIVE SURGERY. (5 cr) Staff
The orthopedic fellow acts as first assistant at operations at University Hospitals and later may be permitted to operate.

8412. ORTHOPEDIC ANATOMY. (2 cr) House and staff
The orthopedic fellow dissects upper and lower extremities and aids in instruction of medical students in anatomy of extremities.

8416. ORTHOPEDIC RESEARCH. (5 cr) Bradford
Problems in experimental or clinical surgery at University Hospitals.

ORTHOPEDIC SURGERY

OFFERED AT ROCHESTER

Professor

Edward D. Henderson, M.D., M.S., *chairman*
Anthony J. Bianco, Jr., M.D., M.S.
Richard S. Bryan, M.D., M.S.
Edmund Y. S. Chao, Ph.D.
Mark B. Coventry, M.D., M.S.
Einer W. Johnson, Jr., M.D., M.S.
Patrick J. Kelly, M.D., M.S.
Ronald L. Lindscheid, M.D., M.S.
Lowell F. A. Peterson, M.D., M.S.

Associate Professor

James H. Dobyns, M.D.
Hamlet A. Peterson, M.D., M.S.
Franklin H. Sim, M.D., M.S.
Richard N. Stauffer, M.D., M.S.

Assistant Professor

Robert D. Beckenbaugh, M.D.
Miguel E. Cabanela, M.D., M.S.
Robert H. Cofield, M.D., M.S.
William P. Cooney, M.D.
Robert H. Fitzgerald, M.D., M.S.
Kenneth A. Johnson, M.D.
Bernard F. Morrey, M.D.
Douglas J. Pritchard, M.D., M.S.
Michael B. Wood, M.D.

The residency in orthopedic surgery is designed to prepare the student for the practice of this specialty in all its phases and is tailored to the specific needs of each student. Additional training is available in research, hand surgery, children's orthopedics, and orthopedic oncology. Qualified applicants are accepted for either a four- or five-year program, which meets certification requirements of the American Board of Orthopaedic Surgery.

The resident gradually assumes increasing responsibility for the care of orthopedic patients. Approximately one year is spent on the orthopedic service of a hospital and in outpatient assignments at the junior residency level. Training includes one quarter in a hand surgery clinic. Integrated into this year may be training in ancillary fields such as general surgery, neurosurgery, neurology, rheumatology, physical medicine, and emergency room care. These assignments vary according to prior experience and the needs of the resident.

A six-month block in basic sciences follows, with no concurrent clinical responsibilities. This period includes study of basic sciences, orthopedics, microanatomy and pathology of bone, various aspects of bone and muscle physiology, musculoskeletal anatomy, biomechanics, and metabolic bone diseases. Didactic teaching periods in pediatric orthopedics, hand surgery, and prosthetics also take place during this time.

A second block assignment provides additional time in children's orthopedics, either at Mayo or at an affiliated institution off campus. This assignment comes near the last year of the resident's training, when the resident can assume considerable responsibility in the care of children to supplement previous experience in the Mayo Graduate School of Medicine program. Off-campus affiliations exist with Gillette Children's Hospital, St. Paul; Primary Children's Hospital, Salt Lake City; and Shriners Hospital, Salt Lake City.

At the senior residency level during the last two years of training, residents are assigned to specific staff services. They carry out consultations on orthopedic patients and take part in making preoperative surgical decisions. They participate actively in surgical procedures and in postoperative management within the hospital and in the outpatient

area. Senior residents are given considerable responsibility and independence in these activities. Experience is enhanced by the large number of patients seen and by the complex nature of many of their medical and surgical orthopedic problems.

Trauma is taught in conjunction with the relatively large number of fracture cases treated in the affiliated hospitals in Rochester. Residents participate in trauma study throughout the entire curriculum. Difficult problems are reviewed with residents and staff at weekly fracture conferences. All fracture problems are under the direction of the staff of the orthopedic section of the Mayo Clinic.

Members of the orthopedic staff are in charge of surgery of the hand. In addition to the quarter at the junior residency level, further training in the area can be obtained through assignments to services that emphasize hand surgery.

During the four- or five-year program outlined above, residents receive the training in general surgery, adult orthopedics, children's orthopedics, fractures and traumatic surgery, and basic sciences required by the American Board of Orthopaedic Surgery. As part of the residency program, assignments as chief resident associate are made. Four or five such positions are available for a six-month period. The chief resident associate is assigned his or her own service, under staff supervision. Opportunity is also afforded for research, and additional time for orthopedic research under the guidance of a full-time staff member in research may be provided in certain instances. The resident may earn an M.S. or a Ph.D. degree in orthopedic surgery by writing a thesis, passing written and oral examinations, and fulfilling the requirements of the Mayo Graduate School of Medicine.

Didactic Program—Fracture conferences are held each week throughout the year. Emphasis is placed on the review of fresh fractures and their treatment or on discussion of allied problems in treatment.

A complete review program in basic sciences is presented through a series of lectures during the resident's six-month assignment in this area. In addition, other lectures are given in basic fields related to orthopedic surgery.

Weekly clinical seminars are presented by residents in consultation with staff members. During the four- or five-year program an attempt is made to cover all aspects of orthopedic problems, both congenital and acquired.

Lectures on orthopedic pathology are given regularly during the basic science period. All orthopedic residents participate in periodic pathologic conferences.

Orthopedic conferences or grand rounds are conducted once a week in affiliated hospitals.

Each year visiting faculty members enhance the program, as do section guests who present lectures to the residency and consulting staffs.

Master's Degree—Offered only under Plan A.

Doctor's Degree—Work leading to the Ph.D. degree is offered.

M 5803. PROSTHETICS FOR ORTHOPEDICS. (1 cr) Pritchard and staff
Biomechanics of skeletal system.

M 8851. ORTHOPEDIC DIAGNOSIS. (6 cr) Henderson and staff
Outpatient clinical practice with emphasis on diagnosis and decisions regarding treatment. History taking, examination, X-ray interpretation and joint discussions regarding diagnosis and management. Postoperative follow-up of patients. Participation in special clinics such as hip, knee, and scoliosis. Seminars.

M 8852. ADULT RECONSTRUCTION. (6 cr) Henderson and staff
Includes surgical aspects at the junior and senior residency level with more advanced participation in surgery as abilities of the resident develop. Surgical experience every other day with preoperative and postoperative evaluation and follow-up on alternate days. Seminars.

M 8853. SURGERY OF THE HAND. (6 cr) Dobyns, Linscheid, and staff
Hand service clinic in Mayo Building, Methodist Hospital operating rooms, and St. Mary's Hospital. Congenital anomalies, deformities, fractures, tendon injuries, multiple injuries, rheumatoid arthritis joint replacement. Hand grand rounds and Thursday breakfast conferences.

M 8854. PEDIATRIC ORTHOPEDICS. (6 cr per qtr; 2 qtrs required) Bianco, Peterson, and staff
Management of all orthopedic problems in children and adolescents. Emphasis on the outpatient management of these problems, the operative treatment, and preoperative and postoperative care.

M 8855. ORTHOPEDIC ONCOLOGY. (6 cr per qtr; 2 qtrs required) Sim and staff
History taking, physical examination, surgical, medical, and radiologic management of patients with benign and malignant lesions of bone and soft tissues. Daily care of patients with a wide variety of neoplastic conditions both in and out of the hospital, regularly scheduled conferences on surgical pathology of neoplasia, and in-hospital clinical conferences on patient management.

M 8856. FRACTURES. (2 cr) Bryan and staff
Comprehensive exposure to fracture problems and adult trauma.

M 8860. STRUCTURE AND FUNCTION OF BONE. (3 cr; prereq #) Henderson and staff
Lectures to include bone morphology, bone infections and treatment, statistics, techniques of bone evaluation, and immunology and joint diseases.

OTOLARYNGOLOGY (Otol)

OFFERED AT MINNEAPOLIS

Professor

Michael M. Paparella, M.D., *head*
S. K. Juhn, M.D., M.S., Dr.Med., *director of graduate study*
Arndt J. Duvall III, M.D., M.S.
Earl R. Harford, Ph.D.
Frank M. Lassman, Ph.D.
William L. Meyerhoff, M.D., Ph.D.
W. Dixon Ward, Ph.D.

Clinical Professor

Jerome A. Hilger, M.D., M.S.
Albert Hohmann, M.D.
Robert E. Priest, M.D., M.S.

Associate Professor

Lawrence R. Boies, Jr., M.D.
David A. Nelson, Ph.D.

Assistant Professor

John H. Anderson, M.D., Ph.D.
Stephen L. Liston, M.D.
Tetsuo Morizono, M.D.
Peter A. Santi, Ph.D.

Clinical Assistant Professor

John D. Banovetz, M.D.

The residency program of the Department of Otolaryngology is designed to provide training in both clinical and experimental aspects of otolaryngology. Rotations at the University Hospitals, Minneapolis Veterans Administration Hospital, St. Paul-Ramsey Medical Center, and Hennepin County Medical Center provide a wide range of material for clinical training and surgical experience. The several research laboratories of the department provide opportunities for independent research in a variety of areas of otolaryngology. These include the laboratories of psychoacoustics, electronmicroscopy, biochemistry, histochemistry, temporal bone pathology, audiology, and vestibular physiology.

All residents in the program spend one year in general surgery and four years in otolaryngology. During the last four years each resident (fellow) is required to spend time in basic or applied research directed toward preparation of an acceptable thesis for a master's degree in otolaryngology.

Master's Degree—Offered under Plan A.

Doctor's Degree—A Ph.D. program is offered, which involves additional time spent in basic research.

8220. RESEARCH IN OTOLARYNGOLOGY. (18 cr) Paparella and staff

8230. CLINICAL OTORHINOLARYNGOLOGY. (6 cr) Paparella, Duvall, and staff
Diagnostic and management instruction and experience in all phases of clinical otorhinolaryngology. Both inpatient and outpatient services are provided at University of Minnesota Hospitals, St. Paul-Ramsey Medical Center, Veterans Administration Hospital, and Hennepin County Medical Center.

8231. SURGERY OF THE EAR, NOSE, AND THROAT. (4 cr) Paparella, Duvall, and staff
Surgical training and experience with a broad scope of surgical problems encountered in otorhinolaryngology provided at University of Minnesota Hospitals, St. Paul-Ramsey Medical Center, Veterans Administration Hospital, and Hennepin County Medical Center.

8232. MAXILLOFACIAL SURGERY. (1 cr) Staff
Basic science principles and management principles of maxillofacial diseases. Problems of maxillofacial trauma. Experience with these problems in the hospitals of the training program, especially the county hospitals.

8233. PLASTIC AND RECONSTRUCTIVE SURGERY OF THE HEAD AND NECK. (1 cr) Staff
Teaching and practical training for otolaryngologic cosmetic surgery with emphasis on rhinoplasty and otoplasty.

8234. ANATOMY OF THE HEAD AND NECK AND TEMPORAL BONE DISSECTION. (2 cr) Paparella
Head and neck anatomy is studied from cadaver material through programmed learning. Temporal bones are dissected to learn anatomy and to practice all otologic surgical procedures.

8235. ROENTGENOLOGY OF THE HEAD AND NECK. (2 cr) Staff
Experience in X-ray diagnostic procedures for otolaryngologic problems.

8236. PHARMACOLOGY IN OTOLARYNGOLOGY. (2 cr) Staff
General principles of pharmacology as they relate to otolaryngology.

8237. ENDOSCOPY. (2 cr) Duvall
Instruction, didactic and practical, in laryngoscopy, esophagoscopy, bronchoscopy, and mediastinoscopy. General management principles stressed.

8238. PATHOLOGY OF THE EAR, NOSE, AND THROAT. (2 cr) Paparella, Duvall
Gross pathology and histopathology of diseases of the ear, nose, throat, and related regions.

8239. OTONEUROLOGY. (2 cr) Paparella, Duvall
Instruction and experience in diagnosis and management of otoneurologic problems including training in electronystagmographic analysis of vestibular function.

8240. ALLERGY. (2 cr) Staff
Concepts and management of otolaryngologic allergy.

8241. TUMOR CLINIC. (1 cr) Staff
Clinical head and neck oncology including consideration of etiology, treatment (both surgical and nonsurgical), and other principles of management.

8242. AUDIOLOGY OF SPEECH PATHOLOGY. (2 cr) Lassman, Harford, and staff
Fundamentals of audiology and speech pathology. Measurement and description of disorders of hearing, speech, and language in children and adults. Peripheral vs. central differential diagnostic signs, hearing aids. Special educational management of children and adults. Community resources.

8243. INTRODUCTION TO RESEARCH METHODOLOGY. (2 cr) Ward and staff
Basic introduction to such topics as statistical methods, experimental design, and execution of otolaryngologic research. Required for all 1st-year otolaryngology residents.

8244. SEMINAR: CURRENT LITERATURE. (1 cr)
Presentation and discussion of selected articles required for all residents.

8245. MASTER'S THESIS RESEARCH. (Cr ar) Staff

8246. PH.D. THESIS RESEARCH. (Cr ar) Staff

8247f. PHYSIOLOGY OF HEARING. (3 cr, §Phsl 8216; prereq #)
Basic functional mechanisms of the auditory system, peripheral and central.

OTOLARYNGOLOGY

OFFERED AT ROCHESTER

Professor

D. Thane R. Cody, M.D.C.M., Ph.D., *chairman*
Lawrence W. DeSanto, M.D.
Eugene B. Kern, M.D., M.S.

Associate Professor

George W. Facer, M.D.
Thomas J. McDonald, M.D., M.S.
Harry B. Neel III, M.D., Ph.D.
Bruce W. Pearson, M.D.
Darrell E. Rose, Ph.D.

Assistant Professor

Stephen G. Harner, M.D.

A four-year residency program is offered in otolaryngology. In addition, one year of general surgery training is required by the American Board of Otolaryngology and is prerequisite to the otolaryngology residency. It may be completed at the Mayo Graduate School of Medicine or through another approved program of general surgery. The general surgery experience at the Mayo Clinic is designed for maximal benefit to the otolaryngologist.

During the otolaryngology program, residents are offered training in diseases of the ear, including neuro-otology, pediatric otology and audiology; nonmalignant and malignant diseases of the nose and paranasal sinuses; physiologic nasal surgery; laryngology and head and neck surgery; and related basic sciences. Usual assignments are 9 months as a junior resident at the Rochester Methodist Hospital and 15 to 21 months as a senior resident at the Rochester Methodist Hospital and the outpatient facilities of the Mayo Clinic.

Three months' training on a hospital thoracic service provides experience in endoscopy and diseases of the chest. Nine months of the last year are spent as a chief resident associate. Under the direction of a member of the Mayo Clinic staff, the chief resident associate is responsible for the diagnostic evaluation, therapy, and rehabilitation of patients.

From 6 to 12 months are spent studying a basic science related to otolaryngology. Nine to 12 months is usually a sufficient period of time to fulfill the research requirements for the M.S. or Ph.D. degree in otolaryngology. Course studies are available in such areas as cadaver surgery of the ear, nose, head, and neck and microsurgery of the ear on laboratory material.

Master's Degree—Offered only under Plan A.

Doctor's Degree—Work leading to the Ph.D. degree is offered.

M 8851f,w,s,su. CLINICAL OTORHINOLARYNGOLOGY. (6 cr) Staff
Theory and practice with differential diagnosis and treatment of diseases of the ear, nose, paranasal sinuses, pharynx, larynx, head, and neck; their relation to general diagnosis.

M 8852f,w,s,su. PREOPERATIVE AND POSTOPERATIVE CARE OF PATIENTS. (6 cr) Staff
Junior residency service.

M 8853f,w,s,su. OPERATIVE OTORHINOLARYNGOLOGY. (6 cr) Staff
Senior residency service.

M 8854f,w,s,su. OPERATIVE OTORHINOLARYNGOLOGY. (6 cr) Staff
Chief resident associate.

M 8855f,w,s,su. ADVANCED AUDIOLOGY. (2 cr) Olsen, Rose
Tests of hearing; evaluation of speech disorders for purposes of diagnosis and as a basis for advising use of hearing aids; educational therapy.

M 8856w. SURGICAL ANATOMY AND SURGERY OF THE NOSE AND PARANASAL SINUSES. (2 cr) Kern, Facer, DeSanto, McDonald, Pearson
Experience in surgical anatomy of the nose and paranasal sinuses and participation in cadaver surgery.

M 8857w. TEMPORAL BONE ANATOMY AND SURGERY OF THE TEMPORAL BONE. (3 cr) Facer, Harner, McDonald
Lectures in basic anatomy of and surgical techniques for the temporal bone.

M 8890. GRADUATE RESEARCH. (6 cr; prereq #) Staff
Graduate thesis research under staff supervision.

PATHOBIOLOGY (Path)

OFFERED AT MINNEAPOLIS

Professor

Ellis S. Benson, M.D., *head, director of graduate study*
Khalil Ahmed, Ph.D.
Miguel Azar, M.D., Ph.D.
Fritz H. Bach, M.D.
David M. Brown, M.D.
Richard C. Brunning, M.D.
Barbara A. Burke, M.D.
Agustin P. Dalmasso, M.D.
John W. Eaton, Ph.D.
Jesse E. Edwards, M.D.
Richard D. Estensen, M.D.
Nelson D. Goldberg, Ph.D.
Franz Halberg, M.D.
Erhard Haus, M.D., Ph.D.
John H. Kersey, M.D.
Juan Rosai, M.D.
Andreas Rosenberg, Ph.D.
Burton L. Shapiro, D.D.S., Ph.D.
John R. Sheppard, Ph.D.
Judson D. Sheridan, Ph.D.
Michael W. Steffes, M.D., Ph.D.
R. Dorothy Sundberg, M.D., Ph.D.

Lee W. Wattenberg, M.D.
James G. White, M.D.
Jorge J. Yunis, M.D.

Associate Professor

Leo T. Furcht, M.D.
Kazimiera Gajl-Peczalska, M.D.
Leonard Greenberg, Ph.D.
Toni N. Mariani, Ph.D.
Walter J. Runge, M.D., Ph.D.
William R. Swaim, Ph.D.
Walid Yasmineh, Ph.D.

Assistant Professor

Connie Clark, Ph.D.
John H. Eckfeldt, M.D., Ph.D.
Nancy N. Wang, Ph.D.
Michael J. Wilson, Ph.D.
Joyce M. Zarling, Ph.D.

Doctor's Degree—The Ph.D. with designation in pathobiology is offered. The student is expected to maintain a B average in courses for both the major and minor. In addition to the usual course examinations, candidates must pass a preliminary written examination at the end of the first year of course work, and the preliminary oral examination after approximately two to three years in the program.

Prerequisites—Graduate students who wish to pursue major work in pathobiology must present a bachelor's degree in some area of science or present credits for the first two years' work in the Medical School of the University of Minnesota. Completion of a course in biochemistry and in histology is required prior to entry. Completion of a course in microbiology is not required but is highly recommended.

Special Major Field Requirements—The following information must be sent to the Department of Laboratory Medicine and Pathology before an application will be evaluated for the pathobiology program: three letters of recommendation; Graduate Record Examination scores (quantitative, analytical, and verbal sections); the Test of English as a Foreign Language score (for foreign students); and a brief autobiographical sketch including such information as reasons for seeking a degree in pathobiology, career objectives, and areas of special interest.

5101. PATHOLOGY. (5 or 6 cr; prereq regis 1st-yr med school...grad by #; offered during med school Phase A) Ratliff and staff
General pathology.

5104. AUTOPSIES. (Cr ar; prereq regis grad med or #) Staff

5105. DISEASES OF THE KIDNEY. (3 cr; prereq regis grad med or #) Staff

5106. DISEASES OF THE HEART. (1 cr; prereq regis grad med or #) Edwards

5107. INTRODUCTORY CYTOPATHOLOGY. (2 cr; prereq regis Phase B or D med or grad med...others #)

5110. SEMINAR: PATHOLOGY. (1 cr; prereq #) Benson

5111. CONFERENCE ON AUTOPSIES. (1 cr; prereq regis grad med or #) Staff

5113. SURGICAL PATHOLOGY. (Cr ar; prereq regis grad med or #) Rosai

5120. DISEASES OF THE LUNGS. (1 cr; prereq regis grad med or #) Staff

5121. DISEASES OF THE ALIMENTARY TRACT. (1 cr; prereq regis grad med or #) Staff

5124. VIRUSES IN THE PATHOGENESIS OF DISEASE. (Cr ar) Kersey

5125. IMMUNOPATHOLOGY. (2 cr; prereq #) Gajl-Peczalska
Discussion of immunogenetics, function of white cells, surface markers, tumor immunology, autoimmunity, aging, and immunopathology of renal diseases.

5126. TECHNIQUES IN IMMUNOPATHOLOGY. (1 cr; prereq 5125) Gajl-Peczalska
Techniques for study of transplantation and fetal antigens, lymphocyte function, immunofluorescence, immunochemistry, and serologic techniques in viral and autoimmune diseases.

5128. EXPERIMENTAL IMMUNOPATHOLOGY. (4 cr; prereq regis med or grad med) Azar

5134. JOURNAL REVIEW. (1 cr; prereq regis med or grad med)

5140. SEMINAR: EXPERIMENTAL CHRONOBIOLOGY. (1 cr) Halberg

5141. PROBLEMS IN EXPERIMENTAL AND CLINICAL CHRONOBIOLOGY. (Cr ar) Halberg

5160s. HUMAN CYTOGENETICS. (3 cr; prereq #; offered 1983 and alt yrs) Yunis
Chromosome structure and function, and genetic and clinical problems associated with the study of human chromosomes.

5161s. HUMAN CYTOGENETICS LABORATORY. (2 cr; prereq #; offered 1983 and alt yrs) Yunis and staff
Techniques for study of mammalian and human chromosomes: cell culture, autoradiography, new techniques for chromosome identification, and chromosome isolation techniques.

5162s. HUMAN BIOCHEMICAL GENETICS. (3 cr; prereq #; offered 1982 and alt yrs) Eaton
Molecular and genetic basis of genetic traits in mammals.

5163s. HUMAN BIOCHEMICAL GENETICS LABORATORY. (2 cr; prereq #; offered 1982 and alt yrs) Eaton and staff
Biochemical techniques used in the study of human genetic traits.

5166. FORENSIC PATHOLOGY. (2 cr; prereq 5104 or ¶5104 or △) Coe

5168f,w. SEMINAR: GENETICS. (1 cr; prereq #)

5169f,w,s,su. RESEARCH IN HUMAN GENETICS. (Cr ar; prereq #) Eaton

5170f,w,s,su. ADVANCED PROBLEMS IN MEDICAL GENETICS. (Cr ar; prereq #) Yunis and staff

5400w. SELECTION, CARE, AND USE OF ANIMALS IN BIOMEDICAL RESEARCH. (3 cr; prereq grad student in life sciences) Manning
Introduction to laboratory animal science with emphasis on the selection, care, and use of research animals.

5415f. MATHEMATICAL MODELS IN PATHOBIOLOGY I: DETERMINISTIC MODELS IN PHYSIOLOGICAL CHEMISTRY. (3 cr; prereq background in biomedical computing, calculus, and pathobiology) Ackerman

5416w. MATHEMATICAL MODELS IN PATHOBIOLOGY II: INFORMATION THEORY, GENETICS, AND POPULATION MODELS. (3 cr; prereq 5415 or #) Ackerman

5417s. MATHEMATICAL MODELS IN PATHOBIOLOGY III: INFORMATION THEORY, GENETICS, AND POPULATION MODELS. (3 cr; prereq 5415 and 5416 or #) Ackerman

8108f. PATHOBIOLOGY I. (3 cr, 8108-8109-8110†; prereq MdBc 5100, Anat 5103, 5104 or ¶5104 or #) Ahmed and staff
In-depth examination of six major areas of pathology: cell injury and death, thrombosis, immunopathology, growth control and carcinogenesis, cytogenetics and inborn errors of metabolism, and acute and chronic inflammation.

8109w. PATHOBIOLOGY II. (3 cr, 8108-8109-8110†; prereq 8108, MdBc 5100, Anat 5103, 5104 or ¶5104 or #) Ahmed and staff
Continuation of 8108.

8110s. PATHOBIOLOGY III. (3 cr, 8108-8109-8110†; prereq 8108, 8109) Ahmed and staff
Discussion of human pathology including epidemiology, pathogenesis, and pathophysiology of selected disease processes.

8122w. BASIC SCIENCE OF CANCER. (Cr ar; prereq MdBc 5100 or equiv) Wattenberg

8135s. BIOCHEMICAL ASPECTS OF CELL GROWTH AND CELL DAMAGE. (3 cr; prereq #; offered 1982 and alt yrs) Ahmed
Current studies on biochemical mechanisms in model systems relating to (a) gene action, cell cycle, physiological, and pathological cell growth, and (b) cell damage and necrosis.

8200f,w,s,su. ADVANCED PROBLEMS IN PATHOLOGY. (Cr ar; prereq #) Benson

8201. RESEARCH. (Cr ar; grad students with necessary preliminary training may elect research, either as majors or minors in pathobiology) Benson and staff

8207. RESEARCH IN EXPERIMENTAL AND CLINICAL CHRONOBIOLOGY. (Cr ar) Halberg

8267. MECHANISMS OF CELLULAR MOTILITY AND RELATIONSHIP OF MOTILITY TO CELLULAR FUNCTION. (2 cr; prereq #)
Biochemistry and structure of contractile proteins and their relationship to cellular events in various normal and pathologic settings.

8270. IMMUNOHEMATOLOGY. (3 cr; prereq #) Azar
Immune response. Band T lymphocytes-cell cooperation. T-dependent responses. Helper cell activity. Autoimmunity-tolerance.

8271f,w. IMMUNOHEMATOLOGY LABORATORY. (4 cr; prereq #) Azar

8272. IMMUNOBIOLOGY. (2 cr; prereq #) Azar
Review of basic research outlines in immunobiology. Methodology, experimental outline, and significance. Dynamic group discussions with full participation.

8273. ADVANCED IMMUNOBIOLOGY. (6 cr; prereq #) Azar, Dalmasso
Molecular aspects of immunopathology. Genetics of immune response. Genetic control of histocompatibility. Difference of immunoblasts. T-B cell cooperation. Research review.

8274s. MOLECULAR ASPECTS OF IMMUNOLOGY. (3 cr; prereq #; offered 1982 and alt yrs) Dalmasso
Molecular pathology of immunoglobulins and their interaction. Genetics of all types. Cell membranes. Complement and molecular features of mediators of immunity.

8701. ADVANCED NEUROPATHOLOGY. (Cr ar, §Neur 8703)

8702. SURVEY OF NEUROPATHOLOGY. (Cr ar, §Neur 8704)
Examination of specimens from current autopsies.

PATHOLOGY

OFFERED AT ROCHESTER

Professor

George M. Farrow, M.D., *chairman, surgical pathology*
Keith E. Holley, M.D., *chairman, anatomic pathology*
Harold L. Moses, M.D., *chairman, cell biology*
Robert C. Bahn, M.D., Ph.D.
David C. Dahlin, M.D., M.S.
Paul Didisheim, M.D.
Jauw T. Lie, M.D., M.S.
Jurgen Ludwig, M.D.
Robert E. Scott, M.D.
Roy G. Shorter, M.D.
Howard F. Taswell, M.D., M.S.
John H. Thompson, Jr., Ph.D.
Heinz W. Wahner, M.D., M.S.

Associate Professor

J. Aidan Carney, M.B.B.Ch., Ph.D.
Thomas A. Gaffey, M.D.
Haruo Okazaki, M.D.
Michael B. O'Sullivan, M.B.B.Ch.
Krishnan Unni, M.B.B.S., M.S.
Louis H. Weiland, M.D.

Assistant Professor

Peter M. Banks, M.D.
R. Jean Campbell, M.B.B.Ch.
Michael J. Getz, Ph.D.
John R. Goellner, M.D.

Prerequisites—Graduate training leading to a designated M.S. or Ph.D. degree in pathology is offered. Two departmental programs are available: one for candidates holding an M.D., a D.D.S., or a D.V.M. degree or an advanced degree in the biological sciences and one for candidates who do not possess one of these degrees. Candidates in the latter category seeking a Ph.D. degree may enter the program either (1) with an undergraduate degree in zoology, biology, biochemistry, chemistry, cell biology, molecular biology, or related fields; or (2) after completion of course work equivalent to the first years of medical school at either the University of Minnesota Medical School, Mayo Medical School or another medical school approved by the department.

Master's Degree—Offered under Plan A only. Course work in the major field should include representative courses such as Introduction to Structure, Systemic Pathology, Electron Microscopy, or their equivalents. Minors will be in related fields or in the basic sciences and must be approved by the department.

Ph.D. Degree—Candidates without an M.D., a D.D.S., or a D.V.M. degree or an advanced degree in the biological sciences will be required to have or to acquire a core background in the biological sciences, including cell biology, biochemistry, and microbiology/immunology, in addition to the other requirements for the major field. Minors will be in related fields or in the basic sciences and must be approved by the department. Specific requirements for a Ph.D. degree are available from the Mayo Graduate School of Medicine.

M 5801. SYSTEMIC PATHOLOGY. (6 cr) Bahn, Holley, Ludwig, Moses

M 5802f. INTRODUCTION TO STRUCTURE. (6 cr) Holley and staff

M 8851f,w,s,su. GENERAL PATHOLOGY. (8 cr) Bahn, Holley, Ludwig, Moses, Okazaki, Scott, Shorter

M 8852f,w,s. SEMINAR: PATHOLOGY. (1 cr) Bahn, Holley, Ludwig, Moses, Okazaki, Scott, Shorter

M 8853f,w,s. CONFERENCE ON AUTOPSIES. (1 cr) Bahn, Holley, Ludwig, Moses, Okazaki, Scott, Shorter

M 8854f,w,s. DISEASES OF THE LIVER. (2 cr) Ludwig

M 8855f,w,s. DISEASES OF THE CARDIOVASCULAR SYSTEM. (3 cr) Lie

M 8856f,w,s. DISEASES OF THE KIDNEY. (2 cr) Holley

M 8857f,w,s. PROBLEMS IN PATHOLOGY. (Cr ar) Bahn, Carney, Dahlin, Farrow, Gaffey, Holley, Ludwig, Moses, Okazaki, Scott, Shorter, Soule, Unni, Weiland, Woolner

M 8858f,w,s. NEUROPATHOLOGY. (8 cr) Okazaki

M 8859f,w,s. PROBLEMS IN NEUROPATHOLOGY. (2 cr) Okazaki

M 8860f. MEMBRANE BIOLOGY AND PATHOLOGY. (1 cr) Scott

M 8861f. ELECTRON MICROSCOPY. (1 cr) Moses, Scott

M 8862. SEMINAR IN HEMATOPATHOLOGY. (2 cr) Banks

M 8867f,w,s. GENERAL PATHOLOGY—SURGICAL PATHOLOGY. (8 cr) Carney, Dahlin, Farrow, Gaffey, Soule, Unni, Weiland, Woolner

M 8868f. LECTURES: SURGICAL PATHOLOGY. (2 cr) Carney, Dahlin, Farrow, Gaffey, Soule, Unni, Weiland, Woolner

M 8870f,w,s,su. CYTOLOGY. (3 cr) Carney, Dahlin, Farrow, Gaffey, Soule, Unni, Weiland, Woolner

M 8871f,w,s,su. OBSTETRIC AND GYNECOLOGIC PATHOLOGY. (1 cr) Gaffey

M 8872f,w,s,su. BONE AND SOFT TISSUE PATHOLOGY. (3 cr) Unni

M 8873f,w,s,su. ORAL PATHOLOGY. (2 cr) Dahlin

M 8885f,w,s,su. SOFT TISSUE PATHOLOGY. (1 cr) Soule

M 8890. GRADUATE RESEARCH. (6 cr; prereq #) Staff
Graduate thesis research under staff supervision.

PEDIATRICS (Ped)

OFFERED AT MINNEAPOLIS

Professor

William Krivit, M.D., Ph.D., *head*
C. Carlyle Clawson, M.D., *director of graduate study*
David M. Brown, M.D.
Russell J. Lucas, Jr., M.D.
Alfred F. Michael, M.D.
Bernard L. Mirkin, M.D., Ph.D.
James H. Moller, M.D.
Mark E. Nesbit, M.D.
Arthur R. Page, M.D.
Paul G. Quie, M.D.
Richard B. Raile, M.D.
Harvey L. Sharp, M.D.
Kenneth F. Swaiman, M.D.
Robert W. ten Bensel, M.D.
Robert A. Ulstrom, M.D.
Homer D. Venters, M.D.
Robert L. Vernier, M.D.
Lewis W. Wannamaker, M.D.
Warren J. Warwick, M.D.
James G. White, M.D.
Francis S. Wright, M.D.

Associate Professor

Rolf R. Engel, M.D.
Patricia Ferrieri, M.D.
Alfred J. Fish, M.D.
Edward L. Kaplan, M.D.
Sheldon M. Mauer, M.D.

Clinical Associate Professor

Edward N. Nelson, M.D.

The Department of Pediatrics offers broad opportunities for graduate training in the general field of pediatrics as well as in subspecialties related to the field. The graduate training program permits candidates to complete the requirements for the specialty of pediatrics established by the American Board of Pediatrics. Highly qualified candidates desiring to pursue full-time careers in teaching and research in the field of pediatrics or further graduate work in certain subspecialties of pediatrics may extend their clinical program to include further training in the basic fields of medicine related to the field of pediatrics.

Three years of clinical work satisfies the requirements for certification by the Specialty Board in Pediatrics. An additional one to two years are required to complete work for the M.S. or Ph.D. degree. The graduate work includes clinical training in all practical aspects of pediatrics. Candidates participate in clinical or laboratory research programs while preparing a thesis dealing with this work. Considerable flexibility in the graduate training program is permitted. The clinical program may be interrupted to pursue further studies in the basic fields of medicine. Following completion of basic science requirements for the

minor for the Ph.D. degree, candidates may return to the clinical department to complete specialty requirements.

Following completion of the basic clinical training program, qualified candidates may extend their clinical programs one or more years by pursuing additional training in the fields of pediatric cardiology, endocrinology, neurology, hematology/oncology, pathology, infectious disease and immunology, clinical pharmacology, and community pediatrics.

The clinical experience in pediatrics is obtained in the outpatient and inpatient services of University of Minnesota Hospitals and affiliated hospitals. The affiliated hospitals are Hennepin County Medical Center, St. Paul-Ramsey Medical Center, Children's Hospital of St. Paul, and Minneapolis Children's Health Center. Extensive clinical experience is provided in the care of premature and newborn infants, communicable and infectious diseases, heart disease, pathology, neurology, child psychiatry, endocrinology and metabolism, immunology, nephrology, hematology, oncology, and community pediatrics.

Master's Degree—Offered only under Plan A.

Doctor's Degree—Programs leading to the Ph.D. may be arranged with members of the graduate faculty.

Prerequisites—General understanding of bacteriology, immunology, pathology, physiology, and biochemistry; the M.D. degree.

Minor—Students are required to complete a minor in one of the fundamental branches or allied fields.

Language Requirement—For the Ph.D. degree, either (a) two languages or (b) one language and the option of a collateral field of knowledge.

8202f,w,s,su. PEDIATRIC CLINICS. (Cr ar; prereq #) Krivit and staff

8204f,w,s,su. RESIDENCY IN PEDIATRICS. (Cr ar; prereq #) Krivit and staff
Two- to four-month rotations on the outpatient, inpatient, and special pediatric services of University Hospitals, Hennepin County Medical Center, Children's Hospital of St. Paul, St. Paul-Ramsey Medical Center, and Minneapolis Children's Health Center.

8206f,w,s,su. PEDIATRIC SPECIAL INTEREST. (Cr ar; for grad students who have completed at least 1½ years of general grad pediatric training; prereq #) Staff
Advanced clinical and basic training in one or more of the following special fields: neurology, cardiology, pathology, endocrinology and metabolism, hematology, immunology, nephrology, infectious diseases, and community pediatrics. Clinical training is obtained in the inpatient and outpatient services of University and affiliated hospitals. Training in basic sciences related to these fields may be obtained in preclinical divisions of the Medical School.

8208f,w,s,su. PEDIATRIC RESEARCH. (Cr ar; prereq #) Staff

PEDIATRICS

OFFERED AT ROCHESTER

Professor

Robert H. Feldt, M.D., M.S., *chairman*
E. Omer Burgert, Jr., M.D., M.S.
Edmund C. Burke, M.D., M.S.
Gerald S. Gilchrist, M.D.
Manuel R. Gomez, M.D., M.S.
Alvin B. Hayles, M.D., M.S.
Douglas D. Mair, M.D.
Donald G. Ritter, M.D., M.S.
Gunnar B. Stickler, M.D., Ph.D.
Abdul J. Tajik, M.B., B.S.
William H. Weidman, M.D., M.S.

Associate Professor

Donald J. Hagler, M.D.
Morey W. Haymond, M.D.
Edward J. O'Connell, M.D.
Kathleen Hable Rhodes, M.D.
James B. Seward, M.D., M.S.
John W. Yunginger, M.D.

Assistant Professor

Frederic Kleinberg, M.D.
John Merideth, M.D.

The Departments of Pediatrics and Neurology (Section of Pediatric Neurology) of the Mayo Clinic and the Mayo Graduate School of Medicine provide opportunities for graduate training in all aspects of pediatrics. Clinical clerkships for one quarter and residencies for three years of training offer a broad educational background for general pediatrics. The program fulfills the requirements of the American Board of Pediatrics for certification in the specialty and prepares the candidate for medical practice in this field.

The program includes experience in the care of children with acute and chronic diseases of the usual type as well as hospitalized children with complex diagnostic problems. Outpatient clinic service assignments include work with children with acute illnesses and those with unusual problems referred to the Mayo Clinic. Clinical experience with newborn and premature infants as well as with all aspects of preventive pediatrics is afforded through the Well-Child Clinics. Time is devoted to child psychiatry under the direction of the faculty in child psychiatry, and experience is gained in evaluation of children with emotional and psychosomatic disorders and in application of the various techniques of psychotherapy.

Advanced training in clinical subspecialties such as pediatric allergy, pediatric cardiology, pediatric endocrinology and metabolism, pediatric gastroenterology, pediatric infectious disease, pediatric neurology, pediatric nephrology, pediatric hematology, and child psychiatry is available to qualified individuals for one or more additional years. Opportunity for participation in laboratory programs in pathology, hematology, chemistry, and physiology leading to the M.S. degree is offered in the third year for those desiring to pursue such research opportunities. In addition, selected individuals may fulfill the requirements for the Ph.D. degree.

Fellows participate in seminars and conferences covering growth and development, fluid balance and renal function, metabolism, hematology, cardiology, allergy, roentgenology, neurology, and case presentations of ambulatory and hospitalized patients.

Master's Degree—Offered only under Plan A.

Doctor's Degree—Work leading to the Ph.D. degree is offered.

M 5801. PEDIATRIC CARDIOLOGY. (2 cr per qtr) Ritter and staff
Experience and responsibility in clinical problems of children with heart disease. Emphasis on clinical diagnosis, noninvasive diagnostic techniques, and exposure to postoperative problems. Clinical research projects encouraged for pediatric cardiology trainees.

M 5802. CARDIAC CATHETERIZATION IN CONGENITAL HEART DISEASE. (2 cr per qtr) Ritter and staff
Provides expertise in cardiac catheterization.

M 5803. CLINICAL PEDIATRIC CARDIOLOGY. (1 cr) Ritter and staff
Exposure to and experience in clinical problems of children with heart disease. Emphasis on clinical diagnosis, electrocardiography, management of congestive heart failure, and postoperative problems.

M 8851f,w,s,su. DIAGNOSIS OF MEDICAL AND SURGICAL DISEASES OF INFANTS AND CHILDREN. (6 cr) Staff

M 8852f,w,s,su. HOSPITAL RESIDENCE. (6 cr) Staff
Diagnosis and care of sick infants and children.

M 8853f,w,s,su. CHILD HEALTH. (6 cr) Staff
Diagnosis and care of sick infants and children of the community under direction of consultants.

M 8854f,w,s,su. CARE OF NEWBORN AND WELL INFANTS. (6 cr) Staff
St. Mary's Hospital newborn nursery and Mayo well-baby clinic.

M 8855f,w,s,su. HEALTH SUPERVISION. (6 cr) Staff
City and county well-baby and well-child clinics and schools of city and county.

M 8856f,w,s,su. PEDIATRIC CARDIOLOGY. (6 cr) Staff

M 8857f,w,s,su. PEDIATRIC ALLERGY. (6 cr) Staff

M 8858f,w,s,su. PEDIATRIC HEMATOLOGY. (6 cr) Staff

M 8859f,w,s,su. PEDIATRIC ENDOCRINOLOGY. (6 cr) Staff

M 8860f,w,s,su. PEDIATRIC NEPHROLOGY. (6 cr) Staff

PHARMACEUTICS (Phm)

OFFERED AT MINNEAPOLIS

Professor
Edward G. Rippie, Ph.D.

Associate Professor
Robin P. Enever Ph.D., *director of graduate study*
Kenneth W. Miller, Ph.D.
Ronald J. Sawchuk, Ph.D.

Pharmaceutics is concerned with the elucidation, analysis, and means of control of the physical chemical properties of drugs and their dosage forms as they influence availability to the site of action in the living organism. Such studies include the investigation of the functional relationships existing between tissue or body fluid concentrations of drugs or related compounds, and the rates or mechanisms of their absorption, distribution, metabolism, excretion, and pharmacological activity. Thus the area is broad, allowing for specialization ranging from highly physical to strongly biological orientations.

Degrees Offered—M.S., Plan A and Plan B; Ph.D.

Prerequisites—A degree from a college of pharmacy and an exceptional scholastic record. Consideration will also be given to applicants who are graduates of institutions other than colleges of pharmacy, provided their undergraduate course work satisfies the prerequisites for the graduate course work in pharmaceutics.

The department offers a comprehensive program of course work and research opportunities leading to the M.S. and Ph.D. degrees. A basic background in the physical and biological sciences is provided as a firm foundation for the study of modern pharmaceutics. The broad scope of the program affords the student an opportunity to elect a course of study that best meets individual needs and interests. Minor fields that are particularly desirable include chemistry, chemical engineering, biochemistry, biometry, and pharmacology.

Language Requirement—For the master's degree, none. For the Ph.D. degree, the option of one foreign language or a collateral field of knowledge chosen with the consent of the director of graduate study. The choice must have the approval of the major adviser.

To satisfy the collateral field requirement, the student must complete a total of nine credits in courses numbered 5000 or above, with grades of at least C. Courses that are a part of the major may not be included.

Master's Degree Final Examination—Oral.

Minor—The choice of the particular courses to be presented in fulfillment of a minor will be made after consultation with the student's adviser.

5670-5680. BIOPHARMACEUTICS—DRUG INFORMATION EVALUATION. (4 cr per qtr; prereq 5th yr, 5640, Phcl 5102; 3 lect hrs, 1 workshop [2 hrs] per wk) Miller, Sawchuk
Processes of drug absorption, distribution, metabolism, and excretion in vivo. Statistical methods and procedures for critical evaluation of current literature dealing with those subjects.

5696.* PREPARATION OF PARENTERAL PRODUCTS. (3 cr; prereq #) Staff
Principles and procedures involved in manufacture of parenteral products.

5699.* SPECIAL PROBLEMS IN PHARMACEUTICS. (Cr ar; prereq #) Staff
Problems in formulation, production, and evaluation of pharmaceutical products.

8100.* SEMINAR: PHARMACEUTICS. (1 cr; required of majors in pharmaceutics) Staff

8101. READINGS IN PHARMACEUTICS. (1 cr; prereq #) Staff
Current literature.

8200.* RESEARCH PROBLEMS. (Cr ar; prereq #) Staff
Experimental investigation of problems in pharmaceutics.

8410. STABILIZATION OF PHARMACEUTICALS. (3 cr; prereq Chem 5503) Enever
Application of physiochemical principles (e.g., chemical kinetics) to elucidate and minimize stability problems in pharmaceutical systems.

8420-8421.* PHARMACOKINETICS. (3 cr per qtr; prereq 5680, Math 1444 or #; offered when demand warrants) Miller, Sawchuk
Application of compartmental models to study of absorption, distribution, metabolism, and excretion of drugs. Introduction to and use of analog computer in determination of model parameters. Techniques of drug administration and biological fluid sampling in laboratory animals.

8430. DRUG TRANSPORT. (3 cr; prereq Chem 5503) Miller
Theory of diffusional transport of drug molecules with applications to pharmaceutical dosage forms.

8440. PHYSICAL PHARMACY. (4 cr; prereq 5680 and survey course in physical chemistry or #; 4 hrs per wk; offered when demand warrants) Rippie
Application of physical chemical relationships between drugs and their formulations for optimization of bioavailability.

8441. PHYSICAL PHARMACY. (3 cr; prereq 5680 and survey course in physical chemistry or #; offered when demand warrants) Rippie
Physical and physical chemical properties of drugs in solid state form as related to their bioavailability.

8442. PHYSICAL PHARMACY LABORATORY. (1 cr; prereq 5680, ¶8441, and a survey course in physical chemistry or #; offered when demand warrants) Rippie
Laboratory experimentation dealing with application of physical and chemical information to dosage form design.

PHARMACOGNOSY (Phcg)

OFFERED AT MINNEAPOLIS

Professor
E. John Staba, Ph.D., *chairman, director of graduate study*
Yusuf Abul-Hajj, Ph.D.

Associate Professor
W. Thomas Shier, Ph.D.

The graduate pharmacognosy program provides an opportunity to study the medicinals in biological systems from one of the four following perspectives: microbiological, biochemical, immunological, botanical. Because of the multidisciplinary nature of pharmacognosy, each student's program will be constructed to meet individual specialized needs and interests. The student may be engaged in interdisciplinary studies through other University departments such as anthropology, biochemistry, botany, microbiology, medicinal chemistry, chemistry, pharmacology, and pharmaceutics.

Degrees Offered—M.S., Plan A (Plan B by special arrangement); Ph.D.

Prerequisites—A degree from an accredited college of pharmacy and a superior scholastic record. Consideration will also be given to applicants who are graduates of institutions other than colleges of pharmacy.

Language Requirement—For the M.S. degree, none. For the Ph.D degree, a reading proficiency in French, German, Russian, Chinese, or Japanese.

5810s. MEDICINAL PLANTS. (2 cr; prereq #) Staba
Survey of the biologic, biochemical, and economic features of natural drugs and their constituents. Emphasis on drugs from higher plants.

5820f. INTRODUCTORY PHARMACOGNOSY. (3 cr; prereq MicB 3103, Phar 5440 or #) Shier
Principles of immunology and allergy, pathogenic microorganisms, and treatment or prevention of disease states with immunizing biologicals.

5830s. INTRODUCTORY PHARMACOGNOSY. (2 cr; prereq MicB 3103, Phar 5440 or #) Staba
Production, constituents, metabolism, and therapeutic uses of drugs containing antibiotics and enzymes, and pharmaceuticals of blood origin.

5840w. INTRODUCTORY PHARMACOGNOSY. (3 cr; prereq MicB 3103, Phar 5440 or #) Abul-Hajj
Production, constituents, metabolism, and therapeutic uses of drugs containing hormones, vitamins, and alkaloids.

5860w. ANTIBIOTICS. (2 cr; prereq 5830 or #; offered 1981-82 and alt yrs) Staba
Natural antibiotic substances. Methods of production, biosynthesis, extraction, and assay; chemical, pharmaceutical, and chemotherapeutic properties. Emphasis on antibiotic development and manufacture.

5870f. HORMONES. (2 cr; prereq #; offered 1981-82 and alt yrs) Abul-Hajj
Biosynthesis, chemistry, biochemical functions, mechanisms of actions, production, and uses.

5880f. PHARMACEUTICAL IMMUNOLOGY. (2 cr; prereq #) Shier
Selected topics dealing with pharmaceutical and clinical aspects of immunology.

5899. SPECIAL PROBLEMS IN PHARMACOGNOSY. (Cr ar; prereq #) Staff
Microbiology, chemistry, or biology of medicinal natural products.

8100w. MEDICINAL PRODUCT ISOLATION AND IDENTIFICATION. (4 cr; prereq 5810 or #) Staff
Isolation and identification of selected natural product types (e.g., steroids, terpenes, phenylpropides, alkaloids, glycosides, pigments).

8300f. PHARMACEUTICAL CELL SYSTEMS. (4 cr; prereq #; offered 1982-83 and alt yrs) Staff
Laboratory exercises demonstrating the uses of cellular techniques in production, biotransformation, and assay of antibiotics, steroids, alkaloids, growth regulators, and other useful compounds by microorganisms, tissue cultures, and extracellular enzyme preparations.

8400. SELECTED TOPICS. (3 cr) Staff
Lectures and discussions on topics varying from quarter to quarter according to staff availability and needs of department.

8500. PHARMACOGNOSY SEMINAR. (1 cr) Staff

8600w. READINGS IN PHARMACOGNOSY. (1 cr; prereq #) Staff
Evaluation of current literature.

8900. RESEARCH IN PHARMACOGNOSY. (Cr ar; prereq #) Staff

PHARMACOLOGY (Phcl)

OFFERED AT MINNEAPOLIS

Professor

Frederick E. Shideman, M.D., Ph.D., *head, director of graduate study*
Marion W. Anders, Ph.D., D.V.M.
Nelson D. Goldberg, Ph.D.
Norman O. Holte, D.D.S.
Gilbert J. Mannering, Ph.D.
Jack W. Miller, Ph.D.
Bernard L. Mirkin, M.D., Ph.D.
Norman E. Sladek, Ph.D.
Sheldon B. Sparber, Ph.D.
Akira E. Takemori, Ph.D.
Lawrence C. Weaver, Ph.D.
Ben G. Zimmerman, Ph.D.

Associate Professor

James F. Cumming, M.D., Ph.D.
Earl W. Dunham, Ph.D.
Patrick E. Hanna, Ph.D.
Jordan L. Holtzman, M.D., Ph.D.
Donald B. Hunninghake, M.D.
Richard J. Meisch, M.D., Ph.D.
Aloysius J. Quebbemann, Ph.D.

Assistant Professor

Robert F. O'Dea, M.D., Ph.D.
George L. Wilcox, Ph.D.

Lecturer

Faruk S. Abuzzahab, M.D., Ph.D.

Pharmacology deals with the interactions between drugs and other chemicals and living organisms or life processes at all levels of organization. Facilities are available for most types of training and research in this field. For those primarily interested in toxicology or psychopharmacology, appropriate programs are available. Excellent opportunities exist for cooperative clinical research through members of the staff who hold joint appointments in clinical departments of the Medical School and are members of the Division of Clinical Pharmacology of the Department of Pharmacology.

Graduate training in the field of pharmacology is usually oriented toward the Ph.D. degree. The M.S. degree is offered only under special circumstances. Several graduate fellowships, research assistantships, teaching assistantships, or traineeships are usually available.

Degrees Offered—Ph.D. and, under special circumstances, M.S., Plan A.

Prerequisites—In addition to fulfilling requirements for admission to the Graduate School, students should be well grounded in the biological and physical sciences.

Major—For a major, the student must complete Phcl 5110 (or an acceptable alternative), 8203, 8204, 8211, 8212, and any other advanced major courses (8206, 8208, 8209 or 8214 through 8219) totaling a minimum of five credits. Prerequisite courses include physiology and biochemistry. Additional requirements are courses in histology, statistics, calculus, microbiology; other courses as may be indicated by the major adviser.

Minor—For a minor, the student must complete 22 credits of course work. This work must include Phcl 5110 (or an acceptable alternative) and 8211 or 8212, and a maximum of six credits of seminar of which at least three credits shall be in 8204.

Language Requirement—For the master's degree, none. For the Ph.D. degree, either (a) one language or (b) a program of additional course work approved by the department. Routinely acceptable languages for the Ph.D. degree are French, German, Italian, Russian, and Spanish.

5110. PHARMACOLOGY A. (8 cr; prereq regis med or #) Shideman and staff
Lectures and laboratories on general principles of pharmacology and major classes of drugs.

8203. RESEARCH IN PHARMACOLOGY. (Cr ar; prereq #) Shideman and staff

8204. SEMINAR: SELECTED TOPICS IN PHARMACOLOGY. (3 cr on completion of 3 qtrs; prereq 5110 or #) Sladek and staff

8206f. SEMINAR: MICROASSAY OF DRUGS. (1 cr; prereq Chem 3101 or #; offered 1981-82 and alt yrs) Holtzman and staff
Review of analytical methods for identification and quantification of drugs in body fluids with emphasis on instrument and radiometric technics. Basic principles, applications, and limits of each method. Demonstrations.

8207. SEMINAR: PSYCHOPHARMACOLOGY. (3 cr on completion of 3 qtrs; prereq #) Sparber and staff
Selected topics on behavioral aspects of drug action.

8208s. NEUROPSYCHOPHARMACOLOGY. (3 cr; prereq 5110, Psy 5018, Psy 5062 or #; offered 1982-83 and alt yrs) Sparber and staff
Lectures on methodologies currently in use to study relationships between drugs and biochemical, behavioral, and neurophysiological consequences. Includes discussions of functional biogenic amine, peptidergic, and other pathways and how specific manipulations result in altered neuronal function and behavior; theories of feedback mechanisms, induction, and inhibition; and theories of tolerance to and/or dependence upon stimulants, hallucinogens, depressants, and opiates.

8209w. NEUROHORMONES AND NEUROPHARMACOLOGICAL AGENTS. (2 cr; prereq 5110 or equiv or #; offered 1981-82 and alt yrs) Hanna
Selected topics on the molecular and bioorganic aspects of the activities of neuroactive chemicals and drugs.

