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Graduate Programs in the Health Sciences

UNIVERSITY OF MINNESOTA

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How to Use This Bulletin

The "General Information" section of this bulletin is your official source of information about the policies of the Graduate School and about procedures in earning graduate degrees.

The section entitled "Fields of Instruction" contains statements of the policies and requirements of the various departments and listings of the course offerings in those departments.

Do Not Fail to Read

(1) The complete description of conditions and requirements for the degree you expect to earn (for the Master's degree, page 10; for the Ph.D. degree, page 13).

(2) The paragraphs headed "Time Limit for Earning the Doctor's Degree and Continuous Registration Requirement," page 15.

(3) The section entitled "Symbols and Explanations," inside back cover. This is your guide to the understanding of terms and symbols used in course descriptions.

The office of the Graduate School is located in Johnston Hall. The Registration and Information Office, 316 Johnston Hall, is open from 8:30 a.m. to 12 noon and from 1 p.m. to 4 p.m.

Graduate Programs in the Health Sciences

I. GENERAL INFORMATION

PURPOSE

Opportunities for graduate study in the health sciences at the University of Minnesota are arranged to meet the educational needs of persons who are looking toward careers in research and teaching, or in the scientific practice of a special field of medicine, dentistry, pharmacy, nursing, or public health.

In clinical branches the degree of master of science primarily indicates scientific proficiency. To be recommended for this degree candidates must have given evidence that they are competent to begin practice of a clinical specialty in a scientific manner, i.e., they must have acquired clinical competence in the selected field and have made a contribution to knowledge related to or basic to their specialty. The doctorate of philosophy in clinical subjects is awarded only to those who give evidence of proficiency at least equal to that required for the Master's degree and who, in addition, have substantially advanced medical science through original investigation.

HUMAN RIGHTS

The Board of Regents has committed itself and the Univeristy of Minnesota to the policy that there shall be no discrimination in the treatment of persons because of race, creed, color, sex, or national origin. This is a guiding policy in the admission of students in all colleges and in their academic pursuits. It is also to be a governing principle in University-owned and University-approved housing, in food services, student unions, extracurricular activities, and all other student and staff services. This policy must also be adhered to in the employment of students either by the University or by outsiders through the University and in the employment of faculty and civil service staff.

LIBRARIES

The biomedical collections are housed in Diehl Hall, located adjacent to the hospitals. Also at the disposal of the student are the University library, the departmental libraries, and the collections of the Hennepin County and Ramsey County Medical Societies. The medical library of the Mayo Graduate School of Medicine at Rochester consists of over 150,000 bound volumes and receives some 2,500 medical journals; a general reading room, reading tables in the stacks, and special rooms for study are available. Current issues and complete files of the most important health science periodicals are available in both Minneapolis and Rochester.

PHYSICAL FACILITIES

The University owns and controls Elliot Memorial Hospital, Cancer Institute, Todd Memorial Hospital, Psychopathic Hospital, Minnesota Hospital and Home for Crippled Children, Variety Club Heart Hospital, Child Psychiatry Hospital, Mayo Memorial Hospital, Masonic Memorial Hospital, Veterans of Foreign Wars Cancer Research Laboratory, and the University Health Service.

Also available for graduate work are Hennepin County General Hospital, Veterans Hospital in Minneapolis, St. Paul-Ramsey Hospital in St. Paul, Gillette State Hospital for Children in St. Paul, Shriners Hospital for Crippled Children in Minneapolis, as well as Mount Sinai Hospital and certain other private hospitals in Minneapolis and St. Paul.

In Rochester, Mayo Clinic facilities, materials and patient records, St. Marys and Methodist Hospitals, and the Rochester State Hospital are available for use by Mayo Graduate School degree candidates.

Some graduate students in medicine may divide their time spent in study between the Mayo Graduate School of Medicine and the Medical School in Minneapolis. Learning experiences for School of Nursing graduate students may be arranged in a variety of community agencies.

Admission

Any student with a Bachelor's degree or its equivalent from a recognized college or university may apply to the dean of the Graduate School for admission. University of Minnesota undergraduates who lack not more than 9 quarter credits or two courses toward the Bachelor's degree (*counting required and sequence courses*), if they meet admission requirements, may register in the Graduate School to begin a graduate program while simultaneously completing work for the Bachelor's degree. Applicants with the necessary background for their chosen major field, an excellent scholastic record from an approved college or university, and satisfactory 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.

Clinical Medical Majors—Entrance to work for the advanced degrees of master of science (M.S.) or doctor of philosophy (Ph.D.) in the clinical departments of medicine is limited to those who have (a) satisfactory professional qualifications; (b) the Bachelor's degree in arts or science or its equivalent; (c) the doctor of medicine degree from an acceptable institution; and in most cases (d) 1 year's experience as an intern or the equivalent in an approved hospital or as an assistant in a laboratory of an acceptable medical school.

Nursing Majors—Satisfactory completion of a National League for Nursing accredited nursing program leading to the baccalaureate degree including public health nursing is a requisite for admission. Personal interviews are highly recommended, and two references are required.

CREDENTIALS EXAMINATION FEE

A credentials examination fee of $15 is required for each applicant. Persons who were previously officially admitted to and registered in a college of the University of Minnesota are exempt from this requirement. (This exemption *does not*

extend to students previously registered only in Continuing Education and Extension or as "summer-only" students.) Residents of the United States must submit the fee by personal check or money order; foreign applicants must submit the fee by certified bank check. All checks should be made payable to the University of Minnesota. The fee will not be refunded.

TEST DATA

Miller Analogies Test—A graduate level form of the Miller Analogies Test is required of applicants for the following major fields or programs (except for applicants from non-English speaking countries):

Hospital and Health Care Administration

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 E. 45th Street, New York, New York 10017, for a list of Miller Analogies testing centers.

Test of English as a Foreign Language (TOEFL)—This test is required of all foreign applicants whose native language is not English except those applying to the Mayo Graduate School of Medicine and in those cases in which applicants will have completed an academic year in residence as full-time students in another recognized institution of higher learning in the United States prior to entering the University of Minnesota. The University of Minnesota reserves the right to require additional testing upon arrival.

Applications will be considered prior to the time that TOEFL results are available, but the Certificate of Eligibility necessary to obtain the visa will not be issued until the University has evidence of satisfactory performance on the test.

Educational Council for Foreign Medical Graduates (ECFMG) Examination—Applicants for 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 United States jurisdiction that is authorized to license physicians. For information concerning the examination for certification, the applicant should write directly to the Educational Council for Foreign Medical Graduates, 3930 Chestnut Street, Philadelphia, Pennsylvania 19104, U.S.A.

LICENSURE

Graduate students working in any field of clinical medicine at the Mayo Graduate School of Medicine must be licensed to practice in Minnesota within 6 months after beginning their work.

APPLICATION PROCEDURE

Requests for application materials must be sent to the Graduate School, 322 Johnston Hall, Minneapolis, Minnesota 55455, and should specify the applicant's proposed major field.

Applications for admission must be received in the Graduate School, complete in every detail (one official transcript from each college attended, the credentials examination fee, the test results, if required) at least 4 weeks prior to the opening of the quarter or summer term in which the applicant expects to register. Applicants would be wise to apply as early as possible, but not more than 1 year prior to the opening of the term in which they propose to begin their studies.

Applicants to the clinical medical fields should contact the departments directly for instruction on application procedures.

FOREIGN APPLICANTS

All foreign applicants who have attended universities which 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 which issue original transcripts or mark sheets only once to the student must submit attested true copies of academic records. If these records are photocopies, they must be attested by a university official after photographing. If the grading system employed by the university is not shown in the credentials themselves, a separate official statement from the university is required giving this information. If an applicant is uncertain of what documents are required, early inquiry is recommended.

Experience at the University of Minnesota has been that quite often during the program of study students have 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 applications for admission—one to be submitted for permanent filing in the Graduate School and the other for personal use.

For admission to the School of Public Health, international students must contact the ministry of health of their home country for an endorsement of their training. This endorsement must be submitted in writing to the school as a part of the application and should include both a statement of the ministry's desire to have the student obtain training in a specific field of public health and the willingness of the ministry to employ the student or assist the student in securing employment upon return to his country. International students already in the United States who are not admitted for permanent residence must also obtain this endorsement.

TRANSIENT GRADUATE STUDENT

Students currently engaged in a graduate degree program in another recognized graduate school who wish to enroll for a summer session or a single quarter in the Graduate School of the University of Minnesota, and who intend thereafter to return to the graduate school in which they are carrying forward their program of studies for a graduate degree, may be admitted as transient graduate

students. They will not be required to submit a full transcript of credits but may ask the dean of their graduate school to complete Form 57 and return it to the Graduate School, 322 Johnston Hall, University of Minnesota, Minneapolis, Minnesota 55455.

Under no circumstances will students be permitted to register for more than 1 quarter or summer session as a transient student. Persons originally registering in this status who wish to apply for regular admission must follow the directions outlined above.

READMISSION, CHANGE OF MAJOR, OR CHANGE OF DEGREE OBJECTIVE

Persons who have withdrawn from the Graduate School for 2 consecutive years or more and who wish to request readmission, or persons currently enrolled who intend to change their major field or degree objective from that originally approved by the Graduate School, should request a copy of the Change of Status form (GS #72) from the Graduate School, 322 Johnston Hall. Processing of these requests requires a minimum of 4 weeks.

Fellowships and Assistantships

Graduate fellowships and assistantships are offered in all departments of the Medical School, School of Dentistry, College of Pharmacy, School of Nursing, and School of Public Health, as well as at the Mayo Graduate School of Medicine in Rochester. Since the duration of support and stipend amounts vary, inquiry should be addressed to the specific department in which a fellowship is desired.

To be eligible to hold an appointment, students must have been admitted to the Graduate School and must be registered in the Graduate School each quarter that they hold the appointment during the academic year.

A Note to Spouses—There are campus employment opportunities open to spouses of graduate students. Applicants should communicate *at once* with the Department of Civil Service Personnel, 2651 University Avenue, St. Paul, Minnesota 55114.

Academic Rank and Candidacy for a Graduate Degree

Members of the University of Minnesota staff of instruction above the rank of instructor or research fellow are not permitted to take a graduate degree at the University of Minnesota. They may register for graduate work, however, and credit thus obtained may be presented elsewhere.

Transfer of Credits

From an Undergraduate College of the University of Minnesota—Credits for advanced courses earned while students were registered as undergraduates at the University may be transferred to the Graduate School record once students have

been admitted and have registered as graduate students, but under the following conditions:

> If not more than 9 quarter credits of undergraduate work are lacking for the degree (including both distribution and total credit requirements), a limited amount of graduate work in approved courses numbered 5000 or above may be carried for graduate course credit, such courses not to be applied toward an undergraduate degree. The conditions stated must exist at the beginning of the quarter in which the courses for graduate credit are taken. Transfer of credit to the Graduate School must be arranged by petition and may not exceed the credits earned in a single academic quarter or summer term. *S-N credits cannot be transferred.*

From Adult Special or Summer Special Status—Students admitted to, and registered in, the Graduate School may transfer to their graduate record the credits earned *in their first academic quarter or summer term* as adult special or summer special students. Such work must be graduate level and taught by a member of the graduate faculty, and students must complete the work required of graduate students in the courses. The courses should be included on the graduate program form when it is submitted for approval.

The adult special and summer special statuses are not intended as trials for graduate study.

From Continuing Education and Extension—No more than 12 credits of graduate-level work taken in Continuing Education and Extension at the University of Minnesota may be transferred to the graduate record and included on the degree program. Courses so taken must bear the special CEE transcript entry showing they were completed for graduate credit. Transfer is achieved by including them on the official degree program when it is submitted for approval. Extension work taken at other institutions is not transferable.

From Independent (Correspondence) Study—Graduate credit is *not* allowed for credits earned through independent (correspondence) study.

From Other Graduate Institutions to Apply Toward a Master's Degree—In the usual Master's program (Plan A—27 credits or Plan B—45 credits) a maximum of 9 quarter credits is allowed from other graduate schools. The transfer allowance will often be higher for Master's programs of greater length (e.g., master of social work, master of fine arts) and referral should be made to the departmental section of the bulletin. The work is included on the official program form when it is submitted for approval.

From Other Graduate Institutions to Apply Toward Ph.D. Degree—Graduate credit may be applied from other institutions. The appropriate work is included on the doctoral program when it is submitted for approval.

Graduate School Newsletter

The Graduate School publishes quarterly and once each Summer Session a newsletter entitled *G.S. Form 7000,* which is used to inform students and graduate faculty of changes in regulations and procedures. The newsletter also contains information on fellowship opportunities, quarterly graduate deadlines, the Council of Graduate Students' activities, and includes a directory of offices in the Graduate School from which information on various matters can be requested. The newsletter is distributed to all graduate students and faculty each term with registration materials.

Quarterly Progress Report

The Graduate School issues a Quarterly Progress Report to the major department for each active student which indicates progress made toward degree attainment. The report includes grades received, grade point average, the content of the official degree program and the courses on it which have been completed, examining committees, and degree requirements yet to be completed.

The computer registration system depends upon the Quarterly Progress Report as a basis upon which to determine whether a student is clear to register. These decisions are based on the individual department's criteria as to G.P.A., acceptable number of incompletes, and deadlines for the submission of degree program and thesis title forms.

Registration

The Graduate School operates on a quarter system and registration ordinarily begins about 6 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 in 2 summer terms of 5 weeks each. For the University calendar and tuition and fee rates please see the University's current *General Information Bulletin.*

Students must receive notification of admission to the Graduate School before registration is permitted.

REGISTRATION REQUIREMENTS

1. All teaching and research assistants must register for full loads in the Graduate School for the full period of residence requirements for the master of science degree (3 calendar years of 4 quarters each for the M.S. with field designated and 3 quarters for the degree without designation). Students who then elect to work toward the Ph.D. degree must register in the Graduate School after residence requirements are met, so long as they are taking any courses or working on a thesis for the degree.

2. Special assignments—Special students (such as fellows from other universities or foundations, officers of the medical corps of the United States Army, Navy, Air Force, or Public Health Service, and others) may be accepted at the Mayo Graduate School of Medicine at Rochester in laboratory and clinical branches for shorter periods. The number is necessarily limited to avoid interference with the work of the resident fellows. Correspondence concerning special assignments should be addressed to: Director of the Mayo Graduate School of Medicine, Rochester, Minnesota 55901.

3. All persons appointed under trainee programs must register full time during the tenure of their appointments.

4. Postprofessional research fellows supported by agencies other than the Regents of the University and employed by the University for 1 quarter or more must either (a) register in the Graduate School (b) be appointed to an appropriate staff position. Any post-M.D. or post-D.D.S. fellow working toward a Graduate School degree shall be registered in the Graduate School as defined in requirement 1 above. A person already holding the Ph.D. degree or its equivalent may be recommended for appointment as honorary fellow.

Varieties of Registration—The four kinds of registration are listed as follows:

1. Registration for course work.
2. "Thesis-only" Registration: This type of registration, for which any students with their adviser's approval are eligible, is for the convenience of the student. It is a means of registering when students must or wish to do so but are not taking course work. They need not actually be working on a thesis. For tuition purposes it is treated as half-time.
3. "Examination-only" Registration: This 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. The status can be utilized only twice. It is not a requirement; it is for the convenience of the student and bears a special tuition rate. *Late registration for "examination only" is not allowed.*
4. Doctoral Candidate Registration: Available only to doctoral students who have passed their preliminary oral examinations. It bears a special tuition rate and *is required.* See the section on degree requirements.

Changes in Registration—Changes in the original registration are made by use of a Cancel-Add Form. Through the first 6 weeks of the academic year quarter or the first 3 weeks of the summer term the Cancel-Add Form requires only the adviser's approval. Changes made after the middle of the term should be cleared in advance with the instructor.

Tuition and Fees

For current tuition and fees see the *General Information Bulletin.*

For Summer Session tuition and fees see the *Summer Session Bulletin.*

All college teachers new to the state of Minnesota, including new full-time University faculty members with the rank of instructor or above, may pay tuition at the resident rate from the time they begin their teaching in this state.

Exemptions from the Student Services Fee—Exemptions from the Student Services Fee are granted on request to:

1. Teachers currently employed full time in elementary and secondary schools (public, private, parochial) in the Twin Cities and surrounding areas and whose quarterly credit load does not exceed 5 credits, or who are registering for "thesis only."
2. Graduate students who are living beyond commuting distance of the campus and whose registration is for "thesis only," research or topics courses, or Plan B papers.
3. Doctoral candidates (students who have passed the preliminary oral examination for the doctorate) who do not wish to pay the fee.

Minimum tuition payments for graduate degrees are described in the sections on the Master's and Doctor's degrees below under residence requirements

Grading System

All courses offered for graduate credit are available on both an A-N (A, B, C, D, N) and S-N basis with the following exceptions: courses at the 8-level for which one grading system has been approved by the department and the Graduate School and, in exceptional cases only, courses at the 5-level for which one grading system has been approved by the department and the Graduate School.

Students may choose the basis upon which they will be graded, except as restricted in 8-level courses, and in 5-level courses by special exception, as stated above. Beyond restricted courses with one basis of grading, students should make

arrangements for grading with the instructor of the course within the first 2 weeks of the term. (Within that time the instructor should have clarified the level of performance which will be expected under each grading system.)

At least two-thirds of the credit hours contained in any student's official program for the degree must have been graded on an A-N basis. Exceptions to this rule may be granted by the Graduate School. Within the constraints stated above, students are free to select which of their program's courses they will take on an A-N basis to meet this proportion.

For information on required G.P.A. standards for degree programs, see the sections on degree requirements.

Incomplete—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. Courses may be retaken only after approval of a petition to the Graduate School. Permission of the course instructor and the major adviser is required before submission of the petition.

Attendance at Commencement

Attendance at commencement is voluntary. However, Ph.D. candidates, since they are individually recognized and hooded at the ceremony, should inform the Graduate School as to whether or not they will attend.

The Master's Degree

The 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 papers for the thesis. Plan B is not employed in the clinical medical fields. For plans offered in each major, consult the departmental sections of this bulletin.

Residence Requirement for the Nonclinical Health Sciences Fields—A Master's program ordinarily takes from 4 to 6 quarters in residence to complete. The minimum residence *requirement* for the degree, however, is 3 academic quarters or its equivalent in summer terms at full tuition (2 summer terms—that is, a full summer session—are equivalent to 1 quarter for this purpose). State residents may petition to complete the program in 5 summer terms, but nonresidents must pay full tuition for the 3 academic quarters or summer equivalent.

Residence Requirement for the Clinical Medical Fields—For the Master's degree (M.S.) in *clinical subjects*, 2 or 3 years are required. For the *Master's degree with field designated in clinical fields* (e.g., M.S. in pathology or radiology), 3 calendar years are required to insure proficiency in the special field. For the ordinary *Master's degree without special designation in clinical fields*, the length of residence may be reduced to 2 years.

Time Limit—All requirements for the Master's degree must be completed within 7 years. The 7-year period specified includes all work transferred to the graduate record of the individual.

Language Requirement—Students should consult their department to determine language requirements, if any, in their program.

The Official Program for the Degree in Nonclinical Health Sciences—After taking 15 credits, and ordinarily not later than the third quarter of registration (the second year for the longer programs), students should file with the Graduate School the official proposed program for the degree (Plan A or Plan B). The program form is obtained in the Graduate School Office. On it students list all work, completed and proposed, which will be offered in fulfillment of degree requirements. If a language is required the one to be offered is specified, and if the degree is being taken under Plan A, students also include their thesis proposal on the program form. *On the basis of this program, the student's final examining committee, and for Plan A the thesis readers, are appointed.* The minimum credit requirements for the program are specified below under the two plans for the degree.

For the Master's degree in the clinical medical branches: Students are encouraged to submit their programs and thesis plans before the end of the second year of registration. Approval by the appropriate graduate program review committee and the Graduate School indicates the student's admission to candidacy for the degree.

Changes in the Program—Once approved, the program must be fulfilled in each detail to meet graduation requirements. Alterations in the program which are found necessary or desirable by students and their adviser should be requested in advance by General Petition form.

The minimum grade point average established by the Graduate School for courses included on the program is 2.80 (on a 4.00 scale). No graduate credit is allowed for work below C level. Higher standards may be set by the individual major fields.

In cases in which students take course work beyond the minimum requirements, both the adviser and the Unit Committee may demand comparable standards of performance for all work taken in evaluating and approving the program submitted, and may both reject the degree program if the total record falls below a 2.80 G.P.A. and terminate candidacy.

PLAN A: MASTER'S DEGREE WITH THESIS

Major and Minor Work in Nonclinical Fields—A minimum of 18 quarter credits in the major and 9 in the minor must be completed in the Graduate School.

Major and Minor Work in Clinical Branches—For the student in a clinical branch, the major is that field in which the student desires to specialize. In choosing a basic field for major work, the candidate must present the minimum undergraduate preparation prescribed in the departmental statement.

For majors in clinical branches, unless variations are permitted by special petition, the minor must be in a nonclinical field which will serve as a basis for the proposed clinical specialization. This fundamental work should be concentrated in the first part of the course. Familiarity with those phases of the basic medical sciences essential to proficiency in the major specialty is required.

At the Mayo Graduate School of Medicine, candidates must complete a minimum of 6 to 9 months of concentrated work in a related laboratory field for the minor.

Master's Thesis—The thesis proposal is submitted for approval in advance as a part of the student's official degree program (see above). The thesis must be written in acceptable English and the student must show ability to work independently as a research scholar. Citation of authorities and a bibliography are included in the thesis.

Instructions for the Preparation of the Thesis—Instructions should be obtained from the Graduate School Office before preparation of the thesis begins. The instructions contain information as to the number of copies required and general regulations governing the preparation. Questions not resolved by the instructions should be settled in consultation with the adviser and by reference to a standard style manual.

Registration of the Thesis with the Graduate School—A complete clean draft of the thesis with title page, table of contents, and bibliography must be presented for registration in the Graduate School Office at least 9 weeks before the commencement at which candidates expect to receive the degree. The copy will be returned to the candidate immediately, together with the report form on which the readers will signify their approval of the thesis and other forms necessary for graduation. When the thesis report form is returned properly signed, a final examination report form will be issued to the student. Please note that the Unit Committee or 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 not less than three, as appointed by the dean of the Graduate School on recommendation of the appropriate Unit Committee 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. *This committee must be unanimous* in certifying that the thesis is ready for defense, and the report form certifying this must be filed with the Graduate School Office before students will be admitted to the final examination.

Inclusion of Published Work in the Thesis—Candidates may include, as a part of the thesis, material published while University of Minnesota graduate students, provided the research was supervised by graduate faculty and its use approved by the adviser.

Thesis Binding—Two copies of the thesis (including the ribbon copy) are to be bound and deposited with the Graduate School Office. For the deadline for a particular commencement, consult the Graduate School Office or the current newsletter.

Examinations—Candidates for the Master's degree, Plan A, must pass a final written examination, a final oral examination, or both, at the discretion of the examining committee.

A final written examination covers the major and minor fields and may include any work fundamental thereto. This examination is arranged by the chairman of the thesis committee, and questions are prepared by the graduate faculty

in the major and minor fields. *A majority vote* of the committee is required to pass candidates on the written examination. The results are reported to the Graduate School on a final examination report form which will be issued to students when the form, certifying that the thesis is ready for defense, is submitted.

A final oral examination is conducted by the committee appointed to examine the thesis, with the adviser normally serving as its chairman, and covers both the major and minor fields. *A majority vote* is required for a pass. Results must be reported to the Graduate School on the report form obtained by the student when the signed thesis approval form is submitted to the Graduate School Office.

If both a written and oral examination are specified, the written examination must precede the oral examination.

Clearing for Graduation—To qualify for graduation in a particular quarter, students must complete the examination and all other requirements (including the submission of required forms and fees) by a specified date *approximately* 5 weeks before the commencement day. The deadlines for a particular term are published in the newsletter for that term and are available from the Graduate School Office.

Substitution of the Doctoral Preliminary Oral for the Master's Final—Students eligible for the preliminary oral examination for the Doctor's degree may, at the discretion of the preliminary oral examination committee, substitute that examination for the final oral for the Master's degree, if all other requirements for the preliminary oral examination have been met and there is no conflict in majors or minors.

PLAN B: MASTER'S DEGREE WITHOUT THESIS

Course Requirements—A total of 45 quarter credits is required, at least 21 of which should be in the major field. Not less than 18 of the total should be offered in at least two related fields of a minimum of 6 credits each.

Plan B Papers—Papers representing the quality but not the range of the Master's thesis shall be prepared in three advanced courses or seminars or in problems courses or courses which permit independent work under faculty supervision and involve the equivalent of 9 quarter credits.

Examinations—Candidates will be examined by a committee of at least three members, normally two from the major and one from a related field, appointed by the dean on recommendation of the appropriate Unit Committee at the time of the approval of the official degree program. This examination may be written or oral or both, at the discretion of the examining committee. Students will make available to the examining committee for its review the Plan B papers prepared to fulfill the requirement for 9 hours of independent work. *A majority vote* is required to pass the student, and the results should be reported to the Graduate School on the form students obtain from that office before the examination.

The Doctor of Philosophy Degree

The degree of doctor of philosophy is granted not on the basis of successful completion of a definite amount of prescribed work but chiefly in recognition of candidates' high attainments and ability in their special field as demonstrated,

first, by passing the required examinations covering both the general and special fields of candidates' subjects, and second, by the preparation of a thesis.

Residence Requirement for the Doctor's Degree—Candidates for the Doctor's degree must register in the Graduate School for at least 9 quarters of graduate study in approved subjects, and thesis research and writing. Students who transfer work from other graduate schools for the degree must spend the first 2 years or the last year in residence at the University of Minneosta. There is also a continuous registration requirement. See below.

The Official Program for the Degree—Students are expected to file the official program for the degree in the second year of the program, the specific quarter depending upon individual departmental requirements. The program form is obtained from the Graduate School Office. The program should contain course work completed and proposed in fulfillment of degree requirements in the major field and in the minor or supporting program fields. Transfer work from other graduate schools may be included as appropriate. On the program 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, students' preliminary oral examining committees will be appointed.*

Major Work—There is no minimum number of credits specified for the major by the Graduate School. The major is that field in which the student desires to specialize. Together with the thesis, the major work should occupy *at least two-thirds* of the total work for the degree. In the clinical fields the Ph.D. is always a degree with designation. In pathology the Ph.D. may be earned either with or without designation.

Minor or Supporting Program Work—It is expected that from 18 to 24 quarter credits in a nonclinical field will 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 students are offering a supporting program, it will comprise a coherent pattern of courses possibly embracing several disciplines. Students electing the supporting program option may be expected to take written preliminary examinations in the fields included but will not be expected to have competency in each of the fields in their supporting program comparable to that of a person with a traditional minor in the field concerned.

Familiarity with those phases of the basic medical sciences essential to proficiency in the major specialty is required.

Rochester candidates must complete a minimum of 9 months of concentrated work in a related laboratory field for the minor.

Changes in the Approved Program or Students' Preliminary Oral Examining Committee—Once approved, the program must be fulfilled in each detail to meet graduation requirements. Changes which are found necessary or desirable by students and their advisers should be requested in advance by General Petition form.

Substitutions on the examining committee, which may be necessitated, for example, by the departure of a faculty member or absence on leave at the point that students wish to take their examination, should be requested *well in advance* through the Graduate School Office.

Official Candidacy—Candidacy is established when students have passed the preliminary oral examination. The Graduate School issues to all students passing the preliminary oral examination without reservation a Candidate in Philosophy certificate. At the Mayo Graduate School of Medicine, candidacy is established after the proposed research project is approved and the candidate successfully passes the Oral Admission to Candidacy Examination.

Time Limit for Earning the Doctor's Degree and Continuous Registration Requirement—Effective with the quarter immediately following admission to candidacy for the doctorate students must:

1. Complete all requirements and receive the degree within 5 calendar years. Petitions for extension of this time limit must be submitted before expiration of the 5 years. Failure to receive the Ph.D. before the close of the 5-year period may necessitate retaking the preliminary oral examination.
2. Register continuously and pay candidacy fees during the academic year (fall, winter, spring) until the doctorate is awarded. Failure to register continuously automatically terminates candidacy for the doctorate. To reinstate candidacy students may be required to retake the preliminary oral examination and must pay fees past due. Course 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.

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 should file the thesis proposal with the Graduate School. The thesis title form is obtained from that office. The form must be accompanied by a typewritten statement, some 250 words in length, describing the research to be undertaken and the methods to be used 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 on recommendation of the appropriate Unit Committee.

Changes in the Thesis Title or Final Oral Examining Committee—Changes in the wording of the thesis title may be made without special approval. If the substance of the proposal should change markedly in the course of the research, a revised proposal should be submitted.

Substitutions on the Final Oral Examining Committee—Please see the section above on changes in the preliminary committee.

Language Requirement—Please see the departmental section to determine the requirement. If there is a requirement, the Graduate School will accept, for graduation purposes, certification from the major department that students are proficient. However, if students wish proficiency recorded on the official transcript, the appropriate language department's proficiency test must be satisfied. For the forms necessary for obtaining proficiency certification, consult the Graduate School.

WRITTEN AND PRELIMINARY ORAL EXAMINATIONS

Written Examination—A written examination in the major subject shall be given by the graduate faculty in the major field prior to either the preliminary

or the final examination, as the graduate faculty in the field may decide. This examination shall cover all work done in the major and may include any work fundamental thereto. *The passing or failing of this written examination shall be reported to the Graduate School* over the signatures of the adviser and the major department's director of graduate study on a form students obtain from the Graduate School. In case of failure, candidates will normally be allowed only one opportunity to retake the failed examination; this reexamination will be permitted not earlier than the following academic quarter.

Preliminary Oral Examination—At least 1 full academic quarter before the degree is conferred, a preliminary oral examination of the student shall be given by the committee appointed by the dean and the appropriate Unit Committee on the basis of the official doctoral program.

Scheduling the Preliminary Examination—It is the student's responsibility to schedule the examination with the examiners *and with the Graduate School Office* not less than 1 week in advance. *In certain of the health science areas, however, 1 month's notice must be given* (for information consult the Graduate School). At the point that the examination is scheduled, the Graduate School must have on file a report on the preliminary written examinations certifying that students have passed them and are ready for the oral.

The Graduate School issues the report form for the preliminary oral examination to the students' adviser, and informs both students and their adviser if the language requirement has not been met or there are courses on the official program which have not yet been completed. The preliminary oral will be authorized in spite of such deficiencies, but these matters must be taken care of before the final oral is scheduled, either by completion or by petition for removal.