8211w. PHYSIOLOGICAL DISPOSITION OF DRUGS. (3 or 4 cr; prereq #) Mannering and staff
Principles underlying absorption, distribution, biotransformation, and excretion of drugs.

8212s. PHARMACODYNAMICS. (3 cr; prereq 5110 or #) Sladek and staff
Lectures and laboratory experiments for studying physiological, biochemical, and behavioral effects of drugs.

8214s. TOXICOLOGY. (3 cr; prereq #; offered 1981-82 and alt yrs) Anders and staff
Lectures on toxic effects and mechanisms of intoxication of drugs and foreign chemicals known to adversely alter health and ecology of humans and animals.

8215w. CANCER CHEMOTHERAPY. (2 cr; prereq #; offered 1982-83 and alt yrs) Sladek and staff
General principles of antineoplastic chemotherapy with emphasis on mechanisms of action and bases for selective toxicity. Lectures, assigned reading, discussions, and demonstrations.

8217w. CARDIOVASCULAR-RENAL PHARMACOLOGY. (3 cr; prereq 5110 or equiv or #; offered 1981-82 and alt yrs) Zimmerman, Quebbemann, Goldberg, and staff
Lectures on neurogenic and humoral control of circulation, transport, and metabolism in the kidney and biochemical and molecular aspects of hormone and neurohormone actions including mechanisms by which pharmacological agents affect these systems.

8219s. ADVANCED TOXICOLOGY. (1 cr; prereq 8214 or #; offered 1982-83 and alt yrs) Anders
Lectures on the biochemical mechanisms of intoxication of selected compounds.

PHARMACOLOGY

OFFERED AT ROCHESTER

Professor

John R. Blinks, M.D., *chairman*
William S. Brimijoin, Ph.D.
Elliott Richelson, M.D.
Joseph H. Szurszewski, Ph.D.
Stuart R. Taylor, Ph.D.
Russell A. Van Dyke, Ph.D.
Richard M. Weinshilboum, M.D.

Associate Professor

Matthew M. Ames, Ph.D.
Garth Powis, D.Phil.
Franklyn G. Prendergast, Ph.D.
Tony L. Yaksh, Ph.D.

A program leading to the Ph.D. is offered at the Mayo Graduate School of Medicine under the aegis of the graduate program in pharmacology in Minneapolis. Candidates whose goal is the master's degree will not normally be considered for admission. Well-prepared students may complete the course requirements for the Ph.D. entirely in Rochester. Students whose backgrounds are deficient in certain subjects may find it necessary to take courses in these fields on the Minneapolis campus. Others may wish to take elective courses in Minneapolis that are not offered in Rochester. For either or both of these reasons, some students may elect to spend one or more quarters on the Minneapolis campus during the course of their graduate work.

Prerequisites—In addition to fulfilling all requirements for admission to the Graduate School, students should be well-grounded in the biological and physical sciences. Specifically, they should have taken college-level courses in general biology, physics, and chemistry; organic chemistry; physical chemistry; and calculus through differential equations. Courses in comparative vertebrate anatomy, histology, and molecular biology are recommended. Students who lack knowledge in some of these areas may in some cases be admitted, but they will be required to make up the deficiencies by completing appropriate courses during their graduate training.

Course Requirements—*General:* Whatever minors they choose, students will be expected to have or to acquire a broad background in the basic medical sciences, including anatomy/pathology, biochemistry, physiology, microbiology/immunology, and statistics. This requirement and the requirements for a minor in any of these fields can be met by taking courses offered in Rochester.

Pharmacology: Students will be expected to take the following courses (or Minneapolis courses, which are in parenthesis): M 5800, M 5801, M 5802 (5110); M 8805 (8211); M 8808 (8212); M 8806; and six credits of elective courses in pharmacology.

Language Requirement—One language (French, German, or Russian) or an additional program of course work approved by the department is required. The additional program usually is in computer science.

Minor—To meet the requirements for a minor in pharmacology, the student must satisfactorily complete 22 credits of course work in pharmacology and statistics. If the student has not already taken comparable courses, these courses must include:

BioS M 5823, M 5824, and M 5825
Phcl M 5800, M 5801, and M 5802 (or 5110)
Phcl M 8805 (or 8211)
Phcl M 8806 (or 8212)

M 5800f, 5801w, 5802s. GENERAL PHARMACOLOGY. (3 cr per qtr; prereq medical school physiology and biochemistry or equiv) Blinks and staff
Survey course for medical and graduate students with no previous training in pharmacology.

M 8800. READINGS IN PHARMACOLOGY. (1 cr) Weinshilboum

M 8801. RESEARCH IN PHARMACOLOGY. (6 cr)

M 8802. PHARMACOLOGY OF HEART MUSCLE. (1½ cr; prereq #) Blinks
Lectures, discussions, and demonstrations on the cellular basis of action of drugs on heart muscle.

M 8803. NEUROPHARMACOLOGY. (3 cr) Brimijoin, Weinshilboum
Lectures, discussions, and demonstrations on the cellular and biochemical basis of action of drugs on the nervous system.

M 8804. CLINICAL PHARMACOLOGY. (1½ cr per qtr, 2 qtrs required; prereq M 5800, 5801, 5802; offered every 3rd year) Weinshilboum and staff
Rational pharmacologic basis of therapy with major categories of drugs used in clinical practice of medicine with emphasis on pharmacokinetics, drug metabolism, pharmacogenetics, and mechanism of action of drugs.

M 8805s. PHARMACOKINETICS AND DRUG METABOLISM. (3 cr; offered alt yrs) Powis and staff
Principles of disposition of drugs in biological systems. Lectures in absorption, distribution, excretion, and metabolic transformation of drugs; descriptions of enzyme systems and factors affecting them.

M 8806w. PHARMACOLOGY OF RECEPTORS. (3 cr; offered 1982 and alt yrs) Brimijoin and staff
Origin of concept of drug-receptor interaction; molecular basis for drug-macromolecule interactions; mathematical theories; isolation and physicochemical characterization of receptors.

M 8808. RESEARCH TECHNIQUES IN PHARMACOLOGY. (3 cr) Staff
Students rotate through a series of laboratories to gain experience with a broad spectrum of research techniques useful in pharmacology.

M 8809. MOLECULAR PSYCHOPHARMACOLOGY. (2 cr; prereq M 5800, 5801, 5802 or equiv) Richelson
In-depth review of mechanism of action of psychotherapeutic drugs designed to give an understanding of their molecular basis of action as therapeutic agents and as laboratory tools.

M 8810. TOXICOLOGY. (1½ cr) Van Dyke and staff
Lectures, discussion, and demonstrations on the principles of intoxication by drugs and other foreign substances. Includes mechanisms of intoxication, detoxification, and a review of specific organic and inorganic intoxicants.

M 8811. PHARMACOLOGY AND PHYSIOLOGY OF SYNAPTIC TRANSMISSION. (3 cr; prereq courses in physical sciences, mathematics, and Phys M 8856 or equiv) Taylor and staff
Lectures, seminars, journal club, and demonstrations on the identification of neurotransmitters and the mechanism of excitatory and inhibitory synaptic transmission, particularly at the neuromuscular junction.

PHYSICAL MEDICINE AND REHABILITATION (PMed)

OFFERED AT MINNEAPOLIS

Professor

Frederic J. Kottke, M.D., Ph.D., *head*
John L. Magness, M.D., M.S., *director of graduate study*
Thomas P. Anderson, M.D., M.S.
Gary T. Athelstan, Ph.D.
Glenn Gullickson, Jr., M.D., Ph.D.
William G. Kubicek, Ph.D.
Frank Lassman, Ph.D.
Alan H. Roberts, Ph.D.

Clinical Professor

Essam A. Awad, M.D., Ph.D.
Paul M. Ellwood, Jr., M.D.

Associate Professor

Nancy M. Crewe, Ph.D.
Robert Patterson, Ph.D.
Mary M. Price, M.D., M.S.

Clinical Associate Professor

Alan Bensman, M.D.
Richard Owen, M.D.

The field of physical medicine and rehabilitation, which includes physical therapy, occupational therapy, vocational counseling, guidance, and training of the physically handicapped, is one of the most rapidly expanding specialties in medicine. Trained physiatrists are in great demand in medical schools, private practice, Veterans Administration hospitals, and many state hospitals for the chronically disabled. The field of physical medicine, therefore, offers unusual opportunity to the young physician.

Opportunity for clinical and fundamental research as well as for clinical experience and training is offered at University of Minnesota Hospitals. Additional clinical experience is obtained at the Hennepin County Medical Center, Veterans Hospital in Minneapolis, Kenny Rehabilitation Institute, and St. Paul-Ramsey Medical Center.

Students devote full time to their training programs and may not carry on outside practice. The three-year program fulfills the requirements of training for the American Board of Physical Medicine and Rehabilitation. As a part of the program, all graduate students are required to carry out a problem of independent research under the direction of their major advisers. For the minor field of study, anatomy, physiology, biophysics, or pathology is highly recommended.

Master's Degree—For graduate physicians, the M.S. degree is offered under Plan A. This program, which also fulfills the didactic requirements of the American Board of Physical Medicine and Rehabilitation, usually requires three years for completion.

Doctor's Degree—The Ph.D. degree in physical medicine and rehabilitation is designed for physicians interested in careers of teaching and research. Completion of this program requires approximately five years. In addition to the clinical training and participation in the teaching program, extensive experience is obtained in laboratory and clinical research.

Language Requirement—For the Ph.D. degree, either (a) one language and the option of a collateral field of knowledge, or (b) two collateral fields of knowledge. Routinely acceptable languages are French, German, Italian, Russian, and Spanish.

8200f,w,s,su. PHYSIATRY SERVICE. (Cr ar) Staff
Service at University Hospitals, Hennepin County Medical Center, St. Paul-Ramsey Medical Center, Kenny Rehabilitation Institute, Veterans Administration Hospital, and other affiliated hospitals.

8205f,w,s,su. READINGS IN PHYSICAL MEDICINE AND REHABILITATION. (2 cr per qtr) Kottke

8206f,w,s. CONFERENCE ON PHYSICAL MEDICINE AND REHABILITATION. (2 cr per qtr) Awad
Topics vary from quarter to quarter. Prepared papers required.

8207. BASIC AND APPLIED PHYSIATRY. (2 cr) Staff
Assigned readings, lectures, and discussions on the anatomic, physiologic, pathologic, biophysical, and psychological bases of physiatry.

8210f,w,s,su. RESEARCH IN PHYSICAL MEDICINE. (Cr ar) Gullickson, Kottke, Kubicek, Patterson, and staff

8211f,w,s,su. ELECTRONICS IN PHYSICAL MEDICINE. (2 cr) Patterson
Review of principles of electronic circuits, vacuum tubes, power supplies, and their application in physical medicine.

8212f,w,s. ELECTROMYOGRAPHY. (Cr ar; prereq #) Staff
Clinical and laboratory training in use and interpretation of electromyography.

8213f,s. ELECTRODIAGNOSIS CONFERENCE. (Cr ar; prereq 8211 or #) Magness
Clinical presentation and discussion of cases examined in the Electrodiagnostic Laboratory.

8214f,w,s. READINGS IN ELECTROMYOGRAPHY. (1 cr; prereq #) Magness
Assigned readings and discussions on the anatomic, physiologic, pathologic, and technical developments in electromyography.

8220f,w,s. SEMINAR: PHYSICAL MEDICINE AND REHABILITATION. (Cr ar) Magness

8230. LEADERSHIP TRAINING FOR INTERDISCIPLINARY SETTINGS. (1 cr) Rosenberg

PHYSICAL MEDICINE AND REHABILITATION

OFFERED AT ROCHESTER

Professor
G. Keith Stillwell, M.D., Ph.D.

Associate Professor
Henry H. Stonnington, M.B.B.S., M.S.

The residency program in physical medicine and rehabilitation, which meets the requirements of the specialty board and is approved by the Accreditation Council for Graduate Medical Education, is open to physicians, whether or not they have previously completed any graduate medical education. The program involves four quarters of

inpatient comprehensive medical rehabilitation (an elective may be substituted for one quarter of this experience), three quarters of consultative experience working with patients for whom other services have primary responsibility, one quarter of neurology, and two quarters of clinical electromyography. For those who have not completed a postgraduate year of medical education, one quarter of internal medicine and one quarter of orthopedic surgery are included early in the program, as required by the American Board of Physical Medicine and Rehabilitation. Extensions of the clinical training by one or two quarters may be arranged. Residents who demonstrate superior performance may receive appointments as senior resident associates during the last quarter or two of their programs.

Consultative experience is gained both in the hospital divisions of the department and in the outpatient division. Experience is gained in applying physiatric practices to a wide variety of clinical conditions and problems through working with patients (about 10,000 patients are seen in the hospitals and 16,000 in the outpatient division each year). Residents work in a preceptorship relationship with staff physiatrists.

On the 58-bed service at St. Mary's Hospital, where the Department of Physical Medicine and Rehabilitation has primary responsibility for the total care of patients, residents become proficient in the medical and physical management of patients with spinal cord injury, hemiplegia, and other major physical disabilities. Residents learn to prescribe rehabilitation programs for severely handicapped patients and to follow their progress. They also gain experience in coordinating and using the services of other medical specialists and health professionals, including speech pathologists, physical and occupational therapists, prosthetists, orthotists, social service personnel, psychologists, and vocational counselors.

Clinical conferences, seminars, lectures, and informal discussions of clinical problems with a staff of about 16 full-time physiatrists make it possible for residents to obtain clinical and theoretical experience in various aspects of physical medicine and rehabilitation as well as in related medical and surgical fields.

Requirements for the M.S. degree include an additional six to nine months of training, and for the Ph.D. degree, an additional 24 months. The additional time is required for completion of a research project, a thesis, additional course work, and written and oral examinations. Research is also generally carried out in one of the basic or nonclinical science departments such as physiology, biophysical sciences, electromyography, biomechanics, anatomy, or statistics. The research is usually completed in the minor field for the degree and provides the material for the thesis.

Master's Degree—Offered only under Plan A.

Doctor's Degree—Work leading to the Ph.D. degree is offered.

M 8850su. INTRODUCTION AND ORIENTATION TO PHYSICAL MEDICINE AND REHABILITATION. (2 cr) Staff
Introduction to the functions of the Department of Physical Medicine and Rehabilitation and the roles of physicians and other health professionals in the department.

M 8851f,w,s,su. OUTPATIENT CLINICAL PHYSICAL MEDICINE AND REHABILITATION. (6 cr) Staff

M 8852f,w,s,su. PHYSICAL MEDICINE AND REHABILITATION HOSPITAL CONSULTING SERVICE. (6 cr) Staff
Physical medicine and rehabilitation as related to rheumatology, orthopedic surgery, neurology, and various other medical and surgical specialties.

M 8853f,w,s,su. HOSPITAL REHABILITATION SERVICE. (6 cr) Staff

M 8854f,w,s. BASIC AND APPLIED PHYSIATRY. (2 cr) Staff
Study, presentation, and discussion of selected relevant subjects.

M 8855f,s. AMPUTATIONS AND PROSTHETICS. (3 cr) Staff
Surgical, medical, and rehabilitative aspects of amputee management. Lectures, laboratories, experience, and attendance at the Amputee Clinic.

M 8856f,w,s. SEMINARS IN PHYSICAL MEDICINE AND REHABILITATION. (1 cr) Staff
Selected readings, seminars, and research papers presented by staff and residents.

M 8857f,w,s,su. READINGS IN PHYSICAL MEDICINE AND REHABILITATION. (1 cr) Staff
Presentation by students and staff of selected readings devoted to a single subject area at each session.

M 8890f,w,s,su. RESEARCH WORK ON SELECTED PROBLEMS. (6 cr)

PHYSICAL THERAPY (PMed)

OFFERED AT MINNEAPOLIS

Professor

Frederic J. Kottke, M.D., Ph.D., *head*
Thomas P. Anderson, M.D.
Essam A. Awad, M.D., Ph.D.
Glenn Gullickson, Jr., M.D., Ph.D.
William G. Kubicek, Ph.D.

Associate Professor

John D. Allison, M.S.
Martin O. Mundale, M.S.

Assistant Professor

Louis R. Amundsen, Ph.D., *director of graduate study*

Graduate study in physical therapy is available for qualified candidates who wish to prepare for careers in teaching, research, or administration. The curriculum is planned to meet Graduate School requirements and to provide students with the academic training and clinical experience necessary to meet individual goals.

For information concerning admission procedures and a recommended course sequence, contact the Director of Graduate Study in Physical Therapy, Box 388, Mayo Memorial Building, 420 Delaware Street, S.E., University of Minnesota, Minneapolis, Minnesota 55455.

Master's Degree—Offered under both Plan A and Plan B.

Prerequisites—Completion of a physical therapy curriculum approved by the American Physical Therapy Association or the American Medical Association Committee on Allied Health Education and Accreditation or its equivalent is required. Candidates must also have completed a baccalaureate degree with sufficient scholarly attainment in the sciences to justify graduate work. Two years of previous clinical experience in physical therapy are recommended. Applicants should submit a statement of their goals and evidence of personal and professional qualifications including three letters of reference. Submission of Graduate Record Examination scores is recommended but not required. Summer or fall entry is recommended.

Minor Field—Students who major in physical therapy under Plan A may select a minor in anatomy, educational psychology, psychology, public health, or education.

Related Fields—Under Plan A or Plan B a minimum of eight of the required credits must be outside the major. The related fields should be selected by students in consultation with their major adviser with consideration of their background and goals. Suggested fields include education, educational administration, social and philosophical foundations of education, psychology, physiology, sociology, public health, child psychology, and business administration.

Language Requirement—None.

Examinations—All candidates will be required to take a final oral examination.

Physical Therapy as a Minor—Offered only to qualified physical therapists majoring in an allied field. Choice of particular courses to be presented in fulfillment of requirements will be made after consultation with the student's adviser.

5182w. FUNCTIONAL NEUROANATOMY AND NEUROPHYSIOLOGY. (5 cr) Huss

5291. SEMINAR: CONTEMPORARY ISSUES IN PHYSICAL THERAPY. (2 cr; prereq #) Ellingham, Pauley

8103f,w,s,su. PHYSICAL THERAPY CLINIC. (Cr ar; prereq physical therapist) Awad, Gullickson, Kottke, Price
Clinical physical therapy in adult and pediatric rehabilitation.

8130. CURRENT LITERATURE SEMINAR IN PHYSICAL THERAPY. (1 cr [may be repeated for cr]) Staff
Presentation and discussion of current literature in physical therapy and related medical fields.

8135. ADVANCED KINESIOLOGY. (3 cr) Mundale, Pohtilla
Functional anatomy stressing anatomical, physiological, and biomechanical aspects of normal and pathological human motion. Lecture with laboratory to include various techniques available for analysis.

8140. PHYSIOLOGICAL ASSESSMENT IN PHYSICAL THERAPY. (1 cr) Allison, Mundale, Amundsen
Introduction to objective methods of assessing function of neuromuscular, cardiovascular, and perceptual motor systems.

8150. RESEARCH METHODOLOGY IN PHYSICAL THERAPY: ELECTROMYOGRAPHY AND NERVE CONDUCTION. (3 cr) Allison, Awad
Lecture and laboratory sessions on instrumentation, physiological, anatomical, and kinesiological considerations related to electromyography and nerve conduction research.

8161, 8162. CLINICAL MEDICINE IN REHABILITATION. (3 cr per qtr) Kottke

8170. SPECIAL TOPICS IN PHYSICAL THERAPY. (1 cr per qtr; prereq #) Staff
Advanced seminar. Topics vary from quarter to quarter. Prepared papers required.

8171. ADMINISTRATION OF PHYSICAL THERAPY SERVICES. (Cr ar; prereq #) Pauley
Selected problems in administration of physical therapy in hospitals, clinics, and community agencies.

8172, 8173. EDUCATIONAL ADMINISTRATION IN PHYSICAL THERAPY. (Cr ar; prereq #) Allison
Philosophy and objectives of physical therapy education, administrative structure, curriculum, and accreditation. 8172: Lectures and discussion. 8173: Practicum; analysis and construction of courses of study.

8180s, 8181f. PHYSIOLOGICAL BASES FOR THERAPEUTIC EXERCISE. (3 cr per qtr) Kottke, Mundale
Lectures on therapeutic exercise plus assigned projects.

8185f,w,s,su. PROBLEMS IN PHYSICAL THERAPY. (Cr ar; prereq physical therapist)

8188. TEACHING PRACTICUM. (Cr ar [max 8 cr]; prereq #) Staff
Supervised experience in teaching and evaluation; development of skills in effective use of instructional materials in lecture and laboratory courses.

8192w. RESEARCH DESIGN IN PHYSICAL THERAPY. (3 cr; prereq #) Amundsen
Critical appraisal of current medical literature; fundamentals of research design and techniques of medical writing.

8193. RESEARCH PROBLEMS IN PHYSICAL THERAPY. (Cr ar; prereq 8192 or #) Allison, Mundale, Amundsen
Methods of research appropriate to physical therapy. Experimental research study.

8195. RESEARCH IN PHYSICAL THERAPY. (Cr ar; prereq 8192 or #) Allison, Kottke, Mundale, Amundsen

8211f,w,s,su. ELECTRONICS IN PHYSICAL MEDICINE. (2 cr) Kubicek

8230. LEADERSHIP TRAINING FOR INTERDISCIPLINARY SETTINGS. (1 cr) Rosenberg

PHYSIOLOGICAL HYGIENE (PubH)

OFFERED AT MINNEAPOLIS

Professor

Arthur S. Leon, M.D., M.S., *director of graduate study*
Henry W. Blackburn, M.D., M.S.
Ronald J. Prineas, M.B.B.S., Ph.D.
Henry L. Taylor, Ph.D.

Associate Professor

Richard S. Crow, M.D.
Richard F. Gillum, M.D
Russell V. Luepker, M.D., M.S.

Assistant Professor

Robert W. Jeffery, Ph.D.
Maurice B. Mittlemark, Ph.D.
Terry Pechacek, Ph.D.

Master's Degree—Offered only under special circumstances under Plan A.

Doctor's Degree—Members of the physiological hygiene faculty who are appointed to the graduate faculty in physiological hygiene, epidemiology, biostatistics, biochemistry, physiology, or nutrition may advise students majoring in those fields. The program will incorporate interdisciplinary subjects within the major. The Ph.D. program in physiological hygiene is open to a limited number of well-qualified students planning an academic career related to the public health aspects of cardiovascular disease.

Minor—It is suggested that students who major in physiological hygiene present a minor in epidemiology, biochemistry, nutrition, medicine, physiology, or a behavioral science.

Language Requirement—For the master's degree, none. For the Ph.D. degree, either one foreign language or a collateral field of knowledge.

Note—For course listings, see the Public Health section of this bulletin.

PHYSIOLOGY (Phsl)

OFFERED AT MINNEAPOLIS

Regents' Professor Emeritus

Maurice B. Visscher, M.D., Ph.D.

Professor

Eugene Grim, Ph.D., *head, director of graduate study*
Marvin B. Bacaner, M.D.
James R. Bloedel, M.D., Ph.D.
H. Mead Cavert, M.D., Ph.D.
Irwin J. Fox, M.D., Ph.D.
Franz Halberg, M.D.
Rodney B. Harvey, M.D., Ph.D.
John A. Johnson, M.D., Ph.D.
William G. Kubicek, Ph.D.
David G. Levitt, M.D., Ph.D.
Nathan Lifson, M.D., Ph.D.
Maurice W. Meyer, D.D.S., Ph.D.
Jack H. Oppenheimer, M.D.
Richard E. Poppele, Ph.D.
Richard L. Purple, Ph.D.
Henry L. Taylor, Ph.D.
Carlo A. Terzuolo, M.D.
Esmail D. Zanjani, Ph.D.

Associate Professor

Charles K. Knox, Ph.D.
C. P. Lee, Ph.D.
Jui S. Lee, Ph.D.
Arthur S. Leon, M.D.
John F. Soechting, Ph.D.
O. Douglas Wangensteen, Ph.D.

Assistant Professor

John H. Anderson, M.D., Ph.D.
Jurgen F. Fohlmeister, Ph.D.
Gordon Kepner, Ph.D.
Richard J. Stish, B.E.E.

Lecturer

Robert L. Evans, Ph.D.
Richard Kronenberg, M.D., Ph.D.
Ida M. Martinson, Ph.D.
Lester D. Michels, Ph.D.
Fernando F. Vargas, D.D.S., Ph.D.

Degrees Offered—M.S., under Plan A or Plan B, and Ph.D.

Prerequisites—For a major or minor in physiology, background in mathematics, physics, chemistry, and morphology acceptable to the graduate faculty is required.

Special Major Field Requirements for Admission—In addition to transcripts of prior course work, applicants are encouraged to take the Graduate Record Examination (verbal, analytical, and quantitative sections).

Program Requirements—Programs are highly individualized and are developed to meet the needs of each student. For all doctoral candidates, the six-quarter sequence 8103 through 8108 is strongly recommended.

Language Requirement—For the M.S. degree, none. For the Ph.D. degree, students, in consultation with their advisers, elect to demonstrate a reading knowledge in one language or to complete a collateral field of knowledge.

Final Examination for Master's Degree—Master's degree students will take a final oral examination.

5094f-5095w. HUMAN PHYSIOLOGY. (3 cr per qtr; primarily for medical-surgical and public health nurses; prereq courses in biochemistry and human or mammalian anatomy) Staff
Survey from a regulatory and control system point of view with emphasis on pathophysiology and regulatory imbalances in disease.

5100s. NEUROSCIENCE FOR DENTAL STUDENTS. (2 cr; prereq courses in biochemistry and human anatomy, ¶Anat 5110 [2 cr]; 3 lect and 3 lab hrs per wk)
Basic principles of nervous function through a combined study of neuroanatomy and neurophysiology.

5101w. HUMAN PHYSIOLOGY. (5 cr; primarily for dental students; prereq biochemistry and 5100)
Principles of physiology of circulation, respiration, digestion, excretion, metabolism, endocrine glands.

5102w. PHYSIOLOGY AND DENTISTRY. (1 cr; prereq 5101 and dental student) Meyer and staff
Lecture-conference course for integrating physiology and dentistry.

8103f. GENERAL PHYSIOLOGY. (3 cr; prereq physical chemistry, #; offered even-numbered yrs) Grim, Johnson, Kepner, Levitt, Lifson
Mechanisms of transport and energy transformation in living organisms.

8104w. NEUROPHYSIOLOGY. (4-6 cr [1 or 2 cr term paper option]; prereq neuroanatomy and #; offered odd-numbered yrs) Knox, Poppele, Purple, Terzuolo

8105s. CARDIOVASCULAR PHYSIOLOGY. (4 cr; prereq #; offered odd-numbered yrs) Bacaner, Cavert, Fox, Johnson

8106f. RESPIRATORY PHYSIOLOGY. (3 or 4 cr [4-cr regis includes laboratory and is intended for physiology grad students only]; prereq #; offered odd-numbered yrs) Kronenberg, Wangensteen

8107w. ALIMENTARY PHYSIOLOGY. (3 cr; prereq #; offered even-numbered yrs) Grim, Lifson

8108s. NEPHROLOGY. (4 cr; prereq #; offered even-numbered yrs) Harvey

8110w. HUMAN PHYSIOLOGY. (5 cr; prereq anatomy, biochemistry)

8111s. HUMAN PHYSIOLOGY. (6 cr; prereq 8110, anatomy, biochemistry; course ends in July)

8113f,w,s,su. PROBLEMS IN PHYSIOLOGY. (Cr ar; prereq #) Staff
Topics assigned for readings or lab study; conferences.

8114f. BIOPHYSICS OF NERVE CELLS. (3 cr; prereq #; offered odd-numbered yrs) Staff
Electrostatics, cable theory, the Hogkin-Huxley model, propagated action potential, theoretical considerations of nerve impulse initiation, generalized Nernst-Goldman equation, noise.

8115w. MATHEMATICAL NEUROPHYSIOLOGY. (4 cr; prereq calculus through ordinary differential equations, Stat 8501 or #; offered even-numbered yrs) Knox
Analysis of nerve impulse trains; interval distributions, auto- and cross-correlation functions, shot noise processes, applications of information theory. Models of neurons, including McCullock-Pitts, random walk, and "leaky integrator" models. Neural networks; randomly connected nets, discrete and cellular space models. Computer simulation techniques.

8116s. BIOPHYSICAL APPROACHES TO PHYSIOLOGY. (4 cr; prereq 3055 or #; 2 hrs lect, 2 hrs conf per wk) Kepner
Basic concepts of membrane permeability and transport. Detailed study of fundamental and classic research papers that provide the physical-chemical foundations for these concepts.

8117. CHRONOPHYSIOLOGY. (Cr ar; prereq #) Halberg
Emphasis on predictable aspects of physiological variability and their role in the definition of health and the diagnosis of disease. Physiological self-measurements, their analysis and interpretation. Course can be tailored to focus on specific interests of a given student.

8201f,w,s. LITERATURE SEMINAR. (1 cr) Staff
Registration in quarters of oral presentation only.

8202.* READINGS IN PHYSIOLOGY. (Cr ar) Staff
Topics selected for each student; written reviews prepared and discussed.

8203.* RESEARCH IN PHYSIOLOGY. (Cr ar)

8204.[1] HISTORY OF PHYSIOLOGY. (Cr ar) Visscher

8210.[1] SELECTED TOPICS IN PERMEABILITY. (Cr ar; prereq 8103 or equiv, #) Grim, Johnson, Kepner, Levitt, Lifson
Advanced seminar.

8211.[1] SELECTED TOPICS IN HEART AND CIRCULATION. (Cr ar; prereq 8105 or equiv, #) Bacaner, Cavert, Fox, Visscher
One or more seminars in advanced physiology of heart and circulation.

8212.[1] SELECTED TOPICS IN RESPIRATION. (Cr ar; prereq 8106 or equiv, #) Kronenberg, Wangensteen
Advanced seminar.

8213.[1] SELECTED TOPICS IN ALIMENTARY PHYSIOLOGY. (Cr ar; prereq 8107 or equiv, #) Grim, Lifson
Advanced seminar.

8214.[1] SELECTED TOPICS IN NEPHROLOGY. (3 cr; prereq 8108 or equiv) Harvey
Advanced seminar.

8216f. SELECTED TOPICS IN NEUROPHYSIOLOGY. (Cr ar, §Otol 8247; prereq 8104 or equiv, #) Poppele, Purple, Terzuolo
Advanced seminar.

8217s. PROPERTIES OF RECEPTOR SYSTEMS. (3 cr; prereq #; offered even-numbered yrs) Poppele
Physiological role of receptors as information gathering and relay devices; behavior of a number of specific receptor organs and their functional components.

8218f. PHYSIOLOGY OF VISUAL SYSTEMS. (3 cr; prereq #; offered even-numbered yrs) Purple
Graduate-level seminar on visual systems. Primary material emphasis on vertebrate visual system, including receptor transduction, retinal structure and physiology, and central visual processes. Conceptual emphasis on visual system as an information-reception and information processing system.

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[1]Students should consult the department for offerings during any specific quarter.

8219s. SPINAL CORD PHYSIOLOGY AND MOTOR CONTROL. (3 cr; prereq #; offered odd-numbered yrs) Terzuolo
Physiological basis of motor control at different functional levels (spinal cord, brain stem, thalamus and basal ganglions, cerebral cortex and cerebellum) in terms of cellular mechanisms, input-output relations and modeling.

8227s. METHODS IN PHYSIOLOGY. (3 cr; prereq #) Stish

8230, 8231.[1] TRANSPORT PROCESS IN BIOLOGY. (3 cr per qtr; prereq 8103 or equiv) Grim, Johnson, Lifson
Relatively systematic coverage of biological transport processes.

8234.[1] RESPIRATION, ACID-BASE CHEMISTRY, AND ELECTROLYTE METABOLISM. (3 cr; prereq 8106 or equiv)

8235.[1] BIOENERGETICS OF CARDIAC CONTRACTION. (3 cr; prereq 8105 or equiv) Cavert

8239w.[1] PHYSIOLOGY OF LYMPHATIC SYSTEM AND MICROCIRCULATION. (Cr ar) Lee, Meyer

PHYSIOLOGY (Phys)

OFFERED AT ROCHESTER

Professor

Franklyn G. Knox, M.D., Ph.D., *chairman*
Edmund Y. S. Chao, Ph.D.
David E. Donald, D.V.M., Ph.D.
Thomas P. Dousa, M.D., Ph.D.
John E. Gerich, M.D.
Robert E. Hyatt, M.D.
Patrick J. Kelly, M.D., M.S.
Edward H. Lamber, M.D., Ph.D.
Kenneth G. Mann, Ph.D.
Erik L. Ritman, M.D., Ph.D.
Joseph R. Rodarte, M.D.
Juan C. Romero, M.D.
John T. Shepherd, M.D., D.Sc.
Stuart R. Taylor, Ph.D.
Gertrude M. Tyce, Ph.D.
Earl H. Wood, M.D., Ph.D.

Associate Professor

George W. Beeler, Ph.D.
James F. Greenleaf, Ph.D.
Robert G. Tancredi, M.D.

Within the Mayo Graduate School of Medicine, physiology and biophysics are combined into one administrative department. The biophysical sciences program is therefore closely related to the physiology program, and listings under biophysical sciences may be found to be pertinent to the student's interests.

Degrees Offered—Graduate training leading to the Ph.D. degree is offered. Programs leading to the M.S. degree are offered only to candidates who hold the M.D. degree.

Prerequisites—A bachelor's degree and a superior undergraduate record. Undergraduate college course work should include biology, mathematics (including calculus), physics, and chemistry (inorganic, organic, qualitative and quantitative, physical). Foreign language study is encouraged but not essential. A limited number of deficiencies are allowed, but candidates are required to make them up after admission.

Program Requirements for the Ph.D. Degree—*General*: Some of the courses in basic physiology are commonly taken on the Minneapolis campus. In addition, the sequence M 8855 through M 8860 at Rochester (or equivalent courses at Minneapolis) is recommended for all doctoral candidates. A total of 24 to 30 credits in physiology are required.

Minor Subjects: The Ph.D. degree also requires a minor field of study. A minimum of 18 credits of course work are required in the minor. A supporting program composed of studies in more than one discipline can be substituted for the minor. A minimum of 6 credits should be completed in each of three component programs; these can include biochemistry, biophysics, bioengineering, biometrics, and any of the physical, chemical, or mathematical sciences.

Language Requirement—For the Ph.D., students may demonstrate either a reading knowledge of one language or competence in a collateral field of knowledge. In the collateral field, the requirement is nine credits (or equivalent) constituting a coordinated program of study; these credits may not be applied to fulfill the major or minor requirements.

[1]Students should consult the department for offerings during any specific quarter.

Physiology as a Minor—For programs in nonclinical basic sciences, 12 credits in graduate-level courses exclusive of Phys M 8853 are required for M.S. programs and 18 to 24 credits for Ph.D. programs. For programs in clinical fields, in addition to the course requirements for the minor in the nonclinical fields, six to nine months of work in a laboratory under the sponsorship of a faculty member in physiology are also recommended.

M 5100. HUMAN PHYSIOLOGY I. (3 cr) Tyce and staff
Basic principles of physiology including a survey of basic cell functions, biological control systems, and body functions.

M 5101. HUMAN PHYSIOLOGY II. (3 cr; prereq M 5100)
Continuation of M 5100.

M 5801f,w,s,su. PRINCIPLES OF BIOMECHANICS. (3 cr) Chao and staff
Basic concepts of orthopedic biomechanics.

M 5881. BIOPHYSICAL SCIENCES I. (3 cr; prereq knowledge of calculus) Greenleaf and staff
Overview of biophysics as applied to optical radiation, sound, membranes, heart, computed tomography, computer methods, ionizing radiation, and synaptic transmission.

M 8851f,w,s. PHYSIOLOGY SEMINARS. (1 cr; prereq M 8854 or, with other listed courses, by arrangement with a staff member)
Weekly seminars in which whole department participates. Research papers presented by students, staff, or invited lecturers.

M 8852f,w,s,su. SEMINARS IN PHYSIOLOGICAL SPECIALTIES. (1½ cr)
Specialized area of physiology reviewed in depth. Research papers presented by students and staff with active discussion.

M 8853f,w,s,su. RESEARCH IN PHYSIOLOGY. (6 cr; prereq △) Staff
Opportunities in research to be arranged with individual staff members, subject to departmental approval.

M 8854f,w,s,su. READINGS IN PHYSIOLOGY. (Cr ar) Staff

M 8855f. MAMMALIAN PHYSIOLOGY I—CARDIOVASCULAR PHYSIOLOGY. (3 cr; offered 1982 and alt yrs) Donald and staff
Current concepts of cardiovascular physiology offered in depth.

M 8857s. MAMMALIAN PHYSIOLOGY II—RENAL. (3 cr; offered 1983 and alt yrs) Romero and staff
Current concepts in renal physiology reviewed in depth.

M 8858f. MAMMALIAN PHYSIOLOGY III—RESPIRATORY. (3 cr; offered 1981 and alt yrs) Hyatt and staff
Lung mechanics, ventilation-perfusion ratios, gas diffusions, transport and exchange, acid-base balance, control of ventilation.

M 8859w. MAMMALIAN PHYSIOLOGY IV—GASTROINTESTINAL. (3 cr; offered 1982 and alt yrs) Go, Phillips, Szurszewski, and staff
Salivary, gastric, and pancreatic secretion; bile composition, function, and control. Motility and absorption mechanisms, regional differences, and control.

M 8860s. MAMMALIAN PHYSIOLOGY V—ENDOCRINE. (3 cr; during some qtrs may substitute for Med M 8864; offered 1982 and alt yrs) Dousa and staff
Neural-hypophyseal systems; reproductive endocrinology; thyroid, parathyroid, and adrenal physiology; mineral metabolism; glucose regulation.

M 8861. PHYSIOLOGY AND PHARMACOLOGY OF THE NERVE IMPULSE. (3 cr; prereq courses in physical sciences, mathematics; offered 1981 and alt yrs) Taylor and staff
Lectures, seminars, journal club, and demonstrations on impulse conduction and electrical properties of axons, excitable membrane theory, and physical and chemical bases of action potential.

M 8862. PHYSIOLOGY AND PHARMACOLOGY OF EXCITATION-CONTRACTION COUPLING. (3 cr; prereq courses in physical sciences, mathematics and M 5881 or equiv; offered 1981 and alt yrs) Taylor and staff
Lectures, seminars, journal club, and demonstrations on the physical chemistry of contractile proteins, and cellular and molecular control mechanisms in contraction of striated muscle.

M 8863su. ANALOG AND DIGITAL ELECTRONICS FOR BIOLOGICAL RESEARCH. (3 cr; offered 1981 and alt yrs) Taylor
Lectures and demonstrations integrating electrical principles with measurement and control concepts and instrumentation used in laboratory research.

M 8878f,s. PHYSIOLOGY OF BONE I. (3 cr; prereq #) Kelly and staff
Lectures in physiology of both normal and abnormal bone; renal, respiratory, and endocrine physiology and function as related to bone.

M 8879w,su. PHYSIOLOGY OF BONE II. (2 cr; prereq #) Kelly and staff
Lectures in crystal structure and mineralization, both normal and abnormal ion transport, and mineral and hormonal metabolism as related to bone.

M 8880. PRINCIPLES OF SOLID MECHANICS. (3 cr; prereq physics and calculus) Chao
Application of vector mechanics to musculoskeletal systems; experimental methodology in obtaining anatomic kinematic data.

M 8881. MECHANICS OF DEFORMABLE MATERIALS. (3 cr; prereq M 8880) Chao
Stress and strain concepts and method of calculation for biological and implantable materials. Methodology and instrumentation for measuring stress, strain, fracture, and wear.

M 8890f,w,s. ADVANCED RESPIRATORY PHYSIOLOGY. (2 cr per qtr [3 qtrs required]) Hyatt and staff

PLASTIC SURGERY (PIS)

OFFERED AT ROCHESTER

Professor
John E. Woods, M.D., Ph.D., *head*

Associate Professor
George B. Irons, Jr., M.D.

The residency in plastic surgery provides training in all aspects of this surgical specialty. Included in the program are the care and management of acute trauma, burns, major tumors of the head and neck, cleft lip and palate, other congenital anomalies, and reconstructive and cosmetic surgery.

The residency meets the requirements of the American Board of Plastic Surgery for a two-year program. Five years of prior general surgery training or board eligibility are required and may be taken in any institution that offers a board-approved residency.

During the first year, residents rotate on three-month services at St. Mary's Hospital and Rochester Methodist Hospital. Surgery is performed during the first year under supervision on consultants' individual services. Exposure to hand surgery is provided by a three- to six-month rotation during the first or second year.

During the second year of training, the resident is designated chief resident associate. The resident maintains an active service, both emergency and elective, at St. Mary's and Rochester Methodist Hospitals. Residents have an opportunity to develop microsurgical techniques in the laboratory and to participate in anatomic dissection.

Opportunity for laboratory investigation is available but must be taken in addition to the two-year training program. The didactic program in plastic surgery includes weekly teaching conferences, journal clubs, case presentations, cleft palate clinics, and joint rounds. In addition, visiting professors in plastic surgery will be invited to lecture on a regular basis.

M 8852f,w,s,su. DIAGNOSTIC AND CLINICAL PLASTIC SURGERY. (6 cr) Staff
Theory and practice of plastic surgery. Diagnosis of diseases and defects requiring plastic repair. Preoperative and postoperative care of patients.

M 8853f,w,s,su. OPERATIVE PLASTIC SURGERY. (6 cr) Staff
Hospital residence. Junior residency in operative service.

M 8854f,w,s,su. OPERATIVE PLASTIC SURGERY. (6 cr) Staff
Operative plastic and reconstructive surgery of entire body including cosmetic surgery; management of burns, tumors of the head and neck, and maxillofacial injuries. Senior residency in operative service.

PSYCHIATRY

OFFERED AT MINNEAPOLIS

Professor

Paula J. Clayton, M.D., *head*
John P. Brantner, Ph.D.
Floyd K. Garetz, M.D., M.S.
Lawrence M. Greenberg, M.D.
William Hausman, M.D.
Gordon Heistad, Ph.D.
Leonard L. Heston, M.D.
David T. Lykken, Ph.D.
Roy W. Pickens, Ph.D.
William Schofield, Ph.D.
Lloyd K. Sines, Ph.D.
Joseph J. Westermeyer, M.D.

Clinical Professor

Faruk S. Abuzzahab, M.D.
Gove Hambidge, M.D.
James J. Lawton, M.D.

Associate Professor

Jerome L. Kroll, M.D.
Richard Meisch, M.D.
Michael K. Popkin, M.D.

Master's and Doctor's Degrees—Programs are offered for the M.S. (Plan A) and Ph.D. (for students accepted for residency in psychiatry) degrees. The minor may be elected in such fields as anthropology, philosophy, psychology, sociology, or a related field that provides a background in broad cultural areas. Under ordinary circumstances the fellowship runs for a period of four years; i.e., it fulfills the requirements for training of the American Board of Psychiatry and Neurology. A five-year program offering advanced training in child psychiatry is also available. Foreign language study is not required.

Psychiatry (AdPy)

5211. APPLIED BEHAVIORAL ANALYSIS. (2 cr; prereq MD or #) Eckert

5800. CASE CONFERENCE: PSYCHIATRY IN MEDICINE. (1 cr; prereq MD or #) Popkin

5801. CONSULTATION-LIAISON PSYCHIATRY. (Cr ar; prereq MD) Popkin

8201. CLINICAL PSYCHIATRY. (Cr ar; prereq MD) Staff

8203. ADVANCED CLINICAL PSYCHIATRY. (Cr ar; prereq MD, 8201) Staff

8205. SPECIAL ASSIGNMENTS IN PSYCHIATRY. (1 cr; prereq MD, 8201, 8203) Staff

8206. RESEARCH IN PSYCHIATRY. (Cr ar; prereq #) Staff

8208. SURVEY OF PHYSIOLOGICAL TREATMENTS. (2 cr; prereq #) Staff

8209. CLINICAL PSYCHOPATHOLOGY. (3 cr) Sines

8210. CLINICAL PSYCHOPHARMACOLOGY. (1 cr; prereq 8208) Abuzzahab and staff
Basic pharmacology and clinical use of psychotropic agents.

8221. SEMINAR: CURRENT LITERATURE. (1 cr; prereq #) Simon

8224. INTRODUCTION TO GROUP THERAPY. (1 cr) Hausman

8226. BIOLOGICAL PSYCHIATRY. (3 cr; prereq MD or #) Heston

8238. CASE CONFERENCE IN PSYCHOLOGICAL MEDICINE. (1 cr; prereq MD or #)

8239. CONTINUOUS CASE SEMINAR: PSYCHOANALYTICALLY ORIENTED PSYCHOTHERAPY. (1 cr; advanced psychiatric residents and psychology interns only; prereq #) London

8240. PSYCHIATRIC PROBLEMS OF THE AGED. (2 cr; prereq #) Garetz

8243. SEMINAR: INTRODUCTION TO CLINICAL THEORY OF PSYCHOANALYSIS. (3 cr; prereq #) Horton

8244. COMPARATIVE THEORIES OF PSYCHOTHERAPY. (3 cr; prereq #) Schofield

8249. CLINICAL NEUROPSYCHOPHARMACOLOGY. (2 cr) Abuzzahab

8264. PRESENTATIONS ON CURRENT AND APPROPRIATE LITERATURE PERTAINING TO ALL PHASES OF MENTAL HEALTH CARE. (1 cr; limited to residents on rotation to Mpls Veterans Administration Hospital Psychiatry Service) Murtaugh

8265. READINGS: PSYCHOSOMATIC MEDICINE, CONSULTATION-LIAISON PSYCHIATRY. (Cr ar [max 3 cr]; prereq MD or #) Popkin

8970. DIRECTED STUDIES. (Cr ar [max 9 cr]) Staff

Child and Adolescent Psychiatry (CAPy)

5203. CHILD AND ADOLESCENT OUTPATIENT PSYCHIATRY FOR HEALTH CARE PSYCHOLOGY INTERNS. (Cr ar; prereq #) Erbaugh
Experience in assessment and therapeutic interventions with children, adolescents, and families in an outpatient child and adolescent psychiatric care setting.

5204. DIAGNOSTIC METHODS IN CHILD, ADOLESCENT, AND FAMILY PSYCHIATRY. (1 cr; prereq med student, #) Erickson
Multidisciplinary evaluations of children, adolescents, and their families presented for discussion, dynamic and diagnostic formulations, and disposition planning in a conference setting.

5206. THERAPEUTIC METHODS IN CHILD, ADOLESCENT, AND FAMILY PSYCHIATRY. (1 cr; prereq med student, #) Greenberg
Therapeutic techniques utilized in child, adolescent, and family psychiatry reviewed through presentation and discussions of ongoing cases.

5500. PEDIATRIC PSYCHIATRY LIAISON. (9 cr for 6 wks full time...option: 18 cr for 12 wks full time; prereq med student, #) Pearson
Supervised consultation, diagnostic, and short-term therapy experience in pediatrics and pediatric neurology.

5520. OUTPATIENT CLINICAL CHILD AND ADOLESCENT PSYCHIATRY FOR PRIMARY CARE TRAINEES. (9 cr for 6 wks full time...option: 18 cr for 12 wks full time; prereq med student, #) Greenberg
Supervised diagnostic and therapeutic experiences in an outpatient setting.

5522. CLINICAL INPATIENT ADOLESCENT PSYCHIATRY FOR PRIMARY CARE TRAINEES. (9 cr for 6 wks full time...option: 18 cr for 12 wks full time; prereq med student, #) Erickson
Supervised diagnostic and therapeutic experiences in an inpatient, multidisciplinary adolescent psychiatry unit with an emphasis on group and milieu therapies.

5602. INTRODUCTORY READINGS IN CHILD, ADOLESCENT, AND FAMILY PSYCHIATRY. (1 cr; prereq med student or MD, #) Miner and staff
Assigned readings and discussion with faculty as an introduction to child, adolescent, and family psychiatry. Topics include child development, diagnostic and therapeutic techniques, and psychopathology.

5603. INPATIENT CLINICAL CHILD PSYCHIATRY FOR PRIMARY CARE PHYSICIANS. (9 cr for 6 wks full time...option: 18 cr for 12 wks full time; prereq med student, #) Moore
Diagnosis and treatment of children referred for comprehensive evaluation and treatment planning to the inpatient child psychiatric unit. Broad range of childhood disorders. Students responsible for patient management. Emphasis on involvement of family.

5608. INTRODUCTION TO FAMILY THERAPY: THEORY AND PRACTICE. (1 cr; prereq MD and/or #, satisfactory completion of course in basic psychopathology [or its equiv], current supervised involvement with treatment of cases, and #) Miner and staff
Introduction to the ideas and treatment approaches of some of the major figures in the current clinical practice of psychotherapy with families: Carl Whitaker, Salvador Minuchin, Lyman Wynne, Jay Haley, Murray Bowen, Virginia Satir, David Olson, and others. Provides practice training experience in the problems and techniques for beginning family therapists through review and discussion of videotapes of current treatment cases of course participants.

5609. CHILD DEVELOPMENT PRACTICUM. (Cr ar; prereq MD and/or #)
Observation conducted at the University-affiliated child care center consisting of three sessions with infants, three sessions with toddlers, and four sessions with preschoolers. Each session consists of one hour of observation of unstructured activities under the guidance of faculty members, one hour of group discussion with child psychiatry and child development faculty, and one hour of demonstration illustrating the characteristic behaviors of each age group.

5610. BIOMEDICAL RESEARCH: PRINCIPLES AND DESIGN. (2 cr; prereq introductory statistics, #) Yellin
Designed to help students develop a basic understanding and skills for planning and executing biomedical research and for critical reading of research reports and articles. Topics include: theoretical models, generating research hypotheses, selecting appropriate research strategies, determining appropriate statistical analyses, interpreting results. Related topics include issues in research with human subjects, and relationship between research and clinical work, the computer as a research tool, resources available for literature searches.

8100. READINGS IN CHILD, ADOLESCENT, AND FAMILY PSYCHIATRY. (1 cr; prereq MD, #)
Comprehensive review of classical and contemporary literature in the field of child, adolescent, and family psychiatry including growth and development, diagnostic and therapeutic techniques, and psychopathology with supplemental course work in other departments and schools.

8110. DIAGNOSTIC METHODS IN CHILD, ADOLESCENT, AND FAMILY PSYCHIATRY. (1 cr; prereq MD, #)
Multidisciplinary evaluations of children, adolescents, and their families presented for discussion, dynamic and diagnostic formulations, and disposition planning in a conference setting.

8120. THERAPEUTIC METHODS IN CHILD, ADOLESCENT, AND FAMILY PSYCHIATRY. (1 cr; prereq MD, #) Greenberg, Stocking
Therapeutic techniques utilized in child, adolescent, and family psychiatry reviewed through presentation and discussion of ongoing cases.

8200. OUTPATIENT CLINICAL CHILD AND ADOLESCENT PSYCHIATRY. (3 cr; 15 hrs per wk; prereq MD, #)
Supervised diagnostic and therapeutic experiences in an outpatient setting.

8212. CLINICAL INPATIENT CHILD PSYCHIATRY. (3 cr; 15 hrs per wk ar; prereq MD, #) Moore
Supervised diagnostic and therapeutic experiences in an inpatient, multidisciplinary child psychiatry unit with emphasis on group and milieu therapies.

8214. INPATIENT CLINICAL ADOLESCENT PSYCHIATRY. (3 cr; prereq MD, #) Erickson
Supervised diagnostic and therapeutic experiences in an inpatient, multidisciplinary adolescent psychiatry unit with emphasis on group and milieu therapies.

8216. PEDIATRIC AND PEDIATRIC NEUROLOGY-PSYCHIATRIC LIAISON. (3 cr: prereq MD, #) Pearson
Supervised consultation, diagnostic, and short-term therapy experiences in pediatrics and pediatric neurology.

8218. GROUP THERAPY. (1 cr; prereq MD, #)
Readings and illustrative group therapy examples reviewed to complement the concurrent clinical experiences.

8223. FAMILY THERAPY. (1 cr; prereq MD, #) Miner, Josephson
Readings and illustrative family therapy examples reviewed to complement the concurrent clinical experiences.

8228. RESEARCH IN CHILD AND ADOLESCENT PSYCHIATRY. (1 cr; prereq MD, #) Yellin
Research design and methodology and current research projects reviewed with faculty and invited guests.

8243. SCHOOL CONSULTATION. (2 cr: 10 hrs per wk; prereq MD, #)
Supervised clinical and consultative experiences in a school setting with literature and clinical seminars.

8301. SEMINAR: CHILD, ADOLESCENT, AND FAMILY PSYCHIATRY. (1 cr; prereq MD, #) Staff
Current diagnostic, therapeutic, and theoretical issues in child, adolescent, and family psychiatry reviewed through clinical and didactic presentations and discussions by students, faculty, and invited guests.

PSYCHIATRY (P)

OFFERED AT ROCHESTER

Professor

Maurice J. Martin, M.D., M.S., *chairman*
Alexander R. Lucas, M.D.
Elliott Richelson, M.D.
David W. Swanson, M.D.
Wendell M. Swenson, Ph.D.
Francis A. Tyce, M.B., M.S.

Associate Professor

Robert C. Colligan, Ph.D.
Jane W. Duncan, M.D.
Harold R. Martin, M.D.
Gordon L. Moore II, M.D., M.S.
Robert M. Morse, M.D., M.S.
David Osborne, Ph.D.

Assistant Professor

Maurice J. Barry, Jr., M.D., M.S.
Leo J. Davis, Jr., Ph.D.
Glen M. Duncan, M.B.B.Ch.
Robert J. Ivnik, Ph.D.
Toshihiko Maruta, M.D., M.S.
Gerald C. Peterson, M.D.
Mark S. Schwartz, Ph.D.
Lloyd A. Wells, M.D.

The clinical work in psychiatry consists of diagnostic and therapeutic outpatient assignments in adult and child psychiatry as well as assignments to hospital services caring for psychotic, nonpsychotic, and chemically dependent patients. These assignments provide opportunities for individual and group therapy as well as training in the standard psychiatric treatment techniques. The hospital services are organized as therapeutic communities with their own recreational and occupational therapy facilities. Clinical psychological services and psychiatric social services are available.

A minimum of six months is devoted to child psychiatry. During that time there is opportunity for long-term intensive psychotherapy of children. There is also an 18-bed residential treatment unit for adolescents.

The resident takes part in long-term intensive psychotherapy of adults and spends at least one quarter in the Intensive Psychotherapy Center, which provides training in short-term intensive group psychotherapy.

There is an opportunity to study a wide variety of psychosomatic problems as a consultant to medical and surgical departments. As an integral part of the residency, there are several conferences, lectures, and seminars, both formal and informal, dealing with the entire range of psychiatric therapy and practice. There is organized instruction in the basic behavioral sciences and related fields such as neuroanatomy, neurophysiology, neuropathology, electroencephalography, and electromyography. Assignment to clinical neurological services is also included.

There is a close liaison with the Student Health Service at St. Olaf College, Northfield, Minnesota, where the mental health problems of the college-age student are studied. There is also a close affiliation with local nursery schools and nearby facilities for the mentally retarded. An alcoholism treatment unit and a pain management center provide opportunity to study inpatients with these two special types of problems.

Master's Degree—Offered only under Plan A.

Doctor's Degree—Work leading to the Ph.D. degree is offered.

M 8851f,w,s,su. DIAGNOSIS IN PSYCHIATRY. (6 cr) Staff
Research. Seminar.

M 8853f,w,s,su. HOSPITAL RESIDENCE IN PSYCHIATRY. (6 cr) Staff

M 8855f,w,s,su. CHILD PSYCHIATRY. (6 cr)

M 8856f,w,s,su. CLINICAL PSYCHIATRY. (6 cr) Staff

M 8858f,w,s,su. BASIC NEUROLOGIC SCIENCES. (6 cr) Staff

M 8859f,w,s,su. PSYCHOLOGY. (6 cr) Staff
Exposure to scientific bases of psychological assessment through readings, observation, and supervised experience in test administration and interpretation. Research.

PUBLIC HEALTH (PubH)[1]

OFFERED AT MINNEAPOLIS

Professor

James Boen, Ph.D., *director of graduate study*
Robert K. Anderson, D.V.M.
Henry W. Blackburn, M.D.
Stanley L. Diesch, D.V.M.
Velvl W. Greene, Ph.D.
Leonard M. Schuman, M.D., M.S.
Henry L. Taylor, Ph.D.
Robert W. ten Bensel, M.D., M.P.H.

Associate Professor

Lester E. Block, D.D.S., M.P.H.
Judith E. Brown, Ph.D.
James Kincannon, Ph.D.
Rexford D. Singer, B.S.C.E., M.S.
Lee D. Stauffer, M.P.H.
Robert L. Veninga, Ph.D.

Adjunct Associate Professor

Lee E. Schact, Ph.D.

Assistant Professor

Michael L. Baizerman, Ph.D.
Robert W. Blum, M.D., Ph.D.
Susan G. Gerberich, Ph.D.
E. Charlotte Pflug, M.P.H.
Marla S. White, Sc.D.

Instructor

Patricia A. Woodbury, M.S.

The curriculum offers preparation for broad, multidisciplinary work in public health as well as concentrations in such specialties as public health nursing. For information regarding admission procedures and course selections, contact the Director of Graduate Study in Public Health, 1360 Mayo Memorial Building, 420 Delaware Street S.E., University of Minnesota, Minneapolis, Minnesota 55455.

Degree Offered—M.S.

Language Requirement—None.

Prerequisite—Applicants must have a baccalaureate degree from an accredited academic institution.

[1]Inquiries concerning course work leading to the master of public health or master of hospital administration degree should be addressed to: Dean of the School of Public Health, 1360 Mayo Memorial Building, 420 Delaware Street S.E., University of Minnesota, Minneapolis, Minnesota 55455. Applicants planning to pursue an M.S. or a Ph.D. degree in biometry and health information systems, environmental health, epidemiology, hospital and health care administration (Ph.D. only), or physiological hygiene are referred to the separate listings in this bulletin.

Minor Requirements—Ph.D. students choosing a minor in public health must complete a minimum of 18 credits of course work in public health. Courses will be selected by agreement among the candidate, the major adviser, and the director of graduate study in public health.

5001. PHILOSOPHICAL AND CONCEPTUAL BASES OF PUBLIC HEALTH PRACTICE. (2 cr; prereq grad public health student or #) Schwanke, Eyler
Multidisciplinary examination of selected historical milestones, developments, problems, controversies, and ethical and technical issues that have shaped basic philosophies, principles, concepts, values, attitudes, and assumptions influencing public health practices and programs. Emphasis on current trends and probable future challenges to traditional public health practice.

5002. PUBLIC HEALTH ISSUES IN HISTORICAL PERSPECTIVE. (3 cr, §HMed 5002)
Evolution of major recurring problems and issues in public health including the environment and health, food customs and nutrition, control of alcohol and drugs, venereal diseases and public policy, human resources regulation, and relationship of science to promotion of health.

5003. INTERDISCIPLINARY TEAM BUILDING IN COMMUNITY HEALTH PRACTICE. (2 cr, 5003-5004†, §5008, §5013; prereq #) Schwanke, Reynolds, Cohn, Ayers
Development of team skills including resource sharing and utilization, verbal and nonverbal communication, giving and receiving feedback, leadership roles and styles, negotiations, decision making and problem solving, conflict utilization, and process intervention. Students select community agency projects, form interdisciplinary groups, and become oriented to team development in preparation for their agency projects.

5004. FIELD INSTRUCTION IN PUBLIC HEALTH. (Cr ar; prereq #)
Generalized, function-oriented, or discipline-oriented community experience under academic and professional supervision. Emphasis on application of acquired knowledge and skills relevant to health issues and problems.

5005.* TOPICS IN PUBLIC HEALTH. (Cr ar; prereq advance proposal and #) Staff
Individualized, directed instruction. Selected readings in public health with discussion based on these readings.

5006. INTRODUCTION TO COMMUNITY HEALTH. (5 cr, §5016; prereq pharmacy student, nursing student, other health professional, or #) Greene, Rothenberger
Lectures, discussions, seminars, personalized readings on critical and current issues in community health emphasizing public health programs and controversies.

5007. HEALTH LEADERSHIP AND EFFECTING CHANGE. (4 cr, §HSU 5007; prereq sr or grad student)
Leadership qualities and their effect on organizational behavior. Various theories of change and their practical application to the field of health. Changing role of the health professional.

5008. WORKSHOP OR INSTITUTE IN PUBLIC HEALTH. (Cr ar) Staff
Special topics, nonregular program or course in public health for preservice or in-service helping professionals.

5013. INTERDISCIPLINARY TEAM TRAINING IN HEALTH SERVICES DELIVERY. (3 cr, §HSU 5001; prereq #) Schwanke, Reynolds, Ayers, Cohn
Basics of interpersonal and group communication with application to team health projects, organization, function, and membership. Lectures, readings, and discussions heavily supplemented by experiential methods and activities to develop attitudes and skills essential to effective team goal setting, decision making, problem solving, and task accomplishment. Emphasis through student projects is on team leadership styles, professional roles and functions, active listening, giving and receiving feedback, and conflict resolution to enhance quality of project outcome.

5015. TOPICS IN INTERDISCIPLINARY STUDIES. (Cr ar; prereq #) Staff
Individualized, directed instruction. Selected readings in interdisciplinary studies with discussions based on these readings.

5016. INTRODUCTION TO PUBLIC/COMMUNITY HEALTH. (3 cr, §5006, §SW 5131; prereq pharmacy, dental hygiene or grad public health student or #) Greene
Lectures, discussions, and seminars on the historical evolution of public/community health, status of organization and delivery of health services, and future organizational changes and innovative models for prevention. Emphasis on epidemiology and prevention of communicable and chronic diseases, chemical dependency, mental health, and measurement of community health status. Health problems and service needs of the poor, minorities, and women. Group or individual project interviews with community health professionals.

5020. PUBLIC HEALTH SOCIAL WORK INTEGRATIVE SEMINAR. (2 cr, §SW 5010; prereq beginning level MSW MPH student) Schwanke, Bracht, McClelland
Student-faculty-practitioner presentations and discussions aimed at building an integrated public health social work professional identity by synthesizing from both fields the relevant historical developments, philosophies and concepts, roles and functions, trends, and professional values and ethics.

5021. HUMAN SEXUALITY FOR HEALTH AND HELPING PROFESSIONALS I. (2-4 cr, §HSU 5025, §FSoS 5240; prereq public health, health sciences, family social science or social work student or #) Terrell, Maddock
Multidisciplinary approach to human sexuality from perspective of public and social health and well-being of the community, society, and individual. Lectures, discussions, films, and readings examine role of sex in health, with emphasis on sexual problems related to physical disease and disability, mental health, and family and relationship difficulties. Skills for imparting sexual knowledge to other health professions and to consumers.

5022. HUMAN SEXUALITY FOR HEALTH AND HELPING PROFESSIONALS II. (3 cr, §HSU 5027, §FSoS 5240; prereq 5021 or #) Maddock, Terrell
Lectures, discussions, films, and readings on rationales for sexual health care and methods of intervention for sex-related problems of individuals, couples, and families. Focus on methods of assessment, creation of comfortable climate to explore sexual concerns, providing sex-related information, techniques for behavior change, and making treatment referrals.

5023. HUMAN SEXUALITY FOR HEALTH AND HELPING PROFESSIONALS III. (3 cr, §HSU 5028, §FSoS 5240; prereq 5022 or #) Maddock, Terrell
Seminar focusing on issues of health policy, preventive education, and service in human sexuality. The policymaking process and current controversial sexual issues. Topics include sexual normalcy and variance/deviance; ethical and legal considerations; public policies regarding sexual minorities; institutional policies regarding sexual health care; sex education programs for children and adults; alternatives for sexual health service delivery. Resource persons contribute to class. Student teams investigate problems in contemporary sexual health policy. Students share knowledge of and experience with sexual health policy issues.

5031. MENTAL HEALTH. (3 cr; prereq #)
Emotional factors underlying wholesome family relations or interfering with successful adjustment in family and community.

5032. EDUCATIONAL ASPECTS OF DRUG USE AND ABUSE. (3 cr, §Hlth 5400; prereq education sr, licensed teacher, school nurse or #) Staff
Basic information on alcohol and other drugs and chemicals with emphasis on curriculum concepts, teaching methodology, materials, and referral procedures appropriate for elementary, junior, and senior high schools.

5033. FUNDAMENTALS OF ALCOHOL AND DRUG PROBLEMS. (3 cr, §HSU 5033) Kincannon, Rothenberger
Lectures, discussions, readings on scientific, sociocultural, and attitudinal aspects of alcohol and other drug abuse problems emphasizing incidence, prevalence, high risk populations, prevention, and intervention.

5034. TOPICS IN ALCOHOL AND DRUG PROBLEMS. (Cr ar; prereq advance proposal, #)
Selected readings and discussions. Individualized, directed instruction.

5035. CONTRIBUTORS TO ALCOHOL AND DRUG PROBLEMS. (3 cr, §HSU 5035) Kincannon
Lectures and readings to enable health professionals to understand the various pharmacological, genetic, behavioral, psychological, sociological, and cultural contributors to drug problems. Theories of drug problem causation.

5036. GROUP COUNSELING IN CHEMICAL DEPENDENCY. (3 cr; prereq #)
Lecture and group discussion and/or exercise to enhance communication skills that will enable students to better facilitate and participate in group counseling activities.

5037. SEMINAR IN PREVENTION OF ALCOHOL AND DRUG PROBLEMS. (3 cr, §HSU 5037; prereq 5035 or #) Kincannon
Discussions to help health professionals contribute to the prevention of various pharmacological, genetic, behavioral, psychological, sociological, and cultural contributors to drug problems.

5038. COMMUNICATION SKILLS DEVELOPMENT FOR HELPING PROFESSIONALS. (Cr ar; prereq #) Seppala
Combines theoretical and practical aspects of communications and group dynamics with emphasis on verbal, nonverbal, and group process skill development. Includes films, exercises, and small group discussions designed to explore how feelings, attitudes, values, conflict, and interpersonal dynamics relate to the development of trust, self-awareness, active listening, sharing, and understanding peer pressures.

5039. ALCOHOL AND DRUG PROBLEMS: ASSESSMENT AND RESPONSE. (3 cr, §HSU 5039; prereq 5033 or #) Kincannon
Lectures and readings to enable health professionals to assess and make appropriate response to most common alcohol and other drug-related problems. Screening, referral, description of ideal resources and areas of controversy.

5040. DYING AND DEATH IN CONTEMPORARY SOCIETY. (3 cr, §Hlth 5402, §Mort 5040, §HSU 5040; prereq health science major, public health grad student, education sr, certified teacher, mortuary science major or #) Slate, Rothenberger, Svendson
Concepts of health and disease. Psychosocial and cultural factors related to health. Educational strategies affecting behavior and their application to the individual and community. Recent approaches to and intervention points and strategies for promoting health and preventing disease.

5053. COMMUNICATION IN HEALTH EDUCATION. (3 cr; prereq health education student) Veninga
Role of communication in health education practice. Communication models applicable to health education practice; process skills in analyzing small group behavior; role of mass communication in health education programs.

5054. FOUNDATIONS OF PUBLIC HEALTH EDUCATION. (3 cr; prereq grad student in health sciences or #) Staff
Social, behavioral, and educational diagnosis of morbidity and mortality problems. Major research relating behavior to positive or negative outcomes in health. History of health education. Ethical issues related to planned change. Applications of health education to contemporary health problems.

5055. HEALTH EDUCATION METHODS AND THE CURRENT EMPHASIS ON HEALTH AND WELLNESS. (3 cr; prereq grad student in health sciences or #) Staff
Concepts of health and disease. Psychosocial and cultural factors related to health. Educational strategies affecting behavior and their application to the individual and community. Recent approaches to and intervention points and strategies for promoting health and preventing disease.

5056. PLANNING FOR HEALTH-EDUCATIONAL APPROACHES TO CHANGE THROUGH PLANNING. (3 cr; prereq 5055, grad student in health sciences or #)
Elements of comprehensive health/health education planning; theory, process, models for educational planning; fact-finding procedures and models; setting behavioral, content, and methodological objectives; theories, principles, and procedures for evaluating health services and their educational components.

5057. HEALTH EDUCATION ISSUES ARISING FROM PLANNED AND UNPLANNED SOCIETAL CHANGE. (3 cr; prereq 5055, grad student in health sciences or #) Staff
Analysis of major processes of change in society. Planned and unplanned change. Change based on social action vs. environmental and technological change. Implications of population changes and ecological adjustments of individuals and communities for health education.

5058. SEMINAR: RESEARCH METHODS AND EVALUATION IN HEALTH EDUCATION. (2 or 3 cr; prereq #)
Analysis of selected research applicable to health education with attention to experimental and quasi-experimental designs. Methodologies used in the behavioral sciences. Models of evaluation applied to health education, and relationship of evaluation to planning and to research.

5059. INTERPERSONAL BEHAVIOR IN HEALTH ORGANIZATIONS. (4 cr, §HSU 5010) Gordon, Veninga
Application of research and theory from the social sciences to organizational problems in hospitals and public health agencies. Focus on organizational behavior and what health professionals can do to improve organizational performance. Leadership behavior, conflict resolution strategies, committee effectiveness, and management of change.

5060. HEALTH OPTIONS FOR THE INDIVIDUAL AND THE COMMUNITY. (2 cr; prereq # if undergrad student) Hakanson
Role and function of health education as an integral part of health programs and services; basic principles and procedures for health education planning and evaluation; methods, materials, and techniques for community health education.

5061. BEHAVIORAL COMPONENTS OF HEALTH PROBLEMS—PROCESSES OF DIAGNOSIS AND CHANGE. (2 or 3 cr; prereq grad or health sciences student or #) Staff
Current research relating behavior to health and disease. Concepts in health education and their applications in local and national public health programs. Significant developments in health education in the last decade.

5062. ORGANIZATION DEVELOPMENT AND CHANGE: APPLICATIONS TO PUBLIC HEALTH AGENCIES. (3 cr; prereq grad student in health sciences) Veninga
Methods to improve employee productivity and morale in public health agencies. Review of current research in organizational development and application of knowledge to human service agencies. Topics include strategies of planned organizational change (Beckhard), leadership and change (Blake), process consultation (Schein), and methods to evaluate organizational development (Likert).

5063. PATIENT EDUCATION IN REPRESENTATIVE HEALTH CARE SETTINGS. (3 cr; prereq #)
Current theories, principles, methods, procedures, and techniques applicable to patient education in a variety of health care settings, i.e. hospitals, health maintenance organizations, clinics, and health agency services. Planning, implementation, and evaluation of patient education.

5064. THE TEACHING-LEARNING PROCESS IN THE HEALTH CARE SETTING. (3 cr, §HSU 5011; prereq #)
Lectures, group discussions, written assignments, and projects dealing with practices of various disciplines; individualized work to meet professional needs of the student.

5065. HEALTH IN THE WORKPLACE: A HEALTH EDUCATION PERSPECTIVE. (3 cr; prereq #) Veninga, McJilton
Relationship of work and health. Relationship of work to onset of disease, effects of stress (information overload and underload, shift work, role conflict, quality control mechanisms) on employee health. Health education programs designed to prevent occupationally related illnesses.

5080. INTERNSHIP IN PATIENT EDUCATION STUDIES. (Cr ar; prereq health education student)
One quarter of full-time supervised health education internship in a health or medical care setting with emphasis on patient education.

5081. INTERNSHIP IN FAMILY AND COMMUNITY STUDIES. (Cr ar; prereq health education student) Needle
One quarter of full-time supervised health education internship in community and family settings.

5082. INTERNSHIP IN OCCUPATIONAL HEALTH STUDIES. (Cr ar; prereq health education student) Veninga
One quarter of full-time supervised health education internship in a workplace and/or in occupational health.

5083. INTERNSHIP IN HEALTH POLICIES AND PLANNING. (Cr ar; prereq health education student)
One quarter of full-time supervised health education internship in educational aspects of health planning and/or health policy development.

5089. COMMUNITY HEALTH EDUCATION LABORATORY. (Cr ar; prereq health education student) Veninga
Practical experience in community agencies and organizations; background studies in specific health service areas; supervised health education practice; action planning for health education.

5090.* RESEARCH TOPICS IN HEALTH EDUCATION. (4-8 cr; prereq health education student) Veninga
Development of a scholarly review of health education research and experience in a selected area.

5091. SEMINAR: HEALTH EDUCATION IN MEDICAL CARE SETTING. (4 cr; prereq health education student)
In-depth review with practitioners and faculty members of current practice and problems. Restricted to students specializing in this area.

5092. SEMINAR: HEALTH EDUCATION IN FAMILY AND COMMUNITY. (4 cr; prereq health education student) Needle
In-depth examination of role of family and community in forming health and disease patterns, and possible intervention strategies. Restricted to students specializing in this area.

5093. SEMINAR; HEALTH EDUCATION IN THE WORKPLACE. (4 cr; prereq health education student) Veninga
In-depth analysis of current practice and future directions of job-related education to improve health behavior. Restricted to students majoring in this area.

5094. SEMINAR: EDUCATIONAL APPROACHES TO HEALTH POLICY AND PLANNING. (4 cr; prereq health education student) Mills
In-depth analysis by practitioners, students, and faculty of current and potential practice. Restricted to students specializing in this area.

5095. ADVANCED SEMINAR IN HEALTH EDUCATION I. (2 cr; prereq health education student) Staff
Current research in health and education related to the profession of health education. Site visits and data analysis where applicable.

5096. TOPICS: RESEARCH. (Cr ar; prereq health education major)
Original research or secondary analysis of data sets related to health education.

5097. TOPICS: SELECTED READINGS. (Cr ar; prereq grad student in health sciences)
Study of a topic in health education not covered in available courses.

5098. TOPICS: SELECTED READINGS. (Cr ar; prereq #)
Selected readings in health education for non-health-science majors, both graduate and undergraduate.

5099. ADVANCED SEMINAR IN HEALTH EDUCATION II. (2 cr; prereq 5095 and health education student) Staff
Current research in health and education related to the profession of health education. Site visits and data analysis where applicable.

5150. TOPICS IN ENVIRONMENTAL HEALTH. (Cr ar; prereq #) Staff
Selected readings and discussions of problems in environmental health.

5152. ENVIRONMENTAL HEALTH. (2 cr) Vesley
General principles of environmental health relating to macro and micro environments and products consumed or used by people.

5156. ENVIRONMENTAL HEALTH I. (2 cr; prereq environmental health student or #) Staff
Biological, chemical, and physical aspects of both natural and artificially produced environments. Mechanisms by which environmental components reach and affect people.

5157. ENVIRONMENTAL HEALTH II. (2 cr; prereq environmental health student or #) Staff
Environmental health prevention and control strategies, measurements, monitoring, surveillance, dose-response relationships, and remedial actions.

5159. SEMINAR: ENVIRONMENTAL HEALTH. (Cr ar; prereq environmental health student or #) Staff

5161. ADMINISTRATION OF ENVIRONMENTAL HEALTH PROGRAMS. (3 cr; prereq environmental health student or #)
Administrative organization of environmental health activities.

5169. SEMINAR: ENVIRONMENTAL HEALTH ADMINISTRATION. (Cr ar; prereq #)

5170. TOPICS IN ENVIRONMENTAL BIOLOGY. (Cr ar; prereq #) Staff
Selected readings in environmental biology with discussion of control techniques.

5171. ENVIRONMENTAL MICROBIOLOGY. (3 cr; prereq MicB 3103 or #) Greene, Vesley, Ruschmeyer
Survival, dissemination, transportation, and significance of microorganisms in the environment; application of principles to environmental health problems.

5172. ENVIRONMENTAL MICROBIOLOGY LABORATORY. (2 cr; prereq 5171, #) Greene, Vesley
Laboratory and field exercises in microbiological sampling, detection, enumeration, and control.

5177. PUBLIC HEALTH BIOLOGY. (3 cr; prereq environmental health student or #) Ruschmeyer
Introduction to plant and animal forms important in environmental health; biological aspects of water supply, waste treatment, stream and special phenomena related to human disease transmission.

5180. TOPICS IN AIR POLLUTION. (Cr ar; prereq #) Staff
Selected readings in air pollution with discussion based on these readings.

5181. INTRODUCTION TO THE AIR POLLUTION PROBLEM. (3 cr)
History, sources, controls, effects, surveys, legal aspects; administration of programs.

5182. AIR POLLUTION CONTROLS AND SURVEYS. (3 cr; prereq 5181 or #)
Public health engineering approach to air pollution controls and surveys.

5183. PROBLEMS OF AIR POLLUTION CONTROL. (Cr ar; prereq 5181, #)
Special supervised studies involving laboratory and field investigation procedures; review of pertinent literature.

5184. AIR ANALYSIS I. (3 cr; prereq 5181, 5183 or 5211, #) McJilton and staff
Laboratory and field exercises involving air flow calibration, dynamic calibration of field equipment for analysis of air contaminants, respirable mass sampling, dust counting and sizing, and instrumentation for measuring physical environment stresses.

5185. AIR ANALYSIS II. (3 cr; prereq 5184, #) McJilton and staff
Laboratory and field exercises involving sampling and analysis techniques for stack sampling and for ambient air monitoring. Group surveys of air pollution problems and special projects.

5190. TOPICS: INJURY CONTROL. (Cr ar; prereq #) Staff
Directed readings and reports on selected problem areas in injury control.

5193. CHEMICAL LABORATORY SAFETY. (1 cr)
Principles of accident and fire prevention in chemical laboratories.

5194. OCCUPATIONAL SAFETY. (2 cr)
Occupational safety procedures, environmental controls to reduce injuries on and off the job, safety program development and administration.

5200. TOPICS IN RADIOLOGICAL HEALTH. (Cr ar; prereq #) Staff
Selected readings in radiological health with discussion based on these readings.

5201. MEASUREMENT AND APPLICATION OF IONIZING RADIATION. (3 cr [lect and lab], 2 cr [lect only]) Barber
Introduction to principles of measurement and use of radiative sources; emphasis on health hazards.

5202. ENVIRONMENTAL RADIOACTIVITY. (2 or 3 cr; prereq 5201 or #) Barber
Sources, measurement, evaluation, and control of environmental radioactivity; hazards to general population.

5207. RADIATION PROTECTION CRITERIA FOR HOSPITALS. (2 cr) Barber, Wollan
Applied procedures and methods for control of ionizing radiation exposure; emphasis on design, surveys, and evaluation of X-ray facilities and radioisotope laboratories.

5209. SEMINAR: HEALTH PHYSICS. (1 cr) Barber
Review and discussion of current health physics problems.

5210. TOPICS IN OCCUPATIONAL HEALTH. (Cr ar; prereq #) Staff
Selected readings in occupational health with discussion based on these readings.

5211. INDUSTRIAL HYGIENE ENGINEERING. (3 cr) McJilton
Concepts and techniques used in occupational health; emphasis on evaluation of potential hazards and preventive techniques.

5212. VENTILATION CONTROL OF ENVIRONMENTAL HAZARDS. (3 cr; prereq 5211, #) McJilton
Theory and application of exhaust ventilation in control of airborne environmental hazards; principles of exhaust hoods, air moving devices, gas cleaning devices; demonstration of measurement techniques; relationship of hazard and process to ventilation design criteria.

5214. AGRICULTURAL OCCUPATIONAL HEALTH. (3 cr; prereq 5211 or #) McJilton
Occupational health problems of agricultural workers; practical and available preventive measures; educational and administrative needs.

5215. APPLIED OCCUPATIONAL TOXICOLOGY. (3 cr; prereq #) Stevens
Application of basic toxicological principles to the work environment; health hazard evaluations; product labeling; regulation of toxic chemicals.

5218. FIELD PROBLEMS IN OCCUPATIONAL HEALTH. (3 cr; prereq 5211, 5212, #) McJilton
Guided evaluation of potential occupational health problems; recommendations and design criteria for correction if indicated.

5219. SEMINAR: OCCUPATIONAL HEALTH. (1 cr; prereq occupational health student, #) Johnson, McJilton, Richard
Interdisciplinary discussions of current occupational health issues.

5220. TOPICS IN FOOD SANITATION. (Cr ar; prereq #) Staff
Review of literature and practice to identify association of food sanitation problems with public health.

5221. INSTITUTIONAL FOOD PROTECTION PROGRAMS. (3 cr) Jopke
Basic principles of food hygiene; development of educational program for food service workers; health aspects of regulatory control for public health agencies.

5222. FOOD SANITATION. (3 cr) Jopke
Review of current literature on sanitary problems in production, processing, and distribution of milk, meat, shellfish, and other foods; methods of supervision.

5230. TOPICS IN INSTITUTIONAL ENVIRONMENTAL HEALTH. (Cr ar; prereq #) Staff
Review of literature and practice to identify institutional environmental health problems.

5231. ENVIRONMENTAL HEALTH AND SAFETY IN HEALTH CARE FACILITIES I. (4 cr; prereq #) Greene
Environmental health concepts and problems related to isolation techniques; cleaning, disinfection, and sterilization; laundry processes; food service; critical care environments; physical plants; interdepartmental relationships.

5232. ENVIRONMENTAL HEALTH AND SAFETY IN HEALTH CARE FACILITIES II. (4 cr; prereq #) DeRoos
Ventilation; water supply; plumbing; solid and liquid waste systems; and other environmental engineering problems.

5233. BIOHAZARD CONTROL IN BIOMEDICAL LABORATORIES. (2 cr; prereq #) Vesley
Topics include assessment of risk, primary barriers, laboratory design criteria, safety devices and equipment, personnel practices, sterilization and disinfection, laboratory animals, and shipping and disposal of biohazardous agents.

5240. TOPICS IN WATER HYGIENE. (Cr ar; prereq #) Staff
Selected readings and discussions of problems relating to health aspects of water supply and wastewater systems.

5241. ENVIRONMENTAL HEALTH ASPECTS OF WATER SUPPLY. (3 cr) Straub, Singer
Role of water in human health; physical, chemical, and biological characteristics; evaluation of source, treatment, and distribution systems.

5242. ENVIRONMENTAL HEALTH ASPECTS OF GROUNDWATER SYSTEMS. (2 cr) Singer
Groundwater geology, quality, and treatment; well design, construction, and maintenance; special references to public and environmental health problems.

5244. ENVIRONMENTAL HEALTH ASPECTS OF WASTEWATER SYSTEMS. (3 cr) Straub, Singer
Role of liquid wastes in human health; physical, chemical, and biological characteristics; evaluation of source, treatment, and disposal facilities.

5246. MICROBIOLOGY OF WATER AND WASTEWATER. (3 cr) Straub and staff
Basic principles and methods used in identification of indicator and other microorganisms of concern in water and wastewaster.

5247. ENVIRONMENTAL ANALYSES. (3 cr) Goppers, Straub
Basic laboratory procedures used in examination of water and wastewater. Application of methods to water and wastewater treatment processes.

5249. SEMINAR: WATER HYGIENE. (1 cr; prereq #) Straub, Singer
Selected readings from contemporary literature; discussion of current environmental health problems related to water supply and wastewater systems.

5253. INTRODUCTION TO HAZARDOUS WASTE MANAGEMENT. (3 cr) Thompson
Review of roles of public and private sectors as generators, disposers, and regulators of hazardous wastes. Includes definitions, sources, transportation, handling, treatment, recovery, disposal, and public health implications.

5260. TOPICS IN ENVIRONMENTAL AND OCCUPATIONAL TOXICOLOGY. (Cr ar; prereq #) Stevens
Selected readings and discussions of problems related to environmental toxicants.

5261. GENERAL ENVIRONMENTAL TOXICOLOGY. (3 cr) Stevens
Basic toxicologic principles; applications to environmental and occupational settings; introduction to environmentally related pathophysiologies.

5262. BASIC TOXICOLOGY FOR THE ENVIRONMENTAL SCIENTIST. (3 cr; prereq #) Stevens
Application of basic biochemical, anatomical, and physiological principles to the field of environmental toxicology; experimental design; animal model development; interpretation of acute vs. chronic data.

5263. PATHOPHYSIOLOGY FOR THE ENVIRONMENTAL SCIENTIST. (3 cr; prereq 5262 or #) Stevens, Garry
General mechanisms of environmentally induced tissue injury; compensatory mechanisms and repair processes; acute and chronic pathophysiology; tissue specificity of toxic agents; mutagenesis; teratogenesis.

5264. ANALYTICAL METHODS IN ENVIRONMENTAL TOXICOLOGY. (3 cr; prereq 5262 or #) Stevens, Goppers
Environmental and biological sampling techniques; quantitative analyses; animal model design; laboratory application.

5265. APPLIED ENVIRONMENTAL TOXICOLOGY. (3 cr; prereq #) Stevens
Application of basic toxicologic principles to the general environment; assessment of potential health hazards; approaches to environmental problems; environmental regulation of toxic chemicals.

5269. SEMINAR: ENVIRONMENTAL AND OCCUPATIONAL TOXICOLOGY. (1 cr; prereq #) Stevens
Procurement and evaluation of scientific literature; report writing; classroom presentations.

5300. COMPARATIVE MEDICINE AND PUBLIC HEALTH. (2 cr; prereq #)
Survey of comparative medicine in human relationship to biologic environment, interrelationship between animal and human health; sources of animal diseases; ecology of zoonoses: food production and hygiene; laboratory animal medicine.

5303. PERSPECTIVES: ANIMAL-HUMAN RELATIONSHIPS AND COMMUNITY HEALTH. (2 cr)
The interrelationships of people and animals sharing a common environment and the effects these relationships have on individual, family, and community health. Encourages constructive examination of social, behavioral, and ethical factors affecting these interrelationships.

5304. PERSPECTIVES: ANIMAL-HUMAN RELATIONSHIPS AND COMMUNITY HEALTH LABORATORY. (1 cr)
Applied laboratory to analyze and discuss problems associated with interactions of animals and people as they relate to community health. Students help develop solutions to these problems.

5306. ANIMAL MODELS OF HUMAN DISEASE. (3 cr; prereq DVM or #)
Selected animal models of human disease; principles involved in developing criteria for meaningful and appropriate use; methods for evaluation of experimental design and objectives of users; criteria for identification of additional models for comparative medical research.

5310. DISEASES TRANSMITTED BETWEEN ANIMALS. (4 cr; prereq DVM or #)
Selected diseases transmitted between animals and humans with emphasis on diagnostic problems, epidemiology, prevention, control, and evaluation.

5315. PROBLEMS IN DISEASE CONTROL AND ERADICATION. (Cr ar; prereq 5330 or #)
Past and present disease control and eradication programs and factors influencing degree of success and failure. Students will develop models for proposed disease control and eradication programs in the United States or a foreign country for group evaluation and analysis.

5317. PROBLEMS IN VETERINARY MEDICAL ADMINISTRATION AND SUPERVISION. (3 cr; prereq DVM or #)
Case studies of selected problems with emphasis on application of knowledge to problem solving, developing and using appropriate skills, evaluation, decision making.

5320. MEAT HYGIENE RELATED TO THE CONSUMER. (3 cr)
Consumer's role in protecting wholesomeness of meat from time of purchase by the consumer through transportation, storage, preparation, and consumption. What the consumer should expect when purchasing meat in terms of industry and government responsibility for wholesomeness and freedom from adulteration. Examples of problems encountered and suggestions to aid consumers.

5323. CHEMICAL DRUG ASPECTS OF MEAT HYGIENE. (3 cr; prereq DVM or #)
Factors leading to drug residues in food-producing animals; residue detection; criteria for determination of tolerance and action levels by government agencies; harmful effects of drug residues in relation to human health.

5326. RESEARCH IN ANIMAL/HUMAN HEALTH. (Cr ar; prereq DVM or #)
Research in animal health as related to human health.

5330.* EPIDEMIOLOGY I. (5 cr; prereq course in microbiology and a 3-cr course in biostatistics or #) Schuman, Anderson, Mandel
Basic concepts and mechanisms of production of infectious and noninfectious disease and maintenance of the health state; basic epidemiologic principles applicable to infectious and noninfectious disease; host-agent-environment complex; factors underlying spread of infectious disease; laboratory applications of statistical and epidemiologic methods.

5331. FUNDAMENTALS OF BIOSTATISTICS. (3 cr) Visiting lecturers
Rates, probability methods, statistical inference, sampling distributions.

5332. FUNDAMENTALS OF EPIDEMIOLOGY. (3 cr) Visiting lecturers
Basic epidemiologic concepts and methods of investigation of diseases.

5333. BIOLOGICAL BASES AND EPIDEMIOLOGY OF HEALTH AND DISEASE. (4 cr; prereq course in microbiology, a 3-cr course in biostatistics or #) Mandel, Anderson
Introduction to basic concepts and mechanisms of infectious and noninfectious diseases, maintenance of the healthy state, and principles of epidemiology illustrative of the factors leading to the rise and fall of disease in populations. Laboratory application of statistical and epidemiologic methods.

5335.* EPIDEMIOLOGY II. (3 cr; prereq 5330) Schuman
Extension of epidemiologic principles to detailed study of selected infectious diseases.

5336. INFECTIOUS DISEASE EPIDEMIOLOGY. (3 cr; prereq basic epidemiology and biostatistics) Visiting lecturers
Factors involved in epidemic occurrence; clinical response to infection; impact on humans of zoonoses; immunologic responses; vaccine evaluation.

5337. SEROLOGIC EPIDEMIOLOGY. (3 cr; prereq basic epidemiology and biostatistics) Visiting lecturers
Applications of immunologic and biochemical methods to epidemiologic problems of disease.

5338. HOSPITAL EPIDEMIOLOGY AND INFECTION CONTROL. (2 cr; prereq basic epidemiology) Visiting lecturers
Application of epidemiologic methods to investigation and control of hospital risk (infections, drug reactions, accidents, excess costs). Review of opportunities for collection and use of hospital data for patient care evaluation in the context of current regulatory efforts.

5339. EPIDEMIOLOGY OF DISEASES DUE TO DRUGS AND OTHER THERAPIES. (2 cr; prereq basic epidemiology and biostatistics) Visiting lecturers
Methods of monitoring, detecting, and investigating diseases and reactions due to medical therapies; specific examples of epidemiologic investigations. Use of intensive hospital monitoring, vital statistics, and drug utilization data in detection and control of adverse drug reactions. Analyses and discussion of case-control and cohort investigations of adverse reactions due to oral contraceptives, hormones, other drugs, surgical and diagnostic techniques.

5340. EPIDEMIOLOGY: STRATEGIES AND METHODS. (3 cr; prereq 5330, 5413 and 5414 or equiv, #) Mandel
Measures of disease occurrence, and strategies and design principles of etiologic and evaluative studies. Measurement problems, interactions, sensitivity and precision, validity and the need for data specification and control of variables.

5341. HEALTH SURVEY METHODS. (2 cr; prereq basic epidemiology and biostatistics) Visiting lecturers
Problems of sampling, sample size determination, interview, questionnaire development, and organization of community health research.

5342. PUBLIC HEALTH BACTERIOLOGY. (Cr ar; prereq MicB 5216, 5232, 5234, #) Stickles
Bacteriologic and serologic diagnosis, public health laboratory administration and methods.

5343. SURVEILLANCE AND CONTROL OF COMMUNICABLE DISEASES. (3 cr; prereq basic epidemiology and biostatistics) Visiting lecturers
Public health aspects of communicable diseases of importance in the United States. Emphasis on surveillance and control of reportable diseases transmitted from person to person, arthropod vectors, lower animals, and other common sources. Characteristics of agents, reservoir mechanisms, modes of transmission, immunologic aspects, and environmental control.

5344. CLINICAL TRIALS—DESIGN, OPERATION, AND ANALYSIS. (2 cr; prereq basic epidemiology and biostatistics) Kjelsberg
For physicians, statisticians, epidemiologists, and others with little or no previous experience in the conduct of clinical trials. Characteristics influencing design of preventive, intervention, therapeutic, and surgical trials; organization of collaborative studies. Techniques for randomization, sample size determination, and data quality control. Statistical analysis illustrated by case examples.

5345. EPIDEMIOLOGY OF CANCER. (3 cr; prereq basic epidemiology and biostatistics, 5357 or ¶5357) Visiting lecturers
Epidemiology of selected cancer sites. Emphasis on existing gaps in knowledge.

5346. EPIDEMIOLOGY OF CARDIOVASCULAR DISEASES. (3 cr; prereq basic epidemiology, biostatistics, 5357 or ¶5357) Visiting lecturers
Epidemiologic aspects of various types of cardiovascular disease with emphasis on multivariate settings of etiologies.

5347. EPIDEMIOLOGY OF MENTAL DISORDERS. (2 cr; prereq basic epidemiology and biostatistics) Visiting lecturers
Application of epidemiologic concepts and methods to psychiatric problems. Specific mental disorders.

5348. EPIDEMIOLOGY OF NEUROLOGIC DISEASES. (2 cr; prereq basic epidemiology and biostatistics) Visiting lecturers
Epidemiologic approach to selected diseases of the nervous system including multiple sclerosis, Parkinsonism, cerebrovascular diseases, malignant diseases, and congenital deformities of the central nervous system.

5349.* EPIDEMIOLOGY OF CHRONIC RESPIRATORY DISEASE. (Cr ar; prereq #) Visiting lecturers
Critical review of current status of chronic respiratory disease epidemiology and methods. Design and analysis of longitudinal studies.

5350. EPIDEMIOLOGIC BASIS FOR HEALTH SERVICES PLANNING AND EVALUATION. (2 cr; prereq 5330, 5332 or equiv, 5331 or equiv) Visiting lecturers
Epidemiologic approaches to planning and criteria of evaluation.

5352. EPIDEMIOLOGIC METHODS IN NUTRITION. (2 cr; prereq 5330, 5333 or #) McLaughlin, Wannamaker
Evaluation from the epidemiologic point of view of survey techniques used in large scale nutritional research. Review of methodological advantages and disadvantages of major survey instruments; 24-hour recall, food frequency, and dietary record. Review of study design and analysis in evaluation of dietary hypotheses in etiologic studies.

5353. EPIDEMIOLOGY OF NUTRITIONAL DISEASES AND ABNORMALITIES. (3 cr; prereq basic epidemiology and biostatistics) Visiting lecturers
Concepts of the influence of nutritional status on health and disease. Methodologies for assessment of nutrition and relationship of nutrition to major disease problems.

5354su. ENVIRONMENTAL EPIDEMIOLOGY. (2 cr; prereq basic epidemiology and biostatistics) Visiting lecturers
Epidemiologic evaluation of potential health effects arising from community-wide nonoccupational environmental exposures. Data from recent studies regarding chemical wastes, radiation exposure, and natural disasters. Practical field approaches to conducting epidemiologic investigations in settings of great community concern. Both acute and chronic health effects; emphasis on dose-response relationships, latency, and multiple causation of disease.

5355. GENETICS AND EPIDEMIOLOGY. (3 cr; prereq basic epidemiology and biostatistics) Visiting lecturers
Genetic methods of evaluating families; topics in population genetics.

5356. POPULATION DYNAMICS. (2 cr; prereq basic epidemiology and biostatistics) Visiting lecturers
Historical and current levels and changes in rates of population growth, mortality, natality, migration.

5357. SELECTED STATISTICAL TOPICS IN EPIDEMIOLOGY. (3 cr; prereq basic epidemiology and biostatistics) Visiting lecturers
Rate adjustment, relative risk, measures of association, matched pair analyses, force of mortality, and estimation of survivorship.

5358. RADIATION EPIDEMIOLOGY. (2 cr; prereq basic epidemiology, biostatistics, advanced statistics) Visiting lecturers
Critical review of epidemiological studies of biological effects of radiation exposure on human beings. Emphasis on methodological problems encountered.

5359su. EPIDEMIOLOGY OF OCCUPATIONAL HAZARDS. (3 cr; prereq basic epidemiology and biostatistics) Visiting lecturers
Epidemiologic approaches to occupational hazards. Selected disease examples.

5360. EPIDEMIOLOGY OF INJURIES. (2 cr; prereq basic epidemiology and biostatistics) Visiting lecturers
Characteristics of accidents, homicide, suicide, and disasters, and application of epidemiologic principles to their control.

5361. EPIDEMIOLOGIC METHODS IN ORAL DISEASE RESEARCH. (3 cr; prereq regis dental public health) Katz
Application of the concepts, principles, and practices of epidemiology to oral diseases. Topics include dental caries, periodontal disease, oral cancer, oral malformations, and occupational diseases. Emphasis on how research designs and methods combine with statistical analysis and common sense can be applied to produce valid interpretation of data.

5362. EPIDEMIOLOGY OF OCCUPATIONAL HAZARDS. (3 cr; prereq 5330 and 5413-5414 or 5450-5451 or equiv, #) Lectures, seminars, current literature review, exercises, and discussions. Epidemiologic methods used to study effects of the work environment on health. Review of existing scientific evidence on established associations between specific occupational exposures and disease. Basic policy concerns such as establishing long-term surveillance systems and instituting preventive measures in the work environment.

5363. ENVIRONMENTAL EPIDEMIOLOGY. (3 cr; prereq basic epidemiology and biostatistics or #) Staff
Effects of pollutants in the ambient environment on human health; includes air pollution, radiation, and toxic substances. Health hazards relating to the domestic environment. Methodology of ecological correlation, cross-sectional, and time-series studies in epidemiology.

5364. EPIDEMIOLOGY IN SOCIETAL DECISION MAKING. (3 cr; prereq 5362 or 5363 or #) Staff
Use of epidemiologic and experimental results in the quantitative estimation of effects on human health of alternative strategies of energy production, regulation of ambient and occupational pollutants, policies relating to consumer products, and other societal decisions regarding engineering and industry, agriculture, transport, and the domestic environment. Methodological aspects of health effects modeling and risk assessment in epidemiology.

5365. EXPERIMENTAL EPIDEMIOLOGY. (Cr ar; prereq 5335 and 5450 or equiv and #) Anderson, Diesch
Infectious and noninfectious diseases in laboratory animal populations and simulated environmental conditions; effect of alterations in agent-host-environment on health and disease under varying controlled experimental conditions measured and evaluated. Results analyzed in terms of application to disease prevention and control programs.

5370. APPLIED EPIDEMIOLOGY. (Cr ar; prereq 5330 and 5450 or equiv and #) Anderson, Diesch
Application of epidemiologic principles and methods in field studies of outbreaks of disease in cooperation with veterinary medical practitioners, state Livestock Sanitary Board, USDA, Minnesota Department of Health, and HHS. Application of principles and methods of planning investigations; collection and analysis of data for proposed prospective and retrospective studies of acute and chronic diseases of animals; analysis and evaluation of field investigations and factors influencing their outcome.

5375. BIOLOGICAL BASES OF HEALTH AND DISEASE. (3 cr; prereq course in microbiology or #) Schuman
Introduction to basic concepts and mechanisms of infectious and noninfectious disease, and maintenance of the healthy state. Specific diseases used as samples or models.

5378. DEVELOPMENT OF AND PERSPECTIVES IN EPIDEMIOLOGY. (2 cr; prereq basic epidemiology and biostatistics) Visiting lecturers
Historical development of epidemiological concepts and methods presented in seminar-lecture form. Potential for use of these concepts and methods in a broad variety of applications. Interrelationships of past and future developments with those in other disciplines such as statistics, genetics, and sociology.

5379.* TOPICS IN EPIDEMIOLOGY. (Cr ar; prereq #) Staff
Selected readings with discussion based on these readings.

5380. APPLIED HUMAN NUTRITION. (5 cr; prereq biochemistry or #) Leon
Food composition and functions; bioenergetics; assessment of nutritional adequacy in individuals and populations; protein-calorie insufficiency; food-drug interactions; food additives; management of obesity; importance of food fiber; nutrition and dental health; relationship of diet to blood lipids, coronary heart disease, diabetes, and cancer; health benefits of exercise.

5385. PHYSIOLOGY OF EXERCISE. (Cr ar; prereq Phsl 5101 or equiv and #) Leon, Taylor
Effects of exercise conditioning and deconditioning on body composition, metabolism, and function.

5386. PUBLIC HEALTH ASPECTS OF CARDIOVASCULAR DISEASES. (3 cr; prereq basic epidemiology and biostatistics) Blackburn, Gillum, and staff
Evaluation of population studies and trials on cardiovascular diseases; modifiable risk factors for coronary heart disease; prevention of other types of heart diseases.

5387. DETECTION OF CORONARY HEART DISEASE. (4 cr, §PE 5387; prereq introductory course in anatomy and physiology, #) Crow, Leon, Prineas, Serfass
Coronary circulation; pathophysiology of atherosclerosis; clinical manifestations of coronary heart disease; relationship of exercise physiology to coronary heart disease; blood pressure determination; resting and exercise ECG interpretation.

5388. EXERCISE TESTING, CONDITIONING, AND REHABILITATION. (4 cr, §PE 5388; prereq 5387) Crow, Leon, Serfass
Exercise testing, prescription and programs for healthy adults, and rehabilitation of cardiac myocardial patients; cardiopulmonary resuscitation.

5389. PRACTICUM: EXERCISE TESTING; PRESCRIPTION, CONDITIONING, REHABILITATION. (2-6 cr, §PE 5389; prereq 5387, 5388) Crow, Leon, Serfass
Participation in exercise testing, conditioning, rehabilitation, and/or coronary risk factor modification programs.

5396. EXERCISE PHYSIOLOGY AND PREVENTIVE MEDICINE. (3 cr) Leon
Health awareness and effects of a life-style of exercise on the human cardiovascular, muscular, and respiratory systems.

5400. INTRODUCTION TO QUANTITATIVE METHODS IN THE HEALTH AND LIFE SCIENCES. (4 cr; for students majoring in biological and health sciences; prereq Biol 1011, Chem 1004-1005, Math 1231 or equiv, #) McHugh
Basic quantitative methods for design and analysis of clinical and laboratory studies in biology and health sciences.

5403. COMPUTER APPLICATIONS IN HEALTH SERVICES ADMINISTRATION. (4 cr; prereq non-biometry major, health science regis or #) Gatewood
Survey of current applications of digital computers for health services, clinical algorithms, and health-related information systems. Costs, benefits, and interrelationships among data acquisition, reduction, storage, interpretation, and dissemination for health services. Administration needs for planning, personnel, backup, and evaluation stressed. Applications illustrated through the use of BASIC computing language and package computer programs.

5404. INTRODUCTION TO BIOSTATISTICS AND STATISTICAL DECISION. (4 cr) Weckwerth
Variation; frequency distribution; probability; significance tests; estimation; trends; data handling; simple operations research applications. Statistical approach to rational administrative decision making. Lectures and laboratory.

5408. BIOMETRIC METHODS II. (3 cr; prereq 5414 with grade of B or #) Le
Demographic techniques and statistical inference.

5409-5410. BIOMETRY IN CLINICAL STUDIES I, II. (3 cr per qtr; prereq DDS, MD, DVM, PharmD, clinical nursing student or #) Staff
Introduction to numerical and graphical treatment of data from dental, medical, and veterinary research. Examples taken from recent literature. Design, conduct, and analysis of clinical studies. Validity and reliability of measurements and calibration studies for clinical settings. Evaluation of presentation, analysis, and interpretation of data in the clinical literature.

5413. VITAL AND HEALTH STATISTICS. (1 cr) Kjelsberg
Morbidity, mortality, fertility, health personnel and facilities, data sources; demographic characteristics and projections; rates; adjustment of rates; federal-state-local statistical programs.

5414. BIOMETRIC METHODS I. (3 cr; prereq public health regis or #) Staff
Basic quantitative methods for public health students including descriptive statistics; graphic methods; measures of variation; estimation concepts and procedures; random sampling; confidence intervals for means and proportions; t and chi-square tests of significance.

5430. BIOMEDICAL COMPUTING I. (4 cr; prereq algebra or #) Gatewood, staff
Digital computers and their use in biology and medicine through an interactive programming language such as BASIC. Simple algorithms for data processing and data quality assurance; using and modifying statistical and graphical library programs; elements of conversational programming.

5431. BIOMEDICAL COMPUTING II. (4 cr; prereq 5430 or #) Ellis
Additional health-related applications of digital computers using FORTRAN. Computer organization; magnetic disc and tape file processing; statistical and analysis package programs; sequential and hierarchical file management.

5432. BIOMEDICAL COMPUTING III. (4 cr; prereq 5431 or #) Ellis
Survey of special purpose computer systems and languages useful in the health sciences for computer-aided instruction, information systems, patient monitoring, and continuous and discrete simulation.

5433. COMPUTER METHODOLOGY IN THE DELIVERY OF HEALTH CARE I: PHYSIOLOGICAL MONITORING AND TESTING. (3 cr; prereq 5432 or #)
Role of the computer in monitoring and testing patients; hardware and software requirements for processing clinically significant signals; comparison and evaluation of currently available systems.

5434. COMPUTER METHODOLOGY IN THE DELIVERY OF HEALTH CARE II: INTRODUCTION TO MEDICAL DECISION-MAKING TECHNIQUES. (3 cr; prereq 5432 and 5452 or #)
Introduction to biometrical concepts and techniques that can be used to support the medical decision process, including test efficacy, decision analysis, Bayes theorem, and multivariate analysis. Current studies of the medical problem-solving process, and computer-based medical decision support systems.

5435. COMPUTER METHODOLOGY IN THE DELIVERY OF HEALTH CARE III: HEALTH INFORMATION SYSTEMS. (3 cr; prereq 5432 or #)
Health information systems for inpatient, outpatient and research use, including status of current systems, costs and benefits, and legal/ethical considerations. System 2000 and other data-based management systems for clinical research used for class problems.

5436. ANALYTICAL TECHNIQUES FOR HEALTH DELIVERY SYSTEMS. (3 cr; prereq 5452 and FORTRAN or #) Gatewood
Operations research and systems analysis techniques applied to health service systems. Emphasis on applications of linear programming, theory of queues, and inventory models in health care systems.

5440-5441. QUANTITATIVE PHYSIOLOGY I, II. (3 cr per qtr, §Phsl 3052-3053; prereq 1-yr sequences in mathematics, physics, chemistry, and biology or #)
Diffusion, surface tension, and mechanics of respiration, circulation, digestion, and locomotion. Chemical aspects of blood, respiration, renal function, nutrition, and metabolism. Endocrine, sensory, neuromuscular, and central neural functioning.

5446. BIOCOMPUTING CONSULTING SEMINAR. (3 cr; prereq biometry major, 5432, 5452 or #) Gatewood
Overview of computer hardware, operating systems, languages and program packages for health science applications. Case examples illustrate roles and responsibilities of project manager in analyzing requirements of health science client, designing and specifying computer interfaces, and supervising development, training, documentation, and evaluation for implementation effort.

5450. BIOMETRY I. (3 cr; prereq ¶5451...familiarity with basic concepts of calculus desirable) Jeffries
Basic concepts in probability; binomial, Poisson, and normal probability models for random phenomena in biological and health sciences.

5451. BIOMETRY LABORATORY I. (2 cr; prereq ¶5450) Jeffries
Application of concepts of probability to development of probability models for random phenomena in biological and health sciences.