Preliminary oral examinations will not be scheduled from the beginning of the second term of summer session to the opening of the fall quarter, when many faculty are away.

The Preliminary Examining Committee—The Unit Committee may recommend the appointment of different examiners for the preliminary oral and final oral examinations if, in their judgment, this seems appropriate. The Unit Committee may also recommend the inclusion on the preliminary oral examining committee of a member of the graduate faculty outside the major and minor fields of the student. Ordinarily the examining committee shall include a minimum of five members, three from the field of the major and two from the field of the minor or supporting program; the Unit Committee may recommend additional members if it seems, in their judgment, desirable in given cases.

The Preliminary Oral Examination—The preliminary oral examination shall cover both the major and minor fields or supporting program and may include any work fundamental thereto, including possible plans for thesis research as determined by the major field.

The outcome of the examination will be recorded in one of three possible ways: passed, failed, passed with reservations. *The voting proportions necessary for these decisions are as follows:* in the case of a five-member examining committee, a favorable verdict for passing candidates will consist of either a unanimous vote or a vote of 4-1; if the committee consists of six members, a unanimous vote or a vote of 5-1 or 4-2 will pass candidates; and if the committee consists of seven members, a unanimous vote or a vote of 6-1 or 5-2 will pass candidates.

Unless candidates obtain favorable committee votes in these proportions, the outcome is failure, except that, on the basis of the same proportions in the voting, the verdict may be passed with reservations.

Pass with Reservations—In the case of an examination reported as passed with reservations, these reservations may involve: additional preparation and study followed by reexamination; the preparation of a special paper or written examination in a stated field; or other special conditions deemed appropriate by the examining committee.

Reporting the Results—The chairman and the examining committee will report the results of the preliminary oral examination to the Graduate School Office, stating clearly, in the case of a pass with reservations, what additional requirements must be met by candidates to remove the reservations. The removal of the reservations must also be subsequently reported in writing to the Graduate School.

Failure of the Examination—Students failing the preliminary oral examination (a) may, upon recommendation of the examining committee, be allowed to retake the preliminary oral examination or (b) may be excluded from candidacy for the degree. In no case may the reexamination take place until at least 1 full academic quarter has passed. No more than two preliminary examinations are allowed.

DOCTOR'S THESIS

The thesis must show originality and power of independent investigation and embody results of research that form a real contribution to knowledge as well as exhibit mastery of the literature of the subject and familiarity with the sources. The matter must be presented with a fair degree of literary skill.

Language of the Thesis—The normal expectation is that theses will be written in English, the language of instruction. However, in some fields of study, particularly foreign languages, a language other than English may be used provided there is a scholarly reason for its use. If a non-English thesis is proposed, the title must be translated into English. At the time of the thesis proposal, a statement from the adviser or director of graduate study must accompany the thesis plan declaring the necessity for the foreign language and attesting that the recommended thesis readers (including the outside reader) are thoroughly competent 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. Questions which are not resolved by the instructions should be settled at the discretion of students and their advisers and by referral to a standard style manual.

Registration of the Thesis with the Graduate School—A complete clean 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 not later than 9 weeks before the commencement at which candidates expect to receive the degree. This copy will be returned to students immediately, together with the report form on which the readers certify that the thesis is ready for defense and a number of other forms required for graduation (for

which see below). One copy of the thesis should be delivered to the Graduate School for each member of the examining committee from the Mayo Graduate School of Medicine.

A 30-day period must elapse between the registration of the thesis and the date of the final oral examination.

Thesis Readers—The thesis must be read by a committee of not less than three members (see Thesis Proposal, page 15). As a rule, the student's major adviser will be the chairman 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 above).

Inclusion of Published Work in the Thesis—The thesis may include material that students have published while University of Minnesota graduate students, provided it was carried out under the direction of the graduate faculty and approved by the adviser for incorporation into the thesis. The adviser should notify the Graduate School in writing of the intention to publish a part of the material, but no approval is required.

THE FINAL ORAL EXAMINATION

For admission to the final oral, students must have completed all work on the official doctoral program, including the language requirement if any; must have passed both the written and oral preliminary examinations, and final written if required; and must have had the thesis certified by the readers as ready for defense. The examination will ordinarily be conducted by a committee appointed at the time of approval of the thesis proposal and will consist minimally of the adviser, two additional readers, and two other members of the graduate faculty. The examination covers the thesis and the field of the candidate's special study and shall not exceed 3 hours.

Scheduling the Final Oral—*The examination must be scheduled by students 1 week in advance* (see below for graduation deadlines) with the committee and *with the Graduate School.* The interval between registration of the thesis (see above) and the date of the oral must ordinarily be at least 30 days. *In certain of the health sciences fields the faculty require 30 days' notice of the scheduling of the final oral.* Please consult the Graduate School for information.

When the examination is scheduled the file will be checked to determine that students are 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.

The date of the examination will be publicly announced, and any member of the graduate faculty may attend.

The final oral cannot be scheduled for the same quarter in which students took the preliminary oral examination.

Reporting the Results of the Final Oral—Upon completion of the examination, a formal vote of the committee shall be taken. To be recommended for the award of the doctoral degree, *candidates must receive either a unanimous vote or a vote showing not more than one dissenting member* of the total examining committee. The results should be reported to the Graduate School on the report form sent to the adviser when the examination was scheduled.

Clearing for Graduation—In addition to the forms mentioned in the above paragraphs, students must submit the following forms which were issued when the thesis was registered. *If students wish to graduate at a particular commencement, the forms, including the report of the results of the final oral,* must be submitted by the deadline date for that commencement. For the proper dates for a particular commencement, students should consult the form issued for this purpose at the time the thesis was registered, or current issue of the newsletter, or the Graduate School Office.

1. *Microfilming Agreement*—Candidates sign, in duplicate, the *Memorandum of Agreement* with University Microfilms, Ann Arbor, Michigan, under which the ribbon copy of the thesis will be microfilmed before being permanently filed in the University of Minnesota Library. The microfilm fee to be paid at that time is $25. If students wish the thesis copyrighted an additional $15 will be required for the Copyright Office and to pay the cost of depositing two microfilm copies with the Library of Congress.
2. *Thesis Abstract*—Candidates must submit *three copies* of an abstract of 600 words or less, approved by their adviser, embodying the principal findings of their research. Such abstracts will be published in *Dissertation Abstracts,* which announces the availability of the thesis for distribution.
3. *Thesis Binding*—Two copies (including the ribbon copy) of the thesis are to be bound and deposited in the Graduate School Office.
4. *Release Card*—Students should sign the Release Card permitting immediate circulation of their thesis. For valid reasons and with their adviser's endorsement they may request, on the same form, that the thesis be withheld from circulation for 6 months to a year.
5. *Office of Scientific Personnel Survey Form*—Before students' names can be included on the degree list, they must complete a survey form for the Office of Scientific Personnel of the National Research Council.
6. *Application for Degree*—This form must be filed with the Office of Admissions and Records and the diploma fee paid.
7. *Commencement Attendance*—A card must be filed indicating whether or not candidates will attend the commencement ceremonies.

II. FIELDS OF INSTRUCTION

Major Fields for the Master's and Ph.D. Degrees

MASTER'S DEGREE	Ph.D. DEGREE
Anatomy (including hematology, histology, and embryology)	Anatomy (including hematology, histology, and embryology)
Anesthesiology	
Biochemistry	Biochemistry
	Biomedical Engineering
Biometry and Health Information Systems	Biometry and Health Information Systems
Biophysics	Biophysics
Dentistry	
Dermatology	Dermatology
Environmental Health	Environmental Health
Epidemiology	Epidemiology
Experimental Surgery	
Family Planning Administration	
Family Practice and Community Health	
	History of Medicine and Biological Sciences
	Hospital and Health Care Administration
Hospital Pharmacy	
Laboratory Medicine	
Medical Microbiology	
Medical Technology	
Medicinal Chemistry	Medicinal Chemistry
Medicine, Internal	Medicine, Internal
Microbiology	Microbiology
Neurology	Neurology
Neurosurgery	Neurosurgery
Nursing	
Nutrition	Nutrition
Obstetrics and Gynecology	Obstetrics and Gynecology
Ophthalmology	
Oral Biology	Oral Biology
Orthopedic Surgery	Orthopedic Surgery
Otolaryngology (including otology, rhinology, and laryngology)	Otolaryngology (including otology, rhinology, and laryngology)
Pathology	Pathology
Pediatrics	Pediatrics
Pharmaceutics	Pharmaceutics
Pharmacognosy	Pharmacognosy
Pharmacology	Pharmacology
Pharmacy Administration	Pharmacy Administration
Physical Medicine and Rehabilitation	Physical Medicine and Rehabilitation
Physical Therapy	
Physiological Chemistry	Physiological Chemistry
Physiological Hygiene	Physiological Hygiene
Physiology	Physiology
Plastic Surgery	
Proctology (colon and rectal surgery)	
Psychiatry	Psychiatry
Public Health	
Radiology	Radiology
Surgery	Surgery
Urology	Urology

ANATOMY (Anat)

OFFERED AT MINNEAPOLIS

Professor

Arnold Lazarow, M.D., Ph.D., *head*
Morris Smithberg, Ph.D., *director of graduate study*
Anna-Mary Carpenter, Ph.D., M.D.
Padamakar K. Dixit, Ph.D.
Carl B. Heggestad, M.D., Ph.D.
R. Dorothy Sundberg, M.D., Ph.D.

Associate Professor

G. Eric Bauer, Ph.D.
Donald W. Robertson, Ph.D.
Robert L. Sorenson, Ph.D.

Assistant Professor

H. David Coulter, Ph.D.
Orion Hegre, Ph.D.

Lecturer

Lars Folke, L.D.S., Ph.D.
Robert J. Issacson, D.D.S., Ph.D.

Prerequisites—Prerequisite work for all majors or minors in the field of anatomy includes general zoology, 9 credits.

Major and Minor, for the Ph.D.—Each major in anatomy must have had or must take the basic courses (8000 level) in anatomy (embryology, gross anatomy, histology, and human neuroanatomy). For majors in hematology, Anat 5765-5766 is required. 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 5100-5101, 5103-5104, 5106-5107, and 5111.

Language Requirement—For the Master's degree, none required. For the Ph.D. degree, reading knowledge of one foreign language—French, German, Italian, Spanish, or Russian. Other requirements, if any, will be at the discretion of the adviser.

Master's Degree—Limited number offered only under Plan A. (Consult director of graduate study prior to submitting application.)

Doctor's Degree—The department provides excellent facilities for work in anatomy leading to the Ph.D. degree.

5105. DENTAL MICROSCOPIC ANATOMY. (6 cr; prereq ‡) Bauer
Minute structure of cells, tissues, and organs of the human body.

5108. GROSS ANATOMY FOR DENTAL STUDENTS. (6 cr; enrollment limited; prereq ‡) Bauer and staff
Lectures and dissection; thorax, extremities; abdomen and pelvis.

5109. GROSS ANATOMY FOR DENTAL STUDENTS. (6 cr; enrollment limited; prereq ‡) Sorenson and staff
Lectures and dissection; head and neck.

5110. DENTAL NEUROANATOMY. (3 cr; prereq 5105 or ‡) Staff
Gross and microscopic structure of central nervous system; emphasis on structure related to function. Laboratory demonstrations include gross anatomy of the brain stem.

5190. ADVANCED ANATOMY. (Cr ar; prereq regis med, 5104) Staff
Teaching methods, supervision of students' original research, or combination of both.

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

8100-8101.† GROSS HUMAN ANATOMY. (16 cr for both qtrs; enrollment limited; prereq ‡) Heggestad, Lazarow, Smithberg, Robertson
Dissection of human body and discussion in small groups to understand anatomic relationships in preparation for teaching.

8103-8104.† HUMAN HISTOLOGY. (8 cr for both qtrs; enrollment limited; prereq ‡) Carpenter, Lazarow
Microscopic structure, cytochemical and functional aspects of cells, tissues, and organs. Current literature, with emphasis on methodology applicable to morphologic research.

8106-8107. HUMAN EMBRYOLOGY. (6 cr for both qtrs; enrollment limited; prereq ‡) Heggestad
Development of the human body. Microscope slides, series of embryo type specimens, and specimens demonstrating anomalies available for individualized study.

8111. HUMAN NEUROANATOMY. (4 cr; enrollment limited; prereq 5104, ‡) Smithberg, Coulter
Structure and function of nervous system including organs of special sense.

8115. ADVANCED DENTAL MICROSCOPIC ANATOMY. (3 cr; enrollment limited; prereq ‡) Bevis
Microscopic structure of oral-related cells, tissue, and organs. Demonstrations and laboratory exercises with electron microscope and associated technics.

8116. ADVANCED DENTAL HISTOLOGY. (1 cr; enrollment limited; prereq 8115 and ‡) Bevis
Complete review of literature on collagen breakdown and renewal bone healing, and other related topics. Lecture only.

8135. BIOLOGICAL ELECTRON MICROSCOPY: TECHNICS. (5 cr; hrs ar; prereq ‡) Coulter

8137. BIOLOGICAL ELECTRON MICROSCOPY: INTERPRETATION. (2 cr; hrs ar; enrollment limited; prereq ¶5105-5104, ¶8135 and ‡) Coulter

8153, 8154, 8155, 8156. ADVANCED ANATOMY. (Cr and hrs ar; prereq ‡) Staff
Cytochemistry, embryology, gross anatomy, hematology, histology, neurology, or experimental morphology.

8160. INTRODUCTION TO HISTOLOGIC AND MORPHOLOGIC-HISTOCHEMICAL TECHNICS. (2 cr; prereq 5104, ‡; offered 1974-75 and alt yrs) Carpenter
Fixation, embedding, and staining of cytological components and enzymes.

8161-8162-8163. METHODS IN ANATOMICAL RESEARCH. (2 cr per qtr; primarily for 1st-yr grad students; prereq 5100 or ‡; offered 1974-75 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.

8168. SEMINAR: CYTOLOGICAL ASPECTS OF PROTEIN SYNTHESIS AND SECRETION. (3 cr; prereq 5101 or ‡; hrs ar) 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. (Cr and hrs ar; prereq ‡) Bauer, Carpenter, Coulter, Dixit, Heggestad, Hegre, Lazarow, Smithberg, Robertson, 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 ‡) Lazarow and staff
Review of current literature and discussion of research work being carried on in the department.

8211. NEUROCYTOLOGY. (1 cr; prereq ‡) Coulter
Ultrastructure, cytochemistry, and physiology.

ANATOMY

OFFERED AT ROCHESTER**

Professor
Frederick W. L. Kerr, M.D.
Richard K. Winkelmann, M.D., Ph.D.

Instructor
Thomas J. Reagan, M.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 8851f,s. ANATOMY FOR GENERAL SURGEONS. Staff
Fundamental anatomical facts and relations, especially of the neck and trunk, reviewed; details of special surgical interest, not generally acquired in undergraduate anatomy, studied in lectures, discussions, and by dissection.

M 8853f. ANATOMY AND NEUROANATOMY OF THE ORBIT. Staff
Lectures and laboratory work in detailed anatomy of the orbit and optic pathways.

M 8854. NEUROANATOMY. Kerr
Review of fundamental structures and connections of the central and peripheral nervous systems.

M 8855s. ORTHOPEDIC ANATOMY. Staff
Lectures and laboratory work on the limbs and back.

ANESTHESIOLOGY (Anes)

OFFERED AT MINNEAPOLIS

Professor
Frederick H. Van Bergen, M.D., M.S., *head*
Joseph J. Buckley, M.D., M.S.
John R. Gordon, M.D., M.S.

Assistant Professor
James F. Cumming, M.D., Ph.D.
John S. Rydberg, M.D., M.S.

Graduate work in anesthesiology in the Medical School offers superior training to a number of fellows 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 are fully met.

Master's Degree—The M.S. degree is offered in anesthesiology under Plan A, with major in anesthesiology and minor in one of the laboratory sciences.

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 POSTANESTHETIC 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 and hrs ar)
Anesthesia problems in experimental laboratory or in hospital.

**Enrollment in these courses is limited.

It is recommended that fellows in anesthesiology also register for courses in other departments selected from the following:

MdBc 5053. PROBLEMS IN BIOCHEMISTRY

MdBc 5100-5101. BIOCHEMISTRY

MdBc 8150. SEMINAR: BIOCHEMISTRY

Med 8202. DISEASES OF THE CARDIOVASCULAR APPARATUS

Phcl 5109. PHARMACOLOGICAL PROBLEMS

Phcl 8203. RESEARCH IN PHARMACOLOGY

PubH 5450. BIOMETRY I

PubH 5451. BIOMETRY LABORATORY I

ANESTHESIOLOGY

OFFERED AT ROCHESTER

Professor

Richard A. Theye, M.D., *chairman*

Associate Professor

Brian Dawson, M.B.
Kai Rehder, M.D.

Assistant Professor

Edward P. Didier, M.D.
Allan B. Gould, Jr., M.D., M.S.
Gerald A. Gronert, M.D.
Virginia B. Hartridge, M.D.
Robert R. Jones, M.D.
Hannaliese Kralemann, M.D.
Paul F. Leonard, M.D.
John D. Michenfelder, M.D.
Charles J. Restall, M.D.
Norbert Schnelle, M.D., M.S.
Alan D. Sessler, M.D.

Instructor

Francoise M. T. Carney, M.B.B.Ch.
Robert A. Devloo, M.D.
Donald R. Krabill, M.D.
Robert D. Mathison, M.D.
Joseph M. Messick, Jr., M.D.
Sheila M. Muldoon, M.B.B.Ch., M.S.
Rungson Sittipong, M.D.
Sait Tarhan, M.D.
Roger D. White, M.D.

Graduate training in anesthesiology at the Mayo Graduate School of Medicine combines opportunity for an advanced degree with *practical* training in anesthesiology. Fellows in anesthesiology may work toward an M.S. degree with a minor in physiology and biophysics, biochemistry, or pharmacology. The residency program fulfills requirements for the American Board of Anesthesiology.

Seminars, conferences, and informal discussions, plus broad experience in surgical anesthesia and respiratory intensive care, make it possible for the fellow to obtain theoretical as well as wide clinical training in all aspects of anesthesiology.

A resident who is particularly interested in study of certain specialized fields of anesthesiology may arrange to concentrate on those areas. A limited number of opportunities are available to anesthesiologists for advanced training in cardiovascular anesthesiology, neuroanesthesiology, and respiratory intensive care.

M 8851f,w,s,su. INTRODUCTION TO GENERAL ANESTHESIA. Theye and staff
Observation and instruction in all types of clinical general anesthesia and simple regional anesthesia, followed by administration under supervision, and finally by responsible administration.

M 8852f,w,s,su. ADVANCED TECHNIQUES IN ANESTHESIA. Theye and staff
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. Carney and staff

M 8854f,w,s,su. NEUROSURGICAL ANESTHESIA. (Prereq 2 yrs basic clinical anesthesia training) Michenfelder and staff
Twelve months of training with increasing graded responsibility. Intensive clinical experience. Several months available for clinical work in related fields: neuroanatomy, neuropathology, neurophysiology, electroencephalography, electromyography, and intensive care.

M 8855f,w,s,su. CARDIOVASCULAR ANESTHESIA. (Prereq 2 yrs basic clinical anesthesia training) Tarhan and staff
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. (Prereq 2 yrs approved residency in allied clinical field) Sessler and staff
Twelve or 24 months of observation, training, and research in all phases of management of patients with respiratory problems, including mechanical ventilation, respiratory physiology, and general intensive care. Experience in the function of hospital respiratory therapy service; particpiation in directing a respiratory intensive care unit.

ANATOMY FOR GENERAL SURGEONS. (See Anatomy)

RESEARCH WORK IN BIOCHEMISTRY. (See Biochemistry)

RESEARCH WORK ON SELECTED PROBLEMS IN PHYSIOLOGY. (See Physiology)

RESEARCH WORK IN PHARMACOLOGY. (See Pharmacology)

GENERAL MEDICAL AND SURGICAL DIAGNOSIS. (See Medicine)

IMMUNOHEMATOLOGY AND BLOOD BANKING. (See Laboratory Medicine) Taswell
A twelve month elective course in techniques and hematology as applied to blood bank procedures, especially as related to the operating room.

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, however, 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—For major work candidates must offer 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 at least 1 year of college physics, mathematics through integral calculus, and 1 year of biology (general, botany, zoology, microbiology, and genetics). Students may be permitted to make up deficiences in these requirements in the course of completing their graduate program. 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.

Major—Both biochemistry departments require completion of the core curriculum (5741-5742-5743 or their equivalent) accompanied by the laboratory program in the respective departments. Additional courses in physical and organic chemistry, advanced biochemistry, and biology are required as described below for each department. Students will also be expected to participate in the graduate seminar programs of their respective departments.

The Ph.D. degree also requires a minor field of study which may be chosen from biophysics, botany, chemistry, genetics, microbiology, 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; the actual number is determined by choice of minor or supporting program.

Minor—The requirements for a minor in biochemistry include the core curriculum plus advanced course in biochemistry to give a total of approximately 20 credits. Two quarters of physical chemistry (Chem 5505 or Chem 5520-5521 or their equivalent) are a prerequisite for a minor. A student who has not had physical chemistry may take it concurrently with the other courses, but it will not be counted as part of the 20 credits.

Supporting Program—The supporting program is designed to allow maximum flexibility in satisfying individual interests and needs. Those desirous of a supporting program involving biochemistry should work out a suitable program through the graduate directors of the respecitve biochemistry departments.

Master's Degree—offered only under Plan A.

Language Requirement—A reading knowledge of one foreign language is required for the Ph.D. degree. Generally the language is selected from among French, German, or Russian. In special cases, some other language in which a significant literature in biochemistry is published may be substituted by petition.

Preliminary Examinations—Written preliminary examinations for the Ph.D. degree are given once or twice a year.

Biochemistry (BioC)

(College of Biological Sciences)

Professor

LaVell M. Henderson, Ph.D., *head, director of graduate study*
Stanley Dagley, D.Sc.
John E. Gander, Ph.D.
Robert L. Glass, Ph.D.
Robert Jenness, Ph.D.
Samuel Kirkwood, Ph.D.
Irvin E. Liener, Ph.D.
Walter O. Lundberg, Ph.D.[1]
Palmer Rogers, Ph.D.[2]
Hermann Schlenk, Ph.D.[1]
Max O. Schultze, Ph.D.
Ulysses S. Seal, Ph.D.[3]
Huber R. Warner, Ph.D.

Associate Professor

John S. Anderson, Ph.D.
Victor A. Bloomfield, Ph.D.
Peter J. Chapman, Ph.D.
Rex E. Lovrien, Ph.D.

Assistant Professor

Ronald E. Barnett, Ph.D.[4]
James A. Fuchs, Ph.D.
Kenneth G. Mann, Ph.D.[5]
Gary Nelsestuen, Ph.D.
Clare Woodward, Ph.D.

[1] Member of the Hormel Institute staff
[2] Primary appointment in Department of Microbiology
[3] Member of Veterans Administration Hospital staff
[4] Primary appointment in Department of Chemistry
[5] Primary appointment at Mayo Clinic, Rochester, Minnesota

Proficiency Examinations—All students are required to take proficiency examinations in analytical, organic, and physical chemistry. These examinations are offered at the time of admission and are used as a guide in the selection of graduate courses.

Requirements for the Ph.D. Degree—Students working for the Ph.D. degree must satisfactorily complete 1 year of graduate biochemistry (5741 to 5747 or its equivalent), 1 quarter of graduate organic chemistry (e.g., Chem 8301), 1 quarter of a graduate physical chemistry course, two further courses in any field of chemistry, and at least 6 credits in selected advanced courses in biochemistry (in either of the biochemistry departments of the University).

All students must have on their record 6 hours of credit in upper division and/or graduate level biology courses.

With the approval of the adviser, courses in various fields of mathematics, physics, chemistry, biology, agricultural, and medical sciences may be included as part of the major course of study.

Beginning graduate students are required to enroll in the orientation seminar (BioC 8091) during their first quarter in residence. This seminar is designed to acquaint the student with the research program of each staff member so that an adviser can be selected early in the winter quarter for the first year. In subsequent quarters all graduate students are expected to participate continuously in the graduate student seminar (BioC 8094), which deals with research and literature reports, and in the departmental seminar (BioC 8194), which features staff, visitors, and students who are nearing completion of theses.

Registration for BioC 8091, 1 credit, BioC 8094, 4 credits, and BioC 8194, 2 credits, is required for the Ph.D. degree and should be taken during the first 2 years to complete the program of study before the preliminary examinations.

5001w-5002s. INTRODUCTION TO BIOCHEMISTRY. (4 cr per qtr; students with grade of A or B in Biol 3021 may be exempted from 5001; prereq Chem 3302 or ‡; 3 lect, 3 lab hrs per wk)
Introduction to fundamentals of composition, chemical properties, reactions, and interactions of biological materials; illustrated in part through laboratory exercises performed by student.

5522f. BIOPHYSICAL CHEMISTRY: STRUCTURE. (4 cr, §Chem 5522; prereq 2 qtrs physical chemistry...5741 or 5002 desirable)
Methods of structure determination of biological macromolecules. Molecular weight determination, hydrodynamics, scattering and diffraction, optical and magnetic resonance spectroscopy. Application to proteins, nucleic acids, and synthetic analogs.

5523w. BIOPHYSICAL CHEMISTRY: ENERGETICS. (3 cr, §Chem 5523; prereq 2 qtrs physical chemistry...5741 or 5002 desirable)
Energetics of biochemical reactions. Titration, binding, and folding stabilization in macromolecules. Conformational changes and cooperative behavior. Coupling and energy gradients in transport.

5524s. BIOPHYSICAL CHEMISTRY: DYNAMICS. (4 cr, §Chem 5524; prereq 2 qtrs physical chemistry...or 5002 desirable)
Application of thermodynamics, statistical mechanics, and chemical kinetics to biological systems. Theoretical and experimental enzyme kinetics, solvent effect, structure-function relation.

5741f-5742w-5743s. GENERAL BIOCHEMISTRY. (3 cr per qtr, §MdBc 5741-5742-5743; prereq Chem 3303 or equiv, Chem 5505 or Chem 5520 or equiv or ¶Chem 5505 or ¶Chem 5520 or ‡) Staff
Introductory course for biochemistry majors and minors, offered jointly by the two departments of Biochemistry—College of Biological Sciences and Medical School. Integrated lectures and readings on structure and function of biomolecules and on intermediary metabolism and regulation.

5745f-5746w. GENERAL BIOCHEMISTRY LABORATORY. (3 cr per qtr; prereq 5741-5742, cr in analytical chemistry, ‡)
Laboratory course to accompany BioC 5741-5742.

5747. ADVANCED BIOCHEMICAL TECHNIQUES. (3 cr; prereq 5746, ¶5743, ‡) Warner
Laboratory in modern methods for study of enzymatic and metabolic reactions.

5970. DIRECTED STUDIES. (1-3 cr; prereq ‡, △) Staff
Offered to enable students to make up certain deficiences in background course work.

8091. GRADUATE STUDENT ORIENTATION. (1 cr) Staff
To acquaint first-year graduate students with current areas of research in department.

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, §MdBc 8220; prereq 5743; offered 1974-75 and alt yrs)
Lectures and assigned readings on composition, structure, chemical and physical properties, and biochemical functions of carbohydrates.

8221s. ENZYMES. (2 cr; prereq 5743; offered 1974-75 and alt yrs)
Lectures and assigned readings on nature and function of enzymes.

8225f. TRACER TECHNIQUES. (3 cr; prereq 5743, 5746, ‡)
Laboratory work on application of radioisotopes to study of metabolic processes.

8231. LIPIDS. (2 cr; prereq 5743; offered 1973-74 and alt yrs)
Lectures and assigned readings on composition, structure, chemical and physical properties, and biochemical functions of fats and fat-like compounds.

8241. METABOLISM OF NUCLEIC ACIDS. (3 cr, §MdBc 8211; prereq ¶5743; offered 1974-75 and alt yrs)
Lectures on synthesis and metablism of nucleotides and nucleic acids, and their role in protein synthesis and cellular metabolism.

8250. SPECIAL TOPICS IN BIOCHEMISTRY. (1-3 cr; prereq 5743) Staff
Lectures and discussions varying from quarter to quarter according to staff availability and needs of department.

8261w. PROTEINS. (3 cr, §MdBc 8217; prereq 5743; offered 1973-74 and alt yrs)
Lectures and assigned readings on composition, structure, chemical and physical properties, and biochemical functions of proteins and amino acids.

8271f. VITAMINS. (3 cr; prereq 5743 or ‡)
Lectures and assigned readings on biochemistry of vitamins and their physiological action.

8990. GRADUATE RESEARCH. (2-5 cr; prereq ‡) Staff
Research problems in various fields in biochemistry represented by staff interests.

Biochemistry (MdBc)

(Medical School)

Professor

Wallace D. Armstrong, Ph.D., M.D., *head*
Charles W. Carr, Ph.D., *director of graduate study*
Robert W. Bernlohr, Ph.D.[2]
Ivan D. Frantz, M.D.
Helmut R. Gutmann, M.D.[3]
Ralph T. Holman, Ph.D.[4]
James F. Koerner, Ph.D.
Andreas Rosenberg, Ph.D.[1]
Leon Singer, Ph.D.
Frank Ungar, Ph.D.
John F. Van Pilsum, Ph.D.
Donald B. Wetlaufer, Ph.D.
Finn Wold, Ph.D.
Leslie Zieve, M.D., Ph.D.[5]

[1] Primary appointment in Department of Laboratory Medicine and Department of Pathology
[2] Primary appointment in Department of Microbiology
[3] Located at Minneapolis Veterans Hospital
[4] Member of the Hormel Institute staff
[5] Primary appointment in Department of Medicine, located at Minneapolis Veterans Hospital

Associate Professor
James W. Bodley, Ph.D.
Mary E. Dempsey, Ph.D.
Ronald D. Edstrom, Ph.D.
Ernest D. Gray, Ph.D.
James B. Howard
Robert J. Roon

Lecturer
Quentin T. Smith, Ph.D.[6]

The core curriculum includes, together with the specified entrance requirements, MdBc 5741, 5742, 5743, and 5750, or by permission MdBc 5100-5101. Majors are also required to present additional laboratory experiences and 1 year of MdBc 5053 as part of their core program and to pass a written preliminary examination at the end of the first year. This examination covers the entrance requirements and the core material. The advanced courses making up the total major and minor (supporting) programs must include a minimum of three biochemistry courses, three chemistry courses, and two biology courses.