5452. BIOMETRY II. (3 cr; prereq 5450, ¶5453) Jeffries
Further consideration of testing statistical hypotheses and interval estimation; chi square applied to frequency data; regression analysis; correlation; analysis of variance; contrasts and multiple comparison techniques.

5453. BIOMETRY LABORATORY II. (2 cr; prereq ¶5452) Jeffries
Application of concepts of testing and estimation of parameters of basic probability models; application of chi square to goodness of fit and heterogeneity tests; application of regression to bioassay; application of analysis of variance to bioassay.

5454. BIOMETRY III. (3 cr; prereq 5452, knowledge of SPSS equiv to a UCC short course or #) Goldman
Multiple regression techniques for biological and health sciences data; stepwise selection, examination of residuals, transformations, numerical problems, and the relationship to analysis of variance and covariance. Analysis of several data bases using a statiscal computer package (SPSS).

5455. BIOMETRY LABORATORY III. (2 cr; prereq 5452 or #) Le
Analysis of nested, randomized block, factorial, and split plot designs.

5456. BIOMETRY CONSULTING SEMINAR. (Cr ar; prereq biometry major) Boen and staff
Consultant and client interaction; communication and formulation of the biometric problem. Role and responsibility of the biometrician. Robustness and relevance of frequently used analytical techniques. Internship experiences.

5459. INTRODUCTION TO MATHEMATICAL THEORY IN BIOMETRY. (3 cr per qtr; prereq 5452 or ¶5452, 2 qtrs calculus or #) Jeffries
Generating functions, curve fitting, iterative estimation, tests, propagation of error, and related topics with illustrations from epidemics and population growth, bioassay, clinical trials, demography, and other biohealth science areas.

5460. DEMOGRAPHY AND HEALTH. (3 cr, §Soc 5561; prereq biometry major...others #) McHugh
Demographic parameters of mortality, fertility, morbidity, and migration. Sources of demographic data in censuses, surveys and registration systems. Refinement and adjustment of parameters by factor specification and standardization. Measurement of reproductivity and population change. Generation and current life tables. Stationary and stable population models. Population estimation and projection.

5461. BIOMETRIC TOPICS IN EPIDEMIOLOGY. (3 cr; prereq biometry major...others #) Kjelsberg
Relative risk; summarization of rates; misclassification; matching designs; incidence as a function of several variables; selection; clustering; familial aggregation.

5462. CLINICAL TRIALS AND LIFE TABLE TECHNIQUES. (3 cr; prereq biometry major...others #) Staff
Introduction to methodology of large-scale collaborative clinical trials; case examples; operational aspects of a data center. Elementary life table techniques and application to follow-up studies in medicine and public health.

5470. TOPICS IN BIOMETRY. (Cr ar; prereq #) Staff
Selected readings with discussion based on these readings.

5500. PUBLIC HEALTH—NORMAL GROWTH AND DEVELOPMENT. (4 cr) Pflug, Berkseth
Analysis of selected theories of physical and psychosocial development; emphasis on developmental stages throughout the life span. Administration and interpretation of selected developmental and psychological screening tests. Applications through laboratory exercises and experiences.

5501. PUBLIC HEALTH—MENTAL HEALTH NURSING. (4 cr; prereq public health nursing student) Pflug, Reynolds
Clinically oriented course with emphasis on systems approach to viewing families. Students are expected to develop their own philosophy and theoretical framework based on family intervention theories presented in class and apply theoretical content in clinical situation. Class presentations, seminar discussions, audiotaping, peer review, and student-faculty conferences.

5502. NEEDS ASSESSMENT FOR COMMUNITY HEALTH PROMOTION. (4 cr; prereq grad student, course in research principles or #) Reynolds, Schwanke
Focus on prevention. The community viewed as a system. The process of community or program assessment and development relevant to prevention.

5510. RESEARCH METHODOLOGY IN NURSING. (3 cr) Staff
Selected research studies in nursing; development of models and theory in nursing research; steps in formulating a research design.

5516. ETHICAL DIMENSIONS OF PUBLIC HEALTH NURSING PRACTICE. (1 cr) Aroskar
Ethical issues and dilemmas in public health nursing practice. Examination of ethical concepts, such as justice and utilitarianism, as they relate to practice issues. Legal, political, and economic considerations. Specific issues confronting public health nurses and agencies.

5529. SYNTHESIS SEMINAR: DEVELOPING PHILOSOPHY, FRAMEWORK, GOALS AND OBJECTIVES. (1 cr; prereq public health nursing student or #; S-N only)
Learner planning of the synthesis experience, including framework conceptualization, formulating a philosophy of public health nursing practice, developing goals and objectives for the synthesis experience, and negotiating a site and field mentor relationship.

5530. SYNTHESIS OF ADVANCED PUBLIC HEALTH NURSING II. (2-5 cr; required of public health nursing grad students nearing completion of program; prereq 8530, 2nd-yr public health nursing student) Aroskar
Synthesis and application of theoretical concepts in public health, public health nursing, and subspecialty area. Practicum in education, administration, or consultation with an appropriate preceptor. Seminar promotes integration of theory and experiential learning.

5531. SYNTHESIS OF ADVANCED PUBLIC HEALTH NURSING II. (2-5 cr; required of public health nursing grad students nearing completion of program; prereq 5530, 2nd-yr public health nursing student) Aroskar

5550. NURSING ADMINISTRATION SEMINAR I. (3 cr; prereq student in Projects in Nursing Administration) Danielsen
Analysis of existing frameworks for the practice of nursing administration. Topics include decision-making models, organizational theory, and historical development of nursing administrative practice.

5551. NURSING ADMINISTRATION SEMINAR II. (5 cr; prereq 5550 and student in Projects in Nursing Administration) Danielsen
Application of decision-making models to various types of organizations leading to initial development of individual frameworks for nursing administrative practice.

5552. NURSING ADMINISTRATION SEMINAR III. (5 cr; prereq 5550, 5551, and student in Projects in Nursing Administration) Danielsen
Continued development of individual frameworks for nursing administrative practice with emphasis on practice issues and problems.

5553. NURSING ADMINISTRATION RESIDENCY. (10 cr; prereq 5550, 5551, 5552) Danielsen
Nine months of fieldwork with line responsibility in the nursing service of an approved health care organization. Focuses on solution of nursing administration problems and special projects.

5554. NURSING ADMINISTRATION SEMINAR IV. (3 cr; prereq #) Danielsen
Examination of theories and models relevant to nursing administration using an organizational diagnostic framework. Literature review, discussion and analysis culminating in the development of individual frameworks for practice. Consultants and practicing professionals participate.

5555. RESEARCH METHODS. (3 cr; prereq #) Danielsen
Presentation, discussion, and use of research processes and methodologies to serve as basis for the Plan B research project.

5559. PHYSICAL ASSESSMENT OF CHILDREN: TOOLS. (2 cr; prereq 5500 or #)
Introduction to physical assessment of children from birth through adolescence. Focuses on the use of POHR format, health histories, and physical examination techniques.

5560. AMBULATORY CHILD HEALTH CARE: CLINICAL I. (3 cr; prereq student in Projects in Nursing Administration, 5559 or #)
Supervised field experience for PNA students in ambulatory care settings. Focuses on data collection and assessment.

5561. AMBULATORY CHILD HEALTH CARE: CLINICAL II. (3 cr; prereq 5560) Berkseth, Erickson, Woodbury
Supervised field experience for PNA students in ambulatory care settings. Focuses on management of physical, developmental, and behavioral problems in children and their families.

5562. AMBULATORY CHILD HEALTH CARE: CLINICAL III. (3 cr; prereq 5561)
Supervised field experience for PNA students in ambulatory care settings. Focuses on management of complex problems of children with other health professionals and use of community resources. Consolidation of the PNA role.

5564. ADOLESCENT PRIMARY HEALTH CARE SEMINAR/PRACTICUM. (1 or 2 cr; prereq student in Projects in Nursing Administration, nurse practitioner or #; S-N only)
Current issues in adolescent health care. Optional supervised clinical practicum in adolescent health care facilities.

5565. THE HEALTH PROBLEMS OF YOUTH—MULTIPLE PERSPECTIVES. (3 cr) Blum
Major health problems of teenagers examined from health professional, parent, and teenager perspectives. Problem definition as a tool for social change. Bases of specific youth programs; assumptions about the nature of the problem addressed and about the nature of adolescence.

5566. THE PSYCHOSOCIAL EFFECTS OF CHRONIC ILLNESS AND HANDICAPPING CONDITIONS ON ADOLESCENT DEVELOPMENT. (3 cr; prereq #) Leonard
The impact of chronic disease and handicapping conditions on the individual's development within the family milieu and the world of school and work. Current local, state, and federal legislation, policies, and programs. Lecture, discussion, and seminar.

5568. INDIVIDUALIZED FIELD EXPERIENCE: AMBULATORY CHILD HEALTH CARE. (1 or 2 cr; prereq student in Projects in Nursing Administration or #)
Participation in ambulatory child health care delivery under the supervision of qualified practitioners in the private or public sector.

5569. PRIMARY HEALTH CARE OF THE SCHOOL-AGE CHILD: SEMINAR/PRACTICUM. (1 or 2 cr; prereq student in Projects in Nursing Administration or #; S-N only)
Selected topics in the primary health care of children from school entry until puberty. Optional field experience.

5572. ADULT HEALTH ASSESSMENT. (4 cr; prereq #) Lentsch
Designed to prepare registered nurses to systematically collect and record an adult health data base including taking history, conducting physical examination, and screening laboratory tests. Problem-oriented system used. Supervised clinical laboratory.

5573. HEALTH SCREENING. (1 or 2 cr) Lentsch
Opportunity for application and synthesis of health screening knowledge within a health promotion framework. Rational approach to planning and evaluation. Existing technologies and services. Variables that affect the development of health promotion programs. Clinical application within a multidisciplinary framework with public health nursing as a focus.

5575. TOPICS IN PUBLIC HEALTH NURSING. (Cr ar; prereq #) Staff
Selected readings in public health nursing with discussions based on these readings.

5576. THE POLITICAL PROCESS IN PUBLIC HEALTH. (4 cr) Richard, Lentsch
Forum for analysis of interrelationships between public health issues and the political process. Designed to prepare public health nursing professionals to assume responsibility and leadership in health policymaking.

5580. ADULT NURSE PRACTITIONER CERTIFICATE PROGRAM I. (8 cr; prereq adult nurse practitioner student) Ostwald, Mateo, Miedema, Russell, Shepard
Focuses on application of theories related to communications and preventive health care. Principles and skills of complete health assessment of adults. Supervised, concurrent clinical experience with physician preceptors in community primary care settings.

5581. ADULT NURSE PRACTITIONER CERTIFICATE PROGRAM II. (8 cr; prereq 5580) Ostwald, Mateo, Miedema, Russell, Shepard
Focuses on knowledge and clinical skills necessary for collaborative management of adults with minor acute and chronic problems. Patient education, counseling, and continuity of care. Supervised, concurrent clinical experience with physician preceptors in community primary care settings.

5582. ADULT NURSE PRACTITIONER CERTIFICATE PROGRAM III. (Cr ar; prereq 5580, 5581) Ostwald, Mateo, Miedema, Russell, Shepard
Focuses on role implementation with application of theories related to nursing, role change, intra- and interprofessional collaboration, conflict resolution, and quality assurance. Management of patients with selected complex physical and psychosocial problems, use of community resources, and collaborative development of joint practice statements and protocols. Clinical experience includes options for independent study related to role implementation.

5585. PUBLIC HEALTH NURSING. (8 cr for 10 wks; prereq current RN licensure and #) Lentsch
For nurses interested in gaining theoretical knowledge and clinical skills in community health nursing.

5590. THEORY AND PRACTICE OF OCCUPATIONAL HEALTH NURSING. (2-4 cr ar; prereq occupational health nursing student) Gerberich, Richard
Focuses on selection and implementation of a conceptual framework for nursing practice in an occupational setting. Standards of occupational health nursing practice; students expand knowledge and skills in assessment and management of common employee health problems. Supervised clinical experience.

5591. PREVENTIVE ASPECTS OF OCCUPATIONAL HEALTH PROGRAMMING. (3 cr; prereq occupational health nursing student) Gerberich, Richard
Focuses on nursing intervention at primary, secondary, and tertiary levels of prevention. Students participate in health hazard evaluation survey and development of health surveillance programs. Supervised clinical experience.

5592. PLANNING AND COORDINATING AN EMPLOYEE HEALTH SERVICE PROGRAM. (3 cr; prereq occupational health nursing student or #) Gerberich, Richard
Focuses on the emerging role of the master's-prepared occupational health nurse. Includes coordination with management, labor, and other health/safety professionals. Supervised clinical experience.

5600. FIELD COURSE I IN PUBLIC HEALTH NUTRITION. (Cr ar; prereq #) Brown, Fleming, Splett
Placement in an approved agency with opportunity for experience in nutritional aspects of public health programs.

5601.* SEMINAR: PUBLIC HEALTH NUTRITION. (Cr ar; prereq #) Brown and staff

5602. MATERNAL AND CHILD NUTRITION. (3 cr; prereq 3600 or equiv or #) Brown and staff
Nutrient functions and requirements throughout pregnancy, lactation, infancy, and childhood through adolescence.

5603. NUTRITIONAL ASSESSMENT. (2 cr; prereq 3600 or equiv or #) Brown and staff
Methods used to assess nutritional status of populations and individuals throughout various stages of the life cycle.

5604. FACTORS AFFECTING NUTRITION BEHAVIOR. (2 cr; prereq Soc 3201 or equiv or #) Fleming
Basic factors involved in formation of food habits; methods used to modify food habits and to promote and maintain nutritional health of individuals or groups.

5605. PRINCIPLES OF PUBLIC HEALTH RESEARCH. (3 cr; prereq grad status, completion of or concurrent regis in course in statistics or vital statistics) Fleming
Designed to prepare students to critically evaluate public health research literature and to undertake independent research projects. Formulation of the research question, research design, sampling techniques, use of research concepts, and data analysis. Data collection techniques examined include questionnaires, interviews, structured and unstructured observation, data analysis, and secondary analysis of existing data.

5606. FIELD COURSE II IN PUBLIC HEALTH NUTRITION. (Cr ar; prereq public health nutrition student) Splett
Placement in an approved agency with opportunity for experience in nutritional aspects of public health programs. For students desiring more than one concurrent field placement.

5607. NUTRITION EDUCATION: AN INTEGRATED APPROACH. (1 or 2 cr)
An integrated approach to nutrition education in the school system. Students participate in a two-day workshop and complete written assignments in curriculum design. Workshop content includes current nutrition issues, techniques for assessment of personal nutrition, nutrition education objectives, strategies for integrating nutrition education in other subject areas, and nutrition education resources.

5608. CURRENT NUTRITION ISSUES IN PUBLIC HEALTH. (3 cr; prereq FScN 5622 or #) York
Current issues in national and international nutrition and prevention or resolution of problems through contributions of various public health disciplines.

5609. TOPICS: PUBLIC HEALTH NUTRITION. (Cr ar; prereq public health nutrition student or #) Brown
Independent study.

5610. PRINCIPLES, PROBLEMS, AND ISSUES IN MATERNAL AND CHILD HEALTH. (3 cr; prereq grad student or #) ten Bensel
General introduction to current issues related to health needs of families, mothers, and children. Emphasis on principles of primary care, health maintenance, preventive care, organization, and evaluation.

5611. PROBLEMS AND PROGRAMS IN MATERNAL AND CHILD HEALTH. (3 cr; prereq 5610 or #) ten Bensel
Current programs and problems of MCH programs including C&Y, MIC, family planning, nutrition, dental care, EPSDT, neonatal intensive care, SIDS, and school health. Community program leaders participate in class discussion.

5612. HUMAN GENETICS AND PUBLIC HEALTH. (3 cr; prereq #) Schacht
Evaluation of current studies in human genetics and applications to community health.

5613. CHRONIC AND HANDICAPPING CONDITIONS OF CHILDREN. (3 cr; prereq 5610 or #) Leonard
In-depth look at the epidemiology, identification, management, follow-up, and prevention of chronic and handicapping conditions of children. Community programs for emotional, physical, and intellectual handicaps.

5614. FIELD EXPERIENCE IN MATERNAL AND CHILD HEALTH. (Cr ar; prereq 5610, 5611 or #) ten Bensel and staff
Field experiences selected by students to meet their career goals.

5615. HEALTH OF THE SCHOOL-AGE CHILD. (3 cr; prereq 5610 or #) Bamford
Review of major health problems among children of school age; methods of providing and evaluating school health services.

5616. THE RIGHTS OF CHILDREN: NEGLECT AND ABUSE. (4 cr, §HSU 5019) ten Bensel
The rights of children and neglect and abuse of children. Historical and legal aspects of the problem, identification and reporting procedures, family assessment and treatment modalities, follow-up processes, research, prevention and implications for societal action. Designed for health, social work, legal, and educational personnel. Experts from community will participate.

5618. YOUTH AND HEALTH: AN INTRODUCTION. (3 cr, §YoSt 5133) Baizerman, Blum
Age-specific morbidity and mortality data regarding youth used as basis for class discussion and individual work on health topics important to a youth population. Introduction to a youth development concept for use in problem analysis.

5619. SOCIAL WORK ASPECTS OF MATERNAL AND CHILD HEALTH PROGRAMS. (2 cr; prereq ¶5611 or #) Bamford
Social work aspects of programs presented in 5611. Discussion and on-site presentations.

5621. MCH STUDENT SEMINAR. (1 cr; prereq MCH grad student) ten Bensel and staff
Biweekly discussion group allowing interaction between maternal and child health students and faculty. Format decided by students; includes presentation of topics of student interest. Faculty members act as resource persons.

5622. WOMEN'S HEALTH: ISSUES AND CONTROVERSIES. (4 cr; prereq #) Turnquist
Health needs of women as an underserved population within a historical context from a public health perspective. Methods of health care delivery, education, current literature, discussion with guest speakers from community.

5624. INTERNATIONAL HEALTH. (Cr ar, §Ped 5525; prereq #)
Major health care problems in developing countries, political and economic constraints involved, and realistic possibilities for solution. Nutritional disturbances, tropical diseases, socioeconomic factors of family health, role of folk medicine as a health resource, use of health auxiliaries and role of the physician in traning them, factors that play a crucial role in patient acceptance.

5626. MATERNAL CHILD HEALTH NURSING SEMINAR I. (2 cr; prereq MCH/PHN grad student or #) Fredlund
Selected maternal and child health nursing issues and problems. Students help select topics and lead discussions.

5627. MATERNAL CHILD HEALTH NURSING SEMINAR II. (2 cr; prereq MCH/PHN grad student or #) Leonard
Practical approaches to solving maternal and child health nursing problems, and to providing nursing leadership intervention.

5632. NUTRITION: ADOLESCENTS, ADULTS, AND THE ELDERLY. (3 cr; prereq 3000-level nutrition course or equiv or #) Story, York
Review of current literature and research on nutrient needs and factors affecting nutritional status of adolescents, adults, and the elderly.

5639. PREVENTION: THEORY, PRACTICE, AND APPLICATION IN PUBLIC HEALTH SERVICE. (4 cr; prereq #) Shandeling
Designed for students (undergraduate, graduate, or continuing education) and professionals in health and related disciplines interested in current issues and controversies concerning prevention and how it relates to the health services. Emphasis on history, idea of prevention, terminology, life-style intervention, programs and legislative issues, education, roles, and implications for societal action.

5640. CHILD ABUSE AND NEGLECT SEMINAR FOR SCHOOL PERSONNEL. (1 cr) ten Bensel
Designed for teachers, administrators, nurses and other school personnel dealing with child abuse and neglect. Historical overview of terminology and dynamics of the school's and community's role in, and prevention of child abuse and neglect. Intended to increase awareness of child abuse and neglect in the schools and to provide material for teachers to incorporate in their curricula.

5641. CHILD ABUSE AND NEGLECT IN THE JUVENILE JUSTICE SYSTEM. (2 cr; offered during summer as part of the Juvenile Justice Institute) ten Bensel
Designed for juvenile justice personnel. Historical aspects of child abuse, terminology, identification, dynamics, outcomes, treatment programs, the role of the police and courts, and prevention programs. Includes a paper on some aspect of the juvenile justice system regarding child abuse and neglect or a critique of an actual case.

5649. TOPICS: MATERNAL AND CHILD HEALTH. (Cr ar; prereq #) Staff
Selected readings and problems.

5650. DENTAL HEALTH. (1 cr; for non-dentists and non-dental hygienists; prereq #) Block
Conditions resulting in tooth decay and loss; preventive and corrective measures; oral hygiene; community programs for dental health.

5651. PHILOSOPHY AND CONCEPTS OF PREVENTIVE DENTISTRY. (Cr ar; prereq #) Block and staff
Basic concepts of preventive dentistry, etiology, and preventive procedures for dental diseases, relationship between oral and general disease processes, organizing and evaluating preventive dentistry programs.

5652. CURRENT ISSUES IN DENTAL PUBLIC HEALTH. (Cr ar; prereq grad student in dental public health or #) Block, Jenny, and staff
Review and discussion of recent dental literature and current controversies involving dentistry and the public.

5653. DENTAL PROGRAM DEVELOPMENT. (Cr ar; prereq 5659 or #)
Project design and proposal development for dental health programs. Review of the proposal writing process, examination of informaton on funding sources and budget preparation, and design of a miniproject for which a proposal must be developed.

5654. TOPICS IN DENTAL PUBLIC HEALTH. (Cr ar; prereq dental public health student or #) Staff
Selected readings with discussion based on these readings.

5656. DENTAL HEALTH ADMINISTRATION. (Cr ar; prereq #) Block and staff
The management process in the delivery of dental services.

5657. INDEPENDENT STUDY IN DENTAL PUBLIC HEALTH. (Cr ar; prereq #) Staff
Independent study under tutorial guidance of selected problems and current issues in the field of dental health and dental health services.

5658. ECOLOGY OF DENTAL HEALTH. (Cr ar; prereq #) Block, Martens, Meskin
Role of dentistry in health care system. Topics include dental epidemiology, dental health education, dental personnel problems, economic and political influences on dentistry, and sociocultural implications for dental health.

5659. ANALYSIS OF DENTAL HEALTH EDUCATION. (Cr ar; prereq #) Block
Analysis of dental health education programs from a public health perspective: examination of educational objectives, resources, barriers, methods, target populations, and outcomes of current programs in terms of effectiveness and practicality; development of priorities in planning dental health education programs.

5660. FIELD EXPERIENCE IN DENTAL PUBLIC HEALTH. (Cr ar; prereq #) Block
Supervised field experience in selected community or public health agencies and institutions.

5662. COMMUNAL WATER FLUORIDATION: EFFICACY AND SAFETY. (3 cr: prereq 5361, 5330, 5414 or equiv)
Use of historical as well as current issues to investigate the fluoridation issue from an epidemiological perspective. The biological efficacy and safety of fluoridation. Analysis of pro- and anti-fluoridation literature with emphasis on statistical interpretations and research methodologies employed. Ethical issues related to water fluoridation as a public health measure. Includes design of individual research projects.

5663.* ADMINISTRATIVE RESIDENCY IN DENTAL PUBLIC HEALTH. (Cr ar: prereq #) Block, staff, and clinical preceptors
Eleven months of fieldwork in an approved community or public health agency; delivery of dental services and implementation of programs; solution of management problems and special projects. Preparation of formal report.

5700.* PUBLIC HEALTH ADMINISTRATION I. (Cr ar; prereq student in public health administration or #)
Structure, basic functions, and activities of public health agencies.

5701. PUBLIC HEALTH ADMINISTRATION II. (Cr ar; prereq 5700 or #)
Issues and problems affecting public health agencies and the interrelationships of public health agencies in the community.

5702. PUBLIC HEALTH ADMINISTRATION III. (Cr ar; prereq 5701 or #) Block
Issues, problems, structure, and activities of other agencies that influence public health, and their relationship to public health agencies.

5703. PUBLIC HEALTH ADMINISTRATION CLERKSHIP. (Cr ar; prereq public health administration student or #) Block
Assignment to Minnesota Department of Health or other health agency for supervised work on a project of limited scope. Preparation of formal report.

5704. FIELD EXPERIENCE IN PUBLIC HEALTH ADMINISTRATION. (Cr ar; prereq public health administration student or #) Block
Supervised field experience at a management level in selected community or public health agencies and institutions.

5707. INDEPENDENT STUDY: PUBLIC HEALTH ADMINISTRATION. (1-12 cr; prereq public health administration student; S-N only)
Independent study under tutorial guidance of selected problems and current issues in public health administration.

5711. PUBLIC HEALTH LAW. (4 cr; prereq public health administration student or #) McInerney
Introductory course for those with little or no formal legal background. Basic concepts of the law, legislative process, legal bases for existence and administration of public health programs, legal aspects of current public health issues and controversies, and regulatory role of government in health services system.

5712. PRINCIPLES OF ORGANIZATION AND MANAGEMENT OF HEALTH MAINTENANCE ORGANIZATIONS I. (2 cr; prereq public health administration student or #) Rupprecht
Health maintenance organizations and prepaid group practices: concepts, history organizational structure, administration, legislation, and providers and consumers; national, state, and local perspectives.

5713. PRINCIPLES OF ORGANIZATION AND MANAGEMENT OF HEALTH MAINTENANCE ORGANIZATIONS II. (2 cr; prereq 5712 or #) Rupprecht
Health maintenance organizations and prepaid group practices. Quality assurance; legal, ethical, and financial concerns; public health implications; impact of national health insurance; international perspectives.

5715. ADMINISTRATIVE DECISION MAKING IN PUBLIC HEALTH AGENCIES. (2 cr; prereq public health administration student or #) Gumnit
Process of public or governmental decision making from an administrative perspective. Case studies involving public health issues and decision making based on state government situations. Case study analyses, group discussions, student presentations, interviews with public health decision makers and their staffs.

5720. INTERPERSONAL EFFECTIVENESS IN HEALTH ADMINISTRATION. (2 cr; prereq public health administration student or #) Veninga
A skill development course. Examines the health services organization as a social system and how the administrator can function most effectively. Students learn to diagnose the health of organizations, conduct performance review programs and employee interviews, develop and evaluate résumés, delegate authority, and determine effective forms of organization, time management, and supervision.

5730. MULTIDISCIPLINARY ASPECTS OF HEALTH PROMOTION/DISEASE PREVENTION. (3 cr; prereq public health administration student, other health professional or #) M Venters, staff
Concepts and issues in disease prevention and health promotion. Medical, administrative, economic, public policy, and behavioral factors considered in examining history, controversies, legislation, cost/benefit, and current issues and state of disease prevention and health promotion. Impact of prevention programs on the health status of populations.

5739.* TOPICS: PUBLIC HEALTH ADMINISTRATION. (Cr ar; prereq student in public health administration or #) Staff

5740. ORGANIZATIONAL BEHAVIOR. (3 cr; prereq ¶5742 and hospital administration student or #) Staff
Human behavior in organizations. Motivation, leadership, influence of organizational structure, informal group behavior, interpersonal relations, supervision. Emphasis on preventing and solving problems among individuals and groups in organizations.

5741 (formerly 5754). ORGANIZATIONAL THEORY. (3 cr; prereq hospital administration student or #)
Application of organizational theory and interorganizational relationships using the multihospital system as a focus.

5742. HOSPITAL ORGANIZATION AND MANAGEMENT. (3 cr; prereq ¶5740 or #) Johnson
The hospital's role in delivery of health services and its relationship to other elements of the health care system. Problems of achieving results with principal emphasis on governance, radical staff, and role of the administrator.

5743 (formerly 5765). MANAGEMENT OF DEPARTMENTS WITHIN HEALTH SERVICES ORGANIZATIONS. (2 cr; prereq 5742)
Organization, operation, and control of selected departments of health services organizations with emphasis on integration of departments and role of departmental manager.

5744 (formerly 5750). PRINCIPLES OF PROBLEM SOLVING IN HEALTH SERVICES ORGANIZATIONS. (3 cr; prereq hospital administration student [sec 1] or grad student [sec 2]) Dornblaser, Westerman, Sweetland
Lectures, seminars, and demonstrations on problem-solving theory and technique. Management problem solving of cases. Solution of a management problem within a health services organization and presentation of report.

5745 (formerly 5753). ADVANCED PROBLEM SOLVING IN HEALTH SERVICES ORGANIZATIONS. (3 cr; prereq 5744 [formerly 5750]) Dornblaser, Sweetland
Solution of specific administrative case problems.

5751. PRINCIPLES OF ORGANIZATION MANAGEMENT IN HEALTH SERVICES ORGANIZATIONS. (3 cr; prereq grad student) Culbertson
Lectures and case studies on the role of health care services administrators, principles of management, and the administrative process.

5752. CLERKSHIP. (4 cr; prereq 5755) Bieter and staff
Survey and solution of management problem within administrative residency organization, and preparation of formal report.

5755. ADMINISTRATIVE RESIDENCY. (Cr ar; prereq 5744 [formerly 5750]) Dornblaser and staff
Ten months of fieldwork in an approved health care planning or operating organization, rotation through departments, solution of management problems, and special projects. Preparation of a thesis and formal report.

5756 (formerly 5764). FINANCIAL MANAGEMENT IN HEALTH SERVICES ORGANIZATIONS. (3 cr; prereq hospital administration student or #) Oszustowicz
Accounting principles and practices applicable to health care organizations with emphasis on hospitals and ambulatory care services; total financial requirements; cost-finding methodologies; third-party payer negotiation; internal control; internal and external financial reporting.

5758. HUMAN RELATIONS SKILLS. (2 cr; prereq hospital administration student)
Focuses on interviewing, small group leadership, and negotiation skills.

5760. OPERATIONS RESEARCH AND CONTROL SYSTEMS FOR HOSPITALS. (3 cr; prereq 5404 or #) Moscovice
Decision-making framework for both operating and control systems in the hospital environment. Emphasis on basic modeling techniques and examples of actual hospital applications.

5761 (formerly 5785). QUANTITATIVE METHODS APPLIED TO HEALTH ADMINISTRATION PROBLEMS. (4 cr; prereq basic statistics) Weckwerth
Application of quantitative methods, including analysis of cyclicities, PERT, data handling systems, simple ANOVA, linear programming, cost benefit analysis, and inventory control, in the solution of health problems at administrative levels.

5763. HEALTH ORGANIZATIONS, STANDARDS, AND EVALUATION. (3 cr; prereq #) Culbertson
Characteristics of health organizations and current standards in the health care field; implications for hospital and health care management; relationship of standards to health care evaluation.

5767. PLANNING FOR HEALTH CARE ORGANIZATIONS. (2 cr; prereq hospital administration student or #) Sweetland, Bieter
Aspects of institutional planning with emphasis on role of program and physical facilities planning.

5768. ADMINISTRATION OF SERVICES TO AN AGING CLIENTELE. (4 cr) Stryker-Gordon
Relationship of physical and psychosocial needs of the aged to programs and services in hospitals, nursing homes, and the community. Emphasis on impact of administrative, cultural, and environmental factors. Lectures, discussions, community observation, films.

5769. CORPORATE PLANNING IN HEALTH CARE ORGANIZATIONS. (3 cr) Orr
Seminar on corporate planning: what it is and how it should be used; strategic planning and objectives; creating action and contingency plans; environmental scanning; use of data; managing external forces; the human side of planning

5770. TOPICS: HOSPITAL AND HEALTH CARE ADMINISTRATION. (Cr ar; prereq hospital administration student or #)
Selected readings in hospital and health care with discussion based on these readings.

5771. HEALTH AND HEALTH SYSTEMS: A POLICY PERSPECTIVE. (3 cr; prereq hospital administration student or #) Kralewski
Policy options and processes relating to emerging public policy issues.

5772. HUMAN RESOURCES MANAGEMENT IN HEALTH SERVICES ORGANIZATIONS. (4 cr) Staff
Introduction to concepts in human resource management as they apply to health service organizations. Relationship between human resources management and general management, nature of work, nature of human resources, compensation and benefits, personnel planning, recruitment and selection, training and development, employee appraisal and discipline, and union-management relations.

5773. FINANCIAL MANAGEMENT IN HEALTH SERVICES ORGANIZATIONS. (4 cr; prereq #) Oszustowicz
Total financial requirements to meet legislative, employer, and/or community demand for health care services. Operational, capital, and cash flow budget management.

5775. MANAGEMENT AND ORGANIZATION IN HOSPITAL AND HEALTH CARE FACILITIES. (15 cr; prereq current employment as health care facility administrator, #) Weckwerth, DeGeyndt and staff
A 12-month program of on-campus residential (2 weeks) and independent study including periodic seminars and monthly sessions with clinical preceptors. Management, organizational behavior, problem solving, executive role, personnel management, financial management, and patient care and support services.

5776. ADMINISTRATIVE AND PROFESSIONAL RELATIONSHIPS WITHIN THE HEALTH CARE FACILITY. (15 cr; prereq 5775 or #) Weckwerth, Gordon, Malban, Heinemann and staff
A 12-month program of on-campus residential (2 weeks) and independent study that includes periodic seminars and monthly sessions with clinical preceptors. Organizational behavior, change theory, governance, medical staff, legal aspects, medical records, planning, community health systems, continuing education.

5777. EXTERNAL FORCES AFFECTING HEALTH CARE DELIVERY. (25 cr; prereq 5776 or #) Weckwerth and staff
Ten-month program of on-campus residential (2 weeks) and off-campus study that includes three regional seminars covering financing, manpower, organizing, social policy, and project planning and design. Required project can be either a management study or research thesis. Ends with week-long symposium in which students present and defend their projects.

5778. PATIENT CARE MANAGEMENT AND ORGANIZATION WITHIN THE HOSPITAL AND HEALTH CARE ORGANIZATION. (25 cr; prereq present employment as director of nursing or equiv, #) Weckwerth, Danielsen and staff
A 12-month program of on-campus residential sessions (3 weeks), independent study monthly meetings with clinical preceptors, and one required seminar. Principles of management, organizational behavior, hospital development and organization, personnel management, administrative and professional relationships within the hospital, role of the patient care administrator, legal aspects, budget, policy development, continuing education.

5779. MANAGING MULTIPLE FORCES: INTERNAL AND EXTERNAL ASPECTS OF PATIENT CARE ADMINISTRATION. (Cr ar; prereq present employment as director of nursing or equiv. 5778, and #) Weckwerth, Danielsen, Gordon, and staff
A 12-month program of on-campus (3 weeks) and independent study that begins with a 1-week introductory residential session each August. Seminars on planning, organizing, staffing, directing, and controlling scheduled during initial phase. Students return to campus the following summer to share and demonstrate their research projects with their peers.

5780. ADMINISTRATION OF LONG-TERM CARE FACILITIES. (6 cr; prereq courses in principles of management, accounting, business law) Stryker-Gordon and staff
A 16-week program of on-campus residential seminars (5 days) and off-campus independent study that includes general principles of administration and aspects of administrative organization, personnel administration, and fiscal management in the area of long-term care.

5781. SERVICES FOR LONG-TERM CARE PATIENTS. (6 cr; courses in medical terminology, basic health, and gerontology recommended) Stryker-Gordon and staff
A 16-week program of on-campus residential seminars (5 days) and off-campus independent study that includes physical and psychosocial aspects of aging, paramedical services, nursing services, environmental standards, statutory and legal requirements.

5782. PRACTICUM IN LONG-TERM CARE ADMINISTRATION. (6 cr; prereq 3750, 3760 or *3760 or #) Woehrer and staff
A 300-hour practicum in a nursing home setting under guidance of a preceptor, and 4 seminar days on campus.

5783. FINANCIAL MANAGEMENT AND PLANNING FOR LONG-TERM CARE. (6 cr)
Basic tools of financial management in long-term care facilities. Opportunity for practical application of these tools in class and also at work site for students employed in long-term care facilities.

5786. RESEARCH METHODOLOGY IN HOSPITAL AND HEALTH CARE ADMINISTRATION. (2 cr; open to hospital administration students only; prereq 5404) Litman, Weckwerth
Research design.

5787. ADMINISTRATION OF THE LONG-TERM CARE ORGANIZATION. (15 cr; prereq #) Gordon, Stryker-Gordon, Anderson, others
Problem solving in management, personnel management, financial management, organizational behavior, and quality assurance areas.

5788. PROGRAM MANAGEMENT FOR LONG-TERM CARE. (15 cr; prereq #) Gordon, Stryker-Gordon, Anderson, others
Program for long-term care patients; gerontology, interdisciplinary health care services environmental control, planning community services, and special needs of the mentally ill, mentally retarded, and chemically dependent patient.

5789. WORK-STUDY SEMINAR FOR LONG-TERM CARE ADMINISTRATORS. (6 cr; prereq 5782 or licensed administrator in position as administrator, assistant administrator or director of nursing) Woehrer, others
On-the-job educational experience designed to enhance the less experienced administrator's skill in carrying out responsibilities through project assignments and six monthly seminars. Areas of study may include financial management; personnel management; relationships with the community, residents, families, and board; and program evaluation.

5790 (formerly 5795). SOCIOLOGY OF MEDICINE AND HEALTH CARE: AN INTRODUCTION TO MEDICAL SOCIOLOGY. (4 cr) Litman
(Same as Soc 5855) Social and psychological components of health and medical care. Organization and delivery of health care services; problems and perspectives. Focuses on the patient, provider of care, and environment in which health care services are dispensed.

5791 (formerly 5790). HEALTH CARE ORGANIZATIONS. (3 cr)
Current arrangements for and financing of health care services. Changing patterns of need, use and cost of medical care. Factors affecting supply and distribution of professional personnel and health facilities. The medical care process as it affects the quantity and quality of services provided.

5792. HEALTH SERVICES ORGANIZATIONS IN THE COMMUNITY. (1 cr; prereq hospital administration student) Henry
Lectures and on-site visits to selected health services organizations in the community. Emphasis on roles of organization and of administrator.

5793 (formerly 8795). ECONOMIC ASPECTS OF HEALTH CARE. (3 cr; prereq #) Feldman
Economic analysis of America's health care sector emphasizing problems of pricing, production, and distribution. Contributions of health care services to the nation's health.

5794. FINANCIAL MANAGEMENT SEMINARS. (3 cr; prereq 5764, 5791) Oszustowicz
Major financial management topics presented by outside experts in fields of public accounting, investment banking, lease financing, insurance counseling, hospital-based physician financial negotiating, rate setting/rate review negotiation, etc. Presentation of papers for class analysis and practical application. Government and third-party payer representatives discuss the impact of legislation and regulation on health care financial management.

5796. INTERNAL OPERATIONS OF A MENTAL HEALTH FACILITY. (15 cr; prereq 1 yr experience as mental health facility administrator and #) Malban and staff
A 12-month program of on-campus residential (2 weeks) and off-campus independent study that includes periodic seminars and monthly classes under program preceptors. Principles of management, organizational behavior, personnel, problem solving and decision making, financial management, mental health professionals, and mental health programs and services.

5797. EXTERNAL RELATIONSHIPS AFFECTING THE ROLE AND FUNCTION OF THE MENTAL HEALTH FACILITY. (15 cr; prereq 5796) Malban and staff
A 12-month program of on-campus residential (3 weeks) and off-campus independent study that includes periodic seminars and monthly classes under program preceptors; governance, legal aspects, public education and information, evaluation of mental health programs, prevention and primary treatment in mental health, current trends and concepts, biostatistics and quantitative methods.

5799. MENTAL HEALTH ADMINISTRATION SEMINAR. (1 cr; restricted to and required of all students registered in mental health administration training project)
Mental health services: historical overview, trends, governance, human resources, disability groups, treatment controversies, legal aspects, financial considerations, standards of quality assurance.

5800. RESEARCH PROJECT IN HEALTH CARE PSYCHOLOGY. (Cr ar [max 6 cr per qtr]) Staff
Supervised participation in some form of research project in the area of health care psychology, i.e., application of psychological and behavioral science research methods to some aspect of health care. The extent and conditions of participation are negotiated directly between student and faculty member in health care psychology.

5801. DIRECTED STUDY IN HEALTH CARE PSYCHOLOGY. (Cr ar [max 4 cr per qtr]) Staff
Supervised, directed study of some aspect of health care psychology, i.e., application of psychological principles and methods to some aspect of the process of health care delivery, research, and education. Specific terms arranged directly between student and instructor should include a statement of objectives, procedures, and means of evaluation.

5802. SPECIAL TOPICS IN HEALTH CARE PSYCHOLOGY. (Cr ar; prereq #) Staff
Small group seminars on selected topics and issues in health care psychology. Selection of topics and procedures is negotiated between students and instructor.

5811. CLERKSHIP IN PSYCHOLOGICAL ASSESSMENT. (Cr ar [max 4 cr per qtr]; prereq grad student in clinical psychology, school psychology, or #) Staff
Individual supervision in psychological assessment. Includes clinical interviewing, psychological test administration, test interpretation, and report writing in various clinical settings of University Hospitals.

5812. CLERKSHIP IN NEUROPSYCHOLOGICAL ASSESSMENT. (Cr ar [max 4 cr per qtr]; prereq #) Meier, Thomas
Administration of neuropsychological test batteries and introduction to neuropsychological inference. Students administer and report results of at least eight complete batteries with actual patients. Each report discussed individually with staff member.

5813. FIELDWORK EXPERIENCE IN HEALTH CARE PSYCHOLOGY. (Cr ar [max 4 cr per qtr]; prereq clinical psychology intern or #; observed by staff) Staff
Supervised experience in psychological assessment, intervention, and consultation in health care settings.

5814. CASE CONFERENCE IN HEALTH CARE PSYCHOLOGY. (1 cr; prereq clinical psychology intern or #) Staff
Individual supervision of a comprehensive psychological assessment for a single clinical case and formal presentation of the findings to a health care team for the purpose of treatment planning.

5815. CASE CONFERENCE IN NEUROPSYCHOLOGY. (1 cr; prereq clinical psychology intern or #) Meier, Thomas
Cases presented weekly by students and discussed by students and staff. While major emphasis is on neuropsychological assessment, treatment recommendations are considered for appropriate cases.

5820. INTERNSHIP IN CLINICAL PSYCHOLOGY. (Cr ar [max 4 cr per qtr]; prereq PhD candidate and 400 hrs clerkship experience) Staff
Supervised training experience in psychological assessment, intervention, research, community service, and teaching and supervising others.

5821. HEALTH CARE PSYCHOLOGY CLINIC INTERNSHIP. (Cr ar [max 4 cr per qtr]; prereq clinical psychology intern or #) Hafner, Petzel, Quast, and staff
Experience in psychological assessment, intervention, and consultation regarding child, adolescent, and adult patients.

5822. MEDICAL CONSULTATION FOR HEALTH CARE PSYCHOLOGY INTERNS. (Cr ar [max 4 cr per qtr]; prereq clinical psychology intern or #) Brantner
Experience in consultation for medical services regarding psychological functioning of medical patients.

5823. HEALTH CARE PSYCHOLOGY INTERNSHIP AT THE BOYNTON HEALTH SERVICE (Cr ar [max 4 cr per qtr]; prereq clinical psychology intern or #) Heiberg
Experience in assessment and individual and group therapy at the Mental Health Clinic of the Boynton Health Service.

5824. HEALTH CARE PSYCHOLOGY FOR THE PHYSICALLY HANDICAPPED CHILD. (Cr ar [max 4 cr per qtr]; prereq clinical psychology intern or #) Briggs and staff
Experience in psychological assessment and management of disabled children and staff consultation at Gillette Children's Hospital.

5825. INTRODUCTION TO NEUROPSYCHOLOGICAL ASSESSMENT. (Cr ar [max 4 cr per qtr]; prereq clinical psychology intern or #) Meier, Thomas
Experience in administering neuropsychological test batteries and principles of neuropsychological inference.

5826. ADVANCED NEUROPSYCHOLOGICAL ASSESSMENT. (Cr ar [max 4 cr per qtr]; prereq clinical psychology intern or #) Meier, Thomas
Emphasis on more subtle or less common discriminations required in neuropsychological inference. Students required to do less testing but more assessment than in 5825. Introduction to current areas of research and their implications.

5827. RURAL COMMUNITY MENTAL HEALTH INTERNSHIP FOR PSYCHOLOGISTS. (Cr ar [max 4 cr per qtr]; prereq clinical psychology intern or #) Morgan and staff
Experience in assessment, intervention, and consultation in a rural community mental health center.

5828. COMMUNITY CHILD GUIDANCE CENTER PSYCHOLOGY INTERNSHIP. (Cr ar [max 4 cr per qtr]; prereq clinical psychology intern or #) Hanvik, Reed, and staff
Experience in assessment, intervention including family therapy and parent counseling, and consultation in schools and social agencies.

5829. STUDENT COUNSELING BUREAU PSYCHOLOGY INTERNSHIP. (Cr ar [max 4 cr per qtr]; prereq clinical psychology intern or #) Loper and staff
Experience in assessment and educational-vocational and personal counseling with a college-age population.

5830. HEALTH CARE PSYCHOLOGY OF THE ELDERLY. (Cr ar [max 4 cr per qtr]; prereq PhD candidate and 400 hrs clerkship experience or #) Anderson
Supervised experience in psychological assessment, intervention, research, and community service dealing with the elderly.

5831. BEHAVIORAL MEDICINE. (Cr ar [max 4 cr per qtr]; prereq PhD candidate and 400 hrs clerkship experience or #) Hung
Supervised experience in assessment, management, and counseling of psychological problems related to mental illness. Includes experience in the Headache Clinic, counseling in human sexuality for medical patients, psychotherapy to aid adjustment to physical illness and disability, and counseling physicians in the behavioral management of problematic patients.

5840. CASE SEMINAR IN HEALTH CARE PSYCHOLOGY. (2 cr; prereq clinical psychology intern or #) Petzel, Schofield, and staff
Experience in preparing and presenting a formal patient work-up including personal history, course of illness, diagnostic data, and therapeutic interventions.

5841. SUPERVISED PSYCHOLOGICAL THERAPY. (Cr ar [max 4 cr per qtr]; prereq #) Staff
Intensive supervision of individual or group psychological therapy approaches. Use of audio and video tapes.

5850. HEALTH SCIENCES EDUCATION IN THE 20TH CENTURY. (3 cr, §HSU 5022) Garrard and staff
Trends and developments in the health sciences in the 20th century. Focus on educational change and reform; funding of education; professional regulations (licensure and certification) and their impact on education; and specialization and professionalism and the effects of education. Medical education is major paradigm used to examine these issues; dental and nursing education are also examined. Theme underlying all lectures and discussions is: "Who controls the education of the profession, what is controlled, and why?"

5851. HUMAN INTERACTION LABORATORY. (4 cr, §HSU 5024) Ayers
Self-study skills for professional and personal competency in face-to-face interactions with others. Participants learn to apply the interpersonal process recall (IPR) procedure of using videotape playback to study their own reactions and behavior in face-to-face interactions with each other. Theoretical issues in human interaction and specific skill development.

5852. PROGRAM EVALUATION IN HEALTH AND MENTAL HEALTH SETTINGS. (4 cr, §HSU 5026; prereq 5414 or equiv basic statistics course) Garrard
For advanced undergraduate and graduate students in fields related to health or mental health. Topics include an overview of evaluation, models of evaluation, objectives of an evaluative study, sampling of subjects, methods of data collection, methodological designs, interpretation of data, preparation of final report, and ethical and political considerations in conducting an evaluative study.

5853. BEHAVIORAL MEDICINE I: THEORY, RESEARCH, AND PRACTICE. (3 cr; prereq psychology grad student, public health student or professional in health-related discipline) Hung
Survey of the history of and current issues in behavioral medicine and health psychology. Emphasis on stress and its management, life-style intervention, preventive measures for public health, psychology of health behavior, self-management, and health education.

5854. BEHAVIORAL MEDICINE II: SELECTED TOPICS. (3 cr; prereq 5853 or #) Hung
In-depth treatment of two or three of the following topics each quarter: prevention/management of cardiovascular diseases and coronary-disease-prone behavior; biofeedback; life-style interventions for persons who are obese, who smoke, or who are chemically dependent; chronic pain; compliance with medical regimens. Guest lecturers.

5855. COMMON PROBLEMS OF LIVING: A SURVEY. (4 cr) Staff
Designed for students in any human services profession who have little opportunity for training in the behavioral sciences. Overview of common problems of living and ways of responding to these problems. Adjustment to: adolescence, prolonged illness, parenting, presumed disabilities, alcohol/drug problems, aging, relationship conflicts, work-related stress, and grief and loss.

5857. PSYCHOLOGICAL PROBLEMS IN APPLIED GERONTOLOGY. (2 cr; prereq #) Anderson, Lentsch
Psychosocial aspects of clinical practice with the aging. Includes psychological problems, life-style changes, responses to illness and disability, and family dynamics. Management approaches discussed using case study format. Emphasis on referral and consultation within the multidisciplinary team. Intended for health science graduate students and professionals.

5858. ELEMENTARY HUMAN NEUROPSYCHOLOGY. (4 cr; prereq Psy 5061 or #) Neuropsychology staff
Discussion of history and theories of human neuropsychology in the context of major research findings. Description of research methods and analysis of major controversies. Comparison of representative modern neuropsychological assessment methods.

8001. SEMINAR: PUBLIC HEALTH. (Cr ar)

8002. FIELD OBSERVATION OF SELECTED PUBLIC HEALTH PRACTICES. (Cr ar; prereq #)

8003. RESEARCH. (Cr ar)
Opportunities for qualified students to pursue research.

8150. RESEARCH: ENVIRONMENTAL HEALTH. (Cr ar) Staff
Opportunities to pursue research in the importance of environmental stresses on human health.

8170. RESEARCH: ENVIRONMENTAL BIOLOGY. (Cr ar; prereq #) Ruschmeyer

8180. RESEARCH: AIR POLLUTION. (Cr ar; prereq #) McJilton

8190. RESEARCH: INJURY CONTROL. (Cr ar; prereq #) McJilton

8200. RESEARCH: RADIOLOGICAL HEALTH. (Cr ar; prereq #) Barber

8201. RADIATION DOSIMETRY. (3 cr; prereq #) Barber
Radiant energy absorption in liquids, gases, and solids; absorption in biological systems.

8202. RADIATION DOSIMETRY LABORATORY. (1 cr; prereq ¶8201) Barber
Laboratory exercises involving principles discussed in 8201.

8208. FIELD PRACTICE IN RADIOLOGICAL HEALTH. (Cr ar; prereq #) Barber

8210. RESEARCH: OCCUPATIONAL HEALTH. (Cr ar; prereq #) McJilton

8211. HEALTH SURVEY OF MANUFACTURING PROCESSES. (2 cr; prereq 5211, #) McJilton
Occupational disease problems and preventive measures in major industries and in operations common to many industries; field trips.

8220. RESEARCH: FOOD SANITATION. (Cr ar; prereq #) Pflug

8230. RESEARCH: INSTITUTIONAL ENVIRONMENTAL HEALTH. (Cr ar; prereq #) Vesley

8240. RESEARCH: WATER HYGIENE. (Cr ar; prereq #)

8260. RESEARCH: ENVIRONMENTAL TOXICOLOGY. (Cr ar; prereq #) Straub

8330. RESEARCH: EPIDEMIOLOGY. (Cr ar) Staff
Opportunities for qualified students to pursue research work through the School of Public Health and various cooperating organizations.

8331. FIELD PRACTICE IN EPIDEMIOLOGIC INVESTIGATIONS. (Cr ar; prereq epidemiology major, #) Mandel
Supervised participation in epidemiologic investigations in the field under the auspices of official and voluntary health agencies.

8340. EPIDEMIOLOGIC ASPECTS OF CANCER. (3 cr; prereq 5330) Mandel
Magnitude of problem, epidemiologic background for current research, examples from cancers of selected sites. Emphasis on studies of those factors offering the best potential for cancer prevention.

8341. EPIDEMIOLOGY OF SELECTED CHRONIC DISEASES. (2 cr; prereq basic epidemiology and biostatistics) Visiting lecturers
Application of epidemiologic concepts and methods to study of selected chronic diseases other than cardiovascular and cancer, e.g., diabetes, arthritis, chronic respiratory disease.

8342. ADVANCED STATISTICAL METHODS IN EPIDEMIOLOGY. (3 cr; prereq 5331, 5332 or #) Visiting lecturers
The fourfold table, with applications to epidemiological and clinical studies. Significance versus magnitude of association; tests of hypotheses and confidence intervals for the relative risk; matching in case-control studies; effects, measurement, and control of misclassification errors; comparing and combining evidence from many studies.

8345. EPIDEMIOLOGIC BASIS FOR CANCER CONTROL. (2 cr; prereq basic epidemiology and biostatistics, 5357 or *5357) Visiting lecturers
Epidemiologic background and rationale for development and application of programs for the control of cancer.

8346. EPIDEMIOLOGY OF CARDIOVASCULAR DISEASE AND CANCER. (3 cr; prereq basic epidemiology and biostatistics) Visiting lecturers
Epidemiologic aspects of various types of cardiovascular disease and cancers with emphasis on methodologic approaches to their study and the multivariate setting of the etiologies.

8356. EPIDEMIOLOGIC ASPECTS OF POPULATION CHANGE. (2 cr; prereq basic epidemiology and biostatistics) Visiting lecturers
Epidemiologic aspects and health implications of changes in population size, composition, and stability.

8378. ADVANCED SEMINAR IN EPIDEMIOLOGY. (1 or 2 cr per qtr [max 3 cr]; prereq #) Staff
Discussion of one or more major research areas of current epidemiologic interest.

8379. SEMINAR: EPIDEMIOLOGY. (Cr ar; prereq #) Mandel
Discussion of selected current epidemiologic problems.

8385. SEMINAR: PHYSIOLOGICAL HYGIENE. (1 cr) Staff
Nutrition, tests and measurements of human physical fitness; gerontology; adaptation in health and disease; body composition; circulatory dynamics and related topics.

8386. READINGS IN PHYSIOLOGICAL HYGIENE. (Cr ar; prereq #) Staff

8387. RESEARCH: PHYSIOLOGICAL HYGIENE AND RELATED AREAS. (Cr ar) Staff

8389. SEMINAR: TOPICS IN HEALTH BEHAVIOR SCIENCE. (3 cr; prereq #) Mittelmark, Jeffery
Current theoretical measurement and research issues in behavioral medicine with emphasis on cardiovascular diseases. Topics drawn from physiological hygiene, psychology, sociology, anthropology, and medicine.

8400. SEMINAR IN BIOMETRY. (Cr ar)

8405-8406-8407. ADVANCED TOPICS IN HEALTH COMPUTER SCIENCE I, II, III. (3 cr per qtr prereq 5432 or #) Staff
Topics may include computer systems design for the health sciences, mini and micro computer concepts and use, computers for clinical services, computer-aided medical decision making, biomedical image processing and pattern recognition, and others of current interest. All discussions include appropriate methods and incorporate case studies from the health sciences.

8420. ADVANCED BIOMETRIC METHODS I. (3 cr; prereq 5455, 5459 or equiv, knowledge of FORTRAN) Johnson
General linear model approach to common designs; quantitative bioassay; nonlinear regression.

8421. ADVANCED BIOMETRIC METHODS II. (3 cr; prereq 8420 or #) Johnson
Multivariate discrimination or classification; survivorship models with risk factors; iterative solutions to multiparameter maximum likelihood estimation.

8422. ADVANCED BIOMETRIC METHODS III. (3 cr; prereq 5455, 5459 or equiv, knowledge of FORTRAN) Staff
Methods of quantal assay; topics in multifactor contingency table analysis; applications of stochastic processes in medicine and biology; problems in the design and analysis of observational studies.

8430-8431-8432. ADVANCED BIOMETRIC ANALYSIS I, II, III. (3 cr per qtr; prereq 8422, advanced calculus, theoretical statistics) McHugh
Randomization theory in clinical and laboratory trials. Biometric theory of epidemiologic case control and cohort studies. Nonparametric and parametric survivorship analysis including censoring and competing risk. Biometric models in demography, medical genetics, and screening and detection of disease. Radioimmunoassay and generalized bioassay models.

8449. TOPICS IN BIOMETRY. (Cr ar; prereq 5450 and #) Staff
Special topics for advanced students.

8450. RESEARCH IN BIOMETRY. (Cr ar) Staff
Opportunity for qualified students to pursue research work.

8503. CLINICAL SEMINAR: ADVANCED COMMUNITY NURSING I. (Cr ar; prereq public health nursing specialties student) Reynolds
Clinical experience as part of a multidisciplinary community team. Focuses on psychosocial concepts related to working with families, groups, and communities in the areas of disease prevention, health maintenance, and rehabilitation. Related theory.

8504. CLINICAL SEMINAR: ADVANCED COMMUNITY NURSING II. (Cr ar; prereq public health nursing specialties student) Reynolds
Opportunity for independent or collaborative interdisciplinary study in an area of interest. Clinical experience in community facilities. Related theory.

8505. PUBLIC HEALTH NURSING IN THE GROUP SETTING. (3 cr; prereq public health nursing student or #) Fredlund, Veninga, and staff
Opportunity for working with small groups in the community with emphasis on the group method of providing public health nursing services.

8510. DIRECTED RESEARCH. (Cr ar; prereq 5510) Staff
Guided study in developing a research design.

8511. DIRECTED RESEARCH. (3 cr; prereq 5510, 8510) Staff
Guided completion of a research study.

8530. EDUCATION, SUPERVISION, AND CONSULTATION IN PUBLIC HEALTH NURSING. (1-4 cr; prereq public health nursing student or #) Fredlund and staff
Analysis of theoretical concepts and frameworks of public health nursing, education, supervision, and consultation as they apply to the practice of public health nursing. Focus on conceptual skill development.

8570. FOUNDATION COURSE IN ADULT/GERIATRIC HEALTH CARE I. (Cr ar; prereq adult nurse practitioner student) Mateo, Miedema, Ostwald, Russell, Shepard
Focus on increasing the quality and quantity of health care available to the consumer by preparing the nurse to perform comprehensive health appraisals of adults based on knowledge of anatomy, physiology, psychology, and sociology. Supervised clinical experience.

8571. FOUNDATION COURSE IN ADULT/GERIATRIC HEALTH CARE II. (Cr ar; prereq 8570 or#) Mateo, Miedema, Ostwald, Russell, Shepard
Designed to expand the nurse's understanding of and skills in history taking, physical assessment, and management. Focuses on recognition and interpretation of signs and symptoms revealed by the assessment and implementation of the plan of care. Supervised clinical experience.

8572. FOUNDATION COURSE IN ADULT/GERIATRIC HEALTH CARE III. (Cr ar; prereq 8571 or #) Mateo, Miedema, Ostwald, Russell, Shepard
Designed to prepare the nurse to provide total health care for adults. Focuses on knowledge and clinical experience assessment and management of adult health care within the family and community environments and on collaboration with other health care professionals. Supervised clinical experience.

8611. MATERNAL AND CHILD HEALTH PROBLEMS. (3 cr; prereq 5610, 5611 or #) Staff
Problems in administration of health programs for infants, preschool and school-age children, handicapped individuals, and women of childbearing age.

8750-8751†. SEMINAR: ALTERNATIVE PATTERNS OF HEALTH CARE. (3 cr per qtr; prereq #; offered 1982-83 and alt yrs) Litman
Alternative approaches to meeting the health care problems of ambulatory care, the aging, chronic disease, physical rehabilitation, maternal and child care, mental health, and the poor.

8752. SEMINAR: COMPARATIVE HEALTH CARE SYSTEMS. (3 cr; prereq #; offered fall 1981 and alt yrs) Litman
Origin and development of various national systems of health care and their relationship to the social, political, economic, and cultural characteristics of the countries involved.

8760. TOPICS: HOSPITAL AND HEALTH CARE ADMINISTRATION. (3 cr; prereq PhD student in hospital administration) Weckwerth
Independent study under tutorial guidance of selected problems and current issues in health and health care.

8761. READINGS IN THEORY AND PRINCIPLES OF HOSPITAL AND HEALTH CARE ADMINISTRATION. (3 cr; prereq 8760) Weckwerth

8762. CONTEMPORARY PROBLEMS OF HOSPITAL AND RELATED HEALTH SERVICES. (3 cr; offered winter 1982 and alt yrs) Weckwerth
Current concepts, problems, principles, and future developments in health and health care.

8770. SEMINAR: HEALTH AND HUMAN BEHAVIOR. (3 cr; prereq 5790 (formerly 5795) or Soc 5855; offered spring 1982 and alt yrs) Litman
Sociology of health and health care; social and personal components of behavior in sickness and in health; community health; and the relationship of social and cultural factors in organization and delivery of health care services.

8780. ADVANCED STATISTICAL METHODS IN HEALTH CARE RESEARCH. (3 cr; prereq one qtr each of applied and theoretical statistics) Weckwerth
Survey and analysis of application of nonparametric statistics to health care research.

8781. SEMINAR: RESEARCH STUDIES IN HEALTH CARE. (3 cr; prereq PhD student in hospital administration or #; offered spring 1983 and alt yrs) Litman
Review and appraisal of design, measuring instruments, research methodology, and findings of contemporary studies.

8782. RESEARCH PRACTICUM. (6 cr; prereq PhD student in hospital administration) Litman, Weckwerth, and staff
Summer field experience in health care research. Supervised independent and team research on selected topics and problems in the field of health care.

8790.* SEMINAR: POLITICAL ASPECTS OF HEALTH CARE. (3 cr; prereq PhD student in hospital administration or #; offered winter 1983 and alt yrs) Litman
Interrelationships between government, politics, and health care; the political and social basis of health legislation and community decision making in provision and modification of health services.

8796. TOPICS IN HEALTH ECONOMICS. (3 cr; prereq at least one economics course and #) Dahl
General principles of health economics applied to current issues in health such as insurance, licensure, family practice, malpractice and hospital costs. Models of hospital functioning, area planning, and disease intervention presented within the framework of economic analysis and used to explain and predict health behavior. Concepts of cost benefit and cost effectiveness analysis discussed and applied to problems in health care delivery.

8800. HEALTH CARE PSYCHOLOGY LABORATORY. (2 cr; prereq Psy 8611, 8612, 8613, 8614) Staff
Instruction and individually supervised practice in administration of psychological tests, interpretation of test results, and psychological test report writing. Emphasis on demonstrated competency with intelligence tests (Stanford-Binet, Wechsler Intelligence Scales), projective personality tests (Rorschach, Thematic Apperception Test), and objective personality tests (Minnesota Multiphasic Personality Inventory).

8801f,s. CLINICAL PSYCHOPATHOLOGY. (3 or 4 cr; prereq #) Sines
Study through assigned readings, lectures, and case presentations of major psychiatric syndromes and disorders. Focuses on the nosological system DSM-III.

8802. PROFESSIONAL PROBLEMS IN CLINICAL PSYCHOLOGY. (1 cr; prereq #) Sines
Readings and discussions of such topics as professional ethics, interprofessional relations (e.g., with psychiatry), the psychologist as expert witness, economic issues in professional psychology, and training of future psychologists.

8803, 8804, 8805. GROUP SUPERVISION OF PSYCHOTHERAPY. (2 cr per qtr; prereq psychiatry resident or psychology intern) Schofield
Intensive group supervision of long-term individual therapy cases.

RADIOLOGY (Rad)

OFFERED AT MINNEAPOLIS

Division of Roentgen Diagnosis

Professor

Eugene Gedgaudas, M.D., *head*
Kurt Amplatz, M.D.
Samuel B. Feinberg, M.D.

Associate Professor

Lawrence H. A. Gold, M.D.
Marvin E. Goldberg, M.D.
Philippe R. L'Heureux, M.D.
Richard Moore, Ph.D.

Division of Nuclear Medicine

Professor

Merle K. Loken, M.D., Ph.D., *director, director of graduate study*

Graduates of Class A medical schools are eligible for appointments as medical fellow specialists with stipend in radiology upon completion of one year of satisfactory internship in a recognized hospital. Previous preparation in internal medicine or pathology, or both, is highly desirable although not required.

For those who have been away from medical practice for an extended period, a preliminary program of education in the laboratory sciences and general medicine is recommended.

Training in radiology covers a three-year span, excluding time devoted to other subjects. Appropriate time is devoted to the various subdivisions of roentgen diagnosis (including special procedures) and to nuclear medicine and ultrasound.

Medical fellows may assist in the teaching of medical students and may teach in elective courses. Research in one or more aspects of radiology should be carried out during the course of the program.

The following institutions are used for practical training in cooperation with and under the general direction of the Department of Radiology of the University of Minnesota:

1. *University Hospitals and Outpatient Departments (UMH)*—A general referral hospital of approximately 800 beds and a very active outpatient clinic offer exposure to unusual clinical material.

In addition, the Variety Club Heart Hospital, which has approximately 100 beds and is connected directly with University Hospitals, offers the opportunity to study acquired and congenital heart disease and conducts an extensive research program in this field.

Another institution closely associated with University Hospitals is the University Health Service, which provides opportunity to study acute health problems that occur in relatively young individuals.

2. *Hennepin County Medical Center (HCMC)*—This institution provides valuable experience, particularly in acute medical problems including trauma. Fellows are usually assigned to this service for a period of three months.

3. *St. Paul-Ramsey Medical Center (SPRMC)*—Here, as in HCMC, there is abundant opportunity to study the use of radiology in the care of both acute and chronic disease. Assignment to this service is usually for a period of three months.

4. *Veterans Administration Hospital (VAH)*—A hospital of approximately 1,000 beds, catering entirely to veterans. Thus, the patient population is predominantly adult males. This hospital participates actively in graduate training and provides ample opportunities for research. VAH serves as the principal training site for some fellows in radiology.

5. *St. Paul Children's Hospital (SPCH)*—This rotation has been established to provide fellows with an opportunity to interact with pediatricians in an acute care center. Fellows are usually assigned to this service for one month.

Master's Degree—The M.S. in radiology is offered under Plan A only.

Diagnostic Roentgenology

0120f,w,s. X-RAY CONFERENCE. Staff
Weekly departmental meetings at which important cases seen in University Hospitals, Hennepin County Medical Center, St. Paul-Ramsey Medical Center, Veterans Administration Hospital, and most of the private hospitals of the Twin Cities are reviewed.

0121f,w,s,su. MEDICAL ROENTGENOLOGIC CONFERENCE. (No cr) Staff

0122f,w,s,su. PEDIATRIC ROENTGENOLOGIC CONFERENCE. (No cr) Staff

0123f,w,s,su. SURGICAL ROENTGENOLOGIC CONFERENCE. (No cr) Staff

0124f,w,s,su. NEUROSURGICAL ROENTGENOLOGIC CONFERENCE. (No cr) Staff

0125f,w,s,su. CARDIOVASCULAR ROENTGENOLOGIC CONFERENCE. (No cr) Staff

0126f,w,s,su. ROENTGENOLOGIC CONFERENCE ON CHEST DISEASES. (No cr) Staff

0127f,w,s,su. ROENTGEN SURGICAL PATHOLOGY CONFERENCE. (No cr) Staff

5140f,w,s,su. SPECIAL PROBLEMS IN ROENTGENOLOGY. (Cr ar) Staff

5174s. PHYSICS OF DIAGNOSTIC RADIOLOGY. (3 cr) Staff
Physics of diagnostic imaging; includes CAT scanning and ultrasound.

8100f,w,s,su. GASTROINTESTINAL ROENTGENOLOGY. (Cr ar) Staff
In-service training in roentgenological evaluation of the gastrointestinal system.

8101f,w,s,su. UROLOGIC ROENTGENOLOGY. (Cr ar) Staff
In-service training in roentgenological evaluation of the genitourinary system.

8102f,w,s,su. NEUROLOGICAL ROENTGENOLOGY. (Cr ar) Staff
In-service training in roentgenological evaluation of the central nervous system.

8103f,w,s,su. CARDIOVASCULAR ROENTGENOLOGY. (Cr ar) Staff
In-service training in roentgenological evaluation of the cardiovascular system.

8104f,w,s,su. PEDIATRIC ROENTGENOLOGY. (Cr ar) Staff
In-service training in roentgenological evaluation of infants and children.

8105f,w,s,su. PULMONARY ROENTGENOLOGY. (Cr ar) Staff
In-service training in roentgenological evaluation of the pulmonary system.

8110f,w,s. NEURORADIOLOGY. (2 cr; offered alt yrs) Staff
Roentgen diagnostic procedures and roentgen findings in study of the head, including diseases of skull, orbits, and intracranial conditions, and in study of spine and spinal canal.

8150f,w,s,su. RESEARCH IN ROENTGENOLOGY. (Cr ar) Staff
Problems in roentgen diagnosis.

Nuclear Medicine

0220f,w,s,su. NUCLEAR MEDICINE CONFERENCE. (No cr) Loken
Weekly presentations of informative nuclear medicine cases seen in University and affiliated hospitals.

5170f. BASIC RADIOLOGICAL PHYSICS. (3 cr; prereq #) Khan, Loken, Morin, Droege
Theoretical and experimental aspects of radiological physics.

5171w. PHYSICS OF NUCLEAR MEDICINE. (3 cr; prereq 5170 or #) Loken, Morin
Theoretical and experimental applications of radionuclides in medicine and biology.

5172s. RADIATION BIOLOGY. (3 cr; prereq 5170 or #) Buchsbaum, Song
Effects of ionizing radiations on cells.

5173. PHYSICS OF RADIATION THERAPY. (3 cr; prereq 5170 or #) Khan
High energy and teletherapy machines.

5240f,w,s,su. SPECIAL PROBLEMS IN NUCLEAR MEDICINE. (Cr ar) Loken

5510w,s,su. BASIC PRINCIPLES OF RADIOLOGICAL PHYSICS. (1 cr) Staff

5540w,s,su. SPECIAL PROBLEMS IN RADIOLOGICAL PHYSICS. (Cr ar) Staff

8200f,w,s,su. NUCLEAR MEDICINE. (Cr ar) Loken
In-service training in uses of radioisotopes in diagnosis and treatment of disease.

8210f,w,s. FUNDAMENTALS OF NUCLEAR MEDICINE. (1 cr; prereq 1st-yr resident) Loken
Lectures and demonstrations on nuclear instrumentation and applications of radioisotopes in medicine.

8250f,w,s,su. RESEARCH IN NUCLEAR MEDICINE. (Cr ar) Staff

For additional course work in radiology, see Therapeutic Radiology.

RADIOLOGY

OFFERED AT ROCHESTER

Department of Diagnostic Radiology

Professor

Hillier L. Baker, Jr., M.D., M.S.
Harley C. Carlson, M.D., Ph.D.
Glen W. Hartman, M.D.
Owings W. Kincaid, M.D., M.S.
W. Eugene Miller, M.D., M.S.

Associate Professor

Richard A. McLeod, M.D., *chairman*
John W. Beabout, M.D.
Robert R. Hattery, Jr., M.D.
O. Wayne Houser, M.D.
John R. Muhm, M.D.
David F. Reese, M.D., M.S.
Patrick F. Sheedy, M.D.
David H. Stephens, M.D.

Assistant Professor

John J. Gisvold, M.D.
Robert L. MacCarty, M.D., M.S.
Anthony W. Stanson, M.D.
Byrn Williamson, M.D.

Division of Therapeutic Radiology

Professor

John D. Earle, M.D. *chairman*
Paul W. Scanlon, M.D., M.S.

Associate Professor

Roger E. Cupps, M.D., M.S.
Joel E. Gray, Ph.D.
Edwin C. McCullough, Ph.D.
Alan L. Orvis, Ph.D.

Assistant Professor

Margaret A. Holbrook, M.D.
Robert E. Lee, M.D., M.S.

Diagnostic Radiology

The Department of Diagnostic Radiology carries out approximately 620,000 diagnostic examinations a year. Fully equipped departments are maintained in the Mayo Building and at Methodist and St. Mary's Hospitals. In addition to these clinical facilities, adequate space has been set aside in the department for conferences, and study cubicles for individual residents are available. A complete film library and a library of radiology texts are available in the department. Graduate students in radiology also have access to the main clinic library and the research facilities of the Mayo Clinic laboratories.

Thirty-five regular residencies in radiology are offered in the Mayo Graduate School of Medicine; approximately ten appointments are made each year. Five of these appointments are offered at the G-1 level, and an opportunity to spend four years of training in radiology is offered such appointees. For candidates entering the G-2 level, the program is three years in duration. In addition, four one-year positions are available for advanced study after completion of a regular residency. Such time may be spent in most areas of subspecialty interest or in additional general training.

Training usually begins in July but in exceptional circumstances may begin at the start of the other academic quarters. The graduate program in radiology is designed, in accordance with the basic requirements stipulated by the American Board of Radiology, to provide training in radiologic physics, radiologic technique, film interpretation, fluoroscopy, ultrasound, computed tomography, radiation biology, and pathology. Numerous departmental and intradepartmental conferences and seminars are held each week. In addition to observation of and progressive participation in the clinical work of everyday practice, there is ample opportunity for study, research, and writing in conjunction with and under the supervision of members of the staff. Those electing to prepare a thesis as well as other requirements may earn the M.S. degree in radiology. Additional time is required for the Ph.D. degree.

Therapeutic Radiology

The program in radiation therapy offers individualized training with emphasis on helping residents achieve their specific goals in preparing for clinical practice, academic pursuit, or research-oriented careers. Both three- and four-year residencies that fulfill the requirements of the American Board of Radiology are offered. Therapeutic radiology applicants may enter the radiation therapy residency program immediately upon graduation from medical school or may be considered for admission after completion of one postgraduate year in another program.

Residents in the three-year program (PG 2-4) in therapeutic radiology spend two years in clinical therapeutic radiology and one year divided among surgical pathology, antitumor chemotherapy, and an elective of their choice. The four-year program (PG 1-4) includes the same three years of training in radiation therapy plus one year of clinical rotations designed to develop the physician's clinical skills. Participation in cancer therapy research is encouraged for residents with investigative abilities and interests.

The Division of Therapeutic Radiology is located in the Curie Pavilion, where patients may be seen jointly with members of the Division of Medical Oncology. Many patients with malignant disease of all origins and at all stages are treated in these sections annually.

Special consulting groups are concerned with breast cancer, gastrointestinal cancer, lung cancer, gynecologic cancer, and hematologic malignancy.

The members of the Division of Therapeutic Radiology conducted 3,837 initial or reevaluation consultations in 1980. During the same year, 2,026 patients received radiation therapy, and a total of 29,545 treatments were administered. A total of 355 patients received radioisotope therapy. The radiology resident examines patients referred to the Division of Therapeutic Radiology, participates in decisions regarding their management, assists in radiation therapy, and takes part in follow-up care.

A new-patient conference is held daily. Interesting and instructive problems in the management of patients with cancer are presented during weekly seminars and the core curriculum lecture series. The radiation physics program for radiation therapy residents includes a 50-lecture didactic course in basic radiologic sciences. An additional series of six lectures on radiation biology is also available. During the time residents spend in the division, they are expected to obtain working knowledge of treatment planning. This includes both hand and computer assisted approaches. Members of the radiation physics staff are always available for direct consultation and provide a series of work sessions designed to familiarize the residents with computer assisted treatment planning.

Facilities and resources include a laboratory for radioactive isotopes; three linear accelerators; one cobalt teletherapy unit; an orthovoltage X-ray unit; a treatment planning simulator; a PC-12 treatment planning computer; a tumor data registry; a simulator with fluoroscopy; beam block modifiers; 137-cesium, 192-iridium, and 125-iodine for intracavitary and interstitial treatment; equipment for the radiation therapy of animals; a laboratory for radiobiology and physics; conference rooms; and a library.

Master's Degree—Offered only under Plan A.

Doctor's Degree—Work leading to the Ph.D. degree is offered.

M 8852f,w,s,su. DIAGNOSTIC RADIOLOGY. (6 cr) Staff
At least 36 months in diagnostic radiology, of which 3 months are spent in isotopes and 3 months in pathology. Additional time may be arranged. Through observation, precept, and progressive partic pation in film interpretation, the student becomes thoroughly familiar with the entire field of diagnosis and observes and participates in a wide variety of special techniques in neuroradiology, cardiovascular radiology, urologic radiology, etc.

M 8853f,w,s,su. THERAPEUTIC RADIOLOGY. (6 cr) Staff
At least 2 years are spent in clinical therapeutic radiology, observing and participating in the treatment of a wide variety of malignant diseases that are amenable to treatment by x- or gamma radiation, electrons, radium, or radioactive isotopes.

M 8854f,w,s,su. RADIOLOGY OF THE MUSCULOSKELETAL SYSTEM. (1 cr) Beabout and staff
Radiological principles in evaluation of bone pathology and skeletal disorders.

SOCIAL AND ADMINISTRATIVE PHARMACY (SAPh)

OFFERED AT MINNEAPOLIS

Professor

Albert I. Wertheimer, Ph.D., *director of graduate study*
Laël C. Gatewood, Ph.D.
Hugh F. Kabat, Ph.D.
Theodor J. Litman, Ph.D.
Lawrence C. Weaver, Ph.D.
Vernon E. Weckwerth, Ph.D.

Associate Professor

Richard Culbertson, M.H.A.
Darwin E. Zaske, Pharm.D.

Assistant Professor

Marian Adcock, M.P.H.
M. W. Anderson, Ph.D.
David M. Angaran, M.S.
L. Peter Bast, Ph.D.
Paul B. Batalden, M.D.
John T. Bush, B.S.
Thomas Choi, Ph.D.
James C. Cloyd, Pharm.D.
Donald A. Dee, M.S.
Cyrus B. Elliott, B.S.
Larry R. Fredrickson, J.D.
Bart Galle, Ph.D.
William Hodapp, M.A.
Richard L. Holloway, Ph.D.
David E. Holmstrom, J.D.
Thomas Jones, M.H.A.
Donnalee Kutchera, M.S.
Thomas McKennell, M.A.
J. Paul O'Connor, S.T.L.
Salvador Pancorbo, Pharm.D.
James M. Schaefer, Ph.D.

Graduate work is available to qualified applicants who wish to prepare for careers investigating the relationships of various biological and physical factors in the social setting in which pharmaceutical functions exist. This flexible interdisciplinary program utilizes the resources of the University's many social science departments to prepare students to investigate drug use, abuse, and nonuse; to research the clinical setting in which pharmacy is practiced; and to direct educational programs for pharmacy practitioners and students.

Master's Degree—Work leading to the M.S. degree is offered under both Plan A and Plan B. Students take both a written and an oral final examination.

Doctor's Degree—Work leading to the Ph.D. degree is offered.

Prerequisites—A baccalaureate degree with an exceptional scholastic record.

Language Requirement—For the master's degree, none. For the Ph.D. degree, none; however, either a collateral field of knowledge or a special research technique is required.

Minor—The choice of minor, collateral field, and special research technique may vary considerably depending on the research interest of the student, and must be developed in consultation with graduate faculty advisers in the area selected. The most frequently selected minor areas include public health, business administration, sociology, psychology, and public affairs.

Program in Hospital Pharmacy

Professor

Hugh F. Kabat, Ph.D., *director of graduate study*
Albert I. Wertheimer, Ph.D.

Assistant Professor

David N. Angaran, M.S.
Ronald L. Broekemeir, M.S.
Daniel M. Canafax, Pharm.D.
James C. Cloyd, Pharm.D.
Thomas F. Jones, M.H.A.
Salvador Pancorbo, Pharm.D., Ph.D.

Graduate work is open to qualified pharmacists who wish to prepare to manage pharmacy services in organized health care settings.

Degrees Offered—M.S., Plan A or Plan B.

Prerequisites—A degree from a college of pharmacy and an exceptional scholastic record. Evidence of personal capability and fitness for work in the hospital field is also considered an essential requirement for admission.

Language Requirement—Students taking the degree under Plan B (without thesis) are not required to offer a language; those taking a Plan A degree (with thesis) must offer one.

Minor Fields—The choice of minor fields of study may vary considerably depending on the research interest of the student. The selection of courses will be made after consultation with the student's adviser.

Final Examination for the Master's Degree—Oral.

5840. PRINCIPLES OF HEALTH BEHAVIOR. (2 cr; prereq PubH 5790 [formerly PubH 5795] or #)
Review and evaluation of theoretical, conceptual, and experimental approaches in the behavioral sciences contributing to an understanding of health attitudes and behaviors, and of motivational and educational approaches to changes of attitude and subsequent health behaviors. Topics include extent and kinds of health beliefs possessed by various segments of the population, cultural and psychosocial determinants of health attitudes, appraisal of the relationships between attitudes and behaviors, methods used in research on health-related attitudes, concepts and models to explain individuals' health-related perceptions and behaviors, influence processes, attempts to modify health attitudes and behaviors.

8100. SEMINAR. (1 cr per qtr) Staff

8200. RESEARCH PROBLEMS. (Cr ar) Staff
Investigation of problems in social and administrative pharmacy.

8235. LEGISLATIVE CONTROLS. (3 cr; prereq #) Fredrickson
Historical development; social and economic causes and consequences; federal and state drug, cosmetic, and narcotic laws. Development of state pharmacy laws, dangerous drug laws, and their regulation. Current legislation affecting the practice of pharmacy.

8255. DRUG MARKETING. (3 cr; prereq #) Kabat
Historical development of distributive systems, underlying economic principles, marketing channels, agencies, institutions, functions, policies, and practices as they relate to the pharmaceutical industry.

8265. ADVANCED DRUG MARKETING. (3 cr; prereq #) Wertheimer
Specialized problems involved in marketing of health care products and services. Quantitative, statistical techniques used in contemporary pharmaceutical marketing and marketing research methodologies and strategies.

8270. CLINICAL CONFERENCES. (2 cr [may be repeated for max 6 cr])
Monitoring of patient drug therapy in a clinical setting.

8280. ADMINISTRATIVE CLERKSHIP. (Cr ar; prereq △)
Coordinated clerkship with the student assisting in ongoing work and projects at local health agencies, planning boards, and legislative staffs to gain experience with and appreciation of the planning and implementation of health policy. Emphasis on pharmaceutically related work where possible. Supervision by departmental faculty in conjunction with agency staff.

8290. CLINICAL CLERKSHIP. (2-5 cr; prereq 8270) Staff
Supervised study of pharmaceutical services at University Hospitals or affiliated institutions.

8301, 8302. CLINICAL THERAPEUTICS. (3 cr per qtr) Staff
Clinical lectures on diagnosis and treatment of common diseases.

8400. SPECIAL CLINICAL PROBLEMS. (Cr ar) Staff
Medication errors, drug distribution systems, patterns of drug utilization, cost benefit analysis of prescribed medication according to diagnosis, age, dosage form, effectiveness, side effects, incidence of adverse effects, or drug use and misuse.

8420. SOCIAL AND BEHAVIORAL ASPECTS OF PHARMACY PRACTICE. (3 cr; prereq #) Wertheimer
Historical development of the profession, its growth and development with emphasis on the forces of education, professionalization, attitude modification, and the resultant changes occurring as a product of legal and organizational forces in society.

8500, 8501, 8502. PHARMACY AND ITS ENVIRONMENT. (3 cr per qtr; prereq #; offered 1981-82 and alt yrs) Wertheimer
Cultural foundations of pharmacy. Development of present state of pharmacy practice. Social-psychological factors in drug use, abuse, or nonuse by the patient practitioner. Role of pharmacist as health practitioner within the profession, in relation to other health practitioners, and in relation to the general public.

8610. BEHAVIORAL AND SOCIAL RESEARCH METHODOLOGIES IN THE HEALTH SCIENCES. (3 cr; prereq #) Martinson
Survey of research methodologies for studying social and behavioral aspects of health care. Development of strategies for selecting and modifying existing research tools for particular purposes. Ethics of doing research on human beings.

8611. RESEARCH DESIGN. (3 cr; prereq 8610 and #) Martinson
Survey of behavioral and social measures and development of skills in research design. Students present their own research designs and measurement tools for class critique and conduct at least a pilot study.

8612. RESEARCH SEMINAR. (2 cr) Martinson
Research issues, ideas, designs, findings, and interpretations presented by students and faculty for discussion.

8700. HOSPITAL ADMINISTRATION. (2 cr; prereq #) Wertheimer
History, classification, organization, and functions of hospital departments in relation to the pharmacy service.

8701.* HOSPITAL PHARMACY ADMINISTRATION I. (3 cr; prereq #) Wertheimer
Organization and administration of pharmacy services in organized health care settings.

8702. HOSPITAL PHARMACY SURVEY. (1 cr; prereq 8701, #) Kabat

8703.* HOSPITAL PHARMACY ADMINISTRATION II. (3 cr; prereq #)
Continuation of 8701.

8810. SOCIAL PSYCHOLOGY OF HEALTH CARE. (3 cr; prereq #) Staff
Assessment of social-psychological aspects of health care delivery. Topics include behavioral and social aspects of pain and suffering, emotions, disease and recovery, responses to drugs and other therapies, patients' continuity with prescribed therapies, relationships between the health care professional and the patient, and relationships between members of various health care professions.

8820. ADVANCED SEMINAR IN THE SOCIAL PSYCHOLOGY OF HEALTH CARE. (3 cr; prereq #) Staff
In-depth assessment of one or more topics related to behavioral and social aspects of health care. Possible topics include relations among members of the health care team, patient counseling, causal attributions as they affect well-being and self-care, and diagnosis and treatment of the health care expert; pain and suffering; positive and negative placebo effects; problem of the "difficult" and dying patient.

8840. SOCIAL MEASUREMENT. (3 cr; prereq #) Choi
Essential methodological techniques used in social research measurement and theory construction. Means for explaining and establishing the correspondence between unobservable concepts and their empirical indicators. Computer analysis of data used.

SURGERY (Surg)

OFFERED AT MINNEAPOLIS

Professor

John S. Najarian, M.D., *chairman*
Robert W. Anderson, M.D.
Henry Buchwald, M.D., Ph.D.
John P. Delaney, M.D., Ph.D.
John J. Haglin, M.D., Ph.D.
Claude H. Hitchcock, M.D., Ph.D.
Edward W. Humphrey, M.D., Ph.D.
Arnold S. Leonard, M.D., Ph.D.
Donald G. McQuarrie, M.D., Ph.D.
John F. Perry, M.D., Ph.D.
Yoshio Sako, M.D., Ph.D.
Richard L. Simmons, M.D.

Clinical Professor

Lyle J. Hay, M.D., Ph.D.
Fletcher Miller, M.D., Ph.D.
Earl G. Yonehiro, M.D., Ph.D.

Associate Professor

Robert L. Goodale, M.D., Ph.D., *director of graduate study*
John Foker, M.D., Ph.D.
Theodor B. Grage, M.D., Ph.D.
Hovald K. Helseth, M.D.
Alan R. Shons, M.D., Ph.D.
W. Albert Sullivan, M.D., M.S.
David E. R. Sutherland, M.D., Ph.D.

Assistant Professor

David Fryd, Ph.D.
Albert Mowlem, M.D., Ph.D.
Robert D. Nelson, Ph.D.

The residency program in general surgery is designed to provide excellent training on the clinical wards and in the laboratory. The goal of the program is to train medical doctors both for the practice of surgery and for academic positions.

The residency training programs include appointments at the University of Minnesota Hospitals, the Minneapolis Veterans Administration Hospital, and St. Paul-Ramsey Medical Center. In addition, the program offers rotations at Methodist and Mount Sinai Hospitals in Minneapolis and at United Hospitals in St. Paul. Each residency appointment is for one year; reappointment is contingent upon superior performance.

All residents in general surgery begin their training with three years of junior assistant residency on the clinical services. The fellows aid the surgical staff in diagnosis and in the preoperative and postoperative care of patients. They help to direct and supervise the work of the G-1 and after their first year assist in the bedside teaching of the surgical clerks. They act as first assistant in operations performed by the general surgical staff. As soon as they prove themselves capable, they perform the simpler major operations, with a staff surgeon acting as first assistant. Later they are permitted to operate under the supervision of the surgeon, and, finally, when they have demonstrated their ability, they operate independently. Increasingly difficult cases are assigned as ability warrants. Supervision is always given until the staff surgeon is satisfied with the fellow's ability to operate independently.

In the second year, residents may rotate on several services including vascular surgery, plastic and head and neck surgery, cardiothoracic surgery, colon and rectal surgery, and other specialty areas. In general, residents select some specialty rotations from this group. Approximately two or three of the four second-year rotations are on specialty services, with the remaining time spent on general surgical services.

In the fourth year most residents enter the experimental laboratory. Senior residents have 8 to 12 months of intensive surgical operative experience under supervision. The remainder of the year consists of clinical rotations by special arrangement. In the fifth and final year of the clinical program, fellows serve as chief surgical resident for 12 months on

the general surgical services of the University Hospitals, Veterans Administration Hospital, or St. Paul-Ramsey Medical Center.

Trainees spend approximately two to three years in the laboratory preparing for advanced degree qualification, either in a basic science or in surgery. Research time may be spent in either a basic science or surgical research laboratory. Following completion of laboratory experience, trainees progress through senior residency and chief residency years.

An additional degree, the master of science in experimental surgery, is offered to qualified candidates from other institutions who are fully trained in clinical surgery. This degree requires two to three years of training and provides an opportunity to learn modern research techniques, apply the scientific method, and obtain practical experience in a research area.

Additional training in thoracic and cardiovascular surgery is available to selected residents following completion of the general surgery training program.

The fundamental laboratories of the Medical School offer numerous graduate courses closely related to surgery. (See Anatomy, Biochemistry, Laboratory Medicine, Microbiology, Pathobiology, Pharmacology, and Physiology.) These fields also offer opportunities for special investigative and research work. The proximity of medical buildings and scheduling of courses facilitate coordination of clinical and laboratory work.

Supervised work is offered by the Department of Surgery in the Experimental Research Laboratories as well as in its hospital and outpatient departments, in surgical diagnosis, and in operative surgery. Similar opportunities are available in some surgical specialties such as colon and rectal surgery, transplantation, and thoracic, cardiovascular, and pediatric surgery.

Medical School surgical fellowships are offered also at Hennepin County Medical Center. Surgical staffs of the affiliated hospitals supervise training of their surgical fellows.

Master of Science in Experimental Surgery—Plan A only. Requirements: (a) thesis—research topic; (b) 40 credits (two years' work), not less than 30 of them in surgical research; (c) minor of 9 credits plus certification from department in which minor is obtained; (d) oral thesis defense.

Master of Science in Surgery—Plan A only. Requirements: (a) thesis—research topic; (b) 70 credits (five years' work)[1], including at least 20 in surgical research; (c) passage of departmental surgical examination; (d) minor of 9 credits plus certification from department in which minor is obtained; (e) combined oral thesis defense and surgery examination.

Ph.D. in Surgery—Requirements: (a) thesis—research topic; (b) 100 credits (six years' work)[1], including at least 40 in research (basic science laboratory credit may be interchangeable with surgical laboratory credit at departmental discretion); (c) passage of departmental surgical examination; (d) minor consisting of 18 to 24 credits in a nonclinical field; (e) written and oral preliminary examinations; (f) oral thesis defense.

Language Requirement—None.

The following courses are given at participating hospitals unless otherwise indicated. Registrants taking fellowships at Hennepin County Medical Center should indicate their section by adding after the course number "Section G."

8200. CLINICAL SURGICAL PROBLEMS IN MANAGEMENT. (5 cr) Staff
Graduate students act as house surgeons and are required to study all phases of patient care including diagnosis, pre- and postoperative management, and operative therapy. Graded responsibility offered under supervision of staff. Fellows operate under supervision beginning with simple procedures. When properly qualified, senior and chief residents manage entire care of some patients. Attendance at rounds, conferences, and seminars is mandatory.

[1]Two years (40 credits) of clinical training may be transferred from other institutions at departmental discretion.

8201. SURGICAL-ROENTGENOLOGICAL CONFERENCE. (1 cr) Delaney, Najarian, and staff
Weekly review of films of all surgical patients presenting interesting roentgen findings. Staffs of the Departments of Radiology and Surgery.

8202. SURGICAL RESEARCH. (5 cr) Staff
Properly qualified students undertake original investigation of problems in either experimental or clinical surgery.

8203. SURGERY COMPLICATIONS AND RESEARCH CONFERENCE. (1 cr) Najarian and staff
Evaluation of selected surgical patients including postoperative course. Current research problems are presented for discussion and critical evaluation.

8204-8205-8206. BIOMEDICAL ENGINEERING SEMINAR. (1-3 cr per qtr) Blackshear
Lectures, demonstrations, and individual research activities designed to introduce graduate students and faculty of mechanical engineering and surgery to techniques and goals of the two disciplines.

8207. TRANSPLANTATION AND BONE MARROW CONFERENCE. (1 cr) Najarian, Simmons
Current clinical and research problems are presented for interdepartmental discussion and evaluation.

SURGERY

OFFERED AT ROCHESTER

Professor

Donald C. McIlrath, M.D., M.S., *chairman*
Martin A. Adson, M.D., M.S.
Philip E. Bernatz, M.D., M.S.
Gordon K. Danielson, M.D.
Michael P. Kaye, M.D., M.S.
Keith A. Kelly, M.D., M.S.
Karl A. Lofgren, M.D., M.S.
Dwight C. McGoon, M.D.
W. Spencer Payne, M.D., M.S.
William H. ReMine, M.D., M.S.
Richard E. Symmonds, M.D., M.S.
John S. Welch, M.D., M.S.
John E. Woods, M.D., Ph.D.

Associate Professor

Roger R. Dozois, M.D., M.S.
Eric P. Lofgren, M.D., M.S.
James R. Pluth, M.D., M.S.
Sylvester Sterioff, M.D.
Robert L. Telander, M.D.
Jonathan A. van Heerden, M.B.Ch.B., M.S.

Assistant Professor

Robert W. Beart, M.D.
Peter C. Pairolero, M.D.
Francisco J. Puga, M.D.

Graduate training in general surgery at the Mayo Graduate School of Medicine combines the opportunity to earn an advanced academic degree and surgical education that fulfills the requirements of the American Board of Surgery.

Appointments to the program are made quarterly; continuation in the program is contingent upon satisfactory performance. Individuals successfully completing the first three years are expected to complete the final two years of the program. Assignments during the usual five-year program are flexible, but generally include, in addition to general surgery, two or three quarters in surgical subspecialties and one quarter of surgical pathology and may include an elective quarter in a medical subspecialty.

There is opportunity for research experience in surgical or basic science laboratories in addition to the five clinical years of the program. A limited number of one- and two-year appointments are available to provide basic surgical experience prior to surgical specialty training.

The final year of the program is spent as a chief resident, with accompanying increased consulting and operating responsibility. Operating experiences are obtained principally at Rochester Methodist Hospital and St. Mary's Hospital. Patients at these hospitals and at the outpatient facilities of the Mayo Clinic provide a wide exposure to general and special surgical disease.

A large number of integrated seminars, lectures, and conferences are held each week.

Master's Degree—Offered only under Plan A.

Doctor's Degree—Work leading to the Ph.D. degree is offered.

M 8851f,w,s,su. PERIPHERAL VEIN SURGERY. (6 cr) Staff
Treatment of complications, surgical and medical, and varicose veins.

M 8852f,w,s,su. SURGICAL PROBLEMS AND MANAGEMENT (JUNIOR RESIDENTS). (6 cr) Staff
Graduate students act as house surgeons and are required to study patients, prepare them for conferences and operative surgery, and participate in postoperative care. Formal conferences, seminars, and informal study in special areas of surgery.

M 8853f,w,s,su. OPERATIVE SURGERY (SENIOR RESIDENTS). (6 cr) Staff
Senior surgical residency with the teaching staff. Management of the patient during entire hospital stay. Surgery performed under direction of faculty by the resident when properly qualified.

M 8854f,w,s,su. OPERATIVE SURGERY. (6 cr) Staff
Chief surgical residency at Mayo Clinic. Elective and urgent surgical cases are managed by senior residents appointed by surgical faculty. Faculty direction continues throughout entire management period.

M 8890. SURGICAL RESEARCH. (6 cr; prereq 1 yr clinical surgery) Staff
Original investigation in surgical fields.

Colon and Rectal Surgery

Associate Professor
Clyde E. Culp, M.D.
Robert J. Spencer, M.D.

Assistant Professor
Robert W. Beart, M.D., *head*
Markham J. Anderson, Jr., M.D., M.S.

Graduate training in colon and rectal surgery/proctology is carried out in conjunction with the Department of Surgery. Residents who have completed the requirements for the American Board of Surgery are eligible to apply for training to obtain certification from the Board of Colon and Rectal Surgery.

Two courses of study are available. The standard clinical program is a one-year experience leading to board eligibility. The two-year program offers a year of basic research experience and a second clinical year. Both programs include extensive experience in colonic and rectal surgery.

Master's Degree—Offered only under Plan A.

M 8851f,w,s,su. COLON AND RECTAL SURGERY. (6 cr) McIlrath and staff

M 8852f,w,s,su. SURGICAL PROBLEMS AND MANAGEMENT (JUNIOR RESIDENTS). (6 cr) Adson, Kelly, McIlrath, ReMine
Graduate students act as house surgeons and are required to study patients, prepare them for conferences and operative surgery, and participate in postoperative care. Formal conferences, seminars, and informal study in special areas of general surgery.

M 8853f,w,s,su. OPERATIVE SURGERY (SENIOR RESIDENTS). (6 cr) Adson, Kelly, McIlrath, ReMine
Senior surgical residency with the teaching staff. Management of the patient during entire hospital stay. Surgery performed under direction of faculty by the resident when properly qualified.

THERAPEUTIC RADIOLOGY (TRad)

OFFERED AT MINNEAPOLIS

Professor
Seymour H. Levitt, M.D., *head*
Faiz M. Khan, Ph.D.
Chang W. Song, Ph.D.

Associate Professor
Thomas K. Jones, Jr., M.D.

Assistant Professor
Donald J. Buchsbaum, Ph.D
Robert E. Haselow, M.D.
Tae H. Kim, M.D.
Chung Kyu Kim Lee, M.D.
Subhash C. Sharma, Ph.D.

The program is designed to provide physicians with well-rounded training in therapeutic radiology and to acquaint them with all aspects of clinical and experimental radiotherapy. The goal of the program is to train physicians for both the practice of therapeutic radiology and for academic positions.

Master's and Doctor's Degrees—The master of science in therapeutic radiology degree is offered under Plan A only. For the Ph.D., see the section on radiology.

Requirements—Graduates of Class A medical schools are eligible for appointment as medical fellows with a stipend in therapeutic radiology upon completion of one year of satisfactory internship in a recognized hospital. Medical fellows without stipend are also accepted if places are available.

Previous preparation in internal medicine, pathology, or both is highly desirable although not required. The course extends over a period of three to four years, excluding any time devoted to other subjects. For those who have been away from medical practice for a considerable period, a preliminary program of studies in the laboratory sciences and general medicine is highly desirable.

Plan A Program: Master's Degree With Thesis—Students must take a minimum of 20 quarter credits in therapeutic radiology and a minimum of 8 quarter credits in one or more nonclinical fields to make up the minimum of 28 quarter credits required for the degree. If students wish to complete a designated minor, they must take 9 or more quarter credits in a single nonclinical field, making the minimum requirement for a Plan A degree with a designated minor not less than 29 credits.

The minimum residence requirement is 13 quarters. There is no language requirement. Medical fellows may assist in the teaching of undergraduate students and may teach elective courses. Research in one or more aspects of therapeutic radiology should be carried out during the course of the program.

5170f. BASIC RADIOLOGICAL PHYSICS. (3 cr; prereq #) Khan
Theoretical and experimental aspects of radiological physics. Physical properties of various ionizing radiations; interactions of ionizing radiations with matter; methods of radiation dose measurement.

5171w. MEDICAL NUCLEAR PHYSICS. (3 cr; prereq 5170 or #) Loken, Morin
Theoretical and experimental applications of radionuclides in medicine and biology. Imaging devices and techniques, dynamic tracer analysis; internal emitter dosimetry. Radioimmunoassay and the statistics of counting.

5172s. RADIATION BIOLOGY. (3 cr; prereq 5170 or #) Song
Effects of ionizing radiations on cells, tissues, and organisms; biochemical and physiological basis of radiation effects, biological rationale for radiation therapy practices.

5173w. PHYSICS OF RADIATION THERAPY. (3 cr; prereq 5170 or #) Khan
High energy and teletherapy machines. Measurements of radiation quality, output and depth dose distributions for clinical use. Calculation of treatment parameters. Beam modification and shaping. Treatment planning for fixed field and rotational therapy. Physics of intracavitary and interstitial therapy. Computer applications in treatment planning. Principles and criteria for radiation protection.

5174s. PHYSICS OF DIAGNOSTIC RADIOLOGY. (3 cr; prereq 5170 or #) Loken, Droege
Physics of diagnostic X-ray imaging, X-ray production, image receptors, radiation exposure and protection. Special imaging modes including computerized tomographic scanning, ultrasound, and electron radiography.

5340f,w,s,su. SPECIAL PROBLEMS IN RADIATION THERAPY. (Cr ar) Haselow, Kim, Lee, Levitt, Potish

5512f,w,s,su. DOSIMETRY OF INTERNAL AND EXTERNAL RADIATION. (1 cr) Khan
Basic principles of radiation dosimetry discussed in detail; clinical applications.

5540f,w,s,su. SPECIAL PROBLEMS IN RADIOLOGICAL PHYSICS. (Cr ar) Khan

5800. RADIATION ONCOLOGY PATHOLOGY. (Cr ar)

8300f,w,s,su. RADIATION THERAPY. (Cr ar) Haselow, Jones, Kim, Lee, Levitt, Potish
In-service training in treatment and management of patients with malignant diseases.

8310f,w,s,su. FUNDAMENTALS OF RADIATION THERAPY. (1 cr) Haselow, Kim, Lee, Levitt, Potish
Lectures on physical and clinical aspects of radiation therapy. Techniques of radiation therapy including radium and other isotopic implants.

8315f,w,s,su. RADIATION THERAPY PATHOLOGY. (1 cr) Staff
Weekly ½- to 2-hour seminar relating microscopic and gross anatomy of tumors to clinical findings, diagnostic workup, and therapy of patients receiving radiation therapy. Includes clinical descriptions of patients followed by comprehensive discussion of the microscopic, gross pathology, and overview of tumor pathology. Offered in conjunction with the Department of Laboratory Medicine and Pathology.

8320f,w,s,su. RADIATION THERAPY TREATMENT PLANNING PROBLEMS. (1 cr) Staff
Weekly ½- to 2-hour seminar. Treatment planning, computer treatment planning, treatment fields of patients under treatment, and treatment planning programs discussed with staff of the clinical and physics sections.

8325f,w,s,su. RADIATION THERAPY PEDIATRICS ONCOLOGY. (1 cr) Staff
Weekly 1½-hour seminar. Pediatric oncology radiation therapy problem situations discussed by pediatric oncology and therapeutic radiology staff. Case presentations and details of radiation therapy, chemotherapy, and instruction in combination therapy outlined. Offered in conjunction with pediatric oncology.

8350f,w,s,su. RESEARCH IN RADIATION THERAPY. (Cr ar)

8410f,w,s,su. SEMINAR: RADIATION BIOLOGY. (1 cr) Staff

8450f,w,s,su. RESEARCH IN RADIATION BIOLOGY. (Cr ar) Staff

8550f,w,s,su. RESEARCH IN RADIOLOGICAL PHYSICS. (Cr ar)

UROLOGY (Urol)

OFFERED AT MINNEAPOLIS

Professor
Elwin E. Fraley, M.D.

Clinical Professor
Baxter A. Smith, Jr., M.D., M.S.

Associate Professor
Alexander S. Cass, M.D

Clinical Associate Professor
Milton P. Reiser, M.D., M.S.

Three- or four-year fellowships, approved by the Council on Medical Education, are offered to students working toward graduate degrees in urology. Work in urology is done at University Hospitals or Minneapolis Veterans Administration Hospital.

Master's Degree—Offered under Plan A only.

Doctor's Degree—Work leading to the Ph.D. degree is offered.

8250. UROLOGICAL SURGERY. (4 cr)

8251. CYSTOSCOPY AND UROLOGICAL DIAGNOSIS. (4 cr)

8252. UROLOGICAL CONFERENCE. (4 cr)

8253. RESEARCH IN UROLOGY. (4 cr)

8254. UROLOGICAL SEMINAR. (3 cr)

8255. UROLOGICAL-RADIOLOGICAL CONFERENCE. (3 cr)

8256. UROLOGICAL-PATHOLOGICAL CONFERENCE. (3 cr)

8257. SPECIAL UROLOGY. (3 cr) Fraley and staff

UROLOGY

OFFERED AT ROCHESTER

Professor
David C. Utz, M.D., M.S., *chairman*
William L. Furlow, M.D., M.S.
Panayotis P. Kelalis, M.D., M.S.

Associate Professor
Frank J. Leary, M.D., M.S.
Reza S. Malek, M.B.B.S., M.S.
Joseph W. Segura, M.D.
Horst Zincke, M.D.

Assistant Professor
David M. Barrett, M.D.
Robert P. Myers, M.D., M.S.

The Department of Urology at the Mayo Graduate School of Medicine seeks to provide excellent training for residents in all phases of clinical and experimental urology. The curriculum leads to certification by the American Board of Urology.

Three-year (G-3 through G-5), four-year (G-2 through G-5), and five-year (G-1 through G-5) programs are offered. The five-year program is designed for medical school graduates. The four-year program is available to trainees who have completed one year (G-1) of postgraduate training in an approved program. The three-year program is available to trainees who have completed two years (G-1 through G-2) of postgraduate training in an approved program.

The three-year program is devoted to 12 quarters of clinical urology and generally does not afford an opportunity to meet M.S. degree requirements.

The four- and five-year programs are also devoted to 12 quarters of clinical urology as well as four or eight additional quarters devoted to basic sciences or clinical studies and lead to the M.S. degree.

Ph.D. candidates usually require an additional year (G-6) or two (G-6 and G-7) for completion of their work.

The care of the urologic patient is the paramount objective of the training program. The resident receives instruction in all aspects of diagnostic, therapeutic, and surgical (both endoscopic and open operative) urology by precept and by participation. With increasing experience the resident assumes greater obligations, progressing to first assistant and in some instances to chief resident associate. In these latter capacities the resident is responsible, under the supervision of a consultant, for the definitive care of the patient. Abundant opportunities for basic and applied urologic research are available, and participation in such activities is encouraged as part of the four- and five-year programs.

Teaching is provided in the clinic, at the bedside, in the operating room, and during ward walks. Assignments include the daily interpretation of urologic roentgenograms. Clinical urographic conferences and urologic conferences are held daily as well as weekly. During the fall, winter, and spring quarters, weekly seminars are presented by the resident staff and by urologic consultants. A Urology Journal Club meets monthly to review the current urologic literature. Attendance at monthly meetings of the general staff and clinicopathologic conferences is encouraged. A series of urologic lectures by distinguished guest urologists is presented two or three times yearly.

During training the resident comes into intimate contact with related or ancillary disciplines such as nephrology, gynecology, nuclear medicine, oncology, roentgenology, microbiology, and pathology. Special training in these and other related fields is possible.