5100. BIOCHEMISTRY. (6 cr; primarily for med students; prereq physics and organic chemistry) Armstrong, Wetlaufer, Wold, Koerner, Bodley

5101. BIOCHEMISTRY. (4 cr; primarily for med students; prereq 5100) Koerner, Bodley, Ungar, Carr

5741f-5742w-5743s. GENERAL BIOCHEMISTRY. (3 cr per qtr, §BioC 5741-5742-5743; prereq Chem 3303, Chem 5501, or Chem 5520 or ¶Chem 5501 or ¶Chem 5520 or ‡)
See BioC 5741.

5750s. BIOCHEMISTRY LABORATORY. (4 cr; biochemistry majors given priority; prereq 5742) Staff
General experimental techniques, instrumental analyses, special individual projects with oral reports and examinations.

5053f,w,s,su. PROBLEMS IN BIOCHEMISTRY. (Cr and hrs ar [may be repeated for cr] prereq 5743 or 5101) Staff

8150f,w,s. SEMINAR: BIOCHEMISTRY. (1 cr) Staff

8206f. ADVANCED ENDOCRINOLOGY AND STEROID CHEMISTRY. (3 cr; minimum of 8 students; prereq 5743 or 5101; offered 1973-74 and alt yrs) Ungar
Type and nature of enzyme systems which synthesize steroid hormones, control mechanisms for hormone production via the CNS-hypothalamus-pituitary-target pathway; hormone-regulated molecular events in metabolism and growth; comparison of mode of action of peptide and steroid hormones.

8211s. NUCLEIC ACID STRUCTURE AND FUNCTION. (3 cr, §BioC 8241; prereq 5743 or 5101; offered 1973-74 and alt yrs) Bodley, Koerner, Gray
Lectures and readings on current topics in DNA and RNA structure, synthesis, and function.

8215su. TOPICS IN LIPID METABOLISM. (3 cr; minimum of 8 students; prereq 5743 or 5101 or ‡; offered 1973 and alt years) Frantz
General survey, with emphasis on pathways of formation and breakdown of various classes of lipids. Applications to human disease are discussed.

8217w. PROTEIN CHEMISTRY. (3 cr, §BioC 8261; minimum of 8 students; prereq 5743 or 5101 or ‡, Chem 5504 or ‡; offered 1974-75 and alt yrs) Wetlaufer
Structure of proteins as revealed by chemical and physical investigations; selected examples of correlation between protein structure and function.

8218s. CURRENT TOPICS IN BASIC AND APPLIED ENZYMOLOGY. (3 cr, §BioC 8221; prereq 5743 or 5101 or ‡; offered 1974-75 and alt yrs) Wold, Howard
Lectures and readings on regulatory mechanism and cellular location of synthesis, degradation and action of enzymes, and on recent developments in "enzyme engineering."

[6] Primary appointment in School of Dentistry

8219f. BIOCHEMISTRY OF SPECIALIZED TISSUES. (3 cr; minimum of 8 students; prereq 5743 or 5101; offered 1974-75 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 5743 or 5101; offered 1973-74 and alt yrs) Edstrom
Lectures and readings in carbohydrate metabolism in mammalian systems. Special emphasis on biosynthesis and degradation of polysaccharides, glycoproteins, and glycolipids. Discussion of metabolic diseases of carbohydrate metabolism involving storage of polymeric products.

8236f,w,s. RADIOISOTOPE SEMINAR. (1 cr, §Rad 8236) Loken, Armstrong, and staff

BIOCHEMISTRY

OFFERED AT ROCHESTER

Professor

Vernon R. Mattox, Ph.D., *head*
Gerard A. Fleisher, Ph.D.

Associate Professor

James D. Jones, Ph.D.
John T. McCall, Ph.D.
Russell A. Van Dyke, Ph.D.

Assistant Professor

Carl Bernofsky, Ph.D.
Ralph D. Ellefson, Ph.D.
Nai-Siang Jiang, Ph.D.
Carlo M. Veneziale, M.D., Ph.D.

Thesis work for graduate degrees in biochemistry can be undertaken in Rochester.

M 5851f,w,s,su. BIOCHEMISTRY. Staff
Research work in problems related to intermediary metabolism of amino acids and carbohydrates, chemistry of the blood, steroid hormones, enzymes, proteins, lipids, and minerals; training in use of methods of organic and inorganic analysis.

M 5852f. BIOCHEMISTRY LECTURE. (3 cr) Staff
Major constituents of cells; enzymes; biological oxidations; metabolism of carbohydrates and amino acids.

M 5853w. BIOCHEMISTRY LECTURE. (3 cr) Staff
Metabolism of lipids and nucleic acids; biosynthesis of proteins; biochemistry of blood and specialized tissues; endocrinology; nutrition.

M 5854. BIOCHEMISTRY SEMINAR. (1 cr) Staff

M 5855w. ENDOCRINOLOGY AND METABOLISM. (3 cr) Staff

M 5856. REGULATION OF CARBOHYDRATES AND FAT METABOLISM. (2 cr; prereq 5852 or 5853 or equiv) Veneziale

BIOPHYSICS—ELECTRONIC COMPUTERS. (See Physiology and Biophysics)
NUTRITION. (See Nutrition)

BIOMEDICAL ENGINEERING

OFFERED AT MINNEAPOLIS

Professor

Kenneth H. Keller (chemical engineering and materials science), *chairman, director of graduate study*
Perry L. Blackshear, Jr. (mechanical engineering)
William E. Bradley (neurology)
A. G. Fredrickson (chemical engineering and materials science)
Otto Schmitt (biophysics)
L. E. Scriven (chemical engineering and materials science)
H. M. Tsuchiya (chemical engineering and materials science)
Richard L. Varco (surgery)
Theodore A. Wilson (aerospace engineering and mechanics)

Associate Professor

J. B. Bassingthwaighte (physiology, Mayo Graduate School of Medicine)
Victor A. Bloomfield (biochemistry)
Henry Buchwald (surgery)
T. F. Fletcher (veterinary anatomy)
Darrell Frohrib (mechanical engineering)
Rex Lovrien (biochemistry)
Frederick M. Waltz (electrical engineering)

Assistant Professor

Gerald Timm (neurology)

This group, together with other members of the graduate faculty approved by the Biomedical Engineering Unit Committee, may serve as graduate advisers for this area.

Degrees—The program in biomedical engineering leads to the Ph.D. degree only. However, work in biomedical engineering can be taken as a minor in either a Master's or Ph.D. program.

Prerequisites—Candidates for the Ph.D. degree should have completed undergraduate work in an engineering, physical, or biological science field. They must have sufficient breadth of training to allow them to undertake graduate level courses in the several fields that comprise the Ph.D. program. Where specific 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.

Approval of Program—The candidate's tentative program will be planned with the aid of an adviser selected from the above list or otherwise approved by the Biomedical Engineering Unit Committee. The unit committee will consider the suitability of the program and thesis topic and will take appropriate action. The unit committee will also be responsible for the appointment of an examination committee.

Major Program—The purpose of the major program is to provide a student with comprehensive training in both the engineering and biomedical aspects of at least one area of biomedical engineering. To accomplish this, the student will normally take a broad but cohesive program consisting of at least 9 credits in each of three departments. Two of these departments should be in a college other than that of the minor. In addition, the student will normally register in one of the on-going biomedical engineering seminar series for at least 6 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, students will be required to complete at least 18 credits in the department designated as their minor with at least 9 of these credits in 8000 series courses. The minor department will normally be the one most closely related to the student's undergraduate training or the one in which the adviser holds an appointment.

Language Requirement—The student will be required to demonstrate proficiency in French, German, or Russian, or to complete an alternative program subject to approval of the unit committee.

BIOMETRY AND HEALTH INFORMATION SYSTEMS

OFFERED AT MINNEAPOLIS

Professor

Leonard T. Kurland, M.D., *chairman*
Eugene A. Johnson, Ph.D., *director of graduate study*
Eugene Ackerman, Ph.D.
Jacob E. Bearman, Ph.D.
Arnold G. Fredrickson, Ph.D.
Wolfgang K. Giloi, Ph.D.
Richard B. McHugh, Ph.D.
Donald G. McQuarrie, M.D., Ph.D.
Andreas Rosenberg, Ph.D.
Vernon E. Weckwerth, Ph.D.

Associate Professor

Marcus O. Kjelsberg, Ph.D., *head*
Glenn E. Bartsch, Sc.D.
James R. Boen, Ph.D.
Kathleen M. Keenan, Ph.D.
Ruth B. Loewenson, Ph.D.
Richard Moore, Ph.D., D.Sc.

Assistant Professor

Prithwis DasGupta, Ph.D.
Läel C. Gatewood, Ph.D.
Anne I. Goldman, Ph.D.

Prerequisites—Mathematics through calculus with an undergraduate major in one of the social, biological, mathematical, or physical sciences.

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. Students may elect courses from one or more of such fields as computer, information and control sciences, hospital and health care administration, epidemiology, mathematics, or statistics to complement biometry course offerings. 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.

Language Requirement—None.

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 or those with a D.D.S., D.V.M., or M.D. degree, or a Ph.D. degree in a bioscience.

Doctor's Degree—Work for the Ph.D. degree is offered in accordance with the general requirements of the Graduate School.

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.*

(Courses listed with no description are described in the Public Health section of this bulletin.)

5403. COMPUTER APPLICATIONS IN HOSPITAL AND HEALTH CARE ADMINISTRATION. (3 cr; prereq hospital and health care administration student, others ‡) Johnson
Introduction to the digital computer.

5404. INTRODUCTION TO BIOSTATISTICS AND STATISTICAL DECISIONS. (4 cr; prereq ‡) Weckwerth

5405. BIOMETRIC METHODS IN ENVIRONMENTAL HEALTH I. (3 cr; prereq environmental health student, others ‡) Staff

5406. BIOMETRIC METHODS IN ENVIRONMENTAL HEALTH II. (3 cr; prereq 5405) Bearman

5407. VITAL STATISTICS I. (3 cr) Bearman, Kjelsberg

5408. VITAL STATISTICS II. (3 cr; prereq 5407 with grade A or B)

5409-5410. BIOMETRY IN CLINICAL STUDIES I, II. (3 cr per qtr; prereq DDS, MD, or DVM or ‡) Bearman

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. Prophylactic and therapeutic trials. Validity and reliability of measurements and calibration studies for clinical setting. Sensitivity and specificity of tests and their application in clinical research and diagnosis. Special problems of cooperative studies.

5411. INTRODUCTION TO MATHEMATICAL DEMOGRAPHY. (3 cr, §Soc 5561; prereq ‡) DasGupta

Basic demographic measures and concepts of fertility, mortality, and migration. Introduction to stable population methods and to demographic estimates from incomplete data.

5412. SURVEY SAMPLING IN SOCIAL AND HEALTH SCIENCE RESEARCH. (3 cr, §Soc 5970; prereq ‡) DasGupta

Introduction to methodology of probability sampling in social and health science surveys. Analysis and application of simple random, stratified, systematic, multistage, and cluster sampling.

5430-5431-5432. BIOMEDICAL COMPUTING I, II, III. (3 cr per qtr; prereq Math 1111) Gatewood

Introduction to digital computers and FORTRAN programming, with applications in biology and medicine; information capture, storage, retrieval, and display; statistical analysis packages; simulation; analog signal processing; nonlinear models; hospital information systems.

5433-5434-5435. COMPUTER METHODOLOGY IN THE DELIVERY OF HEALTH CARE I, II, III. (3 cr per qtr; prereq 5432 or ‡) Ackerman, Gatewood

Records and files, file maintenance, report generation, hospital administrative information and accounting systems. Medical records, abstracting the medical record, medical information systems based on the medical record for hospitals, surveys, physicians, outpatient clinics, and research. Monitoring of clinical laboratory equipment, physiological monitoring of acutely ill patients, total hospital information systems.

5436. ANALYTICAL TECHNIQUES FOR HEALTH DELIVERY SYSTEMS. (3 cr; prereq calculus, 5450, 5451 or ‡) Johnson

Operations research and systems analysis techniques applied to medical service systems. Special emphasis on applications of linear programming, theory of queues, and inventory models in health care systems.

5440-5441. QUANTITATIVE MAMMALIAN BIOLOGY I, II. (3 cr per qtr, §Phsl 3052-3053; prereq 1-yr sequences in mathematics, physics, chemistry, 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.

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

Basic concepts in probability; binomial, Poisson, and normal probability models; estimation and testing statistical hypothesis of parameters of probability models.

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 medical sciences.

5452. BIOMETRY II. (3 cr; prereq 5450, ¶5453) Bartsch, 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, ¶5455) Bartsch, Jeffries
Analysis of nested, randomized block, factorial, and split plot designs.

5455. BIOMETRY LABORATORY III. (2 cr; prereq ¶5454) Jeffries
Basic designs will be illustrated with numerous examples from biological sciences.

5456. BIOMETRY CONSULTING SEMINAR. (3 cr; prereq biometry major) Boen, Goldman
Consultant and consultee interaction; communication and formulation of the biometric problem. Role and responsibility of biometrician. Robustness and relevance of frequently used analytical techniques. Biometry student internship experiences.

5457. STOCHASTIC MODELS IN BIOLOGY AND MEDICINE. (3 cr; prereq 5451, theoretical statistics, biometry major...others ‡) Boen
Applications of stochastic processes to health care systems and to such varied biologic phenomena as epidemics, urinary tract infection, and carcinogenesis.

5459. INTRODUCTION TO MATHEMATICAL THEORY IN BIOMETRY. (3 cr; prereq 2 qtrs calculus, 5455 or ‡) Jeffries
Generating functions, curve fitting, iterative estimation, tests, propagation of error, and related topics with illustrations from epidemics and population growth, biossay, clinical trials, demography, and other biohealth science areas.

5460. DEMOGRAPHY AND HEALTH. (3 cr; prereq biometry major, others ‡) Kjelsberg, McHugh

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. LIFE TABLE TECHNIQUES. (3 cr; prereq biometry major, others ‡) Kjelsberg
Mathematical development of life table techniques and application to follow-up studies in medicine and public health.

5463. MATHEMATICAL DEMOGRAPHY. (3 cr; prereq calculus, 5450, 5451 or ‡) DasGupta
Deterministic and stochastic one- and two-sex models of population growth. Integral equation and matrix approaches to stable population theory. Stochastic models of reproduction.

5465-5466-5467. ADVANCED BIOMETRIC METHODS I, II, III. (3 cr per qtr; prereq 5455 or ‡) Staff
Propagation of random error; elements of bioassay; compartment analysis; nonlinear estimation; categorical and nonparametric data analysis; diagnostic models; classification and clustering techniques; clinical trial methodology; Bayesian inference.

5470. TOPICS IN BIOMETRY. (Cr ar) Staff
Selected readings with discussion based on these readings.

8400. SEMINAR: BIOMETRY. (Cr ar) Staff

8405-8406-8407. ADVANCED TOPICS IN HEALTH COMPUTER SCIENCE I, II, III. (3 cr per qtr; prereq 5432, knowledge of COBOL, BASIC) Ackerman and staff
Peak detection and resolution, nonlinear optimization graphic displays. Small computer operation and programming including hardware concepts, data transmission, and programming. Computer systems design for health sciences, using University of Minnesota Health Science Center as case history, including medical goals and proposed alternate computer systems to achieve these.

8415-8416-8417. MATHEMATICAL BIOLOGY I, II, III. (3 cr per qtr; prereq mathematics through differential equations and 1-yr sequence in physics, chemistry, and a basic biological science, with lab work in 1 or more, or ‡) Ackerman, staff
Physico-, chemico-, mathematical biology, statics and dynamics of tissues and fluids; biological reaction and compartment analysis, ion diffusions, and colloids; analog and digital computer used in biomedicine.

8430-8431-8432. ADVANCED BIOMETRIC ANALYSIS I, II, III. (3 cr per qtr; prereq 5467, advanced calculus, theoretical statistics) McHugh and staff
Biomedical measurement models: quantal, quantitative, direct, indirect. Tolerance distributions and dose-response functions. Parallel line and slope ratio assays. Radioactivity measurement and radiotracer experiments. Multifactorial and multistage designs in medical surveys and clinical trials. Sampling and randomization theory. Validity, reliability, sensitivity, and efficiency in design and analysis of clinical and laboratory research.

8449. TOPICS IN BIOMETRY. (Cr ar; prereq 5450, ‡) Staff
Special topics for advanced students.

8450. RESEARCH IN BIOMETRY. (Cr ar) Staff
For qualified students to pursue research work.

BIOMETRY AND HEALTH INFORMATION SYSTEMS

OFFERED AT ROCHESTER

Professor
Lila R. Elveback, Ph.D.
William F. Taylor, Ph.D.

Instructor
Peter C. O'Brien, M.S., Ph.D.

Graduate work in medical statistics at the Mayo Graduate School of Medicine is offered in the Departments of Medical Statistics and Epidemiology at the Mayo Clinic.

M 5823. INTRODUCTORY STATISTICS I
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, x^2, and introduction to correlation and regression in the two-variable case.

M 5824. INTRODUCTORY STATISTICS II
Further considerations of experimental design. Additional applications of x^2. Analysis of variance. Multivariate regression. Survivorship in chronic disease.

M 5825. INTRODUCTORY STATISTICS III
Poisson distribution, normal values in clinical medicine, nonparametric methods, clinical trials, introduction to sequential methods, bioassay, and analysis of covariance.

M 8826. PROBABILITY THEORY
Introduction to concepts and facts in both discrete and continuous cases. Probability distributions, random variables, expectation, the law of large numbers.

BIOPHYSICS (BPhy)

OFFERED AT MINNEAPOLIS

COMMITTEE

Otto H. Schmitt, Ph.D., *chairman*
Eugene Ackerman, Ph.D.
James Bassingthwaighte, M.D., Ph.D.
Merle K. Loken, Ph.D., M.D.
A. Glenn Richards, Ph.D.

STAFF

Professor
Otto H. Schmitt, Ph.D., *director of graduate study*
Eugene Ackerman, Ph.D.
Merle K. Loken, M.D., Ph.D.
Rufus W. Lumry, Ph.D.
A. Glenn Richards, Ph.D.
Murray D. Rosenberg, M.D., Ph.D.
Carlo A. Terzuolo, M.D.

Associate Professor
Dean E. Abrahamson, Ph.D.
Richard Moore, Ph.D.
Alan L. Orvis, Ph.D. (Mayo Graduate School, Rochester)
Andreas Rosenberg, Ph.D.

Assistant Professor
George W. Beeler, Jr., Ph.D. (Mayo Graduate School, Rochester)
Vaughn C. Moore, Ph.D.

Additional course work in biophysical science areas, needed to strengthen individual student programs in biophysics, and coadvisory staff may be drawn from related departments such as cell biology, physiology, physical chemistry, zoology, electrical engineering, mechanical engineering, chemical engineering, health computer sciences, or control sciences. There is opportunity for thesis research in a wide variety of topical areas such as biocomputer development, simulation, modeling, programming and displays, biological systems theory and pattern recognition, neural and sensory physiology, electrocardiography, automated diagnosis and health care systems, chronobiology, membrane structure and function, computer-aided therapeutic and tracer radiology, hemodynamics, and physical chemistry of proteins. There are additional opportunities for research in diversified biophysical areas at the Mayo Graduate School of Medicine in Rochester, Minnesota. Courses leading to the Master's degree in biophysics are available in the program at Rochester as well as at Minneapolis, but biophysics candidates for the Ph.D. degree usually complete a major portion of their course work on the Minneapolis Campus.

Prerequisites—Students are ordinarily admitted to the graduate biophysics degree programs only if they have had good basic training in a biological, medical, or appropriate physical science area at a level equivalent to an undergraduate major and have had at least introductory courses in biology, physics, chemistry, mathematics, and computing. Some remedial study to fill undergraduate level gaps is often combined with regular graduate work.

Language Requirements—For the Master's degree a reading knowledge of one foreign language, preferably German or Russian, is required, although another language or additional course work can be substituted upon approval of an adviser's recommendation. For the Ph.D., a reading knowledge of Russian or German is required. A second foreign language, German, Russian, or French, is required unless another language or collateral field of study is accepted as a substitute.

Master's Degree—Offered under Plan A and Plan B.

Doctor's Degree—Work leading to the Ph.D. is offered.

Since biophysical science is a broad field including diverse biological and physical disciplines, credit in biophysics is regularly granted for courses drawn from many different departments. A wide diversity of appropriate courses is available in addition to those listed. The student's program should include courses from the following list supplemented by other courses listed under their respective departmental headings. In consultation with the adviser, the student should plan a balanced program tailored to his individual needs. Because biophysics is highly interdisciplinary, a minor field is not identified as such on the student's program.

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 representative 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, 5171, 5172. RADIATION BIOPHYSICS. (3 cr per qtr; prereq ‡) Loken
Theoretical and experimental aspects of radiological physics, medical physics, and radiobiology. Physical properties of various ionizing radiations; interaction of ionizing radiations with biological systems; use of radioactive isotopes as tracer elements.

8204x.* RESEARCH IN BIOPHYSICS AND RADIATION BIOLOGY. (Cr ar) Loken

8218x. SEMINAR: RADIOBIOLOGY. (1 cr; prereq ‡)
Biological effects of ionizing radiations. Discussion of research problems and current literature.

8221, 8222, 8223x.* RESEARCH IN BIOPHYSICS. (Cr ar) Staff

8296, 8297, 8298.* SEMINAR: BIOPHYSICS. (Cr ar) Schmitt

Rad 8236. SEMINAR: RADIOISOTOPE. (1 cr; prereq ‡) Loken

BIOPHYSICS

OFFERED AT ROCHESTER

Associate Professor
Alan L. Orvis, Ph.D.

Assistant Professor
George W. Beeler, Ph.D.

Within the Mayo Graduate School of Medicine, biophysics is a program staffed by members of the administrative Department of Physiology and Biophysics. The physiology program is therefore closely affiliated and should be examined for related studies. Programs in biophysics at Rochester may be used to fulfill M.S. degree requirements, but at this time Ph.D. degree programs require substantial course work to be obtained at the Minneapolis Campus (see listing above). The requirements are the same as those listed for the Minneapolis Campus.

M 8857, 8858, 8859. RADIOLOGY AND RADIOLOGIC PHYSICS. (3 cr per qtr [1st qtr not available for biophysics cr]; prereq ‡) Orvis and staff
Physical basis of radiology, radiologic equipment, dosimetry, radiation safety.

M 8860. MEMBRANE BIOPHYSICS. (3 cr) Bassingthwaighte
Bilayers, membrane models and carriers, energetics and factors determining permeation, irreversible thermodynamics, carrier kinetics, ionic conductances.

M 8861f, 8862w, 8863s. MATHEMATICS FOR BIOLOGY AND MEDICINE. (3 cr per qtr; prereq calculus and ‡; offered alt yrs) Beeler, Bassingthwaighte, and staff
Applications of advanced calculus, differential equations, and partial differential equations to biophysics, physiology, and biochemistry.

M 8864. MATHEMATICAL BASIS OF TRACER METHODOLOGY. (3 cr; prereq calculus and ordinary differential equations) Orvis and staff
Principles of tracer method, compartmental systems, stochastic process, circulatory studies, fitting models to data.

M 8865. RHEOLOGY OF BIOLOGICAL SYSTEMS. (3 cr; prereq M 8861 or ‡) Bassingthwaighte and staff
Elementary classical hydrodynamics, wave transmission, non-Newtonian fluid flow, circulatory mass transport, and diffusion.

M 8871. BIOLOGICAL SYSTEMS ANALYSIS AND MODELING I. (3 cr; prereq ‡) Beeler, Bassingthwaighte, and staff
Network analysis introduction to methods used to describe systems and signals, including differential equations, time domain response (impulse), Fourier and Laplace transforms.

M 8872. BIOLOGICAL SYSTEMS ANALYSIS AND MODELING II. (3 cr; prereq M 8871 or ‡) Beeler, Bassingthwaighte, and staff
Methods of system description and analysis; equations of state, matrix methods of system reduction, frequency analysis including analysis of general system stability, filter theory, auto- and cross-correlation analysis; introduction to nonlinear systems analysis.

M 8873. BIOLOGICAL SYSTEMS ANALYSIS AND MODELING III. (3 cr; prereq M 8872 or ‡) Beeler, Bassingthwaighte, and staff
Basic numerical analysis. Numerical fitting, integration, and approximations. Digital filtering. Introduction to digital transform methods.

M 8880f,w,s. SEMINARS IN NERVE AND MUSCLE. (1½ cr per qtr, §Phsl M 8880, §Phcl M 8880; prereq courses in sciences and mathematics, ‡) Beeler and Bassingthwaighte
Assigned readings, conferences, and demonstrations on excitation and conduction, synaptic transmission, and muscle contraction.

M 8881. PRINCIPLES OF SOLID MECHANICS. (3 cr, §OrSu M 8857; prereq physics and calculus)
Application of vector mechanics to musculoskeletal systems; experimental methodology in obtaining anatomic and kinematic data.

M 8882. MECHANICS OF DEFORMABLE MATERIALS. (3 cr, §OrSu M 8858; prereq M 8881)
Stress and strain concepts and method of calculation for biological and implantable materials. Methodology and instrumentation for measuring stress, strain, fracture, and wear.

M 8895. BIOPHYSICAL INSTRUMENTATION. (2 cr) Beeler
Introduction to methods of measuring physical parameters of biological systems. Emphasis upon range and scope offered by modern electronic devices.

M 8896. RADIOISOTOPE RESEARCH TECHNIQUES. (3 cr; hrs ar) Orvis and staff
Basic principles of effective, safe handling of radioisotopes in research and clinical situations. Theory of atomic decay, qualitative and quanitative measurements of radioactivity, basic radiation safety considerations. Techniques of liquid scintillation counting and sample preparation, gamma counting, autoradiography, radioimmune assay, radiolabeling.

DENTISTRY

OFFERED AT MINNEAPOLIS

Professor

Erwin M. Schaffer, D.D.S., M.S.D., *dean*
Mellor R. Holland, D.D.S., M.S.D., *associate dean*
James R. Jensen, D.D.S., M.S., *assistant dean*
Wallace D. Armstrong, M.D., Ph.D.
Robert J. Gorlin, D.D.S., M.S.
Norman O. Holte, D.D.S., M.S.D.
Robert J. Isaacson, D.D.S., M.S.D., Ph.D.
Lawrence Meskin, D.D.S., Ph.D.
Andrew T. Morstad, D.D.S., M.S.
Edmund S. Olsen, D.D.S., M.S.D.
Burton L. Shapiro, D.D.S., Ph.D.
Leon Singer, Ph.D.
Quenton T. Smith, 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.
Douglas H. Yock, D.D.S., M.S.

Clinical Professor

Theodore T. Edblom, D.D.S., M.S.D.

Associate Professor

Dwight L. Anderson, Ph.D.
Carl L. Bandt, D.D.S., M.S.D.
James O. Beck, Jr., D.D.S., M.S.D.
Richard R Bevis, D.D.S., Ph.D.
James H. Butler, D.D.S., M.S.
Lars E. A. Folke, D.D.S., M.S.D., Ph.D.
Richard J. Goodkind, D.M.D., M.S.
Robert S. Redman, D.D.S., Ph.D.
Thomas M. Speidel, D.D.S., M.S.D.
Michael J. Till, D.D.S., M.S.D.
Paul O. Walker, D.D.S., M.S.D.

Clinical Associate Professor

Norman A. Korn, D.D.S., M.S.D.
Ronald E. LaBelle, D.D.S., M.S.D.
Frank W. Worms, D.D.S., M.S.D.

Assistant Professor

James L. Baker, D.D.S., M.S.D.
Ramesh K. Kuba, D.D.S., M.S.D.
Michael J. Loupe, Ph.D.

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 leads to the degree of master of science in dentistry, a combination of the normal work for the M.S. degree plus achievement of proficiency in some phase of clinical dentistry. Hence, a minimum of 2 academic years in residence is required, though most students probably will need 3 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, 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.

Graduate courses in dentistry are offered in the fields of oral pathology, oral surgery, orthodontics, restorative dentistry, oral medicine, oral radiology, and periodontics.

Prerequisites—A degree from an accredited school of dentistry with an average of B or better or a 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 foreign language requirement. Oral pathology, however, requires German.

Master of Science Degree—Offered only under Plan A.

Dentistry (Dent)

8126. TEACHING AND EVALUATION IN DENTISTRY I. (3 cr; prereq #) Loupe, Proshek
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) Loupe, Proshek
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 test, interpretation of test results, principles of marking.

8128. DENTAL EDUCATION AND ADMINISTRATION. (3 cr; prereq #) Till, Proshek, Loupe
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, Proshek, Till, and staff
Independent study arranged for individual student to pursue advanced work in student learning, instructional development, curriculum planning, student testing and evalu-

ation, 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.

8295. HOSPITAL PROTOCOL. (Cr and hrs ar; prereq ‡) Olsen and staff
Organizational framework of the hospital with emphasis on interdepartmental relationships and policies. Procedures involved in patient admission, treatment, and discharge, including the preparation and function of hospital reports and records.

8400. OCCLUSION. (1 cr) Butler

8401. OCCLUSION. (1 cr) Butler

8402. LITERATURE REVIEW IN OCCLUSION. (1 cr) Butler, others
Related to topics covered in 8400 and 8401.

Endodontics (Endo)

5300f, 5301w, 5302s, 5303su, 5304f, 5305w. ADVANCED CLINICAL ENDODONTICS. (1st 4 qtrs for 1st-yr students, last 2 qtrs for 2nd-yr students) Jensen and staff
Diagnosis and treatment of clinical cases. Students assigned complex cases and explore new and unique techniques.

8001f, 8002w, 8003s, 8004su, 8005f, 8006w. RESEARCH IN ENDODONTICS. (Cr ar; 1st 4 qtrs for 1st-yr grad students, last 2 qtrs for 2nd-yr grad students) Jensen and staff
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. SEMINAR: ENDODONTICS. (2 cr; 1st 4 qtrs for 1st-yr grad students, last 2 qtrs for 2nd-yr grad students) Jensen and staff
Review of current literature, research, and clinical cases. Sessions assigned to student.

8320f, 8321w, 8322s, 8323su. ADVANCED ENDODONTIC LECTURES. (1 cr per qtr) Jensen and staff
Pulpal and periapical pathology, diagnosis, and treatment planning in endodontics.

8330f,w,s. ENDODONTIC DIAGNOSIS AND TREATMENT PLANNING. (Cr ar) Jensen and staff
Etiology, treatment, and prognosis of clinical endodontic patients.

8331f,w,s. TOPICS IN ENDODONTICS. (Cr ar) Jensen and staff
Special topics for advanced students.

8335. ENDODONTIC-PERIODONTIC SEMINAR. (1 cr; hrs ar) Jensen, Folke
Discussions of endodontic-periodontic problems for all graduate dental students.

Oral Biology (OBio)

Note: Descriptions for the following courses may be found in the separate Oral Biology section of this bulletin.

8001. RESEARCH IN ORAL BIOLOGY. (Cr ar)

8002. TUTORIAL IN ORAL BIOLOGY. (Cr ar; 2 hrs per wk = 1 cr [may be repeated for cr])

8010. ORAL BIOLOGY I. (3 cr) Staff

8011. ORAL BIOLOGY II. (3 cr; prereq 8010 or ‡) Staff

8015. SALIVARY GLANDS AND THEIR SECRETIONS. (2 cr; prereq Anat 5103 and Anat 5104 or Anat 5105 or ‡; offered odd yrs only) Redman

8016. DEVELOPMENTAL BIOLOGY OF SALIVARY GLANDS. (2 cr; prereq 8015 or ‡; offered even yrs only) Redman

8018. BIOLOGY OF MINERALIZED AND OTHER CONNECTIVE TISSUES. (3 cr; offered 1975) Smith

8021, 8022, 8023, 8024. TOPICS IN ORAL BIOLOGY. (1-3 cr [may be repeated for cr]; prereq ‡)

8030. SEMINAR. (1 cr [may be repeated for cr])

Oral Pathology (OPat)

8001. RESEARCH IN ORAL PATHOLOGY. (Cr and hrs ar) Gorlin, Vickers

8002-8003. ORAL PATHOLOGY. (4 cr) Gorlin, Vickers
Lectures and laboratory. 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 patholgy. Graduate students participate as laboratory assistants.

8004. HISTOPATHOLOGY. (1 cr) Vickers

8005. ADVANCED ORAL PATHOLOGY. (3 cr; limited to 8 students) Gorlin Vickers, Witkop
Salivary gland development and pathology; dental organ pathology; bone physiology and pathology; radiation pathology; dermatology; lymph node and/or reticuloendothelial pathology; soft issue pathology pertaining to head and neck.

8006. CURRENT LITERATURE REVIEW. (1 cr) Gorlin, Vickers

8007. SPECIAL ORAL PATHOLOGY. (2 cr) Gorlin, Vickers, Witkop
Designed to acquaint potential clinical specialists in dentistry with oral diseases and oral manifestations of systemic disease.

8008. CLINICAL ORAL PATHOLOGY CONFERENCE. (1 cr) Gorlin

8009. EMBRYOLOGY OF THE HEAD AND NECK. (1 cr)

8010. ORAL PATHOLOGY TOPICS. (1 cr) Vickers, Gorlin
Seminars. Research problems, topics, and areas of special interest. Graduate students determine both the subjects for discussion and the level or manner of the discussions.

8011. SURGICAL ORAL PATHOLOGY. (Cr ar) Vickers
Residents or graduate students participate in diagnosis of oral diseases. Histopathologic, frozen section, clinical, cytologic, cytogenetic, microbiologic, hematologic, clinical, radiologic, and other diagnostic means are utilized.

8012. MEDICAL CYTOGENETICS. (2 cr) Cervenka
Methodology of tissue culture, identification of chromosomes, phylogenetic evolution of chromosomes, sex chromatin analysis, chromosomes in amniotic fluid, chromosomes in human cancer, action of mutagenic agents and genetic counseling in autosomal and sex chromsome sydromes. Mechanism of chromosomal aberrations. Procedures of genetic counseling.

8013. PHYSICAL DIAGNOSIS AND THE MEDICAL EVALUATION OF THE PATIENT. (1 cr)

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 and staff

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 pre- 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 OPat 8300.

8302s. SEMINAR: HUMAN DEVELOPMENTAL GENETICS. (Cr ar) Witkop
Selected topics by series of guest speakers on gene action from concpetion through the neonatal period.

Oral Radiology (ORad)

8100. ORAL RADIOLOGY SEMINAR. (1 cr; prereq ‡) Beck, Kuba

8200. ADVANCED ORAL ROENTGENOGRAPHIC TECHNIQUE. (2 cr; prereq ‡) Beck, Kuba
Theory and principles involved in intra-oral and dentally significant extra-oral 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 INTERPRETATIONS. (2 cr; prereq ‡) Beck, Kuba
Theory, principles, and practice of roentgenographic interpreation of intra-oral and extra-oral 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.

8900. ORAL RADIOLOGY RESEARCH. (Cr and hrs ar; prereq ‡) Beck, Kuba

Oral Surgery (OSur)

8250. ADVANCED ORAL SURGERY. (Cr and hrs ar) Waite and staff
Assigned clinics in University, Veterans Administration, Hennepin County General, St. Paul-Ramsey, and Fairview Hospitals, in addition to assigned periods in the Oral Surgery Clinic of the School of Dentistry.

8251. ORAL SURGERY SEMINAR. (1 cr; hrs ar) Shearer

8252. RESEARCH IN ORAL SURGERY. (Cr and hrs ar) Richter

8253. PROBLEMS IN ORAL SURGERY. (Cr and hrs ar) Richter

8254. TOPICS: ORAL SURGERY. (1 cr; hrs ar) Waite, Isaacson

Orthodontics (Otho)

5001, 5002, 5003, 5004. CLINICAL ORTHODONTICS. (Cr and hrs ar) Staff
Students assigned patients for complete management of orthodontic and orthodontically related occlusal problems under direct staff supervision.

8001. RESEARCH IN ORTHODONTICS. (Cr and hrs ar) Bevis, Isaacson, and staff

8200, 8201, 8202, 8203. GROWTH AND DEVELOPMENT. (Cr and hrs ar) Bevis, Edbolm, Isaacson, 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 and hrs ar) Bevis, Edblom, Isaacson, Speidel, Worms
Etiology, treatment, and prognosis of clinical orthodontic patients.

8208, 8209, 8210, 8211. ORTHODONTIC SEMINAR. (Cr and hrs ar) Bevis, Edblom, Isaacson, Speidel, Worms
Review of current literature and discussion of current research and its implications.

8216f, 8217w, 8218s, 8219su. TOPICS IN ORTHODONTICS. (Cr and hrs ar) Isaacson and staff

Pediatric Dentistry (Pedo)

0291. CLINICAL PEDIATRIC DENTISTRY. (Prereq ‡) Till and staff
Principles of advanced preventive, interceptive, and restorative procedures utilized in pediatric dentistry. Instruction and clinical experience in the Pediatric Dental Clinic in the School of Dentistry, University Hospitals, and Cambridge State Hospital.

8001. RESEARCH IN PEDIATRIC DENTISTRY. (Cr and hrs ar; prereq ‡) Staff

8290. PEDIATRIC DENTISTRY. (Cr and hrs ar; prereq ‡)
Diagnosis and treatment of patients in the hospital dental clinic under general anesthesia at University and associated community hospitals.

8292. PEDIATRIC DENTISTRY SEMINAR. (Cr and hrs ar; prereq ‡) Till and staff
Review of current literature and discussion of current research and its implications.

8294. DENTAL PEDIATRICS. (Cr and hrs ar; prereq ‡) Till and staff
Oral health problems of the physically and mentally handicapped child. Normal and abnormal growth of the child.

Periodontology (Pero)

8000f,w,s,su. ADVANCED CLINICAL PERIODONTOLOGY. (Cr ar) Folke, Pihlstrom, and staff
Practical work in clinic in examination, diagnosis, treatment planning, and various phases of treatment of patients with periodontal disease. Practice of curettage, gingival resection, splinting of teeth, and balancing the occlusion.

8100f,w,s,su. RESEARCH IN PERIODONTOLOGY. (Cr. and hrs ar) Folke and staff
Opportunity to take part in many phases of work under way in laboratory for periodontal research.

8200f,w,s,su. LECTURES IN PERIODONTOLOGY. (Cr ar) Folke, Pihlstrom, and staff
Consideration of tissues involved in periodontal disease. Etiology and treatment of periodontal disease.

8250w,s. SUPPORTING STRUCTURES OF THE TEETH. (Cr ar) Folke and staff
Histology, pathology, and physiology of gingival tissues, cementum, periodontal membrane, and alveolar bone discussed in lectures. Associated problems studied on set of microscopic slides.

8300f,w,s,su. SEMINAR: PERIODONTOLOGY. (Cr ar) Folke, Pihlstrom, Sudo, Dennis, Gawronski
Etiology of periodontal disease, histopathology of periodontal symptoms, treatment of periodontal disease, research in periodontics.

8305. PERIODONTIC-PROSTHODONTIC SEMINAR. (1 cr; hrs ar) Folke, Goodkind
Discussions of periodontic-prosthodontic problems for all graduate dental students.

8400. HISTOCHEMISTRY OF THE NORMAL AND PATHOLOGICAL PERIODONTUM. (2 cr) Folke and staff

8450. BACTERIOLOGY AND IMMUNOLOGY OF PERIODONTAL DISEASES. (1 cr) Folke, Sudo, Gaumers

Prosthodontics (Pros)

8001. RESEARCH IN PROSTHODONTICS. (Cr and hrs 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 problem.

8003. ADVANCED TECHNICAL RESTORATIVE DENTISTRY. (Cr and hrs 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 and hrs ar [may be repeated for cr]) Goodkind, Morstad, Yock
Practical clinical experience in examination, diagnosis, treatment planning, and in various phases of treatment of patients with restorative dental problems. New and/or unfamiliar concepts and techniques stressed.

8006. ADVANCED CLINICAL PROSTHODONTICS II. (Cr and hrs ar [may be repeated for cr]; prereq ‡) Goodkind, Morstad, Yock
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 and hrs ar [may be repeated for cr]) Goodkind, Morstad, Olsen
Review of current and selected historical literature with discussion of current research and its implications for restorative dental therapy.

8012. TOPICS IN PROSTHODONTICS. (Cr and hrs ar [may be repeated for cr]; prereq ‡) Goodkind, Morstad, Olsen
Special topics for advanced students.

8015. SEMINAR: PROSTHODONTICS I. (Cr and hrs ar [may be repeated for cr]; prereq ‡) Goodkind, Morstad, Olsen
Current concepts and practices related to treatment of 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 and hrs ar [may be repeated for cr]; prereq ‡) Goodkind, Morstad, Olsen
Tissues involved and treatment of the completely edentulous patient.

8017. SEMINAR: ADVANCED PROSTHODONTICS. (Cr and hrs ar [may be repeated for cr]; prereq ‡) Goodkind, Morstad, Olsen
Treatment planning for the partially edentulous patient.

8018. SEMINAR: ADVANCED PROSTHODONTICS. (Cr and hrs ar [may be repeated for cr]; prereq ‡) Goodkind, Morstad, Olsen
Treatment planning for completely edentulous patient.

8020. APPLIED GNATHOLOGY. (Cr and hrs ar [may be repeated for cr]; prereq ‡) Branstad
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 and hrs ar; prereq ‡) Goodkind, Olsen, Petersen, Yock, and staff
Principles which govern manipulation of materials used in restorative dental practice. Physical properties and dimensional changes are stressed.

8030. INTRODUCTION TO COMPREHENSIVE MAXILLOFACIAL CARE. (Cr and hrs ar; prereq ‡) Kersten
Milestones in development of maxillofacial prosthetics and interdisciplinary relationships in treatment of maxillofacial patient.

8032. PRINCIPLES OF MAXILLOFACIAL CARE. (Cr and hrs ar [may be repeated for cr]; prereq ‡) Kersten
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 and hrs ar [may be repeated for cr]; prereq 8030, 8032, ‡) Warpeha
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

Joseph A. Gibilisco, D.D.S., M.S.D., *chairman*
Stanley A. Lovestedt, D.D.S., M.S.

Associate Professor

William R. Laney, D.M.D., M.S.

Assistant Professor

Juan B. Gonzalez, D.D.S., M.S.
Bruce A. Lund, D.D.S., M.S.D.
Charles M. Reeve, D.D.S, M.S.
A. Howard Sather, D.D.S., M.S.D.
Dan E. Tolman, D.D.S., M.S.D.
Eastwood G. Turlington, D.D.S., M.S.D.

Instructor

Ronald P. Desjardins, D.M.D., M.S.
Eugene E. Keller, D.D.S., M.S.D.
Donald H. Nelson, D.D.S., M.S.D.
Phillip J. Sheridan, D.D.S.

The Department of Dentistry is composed of five closely integrated dental disciplines: oral diagnosis, oral surgery, orthodontics, prosthodontics, and periodontics. The close association of all other medical sections with the graduate dental training programs provides a unique opportunity for advanced education. The master of science in dentistry degree may be earned by any qualified resident in oral surgery, orthodontics, periodontics, and prosthodontics. The degree programs will be under the direction of the Mayo Graduate School of Medicine and the Department of Dentistry staff. A minimum of 3 calendar years is required in each program, except prosthodontics. To supplement training in the clinical care of patients, conferences, lectures, and seminars are scheduled regularly within the section. Joint seminars and conferences are arranged with other sections of the Mayo Graduate School of Medicine. All residents are expected to attend the clinical conferences and staff meetings. While the major requirement for the degree is taken in a clinical field, the minor requirement must be completed in one of the basic sciences. In each specialty area, the educational experience is directed toward fulfilling the requirements for American Board Certification.

Oral Surgery (OrSu)

The residency program in oral surgery is 3 years. Facilities are available to accept three applicants in oral surgery annually.

The clinical aspects of the program constitute the major emphasis of training in oral surgery, while pathology usually constitutes the minor for the Master's degree. Additional basic science work may be arranged at the direction of the staff. Clinical quarters are devoted to oral surgery, plastic surgery, hematology, oral diagnosis, oral roentgenology, and anesthesiology. Residency in oral surgery involves quarterly assignments to the Rochester State Hospital in Rochester, Minnesota, and off-campus assignment to the Detroit General Hospital in Detroit, Michigan.

Facilities for teaching oral surgery are located at the Mayo Clinic, Rochester State Hospital, Rochester Methodist, and St. Marys Hospitals.

A resident and staff consultant work together providing the diagnostic and surgical care for all patients.

Training in anesthesiology is under the supervision of the Department of Anesthesiology. During the 6-month period of assignment in this section, residents are taught techniques such as endotracheal intubation, venipunctures, and procedures in the postanesthesia room. Considerable experience in both endotracheal and intravenous anesthesia is obtained. Instruction is given in the selection and administration of preanesthetic and postanesthetic drugs and also in the management of pain.

M 8850. ORAL SURGERY. (Cr ar; 3 qtrs)
Includes first assistant on all oral surgery problems, in oral surgery Outpatient Clinic and hospitals.

M 8851. DENTAL ROENTGENOLOGY. (Cr ar)
Includes X-ray diagnosis and techniques.

M 8852. ORAL DIAGNOSIS. (Cr ar)
Clinical diagnosis relating to dental and oral surgery problems.

M 8853. SEMINAR: CURRENT LITERATURE. (1 cr)
Weekly literature review from current journals relating to oral surgery.

M 8854. SEMINAR: ORAL SURGERY. (1 cr)
Weekly review of case histories, academic presentation, discussion of oral surgery subjects, and related areas.

M 8856. ADVANCED ORAL SURGERY. (Cr ar; 2 qtrs)
Includes assignment to Detroit General Hospital and Rochester State Hospital.

M 8857. RESEARCH ON SELECTED PROBLEMS. (Cr ar) Gibilisco and staff

M 8859. PRINCIPLES OF ORAL SURGERY. (1 cr)
Lecture presentation of the principles involved in basic oral surgery.

Anes M 8853. ANESTHESIOLOGY. Theye and staff
See Anesthesiology.

Biom M 5823. INTRODUCTORY STATISTICS I. (3 cr) Kurland and staff
See Biometry.

Med M 8853. MEDICAL DIAGNOSIS IN HOSPITAL SERVICE
See Medicine.

Nutr M 8890. CURRENT CONCEPTS IN APPLIED NUTRITION. (2 cr) Nelson

Otol M 8851. CLINICAL OTOLARYNGOLOGY AND RHINOLOGY
See Otolaryngology.

Path M 8867. GENERAL PATHOLOGY—SURGICAL PATHOLOGY. (Cr ar) Dahlin and staff
See Pathology.

Path M 8873. ORAL PATHOLOGY. (Cr ar; 1 hr biweekly) Dahlin, Dockerty
See Pathology

PlSu M 8853. OPERATIVE PLASTIC SURGERY. Staff

Orthodontics (Otho)

The residency program in orthodontics is 3 years. One appointment is made each year to a qualifed 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, plastic surgery, speech pathology, and pediatrics.

Coordinated treatment care with other dental areas (oral diagnosis, oral surgery, prosthodontics, periodontics) as well as medical specialties is stressed.

The clinical facilities at the Mayo Clinic may be supplemented by selected patient care at St. Marys, Methodist, and Rochester State Hospitals.

The usual arrangement is a minor in anatomy or biostatistics. However, with special interest, the minor may be arranged in other basic sciences.

M 8800. ADVANCED ORTHODONTIC TECHNIQUES. (Cr ar) 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. (Cr ar) 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. (Cr ar) Staff
Mechanical principles coordinated with case analyses to provide the treatment plan. Force analysis and biomechanics of tooth movement.

M 8804. CLINICAL ORTHODONTICS. (Cr ar) Staff
Individual treatment care and clinical observation. Treatment care coordinated with other services in selected instances in the hospital.

M 8805. ADVANCED CLINICAL ORTHODONTICS. (Cr ar) Staff
Final treatment care of individual patients.

M 8806. ORTHODONTIC SEMINAR: TECHNIQUE. (Cr ar) Staff
Technical orthodontic procedures.

M 8807. ORTHODONTIC SEMINAR: LITERATURE REVIEW. (Cr ar) Staff
Classical orthodontic literature as well as current literature review.

M 8808. ORTHODONTIC SEMINAR: CASE PRESENTATION. (Cr ar)
Cases with complete records reviewed and new patient treatment plans discussed.

M 8809. ORAL REHABILITATION CLINIC. (Cr ar) Lund, Sather
Case presentation, illustration, diagnostic and treatment procedures that encompass the various dental specialties.

M 8851. DENTAL ROENTGENOLOGY. (Cr ar) Gibilisco, Lovestedt, Tolman
Includes X-ray diagnosis and techniques.

M 8852. ORAL DIAGNOSIS. (Cr ar) Gibilisco, Lovestedt, Tolman
Clinical course in diagnosis related to dental problems.

M 8857. RESEARCH IN SELECTED PROBLEMS. (Cr ar) Gibilisco and staff
Arrangements for research in selected areas related to minor.

M 8861. SPEECH PATHOLOGY. (Cr ar) Darley, Aronson, and staff

Path M 8873. ORAL PATHOLOGY. (Cr ar) Dahlin, Dockerty, Reeve
See Pathology.

Prosthodontics (Pros)

Residency appointments to qualified graduates of approved dental schools are made once a year, beginning in the summer or fall quarter. Services include clinical and laboratory prosthodontics, maxillofacial prosthetics, oral diagnosis and roentgenograhic interpretation, surgical pathology, anatomy and physiology, speech pathology, hospital procedure and clinical practice, and related dental specialties. Under staff supervision, residents care for patients at Methodist, St. Marys, and Rochester State Hospitals. Optional assignments on the Minneapolis Campus are made to provide additional didactic courses, clinical experience, and practice teaching. Seminars and conferences in the specialty field are held regularly. In addition, residents attend seminars relating to their quarterly assignments.

M 8840. CLINICAL PROSTHODONTICS: COMPLETE DENTURES. (2 qtrs) Laney, Gonzalez, 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. (3 qtrs) Laney, Gonzalez, Desjardins
Literature review and discussion of past and current concepts and practices of complete denture prosthesis.

M 8842. CLINICAL PROSTHODONTICS: PARTIAL DENTURES. (1 qtr) Laney, Gonzalez, 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. (2 qtrs) Laney, Gonzalez, Desjardins
Literature review and discussion of past and current concepts and practices of partial denture prosthesis.

M 8844. MAXILLOFACIAL PROSTHETICS (INTRA-ORAL)—ADVANCED PROSTHODONTICS. (3 qtrs) Laney, Gonzalez, Desjardins
Clinical and laboratory procedures involved in management of patients with acquired, congenital, and developmental intra-oral defects.

M 8845. SEMINAR: MAXILLOFACIAL PROSTHETICS (EXTRA-ORAL)—ADVANCED PROSTHODONTICS. (1 qtr) Gonzalez, Desjardins
Lectures and discussion related to clinical and laboratory procedures involved in fabrication of extra-oral prostheses.

M 8846. MAXILLOFACIAL PROSTHETICS (EXTRA-ORAL)—ADVANCED PROSTHODONTICS. (2 qtrs) Gonzalez, Desjardins
Clinical and laboratory procedures involved in management of patients with acquired and congenital head and neck defects.

M 8847. SEMINAR: MAXILLOFACIAL PROSTHETICS (INTRA-ORAL)—ADVANCED PROSTHODONTICS. (2 qtrs) Laney, Gonzalez, Desjardins
Literature review and discussion of past and present concepts and practices related to maxillofacial prosthetics.

M 8849. SEMINAR: CURRENT LITERATURE. Staff
Review and discussion of practical clinical or laboratory applications.

M 8851. DENTAL ROENTGENOLOGY. (Cr ar) Gibilisco, Lovestedt, Tolman
X-ray diagnosis and technique.

M 8852. ORAL DIAGNOSIS. (Cr ar) Gibilisco, Lovestedt, Tolman
Clinical diagnosis related to dental problems.

M 8857. RESEARCH IN SELECTED PROBLEMS. (Cr ar) Gibilisco and staff

M 8861. SPEECH PATHOLOGY. (Cr ar) Darley, Aronson

Biom M 5823. INTRODUCTORY STATISTICS I. (3 cr) Kurland and staff
See Biometry.

Nutr M 8890. CURRENT CONCEPTS IN APPLIED NUTRITION. (2 cr) Nelson
See Nutrition.

Path M 8867. GENERAL PATHOLOGY—SURGICAL PATHOLOGY. (Cr ar) Dahlin and staff
See Pathology.

Path M 8873. ORAL PATHOLOGY. (Cr ar; 1 hr biweekly) Dahlin, Dockerty, Reeve
See Pathology.

PlSu M 8853. PLASTIC SURGERY. (Cr ar) Simons and staff
See Plastic Surgery.

Rad M 8853. THERAPEUTIC RADIOLOGY. (Cr ar) Scanlon and staff
See Radiology.

Periodontics (Pero)

The Mayo Graduate School of Medicine residency in periodontics is a 3-year 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. Marys and Rochester Methodist Hospitals. Seminars and lectures are held in various nonclinical fields, *viz.*, pathology and microbiology.

M 8851. DENTAL ROENTGENOLOGY. (Cr ar) Gibilisco, Lovestedt, Tolman
X-ray diagnosis and technique.

M 8852. ORAL DIAGNOSIS. (Cr ar) Gibilisco, Lovestedt, Tolman
Clinical diagnosis related to dental problems.

M 8857. RESEARCH ON SELECTED PROBLEMS. (Cr ar) Gibilisco and staff

M 8880. CLINICAL PERIODONTICS. (Cr ar) Reeve
Etiology, diagnosis, and treatment of periodontal disease.

M 8881. ADVANCED CLINICAL PERIODONTICS. (Cr ar) Reeve
Case presentation and treatment of difficult periodontal problems.

M 8883. PERIODONTIC SEMINAR. (1 cr) Reeve
Literature review and discussion.

M 8884. PATHOLOGY OF PERIODONTAL DISEASE. (Cr ar) Reeve
Histopathology of periodontal disease. Oral mucous membrane; calcified tissues.

Biom M 5823. INTRODUCTORY STATISTICS I. (3 cr) Kurland and staff
See Biometry.

Derm M 8851. DIAGNOSIS WITH SPECIAL REFERENCE TO DERMATOLOGY. (Cr ar) Kierland and staff
See Dermatology.

Med M 8853. MEDICAL DIAGNOSIS AND HOSPITAL SERVICE. (Cr ar)
See Medicine.

MicB M 8851. DIAGNOSTIC MICROBIOLOGY. (Cr ar) Ritts and staff
See Microbiology.

Nutr M 8890. CURRENT CONCEPTS IN APPLIED NUTRITION. (2 cr) Nelson
See Nutrition.

Path M 8857. GENERAL PATHOLOGY—SURGICAL PATHOLOGY. (Cr ar) Dahlin and staff
See Pathology.

Path M 8873. ORAL PATHOLOGY. (Cr ar) Dahlin, Dockerty, Reeve
See Pathology.

DERMATOLOGY (Derm)

OFFERED AT MINNEAPOLIS

Professor

Robert W. Goltz, *chairman*
Francis W. Lynch, M.D.
Harold G. Ravits, M.D.

Clinical Professor

Kenneth P. Manick, M.D.
Milton Orkin, M.D.
Alvin S. Zelickson, M.D.

Clinical Associate Professor

Bruce J. Bart, M.D.
H. Irving Katz, M.D.
Willard C. Peterson, Jr., M.D.
John G. Rukavina, M.D.

Assistant Professor

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 General Hospital, and Veterans Hospital in Minneapolis, and St. Paul-Ramsey Hospital in St. Paul, combined with attendance at the clinics at the four hospitals. A limited number of graduate students are appointed as residents in dermatology, rotating in these hospitals. The student devotes full time to graduate study and may not carry on outside practice. All graduate students majoring in dermatology and working toward an advanced degree are required to carry on independent research under the direction of the dermatology staff and the head of the basic science department or division in which they wish to do special research.

A 3-year program emphasizes clinical training in dermatology with the minor subject usually in a basic science field. A 5-year program aims, additionally, at greater competence in the major field and at increased knowledge, experience, and research in biochemistry as the minor field. The Ph.D. degree can be earned in this 5-year program.

Language Requirement—For the Ph.D. degree, this requirement may be fulfilled either by (a) two foreign languages or (b) one foreign 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 General Hospital, and St. Paul-Ramsey Hospital.

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 fluorescence microscopy.

8228f,w,s,su. RESEARCH IN DERMATOLOGY. (Cr ar) Zelickson 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

Richard K. Winkelmann, M.D., Ph.D.,
chairman
Robert R. Kierland, M.D., M.S.
Sigfrid A. Muller, M.D., M.S.
Harold O. Perry, M.D., M.S.
Arnold L. Schroeter, M.D.

The Department of Dermatology at the Mayo Graduate School of Medicine affords opportunity for study of a large volume of patients with a great variety of cutaneous diseases and syphilis. A close working relationship between this department and the sections of internal medicine is maintained.

A dermato-histopathologic laboratory with a comprehensive collection of slides is augmented by more than 2,500 biopsy specimens each year. General laboratories of the clinic and foundation are available for routine and investigative work, and a 6-month period of service in the hospital (45 beds) is part of the 3-year training offered.

Residents majoring in dermatology and syphilology also receive instruction in allergy, hematology, mycology, microbiology, pathology, roentgen and radium therapy, and serology. Biochemistry, biophysics, and physiology may be elected. For details see these departments.

Language Requirement—For the Ph.D. degree, either (a) two foreign languages or (b) one foreign language and the option of a collateral field of knowledge.

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. DIAGNOSIS WITH SPECIAL REFERENCE TO DERMATOLOGY AND SYPHILOLOGY. Kierland, Perry, Winkelmann, Muller
Daily seminar. Clinical conference.

M 8842f,w,s,su. HOSPITAL RESIDENCE. Kierland, Perry, Winkelmann, Muller
Care of hospitalized patients.

Basic Dermatologic Science

Basic dermatologic science may serve as a minor for the degree in dermatology and includes assignments to the basic science courses listed below.

M 8851. MICROSCOPIC ANATOMY AND HISTOCHEMISTRY OF THE SKIN. (1 cr) Winkelmann
Lecture and seminar.

M 8852. HISTOCHEMISTRY. (2 cr) Winkelmann, Muller
Principles and practice.

M 8853f,w,s. EXPERIMENTAL ANATOMY AND PHYSIOLOGY OF THE SKIN. (1 cr) Winkelmann, Perry, Muller

M 8854f,w,s,su. EXPERIMENTAL ANATOMY AND PHYSIOLOGY OF THE SKIN. (1 cr) Staff

M 8855f,w,s,su. EXPERIMENTAL PATHOLOGIC ANATOMY OF THE SKIN. (1 cr) Winkelmann, Perry, Muller

M 8856f,w,s,su. EXPERIMENTAL AND PATHOLOGIC ANATOMY OF THE SKIN. (8 cr) Winkelmann, Perry, Muller

M 8857. SPECIAL TOPICS IN EXPERIMENTAL AND ANATOMIC PATHOLOGY. (2 cr) Winkelmann, Perry, Muller

M 8858f,w. CYTOLOGY. (1 cr) Winkelmann

M 8859f,w,s,su. SURFACE MICROSCOPY OF THE SKIN. (1 cr) Staff

M 8860su,f. GROSS AND CLINICAL ANATOMY OF THE SKIN. (1 cr) Winkelmann, Perry, Muller

M 8861w,s. INVESTIGATIVE DERMATOLOGY. (1 cr) Staff

M 8862f,w,s,su. RESEARCH IN EXPERIMENTAL ANATOMY. Staff

M 8863. INVESTIGATIONS IN CLINICAL PHYSIOLOGY AND BIOCHEMISTRY. (1 qtr) Winkelmann and staff

M 8864. BIOCHEMICAL PROBLEMS OF THE SKIN. Biochemistry staff

M 8865. MICROBIOLOGY. Ritts and microbiology staff

ENVIRONMENTAL HEALTH

OFFERED AT MINNEAPOLIS

Professor

Richard G. Bond, M.S., M.P.H., *director*
Conrad P. Straub, M.C.E., Ph.D., *director of graduate study*
Velvl W. Greene, Ph.D.
George S. Michaelsen, M.S.
Harold J. Paulus, Ph.D.
Irving Pflug, Ph.D.

Associate Professor

Donald E. Barber, M.P.H., Ph.D.
Knowlton J. Caplan, M.S.
Rexford Singer, M.S.
Lee D. Stauffer, M.P.H.

Assistant Professor

Walter H. Jopke, M.P.H.
Gustave L. Scheffler, B.S.C.E.
Donald Vesley, Ph.D.

Prerequisites—A Bachelor's degree from an acceptable institution, preferably with a major in engineering or in one of the biological or physical sciences. If preparation appears to be inadequate, certain additional courses may be required.