Fellows majoring in urology may also, if they wish, take work in anatomy, biochemistry, laboratory medicine, physiology, and dermatology. For details, see these departments.

Master's Degree—Offered only under Plan A.

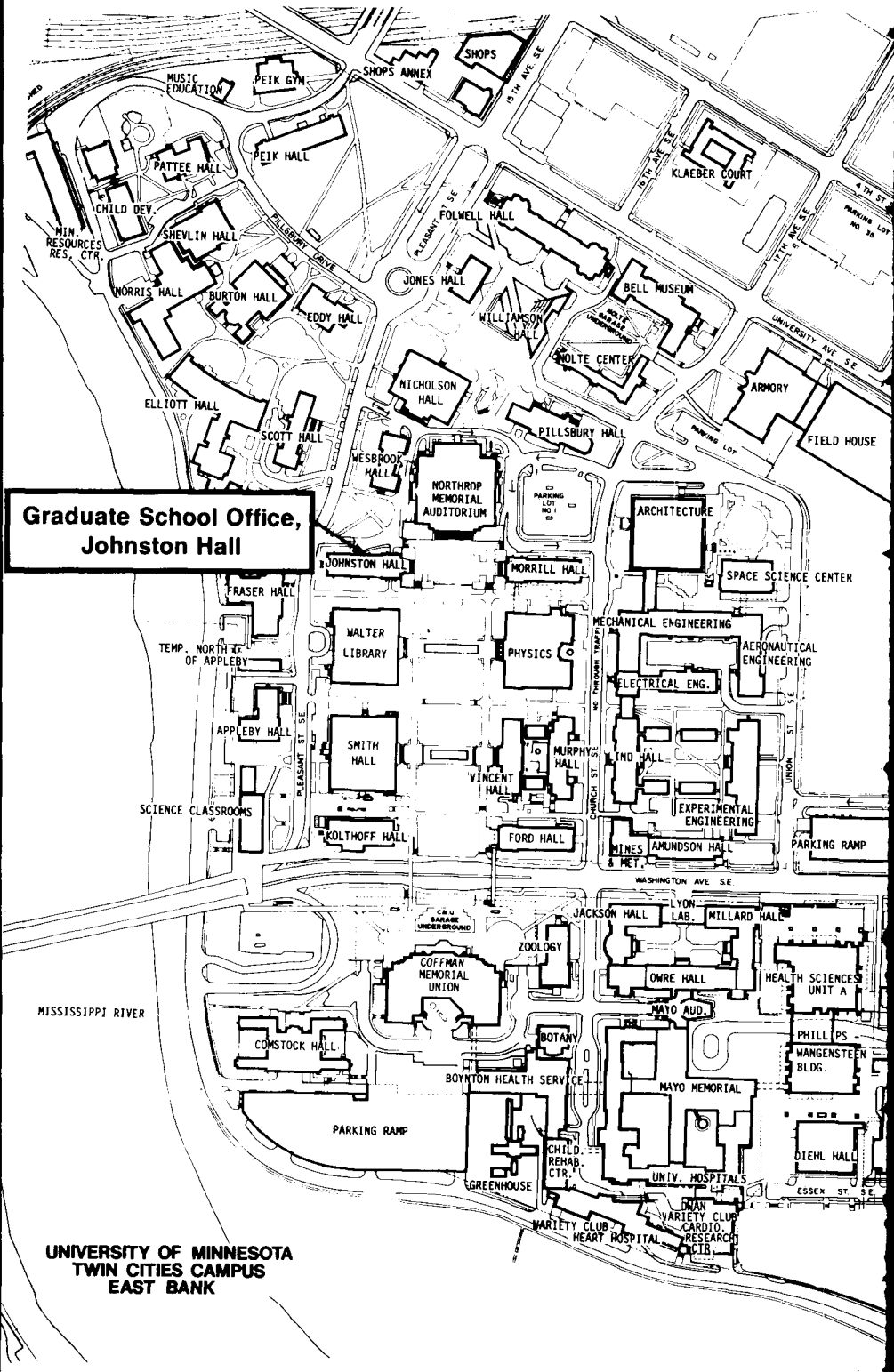
Doctor's Degree—Work leading to the Ph.D. degree is offered.

M 5801. PEDIATRIC UROLOGY. (6 cr) Kelalis
Diagnosis and treatment of urologic disorders of infants and children with opportunities in pediatric urologic endoscopy, uroradiology, and surgical treatment of pediatric urological problems.

M 8851f,w,s,su. UROLOGIC DIAGNOSIS AND SPECIAL UROLOGIC TREATMENT. (6 cr) Staff
Cystoscopic examination. Urography, both retrograde and excretory. History taking and clinical examination in diseases of the genitourinary tract. Study and treatment of acute and chronic infection of the genitourinary tract. Seminar.

M 8852f,w,s,su. GENITOURINARY SURGERY INCLUDING ENDOSCOPIC AND OPEN PROCEDURES. (6 cr) Staff

INDEX


Graduate School Office, Johnston Hall
MUSIC EDUCATION
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PATTEE HALL
CHILD DEV.
MIN. RESOURCES RES. CTR.
SHEVLIN HALL
PILLSBURY DRIVE
PLEASANT ST SE
FOLWELL HALL
KLAEBER COURT
16TH AVE SE
4TH ST
PARKING LOT NO 35
17TH AVE SE
NORRIS HALL
BURTON HALL
EDDY HALL
JONES HALL
WILLIAMSON HALL
BELL MUSEUM
WOLTE GARAGE UNDERGROUND
WOLTE CENTER
UNIVERSITY AVE SE
ARMORY
ELLIOTT HALL
SCOTT HALL
NICHOLSON HALL
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NORTHROP MEMORIAL AUDITORIUM
PARKING LOT NO 1
ARCHITECTURE
JOHNSTON HALL
MORRILL HALL
SPACE SCIENCE CENTER
FRASER HALL
WALTER LIBRARY
PHYSICS
MECHANICAL ENGINEERING
AERONAUTICAL ENGINEERING
TEMP. NORTH OF APPLEBY
NO THROUGH TRAFFIC
ELECTRICAL ENG.
APPLEBY HALL
SMITH HALL
MURPHY HALL
VINCENT HALL
LIND HALL
UNION ST SE
CHURCH ST
EXPERIMENTAL ENGINEERING
SCIENCE CLASSROOMS
KOLTHOFF HALL
FORD HALL
MINES & MET.
AMUNDSON HALL
PARKING RAMP
WASHINGTON AVE SE
CMU GARAGE UNDERGROUND
JACKSON HALL
LYON LAB.
MILLARD HALL
ZOOLOGY
COFFMAN MEMORIAL UNION
OWRE HALL
HEALTH SCIENCES UNIT A
MISSISSIPPI RIVER
MAYO AUD.
COMSTOCK HALL
BOTANY
PHILLIPS WANGENSTEEN BLDG.
BOYNTON HEALTH SERVICE
MAYO MEMORIAL
PARKING RAMP
CHILD. REHAB. CTR.
DIEHL HALL
GREENHOUSE
UNIV. HOSPITALS
ESSEX ST SE
VARIETY CLUB HEART HOSPITAL
VAN VARIETY CLUB CARDIO. RESEARCH CTR.
UNIVERSITY OF MINNESOTA
TWIN CITIES CAMPUS
EAST BANK

Symbols and Explanations

Symbols—The following symbols are used throughout the course descriptions in lieu of page footnotes:

- * Courses in which graduate students may prepare Plan B projects.
- † All the courses preceding the dagger must be completed before credit will be granted for any quarter of the sequence.
- § Credit will not be granted if the equivalent course listed after the section mark has been taken for credit.
- ¶ Concurrent registration is allowed (or required) in the course listed after the paragraph mark.
- # Consent of the instructor is required prior to registration.
- ∴ Consent of the department, division, or school offering the course is required prior to registration.
- f,w,s,su Following course number indicate fall, winter, spring, or summer quarters.

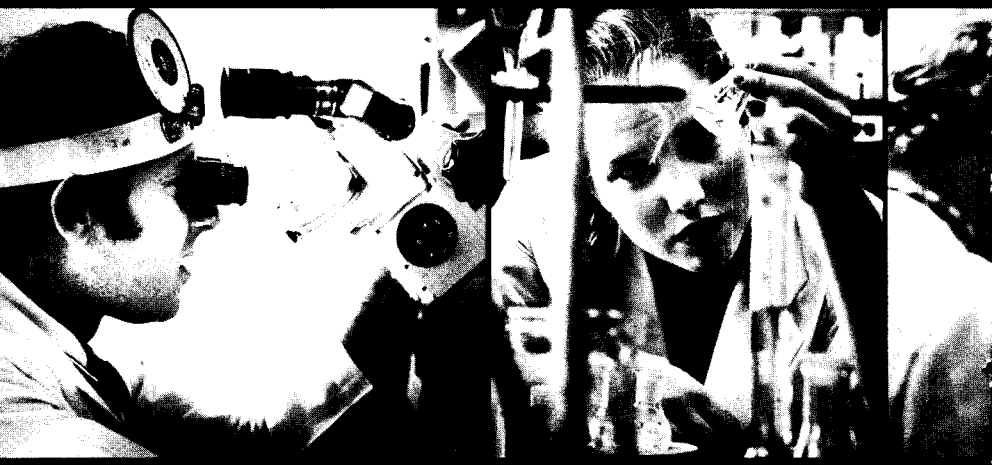
A hyphen between course numbers (e.g., 8142-8143-8144) indicates a sequence of courses that must be taken in the order listed.

A comma between course numbers (e.g., 5234, 5235, 5236) indicates a series of courses that may be entered any quarter.

Courses numbered 8000 or above are open to graduate students only, except by specific permission of the dean of the Graduate School.

Courses numbered 0000 to 0098 are noncredit courses.

A prerequisite course listed by number only (e.g., prereq 5246) is always in the same department as the course being described.



College of Pharmacy

UNIVERSITY OF MINNESOTA

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How to Use This Bulletin

This bulletin is the basic source of information about the College of Pharmacy. It is arranged in four sections:

I. General Information
Mission
History
Degrees and Programs
Admission Requirements
Application Procedures
Degree Requirements
Grading
Access to Student Educational Records
Tuition and Fees
Education, Research, and Special Award Funds
Financial Aids
Awards and Honors
Student Affairs and Activities
Facilities

II. Pharmacy Curricula
Prepharmacy Curriculum
Doctor of Pharmacy Curriculum
Bachelor of Science in Pharmacy Curriculum
Requirements for Minnesota Licensure

III. Description of Courses
Pharmacy
Required Courses Offered by Other Departments

IV. Faculty

All students and prospective students will also need to refer to the *General Information Bulletin* and the *College of Liberal Arts Bulletin*. These bulletins are available at the information booth in Williamson Hall or may be obtained by writing to the Office of Admissions and Records, 110 Williamson Hall, 231 Pillsbury Drive S.E., University of Minnesota, Minneapolis, Minnesota 55455; telephone (612) 373-2153.

For more information about the College of Pharmacy, contact the Office of Student Affairs, College of Pharmacy, 5-110 Health Sciences Unit F, 308 Harvard Street S.E., University of Minnesota, Minneapolis, Minnesota 55455; telephone (612) 373-7997.

College of Pharmacy

I. GENERAL INFORMATION

Mission

The College of Pharmacy is responsible for educating individuals in the knowledge, skills, and attitudes necessary to provide essential pharmaceutical services within the health care delivery system. The college is committed to constantly seeking new knowledge and new applications of existing knowledge in order to assure continuing excellence of scholarship by both faculty and students. It is committed as well to providing services to the people and health practitioners of the state of Minnesota through its educational, service, and research functions.

History

When it was organized by Dean Fredrick J. Wulling in 1892, the College of Pharmacy initiated an entry-level program for pharmacy practice consisting of two years of professional studies leading to the doctor of pharmacy (Phm.D.) degree. In response to recommendations following a series of national studies of pharmacy practice and education, the program gradually expanded to accommodate new knowledge and technology, and the period of formal instruction was extended. The four-year baccalaureate degree (B.S.) program was initiated in 1927 and increased to five years in 1954. More important than the increasing length of curriculum, however, was the change in emphasis from methodological proficiency to an understanding of the principles upon which pharmacy practice depends. A growing scientific base developed to explain the rationale for dosage form design and drug use.

The introduction of a clinical component into the bachelor of science in pharmacy (B.S.) program in 1967 was followed by establishment of the elective advanced standing doctor of pharmacy (Pharm.D.) program in 1971. To keep pace with society's changing needs, the College of Pharmacy introduced the six-year doctor of pharmacy (Pharm.D.) program in 1981 as the optimal preparation for innovative career opportunities in entry-level pharmacy practice. The bachelor of science (B.S.) in pharmacy program continues as an option for those students interested in more traditional roles.

Degrees and Programs

PROFESSIONAL PROGRAMS

The doctor of pharmacy program requires four years of professional study and is open to applicants who have completed two years of preprofessional study in a college of liberal arts. The program is also open to selected applicants who either have completed the second professional year of the bachelor of science in pharmacy degree program or hold a bachelor of science in pharmacy. Students admitted with such advanced standing will receive the degree after approximately two years of study.

The optional bachelor of science program requires three years of professional study, preceded by two years of preprofessional study in a college of liberal arts. This degree is the minimum requirement for eligibility for state licensure to practice pharmacy.

GRADUATE PROGRAMS

Graduate programs for the master of science (M.S.) and doctor of philosophy (Ph.D.) degrees are offered through the Graduate School in medicinal chemistry, pharmaceutics, hospital pharmacy (M.S. only), pharmacognosy, and social and administrative pharmacy. Students who have shown exceptional scholarship and ability as undergraduates in the University's College of Pharmacy or in some other college of pharmacy of equal standing may apply. Those who are not graduates in pharmacy but whose undergraduate work includes training in allied or related subjects may also pursue graduate work in medicinal chemistry, pharmacognosy and social and administrative pharmacy. Detailed information about these programs can be found in the *Graduate Programs in the Health Sciences Bulletin.*

M.B.A. DEGREE PROGRAM

Pharmacy students interested in obtaining a master of business administration (M.B.A.) degree from the University of Minnesota should contact the College of Pharmacy's Office of Student Affairs for information about M.B.A. programs. Students with the bachelor of science in pharmacy degree can sometimes complete an M.B.A. program in as few as three additional academic quarters.

CONTINUING EDUCATION PROGRAMS

The College of Pharmacy recognizes the need and accepts the responsibility for providing continuing education opportunities for practicing pharmacists. Continuing education allows pharmacists to maintain their competence and update their skills as well as to develop new abilities and assume new responsibilities, as required by changing professional duties and roles.

Various learning formats are available to meet the different learning-style preferences of practicing pharmacists. These include lectures, workshops, programmed instruction courses, independent study through use of audio cassette tapes with program outlines, and videotape presentations followed by discussion. Continuing education programs are offered at a number of different sites throughout the state, so that they will be reasonably accessible to pharmacists.

Admission Requirements

High school students who are contemplating a career in pharmacy should complete a rigorous academic program with an emphasis on mathematics, at least through the level of solid geometry and trigonometry, and on science, with courses in biology, chemistry, and physics. Courses in arts, humanities, and social and behavioral studies are helpful. Typing is recommended as a useful skill for college students.

Students who have completed high school must complete a minimum of 90 collegiate quarter credits (or 60 semester credits), including the required courses listed below, to meet the prepharmacy course requirements for admission to either the Pharm.D. or B.S. program in the College of Pharmacy. This course work may be completed either at the University of Minnesota or at other colleges or universities. Students who wish to complete their prepharmacy course work in the College of Liberal Arts of the University of Minnesota must meet the CLA admission requirements specified in the University's *College of Liberal Arts Bulletin.*

PREPHARMACY COURSE REQUIREMENTS[1]

	Semester System	*Quarter System*
General Biology (to include zoology)[2]	2 semesters	2 quarters
Chemistry[2]		
General	Sufficient to qualify for organic chemistry	
Organic (entire sequence) (quantitative analysis recommended)	2 semesters	3 quarters
Calculus	2 semesters	2 quarters
Economics—Macro and Micro Principles or General Business	2 semesters	2 quarters
English—Composition, Communication (speech recommended)	2 semesters	2 quarters
Physics (entire sequence)[2]	2 semesters	2 quarters
Psychology	1 semester	1 quarter
Sociology	1 semester	1 quarter

In addition to the above requirements, students should also complete electives in the arts, humanities, and behavioral and social sciences in order to fulfill the prepharmacy minimum total credit requirement. The pharmacy graduation requirement of 45 quarter credits in general education must include 8 credits of courses in literary and artistic expression (e.g., art, art history, literature, humanities, music, and theatre).

Application Procedures

FIRST-YEAR STUDENTS

Applications for admission to the College of Pharmacy are available from the Office of Admissions and Records, 240 Williamson Hall, 231 Pillsbury Drive S.E., University of Minnesota, Minneapolis, Minnesota 55455. All applications for admission must be accompanied by two official transcripts of previous college coursework. Applications from students not previously enrolled at the University must also include a $10 credentials examination fee. Students are admitted to the college for fall quarter only. Students applying for admission to the entry-level Pharm.D. or B.S. program should file their applications between October 15 and April 15 of the academic year prior to the fall quarter for which they seek admission. In addition, first-year applicants must take the Pharmacy College Admission Test (PCAT) no later than the February prior to fall entry. Information about this test is included in the application materials.

Candidates for admission are evaluated on the bases of prior academic and personal achievement, letters of recommendation, a personal goals statement, the PCAT standardized test scores, and oral and written communication skills. Candidates who expect to complete preprofessional course work during a summer session should follow the application procedures described above, being sure to supply (a) list of courses remaining to be completed, (b) the name of the college in which the courses will be taken, and (c) the dates of the summer session. Two official transcripts including the completed summer session work should be forwarded to the College of Pharmacy immediately following completion of the work, or as soon as grades are available.

Applicants who have a grade average of B or above and meet all other requirements are likely to be admitted. Under terms of reciprocity agreements, residents of North Dakota, South Dakota, and Wisconsin are considered for admission to public institutions in Minnesota under regular resident admission standards. Nonresident applicants with above-average records will be considered individually, as will applicants with lower grade averages and those completing deficiencies.

[1]For a list of University of Minnesota courses that satisfy these requirements, see Prepharmacy Curriculum in section II.
[2]Includes laboratory.

ADVANCED STANDING STUDENTS

Students transferring from another college of pharmacy may apply for advanced standing admission to either the Pharm.D. or B.S. program at the University. Transfer students must have completed the required preprofessional course work before being admitted to the College of Pharmacy and must spend a minimum of one year in residence at the University before qualifying for a degree. These students are not required to take the Pharmacy College Admission Test. Students seeking admission with advanced standing should submit applications and transcripts of their prepharmacy and pharmacy records to the Office of Student Affairs, College of Pharmacy, 5-110 Health Sciences Unit F, 308 Harvard Street S.E., University of Minnesota, Minneapolis, Minnesota 55455. Applications must be filed by December 31 for the following fall quarter.

ADULT SPECIAL STUDENTS

Persons who wish to register for particular courses to meet individual needs rather than to complete a degree program may be admitted to the college as adult special students, with approval of the dean. Adult special students are usually expected to have a bachelor's degree or appropriate experience. Students in this category may not become candidates for degrees or be granted advanced standing without approval of the Committee on Admissions. For information about applying, contact the Office of Student Affairs, College of Pharmacy, 5-110 Health Sciences Unit F, 308 Harvard Street S.E., University of Minnesota, Minneapolis, Minnesota 55455; telephone (612) 373-7997.

Degree Requirements

Degrees from the University of Minnesota are granted by the Board of Regents on recommendation of the College of Pharmacy faculty. To be granted a degree, all students in the college must:

—meet all College of Pharmacy course requirements;

—meet the all-University liberal education distribution requirements;

—earn a minimum of 45 quarter credits in residence and at least 30 of the last 45 quarter credits in residence at the University of Minnesota;

—satisfactorily complete the Basic Pharmaceutical Sciences Examination at the end of the second professional year;

—complete a minimum of 45 quarter credits in nonscience, nonmathematics, nonprofessional general education courses;

—complete a minimum of 300 (Pharm.D.) or 240 (B.S.) quarter credits with a minimum overall grade point average of 2.00 and a minimum overall grade point average in required professional courses of 2.00;

—meet all financial obligations to the University.

Grading

The College of Pharmacy uses the A-B-C-D-No credit (A-N) and Satisfactory-No Credit (S-N) grading systems. All required professional courses and directed elective courses must be taken A-N unless S-N has been approved by faculty action for a particular course. General education elective courses may be taken S-N.

In addition to, or instead of, receiving letter grades, students may be assigned the registration symbols W, I, or V. W (withdrawal) indicates official cancellation of a course without grade. I (incomplete) indicates that course requirements must be completed before a grade will be assigned.

V indicates a noncredit registration as an auditor or visitor. Students must make up grades of incomplete by the end of their next quarter in residence or the I's automatically revert to N's.

A grade point average (GPA) is computed quarterly for each student, using a 4.00 scale: A = 4.00, B = 3.00, C = 2.00, D = 1.00. This GPA is printed on the student's official transcript. N's, for which no grade points are awarded, are not computed into the University GPA. However, the College of Pharmacy includes N's in its calculations to determine scholastic standing and monitor academic progress internally. The college also computes a separate GPA for required courses only, to monitor academic progress. Students who fail to complete satisfactorily (receive N's or I's in) more than three required courses in any academic year will be denied further registration in the College of Pharmacy. Students who fail to complete more than one clinical rotation in an academic year will also be denied further registration in the college.

Access to Student Educational Records

College of Pharmacy and University regulations protect the confidentiality of your records. In accordance with regents' policy on access to student records, information about a student generally may not be released to a third party without the student's permission. The policy also permits students to review their educational records and to challenge the contents of those records.

Some student information—name, address, telephone number, dates of attendance, college and class, major, adviser, and degrees earned—is considered public or directory information. To prevent release of such information outside the University while in attendance at the University, a student must notify the records office on his or her campus.

Students are notified annually of their right to review their educational records. The regents' policy, including a directory of student records, is available for review at the information booth in Williamson Hall, Minneapolis, and at the records offices on other campuses of the University. Questions may be directed to the Office of the Coordinator of Student Support Services, 260E Williamson Hall, (612) 373-2106. A complete statement, "Confidentiality and Access to Student Records," is also available in the Office of Student Affairs in the College of Pharmacy.

Students enrolled in the College of Pharmacy may see all their college records except confidential letters of recommendation to which they have waived right of access or those that were filed before January 1, 1975, and medical, psychiatric, and psychological treatment records. Students may review their files informally with an Office of Student Affairs representative to interpret the contents. Students may copy material and challenge or question contents and may insert materials into their files.

Official academic records are maintained permanently by the University's Office of Admissions and Records. The Office of Student Affairs in the College of Pharmacy retains degree plans measuring student progress for two years following graduation.

Tuition and Fees

Students registered for twelve or more credits in a quarter pay a flat per-quarter tuition rate, plus any additional fees that are assessed. Students registered for fewer than twelve credits pay tuition on a per-credit basis. Students registering for six or more credits in a quarter must pay a student services fee. Tuition and fees for audit registrations are the same as tuition and fees for credit registrations.

A student who receives an N and is required to repeat a course must reregister and pay fees a second time. A student who receives an N in a course but is permitted to complete course requirements in some manner other than reregistration must complete a Special Examination Form and pay a fee before a grade change will be made.

Under terms of reciprocity agreements, residents of North Dakota, South Dakota, and Wisconsin are eligible, upon application, for resident tuition status. Nonresident students who have a B.S. in Pharmacy degree and who are candidates for the Pharm.D. degree may receive

appointments as teaching assistants for 25 percent time or more and thus be eligible to pay tuition at resident rates.

For a detailed statement of current tuition, fees, and other expenses, see the *General Information Bulletin*.

Education, Research, and Special Award Funds

Abbie N. Larson Memorial Pharmacy Scholarship Fund—Provides scholarships for students in the pharmacy curriculum.

William D. and Ruth Nelson Educational Fund—Used to improve pharmaceutical education in the College of Pharmacy.

Pharmaceutical Education and Research Fund—Provides resources on an emergency basis to new programs or areas in which there are pressing needs.

Pharmacy Century Mortar Club—Provides funds for special projects for which state or federal funds are not available.

College of Pharmacy Founders' Memorial Fund—Used to honor individuals who contribute to the goals of the college.

Financial Aids

Loans—The following revolving student loan funds have been established to aid students in the College of Pharmacy:

Burroughs-Wellcome Company, honoring these pharmacist donors:

Saul Amdur
Lyle W. Anderson
Meredeth J. Anderson
Robert R. Anderson
Donald D. Dame
Arlin L. Houtkooper
Vaughn Q. Johnson
Ronald Lavine
Alan Y. Michalka
Richard C. Oftedahl
Richard M. Schenk
Joel C. Schulze
John T. Sernett

Century Mortar Club
Edwin G. Fischer
Kappa Psi Fraternity
Minnesota State Pharmaceutical Association T. O. Soine Memorial
National Association of Retail Druggists Foundation
Women's Auxiliary of the American Pharmaceutical Association

More information about these small, short-term loan funds can be obtained from the College of Pharmacy Office of Student Affairs.

The college also participates in the Health Professions Student Loan Program, which is administered by the Bureau of Health Manpower, Health Resources Administration of the Public Health Service. Under this program, a student may receive up to $2500 a year plus tuition and fees for the five- or six-year program. Interested students should apply through the University's Office of Student Financial Aid.

Loans for which all University students are eligible to apply are also available to pharmacy students through the Office of Student Financial Aid. For information and application forms, contact the Office of Student Financial Aid, 210 Fraser Hall, 106 Pleasant Street S.E., University of Minnesota, Minneapolis, Minnesota 55455.

Scholarships—Students enrolled in the prepharmacy curriculum in the College of Liberal Arts or in the professional curriculum in the College of Pharmacy are eligible for the financial awards listed below. The scholarships are awarded on the bases of scholastic achievement,

financial need, vocational intention, and other criteria. The college Committee on Scholarships, Fellowships, and Awards recommends scholarship candidates to the faculty for its approval. Usually no student is awarded more than one scholarship. Unless otherwise specified, scholarships are awarded annually. For information about all-University scholarships, refer to the section on financial aids in the *General Information Bulletin*.

American Cancer Society Scholarships—Awarded to first- and second-year pharmacy students with demonstrated leadership potential and maturity, who have an interest in oncology.

Robert R. Anderson Memorial Scholarship—Awarded occasionally to a pharmacy student in financial need.

Benjamin M. Cohen Memorial Scholarships—Awarded to students enrolled in the College of Pharmacy.

John W. Dargavel Foundation Scholarship—Awarded to a student enrolled in any of the professional years.

Druggists Mutual Insurance Company Scholarships—Awarded to help a student or students complete the course in pharmacy.

Kappa Psi Fraternity, Minnesota Graduate Chapter Scholarship—Awarded to a third-year student who is a member of Epsilon Chapter.

Keith K. Keller Memorial Scholarship—Awarded to a student enrolled in the prepharmacy or pharmacy program at the University.

Cecil A. Krelitz Memorial Scholarship—Awarded to students enrolled in the prepharmacy years or the first professional year at the University.

Abbie N. Larson Memorial Pharmacy Scholarship—Awarded to a pharmacy student based on scholastic performance and financial need.

Sarah Lavintman Mark Scholarship—Awarded to a pharmacy student interested in hospital pharmacy and entering the last year of professional study.

Roger D. Lehman and James M. Schneider Scholarship—Awarded to a second-year pharmacy student.

Claude A. Mather Memorial Scholarship—Awarded to a student from Eveleth, Minnesota, with preference to students in pharmacy.

McKesson & Robbins Scholarship—Awarded to a pharmacy student based on scholastic achievement, with preference given to the student who received the scholarship the preceding year.

Samuel W. Melendy Grants-in-Aid—Awarded to a limited number of minority students enrolled in the prepharmacy program.

Samuel W. Melendy Memorial Scholarships—Awarded to pharmacy students in either of the last two professional years.

Samuel W. Melendy Undergraduate Research Scholarships—Awarded to qualified applicants, with preference given to students in the second professional year. The scholarships provide funds for the calendar year.

Fred Multaler Memorial Scholarship—Awarded to a Minnesota pharmacy student in financial need.

Northwestern Drug Company Scholarship—Awarded to a pharmacy student in the first professional year or to the student who received the scholarship the preceding year.

William M. and Mildred E. Peters Scholarship—Awarded to a pharmacy student.

Awards and Honors

The following prizes are awarded annually by the faculty of the college to undergraduate students or to members of the graduating class. The bases for the awards are indicated in the brief descriptions.

Carol A. Beaty Memorial Award—Sponsored by the family and friends of Carol A. Beaty. For the student in the college demonstrating the greatest interest and ability in the application of computer techniques to pharmacy.

John Y. Breckenridge Memorial Book Award—Sponsored by the late Mrs. John Y. Breckenridge in memory of her husband, class of 1908. For a second-year pharmacy student in recognition of outstanding scholastic achievement, professional promise, and leadership ability.

Bristol Laboratories Award—Sponsored by Bristol Laboratories, Inc., Division of Bristol-Meyers Company, Syracuse, New York. For the outstanding graduate recognized for extracurricular contributions to the spirit of the class, improvement of the community, or fight against drug abuse.

Hallie Bruce Memorial Award—Sponsored by the family and friends of Hallie Bruce, class of 1916, and by the alumni of the college. For a member of the graduating class in recognition of outstanding achievement in hospital pharmacy.

Harold H. Carpenter Memorial Award—Sponsored by the family of Harold H. Carpenter. Award criteria to be established.

College of Pharmacy Alumni Award—Sponsored by the College of Pharmacy Alumni Association. Awarded to a member of the graduating class for scholastic excellence and extracurricular involvement.

Dean's Award—Sponsored by L. C. Weaver, dean. Awarded at the dean's discretion to a graduating student who has contributed to the goals of the college through efforts outside the academic area.

Druggists Mutual Award—Sponsored by the Druggists Mutual Insurance Company, Algona, Iowa. For a first-year student in recognition of scholastic achievement and extracurricular involvement.

Ole Gisvold Medicinal Chemistry Award—Sponsored by the friends and associates of the late Professor Ole Gisvold. For a graduating pharmacy student who has earned an exceptional grade point average in all chemistry-related courses of the professional curriculum and who has demonstrated exceptional interest in or potential for graduate study in the field of medicinal chemistry.

Johnson & Johnson Mortar and Pestle Award—Sponsored by Johnson & Johnson, New Brunswick, New Jersey. For a second-year pharmacy student in recognition of outstanding work in the area of pharmacy and business administration.

Kappa Epsilon Award—Sponsored by the Alumnae Chapter of Kappa Epsilon. For a student member who has rendered outstanding service to the College of Pharmacy.

Kappa Psi Pharmacopa Award—Sponsored by the Epsilon Chapter of Kappa Psi Pharmacy Fraternity. Awarded to the editor of *Pharmacopa* for dedication to promoting interest in and providing information about possible careers in pharmacy.

Kappa Psi Scholarship Award—Sponsored by the Minnesota Graduate Chapter of Kappa Psi Pharmacy Fraternity. Awarded to a graduating student member on the basis of scholastic performance.

Deborah A. Kasper Memorial Award—Sponsored by the family of Deborah A. Kasper and the class of 1978. For the first-year student who has contributed most to class *esprit de corps* in the course of everyday college studies.

Lilly Achievement Award—Sponsored by Eli Lilly and Company, Indianapolis, Indiana. For the third-year pharmacy student who best exemplifies scholastic and professional achievement, leadership ability, and ethical conduct.

McKesson & Robbins Award—Sponsored by McKesson & Robbins, Inc., New York, New York. For the president of the Student Chapter of the American Pharmaceutical Association.

Merck Award—Sponsored by Merck and Company, Inc., Rahway, New Jersey. For graduating students who have demonstrated outstanding scholastic achievement in pharmacy.

Minnesota Society of Hospital Pharmacists Award—Sponsored by the Minnesota Society of Hospital Pharmacists. For a graduating student who has excelled academically and who has made a contribution to and has demonstrated leadership in hospital pharmacy.

Minnesota State Pharmaceutical Association Outstanding Student Award—Sponsored and selected by the Minnesota State Pharmaceutical Association. For an outstanding third-year pharmacy student.

Phi Delta Chi Award—Sponsored by the Theta Alumni Chapter of Phi Delta Chi Pharmacy Fraternity. For a graduating student member who has rendered outstanding service to the fraternity and to the College of Pharmacy.

Phi Delta Chi Scholarship Award—Sponsored and selected by members of the Theta Chapter of Phi Delta Chi Fraternity. For a student member who has demonstrated outstanding scholarship in the first professional year.

Rho Chi Award—Sponsored by Mu Chapter, Rho Chi, Pharmacy Honor Society. For the first-year pharmacy student who has earned the highest scholastic average.

Rho Chi Research Award—Sponsored by Mu Chapter, Rho Chi, Pharmacy Honor Society. Established by a gift from Professor Izaak M. Kolthoff. For a student who has contributed to and shown promise of excellence in research in pharmaceutical science.

Smith Kline & French Clinical Pharmacy Award—Sponsored by Smith Kline & French Laboratories, Philadelphia, Pennsylvania. For a graduating Pharm.D. student demonstrating superior student achievement.

T. O. Soine Memorial Award—Sponsored by the family and friends of Professor T. O. Soine. For a second-year student who has made significant contributions by enhancing interstudent communication, stimulating class spirit, and serving the needs of the college and its students.

Upjohn Pharmacy Achievement Award—Sponsored by the Upjohn Company, Kalamazoo, Michigan. For a graduate who has performed distinguished public service.

F. J. Wulling First-Year Student Award—Sponsored by the late Mrs. Frederick J. Wulling in memory of her husband, dean of the College of Pharmacy, 1892-1936. For a pharmacy student who has excelled in the first professional year.

F. J. Wulling Second-Year Student Award—Sponsored by the late Mrs. Frederick J. Wulling in memory of her husband, dean of the College of Pharmacy, 1892-1936. For a pharmacy student who has excelled in the second professional year.

F. J. Wulling Third-Year Student Award—Sponsored by the late Mrs. Frederick J. Wulling in memory of her husband, dean of the College of Pharmacy, 1892-1936. For the pharmacy student who has earned the highest scholastic average during the professional years.

Student Affairs and Activities

All pharmacy students are invited to participate in any of the following activities. Information about these activities can be obtained from the Office of Student Affairs, 5-110 Health Sciences Unit F.

Class Officers—At the beginning of each academic year, students elect their class officers for the purpose of organizing class functions and activities.

College Board—As the student government body, the College Board acts as the students' representative and liaison and sponsors many all-college activities. Its purpose is to advance the interests of students in the College of Pharmacy through active student participation. It is composed of class representatives and leaders of all recognized student organizations in the college.

Student American Pharmaceutical Association/Minnesota State Pharmaceutical Association—The largest student organization in the College, the association concerns itself with the

professional needs of students at the local, state, regional, and national levels. It is actively involved in educational activities and legislation affecting the profession at the state or national level.

American Association of Colleges of Pharmacy (AACP) Representative—Each active member school of the AACP is entitled to select one student representative to serve as liaison between the association, the college's student body, and the college's faculty and dean delegates. At least one student representative is appointed as a voting delegate to each AACP standing committee.

Professional Societies—Three professional pharmacy societies are active on this campus: Kappa Epsilon, Kappa Psi, and Phi Delta Chi; each organization has a faculty adviser. These groups sponsor activities involving students, the college, the profession, and the public.

Honor Societies—Rho Chi, the national honor society of pharmacy, is represented at Minnesota by the Mu Chapter. At the end of their second professional year, eligible students may be elected to membership by society members. Election to the society is based on scholarship, character, and conduct. A maximum of 20 percent of a class is eligible. Pharmacy students are also eligible for invitation to membership in Iota Sigma Pi, national honor society for women in chemistry, and Phi Lambda Upsilon, scholastic honor society for men and women in chemistry.

Faculty Committees—Students are appointed to all regular standing committees as well as ad hoc committees that govern the college.

CHIP (Council for Health Interdisciplinary Participation)—This health science student organization promotes the team approach to health care delivery through student services and community programs.

DISC (Drug Information Service Center)—This organization is dedicated to the advancement of drug education. When invited by grade schools, high schools, or community organizations, student volunteers present talks on drugs. DISC also operates an information/referral center to handle drug problems.

Pharmacopa—Kappa Psi Pharmacy Fraternity, on its own initiative, prepares the annual, *Pharmacopa*, which contains articles of interest as well as pictures of members of the graduating class, faculty, and staff.

Pharmacy Book Exchange—The student book exchange operates the first week of each quarter. Students may place used textbooks in the exchange on consignment.

Special Lectures—From time to time throughout the school year, outstanding individuals in pharmacy and related sciences are invited to address the students and staff in the College of Pharmacy. Students are urged to attend.

Samuel W. Melendy Memorial Lecture—The College of Pharmacy sponsors an annual lecture by a pharmacist of national reputation on a subject intended to advance the interests of the profession. This lectureship has been made possible by the Samuel W. Melendy Memorial Fund.

Pharmaceutical Education Trip—Students in the College of Pharmacy have an opportunity to visit the laboratories of at least one pharmaceutical or biological manufacturer during spring vacation. Students are encouraged to take at least one of these trips.

ROTC—Consult the *General Information Bulletin* for Reserve Officers' Training Corps programs available at the University. For detailed information, see the *Army, Navy, Air Force ROTC Bulletin*.

Facilities

Libraries—Students in the College of Pharmacy have access to the collection of the University Libraries, totaling more than 3.5 million volumes on the Twin Cities campus. More than 250,000 volumes of resource materials in the fields of clinical pharmacy, hospital pharmacy, medicinal chemistry, pharmaceutics, pharmacognosy, and social and administrative pharmacy are located in the Biomedical Library in Diehl Hall or in the Chemistry Library.

Clinical Practice Laboratories—The facilities of the Hennepin County Medical Center, St. Paul-Ramsey Medical Center, University of Minnesota Health Sciences Center, and Veterans Administration Medical Center, as well as private hospitals and numerous metropolitan pharmacies, are used as practice instruction sites.

Health Sciences Unit F—In 1981 the College of Pharmacy moved to new facilities designed specifically for the School of Nursing and the College of Pharmacy in the University of Minnesota Health Sciences Center. This modern physical plant, which cost in excess of $21,000,000, trebled space for pharmacy study and research.


Kaolin
N.F.
Mallinckrodt
Lactosum
Mallinckrodt
Magnesium
Carbonate
U.S.P.
Mallinckrodt
Magnesium Oxide
Heavy
USP
Mallinckrodt
Magnesium
Oxide
U.S.P. (Light)
Mallinckrodt

II. PHARMACY CURRICULA

Prepharmacy Curriculum

High school graduates interested in pharmacy should enroll as prepharmacy students in the College of Liberal Arts of the University of Minnesota or in another accredited liberal arts college or university. When they have satisfactorily completed the required prepharmacy courses, students are eligible to apply for admission to the College of Pharmacy.

In the belief that all students, whatever their area of specialization or vocational goals, should share the goal of obtaining a liberal education, the University of Minnesota has established liberal education requirements for all undergraduate programs. Students in the College of Pharmacy must also complete these requirements. The required courses in the prepharmacy program (see below) fulfill the following all-University liberal education group requirements: Communication, Language, and Symbolic Systems; The Physical and Biological Sciences; and The Individual and Society. Electives in the prepharmacy or professional program can be selected to fulfill the Literary and Artistic Expression credit requirement for graduation from the College of Pharmacy. Refer to the *College of Liberal Arts Bulletin* for a listing of courses that can be used to satisfy this requirement.

Courses that fulfill prepharmacy requirements and professional (directed) electives must be taken under the A-N grading system, unless a course is offered under S-N grading only or advanced placement (exemption) has been granted. Professional electives beyond the minimum requirements, as well as general electives, may be taken S-N unless prohibited by the college offering the course. A maximum of five credits in ROTC courses will be accepted as part of the 90-quarter-credit minimum. Credits for typing, personal orientation, and physical education are not acceptable.

Students applying for admission to the professional curriculum in the College of Pharmacy must satisfactorily complete the following courses or their equivalents.

PREPHARMACY COURSE REQUIREMENTS[1]

	Approximate Credits	
	Semester	*Quarter*
General Biology—Biology-Zoology[2]	6	10
Biol 1011, 1106		
Chemistry—General and Organic (quantitative analysis recommended)[2]	16	26
Chem 1004-1005, 3301/3305, 3302/3306, 3303		
Economics—Macro and Micro Principles or General Business	4	8
Econ 1001, 1002		
English—Communication or Composition (speech recommended)	6	8
Comp 1001, 1002 or Comm 1001, 1002[3]		
Mathematics	8	10
Math 1211-1221		
Physics[2]	8	10
Phys 1031/1035, 1032/1036		
Psychology	4	5
Psy 1001		
Sociology	3	4
Soc 1001		
Electives—Arts and Humanities, Behavioral and Social Sciences	5	9
	60	90

[1]University of Minnesota courses are designated by course name and number.

[2]Includes laboratory.

[3]This requirement is expected to change effective fall quarter 1982. Check with your college office for current information.

Doctor of Pharmacy Curriculum

The purpose of the doctor of pharmacy program is to prepare mature health professionals who are specialists in drug use, misuse, and abuse to serve as consultants to patients and health professionals in order to assure safe and effective use of drugs by society. Students in the doctor of pharmacy program must complete a minimum of 300 quarter credits in preprofessional, professional, and general elective courses. Students who present two or more years of preprofessional collegiate work and meet the prepharmacy minimum course requirements can expect to complete the professional program in four additional years. Students who have completed two years of professional study or hold the B.S. in pharmacy degree can expect to complete the program in approximately two additional years. Requirements include the courses listed below.

FIRST PROFESSIONAL YEAR

(50 credits minimum)

Elementary Anatomy—Anat 1004 (4 cr)
Biochemistry of Medicinals—Phar 5430-5440 (7 cr)
Communications for the Health Sciences I—Phar 5303 (1 cr)
Drugs and Health Care—Phar 5201 (3 cr)
Fundamental Principles and Processes Laboratory—Phar 5621 (1 cr)
General Microbiology—VPB 3103 (5 cr)
Human Nutrition and Drug Therapy—Phar 5445 (3 cr)
Human Physiology—Phsl 3070 (6 cr)
Instrumental Analysis—Phar 5421 (2 cr)
Introduction to Dosage Form Design Laboratory—Phar 5605 (2 cr)
Pathology—Phar 5150-5151 (4 cr)
Pharmaceutical Calculations—Phar 5603 (1 cr)
Principles of Drug Delivery I-II—Phar 5610-5620 (7 cr)
Therapeutic Agents I—Phar 5320 (3 cr)
Therapeutic Agents Laboratory—Phar 5841 (1 cr)

SECOND PROFESSIONAL YEAR

(52 credits minimum)

Biopharmaceutics—Phar 5630 (3 cr)
Biopharmaceutics Laboratory—Phar 5631 (2 cr)
Clinical Research Methods and Biostatistics—Phar 5295 (3 cr)
Dispensing Pharmacy—Phar 5650 (3 cr)
Dispensing Pharmacy Laboratory—Phar 5651 (2 cr)
Financial Management—Phar 5245 (3 cr)
General Pharmacology—Phcl 5101-5102 (8 cr)
Pharmacokinetics—Phar 5680 (4 cr)
Pharmaceutical Microbiology and Immunology—Phar 5360 (4 cr)
Pharmacy and the Health Care System—Phar 5250 (3 cr)
Social and Behavioral Pharmacy—Phar 5260 (3 cr)
Therapeutic Agents II, III, IV—Phar 5330-5340-5350 (13 cr)
Therapeutic Agents Laboratory II—Phar 5842 (1 cr)

THIRD PROFESSIONAL YEAR

(54 credits minimum)

Clinical Therapeutics—Phar 5317-5318-5319 (15 cr)
Clinical Toxicology—Phar 5306 (2 cr)

Communication for the Health Sciences II—Phar 5304 (1 cr)
Drug Information Evaluation and Study Design—Phar 5670 (2 cr)
Orientation Clerkship—Phar 5394 (2 cr)
Pathophysiology—Phar 5310-5311-5312 (30 cr)
Pharmacy and the Law—Phar 5230 (2 cr)

FOURTH PROFESSIONAL YEAR

(48 credits)

Pharm.D. Clerkship—Phar 5396 (48 cr)

The fourth year consists of 13 four-week rotations in required and elective clerkships, or elective course work. Required clerkships are

Community Practice (8 weeks)
Medicine (8 weeks)
Pediatrics (4 weeks)
Psychiatry (4 weeks)
Surgery (4 weeks)

Elective course work will be offered in two-credit modules during three to four intensive instructional periods (IIP) during the year. Elective courses are

Contemporary Pharmacy—Phar 5280
Drug-Induced Diseases—Phar 5275
Drugs and the Elderly—Phar 5265
Hormones—Phar 5870
Hospital Pharmacy—Phar 5291
Monitoring Parameters for Medicated Patients—Phar 5316
Nuclear Pharmacy—Phar 5695
Parenteral Products—Phar 5696
Pharmacy Accounting—Phar 5244
Pharmacy Management—Phar 5240
Social and Psychological Aspects of Death—Phar 5255
Special Problems—Phar 5999
Veterinary Pharmacy—Phar 5520

Bachelor of Science in Pharmacy Curriculum

The bachelor of science (B.S.) degree in pharmacy is an optional program. The B.S. degree will be awarded to all students in the College of Pharmacy who have completed the two-year prepharmacy curriculum, the first two professional years of the doctor of pharmacy program, plus a third professional year as follows:

Clinical Therapeutics—Phar 5301-5302 (6 cr)
Community Pharmacy Clerkship—Phar 5390 (12 cr)
Drug Information Evaluation and Study Design—Phar 5670 (2 cr)
Hospital Practice Clerkship—Phar 5392 (12 cr)
Pharmacy and the Law—Phar 5230 (2 cr)
Directed Electives—(6 cr)

Directed electives must include six credits in interdisciplinary health science, pharmacy, or public health courses. General electives should be completed as needed to fulfill the 45-quarter-credit general education requirement and the 240-quarter-credit degree requirement.

Requirements for Minnesota Licensure

The State Board of Pharmacy meets at the college at least twice each year to examine candidates for licensure to practice pharmacy in Minnesota. State law requires that candidates for examination for licensure meet the following qualifications:

SECTION 151.10 QUALIFICATIONS OF APPLICANTS

To be entitled to examination by the board as a pharmacist the applicant shall be of good moral character, at least 21 years of age, and shall be a graduate of the College of Pharmacy of the University of Minnesota or of a college or school of pharmacy in good standing of which the board shall be the judge and shall have completed internship requirements as prescribed by the board.

SECTION 151.101 INTERNSHIP

The board may register as an intern any natural person who has satisfied the board that he is of good moral character, not physically or mentally unfit, and who has successfully completed the educational requirements for intern registration prescribed by the board. The board shall prescribe standards and requirements for internship training but may not require more than one year of such training.

The board in its discretion may accept internship experience obtained in another state provided the internship requirements in such other state are in the opinion of the board equivalent to those herein provided.

Regulation 61 of the Minnesota State Board of Pharmacy describes the internship program and requires that students register with the board before beginning employment as interns. Students must complete a total of 1,500 internship hours. Credit for internship time cannot be granted unless the intern is properly registered with the board. To be registered, the intern must have successfully completed classes in the first professional year of the pharmacy curriculum. Students registered as interns must maintain satisfactory progress toward completion of the pharmacy curriculum.

In order that internship experience obtained during summer vacations may be properly credited toward the 1,500-hour requirement, a student must file the following documents at the specified times with the Minnesota State Board of Pharmacy: (a) within five days of beginning work, a notice of employment form stating date employment began; (b) within five days of completing work, a progress report that describes the internship training experiences and that has been attested to by the pharmacist preceptor. Instructions for completing these reports and any other required forms may be obtained from the secretary of the Board of Pharmacy.

In addition to completing the above-mentioned forms, each intern must take a series of examinations before and after each three-month period of internship experience exclusive of the internship hours credited through designated clinical pharmacy courses and employment time completed concurrently with full-time studies. An intern must demonstrate minimum competency levels in these examinations before being granted credit for the internship experiences. A minimum grade of 65 percent is required on the examination following the first three-month period of internship. Thereafter, a minimum grade of 75 percent is required on the remaining examinations.

The Minnesota State Board of Pharmacy requires that an official or certified transcript of scholastic work accompany the application for examination for licensure to practice pharmacy in this state. Minnesota graduates may obtain their transcripts from the Office of Registration, Student Records, and Scheduling, 155 Williamson Hall, 231 Pillsbury Drive S.E., University of Minnesota, Minneapolis, Minnesota 55455. Students should request transcripts at least three weeks before they intend to file their application with the Board of Pharmacy.

For information concerning any matters coming under the jurisdiction of the board, contact the Secretary of the Minnesota State Board of Pharmacy, 717 Delaware Street S.E., #351, Minneapolis, Minnesota 55414.

III. DESCRIPTION OF COURSES

Symbols and Course Listing Information—The following symbols are used throughout the course descriptions in lieu of page footnotes:

§ Credit will not be granted if the equivalent course listed after the section mark has been taken for credit.

¶ Concurrent registration is allowed (or required) in the course listed after the paragraph mark.

Consent of the instructor is required prior to registration.

** Elective course.

A hyphen between course numbers (e.g., 3142-3143-3144) indicates a sequence of courses that must be taken in the order listed.

A class rank prerequisite (e.g., 3rd yr) states the minimum class standing a student must hold to register for a course without special permission from the Academic Standing Committee.

A prerequisite course listed by number only (e.g., prereq 5246) is in the same department as the course being described.

All students are required to prepurchase laboratory deposit cards from the bursar for breakage and supplies.

Pharmacy (Phar)

5150-5151. PATHOLOGY. (2 cr per qtr)
Introduction to fundamental concepts of pathology using programmed learning format.

5201. DRUGS AND HEALTH CARE. (3 cr; S-N grading)
Introduction to the role of pharmacy in the control and utilization of drugs in society; introductory clerkship.

5210. ** **TERMINOLOGY OF THE HEALTH SCIENCES.** (2 cr, §HSU 5210)
Survey of the language of the health sciences using a programmed learning format.

5230. PHARMACY AND THE LAW. (2 cr)
Introduction to the state (Minnesota) and federal laws, rules, and court decisions that affect the practice of pharmacy. Topics include legal control mechanisms; peer regulation; licensing; acts of unprofessional conduct; labeling; drug distribution channels; the Controlled Substances Act; the Federal Food, Drug, and Cosmetic Act; business law; and other special regulations and related subjects.

5232. ** **DRUGS AND PRISON HEALTH.** (2 cr)
Drug use and abuse in correctional institutions.

5236. ** **INTRODUCTION TO COMPUTER APPLICATIONS IN PHARMACY.** (3 cr; prereq 2nd-yr pharmacy student)
Introduction to hardware and software aspects of computers, including terminology, programming skills, information management, and applications in pharmacy practice and research.

5240. ** **PHARMACY MANAGEMENT.** (2 cr)
Policy planning, decision making, and personnel management.

5244. ** **PHARMACY ACCOUNTING.** (2 cr)

5245. FINANCIAL MANAGEMENT. (3 cr)
Basic principles of pharmacy accounting, management analysis, business management principles, and strategic financial planning.

5250. PHARMACY AND THE HEALTH CARE SYSTEM. (3 cr)
Examination of the United States' health care delivery system with emphasis on the delivery of drugs and pharmacy services.

5255. ** **SOCIAL AND PSYCHOLOGICAL ASPECTS OF DEATH.** (2 cr; prereq #)
The role and social organization of death in our society and the relationship of the pharmacist to the terminally ill patient.

5260. SOCIAL AND BEHAVIORAL PHARMACY. (3 cr)
Analysis of the basic human behaviors related to illness, health, and death. Selected topics include the placebo effect, compliance problems, risk-taking behavior, delay in seeking care, professionalism, hypochondria, and the lay referral system.

5265. ** **DRUGS AND THE ELDERLY.** (2 cr; prereq #)
Psychological, sociological, physiological/pharmacological, and economic aspects of aging and drug use among the elderly.

5266. ** **DRUGS AND THE ELDERLY WORKSHOP.** (1-3 cr; prereq 5265 or #)
Seminar/discussion/workshop sessions on specific drug problems, communication skills with the elderly, and problem-solving techniques. Clinical experiences include home visits to individuals with drug problems and presentations to senior citizen groups on a variety of drug-related subjects.

5275. DRUG-INDUCED DISEASES.** (2 cr; prereq Phcl 5102)
Organ system approach to iatrogenic disease. Mechanisms of drug-induced pathology (e.g., allergic, toxic); relative incidence, severity, and reversibility of such reactions; summary of the pathophysiology of the disease state; and methods for detection.

5280. CONTEMPORARY PHARMACY.** (2 cr; prereq 2nd-yr pharmacy student, #)
Contemporary topics in pharmacy.

5286. DRUGS AND SOCIETY WORKSHOP.** (1-3 cr; prereq #)
Planning, development, and implementation of community-oriented drug use problem prevention and treatment programs.

5290. SPECIALTY CLERKSHIPS.** (Cr ar)
Practice experience with specialized populations.

5291. HOSPITAL PHARMACY.** (2 cr; lect and hospital visitations)
History, organization, and administration of pharmaceutical services in institutional settings.

5295. CLINICAL RESEARCH METHODS AND BIOSTATISTICS. (3 cr)
Introduction to fundamental methodological aspects of clinical research. Development of biostatistical concepts used in clinical research.

5301-5302. CLINICAL THERAPEUTICS. (3 cr per qtr; prereq 5350 or #)
Clinical therapeutics of common diseases.