Language Requirement—Optional with the division head and determined by career plans of the individual. For the Master's degree, knowledge of a foreign language may be required or, at the discretion of the adviser, substitution may be made by additional academic work that is clearly identified as a replacement for the language requirement. For the Ph.D. degree, at the discretion of the adviser, the requirement may be met by reading knowledge of two foreign languages, one foreign language and additional defined course work, or no language and additional defined course work.

Master's Degree—Offered under both Plan A and Plan B. All candidates for this degree must take PubH 5151, 5159, and 8002.

Doctor's Degree—The course work will be adapted to the needs of the individual student and will take cognizance of the several fields of specialization within environmental health (air pollution, environmental biology, hospital engineering, injury control, occupational health, radiological health, water hygiene). Candidacy for the Ph.D. degree implies the completion of a Master's degree or equivalent in environmental health or related fields. Minors will be chosen from a fundamental discipline appropriate to the student's previous academic training and individual needs.

Note—For descriptions of the following courses, see the Public Health section of this bulletin.

5150. TOPICS: ENVIRONMENTAL HEALTH. (Cr ar; prereq ‡) Staff

5151.* ENVIRONMENTAL HEALTH. (3 cr; prereq ‡) Bond and staff

5153.* INSTITUTIONAL ENVIRONMENTAL HEALTH. (3 cr; prereq hospital administration student or ‡, 5002) Michaelsen, Bond

5159.* SEMINAR: ENVIRONMENTAL HEALTH. (Cr ar; prereq ‡) Staff

5161.* ADMINISTRATION OF ENVIRONMENTAL HEALTH PROGRAMS. (3 cr, §5154; prereq ‡) Bond

5170. TOPICS: ENVIRONMENTAL BIOLOGY. (Cr ar; prereq ‡) Staff

5171.* ENVIRONMENTAL MICROBIOLOGY. (3 cr; prereq 5151, MicB 3103 or ‡) Greene

5172. ENVIRONMENTAL MICROBIOLOGY LABORATORY. (2 cr, §5233; prereq ¶5171, ‡) Greene, Vesley

5177. ENVIRONMENTAL BIOLOGY. (3 cr; prereq ‡)

5178. VECTORS AND PARASITES IN HUMAN DISEASES. (3 cr; prereq ‡)

5179. PUBLIC HEALTH BIOLOGY—FIELD INVESTIGATIONS. (3 cr; prereq ‡)

5180. TOPICS: AIR POLLUTION. (Cr ar; prereq ‡) Staff

5181. INTRODUCTION TO THE AIR POLLUTION PROBLEM. (3 cr; prereq ‡) Paulus

5182. AIR POLLUTION CONTROLS AND SURVEYS. (3 cr; prereq 5181 or ‡) Paulus

5183. PROBLEMS OF AIR POLLUTION CONTROL. (Cr ar; prereq 5181, ‡) Paulus

5184. AIR ANALYSIS. (3 cr; prereq 5211 or 5181, 5183, ‡) Paulus

5185. AIR ANALYSIS II. (3 cr; prereq 5184) Paulus, Caplan

5190. TOPICS: INJURY CONTROL. (Cr ar; prereq ‡) Michaelsen, Scheffler

5191. PRINCIPLES AND METHODS OF INJURY CONTROL. (Cr ar; prereq ‡) Michaelsen, Scheffler

5192. HOSPITAL SAFETY. (3 cr; prereq ‡) Michaelsen, Scheffler

5193. CHEMICAL LABORATORY SAFETY. (1 cr; prereq ‡) Scheffler

5194. OCCUPATIONAL SAFETY. (2 cr; prereq ‡) Michaelsen, Scheffler

5200. TOPICS: RADIOLOGICAL HEALTH. (Cr ar; prereq ‡) Staff

5201. MEASUREMENT AND APPLICATION OF IONIZING RADIATION. (3 cr [lect and lab], 2 cr [lect only]; prereq ‡) Barber, Jonas

5202. ENVIRONMENTAL RADIOACTIVITY. (3 cr; prereq ‡) Barber, Straub

5203. LOW-LEVEL RADIOACTIVITY MEASUREMENTS. (3 cr; prereq ‡) Barber

5207. RADIATION PROTECTION CRITERIA FOR HOSPITALS. (2 cr; prereq ‡) Barber, Wollan

5209. SEMINAR: HEALTH PHYSICS. (1 cr; prereq ‡) Barber

5210. TOPICS: OCCUPATIONAL HEALTH. (Cr ar; prereq ‡) Staff

5211.° INDUSTRIAL HYGIENE ENGINEERING. (3 cr; prereq ‡) Caplan, Michaelsen

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

5213. PUBLIC HEALTH ASPECTS OF TOXIC PRODUCTS. (2 cr; prereq ‡) Caplan

5214. AGRICULTURAL OCCUPATIONAL HEALTH. (3 cr; prereq 5211 or ‡) Caplan

5215. ENVIRONMENTAL TOXICOLOGY. (3 cr; prereq 5181 or 5211, ‡) Caplan, Long

5216. HEALTH ASPECTS OF AIR CONTROL IN HOSPITALS. (2 cr; prereq ‡) Michaelsen

5220. TOPICS: FOOD SANITATION. (Cr ar; prereq ‡) Staff

5221. INSTITUTIONAL FOOD PROTECTION PROGRAMS. (3 cr; prereq ‡) Bond, Jopke

5222.° FOOD SANITATION. (3 cr; prereq 5002, ‡)

5230. TOPICS: INSTITUTIONAL ENVIRONMENTAL HEALTH. (Cr ar; prereq ‡) Staff

5231.° ENVIRONMENTAL HEALTH AND SAFETY IN HEALTH CARE FACILITIES I. (4 cr; prereq ‡) Michaelsen, Greene, Vesley

5232.° ENVIRONMENTAL HEALTH AND SAFETY IN HEALTH CARE FACILITIES II. (4 cr; prereq ‡) Michaelsen, DeRoos

5233.° ENVIRONMENTAL HEALTH AND SAFETY IN HEALTH CARE FACILITIES III. (4 cr; prereq ‡) Michaelsen, Vesley

5239. HOSPITAL ENGINEERING PROBLEMS. (Cr ar; prereq ‡) Michaelsen and visiting lecturers

5241. ENVIRONMENTAL HEALTH ASPECTS OF WATER SUPPLY SYSTEMS. (3 cr; prereq ‡) Straub, Singer

5244. ENVIRONMENTAL HEALTH ASPECTS OF WASTEWATER SYSTEMS. (3 cr; prereq ‡) Straub, Singer

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 ‡) Greene

8180. RESEARCH: AIR POLLUTION. (Cr ar; prereq ‡) Paulus

8190. RESEARCH: INJURY CONTROL. (Cr ar; prereq ‡) Michaelsen

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 ‡) Michaelsen

8211. HEALTH SURVEY OF MANUFACTURING PROCESSES. (2 cr; prereq 5211, ‡) Caplan

8218. FIELD PROBLEMS IN OCCUPATIONAL HEALTH. (3 cr; prereq 5211, 5212, or ¶5213, ‡) Caplan

8220. RESEARCH: FOOD SANITATION. (Cr ar; prereq ‡) Pflug

8230. RESEARCH: INSTITUTIONAL ENVIRONMENTAL HEALTH. (Cr ar; prereq ‡) Michaelsen, Greene

8248. WATER QUALITY INVESTIGATION AND RESEARCH TECHNIQUES. (6 cr; prereq ‡) Odlaug

8249. WATER QUALITY RESEARCH. (6 cr; prereq ‡) Odlaug

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.

Assistant Professor

James H. Stebbings, Jr., Sc.D.

Lecturer

Henry Bauer, Ph.D.

Prerequisites—Specialized training in epidemiology is offered to qualified graduates in medicine, dentistry, and veterinary medicine. Other students with adequate background in biological or physical sciences or with demonstrated competence in investigative work may be admitted. Since positions in the program are relatively limited, selection of candidates is competitive with respect to background of instruction and experience presented.

Language Requirement—Reading knowledge of foreign languages is advised but not required for either the Master's or the Ph.D. degrees, except that for the Ph.D. degree, a reading knowledge of foreign languages must be acquired as part of a major program when such skill is needed to support the student's research objectives.

Minor—For the Master's degree, 9 credits selected by the minor adviser on the basis of the candidate's field of study.

For the Ph.D. degree, PubH 5375 and 23 additional credits selected by the minor adviser on the basis of the candidate's field of major study.

Master's Degree—Offered under both Plan A and Plan B. All candidates for this degree must take PubH 5375.

Doctor's Degree—Applicants for the degree in epidemiology 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.

For descriptions of the following courses, see the Public Health section of this bulletin.

5300. COMPARATIVE MEDICINE AND PUBLIC HEALTH. (2 cr; prereq 5375, ‡) Diesch

5330.* EPIDEMIOLOGY I. (3 cr; prereq 5375, and 5407 or 5405, or 5450-5451, ‡) Schuman, Stebbings

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

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

5336. INFECTIOUS DISEASE EPIDEMIOLOGY. (3 cr; prereq basic epidemiology and biostatistics) Visiting lecturers
Factors involved in epidemic occurrence, clinical response to infection, impact on man 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.

5340. EPIDEMIOLOGIC SURVEY METHODS. (3 cr; prereq 5330 and 5407 or equiv, ‡) Schuman, Stebbings

5341. HEALTH SURVEY METHODS. (2 cr; prereq basic epidemiology and biostatistics) Visiting lecturers
Problems of sampling, sample-size determinations, interview, questionnaire development, and organization of community health research.

5342. PUBLIC HEALTH BACTERIOLOGY. (Cr ar; prereq MicB 5232, MicB 5216, ‡) Bauer

5345. EPIDEMIOLOGY OF CANCER. (3 cr; prereq basic epidemiology and biostatistics, 5357 or ¶5357) Schuman and visiting lecturers
Epidemiologic aspects of selected types of cancer with emphasis on approaches to study.

5346. EPIDEMIOLOGY OF CARDIOVASCULAR DISEASES. (3 cr; prereq basic epidemiology and biostatistics, 5357 or ¶5357) Visiting lecturers
Epidemiologic aspects of various types of cardiovascular disease with emphasis on multivariate setting 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, and malignant disease and congenital deformities of the central nervous system.

5349. EPIDEMIOLOGY OF CHRONIC RESPIRATORY DISEASE. (Cr ar; prereq ‡) Stebbings
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. (3 cr; prereq 5330, 5332 or equiv, and 5407, 5331 or equiv) Visiting lecturers
Epidemiologic approaches to planning and criteria of evaluation.

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)
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, and advanced statistics) Visiting lecturers
Critical review of epidemiological studies of biological effects of radiation exposure on man, with emphasis on methodological problems encountered.

5365. EXPERIMENTAL EPIDEMIOLOGY. (Cr ar; prereq 5335, 5407 or 5450 or equiv, ‡)

5370. APPLIED EPIDEMIOLOGY. (Cr ar; prereq 5330, 5407 or 5450 or equiv, ‡)

5375. BIOLOGICAL BASES OF HEALTH AND DISEASE. (3 cr; prereq course in microbiology, or ‡) Schuman

5379.* TOPICS IN EPIDEMIOLOGY. (Cr ar; prereq ‡) Staff

5380.* APPLIED HUMAN NUTRITION. (3 cr; prereq ‡) J Anderson, Grande, Stief

5386. PUBLIC HEALTH ASPECTS OF CARDIOVASCULAR DISEASE. (3 cr; prereq ‡) Grande, Blackburn, and staff

5407. VITAL STATISTICS I. (3 cr) Bearman

5450-5452-5454. BIOMETRY I, II, III. (3 cr per qtr; prereq Math 1111 or ‡, ¶5451-5453-5455) Bartsch

5451-5453-5455. BIOMETRY LABORATORY I, II, III. (2 cr per qtr; prereq ¶5450-5452-5454) Bartsch

5612. HUMAN GENETICS AND PUBLIC HEALTH. (3 cr) Schacht

5651. PHILOSOPHY AND CONCEPTS OF PREVENTIVE DENTISTRY. (3 cr; prereq ‡) Meskin

8330. RESEARCH: EPIDEMIOLOGY. (Cr ar)

8340.* EPIDEMIOLOGY OF NONCOMMUNICABLE DISEASES. (3 cr; prereq 5330) Schuman, Stebbings

8341. EPIDEMIOLOGY OF SELECTED CHRONIC DISEASES. (2 cr; prereq basic epidemiology and biostatistics) Visiting lecturers

8345. EPIDEMIOLOGIC BASIS FOR CANCER CONTROL. (2 cr; prereq basic epidemiology and biostatistics, 5357 or ¶5357) Visiting lecturers

8356. EPIDEMIOLOGIC ASPECTS OF POPULATION CHANGE. (2 cr; prereq basic epidemiology and biostatistics) Visiting lecturers

8379. SEMINAR: EPIDEMIOLOGY. (Cr ar; prereq ‡) Schuman, Stebbings

EPIDEMIOLOGY

OFFERED AT ROCHESTER

Professor

Leonard T. Kurland, M.D., *chairman*
Lila R. Elveback, Ph.D.
William F. Taylor, Ph.D.

Assistant Professor

Fred T. Nobrega, M.D.

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 diseases 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
Presentation, analysis, and discussion of proposed investigative work, research developments, and results by members of the department and guest lecturers. Reesarch 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 8851f,w,s. RESEARCH PROBLEMS IN EPIDEMIOLOGY

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 returning to their own ethnic and cultural groups to work in programs there.

Language Requirement—No foreign language is required.

Master's Degree—Offered under both Plan A and Plan B. Knowledge and skills necessary for family planning administration are drawn from diverse disciplines: medicine, public health, sociology, etc. All candidates for the degree must take PubH 5407—Vital Statistics, Soc 5551—World Population Problems, PubH 5411—Introduction to Mathematical Demography, and FPAd 5241—Family Planning Administration. Depending upon background and objectives, each student, with the counsel of the adviser, has a wide choice of optional 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.

5244. POPULATION POLICIES AND PROGRAMS. (3 cr; prereq ‡) Foreman
Potential and operational approaches to alleviate population pressures in societies both in developed and less developed regions of the world.

5245. HISTORY AND DEVELOPMENT OF FAMILY PLANNING. (3 cr; prereq ‡) Foreman
Family planning programs over the world (including U.S.) instituted to meet health needs as well as to alleviate population pressures.

5247. FAMILY PLANNING PROBLEMS COUNSELING. (3 cr; prereq ‡)
Counseling on family health: maternal, child health, nutrition, contraception, birth control, etc.

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*
Vernon Weckwerth, M.D.

Associate Professor
Eldon B. Berglund, M.D.
Vincent R. Hunt, M.D.
John B. O'Leary, M.D.
John E. Verby, M.D.

Assistant Professor
Joseph P. Connolly, M.D.
David L. Spencer, M.D.

Graduate work in the Department of Family Practice and Community Health offers preparation for a career in teaching and research or in the practice of family medicine and community health.

A minor subject may be pursued simultaneously with clinical studies and work. Particular emphasis will be placed on interpersonal communications, epidemiology in clinical practice, sociological aspects of delivering medical care, innovative ways of developing health care delivery systems, new knowledge developing in education, and genetics and marriage counseling.

Intensive clinical experiences will be available in one or more of the various affiliated hospitals and will emphasize ambulatory care. Every effort will be made to teach the student in an environment comparable to the environment of his future practice.

Fellowships in the Department of Family Practice and Community Health will be planned for a 2-year period beyond the internship. Three months of this time will be elective. Various opportunities will be provided for different kinds of community experience in addition to the experience gained within the more formal departmental program.

Lectures, daily ward rounds, teaching seminars, and direct collaborative work with a member of the faculty will provide most of the important learning media beyond the actual inpatient and outpatient services that the department will provide for its fellows.

A minimum of 45 credit hours should be obtained for completion of the master of science degree. At least 25 of the 45 credit hours should be in the major field. Not less than 18 of the 45 credits should be offered in at least two related fields with a minimum of 6 credits in each.

Prerequisites—The student should complete the following requirements before applying for the master of science degree in family practice and community health.

1. The candidate should be a holder of the M.D. degree.
2. The candidate should have completed the first-year requirements of an approved residency training program in family practice and community health.

Language Requirements—For the M.S., knowledge of a foreign language may be waived on recommendation of the adviser. It will be assumed that all holders of the M.D. degree will have had some background and course work in at least one foreign language.

Master's Degree—Offered under Plan B.

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 available in other departments of the University. Students should also consult the *Graduate School Bulletin.*

8201. CLINICAL FAMILY MEDICINE. (Cr ar) Verby, O'Leary, and staff
Supervised care for fixed population of patients of all ages on a continuous, primary, preventive, and general diagnostic basis. Diagnosis, methods of treatment, and problem solving devices for benefit of patient and family. Health hazard appraisal. New and refined methods of recording, documentation, and retrieval of clinical data.

8202. DYNAMICS OF MARRIAGE AND FAMILY. (2 cr; prereq #) Nelson
Stresses interacting concepts of marital and family living. Special attention to role division and marital and family communication in light of developmental concepts in the family life cycle. Clinical findings and literature research form basis for study of factors in family interaction affecting health.

8204. SEMINAR: QUANTITATIVE LOGIC IN CLINICAL JUDGMENT. (1 cr) Weckwerth
Quanitative methods applied to medical practice. Students must prepare and present their own applications of quantitative logic and methods to medical practice problems.

8206. SEMINAR: PSYCHOLOGY IN MEDICINE. (2 cr) Ireton and staff
Psychological principles and techniques for the primary physician. Psychological evaluation through interview and testing; illness and emotional distress; patient and family in crisis; resources for coping with psychological aspects of illness.

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) McConnell

8240. COMMUNITY RESOURCES. (2 cr) Ciriacy and staff
Participation in discussions with representatives of selected community agencies.

8242. ECONOMICS OF HEALTH CARE DELIVERY SYSTEMS. (3 cr) Peterson and staff
Economic aspects of health care delivery. Economic impact of illness to total cost and cost effectiveness of various delivery systems.

8245. ANALYSIS OF INSTRUCTION AND EDUCATIONAL EVALUATION. (Cr ar) Lenarz
Psychology of learning, preparation of instructional objectives, educational evaluation, uses of instructional media, and educational methodology.

8253.* RESEARCH PROBLEMS. (Cr ar) O'Leary and staff

HISTORY OF MEDICINE (HMed)

OFFERED AT MINNEAPOLIS

Professor

Leonard G. Wilson, Ph.D., *director of graduate study*

The program in the history of medicine 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 doctorate in these areas will prepare students for a career 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.

Language Requirements—Students will be required to demonstrate competence in two foreign languages, preferably French and German. They must pass the examination in one foreign language before the end of their first academic year and in both languages before the end of their second year of graduate study. For students interested in a historical period before 1800, Latin will be a third required foreign language.

During their first 2 years, students will take 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. A student who passes the comprehensive examination successfully may begin work on a thesis.

Thesis requirement—Candidates for the Ph.D. degree must submit a thesis, prepared under the advisory guidance of a member of the faculty.

5400, 5401, 5402. HISTORY OF MEDICINE. (3 cr per qtr)

5410, 5411, 5412. SEMINAR: EMERGENCE OF MODERN MEDICINE, 1750-1900. (3 cr per qtr)

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 twentieth 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, e.g., Ptolemic astronomy, Aristotle's physics and biology, Galenic physiology, the Copernican revolution, Kepler, Galileo, Newton, Harvey, Lavoisier, Lyell, Darwin.

HISTORY OF MEDICINE (HMed)

OFFERED AT ROCHESTER

Associate Professor

Charles G. Roland, M.D., *head*

Instructor

Jack D. Key, M.S.
Ruth J. Mann, B.S.
Clark W. Nelson, B.S.

A survey course in the history of medicine is offered annually, providing the student a view of broad trends in this field. It is hoped that students will be stimulated to pursue additional study of medical history; seminars can be arranged for this purpose. Occasional lectures will be offered, presenting special speakers and other appropriate programs.

M 8800. HISTORY OF MEDICINE. Staff
Broad trends. Lectures, seminars.

HOSPITAL AND HEALTH CARE ADMINISTRATION (PubH)**

OFFERED AT MINNEAPOLIS

Professor

Bright M. Dornblaser, M.H.A., *director*
Theodor J. Litman, Ph.D., *coordinator of doctoral study*
James W. Stephan, M.B.A.
Vernon E. Weckwerth, Ph.D.

Associate Professor

Mario F. Bognanno, Ph.D.

Assistant Professor

Jerome T. Bieter, M.H.A.
Janet G. Brodahl, M.H.A.
John Sweetland, Jr., M.H.A.

Prerequisites—Applicants are expected to have demonstrated both marked academic ability as well as potiential 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, or medicine are encouraged to seek enrollment as well. Applicants lacking basic public health courses may be required to take such courses concurrently with their doctoral program. Graduate work satisfactorily completed prior to admission may be applied to 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.

** 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, 1260 Mayo Memorial Building, Box 97, University of Minnesota, Minneapolis, Minnesota 55455; inquiries concerning the Master's degree program (MHA) should be sent to the Director, Program in Hospital and Health Care Administration, same address.

Language Requirement—A reading knowledge of one foreign language, or 9 credits of computer science, plus a collateral field of knowledge (see below).

Thesis—The dissertation shall deal with a significant problem in the area of health care.

Doctor's Degree—In contrast with the professional Master's degree program offered in the School of Public Health, the doctoral program is designed for those interested in a career in teaching, research and/or planning in the field of health care. Emphasis in the curriculum is thus more upon depth and breadth of learning than upon the acquisition of technical and management skills. While the academic program normally takes 3 years to complete, it may take somewhat longer depending upon the individual and the kind of program pursued. Each student's course of study will be developed with the guidance of the adviser, to build upon the individual's own background and interests. Candidates will be expected to demonstrate proficiency in four major 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 and health care
4. Comprehensive health planning.

In addition to the work in the major field, the student will be required to pursue a supporting field of study or minor in such related social sciences as business administration, economics, sociology, industrial relations, public administration, or political science. In accordance with the rules and regulations of the Graduate School and with the approval of the adviser, the student may elect to meet this requirement through one of the following options:

1. One-sixth of graduate studies in a coherent program of courses selected from the related social sciences
2. All of the minor field requirements in one of the related social sciences or in two social science fields as a split minor
3. A second major in one of the related social sciences

In addition, all candidates must complete a minimum of 9 credits in statistics and/or quantitative analysis in courses numbered 5000 or above, which may be used to satisfy the collateral field requirement (see above).

Minor—A minor in this field is also available subject to approval of the minor adviser.

For a more complete statement of admission requirements and related information, see the special *Program in Hospital and Health Care Administration Bulletin* of the School of Public Health.

Note—Courses listed with no description are described in the Public Health section of this bulletin.

5404. INTRODUCTION TO BIOSTATISTICS AND STATISTICAL DECISION. (3 cr; prereq ‡) Weckwerth

5750. PRINCIPLES OF ADMINISTRATION IN HOSPITAL AND HEALTH CARE INSTITUTIONS. (6 cr; prereq ‡) Dornblaser, Sweetland, and staff

5751. PRINCIPLES OF ORGANIZATION AND MANAGEMENT. (3 cr; prereq ‡) Dornblaser and staff

5753. MANAGEMENT PROBLEMS IN HOSPITAL AND HEALTH CARE ADMINISTRATION. (6 cr; prereq 5751, 5750, 5752) Dornblaser, Sweetland, Westerman

5785. QUANTITATIVE METHODS APPLIED TO HEALTH ADMINISTRATIVE PROBLEMS. (3 cr; prereq hospital administration student or ‡) Weckwerth and staff
Application of quantitative methods including analysis of cyclicities, PERT, data handling systems, simple ANOVA, linear programming, cost benefit analysis, task analysis, and inventory control in solution of health problems at administrative levels.

5790. SOCIAL, POLITICAL, AND ECONOMIC ASPECTS OF MEDICAL CARE. (3 cr; prereq ‡) Litman and staff

5855. SOCIOLOGY OF MEDICINE AND MEDICAL INSTITUTIONS. (3 cr, §Soc 5855; prereq ‡) Litman
Social and psychological components of physical and mental illness and their treatment. Social organization of medical institutions and their relationship to public needs for health care. Role of major providers of health care.

8750-8751.† SEMINAR: ALTERNATIVE PATTERNS OF HEALTH CARE. (3 cr per qtr; prereq ‡; offered f,w 1974-75 and alt yrs) Litman
Alternative approaches to meeting health care problems of ambulatory care, aging and chronic diseases, rehabilitation, maternal and child care, mental health, and the poor.

8752. SEMINAR: COMPARATIVE HEALTH SYSTEMS. (3 cr; prereq ‡; offered f 1973 and alt yrs) Litman
Origin and development of various national systems of health care and their relationship to social, political, economic, and cultural characteristics of countries involved.

8760. TOPICS IN HOSPITAL AND HEALTH CARE ADMINISTRATION. (Cr ar; prereq ‡) Dornblaser, Weckwerth, and staff
Independent study under tutorial guidance on selected problems, current issues.

8761. READINGS IN THEORY AND PRINCIPLES OF HOSPITAL AND HEALTH CARE ADMINISTRATION. (Cr ar; prereq ‡) Weckwerth and staff

8770. SEMINAR: HEALTH AND HUMAN BEHAVIOR. (3 cr; prereq Soc 5855; offered s 1973-74 and alt yrs) Litman
Sociology of health and health care; social and personal components of health and illness behavior; community health; and relationship of social and cultural factors in organization and delivery of health care systems.

8780. ADVANCED STATISTICAL METHODS IN HEALTH CARE RESEARCH. (3 cr; prereq 5450 or ‡) Weckwerth
Survey and analysis of application of nonparametric statistics of health care research.

8781. SEMINAR: RESEARCH STUDIES IN HEALTH CARE. (3 cr; prereq ‡; offered s 1974-75 and alt yrs) Litman
Review and appraisal of design, measuring instruments, research methodology, and findings of contemporary studies in field of health care.

8782. RESEARCH PRACTICUM. (6 cr; prereq ‡) Litman, Weckwerth, and staff
Summer field experience in health care research. Supervised independent and team research on selected topics and problems.

8790. POLITICAL ASPECTS OF HEALTH SERVICES. (3 cr; prereq ‡; offered w 1974-75 and alt yrs) Litman
Analysis of interrelationship between government, politics, and health care; political and social basis of health legislation and community decision making in provision and modification of health services.

8795. ECONOMIC ASPECTS OF HEALTH CARE. (3 cr) Bognanno
Economic analysis of America's health care sector, emphasizing its problems of pricing, production, and distribution. Evaluating health care services as one factor contributing to the nation's health.

8796. TOPICS IN HEALTH ECONOMICS. (3 cr) 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.

LABORATORY MEDICINE (LMed)

OFFERED AT MINNEAPOLIS

Professor

Ellis S. Benson, M.D., *head*
Jorge J. Yunis, M.D., *director of graduate study*
Eugene Ackerman, Ph.D.
David M. Brown, M.D.
Esther F. Freier, M.S.
Andreas Rosenberg, Ph.D.
R. Dorothy Sundberg, M.D., Ph.D.
Edmond J. Yunis, M.D.

Associate Professor

Miguel Azar, M.D., Ph.D.
Donna Blazevic, M.P.H.
G. Mary Bradley, M.D.
Robert A. Bridges, 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.
Ben Hallaway, M.S.
John Matsen, M.D.
Richard Moore, Ph.D.
Herbert F. Polesky, M.D.
Lorraine G. Stewart, M.S.
Patrick C. J. Ward, M.D.
Walid Yasmineh, Ph.D.

Assistant Professor

Philip Blume, M.D.
Nancy Staley, M.D.

Graduate work in the Department of Laboratory Medicine offers opportunities to physicians, medical technologists, and other qualified students to prepare themselves for careers of teaching and research in the field. 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 18 credits with emphasis in one major area of laboratory medicine (chemistry, genetics, hematology, immunology, or microbiology). The minor subject (9 credits) may be chosen from among one of the basic fields of science such as anatomy, biochemistry, genetics, or pathology. The student is expected to maintain a B average in courses for both the major and minor. There is no foreign 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.

Residency Requirements—Candidates for the Master's degree must be registered at the University for a minimum of 3 quarters before receiving a degree. Students are also encouraged to file their programs by the end of their first quarter of graduate work in order to be reviewed by the departmental graduate committee.

Student's Progress and Examinations—The student's 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, the candidate must pass a final oral examination which will cover the conceptual aspects of the subject covered in the thesis and graduate courses taken. This examination will be conducted by a committee appointed by the Graduate School to examine the thesis.

5103s. PRINCIPLES OF DIAGNOSTIC MICROBIOLOGY. (3 cr; prereq MdBc 3103, 5232 or ♯) Blazevic, Ederer, Matsen

5133f. MEDICAL MYCOLOGY. (3 cr; hrs ar; prereq medical microbiology, diagnostic microbiology or ‡) Blazevic
Laboratory diagnosis of infections caused by yeasts, 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. Role of anaerobes in disease.

5138f,w,s,su. CLINICAL MICROBIOLOGY SEMINAR. (1 cr; prereq ‡) Blazevic, Ederer, Matsen

5139f,w,s,su. ADVANCED MICROBIOLOGY. (Cr ar; prereq ‡) Matsen and staff

5160s. HUMAN CYTOGENETICS. (2 cr; prereq ‡; offered 1974-75 and alt yrs) J Yunis
Chromosome structure and function and genetic and clinical problems associated with study of human chromosomes.

5161s. HUMAN CYTOGENETICS LABORATORY. (3 cr; prereq ‡; offered 1974-75 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. (2 cr; prereq ‡; offered 1973-74 and alt yrs) J Yunis, Yasmineh
Molecular and genetic basis of human genetic traits.

5163s. HUMAN BIOCHEMICAL GENETICS LABORATORY. (3 cr; prereq ‡; offered 1973-74 and alt yrs) J Yunis, Aldrich
Biochemical techniques used in study of human genetic traits.

5164s. CLINICAL GENETICS. (2 cr) J Yunis
Importance of genetic principles in modern medicine. Specific disorders used to illustrate general concepts and their application to common diseases.

5168f,w,s. GENETICS SEMINAR. (1 cr; prereq ‡) J Yunis and staff

5169. RESEARCH IN HUMAN GENETICS. (Cr ar; prereq ‡) J Yunis, Yasmineh

5170. ADVANCED PROBLEMS IN MEDICAL GENETICS. (Cr ar; prereq ‡) J Yunis and staff

5172f. HUMAN GENETIC TRAITS INCLUDING BLOOD GROUPS AND SERUM PROTEIN POLYMORPHISM. (3 cr, §Anth 5641; prereq ‡) Polesky

5173f. ANALYTICAL TECHNIQUES IN LABORATORY MEDICINE. (2 cr; prereq ‡; offered 1973-74 and alt yrs) Rosenberg

5176f. INTRODUCTION TO CLINICAL CHEMISTRY. (4 cr; prereq ‡) Cox, Freier
Fundamental principles and techniques in clinical chemistry.

5177w,s. CLINICAL CHEMISTRY. (6 cr; prereq ‡) Freier and staff
Principles of modern clinical chemistry techniques, with emphasis on instrumental methods.

5179f,w,s,su. CHEMISTRY SEMINAR. (1 cr; prereq ‡) Benson, Blume, Bridges, Brown, Dempsey, Freier, Hallaway, Rosenberg, Stewart

5180f,w,s,su. ADVANCED CHEMISTRY. (Cr ar; prereq ‡) Benson, Blume, Bridges, Brown, Dempsey, Freier, Hallaway, Rosenberg, Stewart

5267f,w,s,su. MUSCLE CELL STRUCTURE AND FUNCTION. (1 cr; prereq MdBc 5101 or ‡) Benson, Dempsey, Hallaway, Rosenberg, Staley
Structure and function of heart and skeletal muscle, including biochemical properties of contractile proteins and their relation to cellular components.

5268s. TECHNIQUES IN IMMUNOCHEMISTRY. (1 cr; prereq MdBc 5301 or ‡) Bridges, Stewart
Antigen-antibody reaction applied to quantitative and qualitative analysis of specific patterns of clinical significance. Preparation of antigens and of antisera. Nature of antigen-antibody complexes. Applications of precipitin, neutralization, radioimmune, double antibody, and hemolysin techniques.

5269s. TECHNIQUES IN IMMUNOCHEMISTRY LABORATORY. (1 cr; prereq MdBc 5301 or ‡) Bridges, Stewart

5270f. IMMUNOHEMATOLOGY. (3 cr; prereq 5266 or ‡) Azar, E Yunis
Immune response. Blood cells as antigens. Antibodies to 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 5272 or ‡) Azar, McCullough, Swanson, E Yunis

5272f,s,su. IMMUNOLOGY SEMINAR. (1 cr; prereq ‡) Azar, Bridges, McCullough, Polesky, Stutman, E Yunis

5273f,w,s,su. ADVANCED IMMUNOLOGY. (Cr ar; prereq ‡) Azar, Bridges, McCullough, Polesky, E Yunis

5274w. 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. 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, J Yunis

5865f,w,s. DEPARTMENTAL SEMINAR. (1 cr; prereq ‡) Benson, J Yunis

8235f,w,s,su. ADVANCED CLINICAL LABORATORY MEDICINE. (Cr ar) Benson, J Yunis

8236f,w,s,su. RESEARCH ON CLINICAL LABORATORY PROBLEMS. (Cr ar) Benson, J Yunis

LABORATORY MEDICINE

OFFERED AT ROCHESTER

Professor

Frank T. Maher, M.D., Ph.D.

Associate Professor

W. Eugene Mayberry, M.D., *chairman*
Edward J. W. Bowie, M.D.
Paul Didisheim, M.D.
Virgil F. Fairbanks, M.D.
J. Donald Jones, Ph.D.
Harold Markowitz, M.D.
John T. McCall, Ph.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.

Assistant Professor

Ralph D. Ellefson, Ph.D.
Nai-Siang Jiang, Ph.D.
William J. Martin, Ph.D.
Robert V. Pierre, M.D.

Instructor

Nicholas G. Nolan, M.D.
Michael B. O'Sullivan, M.D.
Jean M. Slockbower, M.D.
Thomas F. Smith, Ph.D.
Anthony S. Woo, Jr., M.D.

Three programs in laboratory medicine are offered: (a) a 2-year program as part of a 4-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 3-year program in laboratory medicine alone leading to eligibility for examination and certification by the American Board of Pathology in the field of clinical pathology; and (c) courses in specific fields of laboratory medicine available to residents in any specialty of medicine or other postdoctoral students.

These programs consist of lectures, seminars, demonstrations, and actual performance of tests in the laboratories of blood bank and transfusion services, 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 5100f,w,s,su. PARASITOLOGY. (2 cr) Thompson

M 5101w. LECTURES IN CLINICAL MICROBIOLOGY. (1 cr) Washington, Martin, Roberts, Smith

M 5102w. CLINICAL MICROBIOLOGY. (6 cr) Washington, Martin, Roberts, Smith
Experience in routine and special diagnostic laboratories of bacteriology, mycology, and virology.

M 5103-5104f,w,s,su. LABORATORY HEMATOLOGY. (6 cr per qtr) Pierre, Bowie, Didisheim, Fairbanks, O'Sullivan
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 5105-5106f,w,s,su. IMMUNOHEMATOLOGY AND BLOOD BANKING. (8 cr per qtr) Taswell

M 5107f,w,s,su. NUCLEAR MEDICINE. (4 cr) Wahner, Fairbanks, Maher, Nolan, Jiang

M 5108f,w,s.su. CLINICAL PHYSIOLOGY. (2 cr) Wahner, Maher, Nolan, Pierre
Experience and lectures offered in special patient procedures involving studies of function of kidney, liver, and endocrine organs and in analysis of gastic contents, urine, and cerebrospinal fluid.

M 5109f. CLINICAL CHEMISTRY. (6 cr) Ellefson, Fleisher, Jiang, Jones, Mayberry, Markowitz, McCall, Woo
Lectures, seminars, and experience offered in general clinical chemistry, analysis of amino acids, enzymology, lipid chemistry, analysis of metals, toxicology, hormonal analysis, immunochemistry, protein chemistry, and serology.

M 8200f,w,s,su. RESEARCH PROBLEMS. (Cr ar) Mayberry and staff

MEDICAL TECHNOLOGY (MedT)

OFFERED AT MINNEAPOLIS

Professor

Ellis S. Benson, M.D., *head*
Ruth F. Hovde, M.S., *director of graduate study*
Richard P. Doe, M.D.
Esther F. Freier, M.S.
Verna L. Rausch, M.S.
Andreas Rosenberg, Ph.D.
R. Dorothy Sundberg, M.D., Ph.D.
Edmond J. Yunis, M.D.
Jorge J. Yunis, M.D.

Associate Professor

Miguel M. Azar, M.D., Ph.D.
Donna Blazevic, M.P.H.
Robert A. Bridges, M.D.
David M. Brown, M.D.
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.
Ben Hallaway, M.S.
Paul H. Lober, M.D.
John M. Matsen, M.D.
Lorraine G. Stewart, M.S.

Assistant Professor

Philip Blume, M.D.
Gloria M. Bradley, M.D.
Sandra J. Carter, M.S.
Carol G. Cox, Ph.D.
Karen Karni, M.S.
John J. McCullough, M.D.
Herbert F. Polesky, M.D.
Walid Yasmineh, Ph.D.

Graduate work in the field of medical technology is available for qualified candidates who wish to prepare themselves for a career of teaching and investigation in the clinical laboratory area. Regardless of ultimate aim, 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 MT(ASCP) or eligibility for such certification is required in addition to a Bachelor's degree from an acceptable 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 desirable. For a minor in medical technology certification as MT(ASCP) is not required.

Minor—It is suggested that students who major in medical technology present a minor in one of the following fields: hematology, biochemistry, microbiology, or immunohematology.

Master's Degree—Offered only under Plan A. Students are required to complete a thesis problem of independent research in one of the subareas of this field under the direction of their adviser.

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.

5105. INTRODUCTION TO BIOLOGIC ELECTRON MICROSCOPY. (2 cr)
Electron optics, preparative technique for electron microscopy, recording and interpretation of micrographs.

5106. BASIC TECHNIQUES FOR ELECTRON MICROSCOPY. (2 cr)
Demonstration and experience in preparing biological material for electron microscopy, including microscope maintenance and operation.

5120. SEMINAR: MEDICAL TECHNOLOGY. (1 cr)
Review and discussion of current literature; presentation and discussion of research being carried on in the department.

5125. PRACTICUM TEACHING. (Cr ar [3 cr max]; prereq △)
Supervised experience in teaching; development of skills in effective use of instructional materials, tests and measurements.

5130, 5131.* ELEMENTS OF ADMINISTRATION IN MEDICAL TECHNOLOGY. (2 cr per qtr)
Organization and role of laboratory service in hospitals; job analysis and classification; personnel assignments and evaluation; plant, supplies, and equipment with assignment of specific problems in management.

5133. MEDICAL MYCOLOGY. (3 cr; prereq MicB 5232 or MedT 5102 or ‡)
Laboratory diagnosis of infections caused by yeasts, dermatophytes, and systemic fungi.

5135. ADVANCED CLINICAL MICROBIOLOGY. (5 cr; prereq ‡)
Observation, study, and practice in special problems, advanced techniques, and methodology in clinical microbiology.

5138x. SELECTED TOPICS IN MICROBIOLOGY. (Cr ar [may be repeated for cr])
Advanced seminar; topics assigned for conferences and reading.

5140, 5141.* EDUCATIONAL ADMINISTRATION IN MEDICAL TECHNOLOGY. (3 cr per qtr)
Development, organization, and administration of educational programs in medical technology, analysis and construction of courses of study.

5145. DEVELOPMENT OF MEDICAL TECHNOLOGY. (3 cr) Hovde
Current problems; topics and research.

5154. SELECTED TOPICS IN ADVANCED TECHNIQUES AND THEORY OF ELECTRON MICROSCOPY. (Cr ar)
Discussion of new techniques and theory of electron microscopy.

5155. ADVANCED CLINICAL HEMATOLOGY. (5 cr; prereq ‡)
Observation, study, and practice in special problems, advanced techniques, and methodology in clinical hematology.

5165. ADVANCED CLINICAL IMMUNOHEMATOLOGY. (5 cr; prereq ‡)
Observation, study, and practice in special problems, advanced techniques, and methodology in clinical immunohematology.

5173. ANALYTICAL TECHNIQUES IN LABORATORY MEDICINE. (2 cr) Benson

5175. ADVANCED CLINICAL CHEMISTRY. (5 cr; prereq ‡)
Observation, study, and practice in special problems, advanced techniques, and methodology in clinical chemistry.

5179. CHEMISTRY SEMINAR. (1 cr; prereq ‡)

5180. ADVANCED CHEMISTRY. (Cr ar; prereq ‡)

5268. TECHNIQUES IN IMMUNOCHEMISTRY. (1 cr; prereq MdBc 5300, 5301, ‡)
The antigen-antibody reaction applied to quantitative and qualitative analysis of specific patterns of clinical significance. Preparation of antigens and of antisera. Nature of antigen-antibody complexes. Application of precipitin, neutralization, radioimmune, double antibody, and hemolysin techniques.

5269. TECHNIQUES IN IMMUNOCHEMISTRY. (1 cr; prereq MdBc 5300, 5301, ‡)
Laboratory

LMed 5270. IMMUNOHEMATOLOGY. (3 cr)

LMed 5271. IMMUNOHEMATOLOGY LABORATORY. (2 cr)

LMed 5272. IMMUNOLOGY SEMINAR. (1 cr)

LMed 5273. ADVANCED IMMUNOLOGY. (Cr ar)

LMed 5274. MOLECULAR ASPECTS OF IMMUNOLOGY. (3 cr; prereq ‡) Dalmasso

MEDICINAL CHEMISTRY (MedC)

OFFERED AT MINNEAPOLIS

Professor
Taito O. Soine, Ph.D., *head, director of graduate study*
Frank E. DiGangi, Ph.D.
Herbert T. Nagasawa, Ph.D.
Philip S. Portoghese, Ph.D.

Associate Professor
Robert E. Ober, Ph.D.
Robert Vince, Ph.D.

Assistant Professor
Mahmoud Abdel-Monem, Ph.D.
Dwight S. Fullerton, Ph.D.
Patrick E. Hanna, Ph.D.

Medicinal chemistry involves the applications of the principles and processes of the various areas of chemical science to organic and inorganic medicinal agents. It deals with the synthesis of compounds in accordance with molecular and structure-biological activity concepts or as congeners of medicinal agents that are often of natural origin. It also is concerned with the phytochemistry of natural products used for medicinal purposes.

Prerequisites—Graduate work leading to the M.S. and Ph.D. degrees with a major in medicinal chemistry is open to students who have shown exceptional scholarship and ability in undergraduate courses at the University of Minnesota College of Pharmacy or at some other college of pharmacy of equal standing.

Consideration will be given to applications of students who are not graduates in pharmacy but whose pattern of undergraduate work includes training in such allied or related subjects as would qualify them to do successful graduate work with a major in medicinal chemistry.

Language Requirement—For the Master's degree, no foreign language is required. For the Ph.D. degree, one foreign language (German would be routinely acceptable, but other languages pertinent to the field of study will be considered by the staff on petition).

Master's Degree—In general, offered under Plan A. Plan B may be followed by petition.

Doctor's Degree—Graduate work leading to the Ph.D. degree is offered to students prepared for advanced work in medicinal chemistry.

5460-5470-5480-5490. MEDICINAL CHEMISTRY. (4 cr per qtr; prereq 5440 or ‡) Staff
Consideration of factors involved in drug absorption, distribution, excretion, metabolism, mechanism of action, receptor interaction, and rational drug design prefaces treatment of individual pharmacological drug categories from structure-activity standpoint. Agents used as pharmaceutical aids and adjuncts.

5494. INSTRUMENTATION IN MEDICINAL CHEMISTRY. (3 cr; prereq Chem 3303 or ‡) Abdel-Monem
Modern approaches to drug analysis.

5496. MODERN CONCEPTS IN MEDICINAL CHEMISTRY. (3 cr; prereq 5494) Staff
Basic principles and concepts in design of medicinal agents, drug transport, molecular concepts of drug action, chemotherapeutic agents, and analysis of drug receptor interactions.

5499. SPECIAL PROBLEMS IN MEDICINAL CHEMISTRY. (Cr ar; prereq ‡) Staff
Analysis, synthesis, and phytochemistry of medicinal agents.

8100.* SEMINAR: MEDICINAL AND NATURAL PRODUCT CHEMISTRY. (Cr ar; required of all majors in medicinal chemistry) Nagasawa

8200. SELECTED TOPICS. (Cr ar) Hanna

8300. ADVANCED MEDICINAL CHEMISTRY. (3 cr; prereq 5460, Chem 3303 or ‡; offered 1973-74 and alt yrs) Portoghese
General principles of drug design and molecular bases of biological responses to applied agents.

8400. ADVANCED MEDICINAL CHEMISTRY. (3 cr; prereq 5460 or ‡; offered 1973-74 and alt yrs) Soine
Correlations of molecular structure and biological activity with principal reference to autonomic nervous system.

8500. ADVANCED MEDICINAL CHEMISTRY. (3 cr; prereq 5460 or ‡; offered 1973-74 and alt yrs) Vince
Modern methods in design and evaluation of chemotherapeutic agents, including enzyme inhibitors and metabolic blockers.

8600. ADVANCED MEDICINAL CHEMISTRY. (3 cr; prereq 5460, Chem 3303 or ‡; offered 1974-75 and alt yrs) Abdel-Monem and staff
Chemical aspects of drug metabolism, including discussion of 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

Richard B. Ebert, M.D., *head, director of graduate study*
Carl S. Alexander, M.D., Ph.D.
Henry W. Blackburn, Jr., M.D., Ph.D.
Howard B. Burchell, M.D., Ph.D.
Richard P. Doe, M.D., Ph.D.
Ivan D. Frantz, Jr., M.D.
Frederick C. Goetz, M.D.
Wendell H. Hall, M.D., Ph.D.
Ben I. Heller
Robert B. Howard, M.D., Ph.D.
Harry S. Jacob, M.D.
Manuel E. Kaplan, M.D.
Byrl J. Kennedy, M.D., M.S.C.
Frank M. MacDonald, M.D.
M. John Murray, M.D.
Alvin L. Schultz, M.D., M.S.
Samuel Schwartz, M.D.
Louis Tobian, Jr., M.D.
C. Paul Winchell, M.D.
Leslie Zieve, M.D., Ph.D.
Horace H. Zinneman, M.D.

Clinical Professor

Reuben Berman, M.D.
Howard L. Horns, M.D.

Associate Professor

Jonathan S. Bishop, M.D.
Michael D. Levitt
F. Bruce Lewis, M.D.
Robert J. McCollister, M.D.
Luigi Taddeini, M.D.
Athanasios Theologides
Naip Tuna, M.D., Ph.D.
Yang Wang, M.D.
I. Dodd Wilson

Clinical Assistant Professor

William F. Mazzitello, M.D., M.S.

Graduate work in the Department of Medicine offers opportunities for physicians having outstanding undergraduate scholastic records, or giving other evidence of promise, to prepare themselves for careers of teaching, research, or practice in internal medicine or any of its subdivisions as a specialty. Programs are organized to provide graduate education in clinical medicine and related preclinical areas. Medical fellowships are offered in general internal medicine or on 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 General Hospital, Mount Sinai Hospital, Northwestern Hospital, St. Paul-Ramsey County Hospital, and Veterans Administration Hospital. These institutions are the primary resources for graduate education in clinical medicine. Opportunities for research in the laboratories are open to members of the Department of Medicine in all of the hospitals.

Anatomy, biochemistry, immunology, microbiology, pathology, pharmacology, and physiology all have their laboratories and teaching centers on the campus, and the pursuit of a minor subject may be carried on simultaneously and in intimate relation with clinical studies. Work in any of these subjects may be continued further to meet the requirements of a degree program for a minor field.

In general, fellowships with an advance degree program are planned for a 4-year period, of which 2½ to 3 years are devoted to clinical medicine and research and 1 to 1½ years to basic sciences and research. During the greater part of the first period, the individual will act as assistant resident physician or as 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 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 scholarly, original investigation developed with implications for clinical medicine.

Language Requirement—For the Master's degree, no foreign language is required. For the Ph.D. degree, the language requirement or a special research technique is 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 requirements must be logically related to medicine and 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, the individual capabilities and purposes of the fellow being given particular attention.

8201f,w,s,su. CLINICAL MEDICINE. (Cr ar) Ebert, Heller, Howard, Schultz, Lewis, 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) Ebert and 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, Ebert, and staff
Presentation and discussion of X-ray films from the Medical Service, with clinical correlation.

8204f,w,s,su. PATHOLOGICAL CONFERENCE. (1 cr) Ebert and staff
Presentation of clinical features, necropsy findings, and discussion. Medical and surgical cases.

8205f,w,s,su. ELECTROCARDIOGRAPHIC CONFERENCE. (1 cr) Tuna

8210f,w,s,su. INFECTIOUS DISEASE SEMINAR. (Cr ar) Hall and staff

8211f,w,s,su. DISEASES OF THE CARDIOVASCULAR SYSTEM. (Cr ar) Burchell, 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) Ebert 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) Tobian 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) Doe, 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) Zieve, 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 consultative, methods of treatment, and laboratory skills.

8220f,w,s,su. RESEARCH IN MEDICINE. (Cr ar) Ebert, Heller, Howard, Schultz, Lewis, and staff

8221f,w,s,su. TOPICS IN MEDICINE. (Cr ar) Ebert and staff

8223f,w,s,su. TOPICS IN RELATED BASIC SCIENCE. (Cr ar) Ebert and staff

MEDICINE

OFFERED AT ROCHESTER

Professor

Richard J. Reitemeier, M.D., M.S., *chairman*
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.
Robert O. Brandenburg M.D., M.S.
Hugh R. Butt, M.D., M.S.
James C. Cain, M.D., M.S.
David T. Carr, M.D., M.S.
Haddon M. Carryer, M.D., Ph.D.
Guy W. Daugherty, M.D., M.S.
William H. Dearing, M.D., Ph.D.
William T. Foulk, Jr., M.D., M.S.
Clifford F. Gastineau, M.D., Ph.D.
Joseph E. Geraci, M.D., M.S.
John B. Gross, M.D., M.S.
Albert B. Hagedorn, M.D., M.S.
Lowell L. Henderson, M.D., M.S.
Alan F. Hofmann, M.D.
James C. Hunt, M.D., M.S.
Robert E. Hyatt, M.D.
William M. McConahey, M.D., M.S.
R. Drew Miller, M.D., M.S.
Charles G. Moertel, M.D., M.S.
Carl G. Morlock, M.D., M.S.
Donald R. Nichols, M.D., M.S.
Arthur M. Olsen, M.D., M.S.
Charles A. Owen, Jr., M.D., Ph.D.
Howard F. Polley, M.D., M.S.
Raymond D. Pruitt, M.D., M.S.
Raymond V. Randall, M.D., M.S.
Robert J. Ryan, M.D.
Robert M. Salassa, M.D., M.S.
William G. Sauer, M.D., M.S.
Charles H. Slocumb, M.D., M.S.
Lucian A. Smith, M.D., M.S.
John A. Spittell, Jr., M.D., M.S.
J. Minott Stickney, M.D., M.S.
William H. J. Summerskill, M.D., M.A.
Laurentius O. Underdahl, M.D., M.S.
L. Emmerson Ward, M.D., M.S.
Eric E. Wollaeger, M.D., M.S.

Associate Professor

Claude D. Arnaud, M.D.
Kenneth G. Berge, M.D., M.S.
Harry F. Bisel, M.D.
Edward J. W. Bowie, M.B.B.Ch., M.S.
James C. Broadbent, M.D., M.S.
John A. Callahan, M.D., M.S.
Donald C. Campbell, M.D., M.S.
Earl T. Carter, M.D., Ph.D.
Norman A. Christensen, M.D., M.S.
Daniel C. Connolly, M.D., Ph.D.
Talbert Cooper, M.D., M.S.,
David E. Dines, M.D., M.S.
Matthew B. Divertie, M.D., M.S.
John F. Fairbairn II, M.D.
Virgil F. Fairbanks, M.D.
Richard H. Ferguson, M.D.
Robert S. Fontana, M.D., M.S.
Robert L. Frye, M.D.
Emilio R. Giuliani, M.D.
Gerald J. Gleich, M.D.
Ralph S. Goldsmith, M.D.
Hymie Gordon, M.B.Ch.B., M.D.
Carlos E. Harrison, Jr., M.D., M.S.
Norman G. G. Hepper, M.D., M.S.
Paul E. Hermans, M.D., M.S.
John A. Higgins, 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.
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.
Giles A. Koelsche, M.D., Ph.D.
Bruce A. Kottke, M.D., Ph.D.
Robert A. Kyle, M.D., M.S.
Jorge E. Maldonado, M.D., Ph.D.
William E. Mayberry, M.D., M.S.
Frederic C. McDuffie, M.D.
Douglas B. McGill, M.D., M.S.
James R. McPherson, M.D., M.S.
George D. Molnar, M.D., Ph.D.
Philip J. Osmundson, M.D., M.S.
Robert L. Parker, M.D., M.S.
Thomas W. Parkin, M.D., M.S.
Gustavus A. Peters, M.D., M.S.
Sidney F. Phillips, M.B.B.S.
B. Lawrence Riggs, M.D., M.S.
Randolph A. Rovelstad, M.D., Ph.D.
Alexander Schirger, M.D.
Donald A. Scholz, M.D., M.S.
Sheldon G. Sheps, M.D.
Richard M. Shick, M.D., M.S.
Murray N. Silverstein, M.D., Ph.D.
Ralph E. Smith, M.D.
Charles F. Stroebel, M.D., M.S.
William E. Wellman, M.D., M.S.

Assistant Professor

David L. Ahmann, M.D., M.S.
George L. Allen, M.D.
Carl F. Anderson, M.D.

William P. Baldus, M.D., M.S.
Leo F. Black, M.D., M.S.
Philip W. Brown, Jr., M.D., Ph.D.
Mahlon K. Burbank, M.D., M.S.
Edgar R. Dickson, M.D., M.S.
G. Roy Diessner, M.D., M.S.
Eugene P. DiMagno, M.D.
James V. Donadio, Jr., M.D.
F. Edmund Donoghue, M.D., M.S.
Bruce E. Douglass, M.D., M.S.
Thomas P. Dousa, M.D., Ph.D.
Allen A. Frethem, M.D., M.S.
Peter P. Frohnert, M.D., M.S.
Michael G. Geall, M.B.B.S.
Stafford W. Gedge, M.D., M.S.
Hossein Gharib, M.D.
Vay L. W. Go, M.D.
Colum A. Gorman, M.B.Ch.B., Ph.D.
Richard G. Hahn, M.D.
David G. Hanlon, M.D., M.S.
Richard W. Hill, M.D., M.S.
David L. Hoffman, M.D.
Llewelyn P. Howell, M.D., M.S.
Horace K. Ivy, M.D., M.S.
John W. Joyce, M.D.
Francis J. Kazmier, M.D., M.S.
Ronald F. Kettering, M.D.
Malcolm I. Lindsay, Jr., M.D.
Harold T. Mankin, M.D., M.S.
John G. Mayne, M.D., M.S.
Charles H. McKenna, M.D.
John Merideth, M.D.
Wallace A. Merritt, M.D., M.S.
George W. Morrow, Jr., M.D., M.S.
Albert D. Newcomer, M.D.
Fred T. Nobrega, M.D.
Thomas P. B. O'Donovan, M.D.
John D. O'Duffy, M.D.
Pasquale J. Palumbo, M.D., M.S.
Robert V. Pierre, M.D.
Don C. Purnell, M.D., M.S.
Donald E. Ralston, M.D., M.S.
Edward C. Rosenow III, M.D., M.S.
James B. Ross, Jr., M.D., M.S.
Thomas T. Schattenberg M.D., M.S.
Allan J. Schutt, M.D.
Richard E. Sedlack, M.D., M.S.
Frederick J. Service, M.D., Ph.D.
Lynwood H. Smith, M.D.
Donald A. Sones, M.D., M.S.
Ralph E. Spiekerman, M.D., M.S.
Cameron G. Strong, M.D., M.S.
Harry A. Swedlund, M.D., M.S.
Johnson L. Thistle, M.D., M.S.
Deloran L. Thurber, M.D., M.S.
Ross M. Tucker, M.D.
Christian J. Van Den Berg, M.D., M.S.
Carlo M. Veneziale, M.D., Ph.D.
Richard D. Wagoner, M.D.
Heinz W. Wahner, M.D., M.S.
Richard E. Weeks, M.D., M.S.
Richard Weinshilboum, M.D.
David M. Wilson, M.D.
J. W. Worthington, Jr., M.D., M.S.

Instructor

Leonard A. Brennan, Jr., M.D.
Alan J. Cameron, M.D.
Douglas T. Coles, M.D.
Joseph J. Combs, M.D.
Doyt L. Conn, M.D.
Richard A. DeRemee, M.D.
William W. Douglas, M.D.
Richard F. Emslander, M.D.
Willard S. Gamble, M.D.
Gerald T. Gau, M.D.
Norbert O. Hanson, M.D.
H. Clark Hoagland, M.D., M.S.
Charles C. Kennedy, M.D.
Ralph A. Kilby, M.D.
J. Paul Marcoux, M.D.
Audrey M. Nelson, M.D.
Robert M. Petitt, M.D.
Joseph R. Rodarte, M.D.
David R. Sanderson, M.D.
John P. Stokes, M.D.
Richard G. Van Dellen, M.D.
Robert E. Van Scoy, M.D.
Louis D. Vaughn, M.D., M.S.
Adolph H. Walser, M.D., M.S.
Philip R. Westbrook, M.D.
Conard J. Wilkowske, M.D.

A major responsibility of the field of internal medicine is diagnosis. Patients receive a comprehensive diagnostic evaluation in 1 of 23 general diagnostic sections. The fellow in medicine is charged with the initial independent diagnostic opinion and plans for special diagnostic procedures in consultation with a member of the faculty. Clinical work in the first year is scheduled to provide time for reading and library work in preparation for advanced assignments and for research work, which is usually started the second or third year. Each of the general diagnostic sections also has a special field of interest including allergy, infectious diseases, rheumatology, cardiovascular and renal diseases, diseases of the chest, metabolic diseases, endocrinology, hematology, or gastroenterology. Each of these sections of medicine has a hospital service in which the subspecialty is of prime concern. In the hospital, patients are grouped on a subspecialty service when their condition requires intensive treatment or continuing observation. More than 500 hospital beds are allotted to medical patients. Residents are

assigned quarterly to most of the subspecialty services through the 3-year residency. This allows for intensive study in a specialty each quarter. Care of patients is a cooperative responsibility of residents under faculty supervision. Those residents showing clinical promise are offered increasing responsibility throughout the 3-year period of study. In addition, subspecialty training programs of 2-year duration in allergy, cardiovascular diseases, gastroenterology, hematology, infectious diseases, nephrology, pulmonary diseases, and rheumatology are available to a limited number of qualified residents who have completed at least 2 years of training in internal medicine.

Didactic lectures play a minor though significant role in graduate medical education. Daily ward rounds, teaching seminars, and direct collaborative work with a member of the faculty provide the most important learning media. Knowledge of appropriate current medical literature augments the learning value of these seminars, be they large or small, in the hospital, clinic or laboratories.

Full-time assignments for at least 6 or 9 months in one of the basic sciences are recommended for the minor field for degree candidates. Microbiology, hematology, pathology, biochemistry, or physiology laboratories offer opportunities for those seeking careers in research or academic medicine and enrich the graduate study in internal medicine for any talented physician. It is at this time that all or most of the original research is done, forming the basis for the graduate thesis. Those seeking academic careers are advised to use the basic sciences as major fields for the degree even though the fellowships are primarily in medicine.

Residents showing academic promise are urged to avail themselves of these research opportunities to add depth to their broad exposure to clinical problems.

Language Requirement—For the Ph.D. degree, either (a) two foreign languages or (b) one foreign language and the option of a collateral field of knowledge.

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. GENERAL MEDICAL AND SURGICAL DIAGNOSIS. Staff
Research. Seminar.

M 8852f,w,s,su. MEDICAL HOSPITAL RESIDENCE. Staff
Research. Seminar.