5303-5304. COMMUNICATIONS FOR THE HEALTH SCIENCES I-II. (1 cr per qtr; prereq pharmacy student or #)
The communications model as it relates to the health professions.

5306. CLINICAL TOXICOLOGY. (2 cr; prereq #)
Poison treatment and prevention.

5307. CLINICAL CONFERENCES. (2 cr; prereq 4th-yr PharmD candidate)

5310-5311-5312. PATHOPHYSIOLOGY OF DISEASE. (10-12 cr per qtr; lect and rec; prereq 5350, PharmD candidate or #)

5315. INTERPERSONAL COMPETENCIES. (2 cr)
Students analyze their personal impact on peers, patients, and other health science professionals. Topics include methods of communication, persuasion, manipulation, and educational techniques. Extensive video feedback and practical experiences in clinical settings.

5316. MONITORING PARAMETERS IN MEDICATED PATIENTS.** (2 cr; prereq #)
Introduction to all relevant physical assessment skills necessary to monitor patient drug therapy.

5317-5318-5319. PHARM.D. CLINICAL THERAPEUTICS. (5 cr per qtr)

5320-5330. THERAPEUTIC AGENTS I-II. (3/5 cr; prereq 5430)
Factors involved in drug absorption, distribution, excretion, metabolism, mechanisms of action, and receptor interaction; rational drug design, therapeutic properties and uses of individual pharmacological drug categories.

5335. PHARMACEUTICAL MICROBIOLOGY. (3 cr; prereq VPB 3103 or #)
Fundamentals of immunology and microbiology with emphasis on preparation and use of immunological agents in the control of infectious diseases.

5340-5350. THERAPEUTIC AGENTS III-IV. (5/3 cr; prereq 5430)
Factors involved in drug absorption, distribution, excretion, metabolism, mechanisms of action, and receptor interaction; rational drug design; therapeutic properties and uses of individual pharmacological drug categories.

5360. PHARMACEUTICAL MICROBIOLOGY AND IMMUNOLOGY. (4 cr; prereq 2nd-yr pharmacy student)
Selected topics in pharmaceutical and clinical aspects of immunology and microbiology with emphasis on preparation and use of immunological agents in the control of diseases.

5390. COMMUNITY PRACTICE CLERKSHIP. (12 cr; prereq 3rd-yr pharmacy student, 40 hrs per wk for 12 wks)
Supervised and evaluated practical experience under college-coordinated field preceptors.

5392. HOSPITAL PRACTICE CLERKSHIP. (12 cr; prereq 3rd-yr pharmacy student; 40 hrs per wk for 12 wks)
Supervised and evaluated practical experience under college-coordinated field preceptors.

5394. ORIENTATION CLERKSHIP—PHARM.D. (2 cr; prereq 3rd-yr PharmD candidate)
Introduction to patient drug monitoring in patient care settings.

5396. PHARM.D. IV CLERKSHIP. (12 cr; prereq 5312 or #)
Monitoring of patient drug therapy at University Hospitals and other affiliated institutions.

5421. INSTRUMENTAL ANALYSIS. (2 cr)
Modern instrumental methods.

5430-5440. BIOCHEMISTRY OF MEDICINALS. (3/4 cr; prereq Chem 3303 or #)
Selected topics in biochemistry essential to understanding of pharmacodynamic action and therapeutic use of medicinal agents.

5445. HUMAN NUTRITION AND DRUG THERAPY. (3 cr; prereq 5440 or #)
Basic concepts of human nutrition, clinical and applied human nutrition, and nutrition fads.

5494. INSTRUMENTATION.** (3 cr; prereq Chem 3303 or #)
Modern approaches to drug analysis. Series of laboratory exercises and lectures on NMR, MS, high pressure LC, radioimmune assay, liquid scintillation, forensic drug identification, monitoring of drug therapy, drug metabolism law related to drug analysis, and emergency poison identification.

5520. VETERINARY PHARMACY.** (3 cr; prereq Phcl 5102 or equiv)
(Same as LACS 5681) Professional interrelationships between pharmacists and veterinarians, disease problems of domestic animals, and animal pharmacology.

5603. PHARMACEUTICAL CALCULATIONS. (1 cr)
Mathematics associated with dosage form design.

5605. INTRODUCTION TO DOSAGE FORM DESIGN. (2 cr)
Technology of common pharmaceutical dosage forms.

5610-5620. PRINCIPLES OF DRUG DELIVERY I-II. (4/3 cr)
Fundamental phenomenological and theoretical bases of processes controlling drugs and dosage forms.

5621. FUNDAMENTAL PRINCIPLES AND PROCESSES LABORATORY. (1 cr; prereq ¶5620; S-N grading)

5630. BIOPHARMACEUTICS. (3 cr; prereq 5620)
Applied theory of dosage form design for optimal drug activity and bioavailability.

5631. BIOPHARMACEUTICS LABORATORY. (2 cr; prereq ¶5630; S-N grading)

5650. DISPENSING PHARMACY. (2-3 cr; prereq 5630)
Technology, record systems, interprofessional relationships, drug use control, and other factors involved in dispensing prescription medications.

5651. DISPENSING PHARMACY LABORATORY. (2 cr; prereq ¶5650; S-N grading)

5670. DRUG INFORMATION EVALUATION AND STUDY DESIGN. (2 cr; prereq 5350)
Drug information retrieval, drug information evaluation, and pharmaceutical applications.

5680. PHARMACOKINETICS. (4 cr; prereq 5620, Phcl 5102 or #)
The kinetics of drug absorption, distribution, metabolism, and excretion in humans. Bioavailability, the plateau principle, and effect of patient variability on dosage regimens.

5685. CLINICAL PHARMACOKINETICS. (3 cr; prereq 5680)
Application of knowledge of the time-course behavior of a drug in the body to the safe and effective therapeutic management of individual patients.

5695. NUCLEAR PHARMACY.** (2 cr)
Introduction to clinical nuclear pharmacy. Topics include health physics and radiation safety, radiation and drug regulations, radiation biology, production and medical use of radionuclides, quality control of radiopharmaceuticals, and a description of the practice of nuclear pharmacy.

5696. PARENTERAL PRODUCTS.** (2-3 cr; prereq 5630, VPB 3103 or #)
Principles and procedures involved in the manufacture of parenteral products.

5841-5842. THERAPEUTIC AGENTS LABORATORY. (1 cr per qtr; S-N grading; 3 lab hrs per wk)
Experiments with biological cell systems concerned with the production, assay, biosynthesis, or metabolism of drugs.

5870. HORMONES.** (2 cr; prereq #)
Biosynthesis, chemistry, biochemical functions, mechanisms of action, production, and use.

5880. PHARMACEUTICAL IMMUNOLOGY. (2 cr; prereq #)
Selected topics in pharmaceutical and clinical aspects of immunology.

5970. DIRECTED STUDIES.** (Cr ar; prereq #)

5999. SPECIAL PROBLEMS.** (Cr ar; prereq #)
Research in medicinal chemistry, pharmacognosy, pharmaceutics, social and administrative pharmacy, or clinical practice.

Required Courses Offered by Other Departments

Anat 1004. ELEMENTARY ANATOMY. (4 cr)

Phcl 5101-5102. GENERAL PHARMACOLOGY. (4 cr per qtr)

Phsl 3070. HUMAN PHYSIOLOGY. (6 cr)

VPB 3101. GENERAL MICROBIOLOGY. (5 cr)

IV. FACULTY

Clinical Sciences

Kenneth W. Miller, Ph.D., Associate Professor and Assistant Dean
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Barton W. Galle, Ph.D., Assistant Program Director

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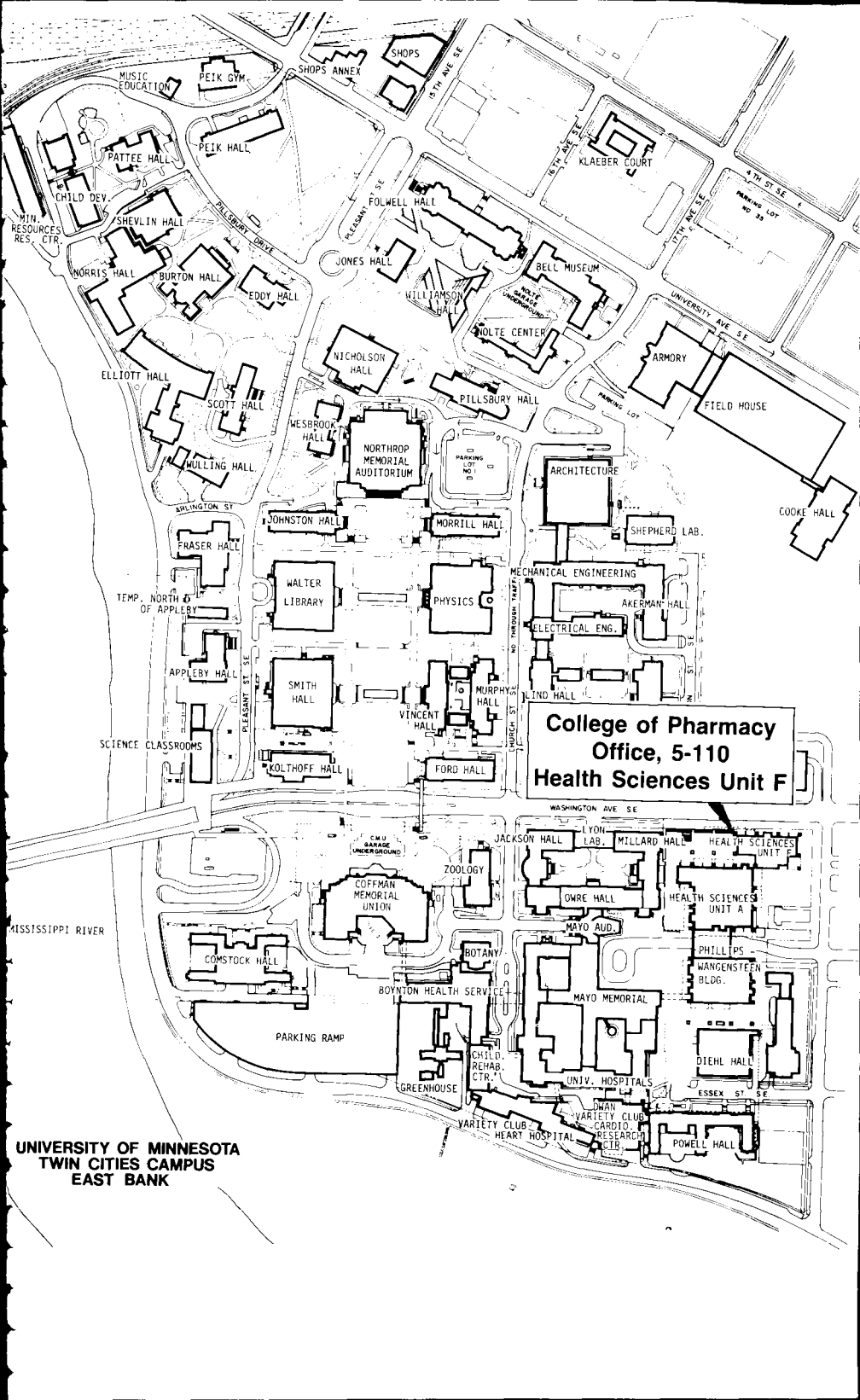

UNIVERSITY OF MINNESOTA
TWIN CITIES CAMPUS
EAST BANK

College of Veterinary Medicine

UNIVERSITY OF MINNESOTA

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College of
Veterinary Medicine

UNIVERSITY OF MINNESOTA

How to Use This Bulletin

This bulletin describes College of Veterinary Medicine programs, learning opportunities, procedures, degree and other requirements, and courses. Students are expected to be familiar with all information that is pertinent to the D.V.M. degree program.

The *Class Schedule*, distributed with registration materials just before the registration period each quarter, lists course offerings with prerequisites and class hours, rooms, and instructors. It includes registration instructions, final exam schedules, and other useful information.

All current and prospective students should also refer to the *General Information Bulletin.* Information about evening courses and summer offerings is contained in the *Extension Classes Bulletin* and the *Summer Session Bulletin* respectively.

The Official Daily Bulletin, a *Minnesota Daily* column, publishes announcements about University courses, study opportunities, meetings, and activities. Students are expected to be aware of any information printed in the column that affects them.

CONTENTS

College of Veterinary Medicine

I. GENERAL INFORMATION

History

Veterinary medicine is concerned with the prevention, cure, and alleviation of diseases of animals. Legal documents and other records from about 2250 B.C. found in China, Egypt, and India contain the earliest references to veterinary medical practice. In India, where veterinary hospitals were established by the state, the practice of veterinary medicine became very sophisticated.

After several false starts, veterinary medical education in the United States originated with the Veterinary College of Philadelphia's charter, granted in 1852. During the next 75 years, 55 veterinary schools opened in this country, and 34 of them closed. The veterinary school at Cornell University, established in 1868, is the oldest one still in existence in the United States. Currently there are 31 veterinary schools in the United States and Canada, and several more are planned.

Veterinary Medical Education at Minnesota

The College of Veterinary Medicine at the University of Minnesota was established in 1947 in response to the need for veterinary medical services in the livestock industry and for pets, the need for research in animal diseases, and growing student interest in the study of veterinary medicine. Since its establishment, the college has grown from an initial class of 21 students to 80 students in 1981-82.

The College of Veterinary Medicine at the University of Minnesota is accredited by the Council of Education of the American Veterinary Medical Association.

Career Opportunities

Career opportunities for veterinarians are available in a wide variety of work settings and involve diverse activities. Most veterinarians are engaged in private clinical practice, in either a general or a specialized area. Veterinarians in general practice care for food and companion animals, both large and small. Those in specialized practice may care primarily for a single species, or they may concentrate in clinical disciplines such as animal reproduction, surgery, or diseases of specific systems. Others pursue careers in education, research, and industry. Challenging careers are offered by government agencies such as the Department of Health and Human Services, the Department of Agriculture, the armed forces, the Department of Energy, and the National Aeronautics and Space Administration. Careers in laboratory animal medicine, zoo animal practice, public health, and food inspection also are available. New opportunities for research and service exist in such areas as comparative medical research and aquatic and wildlife animal medicine.

In a study of U.S. veterinary medical employment needs in 1977, the consulting firm of Arthur D. Little, Inc., found that the supply and demand for veterinarians in private practice (75 percent of all veterinarians are in private practice) was balanced nationally; shortages existed in educational institutions and industry. All students graduating from this college in recent years have found employment or pursued further education in the veterinary medical profession. Demand for the services of veterinarians is likely to continue.

Although veterinary medicine traditionally has been viewed as a man's field, women are now entering the profession in increasing numbers and are employed in all fields.

Professional Curriculum

The College of Veterinary Medicine awards two degrees, the bachelor of science (B.S.) in veterinary science and the doctor of veterinary medicine (D.V.M.). Most of the students who apply to the college have already earned bachelor's degrees and are therefore interested only in the D.V.M. degree; students who wish to earn the B.S. degree in veterinary science may do so at the end of the second year of the veterinary curriculum.

The primary goal of the veterinary medical curriculum is to provide the education and training necessary for the general practice of veterinary medicine. Secondary to this goal, the curriculum is designed to allow the student to pursue some degree of specialized training. Graduates of the program should be prepared to enter veterinary medical practice or residency or graduate education programs.

The curriculum focuses on providing students with a sound foundation of training in the basic biomedical sciences to enable them to understand the causes and control of animal diseases and the maintenance of animal health. Students develop clinical skills in the diagnosis, treatment, and prevention of disease. Students can obtain additional education or training in areas of special interest. Studies are designed to nurture the students' professional identity, including their commitment to lifelong learning and service to clients and the community. Studies should provide the necessary background for evaluating and assimilating new information in the biomedical sciences, and should facilitate development of the future veterinarian's ability to apply useful new information in the practice of veterinary medicine.

A substantial portion of the veterinary training takes place in the teaching hospital, where students apply knowledge of the basic sciences to solving clinical problems. By working directly with clients' animals and hospital equipment under the supervision of clinical faculty members, students gain the experience necessary to integrate classroom knowledge with veterinary medical practice.

In the first year of the veterinary medicine program, students examine the structure and function of normal animals and begin to study the pathogenesis of diseases and pathophysiologic concepts. In the second year, emphasis is on the pathogenesis of infectious diseases. The third year of the program is devoted chiefly to the study of the prevention, alleviation, and clinical therapy of diseases. In the fourth year, students learn methods of care and develop skills needed for professional practice by dealing with clients and caring for and managing patients.

The M.S. and Ph.D. degrees may be earned in the following disciplines: veterinary anatomy; veterinary medicine; veterinary microbiology; veterinary parasitology; veterinary pathology; veterinary physiology and pharmacology; veterinary surgery, radiology, and anesthesiology; and theriogenology. The School of Public Health offers a specialization in veterinary public health for its master of public health (M.P.H.) degree. The M.S. and Ph.D. programs are administered by the Graduate School. For more information, see the *Graduate School Bulletin* or write to the Associate Dean for Academic Affairs and Research, College of Veterinary Medicine, 301 Veterinary Science Building, 1971 Commonwealth Avenue, University of Minnesota, St. Paul, Minnesota 55108.

The college regularly schedules continuing education programs for members of the veterinary medical profession to bring them up to date on advances in the field. Innovative clinical procedures, new concepts, and recent developments in research are presented. Veterinary medical associations may arrange for specific courses. Sessions include one- and two-day conferences, seminars, and laboratory workshops.

Facilities

The College of Veterinary Medicine is housed primarily in three buildings on the St. Paul campus. Most of the classrooms and laboratories students use during their first two years in the professional curriculum are in the Animal Science-Veterinary Medicine and the

Veterinary Science buildings. Extensive research facilities, including the college library, are also located in these buildings. In the Veterinary Hospitals building, space and facilities are provided for various diagnostic and therapeutic procedures. Clinical laboratories for hematology, chemistry, pathology, toxicology, parasitology, and microbiology and radiological as well as animal holding facilities are housed here too. In addition, the Veterinary Diagnostic Laboratory is located in the hospital building.

The off-campus facilities of the Minneapolis and St. Paul Health Departments, Minnesota Board of Animal Health, veterinary services of the United States Department of Agriculture, and food industries in the state are also used in teaching the public health aspects of veterinary medicine.

High School Preparation

First consideration should be given to meeting the admission requirement of the college or university the student plans to attend to complete the preprofessional course requirements. Prospective students are urged to take as many mathematics and science courses as possible in high school. Students who have taken trigonometry in high school need not take a college course, and in that way meet part of the minimum mathematics requirement for admission to the College of Veterinary Medicine at the University of Minnesota.

Preprofessional Curriculum

To qualify for admission to the College of Veterinary Medicine, students must complete specified courses—about three years of work—at an accredited college not later than the end of the winter quarter (or fall semester) of the academic year in which they apply. Most students earn a bachelor's degree before they apply, but they are not given preference in admissions decisions over those who do not hold a degree. Application to the professional curriculum must be made nearly one year in advance, or not later than November 15 in the year prior to the fall quarter in which they wish to be admitted.

All course work used to meet the preprofessional requirements should be evaluated with the A-N letter grading system, except when a college does not offer a required course under that grading system or when advanced placement (exemption) is granted.

Distribution requirements in liberal arts studies have been established by the all-University Council on Liberal Education for all programs leading to a bachelor's degree conferred by the University of Minnesota. Students entering the College of Veterinary Medicine must fulfill these requirements prior to admission unless they have completed a bachelor's degree prior to entrance.

The required areas of study, including the number of quarter credits required for admission to the College of Veterinary Medicine, are:

1. Communication, Language, Symbolic Systems

Freshman English, Communication (8-12 credits)

Normally the student must satisfy the requirement for graduation of the college he or she is attending.

Mathematics (5-15 credits)

Trigonometry (high school course is acceptable); college algebra (with prerequisite high school higher algebra) or precalculus or calculus.

Public Speaking (3-5 credits)

Introductory speech.

2. The Physical and Biological Sciences

Chemistry (25-30 credits)

To include general inorganic, qualitative analysis (solution), analytic (quantitative analysis), and organic, nonterminal. All courses must include laboratory.

Physics (10-15 credits)

To include mechanics, heat, sound, light, electricity, magnetism, and atomic physics, topics normally covered in an introductory sequence with laboratory.

Biology (10-12 credits)

To include an introductory sequence in general biology and animal biology or animal biology and plant biology.

Genetics (4 or 5 credits)

To include the mechanics of heredity and their applications.

Biochemistry (4 or 5 credits)

To include metabolic pathways, cellular energetics, and biosynthesis of cellular constituents; either a 4-credit lecture course or a 5-credit lecture and laboratory course with an organic chemistry prerequisite.

Microbiology (4 or 5 credits)

An introductory course with laboratory to include taxonomy, morphology, physiology, and ecology of microbes.

3. The Individual and Society (8 or more credits)

Economics

An introductory macro or micro course (3-5 credits).

Other

Introductory courses chosen from anthropology, economics, geography, history, political science, psychology, social science, and sociology.

4. Literary and Artistic Expression (8 or more credits)

Courses chosen from art, literature, music, and many humanities, theater, and foreign-language literature courses.

5. Electives

Electives may be selected on the basis of the student's interests to make up a broad educational program. Students planning careers in veterinary medical practice are encouraged to choose courses in the care and management of cattle, dogs, horses, sheep, and swine if they are available. Students planning academic or research careers should consider additional science and mathematics courses.

Applicants who have not earned the baccalaureate degree prior to entering the College of Veterinary Medicine must have completed the minimum credit requirements in The Individual and Society and the Literary and Artistic Expression categories. Those entering with a degree must have completed introductory economics and may meet the remaining credit requirements in the two above-mentioned categories by completing 16 credits of courses in either or both areas. In calculating the grade point average for courses required for admission, all applicants must include the grade earned in introductory economics, and may include additional grades for 16 credits of courses completed in either or both categories.

Examples of courses offered on the University of Minnesota Twin Cities campus that meet the admission requirements follow.

1. Communication, Language, Symbolic Systems

Freshman English, Communication—The student must satisfy the requirement for graduation of the college he or she is attending.

Math 1008—Trigonometry and Math 1111—College Algebra, Analytic Geometry (or) Math 1142—Short Calculus

(or) Math 1201—Pre-Calculus
Rhet 1222—Public Speaking
(or) Spch 1101—Fundamentals of Speech Communication: Oral Communications

2. The Physical and Biological Sciences

Biol 1011—General Biology
Biol 1106—General Zoology
Biol 5001—Biochemistry
Chem 1004-1005—General Principles
Chem 1006—Principles of Solution Chemistry
Chem 3100/3101—Quantitative Analysis
Chem 3301/3305, 3302/3306—Elementary Organic Chemistry I and II
GCB 3022—Genetics
Phys 1031/1035-1032/1036—Introductory Physics: Measurement, Applications
VPB 3103—General Microbiology
(or) MicB 3103—General Microbiology

3. The Individual and Society

AgEc 1020—Principles of Macroeconomics
(or) Econ 1001—Principles of Macroeconomics
(or) Econ 1002—Principles of Microeconomics

For additional courses to complete the required 8 or more credits, see the group distribution and course lists in the *College of Liberal Arts Bulletin*.

4. Literary and Artistic Expression

See the group distribution and course lists in the *College of Liberal Arts Bulletin* for selection of courses to total 8 or more credits.

5. Electives

For additional courses, see suggestions listed above.

Admission Procedures for the Professional Curriculum

Enrollment in the professional curriculum of the College of Veterinary Medicine is limited; many applicants cannot be accepted. A first-year class enters the program in the fall quarter of each year, and applicants must satisfy the admission requirements by the end of the preceding winter quarter (or fall semester). To apply, prospective students should request the College of Veterinary Medicine application packet, which is available *only* from the Office of Admissions and Records, 130 Coffey Hall, 1420 Eckles Avenue, University of Minnesota, St. Paul, Minnesota 55108. Neither Graduate School nor Advanced Standing applications may be used to apply to the College of Veterinary Medicine. First priority is given to residents of Minnesota and of states with which reciprocity or contractual agreements exist. Minority applicants are included in the first priority. Second priority is given to residents of other states that do not have a college of veterinary medicine. Third priority is given to residents of states with colleges of veterinary medicine.

Applicants are encouraged to read carefully and follow all directions in the packet since failure to provide all information requested delays admission decisions.

The completed application form should be returned to the Office of Admissions and Records as soon as possible and *not later than November 15 prior to the fall quarter the applicant wishes to start the program.* Applications must be accompanied by a credentials examination fee, without which no application is considered.

Applicants for fall 1982 will be rated according to a 100-point scale based on the following areas of evaluation.[1]

A. Objective Measures of Educational Background (70 points)
   1. Grade point average in required courses (30 points)
   2. Cumulative grade point average for most recent terms, starting with the fall the student applies and going back to include a minimum of 60 quarter (45 semester) credits of letter-graded undergraduate or graduate courses (15 points)
   3. Graduate Record Examination (10 points)
   4. Veterinary Aptitude Test (10 points)
   5. Amount of education. Applicants who have completed elective course work or bachelor's degrees in areas of study related to veterinary medicine are not given priority for admission. (5 points)

B. Subjective Measures of Personal Experience (30 points)
   1. Knowledge of and interest in the veterinary medical profession and animals —experiences with veterinarians and experiences with and responsibility for the care and management of animals (15 points)
   2. Maturity and reliability—employment experience and responsibilities, ability to communicate with others, experience demonstrating leadership, extracurricular activities, credit load, and amount of time devoted to employment and other activities while enrolled in college (15 points)

All correspondence concerning application should be sent to the Office of Admissions and Records, 130 Coffey Hall, 1420 Eckles Avenue, University of Minnesota, St. Paul, Minnesota 55108. Applicants who are accepted receive a preliminary fee statement of $50; payment is applied to the first quarter's tuition and confirms the applicant's intention to enroll.

Estimated Yearly Expenses

Students in the first three years pay the following fees and expenses for the 1981-82 academic year. These fees and expenses are subject to change.

Tuition and Student Services Fee:	
Resident ($986.30 per quarter)	$2,958.90
Nonresident ($2,581.30 per quarter)	$7,743.90
Microscope	$400.00-900.00
Books, Laboratory Equipment, Notes, Dissecting Set, and Supplies	$400.00-500.00

The above expenses do not include room and board, laundry and clothing, required health insurance, recreation, travel, and other incidental expenses. For more information about expenses, see the current University of Minnesota *General Information Bulletin.*

Awards, Scholarships, and Loans

Students in the College of Veterinary Medicine are eligible to compete for awards and scholarships designated specifically for veterinary medical students as well as for scholarships available to all University students. In general, it is the responsibility of the interested student to obtain, complete, and submit appropriate application forms for loans and financial aids.

[1]Selection criteria are subject to change.

For additional information concerning awards and scholarships, contact either the Associate Dean for Academic Affairs and Research, College of Veterinary Medicine, 301 Veterinary Science Building, 1971 Commonwealth Avenue, University of Minnesota, St. Paul, Minnesota 55108, or the Office of Student Financial Aid, 199 Coffey Hall, 1420 Eckles Avenue, University of Minnesota, St. Paul, Minnesota 55108.

Awards and scholarships that are limited to veterinary medical students include the following.[1]

AAHA (American Animal Hospital Association) Award—This award is given to a senior with clinical proficiency in small animal medicine and surgery. ($100 and plaque)

Allen Products Scholarships—These awards are given annually to assist one needy and deserving sophomore, junior, and senior student with his or her veterinary medical education. ($1,000 per year)

Alpha Zeta Traveling Scholarship—This award is given to help defray the expenses of sending the president-elect of the student chapter to the annual meeting of the American Veterinary Medical Association.

Diamond Service Award—This award is given annually to a junior student based on scholarship and financial need. ($500)

Caleb Dorr—Cash awards are presented annually to the top individuals in the freshman, sophomore, and junior classes. The highest-ranking individual in the graduating class is awarded a medal. ($200)

Caleb Dorr Certificates—Awarded to individuals in the top 10 percent of each class.

Harwal Prize for Pharmacology—A cash award and a book are given to a senior student who has demonstrated outstanding ability in the area of clinical pharmacology. ($25 and book)

Harvey H. Hoyt Memorial Scholarship Award—A scholarship is given annually in memory of Dr. Harvey H. Hoyt to an outstanding senior student in the College of Veterinary Medicine on the basis of scholarship and intent to pursue a career in teaching and research in veterinary medicine. Preference is given to students with interests in clinical veterinary medicine. ($75)

H. C. H. Kernkamp Student Award—This fund, provided through the generosity of the alumni of the college, makes an award to a senior in recognition of student contributions to the profession of veterinary medicine. (plaque)

Lee McDonald Memorial Award in Feline Medicine—This award is given to a senior student with expertise in feline medicine. ($400 and plaque)

Merck Veterinary Medicine Award—*Merck Veterinary Manuals* are awarded to two senior students in the College of Veterinary Medicine on the basis of their scholastic records and dedication to clinical veterinary medicine.

Minneapolis Kennel Club Scholarship in Veterinary Medicine—This scholarship was established to provide recognition for and financial assistance to several qualified students in veterinary medicine at the University of Minnesota. Preference is given to residents of Minnesota with special interest in the treatment of small animals. ($200)

Minnesota Veterinary Medical Association—Two awards are given annually by this state association. A plaque is awarded to an outstanding senior student in clinical veterinary medicine, and a cash award based on need and scholarship is made. ($300)

Dr. Hilary Mohr's Veterinary Grip—This award is given to a senior student who demonstrates outstanding capabilities, knowledge, and sincerity in clinical large animal medicine.

Bob Monico Memorial Awards—Awards are made to two senior students for excellence in equine medicine in memory of Bob Monico, a senior student who was fatally injured in the summer of 1970 while vacationing in Norway. (plaques)

Nelson Laboratories Scholarships—These awards are given annually to deserving students on the basis of financial need and scholarship. ($2,500)

Margaret K. Nolz Memorial Scholarship—This award is granted to a veterinary student based on scholarship and need. ($200)

Ned E. Olson Memorial Scholarship Award—This award is granted annually in memory of Dr. Ned E. Olson to a senior student in the College of Veterinary Medicine who demonstrates great proficiency and professional promise in the field of large animal medicine. ($50)

Clifton A. Paulson Memorial Scholarship—This award is given to a junior student who shows high interest and is active in furthering professional veterinary medicine and is active in the Student Chapter of the American Veterinary Medical Association. ($100)

Pfizer Award—This cash award is presented to a junior student on the basis of scholarship, leadership, and financial need. ($400 and plaque)

Carl Schlotthauer Memorial Surgery Award—This award is made to a senior veterinary student who demonstrates outstanding ability in veterinary surgery. ($25)

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[1]Awards are available only to students in the second, third, and fourth years of the veterinary medical program.

Upjohn Awards—Cash awards are presented to two senior students, one for proficiency in large animal clinical medicine and one for proficiency in small animal clinical medicine. (two $100 awards)

Veterinary Medicine Student Council Award—This award is granted to a deserving sophomore student who has been active in extracurricular activities and service to the University, the college, and the community. ($100)

Laura K. Westerman Award—This award is given to a College of Veterinary Medicine student who demonstrates outstanding proficiency in small animal surgery. ($150)

Auxiliary to the American Veterinary Medical Association—A cash award is given annually to a senior student who makes an outstanding contribution to campus activities. ($100)

Auxiliary to the Minnesota Veterinary Medical Association—A cash award is made annually to a junior student in the College of Veterinary Medicine selected on the basis of need and scholarship. ($100)

Auxiliary to the Wisconsin Veterinary Medical Association—A scholarship is awarded to a Wisconsin resident who is a junior veterinary medicine student. Selection is based on grade point average. ($200)

Loans and scholarships administered by the Office of Student Financial Aid of the University of Minnesota or by the Auxiliary to the American Veterinary Medical Association include:

Federally Insured Student Loans or Guaranteed Student Loans—Loans of up to $5,000 per year are available from some local lending institutions and from various state lending programs; actual amounts are governed by an estimate of expenses at a particular school. Many lending agencies limit these loans to regular customers and their dependents, and not all agencies participate in the program. The federal government pays 9 percent simple interest while the student is in school. Repayment installments and 9 percent simple interest are paid by the student beginning nine months after graduation or termination of study. Application forms are available from the Office of Student Financial Aid at 199 Coffey Hall, 1420 Eckles Avenue, University of Minnesota, St. Paul, Minnesota 55108.

Reuel Fenstermacher Student Loan Fund for Veterinary Medicine—This fund provides loans to needy students in the College of Veterinary Medicine who are making satisfactory progress toward a degree and who indicate a sincere intention of completing the requirements for the degree.

Health Professions Student Loan Program—Congress enacted a Federal Health Professions Scholarship program effective October 1, 1977, for first-year students who show "exceptional financial need." Priority is given to students enrolled in schools of medicine, osteopathy, and dentistry. Each award includes the basic educational costs, plus a monthly stipend for living costs for the freshman year only. One or two College of Veterinary Medicine students receive aid each year.

The Federal Health Professions Student Loan program specifies a maximum yearly loan of the cost of tuition plus $2,500; most students receive considerably less. "Exceptional financial need" must be demonstrated. The interest rate during the repayment period is 7 percent (interest is not charged while the student is still in school). Funding for this loan program has been diminishing, and applicants are advised to check on the availability of funds from year to year.

Information and application forms are available from the Office of Student Financial Aid, 199 Coffey Hall, 1420 Eckles Avenue, University of Minnesota, St. Paul, Minnesota 55108.

Auxiliary to the American Veterinary Medical Association—Loans are available to junior, senior, and graduate students in veterinary medicine. Seniors receive preference. The limit of indebtedness is $2,500.

Auxiliary to the Minnesota Veterinary Medical Association—Loans of up to $500 can be arranged on short notice.

Student Services

High school and college students interested in entering the College of Veterinary Medicine are urged to contact the Office of the Associate Dean for Academic Affairs and Research, 301 Veterinary Science Building, (612) 376-3886, for assistance in planning their educational programs at any college or university. This office arranges meetings for advisers, applicants, and prospective applicants each fall prior to the November 15 application deadline for discussion of selection criteria and application procedures. Meetings are held in Minnesota and other states with which contractual agreements exist. High school counselors and college advisers are encouraged to contact this office for current information about admissions requirements.

Minority students interested in veterinary medicine as a career are encouraged to contact Ralph Holcomb, coordinator of minority recruitment, in the Office of Academic Affairs, (612) 376-3892, for special assistance in planning their educational programs.

The Office of Academic Affairs serves faculty committees on admissions, curriculum, scholastic standing, and awards and scholarships. This office is administratively responsible for maintenance of student and alumni records, admission, registration, scholastic standing and degree requirements, and the issuance of awards and scholarships specific to the college and the D.V.M. graduation ceremony.

Each of the four classes in the college has a faculty adviser. The Office of Academic Affairs provides assistance to these advisers and to student organizations, which include Student Council; Honor Case Commission; Student Chapter of the American Veterinary Medical Association; Zoo, Exotic, and Wildlife Medicine Club; and University of Minnesota Preveterinary Medicine Club. Student chapters of specialty organizations including the American Associations of Bovine Practitioners, Equine Practitioners, Feline Practitioners, and Swine Practitioners are also provided administrative assistance by this office.

The agencies listed below provide student services directly or on referral from a faculty adviser or the Office of Academic Affairs. Services are available in 190 Coffey Hall on the St. Paul campus unless otherwise noted.

Admissions and Records—130 Coffey Hall. Information about courses, student records, graduation, and University regulations.

Bailey Hall Dormitory—The only residence hall on the St. Paul campus. For further information write to the Head Resident Director, Bailey Hall, 1458 North Cleveland Avenue, University of Minnesota, St. Paul, Minnesota 55108.

Financial Aid—199 Coffey Hall. Counseling and assistance for students with financial difficulties.

Health Service—Treatment of routine health problems in facilities on the St. Paul campus. Hospitalization facilities and specialized health services are available at the Boynton Health Service on the Minneapolis campus.

International Student Adviser—Counseling for international students is available two days a week.

OASIS—Counseling services to help students through the maze of courses, majors, University procedures, and community programs.

Off-Campus Housing—Assistance for students making living arrangements. In addition, this office provides information on landlord-renter rights and assistance in pursuing them.

Religious Activities—Offered through the St. Paul Campus Ministry Center, 1407 North Cleveland Avenue. The Lutheran Campus Ministry—University Lutheran Center, Newman Center, and United Ministries in Higher Education are located on the Minneapolis campus.

St. Paul Gymnasium—Sports and recreational facilities; intramural teams sign up here. Facilities open to students and their families include a swimming pool, tennis courts, basketball courts, handball courts, and equipment for many other sports.

Speech and Hearing Clinics—Free evaluations, consultations, and other clinical services (in such areas as voice, articulation, stuttering, and foreign accent) for students with speech or hearing difficulties are offered at the Speech and Hearing Clinic in 115 Shevlin Hall (Minneapolis campus).

Student Activities—Information for students interested in participation in organizations, clubs, and other activities.

Student Counseling Bureau—Counseling for students with academic difficulties and relationship problems and help with vocational choice and reading and study skill problems.

Student Employment Service—Part-time jobs on and off campus are listed with the Student Employment Service, 6 Morrill Hall (Minneapolis campus). On-campus jobs and some off-campus jobs are also posted in 190 Coffey Hall in St. Paul.

Student Legal Services—Legal aid staff members are available on a part-time basis. Students who need legal advice make an initial contact in 190 Coffey Hall.

Veteran's Assistance—Assistance for veterans (students and nonstudents) with veterans' benefits, admission problems, financial advice, and similar matters.

Student Activities

The College of Veterinary Medicine Student Council advises and makes recommendations to the dean on matters of student concern, elects members to several faculty committees, and coordinates its activities with the St. Paul Board of Colleges and the Twin Cities Student Assembly. Members are elected to represent each of the four undergraduate classes and graduate students. Nine students serve as representatives on other units of student government in the college.

The Student Chapter of the American Veterinary Medical Association sponsors a variety of activities including the annual College of Veterinary Medicine Open House (held on a Sunday in April), a booth at the Minnesota State Fair, a speakers' bureau that provides speakers for groups located within 60 miles of the campus, the semi-annual publication *Minnesota Veterinarian,* lectures by prominent scientists, and a variety of social events. Most activities of the chapter are joint efforts with the college, its alumni, and the Minnesota Veterinary Medical Association.

The national honor society of veterinary medicine, Phi Zeta, recognizes and promotes scholarship and research in matters pertaining to the welfare and diseases of animals. The local chapter sponsors lectures by outstanding scientists in fields related to veterinary medicine.

The St. Paul Board of Colleges directs and coordinates student activities on the St. Paul campus and encourages student leadership. Its membership is drawn from the five colleges located on the campus. The board cooperates with the Minnesota Student Association, brings questions from the student body to the attentior of the colleges, and discusses matters of general interest to students and faculty.

The Student Center Board of Governors (SCBG) guides the activities of the St. Paul Campus Student Center, the focal point of social activities on the St. Paul campus. A varied recreational program that enables students to exercise, improve special skills, and cultivate hobbies is provided. Membership is drawn from the five colleges on the campus, including graduate students and faculty.

Senior veterinary students in large animal medicine bandage the infected foot of a Charolais bull.

II. CURRICULUM AND ACADEMIC POLICIES

Areas of Study Within the Curriculum

Following are brief descriptions of areas of study in the College of Veterinary Medicine. Students in veterinary medicine take courses in each of these areas. In addition, third- and fourth-year students learn through various field experiences described under Clinic Rotation on page 15.

Anatomy—Professors Cox, Czarnecki, Fletcher, Weber. Anatomy is divided into four related areas: gross anatomy, histology, embryology, and neuroanatomy. In gross anatomy, students learn the normal structure and function of domestic animals by dissecting the dog, cat, horse, and cow and comparing them with the pig, sheep, goat, laboratory mammals, and avian species. In histology, students utilize microscopy to examine the cellular features of tissues and organs. In embryology, students discover normal and abnormal developmental processes as they relate to adult structures. The focus in neuroanatomy is on identification of structural units of the central nervous system that control perception, movement, and overall behavior.

Anesthesiology—Professor Raffe. Anesthesiology lectures cover the pharmacology of anesthetic agents, cardiopulmonary physiology, and the use of anesthetic agents and equipment for various types of patients and surgical procedures. Students also learn to deal with shock, the traumatized or critically ill patient, and various methods of monitoring the surgical patient. Techniques are practiced in special anesthesiology laboratories, in the surgery teaching laboratory, and on patients in the Veterinary Hospitals.

Biochemistry—Professors Jorgensen, Louis. The functioning of biological systems at the molecular level is the subject of study in this discipline. Students learn the mechanisms by which animals digest and absorb nutrients, how they use the absorbed molecules to maintain normal physiological processes, and how the end products of metabolism are eliminated. The principal nutrients discussed are carbohydrates, lipids, and proteins. After learning the properties of enzymes, the ways in which they affect biological reactions, and how they are affected by environmental factors, students examine how metabolic processes are regulated. The role of the different hormones in regulatory metabolism of the whole animal under different nutritional states is discussed. Study of the metabolic role of different tissues in the body and the molecular basis for some metabolic abnormalities provides the foundation for understanding disease.

Clinical Pathology—Professors Perman, Stevens. Clinical pathology is a broad area of laboratory medicine that crosses several disciplines including hematology, cytology, surgical pathology, immunohematology, blood coagulation, clinical chemistry, and urine analysis. Students learn to evaluate laboratory results and to decide when such results may be interpreted with confidence and when they must be applied with reservations. The important aspects of statistical assessment—precision, accuracy, reliability, and interpretability—are presented.

Epidemiology and Public Health—Professors Diesch, Pullen, Robinson. By studying epidemiology and public health, veterinary students learn the principles of epidemic diseases, food hygiene, environmental health, and zoonoses. These principles are then applied to solve problems encountered in the practice of preventive medicine for all animal species, in herd health management for food animals, in clinical epidemiology, in food protection and hygiene maintenance throughout food production, in transmission of diseases between animals and humans, and in management of environmental factors affecting the health of animals and humans.

Microbiology—Professors Bey, Loken, Maheswaran, Newman, Shope, Ward. Microbiology includes the areas of immunology, virology, bacteriology, and mycology. Courses are designed to expand the student's basic background in microbiology acquired in the preveterinary curriculum. Microbiology provides a basis for the study of many disciplinary areas of the curriculum including medicine, surgery, pharmacology, and public health. Emphasis is on basic mechanisms and interactions between microbial pathogens and their animal hosts.

Nutrition—Professors Goodrich, Jorgensen, Olson, Otterby. Students learn how to assess an animal's dietary requirements for water, energy, protein, vitamins, and minerals. The role of these nutrients in the overall metabolism of the animal is reviewed and related to the metabolic pathways covered in biochemistry. Factors affecting the relative amounts of nutrients required at different stages of growth and lactation and in an adult animal are discussed. The signs and symptoms of deficiency and excess are described in relation to the metabolic role of each nutrient. In the latter part of the course the focus is on sources of nutrients in animal feeds and formulation of diets and rations to meet the requirements for various species. A series of lectures on feeding cats, dogs, beef and dairy cattle, swine, and horses is given by faculty members who have expertise with particular species. Students tour a large feed mill and the University farm at Rosemount to see how feeds are mixed, packaged, and fed to animals in the livestock industry.

Parasitology—Professors Bemrick, Schlotthauer, Stromberg. Parasitology deals with the protozoa, arthropods, and helminths that infest animals. Students learn about life cycles of parasites, the effect of parasites on the health of animals, and parasite control. Both internal and external parasites are studied. Special attention is given to detecting and identifying parasites and to drugs and management procedures used to control them.

Pathology—Professors D. Barnes, Hayden, Higbee, K. Johnson, Kurtz, Leininger, O'Leary, Ruth, Sautter, Walser, Werdin. Courses in this field explain how cells and tissues react to injury and relate morphologic changes to functional changes. Cell degeneration, cell death, inflammation, immunopathology, and neoplastic and nonneoplastic growth abnormalities are some of the topics examined. Students are expected to differentiate abnormal from normal cells or tissues at the gross and microscopic levels, identify abnormalities using appropriate terminology, and understand mechanisms (pathogenesis) involved in the development of the abnormalities.

Pharmacology—Professors Gray, A. Larson, Stowe. The goals for students in this course are twofold: to understand the general principles of pharmacology as the conceptual basis of rational drug therapy, and to acquire detailed knowledge of specific drugs and their applications in veterinary practice through study of examples from the major drug groups. The general principles of pharmacology involve mechanisms of drug action and drug disposition, dose-response relationships, pharmacokinetics, and drug interactions and adverse effects. Specific drug groups studied include anesthetics, analgesics, tranquilizers, anti-inflammatory agents, chemotherapeutic (antibiotic, antiparasitic) drugs, fluid and electrolyte preparations, and drugs that act on specific organ systems.

Physiology—Professors Duke, Dziuk, Good, Jankus, Redig. This discipline, which is closely related to both anatomy and biochemistry, focuses on the function of all the major body organs and organ systems, such as the circulatory, digestive, renal, reproductive, and respiratory systems. Since clinical problems frequently involve digestion and reproduction, these areas are emphasized. The endocrine organs are studied in endocrinology. The structure, principal effects, target organs, and regulation of hormones are studied, with emphasis on reproductive endocrinology. Students also learn about interrelationships among hormones and the consequences of secretion of abnormal quantities of hormones.

Radiology—Professors Feeney, Hanlon, Jessen, G. Johnston. Radiology concentrates on the properties and production of X-rays: their use in diagnosis and therapy; safety factors, including the major safety regulations; and processing film. Interpretation of radiograms and basic principles of radiation therapy and nuclear medicine are also highlighted.

Theriogenology—Professors Fahning, S. Johnston, Seguin, Spurrell, Williamson, Zemjanis. The discipline includes animal reproduction, infertility, obstetrics, and breeding technology. Students learn the effect of management, genetics, nutrition, environment, and disease on reproductive performance of most domestic animal species. Laboratories, hospital cases, and extensive reproductive herd health programs provide opportunities for students to develop skills for monitoring reproductive efficiency and management of infertility (see Clinic Rotation below).

Large Animal Medicine—Professors Anderson, Farnsworth, Haggard, D. Johnson, V. Larson, Leman, Olson, Sherman, Sorensen. This field includes work with food- and fiber-producing animals, horses, and zoo animals. Students learn how to approach a clinical case, do a thorough physical examination, reach a diagnosis, carry out a course of therapy, give a prognosis, and recommend methods to control and prevent a disease. Field investigations of disease problems are a valuable part of the learning experience. Students also participate in establishing and conducting herd health programs and in handling diseases in herds of animals. Zoo animal medicine is presented in lectures and learned by experience at the Como Zoo or with zoo animals brought to the Veterinary Hospitals. Externships (see Clinic Rotation below) enable fourth-year students to work with animal health problems in veterinary medical practices throughout the country.

Small Animal Medicine—Professors Bistner, Hardy, S. Johnston, Klausner, McKeever, Ogburn, Osborne. Current information about all aspects of diseases of pet animals is presented. Techniques and procedures used in the diagnosis, therapy, and management of such diseases are demonstrated and practiced. Courses in diagnostic and therapeutic techniques and physical diagnosis prepare students for active participation in small animal clinical care. In the clinics, students integrate and use information obtained in both basic science and clinical courses to solve pet animal health problems.

Large Animal Surgery—Professors Booth, D. Stevens, Usenik. Theories and techniques of veterinary surgery are applied to large animals in this disciplinary area. Additional important areas of study are the etiology and pathophysiology of diseases that require surgical intervention. Students learn to correlate information from both preclinical and clinical courses in making decisions about surgery and in managing the surgical patient. Course work includes basic principles of veterinary surgery, surgical diagnosis, therapeutic techniques, and aftercare for specific diseases. Surgery laboratory courses afford firsthand experience in certain surgical procedures: casting, splinting, and bandaging techniques; patient care; and large animal anesthesia.

Small Animal Surgery—Professors Caywood, Lipowitz, Wallace. The small animal surgery program provides students with a broad basic education in principles, theories, and techniques of veterinary surgery and anesthesiology. The program includes study of the etiology and pathophysiology of diseases that require surgical intervention. Knowledge of the other clinical sciences and of the basic sciences is brought to bear in developing sound programs for the management and therapy of surgical patients.

Clinic Rotation—Direct experience with veterinary medical problems and patients forms the major part of the fourth-year curriculum. Field, clinic, and laboratory assignments of one to six weeks are offered both on and off campus. They include assignments in the clinical areas described above as well as in ambulatory clinics and elective work.

Students electing externships off campus are supervised for a period ranging from a minimum of two weeks to a maximum of six weeks by practicing veterinarians who are selected by but not associated with the college. Location and type of animal cared for cover

a broad range. In recent years, for instance, students have worked in an equine practice in Kentucky, at the San Diego Zoo, in a mixed practice in Jamaica, and in cattle practices in North and South Dakota.

Ambulatory clinics are mobile units dispatched on request to deliver on-site veterinary medical care to animals on University farms and on farms within reasonable distance from the St. Paul campus. By accompanying staff members on these calls, students supplement the training received in the Veterinary Hospitals and learn to manage cases under farm conditions.

Production animals and their farm environments are examined and tested on a regular basis by students and staff members who are concentrating on preventive medicine. Herd health programs are provided for beef cattle, dairy cattle, horses, poultry, and swine.

Professional Curriculum

The college's four-year curriculum is based on standards established by the Council on Education of the American Veterinary Medical Association. Course requirements for the first three years are similar for all members of a class. Although basic science courses (anatomy, biochemistry, pharmacology) predominate in the first year of the curriculum, some clinical sciences (radiology, diagnostic and therapeutic techniques) are also presented. The second year begins with emphasis on pathobiology and ends with emphasis on animal disease prevention and management. Third-year courses deal largely with medicine, surgery, reproduction, and other subjects directly used in the practice of veterinary medicine. All required course work is completed by the beginning of the fourth year, which lasts for four quarters and is devoted chiefly to clinical training. Students may pursue special interests through optional clinical assignments and elective course work. A breakdown of the program by year and term follows.

FIRST YEAR

	Fall	Credits
CVM 5100	Introduction to Veterinary Medicine	2
CVM 5150	Diagnostic and Therapeutic Techniques	1
SACS 5450	Veterinary Radiology: Introduction and Fundamentals	1
VB 5100	Veterinary Anatomy I	6
VB 5103	Veterinary Prenatal Development	3
VB 5104	Microscopic Anatomy of Domestic Animals	5
VB 5210	Veterinary Biochemistry	4
	Total	22
	Winter	
CVM 5271	Interpersonal Communication and the Problem-Oriented Medical Record System	2
VB 5102	Veterinary Neurobiology	3
VB 5105	Microscopic Anatomy of Domestic Animals	4
VB 5211	Veterinary Biochemistry Laboratory	1
VB 5212	Veterinary Biochemistry and Nutrition	4
VB 5306	Animal Physiology	5
	Total	19
	Spring	
AnSc 5404	Applied Animal Nutrition	3
LACS 5650	Veterinary Epidemiology	3
VB 5308	Animal Physiology	5
VPB 5501	Basic Veterinary Pathology	5
VPB 5701	Advanced Veterinary Microbiology, Immunology	3
	Total	19

SECOND YEAR

	Fall	Credits
VB 5310	Animal Physiology	3
VB 5400	Veterinary Pharmacology	4
VPB 5502	Systemic Veterinary Pathology	5
VPB 5601	Veterinary Parasitology I	4
VPB 5703	Veterinary Virology	4
	Total	20

	Winter	
LACS 5151	Diagnostic and Therapeutic Techniques I	1
VB 5401	Veterinary Pharmacology	4
VPB 5504	Veterinary Clinical Pathology	3
VPB 5602	Veterinary Parasitology II	4
VPB 5702	Pathogenic Bacteria and Fungi	5
VPB 5704	Avian Diseases	3
	Total	20

	Spring	
LACS 5160	Large Animal Medicine	6
LACS 5550	Diagnostics and Obstetrics in Theriogenology	2
LACS 5551	Theriogenology Diagnostics Laboratory	1
SACS 5170	Small Animal Medicine	4
SACS 5451	Veterinary Radiology I	1
VB 5126	Veterinary Anatomy II	5
VB 5402	Veterinary Pharmacology	2
	Total	21

THIRD YEAR

	Fall	
CVM 5350	Principles of Veterinary Surgery	5
CVM 5400	Laboratory Animal Medicine	3
LACS 5161	Large Animal Medicine	5
LACS 5552	Veterinary Obstetrics Laboratory	1
SACS 5171	Small Animal Medicine	5
SACS 5380	Anesthesiology and Traumatology	2
	Total	21

	Winter	
LACS 5162	Large Animal Medicine	6
LACS 5570	Reproductive Diseases of Domestic Animals	5
SACS 5152	Diagnostic and Therapeutic Techniques	2
SACS 5172	Small Animal Medicine	4
SACS 5351	Veterinary Surgery	4
VPB 5180	Applied Immunology	1
	Total	22

	Spring	
CVM 5750	Clinics	1
LACS 5153	Diagnostic and Therapeutic Techniques II	1
LACS 5165	Veterinary Toxicology	3
LACS 5270	Law, Economics, and Ethics in Veterinary Medicine	4
LACS 5352	Large Animal Surgery	4
LACS 5651	Veterinary Community Medicine	3
SACS 5452	Veterinary Radiology II	1
VPB 5503	Diagnostic Pathology	3
	Total	20

FOURTH YEAR

A four-quarter series of clinics: CVM 5760 (summer), 5761 (fall), 5762 (winter), and 5763 (spring). Each course carries 16 credits. In addition, the student must complete at least 8 credits in elective courses.