M 8853f,w,s,su. MEDICAL DIAGNOSIS AND HOSPITAL SERVICE. Staff

M 8854f,w,s,su. ADVANCED MEDICAL DIAGNOSIS AND MANAGEMENT. Staff

M 8855f,w,s,su. ALLERGY (SPECIAL CLINICAL AND LABORATORY TECHNIQUES). Staff

M 8856f,w,s,su. CLINICAL HEMATOLOGY (SPECIAL CLINICAL AND LABORATORY TECHNIQUES). Staff

M 8857f,w,s,su. GASTROENTEROLOGY (SPECIAL CLINICAL AND LABORATORY TECHNIQUES). Staff

M 8858f,w,s,su. CARDIOVASCULAR DISEASES (SPECIAL CLINICAL AND LABORATORY TECHNIQUES). Staff

M 8859f,w,s,su. PERIPHERAL VASCULAR DISEASES (SPECIAL CLINICAL AND LABORATORY TECHNIQUES). Staff

M 8860f,w,s,su. NEPHROLOGY (SPECIAL CLINICAL AND LABORATORY TECHNIQUES). Staff

M 8861f,w,s,su. RHEUMATOLOGY (SPECIAL CLINICAL AND LABORATORY TECHNIQUES). Staff

M 8862f,w,s,su. THORACIC DISEASES (SPECIAL CLINICAL AND LABORATORY TECHNIQUES). Staff

M 8863f,w,s,su. INFECTIOUS DISEASES (SPECIAL CLINICAL AND LABORATORY TECHNIQUES). Staff

M 8864f,w,s,su. ENDOCRINOLOGY AND METABOLISM (SPECIAL CLINICAL AND LABORATORY TECHNIQUES). Staff

Psy M 8856f,w,s,su. CLINICAL PSYCHIATRY. Staff
Diagnostic and hospital services.

Neur M 8857f,w,s,su. CLINICAL NEUROLOGY. Staff
Diagnostic and hospital services.

HOSPITAL RESIDENCE IN NEUROLOGY. (See Neurology)

HOSPITAL RESIDENCE IN PSYCHIATRY. (See Psychiatry)

NECROPSY SERVICE. (See Pathology)

HEMATOLOGY. (See Pathology)

RESEARCH WORK ON SELECTED PROBLEMS IN PHYSIOLOGY. (See Physiology)

BIOCHEMISTRY. (See Biochemistry)

Fellows majoring in internal medicine may also take work in biophysics, dermatology, pediatrics, and physical medicine and rehabilitation. For details, see these departments.

MICROBIOLOGY (MicB)

OFFERED AT MINNEAPOLIS

Professor

Dennis W. Watson, Ph.D., *head*
Robert W. Bernlohr, Ph.D.
Gerhard K. Brand, M.D.
Francis Busta, Ph.D.
Martin Dworkin, Ph.D.
V. William Greene, Ph.D.
Wendell H. Hall, M.D., Ph.D.
Howard M. Jenkin, Ph.D.
Robert K. Lindorfer, Ph.D.
Charles F. McKhann, M.D.
Palmer Rogers, Ph.D.
Edwin L. Schmidt, Ph.D.
Henry M. Tsuchiya, Ph.D.
Lewis W. Wannamaker, M.D.
Horace Zinneman, M.D.

Associate Professor

Peter G. W. Plagemann, Ph.D., *director of graduate study*
Dwight L. Anderson, Ph.D.
Peter J. Chapman, Ph.D.
Beulah H. Gray, Ph.D.
Russell C. Johnson, Ph.D.
John M. Matsen, M.D.
Gerald M. Needham, Ph.D.
James T. Prince, M.S.

Assistant Professor

P. Paul Cleary, Ph.D.
Arthur Y. Elliott, Ph.D.
Dolph Klein, Ph.D.
William F. Liljemark, D.D.S., Ph.D.
Larry McKay, Ph.D.
Jon R. Schmidtke, Ph.D.
Lea Sekely, Ph.D.
James F. Zissler, Ph.D.

Lecturer

Henry Bauer, Ph.D.
Donna J. Blazevic, M.P.H.
Grace M. Ederer, M.S.
Alan B. Hooper, Ph.D.
Alfred G. Karlson, D.V.M., Ph.D.
Richard Simmons, M.D.

Language Requirement—For the Master's degree, none. For the Ph.D. degree, either (a) a collateral field of knowledge as outlined by the graduate faculty in microbiology or (b) a high level of proficiency in one foreign language.

Master's Degree in Microbiology—Offered under Plan A.

Doctor's Degree in Microbiology—Work leading to the Ph.D. degree is offered.

Master's Degree in Medical Microbiology—Offered under Plan B, the program is for students interested in a career and supervisory role in clinical diagnostic microbiology. The program includes major and minor course work and a number of preceptorships (see MicB 8239 and 8240) in various diagnostic microbiology laboratories of area hospitals affiliated with the University Medical School. Satisfactory completion of a practical examination and the examination for the American Academy of Microbiology Registry are required as partial fulfillment of the degree.

5105f,w,s,su. BIOLOGY OF MICROORGANISMS.** (4 cr, §3103, §Biol 3013; prereq 5 cr in biological sciences, Chem 3302 or ‡) Dworkin, Chapman
Lectures, demonstrations, and laboratory exercises in taxonomy, anatomy, physiology, biochemistry, and ecology of microbes. Some emphasis on molecular structure in relation to bacterial function.

5201f. MICROBIOLOGY FOR DENTAL STUDENTS.** (6 cr) Anderson and staff
Nature and diversity of microorganisms; microbial structure and function; metabolism and growth; genetics and virology; principles of sterilization and disinfection; chemotherapy; host-parasite relationships; fundamentals of immunology; pathogenic bacteria, fungi, and viruses; ecology of oral microorganisms; microbiology of dental caries and periodontal diseases.

5205. MICROBIOLOGY FOR MEDICAL STUDENTS.** (6 cr; prereq regis md fr or grad) Brand and staff
Immunology, parasitology, mycology, and medical bacteriology, virology with emphasis on pathogenesis. Principles and techniques enabling diagnosis, treatment (especially chemotherapy), and prevention of infectious disease.

5206suI. MICROBIOLOGY FOR MEDICAL STUDENTS.** (4 cr)
(Continuation of 5205) Lecture and laboratory.

5216w. IMMUNOLOGY. (4 cr; prereq 3103 or 5105 or Biol 3013) Gray
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.

5218w. IMMUNOLOGY. (3 cr; prereq 3103 or 5105 or Biol 3013) Gray
Same as 5216 without laboratory.

5232s. MEDICAL MICROBIOLOGY.** (4 cr; not open to med students; prereq 5216) Klein
Pathogenic bacteria, fungi, and viruses with emphasis on mechanisms of pathogenicity and virulence; properties of microorganisms and their animal hosts which influence the rate of host-parasite relations analyzed from genetic and metabolic view. Includes laboratory.

5233f. 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.

** Microscope required. Students may obtain use of microscope by purchasing $3 microscope cards from the bursar.

5321w. PHYSIOLOGY OF BACTERIA. (3 cr; prereq 3103 or 5105 or Biol 3013...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 3021) 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 tumorigensis. Includes laboratory.

5612s. ECOLOGY OF SOIL MICROORGANISMS. (4 cr; prereq 3103 or 5105 or Biol 3013, ‡; offered 1974-75 and alt yrs) Schmidt
(Same as Soil 5612) Soil as a microhabitat; nature of microbial population of soil; interactions among microorganisms in soil ecosystem; significant activities of soil microorganism.

5970f,w,s. SPECIAL PROBLEMS. (Cr ar; prereq ‡)

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.

8112suII. MICROBIAL GENETICS. (2 cr; prereq ‡) Zissler
Genetics of microorganisms: mutation, recombination, control of phage and animal viruses.

8120f. MICROBIOLOGY LABORATORY.** (3 cr; prereq ¶8110 or ‡) Dworkin
Laboratory only; emphasizing isolation and description of variety of common and uncommon bacteria.

8122suI. ADVANCED MICROBIOLOGY.** (3 cr; prereq 5321, 5424 or ‡) Rogers
Experimentation in physiology, genetics, and virology.

8218f. IMMUNOCHEMISTRY AND IMMUNOBIOLOGY. (3 cr; prereq 5216, ‡) Schmidtke
Combination of 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

8237suI,II. METHODS IN CLINICAL MICROBIOLOGY—PART I. (6 cr; prereq ‡) Matsen, Klein, and staff
Lecture demonstrations and laboratory exercises in bacteriology, virology, mycology, parasitology, and serology, with emphasis on diagnostic procedures and their underlying scientific principles.

8238f. DIAGNOSTIC METHODS IN CLINICAL MICROBIOLOGY—PART II. (6 cr; prereq ‡) Matsen, Klein, and staff
Continuation of 8237.

8239w, 8240s. PRECEPTORSHIP IN MEDICAL MICROBIOLOGY. (6 cr; prereq ‡) Matsen, Klein, and staff
Working experience in participating diagnostic laboratories.

8242f,w,s. DIAGNOSTIC MICROBIOLOGY. (Cr ar; prereq grad student in microbiology, ‡) Matsen
Laboratory procedures for isolation and identification of microorganisms from patients. Work carried out in diagnostic microbiology laboratories of hospital.

** Microscope required. Students may obtain use of microscope by purchasing $3 microscope cards from the bursar.

8323f. REGULATION OF METABOLISM. (3 cr; prereq 5321, BioC 5748 or equiv or ‡) Bernlohr
Metabolic pathways of specific bacterial and mammalian cells, with emphasis on regulation. Energetics; catabolite repression; enzyme induction, repression and feedback inhibition; transport of pools, turnover, inborn errors of metabolism.

8425. LABORATORY METHODS, APPLIED ANIMAL CELL CULTURE AND VIROLOGY.** (3 cr prereq 5424 or ¶5424, ‡; offered when feasible) Staff
Laboratory exercises on preparation of animal cell cultures; study and laboratory diagnosis of viral and rickettsial infections.

8910f,w,s. SEMINAR. (1 cr; prereq ‡) Staff

8911f,w,s. COLLOQUIUM IN MICROBIOLOGY. (1 cr) Staff
Series of independent units, each lead 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) Watson, Schmidtke, and staff
Research seminars. Presentation of research or literature seminar required for credit.

8990f,w,s,su. RESEARCH IN MICROBIOLOGY. (Cr and hrs ar) Staff
Graduate students with requisite preliminary training may elect research project outside their thesis work.

MICROBIOLOGY

OFFERED AT ROCHESTER

Professor
R. E. Ritts, Jr., M.D., *chairman*
Alfred G. Karlson, D.V.M., Ph.D.

Associate Professor
Gerald J. Gleich, M.D.
Robert G. Krueger, M.S., Ph.D.
Harold Markowitz, M.D., Ph.D.
Frederic C. McDuffie, M.D.
Gerald M. Needham, Ph.D.
John A. Washington II, M.D.

Assistant Professor
William J. Martin, Ph.D.

Instructor
Glenn D. Roberts, M.S., Ph.D.
Thomas F. Smith, M.A., Ph.D.

Opportunities are offered for advanced work in microbiology (bacteriology, mycology, virology, immunology, parasitology). 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 2-year Master's degree program in medical microbiology is offered, and a 2-year accredited residency-fellowship in medical microbiology program is open to Ph.D.'s in microbiology and to physicians. Both programs satisfy the American Board of Microbiology requirements for certification at their respective levels.

M 8851f,w,s,su. CLINICAL MICROBIOLOGY AND IMMUNOLOGY. Staff
Experience in routine and special diagnostic laboratories of bacteriology, mycology, virology, and immunology.

** Microscope required. Students may obtain use of microscope by purchasing $3 microscope cards from the bursar.

M 8852f,w,s,su. EXPERIMENTAL MICROBIOLOGY AND IMMUNOLOGY. (Cr and hrs ar)
Graduate thesis research under supervision of staff.

M 8853f,w,s,su. LECTURES IN MICROBIOLOGY. Staff
Didactic presentation of selected topics in bacteriology, mycology, and virology. Weekly.

M 8854, 8855. IMMUNOLOGY. (2 cr per qtr) 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 8856. SEMINAR: IMMUNOLOGY. Staff
Current research in immunology and immunochemistry.

M 8857. MEDICAL MICROBIOLOGY. Staff

M 8858. SEMINAR: MICROBIOLOGY. Staff

NEUROLOGY (Neur)

OFFERED AT MINNEAPOLIS

Professor

Abe B. Baker, M.D., Ph.D., Regent's Professor, *head, director of graduate study*
Milton Alter, M.D., Ph.D.
Giovanni F. Ayala, M.D.
James F. Berry, Ph.D.
William E. Bradley, M.D.
Milton G. Ettinger, M.D.
George C. Flora, M.D.
Robert J. Gumnit, M.D.
William R. Kennedy, M.D., M.S.
Joseph A. Resch, M.D.
Joo Ho Sung, M.D.
Kenneth F. Swaiman, M.D.
Fernando Torres, M.D.
Arthur G. Waltz, M.D.
David D. Webster, M.D.

Clinical Professor

Harold H. Noran, M.D.
Sidney K. Shapiro, M.D.

Associate Professor

Harold P. Cohen, Ph.D.
Arthur C. Klassen, M.D.
Sping Lin, Ph.D.
Ruth B. Loewenson, M.D.
Angeline Mastri, M.D.
Francis S. Wright, M.D.

Assistant Professor

Lawrence A. Lockman, M.D.
Jerrold M. Milstein, M.D.
Alan Rubens, M.D.
Gerald W. Timm, Ph.D.

Master's and Doctor's Degrees—Excellent facilities are available for the M.S. (Plan A) and Ph.D. degrees in neurology. The minor may be elected in anatomy, pathology, physiology, or other laboratory fields. Under ordinary circumstances the fellowship runs for a period of 3 years, i.e., fulfilling the requirements of training for the American Board of Psychiatry and Neurology.

To fulfill the Ph.D. requirements, fellows in neurology must spend a minimum of 5 years (6 months to 1 year of which is spent in the basic minor field) in the program. The Master's degree may be earned in 3 years but usually requires an additional year.

Language Requirement—For the Ph.D. degree, reading knowledge of two foreign languages is required. Routinely acceptable languages are French, German, Italian, Russian, and Spanish.

8200f,w,s,su. CLINICAL NEUROLOGY. (Cr and hrs ar) Baker and staff

8201f,w,s,su. CLINICAL PEDIATRIC NEUROLOGY. (Cr and hrs ar) Swaiman and staff

8202f,w,s,su. RESEARCH IN NEUROLOGY. (Cr and hrs ar) Baker and staff

8203f,w,s,su. APPLIED ELECTROENCEPHALOGRAPHY. (Cr and hrs ar) Torres

8204f,w,s,su. APPLIED ELECTROMYOGRAPHY. (Cr and hrs ar) Kennedy

8205f,w,s,su. APPLIED NEUROPATHOLOGY. (Cr and hrs 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) Berry

8222f,w. APPLIED NEUROPHYSIOLOGY. (2 cr; offered every 3rd yr) Bradley

8223w,s. NEUROLOGICAL COMPLICATIONS OF INTERNAL DISEASE. (1 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)

8228f,w,s. NEUROGENETICS. (1 cr; prereq M.D., resident in neurology or ‡) Alter
Introduction to genetic principles and cytogenetic disorders related to the nervous system.

8229su. CLINICAL CORRELATIVE NEUROANATOMY. (1 cr)

8230s. INFECTIOUS DISEASES OF THE NERVOUS SYSTEM. (1 cr) Baker

8231f,w,s. ADVANCED CLINICAL NEUROLOGY. (1 cr) Baker and staff

8233f,w,s. NEUROLOGICAL CLINICAL PATHOLOGICAL CONFERENCE. (1 cr) Baker and staff

8234f,w,s. NEUROPSYCHOLOGY CONFERENCE. (1 cr) Meier

8235w. ADVANCED NEUROPSYCHOLOGY. (2 cr) Meier

8236f,w,s,su. RESEARCH IN NEUROPATHOLOGY. (Cr and hrs ar) Sung

8240f,w,s. SEMINAR: NEUROENGINEERING RESEARCH. (Cr and hrs ar; prereq ‡) Timm and staff
Research reports, engineering and medical approaches to organization, development, and function of the nervous system.

8241f,w,s. DERMATOGLYPHICS. (1 cr; prereq ‡) Alter, Schauman
Dermatoglyphic traits of clinical value, flexion creases, inheritance of dermatoglyphics, clinical applications of dermatoglyphic analysis, printing techniques.

8242su. NEUROLOGY FOR PSYCHOLOGISTS AND PSYCHIATRISTS. (4 cr) Bradley and staff
Introductory course in neurology to familiarize psychologists and psychiatrists with neurologic conceptualization of disease and define diagnostic approaches to diseases of the nervous system.

8701. NEUROOPHTHALMOLOGY. (2 cr; offered every 3rd yr) Baker

8702. NEURORADIOLOGY. (1 cr, §Rad 8110; offered alt yrs) Peterson

8703f,w. ADVANCED NEUROPATHOLOGY. (2 cr, §Path 8701; offered alt yrs) Sung

8704f,w,s,su. SURVEY OF NEUROPATHOLOGY. (1 cr, §Path 8702) Sung and staff

8705f,w,s,su. NEUROLOGICAL-NEUROSURGICAL CONFERENCE. (1 cr, §Surg 8318, §Rad 0124) Peterson, Baker

8706f. STIMULATION AND ELECTRODES. (3 cr, §EE 5951; prereq ‡; 3 lect hrs per wk) Timm and staff

8707w. ENERGY SOURCES FOR BIOMEDICAL APPLICATIONS. (3 cr §EE 5952; prereq ‡; 3 lect hrs per wk) Timm

NEUROLOGY

OFFERED AT ROCHESTER

Professor

Jack P. Whisnant, M.D., M.S., *chairman*
Joe R. Brown, M.D., M.S.
Frederic L. Darley, Ph.D.
Peter J. Dyck, M.D.
Andrew G. Engel, M.D.
Norman P. Goldstein, M.D., M.S.
Edward H. Lambert, M.D., M.S., Ph.D.
Clark H. Millikan, M.D.
Donald W. Mulder, M.D., M.S.
Joseph G. Rushton, M.D., M.S.
Robert G. Siekert, M.D., M.S.
Robert E. Yoss, M.D., Ph.D.

Associate Professor

Arnold E. Aronson, Ph.D.
Manuel R. Gomez, M.D., M.S.
Frank R. Howard, Jr., M.D.
Donald W. Klass, M.D.
E. Douglas Rooke, M.D., C.M., M.S.
Juergen E. Thomas, M.D., M.S.

Assistant Professor

James A. Bastron, M.D., M.S.
Robert C. Burton, M.D.
J. Keith Campbell, M.B.Ch.B.
Jerry G. Chutkow, M.D.
Allen J. D. Dale, M.D., M.S.
Jasper R. Daube, M.D., M.S.
Robert P. Dinapoli, M.D.
Drake D. Duane, M.D.
Raul E. Espinosa, M.D.
Jack D. Grabow, M.D.
Robert V. Groover, M.D.
William E. Karnes, M.D.
Donald D. Layton, Jr., M.D.
Manfred D. Muenter, M.D.
Burton A. Sandok, M.D.
Takehiko Yanagihara, M.D.

Instructor

Thomas J. Reagan, M.D.
Frank W. Sharbrough III, M.D.
J. Clarke Stevens, M.D.

Two types of residencies are available in neurology. The 3-year program in clinical neurology includes 6 quarters of clinical neurology divided between hospital and outpatient experience and 6 quarters of electives in the laboratory sciences and other fields related to neurology. A 4-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 who are available for consultation and guidance at all times. In the laboratory sciences and related fields, residents obtain experience in neuropathology, neuroanatomy, electroencephalography, electromyography, funduscopy, and physical medicine and rehabilitation. Experience in psychiatry may also be provided in the residency in neurology. In addition to practical experience, there is an organized series of lectures, conferences, and seminars in clinical neurology, neuroanatomy, neuropathology, neuroradiology, speech pathology, cerebrovascular disease, pediatric neurology, and selected topics in allied specialties. Sections on neurology are closely associated with other medical and surgical sections of the Mayo Clinic as well as with various clinical and research laboratories.

Language Requirement—For the Ph.D. degree, reading knowledge of two foreign languages.

Master's Degree—Offered only under Plan A.

Doctor's Degree—Work leading to the Ph.D. degree is offered.

M 8850f,w,s,su. DIAGNOSIS IN NEUROLOGY. Staff
Research. Seminar.

M 8852f,w,s,su. HOSPITAL RESIDENCE IN NEUROLOGY. Staff

M 8857. CLINICAL NEUROLOGY. Staff

M 8858f,w,s,su. BASIC NEUROLOGIC SCIENCES. Staff

M 8859f,w,su. NEUROLOGICAL DISEASES OF INFANTS AND CHILDREN. Staff

M 8860. ELECTROMYOGRAPHY. Staff

M 8861, 8862, 8863. NEUROLOGY CONFERENCE ON ELECTROENCEPHALOGRAPHY I, II, III. Klass
Introductory, intermediate, and advanced electroencephalography.

M 8864. NEUROLOGICAL DIAGNOSTIC ELECTROENCEPHALOGRAPHY. Klass
Continuation of M 8863.

NEUROANATOMY. (See Anatomy)

NEUROPATHOLOGY. (See Pathology)

NEUROPHYSIOLOGY. (See Phyisology)

NEUROOPHTHALMOLOGY. (See Ophthalmology)

NEUROSURGERY (NSur)

OFFERED AT MINNEAPOLIS

Professor
Shelley N. Chou, M.D., Ph.D., *acting head*
Lyle A. French, M.D., Ph.D.

Clinical Professor
Harold I. Buchstein, M.D., M.S.
Leonard A. Titrud, M.D., Ph.D.

Associate Professor
Edward L. Seljeskog, M.D., Ph.D.

Clinical Associate Professor
C. Norman Shealy, M.D.

Assistant Professor
Donald L. Erickson, M.D.

Clinical Assistant Professor
Paul S. Blake, M.D.
Robert L. Merrick, M.D., Ph.D.
Erich Wisiol, M.D.

Instructor
James I. Ausman, M.D., Ph.D.
Robert E. Maxwell, M.D.
Max Zarling, M.D.

Clinical Instructor
Donald L. Erickson, M.D.
John L. Seymour, 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 is for a minimum of 4 years; many of the trainees who obtain advanced degrees remain longer than this minimal requirement. The minimal period is adjusted to comply with the requirements for certification by the American Board of Neurological Surgery. At least 30 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 12-month period the trainee also takes lecture and laboratory work in neuroanatomy and neurophysiology so that reasonable competence in these fields is obtained.

More extensive training in basic sciences can be obtained in the fundamental laboratories of the Medical School, which offer numerous graduate courses related to neurological surgery (see statements of the Departments of Anatomy, Physiology, Pathology, 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 attended so that a well-

rounded clinical training is obtained through both didactic courses and practical clinical experience.

The Department of Neurological Surgery is closely associated in its training with the Department of General Surgery at the University and with the Section of Neurosurgery at the Mayo Clinic.

8305. NEUROSURGICAL DIAGNOSIS. (3 cr) Chou, French, and staff
The neurosurgical fellow assists in instruction of clinical clerks and interns and studies problems in diagnosis in University Hospitals.

8308. NEUROSURGICAL PROBLEMS AND MANAGEMENT. (4 cr) Chou, French, and staff
The neurosurgical fellow acts as house surgeon at University Hospitals.

8311. OPERATIVE NEUROSURGERY. (4 cr) Chou, French, and staff
The neurosurgical fellow acts as first assistant at operations in University Hospitals and later may be permitted to operate.

8316. NEUROSURGICAL RESEARCH. (3 cr) Chou, French, and staff
Problems in experimental or clinical surgery.

8318. NEURORADIOLOGICAL CONFERENCE. (1 cr) Chou, French, Seljeskog, and staff
Review of X-rays and case histories on neurosurgical service.

8320. NEUROSURGICAL CONFERENCE. (1 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

NEUROSURGERY

OFFERED AT ROCHESTER

Professor
Collin S. MacCarty, M.D., M.S., *chairman*
Frederick W. L. Kerr, M.D., M.S.

Associate Professor
Ross H. Miller, M.D., M.S.
Thoralf M. Sundt, Jr., M.D.

Assistant Professor
Edward R. Laws, Jr.
Burton M. Onofrio, M.D.

The development of excellence in surgery of the nervous system is the primary goal of this 4-year training program. It provides the background in the neurological sciences now necessary for the practice of surgical neurology and clinical neurosurgery and will allow the graduate to pursue a purely clinical, academic, or investigative career. This program, preceded by 12 months of general surgery, completes the requirement of the American Board of Neurological Surgery.

Surgical skill is developed first by assisting, 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, and electromyography. Competence in neuroradiology is developed through performance and through interpretation of a large number of contrast studies. Virtually all neuroradiologic contrast studies done at the Mayo Clinic are performed by the neurosurgical residents aided by a member of the neuroradiologic staff.

During the period in which the trainees are assigned to the basic sciences departments, they see pathology specimens obtained at necropsy and at surgery, attend neuroanatomy and neurophysiology lectures, and have an opportunity to work on a research problem leading to an advanced degree. The vast amount of material in the pathology museum, as well as the clinical records of patients with neurological disease, are available for residents who wish to carry out research problems in this phase.

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.** MacCarty, Miller, Kerr, Onofrio, Laws
Operative technique and study of special problems involved. Seminar. Residence.

M 8858f,w,s,su. **BASIC NEUROLOGIC SCIENCES.** Staff

NEUROANATOMY. (See Anatomy)

NEUROPATHOLOGY. (See Pathology)

ELECTROENCEPHALOGRAPHY. (See Neurology)

ELECTROMYOGRAPHY. (See Neurology)

NEUROPHYSIOLOGY. (See Physiology)

DIAGNOSIS IN NEUROLOGY AND PSYCHIATRY. (See Psychiatry and Neurology)

HOSPITAL RESIDENCE IN NEUROLOGY. (See Psychiatry and Neurology)

NECROPSY SERVICE. (See Pathology)

NEUROOPHTHALMOLOGY. (See Ophthalmology)

Residents in neurosurgery may also take work in general pathology, physiology, and general surgery. For details, see these departments.

NURSING (Nurs)

OFFERED AT MINNEAPOLIS

Professor

Isabel Harris, Ph.D., *dean, director of graduate study*
Florence J. Julian, M.N.A.
Barbara K. Redman, Ph.D.

Associate Professor

Florence Brennan, M.A.
Frances E. Dunning, M.Ed.
Ellen C. Egan, Ph.D.
Eugenia Taylor, M.A.

Assistant Professor

Marilyne R. Backlund, M.S.
Sheila A. Corcoran, M.Ed.
Ida M. Martinson, Ph.D.
Virginia A. Pidgeon, Ph.D.
Sharon L. Rising, M.S.N.
Alice Marilyn Sime, Ph.D.
Joan M. Tuberty, M.S.N.

Master's Degree—The program usually requires 5 to 6 quarters for completion. Candidates for admission must meet the general requirements for the master of science degree, Plan B, as listed in the General Information section of this bulletin. Approval of the student's planned program by the appropriate review committee of the Graduate School constitutes acceptance for candidacy for the degree.

Requirements for the Degree—Requirements fall in three areas, clinical nursing, related fields, and research, and include a minimum of 45 credits in

total (18 credits in clinical nursing, 18 credits in related fields, and 7 credits in nursing research). Plan B papers, involving 9 credits of independent investigation with faculty guidance, are required; a minimum of 3 credits of Plan B papers must be in nursing research. It is expected that many students will need to complete more than 45 credits in order to meet the program objectives. Each student, with his School of Nursing adviser, plans an individual program under which he meets the objectives of the M.S. program and of his personal goals. Petitions for alteration of School of Nursing degree requirements must be approved by the School of Nursing Student Scholastic Standing Committee.

The nursing major is designed to enable the student to meet the following objectives:

1. Demonstrate ability to develop human relationships characterized by mutual response and responsibility within professional situations. The skill expectation is that of the primary practitioner.
2. Experience one's self, expressed in such areas as biases, values, and potential, being conscious of the influence of one's behavior.
3. Engage in innovative problem solving that reflects:
   a. A refined identification and simple articulation of a problem.
   b. The utilization of several frames of reference.
   c. Discrimination of:
      (1) Frames of reference
      (2) Courses of action
      (3) Consequences
4. Recognize when change is appropriate and develop skills that result in changes which improve the health of people.
5. Formulate ideas characterized by:
   a. Relevance
   b. Refinement
   c. Orderliness
   d. Expanded knowledge base
   e. Originality
6. Demonstrate ability to identify a researchable nursing problem, to design and conduct a study, to evaluate and make increasingly discriminating use of research findings.
7. Demonstrate a course of action indicative of a self-directed learner.
8. Demonstrate an evolving and coherent personal nursing framework.

AREAS OF STUDY IN THE NURSING MAJOR

In the first year, the student selects *one* of three fields of concentration. In the second year, there are options in areas of nursing education, clinical nursing leadership, or advanced clinical nursing, plus potential for special combinations of these functional areas.

GENERAL PLAN OF PROGRAM

A. FIELDS OF CONCENTRATION IN CLINICAL NURSING—FIRST YEAR

Medical-Surgical Nursing—Emphasis is placed on the identification of characteristics of humanness and health, the effect of selected experiences on states

of health, and current and potential roles of nursing in assisting people toward optimal health goals.

Required: Nurs 8100, 8101, 8102 plus humanities and physiology

Psychiatric and Mental Health Nursing—The purpose of this field is to prepare a mental health nursing specialist who will have a sound foundation in the theory of mental illness and in the promotion of mental health. He will have studied and developed skills in therapy (one-to-one, group, and family therapy) collaborating with other professional and nonprofessional mental health workers, participating in the therapeutic milieu, and participating and intervening in community health planning and programs.

Required: Nurs 8200, 8201, 8202, 8203, 8204, course work in small group communication

Childbearing and Childrearing Family Nursing—The purpose of this field of concentration is to prepare clinical specialists who can directly or indirectly assist patient and family in their efforts to attain optimal health during the childbearing, childrearing, and childhood years. Includes core seminars, nursing process, and concentration in either childbearing or childrearing. The childbearing sequence emphasizes theory and clinical experience in the management of the care of the normal childbearing family and nursing care of high-risk mothers and infants. The childrearing sequence emphasizes the development of assessment and counseling skills in the provision of child health care and of nursing management of the health care of children with acute or chronic illness. It is anticipated that preparation for national certification in nurse-midwifery may be offered by 1975.

Required: Nurs 8300, 8301, 8302, plus
Either CBF: Nurs 8310, 8311, 8312, 8313, physiology, family development
(or) CRF: Nurs 8350, 8351, 8352, Soc 5505, CPsy 5331

B. SECOND YEAR OPTIONS

1. *Advanced Clinical Nursing*—This option allows for in-depth concentration in a particular clinical area of nursing chosen by the student in accordance with a special interest. Emphasis is on hypotheses generation and testing for the purpose of developing creative and critical approaches to nursing. This may include special roles such as adult health practitioner or nurse-midwifery.