Academic Policies

Registration—Students admitted to the first-year class receive complete registration information from the Office of Academic Affairs and Research.

Each student is required to purchase a microscope that meets the minimum specifications announced at the time of acceptance. Used microscopes must be examined and approved by designated staff members before they are purchased. In addition to a microscope and textbooks, the student will be expected to purchase certain special items of clothing and some instruments.

Degree Requirements—The bachelor of science (B.S.) degree with a major in veterinary science is granted upon satisfactory completion of the first two years of the program of studies with a grade point average of 2.00 or above. Students earning the B.S. degree must also satisfy the distribution requirements in liberal studies established by the all-University Council on Liberal Education.

Students in the upper 6 to 10 percent of their class are awarded baccalaureate degrees with distinction and those in the upper 5 percent of their class receive degrees with high distinction.

The doctor of veterinary medicine (D.V.M.) degree is awarded following the satisfactory completion of the four-year professional curriculum with a grade point average of 2.00 or above.

Honor System—The students of the College of Veterinary Medicine, rather than the faculty, monitor examinations. An honor system operates on the assumption that students are honest. Students are trusted not to give or receive aid during examinations and are responsible for their own honesty.

The Honor Case Commission, composed of students elected from the four classes, confidentially considers reports of suspected acts of dishonesty during examinations. The commission may request that a hearing be held to determine if scholastic dishonesty has occurred. In such case, four faculty representatives are selected by the dean and the Faculty Council to form a Student-Faculty Honor Case Commission that will participate in the hearing. If they determine that the student involved is guilty, an appropriate penalty will be determined and referred to the dean for implementation.

The honor system is a preventive rather than a punitive system. New students receive a brochure on the honor system, and it is also explained to them by a member of the Honor Case Commission during the course Introduction to Veterinary Medicine.

Examinations and Assignments—All students have a responsibility to inform the instructor if they must miss a scheduled examination, quiz, or deadline for any course assignment that will count toward their grade.

Grades—For courses entitled Clinics and Special Clinics there are two permanent grades: O, representing achievement that is outstanding relative to the level necessary to satisfy course requirements, and S, representing achievement that is satisfactory to the instructors. An N is assigned when the student does not earn an O or an S and is not assigned an incomplete.

Doctor of veterinary medicine degree candidates are evaluated under the A-B-C-D-N grading system for most other courses offered by the college. Under this system there are four permanent passing grades: A, representing achievement that is outstanding relative to the level necessary to meet course requirements; B, representing achievement that is significantly above the level necessary to satisfy course requirements; C, representing achievement that meets the basic course requirements in every respect; and D, representing achievement that is worthy of credit though it does not fully meet the basic course requirements in every respect.

An instructor is obligated to define to a class in its early meetings, as explicitly as possible, the performance that will be necessary to earn each grade. An N (no credit) is assigned when a student does not earn an S or a D or a higher grade and is not assigned an incomplete.

The symbol I is assigned to indicate an incomplete when in the instructor's opinion there is a reasonable expectation that a student can complete successfully any course work left unfinished at the end of a quarter. An I that is not made up by the end of the quarter break following the next quarter in residence becomes an N. When an I is changed to a permanent grade, the I is removed from the record.

The symbol W is entered by the recorder when a student officially withdraws from a course. This symbol is assigned in all cases of official cancellation during the first six weeks of classes and requires the approval of the instructor, the class adviser, and the chair of the Admissions and Scholastic Standing Committee. After the sixth calendar week, a W is recorded only if the student is doing at least D- or S-level work at the time of official cancellation; students who are not achieving at this level receive a grade of N.

The symbol X is reported in a continuing course in which a grade cannot be determined until the full sequence of quarters is completed. The instructor submits a grade for each X when the student completes the sequence.

The symbol V indicates registration as an auditor or visitor, a noncredit, nongrade registration.

Scholastic Requirements—Each student must maintain a grade point average of 1.50 or higher for any single quarter and must earn a passing grade in each course. Students failing to achieve a grade point average of at least 1.50 or receiving a grade of N (no credit) in any single quarter may be dropped from the professional curriculum. Those having a cumulative grade point average lower than 2.00 are placed on probation. A grade point average of 2.00 must be maintained each year to continue in the professional curriculum and to earn the D.V.M. degree.

The Admissions and Scholastic Standing Committee may grant permission for repeating course work. A grade point average of 2.50 or higher is required for repeated course work. Substitute courses will be considered as repeat courses; prior approval of the Admissions and Scholastic Standing Committee must be obtained to take such courses. To request this and other exemptions, students must petition the committee. Forms for this purpose are available in the Office of Academic Affairs and Research, 301 Veterinary Science.

Readmission—If a student is dropped from the program, he or she may not be reinstated without the permission of the Admissions and Scholastic Standing Committee. Credits earned at other institutions during the period of suspension will not apply toward graduation from the University of Minnesota unless permission was given in advance by the Admissions and Scholastic Standing Committee. If permitted to return, the student will be placed on probation and may be dropped again at any time his or her work is unsatisfactory.

Grievance Procedures—Persons who wish to file grievances or appeals within the college may do so through procedures that conform to the principles of fairness and accessibility defined in the University Senate Statement on Academic Freedom and Responsibility. The Student Conduct Code is published annually in the *Minnesota Daily*. Grievances must be presented in accordance with the regulations of the University Senate and the procedures established by the college.

Access to Student Educational Records—In accordance with regents' policy on access to student records, information about a student generally may not be released to a third party without the student's permission. The policy also permits students to review their educational records and to challenge the contents of those records.

Some student information—name, address, telephone number, dates of attendance, college and class, major, adviser, and degrees earned—is considered public or directory information. To prevent release of such information outside the University while in attendance at the University, a student must notify the records office on his or her campus.

Students are notified annually of their right to review their educational records. The regents' policy, including a directory of student records, is available for review at the information booth in Williamson Hall, Minneapolis campus, and at the records offices on other campuses of the University. Questions may be directed to the Office of the Coordinator of Student Support Services, 260E Williamson Hall, (612) 373-2106.

Dr. L. J. Wallace and a senior veterinary student examine a postoperative patient.

III. COURSE DESCRIPTIONS

Symbols—The following symbols are used throughout the course descriptions in lieu of page footnotes:

Consent of the instructor is required prior to registration.

△ Consent of the department, division, or school offering the course is required prior to registration.

f,w,s,su Following course number indicate fall, winter, spring, or summer quarters.

A hyphen between courses numbers (e.g., 3142-3143-3144) indicates a sequence of courses that must be taken in the order listed.

A comma between course numbers (e.g., 1234, 1235, 1236) indicates a series of courses that may be entered any quarter.

Elective courses available to fourth-year students are identified in groupings entitled "Other Courses" and are listed by departments.

College of Veterinary Medicine (CVM)

REQUIRED COURSES

1100. ORIENTATION TO VETERINARY MEDICINE. (1 cr)
History of the veterinary profession, careers within the profession, and employment trends. Resources available to those interested in a career in the profession, including the College of Veterinary Medicine and the animal health technology courses offered in Minnesota.

3100. PERSPECTIVES: INTERRELATIONSHIPS OF PEOPLE AND ANIMALS IN SOCIETY TODAY. (2 or 3 cr)
(Same as PubH 3301) Interrelationships of people and animals from several viewpoints. The social, economic, and health consequences of these relationships including issues such as pets and people sharing an urban environment, animal rights, and the influence of differences in cultures on animal-human relationships.

5100. INTRODUCTION TO VETERINARY MEDICINE. (2 cr; prereq regis vet med, 1st yr)
Lectures and laboratory on academic policies, student support services, curriculum, student government, personal health and safety, and legal issues related to the D.V.M. program.

5150. DIAGNOSTIC AND THERAPEUTIC TECHNIQUES. (1 cr; prereq #)
Demonstration and application of diagnostic techniques and procedures and restraint of animals. Discussions of therapeutic regimens and demonstrations of therapeutic procedures.

5271. INTERPERSONAL COMMUNICATION AND THE PROBLEM-ORIENTED MEDICAL RECORD SYSTEM. (2 cr; prereq #)
Effective interpersonal behavior and communication, and introduction to the problem-oriented system.

5350. PRINCIPLES OF VETERINARY SURGERY. (5 cr; prereq VB 5126 or #)
Introduction to the science and art of veterinary surgery. Basic materials necessary for the clinical management of the large and small animal surgical patient. Aseptic technique, patient evaluation, physiologic responses of body systems to surgery, the repair and healing of tissue, and surgical anatomy emphasized.

5400. LABORATORY ANIMAL MEDICINE. (3 cr; prereq #)
Lectures, discussions, and demonstrations concerning care and management of laboratory animals. Diseases, nutrition, zoonoses, gnotobiotics, restraint, anesthesia, and environmental practices. Tours of laboratory animal colonies, both commercial and institutional.

5750. CLINICS. (1 cr; prereq #)
An introduction to the medical, obstetrical, radiological, surgical, and laboratory examination of animals.

5760, 5761, 5762, 5763. CLINICS. (16 cr per qtr; prereq #)
Laboratories devoted to the application of principles and techniques of the basic and clinical medical sciences to the diagnosis, prognosis, treatment, prevention, and eradication of disease in domestic animals.

AnSc 5404. APPLIED ANIMAL NUTRITION. (3 cr; prereq #)
Nutrient requirements of beef and dairy cattle, swine, horses; nutrient content of feedstuffs; protein and nonprotein nitrogen utilization; energy utilization; nutritional disorders; formation of adequate rations.

Large Animal Clinical Sciences (LACS)

REQUIRED COURSES

5151. DIAGNOSTIC AND THERAPEUTIC TECHNIQUES I. (1 cr; prereq CVM 5150 or #)
Application of general physical examination procedures, special diagnostic techniques, and therapeutic procedures to large animals.

5153. DIAGNOSTIC AND THERAPEUTIC TECHNIQUES II. (1 cr; prereq #)
Demonstration and practice of restraint of and diagnostic and therapeutic techniques for large animals.

5160. LARGE ANIMAL MEDICINE. (6 cr; prereq 5151 or #)
Diseases of ruminants covered on a system basis.

5161. LARGE ANIMAL MEDICINE. (5 cr; prereq 5160 or #)
Continuation of study of ruminant diseases and equine diseases covered on a system basis.

5162. LARGE ANIMAL MEDICINE. (6 cr; prereq 5161 or #)
Nutritional, metabolic, and infectious diseases of large domestic animals.

5165. VETERINARY TOXICOLOGY. (3 cr; prereq VB 5401 or equiv or #)
Toxicology of minerals, pesticides, herbicides, poisonous plants, venoms, and miscellaneous toxicants.

5270. LAW, ECONOMICS, AND ETHICS IN VETERINARY MEDICINE. (4 cr; prereq reg s vet med or #)
Basic economic concepts and terminology, relationship of animal health to productivity, cost/benefit relationships for disease control programs, financial return and economic analysis of livestock operations, economics of practice management, trends in livestock production, and ethical and legal issues in veterinary medicine.

5352. LARGE ANIMAL SURGERY. (4 cr; prereq #)
Common surgical procedures applied to large animals.

5550. DIAGNOSTICS AND OBSTETRICS IN THERIOGENOLOGY. (2 cr; prereq regis vet med or grad student or #)
Diagnostic, therapeutic, and obstetrical procedures in theriogenology.

5551. THERIOGENOLOGY DIAGNOSTICS LABORATORY. (1 cr; prereq regis vet med or grad student or #)
Demonstrations and laboratory practices in diagnostic and therapeutic procedures n theriogenology.

5552. VETERINARY OBSTETRICS LABORATORY. (1 cr; prereq 5550 or #)
Demonstrations and laboratory practice in obstetrical procedures.

5570. REPRODUCTIVE DISEASES OF DOMESTIC ANIMALS. (5 cr; prereq 5550 or #)
Lectures covering the physiology and pathology of reproduction, artificial insemination, abortive diseases, postpartum injuries, and breeding management in domestic animals.

5650. VETERINARY EPIDEMIOLOGY. (3 cr; prereq 10 cr biology, 12 cr chemistry or #)
Principles of epidemiology, ecology, and veterinary public health. Biostatistics applied to the measurement of health and disease in populations.

5651. VETERINARY COMMUNITY MEDICINE. (3 cr; prereq VPB 5503, VPB 5703 or equiv or #)
Principles and practices of environmental health and food hygiene; includes meat, poultry, milk, and other foods as they are important for animal and human health. Diseases transmitted between animals and humans.

OTHER COURSES

3502. ANIMAL HEALTH AND DISEASE. (5 cr)
Designed for nonveterinary students to give a broad understanding of veterinary science as it applies to the health and diseases of domestic animals. Emphasis on basic concepts of disease and common animal diseases that demonstrate these concepts. How stress and management practices aggravate and create new disease conditions.

5180. INTRODUCTION TO HERD HEALTH AND DAIRY HERD HEALTH MANAGEMENT. (2.5 cr; prereq regis vet med, 4th yr or grad student or #)
Herd health management, general epidemiology, disease surveillance, and economics of farming. Dairy cattle genetics and breeding, reproduction, applied nutrition, housing, preventive medicine programs, and management practices.

5181. BEEF HERD HEALTH MANAGEMENT. (2 cr; prereq regis vet med, 4th yr or grad student or #)
Beef cattle breeds and breeding, reproduction, applied nutrition, housing, preventive medicine programs, and management practices.

5182. SHEEP AND GOAT HERD HEALTH MANAGEMENT. (1 cr; prereq regis vet med, 4th yr or grad student or #)
Sheep and goat breeds and breeding, reproduction, applied nutrition, housing, preventive medicine programs, and management practices.

5183. EQUINE HERD HEALTH MANAGEMENT. (1 cr; prereq regis vet med, 4th yr or grad student or #)
Equine breeding, reproduction, applied nutrition, housing, preventive medicine programs, and management practices.

5185. SWINE HERD HEALTH MANAGEMENT I. (Cr ar; prereq regis vet med, 4th yr or grad student or #)
Swine genetics and breeding, reproduction, applied nutrition, housing, preventive medicine programs, and management practices.

5186. PREVENTION AND CONTROL OF BOVINE MASTITIS. (1 cr; prereq regis vet med, 4th yr or grad student or #)
Principles and procedures used to prevent and control mastitis in dairy cattle. The role of the milking machine and laboratory procedures in solving herd problems.

5187. SWINE HERD HEALTH MANAGEMENT II. (1 cr; prereq 5185, regis vet med, 4th yr or grad student or #)
Continuation of 5185.

5273. ECONOMICS OF VETERINARY MEDICINE. (1 cr; prereq vet med major)
Designed for senior veterinary students to demonstrate important economic concepts through practical examples. Introduction to basic economic concepts, terminology, relationship of animal health to animal productivity, and financial return and analysis of the cost and returns of actual beef cattle, dairy cattle, and hog farms. Economic issues facing veterinarians in practice management and the client in livestock production. Trends and outlooks in livestock production.

5275. DISEASES OF ZOO ANIMALS AND EXOTIC PETS. (1 cr; prereq regis vet med, 4th yr or grad student or #)
Diseases of and management procedures for zoo animals and exotic pets, restraint procedures, medication, and diagnosis.

5280. SEMINAR: WORLD FOOD SUPPLY PROBLEMS. (4 cr; prereq major in agriculture, veterinary medicine, nutritional sciences, social science field or #...grad students by △ only)
(Same as AgEc 5790, Agro 5200, FScN 5643, PlPa 5220, and Soc 5675) A multidisciplinary approach to the social, economic, and technical problems of feeding the world's growing population. Principles sought from the social and economic, plant, animal, and nutritional sciences for their application to food problems.

5364. EQUINE LAMENESS. (2 cr; prereq regis vet med, 4th yr, 5352 or #)
All major musculoskeletal diseases affecting the horse that contribute to lameness.

5366. LARGE ANIMAL ABDOMINAL SURGERY. (1 cr; prereq regis vet med, 4th yr or grad student or #)
Abdominal procedures in the bovine and equine species.

5562. INFERTILITY CLINICS. (Cr ar; prereq 5560, 5570 or #)
Investigation of hospital cases and field problems involving infertility in domestic animals. Clinical examination, discussion of diagnosis, prognosis, and therapy. Assignment of special study of certain reproductive disorders.

5571. REPRODUCTION AND INFERTILITY IN THE HORSE. (1 cr; prereq 5570, regis vet med, 4th yr or grad student or #)
Lectures and demonstrations dealing with reproductive patterns, breeding practices, management, artificial insemination, economics of reproductive performance, and infertility in horses.

5572. REPRODUCTIVE PATTERNS AND INFERTILITY IN THE DOG AND CAT. (1 cr; prereq 5570, regis vet med, 4th yr or grad student or #)
Lectures on reproductive patterns, breeding management, artificial insemination, and infertility in dogs and cats.

5573. ADVANCED DAIRY CATTLE REPRODUCTION. (1 cr; prereq 5570 or #)
Lectures covering the pathology of reproduction, artificial insemination, and abortive diseases of dairy cattle. Evaluation of applied research on fertility, herd health problems, and management programs.

5574. REPRODUCTION AND INFERTILITY IN THE BULL. (1 cr; prereq 5570, regis vet med, 4th yr or grad student or #)
Lectures and demonstrations covering reproductive patterns, management, fertility, and infertility of the bull. Emphasis on a clinical approach to diagnosis, prognosis, and treatment.

5575. REPRODUCTION AND INFERTILITY IN SWINE. (1 cr; prereq 5570, regis vet med, 4th yr or grad student or #)
Lectures and demonstrations concerning reproductive patterns, breeding practices, management, artificial insemination, synchronization of estrus, economics of reproductive performance, and infertility in swine.

5660. EPIDEMIOLOGY OF ZOONOSES I. (1 cr; prereq regis vet med, 4th yr or grad student or #)
Zoonotic diseases of companion animals. Reservoirs, sources, transmission, and specific prevention and control programs emphasized.

5661. EPIDEMIOLOGY OF ZOONOSES II. (1 cr; prereq regis vet med, 4th yr or grad student or #)
Zoonotic diseases of food-producing animals. Reservoirs, sources, transmission, and specific prevention and control programs emphasized.

5665. MONITORING OF ANIMAL DISEASE. (Cr ar; prereq #)
Seminars and discussions on techniques used to monitor disease in animal populations.

5670. COMPARATIVE MEDICINE AND PUBLIC HEALTH. (2 cr; prereq PubH 5002 or #)
Human relationship to the biologic environment. Interrelationships of animal and human health, occurrence of animal diseases, ecology of zoonoses, food production and hygiene, laboratory animal medicine.

5671. BIOHAZARDS IN VETERINARY MEDICINE. (Cr ar; prereq #)
Seminars and discussions on microbiological, toxicological, drug, and other hazards in veterinary medicine.

5672. PERSPECTIVES: ANIMAL-HUMAN RELATIONSHIPS AND COMMUNITY HEALTH. (2 or 3 cr; prereq #)
(Same as PubH 5303) Perspectives on cultural, psychological, ethological, and environmental aspects of the interrelationships of people and animals as they affect individual and community health.

5680. PROBLEMS IN VETERINARY EPIDEMIOLOGY AND PUBLIC HEALTH. (Cr ar; prereq 5650 or equiv or #)
Individual study arranged with a faculty member.

5681. VETERINARY SCIENCE. (3 cr; prereq pharmacy sr or Phsl 3070, Phcl 5102 or equiv or #)
(Same as Phar 5520) Professional interrelationships between pharmacists and veterinarians; disease problems of domestic animals; veterinary pharmacotherapeutics.

5785. EXTERNSHIP SEMINAR. (1 cr; prereq regis vet med, 4th yr or grad student or #)
Discussion of clinical problems experienced by students in their externships with veterinarians in private practice. Emphasis on diseases of food-producing animals and horses.

GRADUATE COURSES

(See the *Graduate School Bulletin* for course descriptions)

5951. DIRECTED STUDIES

8193. ADVANCES IN CLINICAL IMMUNOBIOLOGY

8194. PROBLEMS IN DIAGNOSTIC VIROLOGY, SEROLOGY, AND IMMUNOLOGY

8195. PREVENTIVE VETERINARY MEDICINE

8197. METABOLIC AND NUTRITIONALLY INDUCED DISEASES OF CATTLE

8199. PROBLEMS IN ECONOMICS OF ANIMAL HEALTH

8290. ADVANCED VETERINARY MEDICINE

8291. ADVANCED DIAGNOSIS AND THERAPEUTICS OF ANIMAL DISEASES

8292. SEMINAR: VETERINARY MEDICINE

8293. MEDICAL CONFERENCE

8294. ADVANCED COMPARATIVE IMMUNOCHEMISTRY AND IMMUNOBIOLOGY

8299. RESEARCH IN VETERINARY MEDICINE

8390. SEMINAR: VETERINARY SURGERY

8392. ADVANCED LARGE ANIMAL SURGERY

8393. PROBLEMS IN LARGE ANIMAL ORTHOPEDICS

8395. SURGICAL DISEASES OF THE MAMMARY GLAND OF DOMESTIC ANIMALS

8397. LARGE ANIMAL ANESTHESIA

8590. ADVANCED DIAGNOSTIC METHODS IN REPRODUCTIVE DISEASES

8591, 8592, 8593. ADVANCED ENDOCRINOLOGY OF REPRODUCTION

8594. SPECIAL PROBLEMS IN ANIMAL REPRODUCTION

8595. SEMINAR: VETERINARY OBSTETRICS

8596. HEREDITY IN ANIMAL DISEASE

8690. ZOONOSES AND COMPARATIVE MEDICINE

8790. PROBLEMS IN VETERINARY CLINICAL PHARMACOLOGY AND THERAPEUTICS

8791. SEMINAR IN CLINICAL PHARMACOLOGY AND THERAPEUTICS

8792. SEMINAR IN VETERINARY TOXICOLOGY

Small Animal Clinical Sciences (SACS)

REQUIRED COURSES

5152. DIAGNOSTIC AND THERAPEUTIC TECHNIQUES. (2 cr; prereq #)
Demonstration and application of diagnostic procedures for and restraint of animals. Discussion of therapeutic regimens and demonstration of therapeutic procedures.

5170. SMALL ANIMAL MEDICINE. (4 cr; prereq #)
Etiology, pathophysiology, diagnosis, prognosis, and treatment of disorders of various body systems of companion animals. Fundamental principles of diagnosis and treatment, and polysystemic disorders including nutritional abnormalities, immune-mediated diseases, infectious diseases, intoxications, and neoplasia.

5171. SMALL ANIMAL MEDICINE. (5 cr; prereq 5170 or #)
Continuation of 5170.

5172. SMALL ANIMAL MEDICINE. (4 cr; prereq 5171 or #)
Continuation of 5171.

5351. VETERINARY SURGERY. (4 cr; prereq CVM 5350 or #)
Common surgical procedures applied to small animals.

5380. ANESTHESIOLOGY AND TRAUMATOLOGY. (2 cr; prereq 5170 or #)
Principles and application of anesthesia. Management of the severely injured patient.

5450. VETERINARY RADIOLOGY: INTRODUCTION AND FUNDAMENTALS. (1 cr; prereq #)
Basic concepts of radiation physics, radiation safety and environmental health hazards, and radiography.

5451. VETERINARY RADIOLOGY I. (1 cr; prereq 5450 or #)
Radiographic interpretation of normal systems.

5452. VETERINARY RADIOLOGY II. (1 cr; prereq 5451 or #)
Continuation of 5451.

OTHER COURSES

5250. SMALL ANIMAL DERMATOLOGY. (2 cr; prereq regis vet med, 4th yr or grad student or #)
The pathogenesis, clinical features, diagnosis, and therapy of skin diseases of companion animals.

5255. DISEASES OF THE URINARY SYSTEM. (2 cr; prereq regis vet med, 4th yr or grad student or #)
The etiology, pathophysiology, clinical and laboratory findings, diagnosis, prognosis, and treatment of disorders of the urinary system. A case-oriented format with student participation in discussion emphasized.

5256. DISEASES OF THE LIVER AND PANCREAS. (2 cr; prereq regis vet med, 4th yr or grad student or #)
The etiopathogenesis, diagnosis, and treatment of hepatic and pancreatic diseases in companion animals.

5265. COMPARATIVE CARDIOLOGY. (2 cr; prereq 4th yr or grad student or #)
Designed to help students develop skills in recognition, definition, and resolution of problems involving the cardiovascular system.

5271. HOSPITAL MANAGEMENT. (1 cr; prereq regis vet med, 4th yr or grad student or #)
Lectures on management of a small animal hospital. Zoning restrictions, employee supervision, drug purchases, facilities, fees, and other information pertinent to the operation of a modern veterinary medical hospital.

5285. CANINE CLINICAL NEUROLOGY. (1 cr; prereq regis vet med, 4th yr or grad student or #)
Anatomic and physiologic bases for neurological examination of the dog. Emphasis on a clinical approach to neurology, well illustrated with case materials.

5352. ABDOMINAL AND THORACIC SURGERY OF SMALL ANIMALS. (2 cr; prereq #)
Lectures on the pathophysiology, diagnosis, and surgical-medical management of selected diseases of abdominal and thoracic viscera.

5360. SMALL ANIMAL ORTHOPEDICS. (2 or 3 cr; prereq regis vet med, 4th yr or grad student or #)
Small animal orthopedic problems and surgical procedures to correct them.

5453. SPECIAL PROCEDURES IN VETERINARY RADIOLOGY. (2 cr; prereq regis vet med, 4th yr or grad student or #)
Contrast agents and procedures used to examine various body systems or anatomical areas.

5454. ROENTGENOLOGY BONE—LARGE ANIMALS. (1 cr; prereq regis vet med, 4th yr or grad student or #)
Roentgen signs of common bone diseases of large animals. Primary emphasis on the horse.

5455. ROENTGENOLOGY BONE—SMALL ANIMALS. (1 cr; prereq 4th yr or grad student or #)
Roentgen signs of common bone diseases of small animals.

GRADUATE COURSES

(See the *Graduate School Bulletin* for course descriptions)

8180. ADVANCED CLINICAL NEUROLOGY

8190. COMPARATIVE CARDIOVASCULAR DISEASES

8191. ADVANCED COMPARATIVE ELECTROCARDIOLOGY

8192. SPECIAL CARDIOLOGY CLINICS

8196. INTERNAL MEDICINE IN SMALL COMPANION ANIMALS

8197. ADVANCED DERMATOLOGIC CLINICS

8198. PROBLEMS IN VETERINARY COMPARATIVE DERMATOLOGY

8290. ADVANCED VETERINARY MEDICINE

8291. ADVANCED DIAGNOSIS AND THERAPEUTICS OF ANIMAL DISEASES

8292. SEMINAR: VETERINARY MEDICINE

8293. MEDICAL CONFERENCE

8295. COMPARATIVE VETERINARY MEDICAL OPHTHALMOLOGY

8296. COMPARATIVE VETERINARY SURGICAL OPHTHALMOLOGY

8297. ADVANCED CLINICAL VETERINARY OPHTHALMOLOGY

8298. RESEARCH IN VETERINARY OPHTHALMOLOGY

8299. RESEARCH IN VETERINARY MEDICINE

8390. SEMINAR: VETERINARY SURGERY

8391. ADVANCED SMALL ANIMAL SURGERY

8394. SURGERY OF THE GASTROINTESTINAL SYSTEM

8396. ADVANCED VETERINARY ANESTHESIA

8410. SURGICAL PHYSIOLOGY

8420. NEUROSURGERY

8430. THORACIC AND CARDIOVASCULAR SURGERY

8471. THERAPEUTIC RADIOLOGY

8480. SEMINAR: VETERINARY RADIOLOGY

8483. ABDOMINAL ROENTGENOLOGY

8484. UROLOGIC AND GYNECOLOGIC ROENTGENOLOGY

8485. THORACIC ROENTGENOLOGY

8490. PROBLEMS IN DIAGNOSTIC RADIOLOGY

8491. FUNDAMENTALS OF NUCLEAR MEDICINE

8492. RADIATION BIOLOGY

Veterinary Biology (VB)

REQUIRED COURSES

5100. VETERINARY ANATOMY I. (6 cr; prereq #)
Gross anatomic structure and function. The dog is used as a type species to introduce nomenclature and principles of mammalian gross anatomy. Cervical, thoracic, and abdominal viscera—including those of the dog, cat, ruminant, horse, pig, and bird—examined from a comparative and radiological approach.

5102. VETERINARY NEUROBIOLOGY. (3 cr; prereq #)
Structural and functional organization of the central nervous system of domestic animals.

5103. VETERINARY PRENATAL DEVELOPMENT. (3 cr; prereq #)
Ontogenetic processes in organ systems of domestic animals and developmental anomalies of clinical significance.

5104. MICROSCOPIC ANATOMY OF DOMESTIC ANIMALS. (5 cr; prereq #)
Light microscopic and relevant ultrastructural studies of cells, tissues, and organ systems.

5105. MICROSCOPIC ANATOMY OF DOMESTIC ANIMALS. (4 cr; prereq #)
Continuation of 5104.

5126. VETERINARY ANATOMY II. (5 cr; prereq 5100 or #)
Comparative anatomy with emphasis on the pelvis, reproductive system, limbs, and head from a morphodynamic and radiographic approach. Species covered include the horse, domestic ruminants, swine, dog, cat, chicken, and various laboratory animals.

5180. APPLIED IMMUNOLOGY. (1 cr; prereq regis vet med, grad student or #)
Review of the principles of immunology and their clinical appplication.

5210. VETERINARY BIOCHEMISTRY. (4 cr; prereq #)
The molecular nature of cells and tissues and the ways in which dietary carbohydrates, lipids, and proteins are metabolized to generate energy for growth and maintenance of the animal. Regulation of metabolism by hormones.

5211. VETERINARY BIOCHEMISTRY LABORATORY. (1 cr; prereq #)
Basic biochemical laboratory techniques and analyses of biological materials.

5212. VETERINARY BIOCHEMISTRY AND NUTRITION. (4 cr; prereq #)
Metabolism in specific body tissues; problems in metabolism. Requirements and functions of nutrients in large and small animals; sources of nutrients in animal feeds.

5306. ANIMAL PHYSIOLOGY. (5 cr; regis vet med or #)
Lectures and laboratory dealing with the physiology of the circulatory, respiratory, and renal systems of the animal body.

5308. ANIMAL PHYSIOLOGY. (5 cr; regis vet med or #)
Lectures and laboratory dealing with the physiology of the digestive systems of animals, and the mechanisms of temperature regulation and heat production.

5310. ANIMAL PHYSIOLOGY. (3 cr; prereq 5308 or #)
Lectures on the physiology of the endocrine and reproductive systems of domestic animals.

5400. VETERINARY PHARMACOLOGY. (4 cr; prereq 5308 or #)
General principles of drug action, drug disposition, and drug use in domestic animals. Pharmacology of autonomic drugs, inhalant anesthetic agents, cardiac stimulant and anti-arrhythmic drugs, diuretic agents, gastrointestinal drugs, and fluid and electrolyte preparations. Veterinary applications.

5401. VETERINARY PHARMACOLOGY. (4 cr; prereq 5400 or #)
Pharmacology of neuromuscular blocking agents, injectable general and local anesthetics, tranquilizers, analgesic drugs, analeptic and anticonvulsant agents, autocoids, antihistamines, and adrenalcorticosteroids. Veterinary applications.

5402. VETERINARY PHARMACOLOGY. (2 cr; prereq 5401 or #)
Pharmacology of sulfonamides, nitrofurans, arsenicals, antibiotics, coccidiostats and other antiprotozoan drugs, antifungal agents, anthelmintics, and other anti-infectious drugs. Principles and applications in the prevention and treatment of microbial and parasitic diseases of domestic animals.

OTHER COURSES

1120. COMPARATIVE VERTEBRATE MORPHOLOGY. (5 cr; not open to vet med students; prereq Biol 1106 or #)
Interpretation of vertebrate morphology, morphogenesis, and function with emphasis on phylogeny and adaptive significance.

5110. CYTOGENETIC EVALUATION OF ANIMAL DISEASES. (1 cr; prereq regis vet med, 4th yr or grad student or #)
Five lectures dealing with current information about the use of cytogenetics in animal disease diagnosis and current methods of laboratory preparation and analysis of chromosomes. Five laboratory periods devoted to preparing prophase spreads of chromosomes, staining and photographing them, and preparing karyograms for analysis.

5120. COMPARATIVE VERTEBRATE MORPHOLOGY
See 1120.

5140. VERTEBRATE MICROANATOMY. (6 cr; prereq 5120 or #)
The microscopic structure and cytochemical and functional aspects of cells, tissues, and organs of representative examples of vertebrates. Four units: basic tissues (2 cr); gastrointestinal tract (1 cr); respiratory and integumentary systems (1 cr); and excretory, reproductive, and endocrine systems (2 cr). Depending on background and interest, students may register for any or all units.

5320w. AVIAN PHYSIOLOGY. (5 cr; prereq AnSc 3301 or 6 cr systemic physiology or equiv. #; offered 1982 and alt yrs)
Physiology of wild and domestic birds.

5330. WILD BIRD MEDICINE. (2 cr; prereq 4th year or grad student or #)
Brief summary of important aspects of avian anatomy and physiology. Survey of diseases common to wild birds and surgical repair of common injuries and fractures.

GRADUATE COURSES

(See the *Graduate School Bulletin* for course descriptions)

5149. TOPICS OF ORGANOLOGY

5920. INDEPENDENT RESEARCH IN VETERINARY BIOLOGY

5950. DIRECTED STUDIES

8109. FUNCTIONAL MORPHOLOGY AND ADAPTATION

8110. MORPHOLOGY OF ANIMAL CELLS AND INTERCELLULAR SUBSTANCES

8111. HISTOLOGIC AND ULTRAHISTOLOGIC TECHNIQUES

8112-8113-8114. RESEARCH PROPOSITIONS IN MORPHOLOGY

8134-8135. COMPARATIVE VETERINARY NEUROLOGY

8136. EXPERIMENTAL COMPARATIVE VETERINARY NEUROLOGY

8148. SEMINAR: VETERINARY ANATOMY

8150. RESEARCH PROBLEMS IN VETERINARY ANATOMY

8307. ANIMAL PHYSIOLOGY LABORATORY

8309. ANIMAL PHYSIOLOGY LABORATORY

8330. SEMINAR: PHYSIOLOGY AND/OR PHARMACOLOGY

8335. PHYSIOLOGICAL AND PHARMACOLOGICAL RESEARCH TECHNIQUES FOR LARGE ANIMALS

8349. RESEARCH IN PHYSIOLOGY

8448. PROBLEMS IN VETERINARY PHARMACOLOGY

Veterinary Pathobiology (VPB)

REQUIRED COURSES

5501. BASIC VETERINARY PATHOLOGY. (5 cr; prereq #)
Lecture and laboratory studies of basic mechanisms involved in reactions of cells/tissues to injury. Emphasis on retrogressive changes in cells, cell death, pigments, circulatory disturbances, inflammation, and alterations in cell growth and multiplication (including neoplasia). Laboratory exercises deal with the application of basic principles of pathology to evaluation of gross and microscopic tissue alterations.

5502. SYSTEMIC VETERINARY PATHOLOGY. (5 cr; prereq 5501 or #)
Reaction of specific systems to injury with emphasis on the basic response capabilities of the tissue or organ, with materials illustrating gross and microscopic changes.

5503. DIAGNOSTIC PATHOLOGY. (3 cr; prereq 5502 or #)
Gross and microscopic changes associated with specific infectious and noninfectious diseases of domestic animals.

5504. VETERINARY CLINICAL PATHOLOGY. (3 cr; prereq 5503 or #)
Technique, application, and interpretation of basic laboratory tests applied to clinical diagnosis.

5601. VETERINARY PARASITOLOGY I. (4 cr; prereq 5501 or #)
Systematic and biologic study of protozoan and arthropod parasites of animals. Emphasis on their relationships to diseases and principles of parasite control.

5602. VETERINARY PARASITOLOGY II. (4 cr; prereq 5601 or #)
Helminth parasites and parasitic diseases of animals with emphasis on principles of control.

5701. ADVANCED VETERINARY MICROBIOLOGY, IMMUNOLOGY. (3 cr; prereq 3103, 1st yr vet med, #)
Lectures on humoral and cellular immune responses, hypersensitivity, bacterial genetics, and antimicrobial agents and their actions.

5702. PATHOGENIC BACTERIA AND FUNGI. (5 cr; prereq 5701 or equiv or #)
Lectures and laboratory dealing with animal pathogens with emphasis on basic mechanisms of infection.

5703. VETERINARY VIROLOGY. (4 cr; prereq 5701 or equiv or #)
Lectures and laboratory dealing with basic techniques of virology with emphasis on viral and rickettsial agents causing animal diseases.

5704. AVIAN DISEASES. (3 cr; prereq 5503, 5703 or #)
Lectures on diseases involving poultry and caged and aviary birds.

OTHER COURSES

3103. GENERAL MICROBIOLOGY. (5 cr; not open to vet med students; prereq 10 cr chemistry, 4 cr biological sciences)
Lectures and laboratory exercises on the morphology, taxonomy, genetics, physiology, and ecology of microorganisms. Practical application of fundamental principles of microbiology to other phases of science and industry.

5511. DISEASES OF THE PIG. (1 or 2 cr; prereq regis vet med, 4th yr or grad student or #)
Illustrated lectures on the pathogenesis and pathology of porcine diseases with emphasis on differential etiologic diagnosis of common clinical disease syndromes.

5513. DISEASES OF FUR-BEARING ANIMALS. (2 cr; prereq 5503, regis vet med, 4th yr or grad student or #)
Etiology, symptomatology, and treatment of diseases of fur-bearing animals.

5533. DIRECTED STUDIES IN VETERINARY PATHOBIOLOGY. (Cr ar; prereq regis vet med, 4th yr and #)
Principles, methods, and laboratory exercises in selected pathobiological research problems. Assigned research problems conducted under faculty direction.

5603s. PARASITES OF WILDLIFE. (3 cr; prereq #; offered 1983 and alt yrs)
Economic and biologic relationships of animal parasites and disease to regional wildlife.

5604s. DISEASES OF WILDLIFE. (3 cr; prereq #; offered 1982 and alt yrs)
Economic and biologic relationships of infectious and noninfectious diseases of wildlife.

5707. POULTRY DISEASE CONTROL. (3 cr; not open to vet med students; prereq Biol 1002 and AnSc 1100, MicB 3103 or equiv)
General anatomy; physiology of digestion and reproduction; prevention and control of important diseases affecting poultry.

5709. PREVENTIVE AVIAN MEDICINE. (1 cr; prereq regis vet med, 4th yr or grad student or #)
Preventive avian disease programs and management practices. Visits to poultry and aviary establishments.

5748. PROBLEMS IN VETERINARY MICROBIOLOGY AND PUBLIC HEALTH. (Cr ar; prereq 5703 or equiv, #)

GRADUATE COURSES

(See the *Graduate School Bulletin* for course descriptions)

5520. VETERINARY CLINICAL PATHOLOGY

5521. SURGICAL PATHOLOGY

5522. DIAGNOSTIC PATHOLOGY

5523. PATHOLOGY OF SPONTANEOUS DISEASES OF LABORATORY ANIMALS

5524. PATHOLOGY OF SPONTANEOUS DISEASES OF POULTRY

5720. CLINICAL MICROBIOLOGY

8500. SEMINAR: VETERINARY PATHOLOGY

8501. ADVANCED BASIC VETERINARY PATHOLOGY

8502. ADVANCED SYSTEMIC PATHOLOGY

8503. ADVANCED DIAGNOSTIC PATHOLOGY

8504. SEMINAR; ADVANCED VETERINARY HISTOPATHOLOGY

8530. ONCOLOGY

8531. VETERINARY NECROPSY

8532. COMPARATIVE NEUROPATHOLOGY

8533. PROBLEMS: PATHOLOGY

8534. PROBLEMS: CLINICAL PATHOLOGY

8601. ADVANCED VETERINARY PARASITOLOGY

8602. ADVANCED VETERINARY PARASITOLOGY

8611. IMMUNITY AND PARASITIC INFECTIONS: PROTOZOA AND ARTHROPODS

8612. IMMUNITY TO PARASITIC INFECTIONS: HELMINTHS

8648. PROBLEMS IN VETERINARY PARASITOLOGY

8700. SEMINAR: VETERINARY MICROBIOLOGY

8720. ADVANCED VETERINARY MICROBIOLOGY

8721. ADVANCED POULTRY DISEASES

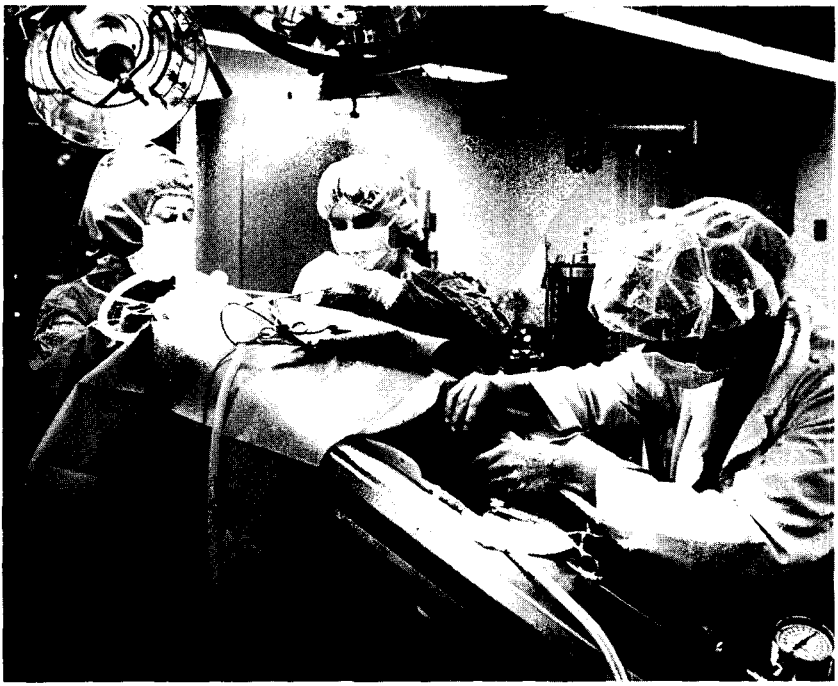
8722. ADVANCED COMPARATIVE IMMUNOCHEMISTRY AND IMMUNOBIOLOGY

8723. IMMUNOBIOLOGY OF THE LYMPHOCYTE

8724. ADVANCED VETERINARY DIAGNOSTIC MICROBIOLOGY

8725. CELL CULTURE TECHNIQUES

8726. COLLOQUIUM IN IMMUNOLOGY



Veterinary surgical students assist Dr. Cay Wood in operating on a cat.

IV. FACULTY

DEPARTMENT OF LARGE ANIMAL CLINICAL SCIENCES

Professor

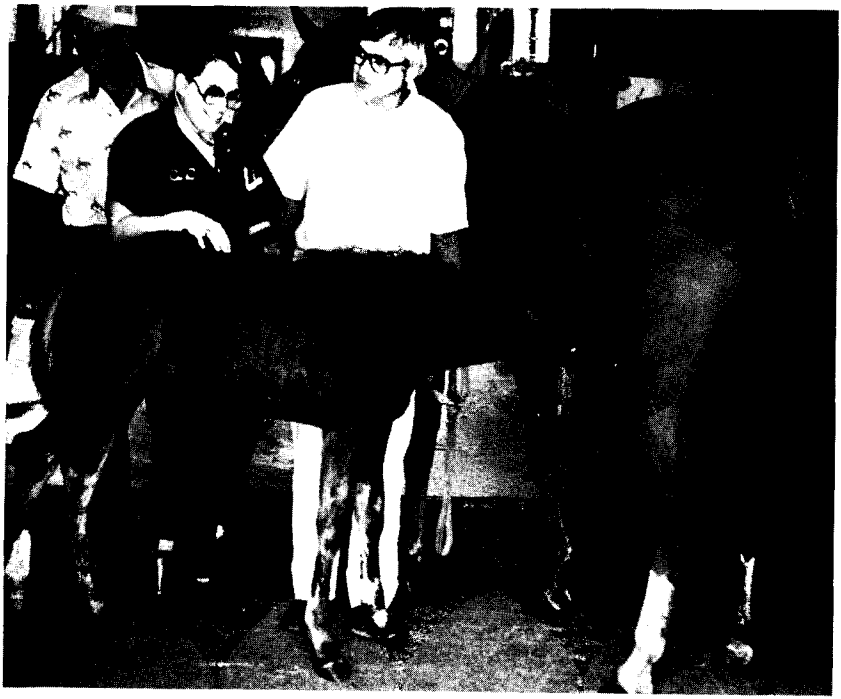
Robert H. Dunlop, D.V.M., Ph.D., *dean*
Dale K. Sorensen, D.V.M., Ph.D., *associate dean, academic affairs and research*
Roger S. Morris, B.V.Sc., Ph.D., *chairman*
James O. Hanson, D.V.M., *director, continuing education, and project leader, veterinary extension*
John F. Anderson, D.V.M., M.S.
Stanley L. Diesch, D.V.M., M.P.H.
Melvyn L. Fahning, D.V.M., Ph.D.
Ralph J. Farnsworth, D.V.M., M.S.
Donald W. Johnson, D.V.M., Ph.D.
Vaughn L. Larson, D.V.M., Ph.D.
Allen D. Leman, D.V.M., Ph.D.
Michael M. Pullen, D.V.M., M.S.
Robert A. Robinson, B.V.Sc., Ph.D.
Bradley E. Seguin, D.V.M., Ph.D.
Francis A. Spurrell, D.V.M., Ph.D.
Clarence M. Stowe, V.M.D., Ph.D.
Edward A. Usenik, D.V.M., Ph.D.
Raimunds Zemjanis, D.V.M., Ph.D.

Associate Professor

Charles C. Muscoplat, Ph.D.
William G. Olson, D.V.M., Ph.D.
Robert A. Wescott, D.V.M.
Norman B. Williamson, B.V.Sc., M.V.Sc.

Assistant Professor

Trevor R. Ames, D.V.M., M.S.
Larry C. Booth, D.V.M., M.S.
Dale L. Haggard, D.V.M., M.S.
Harvey D. Hilley, D.V.M., M.S.
Han S. Joo, D.V.M., Ph.D.
R. J. Frederick Markham, Ph.D.
David M. Sherman, D.V.M., M.S.
Raymond B. Solac, D.V.M.
Donna L. Stevens, V.M.D., M.S.



Dr. V. L. Larson reviews a neurological problem of a foal with an equine medicine student and the owner.

DEPARTMENT OF SMALL ANIMAL CLINICAL SCIENCES

Professor

Carl R. Jessen, D.V.M., Ph.D., *associate dean, planning and veterinary medical services*
Carl A. Osborne, D.V.M., Ph.D., *chairman*
Griselda F. Hanlon, D.V.M., M.S.
Larry J. Wallace, D.V.M., M.S.

Associate Professor

Stephen I. Bistner, D.V.M.
Robert M. Hardy, D.V.M., M.S.
Jeffrey S. Klausner, D.V.M., M.S.
Alan J. Lipowitz, D.V.M., M.S.
Patrick J. McKeever, D.V.M., M.S.
Philip N. Ogburn, D.V.M., Ph.D.

Assistant Professor

Dennis D. Caywood, D.V.M., M.S.
Daniel A. Feeney, D.V.M., M.S.
Gary R. Johnston, D.V.M., M.S.
Charles J. McGrath, D.V.M.
Marc R. Raffe, D.V.M., M.S.

DEPARTMENT OF VETERINARY BIOLOGY

Professor

Harold E. Dziuk, D.V.M., Ph.D., *acting chairman*
Caroline Czarnecki, Ph.D.
Gary E. Duke, Ph.D.
Thomas F. Fletcher, D.V.M., Ph.D.
Archie L. Good, V.M.D., Ph.D.
Alvin F. Weber, D.V.M., Ph.D.

Associate Professor

Wendell J. DeBoer, Ph.D., *coordinator, student affairs*
Ronald P. Brockman, D.V.M., Ph.D.
Victor Cox, D.V.M., Ph.D.
Grace W. Gray, Ph.D.
Edward F. Jankus, D.V.M., Ph.D.
Sally E. Jorgensen, Ph.D.
Charles F. Louis, D.Phil.

Assistant Professor

Alice A. Larson, Ph.D.
Patrick T. Redig, D.V.M., Ph.D.

DEPARTMENT OF VETERINARY PATHOBIOLOGY

Professor

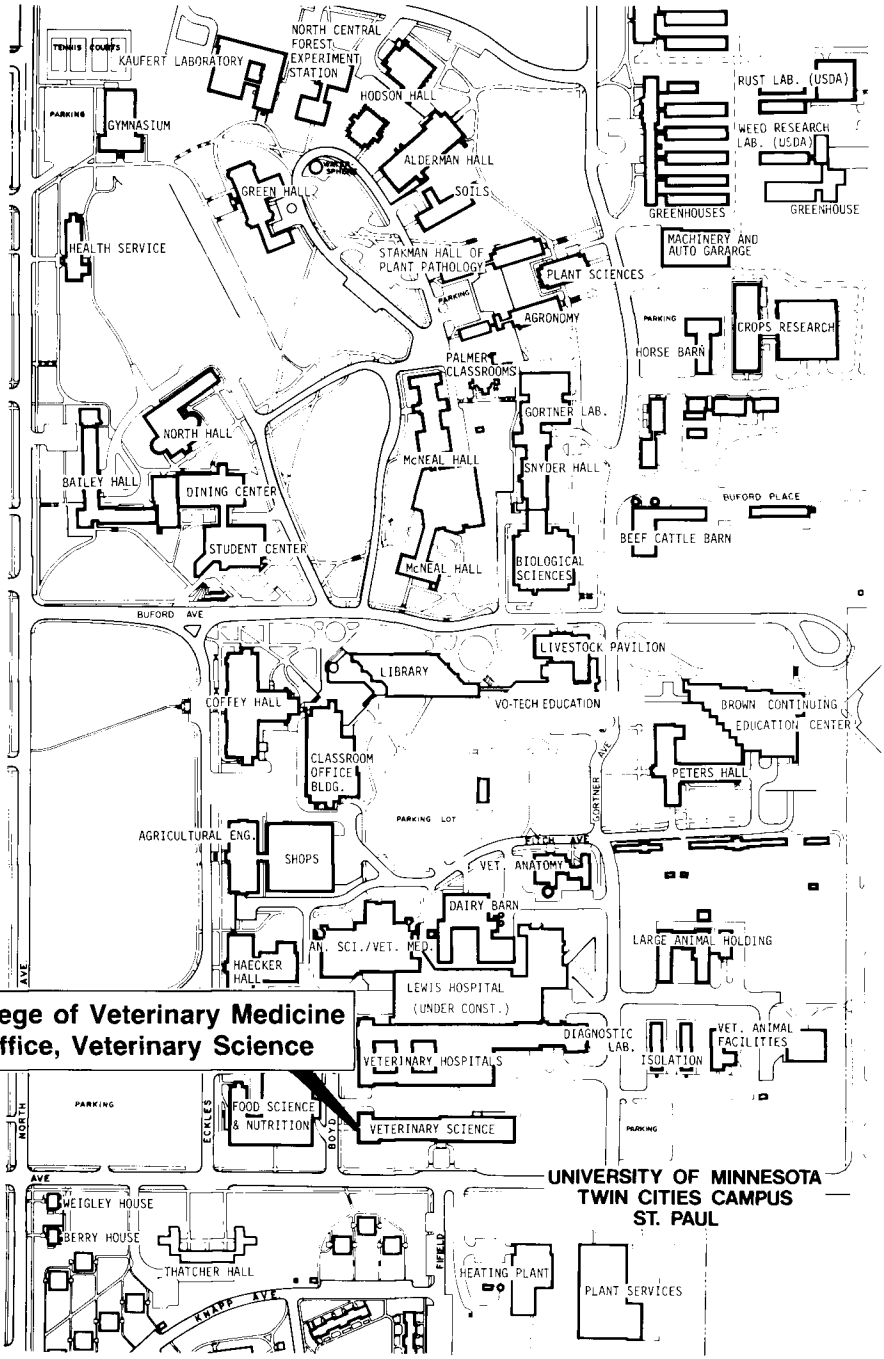
Kenneth H. Johnson, D.V.M., Ph.D., *chairman*
Donald M. Barnes, D.V.M., Ph.D.
William J. Bemrick, Ph.D.
John M. Higbee, D.V.M.
Harold J. Kurtz, D.V.M., Ph.D.
Keith I. Loken, D.V.M., Ph.D.
S. K. Maheswaran, D.V.M., Ph.D.
Glen H. Nelson, D.V.M.
Victor Perman, D.V.M., Ph.D.
Jay H. Sautter, D.V.M., Ph.D.
Jerry B. Stevens, D.V.M., Ph.D.
Ronald E. Werdin, D.V.M., Ph.D.

Associate Professor

David A. Halvorson, D.V.M.
David W. Hayden, D.V.M., Ph.D.
Joel R. Leininger, D.V.M., Ph.D.
John A. Newman, D.V.M., Ph.D.
Terrance P. O'Leary, D.V.M., Ph.D.
George R. Ruth, D.V.M., Ph.D.
John C. Schlotthauer, D.V.M., Ph.D.
Richard E. Shope, Jr., D.V.M., Ph.D.
Bert E. Stromberg, Ph.D.
Gilbert E. Ward, D.V.M., Ph.D.

Assistant Professor

Russell R. Bey, B.A., Ph.D.
Michael J. Tomlinson, D.V.M., Ph.D.
Mary M. Walser, V.M.D., Ph.D.



College of Veterinary Medicine
Office, Veterinary Science