Required: Nurs 8060 (9 cr minimum)

2. *Nursing Education* (see Related Fields below)—The purpose of study in nursing education is preparation for beginning faculty positions. Emphasis is on teaching in clinical laboratories and on working with individuals and groups. Graduate study in a field of concentration and foundational courses in educational theory provide the basis for study in nursing education. Practicum experiences are included, generally in associate degree and baccalaureate programs.

Required: Nurs 8500, 8501, 8502, PsyF 5120, PsyF 5141

3. *Clinical Nursing Leadership* (see Related Fields below)—This option includes courses and related field experience for nurses interested in effecting change in health care delivery; emphasis is on developing skills in assessing the climate and functioning systems within a nursing agency and on investigating means of influencing patient care services. Each student will be expected to determine individual goals and approaches to achieve these goals utilizing guidance of faculty and preceptors. Field experience in selected health care

agencies and seminar discussions as supportive to the learning process will be arranged.

Required: Nurs 8600, 8601, 8602, plus two supportive courses (6 cr) related to organization theory, change process, or communication.

4. *Special combinations* of the above second-year options may be arranged—Nurs 8508 (4 cr) plus Nurs 8060 have been used in this way.

5. Another possibility is for a student to select course work from a second field of concentration with faculty permission.

C. RESEARCH

This component of the nursing major includes required course work plus 9 credits in Plan B papers involving independent investigation; of these 9, at least 3 credits must be in nursing research. The student contracts with a graduate faculty member for each Plan B paper. A statistics course is required unless the student can demonstrate adequate knowledge of statistics; this would involve exceeding the minimum number of credits.

Required: Nurs 8021, 8050, and knowledge of statistics

D. RELATED FIELDS

The School of Nursing graduate faculty places high value on the Graduate School requirement of related fields for greater breadth of study. A minimum of 18 credits must be taken in at least *two* related fields, with a minimum of 6 credits in each. Courses from different disciplines may constitute a related field if their content relationship can be substantiated.

One of the related fields may be one of the School of Nursing second-year options of nursing education or clinical nursing leadership. The rationale for this is that the focus of these options is on education and leadership.

8009. SPECIAL TOPICS IN NURSING. (Cr ar)

8010. PROBLEMS IN PHYSIOLOGY. (2-6 cr; prereq △)

8020. FOUNDATIONS OF NURSING. (3 cr)
Critical examination of theory, its generation, and its significance for nursing. Analysis of interrelationships of basic science theory, nursing theory, nursing science, nursing practice, nursing research and philosophy.

8021. RESEARCH IN NURSING. (3 cr)
Exploration of needs for research and discussion of possible ways in which selected research efforts might be undertaken.

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.

8060. ADVANCED CLINICAL NURSING. (3-9 cr; prereq 8102 or 8203 or 8302 and 8313 or 8302 and 8352)
Hypothesis generation and testing in general nursing for the purpose of developing creative and critical approaches to nursing.

8062. SEMINAR: INTERDISCIPLINARY HEALTH. (3 cr)
Exploration of relationship of health care to goal of health.

8063. NURSING CONSULTATION. (3 cr)
Study and practice in consultation in nursing care.

8100. NURSING ASSESSMENT FROM A GROWTH-ORIENTED PHILOSOPHY. (6 cr; prereq advanced physiology, humanities)
General concepts of man, health, and nursing.

8101. CRISIS EXPERIENCE: NURSING ASSESSMENT AND INTERVENTION. (6 cr; prereq 8100)
Crisis experiences; effects of man's states of health and nursing intervention.

8102. ASSISTING GROUPS TO IMPROVE THEIR HEALTH. (6 cr; prereq 8101)
Utilizing assessment and change processes to assist a group to improve its health status.

8200. FOUNDATIONS OF PSYCHIATRIC NURSING. (3 cr; prereq 8020 or ¶8020)
Concepts and criteria for mental health. Societal influence upon development of psychiatric nursing and care and treatment of the mentally ill.

8201. PSYCHIATRIC NURSING—INDIVIDUAL PATIENTS. (8 cr; prereq 8200)
Nurse-patient relationships; examination of effective and ineffective interpersonal relationships. Supervised clinical experience with individual patients, planning dynamic nursing care, and participation on interdisciplinary team.

8202. PSYCHIATRIC NURSING—GROUPS OF PATIENTS. (3 cr; prereq 8201)
Supervised experience working with groups. Concepts of development, leadership, cohesiveness, goals, and functions of therapeutic groups. Use of various group methods in meeting therapeutic goals.

8203. PSYCHIATRIC NURSING—COMMUNITY. (4 cr; prereq 8202)
Community mental health problems, community resources, and psychiatric nurse's role in the community.

8204. PSYCHOPATHOLOGY. (3 cr; prereq ¶8201)
Eclectic approach to dynamics of mental illness.

8300-8301-8302. CHILDBEARING AND CHILDREARING FAMILY NURSING. (2 cr per qtr; prereq or ¶family development course work)
Core seminars: Consideration of physiological changes and attainment of parental roles during childbearing cycle; neonatal assessment and infant development reactions of families to various stresses of childbearing and childrearing; experience following family through childbearing and early childrearing cycle.

8310. CARE OF THE CHILDBEARING FAMILY I. (3-4 cr; prereq 8300, physiology, Soc 5505 or ¶8300, ¶physiology, ¶Soc 5505)
8310-8311-8312 taught in a series of 3 quarters which emphasize nursing care and management of basically healthy childbearing family unit. Through theoretical and clinical components, involvement in family planning, antepartum, intrapartum, and postpartum care and management, newborn care and assessment, and group leadership. Besides clinical experiences in all areas, students carry small number of childbearing families throughout the year for continuity of nursing care and management. Group and individual conferences focus on an analysis of nurse-patient interaction and its effect on care. Course credits are negotiable between student and faculty and are based on long-term goals and previous clinical experience of student.

8311. CARE OF THE CHILDBEARING FAMILY II. (3-5 cr; prereq 8310, 8301 or ¶8301)
See description for 8310.

8312. CARE OF THE CHILDBEARING FAMILY III. (5-6 cr; prereq 8311, 8302 or ¶8302 or ‡)
See description for 8310.

8313. CARE OF THE CHILDBEARING FAMILY IN RISK. (4-6 cr; prereq 8302, physiology, ‡)
Problems encountered during perinatal period, with emphasis on nursing care of mothers and babies with medical complications. Toxemia, diabetes, Rh disease, respiratory distress syndrome are some of the topics covered. Socio-economic problems, battering and neglect, unsual psychological stress. Clinical experience with complex medical cases involving mothers, newborns in intenisve care, and families experiencing social and/or economic deprivation.

8314. NURSE-MIDWIFERY MANAGEMENT DURING CHILDBEARING. (9-10 cr; prereq 8313 and ‡)
For students wanting to complete requirements for nurse-midwifery certification. Emphasis on labor and delivery management with opportunity to improve skills throughout childbearing period. To assure availability for clinical experiences, the student is encouraged to elect a minimum of other courses during this quarter.

8350. CHILDREARING FAMILY IN HEALTH I. (3 cr; prereq Soc 5505, CPsy 5331, 8300 or ¶8300 or ‡)
Developmental and health needs of infants and preschool children and the early stages of parenthood. Experience in observation of parent-child interaction, identification of health needs of infants and children, and parental counseling.

8351. CHILDBEARING FAMILY IN HEALTH II. (3 cr; prereq Soc 5505, CPsy 5331, 8301 or ¶8301 or ‡)
Developmental and health needs of schoolage children and adolescents and later stages of parenthood. Experience in identification of health needs of schoolage children and adolescents and participation in the provision of health care to a particular age group.

8352. CHILDBEARING FAMILY IN ILLNESS. (6 cr; prereq Soc 5505, CPsy 5331, 8302 or ¶8302 or ‡)
Impact of illness on the child and his family and role of the nurse in supporting their coping with the situation and in providing short- and long-term care. Experience in planning and caring for sick children and their families over time in the hospital and other settings.

8500. NURSING EDUCATION IN THE UNITED STATES. (3 cr; prereq ¶PsyF 5151 or ¶PsyF 8502)
Educational programs in nursing within higher educational institutions. Relationship between professional and liberal education.

8501. INSTRUCTION IN NURSING. (6 cr; prereq 8500)
Role of teacher in a clinical setting; use of resources of clinical area; selected experiences in a school of nursing.

8502. EVALUATION IN NURSING EDUCATION. (3 cr; prereq 8501)
Evaluation of student learning based on learning objectives.

8508. TEACHING-LEARNING PROCESS IN CLINICAL PRACTICE. (4 cr; prereq 2nd-yr grad student or ‡)
Teaching-learning process in nursing and beginning skill through supervised practice in health care setting.

8509. SPECIAL TOPICS IN NURSING EDUCATION. (Cr ar)

8550. PROBLEMS IN NURSING EDUCATION. (1-9 cr; preq ‡)
Individual study of a problem.

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 in these institutions.

8601. CLINICAL NURSING LEADERSHIP I. (6 cr; prereq 8600)
Clinical practice involving extension of patient assessment in 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 for purpose of creating more positive approaches to care of individuals.

8602. CLINICAL NURSING LEADERSHIP II. (3 cr; prereq 8601)
Clinical practice involving extension of patient assessment in various health care institutions, working with and through others to achieve patient care goals.

8609. SPECIAL TOPICS IN NURSING SUPERVISION. (Cr ar)

NUTRITION (Nutr)

OFFERED AT MINNEAPOLIS AND ST. PAUL

Professor

Robert J. Meade, (Animal Science), *chairman*
Joseph T. Anderson, (Physiological Hygiene), *vice chairman*
Donald E. Otterby (Animal Science), *director of graduate study*
Charles F. Code (Mayo Foundation, Rochester)
John D. Donker (Animal Science)
Margaret D. Doyle (Food Science and Nutrition)
Clifford F. Gastineau (Mayo Foundation, Rochester)
Robert L. Glass (Biochemistry, Biological Sciences)
Richard D. Goodrich (Animal Science)
Joan Gordon (Food Science and Nutrition)
Francisco Grande (Physiological Hygiene)
Lester E. Hanson (Animal Science)
LaVell M. Henderson (Biochemistry, Biological Sciences)
Ancel Keys (Physiological Hygiene)
Theodore P. Labuza (Food Science and Nutrition)
Irvin E. Liener (Biochemistry, Biological Sciences)
Jay C. Meiske (Animal Science)
Lura M. Morse (Food Science and Nutrition)
Max O. Schultze (Biochemistry, Biological Sciences)
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

Patrick J. Hegarty (Food Science and Nutrition)
John D. Smith (Animal Science)
George M. Speers (Animal Science)
Ruth E. Stief (Public Health)

Assistant Professor

James D. Jones (Mayo Foundation, Rochester)
Ralph A. Nelson (Mayo Foundation, Rochester)

Prerequisites—A strong foundation in biological sciences including 1 quarter of microbiology, college mathematics through calculus, the equivalent of a year of general chemistry, a year of organic chemistry, a course in quantitative analysis, and a minimum of 2 quarters of college physics. Deficiences must be removed before students can become candidates for a degree. For minor work, students must satisfy the nutrition graduate faculty that they have an adequate background.

Language Requirements—No foreign language is required for the M.S. or Ph.D. in nutrition. However, an individual adviser may specify one or two foreign languages for a student's program. Students wishing to have proficiency in a foreign language recorded on their transcript must pass the Graduate School Foreign Language Test or be certified as proficient by the appropriate language department.

Master's Degree—Offered under Plan A and Plan B.

Doctor's Degree—For a major study, students will be required to develop and demonstrate a general competence in nutrition, including a comprehensive knowledge of basic biochemistry and statistics. In addition, students will be 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 (a) human nutrition, (b) nonruminant nutrition (laboratory rat, swine, and poultry), or (c) ruminant nutrition. General competence in nutrition will be required of students with a nutrition minor.

Note—The following is a list of courses from which selections for major and minor programs are commonly made; other courses are also available. Detailed descriptions of all courses can be seen in the course lists of the indicated departments.

AnSc 8420.* ENERGY IN ANIMAL NUTRITION. (3 cr; prereq BioC 5002 or equiv or ‡...BioC 5743 recommended; offered 1974-75 and alt yrs)

AnSc 8421.* PROTEIN AND AMINO ACID NUTRITION. (3 cr; prereq BioC 5002 or equiv or ‡...BioC 5743 recommended; offered 1974-75 and alt yrs)

AnSc 8422.* VITAMIN NUTRITION. (3 cr; prereq BioC 5002 or equiv or ‡...BioC 5742 recommended; offered 1973-74 and alt yrs)

AnSc 8423.* MINERAL NUTRITION. (3 cr; prereq BioC 5002 or ‡...BioC 5742 recommended; offered 1974-75 and alt yrs)

AnSc 8440.* RUMINANT NUTRITION. (3 cr; prereq BioC 5002 or ‡...MicB 5321 recommended; offered 1974-75 and alt yrs)

AnSc 8740. CONCEPTS AND DEVELOPMENTS IN RUMINANT NUTRITION. (2 cr; prereq ‡)

AnSc 8741. CONCEPTS AND DEVELOPMENTS IN AVIAN NUTRITION. (2 cr; prereq ‡; offered 1974-75 and alt yrs)

AnSc 8742. CONCEPTS AND DEVELOPMENTS IN SWINE NUTRITION. (2 cr; prereq ‡; offered 1974-75 and alt yrs)

AnSc 8840x.* RESEARCH: ANIMAL NUTRITION. (Cr ar; prereq ‡)

BioC 5741f-5742w-5743s. GENERAL BIOCHEMISTRY. (3 cr per qtr; prereq ¶5745-5746 except with △, Chem 3303, 5501 or 5520 or equiv, or ¶Chem 5501 or ¶5520 or ‡)
Same as MdBc 5741-5742-5743.

BioC 5745-5746. GENERAL BIOCHEMISTRY LABORATORY. (3 cr per qtr; prereq ¶5741-5742, cr in analytical chemistry, ‡)

BioC 5747. ADVANCED BIOCHEMICAL TECHNIQUES. (3 cr; prereq 5746, ¶5743, ‡) Staff

BioC 8225. TRACER TECHNIQUES. (3 cr; prereq 5743, 5746 or MdBc 5750, ‡)

BioC 8271. VITAMINS. (3 cr; prereq 5743 or ‡) Schultze

FScN 5100. GENERAL SEMINAR. (1 cr; prereq sr or ‡)

FScN 5621. READINGS IN NUTRITION. (2 cr; prereq 5622)

FScN 5622. HUMAN NUTRITION. (5 cr; prereq 1602, BioC 5002, Phsl 3051 or ‡)

FScN 5642. FIELD EXPERIENCE IN COMMUNITY NUTRITION. (3-18 cr; prereq course in human nutrition and ‡)

FScN 5662. CLINICAL NUTRITION. (5 cr; prereq 5622, BioC 5002 or ‡)

FScN 5664. FIELD EXPERIENCE IN CLINICAL NUTRITION. (3-18 cr; prereq course in human nutrition and ‡)

FScN 8101. RESEARCH SEMINAR. (1 cr; prereq ‡)

FScN 8205. GENERAL SEMINAR. (1 cr; prereq ‡)

FScN 8621. INDEPENDENT STUDY: NUTRITION. (1-5 cr; prereq ‡)

FScN 8622-8623. ADVANCED HUMAN NUTRITION I AND II. (5 cr per qtr; prereq 5622, BioC 5002 or MdBc 5101 or equiv and ‡)

Nutr 8745. SEMINAR. (1 cr [may be repeated for cr]; prereq ‡) Staff

PubH 5380. APPLIED HUMAN NUTRITION. (3 cr; prereq ‡) J Anderson, Stief

NUTRITION

OFFERED AT ROCHESTER AND AT ST. PAUL

Professor

Charles F. Code, M.D., Ph.D.
Clifford F. Gastineau, M.D., Ph.D.

Associate Professor

Harry N. Hoffman II, M.D.

Assistant Professor

Ralph A. Nelson, M.D., Ph.D., *head*
James D. Jones, Ph.D.

Mayo Graduate School of Medicine annually offers fellowships for study in nutrition and dietetics. Holders of these fellowships are able to obtain graduate credit in courses which may be applicable to an advanced degree in the fields of home economics (emphasizing nutrition) and nutrition. The fellowships are offered to provide opportunities that will qualify dietitians for positions in metabolic research, clinical dietetics, and teaching. Supervision is by the faculty of the Mayo Graduate School in medicine, physiology, and biochemistry. The clinical, laboratory, and research facilities of the Mayo Graduate School, the Mayo Clinic, and St. Marys Hospital are available for training and research.

Applicants for the fellowship program must concurrently apply for admission to the Graduate School of the University of Minnesota if they wish to be considered as potential candidates for a Master's degree. Failure to be accepted as a candidate for an advanced degree will not necessarily rule out the possibility of holding a 1-year fellowship in nutrition and dietetics.

The fellow's 1-year program at Rochester has considerable flexibility and is planned individually with the candidate. It usually includes the majority of the courses listed below.

Upon completion of the fellowship program at Rochester, the student who desires an advanced degree must plan for further study on the Twin Cities Campus of the University of Minnesota. Degree programs must conform to the general requirements for advanced degrees as stated in the current *Graduate School Bulletin.*

The minor or related fields usually chosen are in such fields as biochemistry, education, physiology, or public health. The work in residence on the Twin Cities Campus generally follows the fellow's 1-year program in Rochester, although in certain cases some work on the Twin Cities Campus might be advised in advance of the year of study at Rochester. If research or teaching assistantships are not available for the period of study on the Twin Cities Campus, the Mayo Graduate School fellowship will be continued, provided the fellow's progress in the program is satisfactory.

Prerequisites—A B.S. degree and a completed dietetic internship approved by the American Dietetic Association.

FScN M 5373. METABOLIC BASIS FOR THERAPEUTIC NUTRITION. (4 cr; prereq ¶5393 or ‡) M Jones
Physiological and biochemical basis for dietary treatment; exploration of dietary principles as related to adequate nutrition. Dietary case presentation.

FScN M 5391. NUTRITION TOPICS. (1 cr; prereq 5361) Jones

FScN M 5393. CLINICAL PROBLEMS IN NUTRITION. (2 cr; prereq HE 5361 or equiv; offered at St. Marys Hospital in Rochester)

FScN M 8371. ADVANCED DIET THERAPY WITH CLINICAL EXPERIENCE. (4 cr; prereq HE 5371 or equiv, ‡; offered at St. Marys Hospital in Rochester)
Three months in clinical dietetics; daily hospital rounds with the medical staff, planning of therapeutic diets for various diseases, and responsibility for providing dietetic treatment for patients on one clinical service. Work is under supervision of a section of medicine and the Department of Dietetics, St. Marys Hospital. Lectures and conferences.

FScN M 8373. HUMAN METABOLIC STUDIES IN HEALTH AND DISEASE. (4 cr; prereq HE 5371 or equiv; offered at Rochester) Goldsmith, Nelson
Three months in a metabolic unit affords opportunity to learn principles, procedures, and dietary techniques employed in conducting research studies of a metabolic nature; experience and responsibility in planning and executing such studies. Work is supervised by the Departments of Medicine and Physiology. Conferences and group discussions.

M 8851f,w,s,su. RESEARCH IN BASIC NUTRITION OR METABOLISM. Code, Gastineau, Feldt, Goldsmith, Jones, Kottke, Molnar, Nelson, Palumbo, Wahner
Research project concerned with a problem in human or animal nutrition or with physiologic or biochemical nutritional problems.

M 8852f. CURRENT CONCEPTS IN APPLIED NUTRITION. (2 cr) Nelson

M 8864f,w,s,su. ENDOCRINOLOGY AND METABOLISM. Gastineau, Nelson
Obesity clinic, seminar, and biweekly discussions of endocrine problems (along with medical fellows).

OBSTETRICS AND GYNECOLOGY (Obst)

OFFERED AT MINNEAPOLIS

Professor

John J. Sciarra, M.D., Ph.D., *head, director of graduate study*
Takashi Okagaki, M.D., Ph.D.
Konald A. Prem, M.D.
A. Elmore Seeds, M.D.

Associate Professor

Leon L. Adcock, M.D.
Harry Foreman, M.D.

Assistant Professor

Edward C. Hanish, Jr., M.D.
George E. Tagatz, M.D.

Language Requirement—For the Ph.D. degree, either (a) two foreign languages or (b) one foreign language and the option of a collateral field of knowledge. Routinely acceptable languages are French, German, and Spanish.

Master's Degree—Offered only under Plan A.

Doctor's Degree—Work leading to the Ph.D. degree is offered.

5241. FAMILY PLANNING ADMINISTRATION. (3 cr; prereq ‡) Foreman
Planning, operation,and administration of publicly funded family planning programs.

5242. COMMUNITY OBSTETRICS, MATERNAL AND CHILD CARE. (3 cr; prereq ‡) Foreman, Freeman, Lyons, and staff
Social aspects of maternal and child care, preventive aspects, public funding; sterilization, abortion, venereal disease, pre- and postnatal care.

5244. POPULATION POLICIES AND PROGRAMS. (3 cr; prereq ‡) Foreman
Potential and operational approaches to alleviate population pressures in societies both in developed and lesser developed regions of the world.

5245. HISTORY AND DEVELOPMENT OF FAMILY PLANNING. (3 cr; prereq ‡) Foreman
Family planning programs over the world (including the U.S.) that have been instituted to meet family health needs as well as to alleviate population pressures.

8201-8202-8203-8204. ADVANCED OBSTETRICS AND GYNECOLOGY. (Cr ar; required of 1st-yr fellows)
Includes service in the University of Minnesota Affiliated Hospitals (University, Hennepin County General, St. Josephs, St. Marys, and Fairview Hospitals and Metropolitan 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.

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

David G. Decker, M.D., M.S., *chairman*
Edward A. Banner, M.D., M.S.
Joseph H. Pratt, M.D., M.S.
Richard E. Symmonds, M.D., M.S.
Robert B. Wilson, M.D., M.S.

Associate Professor

Leonard A. Aaro, M.D., M.S.
Carl E. Johnson, M.D., M.S.
Roger D. Kempers, M.D., M.S.
George D. Malkasian, M.D., M.S.
M. Elizabeth Mussey, M.D., M.S.
Reginald A. Smith, M.D., M.S.
John S. Welch, M.D., M.S.
Tiffany J. Williams, M.D.

Assistant Professor

Edward O. Jorgensen, M.D.
Raymond A. Lee, M.D., M.S.
Richard S. Sheldon, M.D., M.S.

Instructor

Carolyn B. Coulam, M.D., M.S.
Charles R. Fish, M.D.
Maurice J. Webb, M.B.B.S.

Opportunity is available for extensive experience in diagnosis and treatment of gynecologic diseases and obstetrics. Studies in basic sciences are incorporated

during the period of clinical training. Experience in operative surgery is obtained in gynecologic surgical sections. Seminars and conferences are held regularly.

Through special arrangements each resident is assigned for a period of 6 months to the Cook County Hospital in Chicago, Illinois, to receive special training in obstetrics.

An appointment for advanced training in gynecologic surgery is offered approximately every 2 years to an individual who has completed a residency in obstetrics and gynecology.

Language Requirement—For the Ph.D. degree, either (a) two foreign languages or (b) one foreign language and the option of a collateral field of knowledge.

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. Staff
Principally in relation to obstetrics and gynecologic conditions. Research. Seminar.

M 8852f,w,s,su. CLINICAL OBSTETRICS AND GYNECOLOGY. Staff
Diagnosis and treatment with special study of selected obstetric and gynecologic cases. Residence. Seminar.

M 8853f,w,s,su. OPERATIVE SURGERY. Pratt, Welch, Symmonds, Williams, Lee

ANATOMY FOR GENERAL SURGEONS. (See Anatomy)

SURGICAL AND FRESH TISSUE PATHOLOGY. (See Pathology)

Students majoring in obstetrics and gynecology may also take work in physiology, radium therapy, urology, and anesthesiology. For details, see these departments.

OPHTHALMOLOGY (Opth)

OFFERED AT MINNEAPOLIS

Professor

John E. Harris, M.D., Ph.D., *head, director of graduate study*

Clinical Professor

Robert H. Monahan, M.D.
John P. Wendland, M.D., M.S.

Associate Professor

David E. Eifrig, M.D.
William L. Fowlks, Ph.D.
William Knobloch, M.D.
Robert D. Letson, M.D.
William B. Rathbun, Ph.D.

Clinical Associate Professor

Llewellyn E. Christensen, M.D.
Robert R. Cooper, M.D.
Walter L. Hoffman, M.D., M.S.
Richard C. Horns, M.D., M.S.
Bourne Jerome, M.D.
Douglas L. Johnson, M.D.
Sidney Nerenberg, M.D.
George Tani, M.D., M.S.

Assistant Professor

Donald J. Doughman, M.D.

Graduate work in the field of ophthalmology is open to qualified physicians who wish to prepare themselves for the private practice of this specialty or to gear their training toward a career of teaching or research in the basic science or clinical aspects of ophthalmology. The wide variety of ophthalmologic problems presented at the University Hospitals, Hennepin County General Hospital, St. Paul-Ramsey Hospital in St. Paul, and the Veterans Hospital in Minneapolis provides an excellent core for clinical training and insures adequate surgical

experience for each individual fellow. The department's laboratory facilities and its staff are available to all for research in basic or clinical studies of the specialty. Regardless of ultimate aim, all fellows spend a period of time in the laboratory familiarizing themselves with the research problems of ophthalmology. Those wishing to prepare themselves for teaching and research in ophthalmology are provided additional opportunities for training along these lines.

Master's Degree—Work toward the Master's degree is provided in the department. Individuals who desire such a degree are encouraged but not required to take an additional year of training. Minor fields for the Master's degree are taken in one of the basic science disciplines by special arrangement with the department involved. Partciular emphasis is given to such fields as physiology, biophysics, biochemistry, microbiology, etc. The Master's degree is offered only under Plan A.

Doctor's Degree—A Ph.D. degree is offered in ophthalmology, however, individuals desiring the Ph.D. are encouraged to take it in one of the basic sciences, doing their research on some ophthalmologic problem appropriate to their major subject.

The listed course work is required of all graduate students whether they are working toward a degree or not. Opth 8101, 8131, 8141, and 8151 are offered on a continuing basis throughout the 3-year program. Opth 8151 covers the basic subjects of physiology, biophysics, biochemistry, pharmacology, etc., as they apply to the practice of ophthalmology. The remainder of the courses (with the exception of Opth 8142, 8153, and 8154) are presented once during the 3-year program.

8101f,w,s,su. CLINICAL OPHTHALMOLOGY. (6 cr) Harris and staff

8102s,f. EXTERNAL DISEASES. (1 cr) Wendland and staff

8103f,w,s. MEDICAL OPHTHALMOLOGY. (1 cr) Nerenberg

8104s. RADIOLOGY OF THE EYE, ORBIT, AND HEAD. (1 cr) Peterson

8106. STRABISMUS MANAGEMENT. (1 cr) Letson

8107su. OCULAR ANATOMY. (1 cr; prereq regis med fellow in ophthalmology residency training program)

8121f. REFRACTION. (1 cr) Tani

8122w,s. PHYSIOLOGIC OPTICS. (1 cr) Ellingson, Jerome

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

8132. DIDACTIC OCULAR SURGERY. (1 cr) Eifrig

8141f,w,s. OCULAR PATHOLOGY CONFERENCE. (1 cr) Monahan and staff

8142. OPHTHALMIC PATHOLOGY LABORATORY. (2 cr) Monahan and staff

8143f,w. PATHOLOGY OF THE EYE. (1 cr) Monahan and staff

8151f,w,s,su. BASIC AND APPLIED OPHTHALMOLOGY. (2 cr) Harris and staff

8152. OPHTHALMOLOGY LABORATORY. (9 cr) Harris and staff

8153. RESEARCH IN OPHTHALMOLOGY. (Cr ar) Harris and staff

8154. SEMINAR: OPHTHALMOLOGY. (Cr ar) Harris and staff

8701f,w,s. NEUROOPHTHALMOLOGY. (1 cr) Wendland, Baker, and staff

OPHTHALMOLOGY

OFFERED AT ROCHESTER

Professor

John W. Henderson, M.D., M.S., *chairman*
Robert W. Hollenhorst, M.D., M.S.
Thomas P. Kearns, M.D., M.S.

Associate Professor

John A. Dyer, M.D., M.S.
Theodore G. Martens, M.D., M.S.

Assistant Professor

Paul G. Belau, M.D., M.S.
Richard F. Brubaker, M.D.
Thomas J. Kirby, Jr., M.D., M.S.
Roger W. Neault, M.D., M.S.
Fenwick C. Riley, M.D.
Dennis M. Robertson, M.D., M.S.

Instructor

James C. Trautmann, M.D.
Robert R. Waller, M.D.

Residents majoring in ophthalmology receive practical experience in diagnosis and treatment of diseases of the eye under supervision of full-time staff members. Departmental seminars and conferences are held throughout the year. Studies in related laboratory sciences and ophthalmic research are available.

Language Requirements—For the Ph.D. degree, either (a) two foreign languages or (b) one foreign language and the option of a collateral field of knowledge.

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 OPHTHALMIC MYOLOGY. Martens, Dyer, Belau, Ludes
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. CLINICAL OPHTHALMOLOGY. Brubaker, Henderson, Kirby, Neault, Robertson, Waller
Diagnosis and treatment of diseases of the eye and its adnexa.

M 8853f,w,s,su. MEDICAL AND NEUROLOGIC OPHTHALMOLOGY. Hollenhorst, Kearns, Riley, Trautmann
Ophthalmology and ophthalmoscopy as they pertain to the fields of internal medicine and neurology.

M 8854f,w,s,su. OPHTHALMIC SURGERY. Brubaker, Henderson, Neault, Robertson, Waller
A 9-month hospital service.

ANATOMY OF THE ORBIT. (See Anatomy)

PATHOLOGY OF THE EYE. (See Pathology)

ORAL BIOLOGY (OBio)

OFFERED AT MINNEAPOLIS

Professor

Burton L. Shapiro, D.D.S., M.S.D., Ph.D., *chairman, director of graduate study*
Wallace D. Armstrong, M.D., Ph.D.
Robert J. Gorlin, D.D.S., M.S.
Robert J. Isaacson, D.D.S., M.S.D., Ph.D.
Lawrence H. Meskin, D.D.S., M.S.D., M.P.H., Ph.D.
Quenton T. Smith, M.S., Ph.D.
Carl J. Witkop, D.D.S., M.S.

Associate Professor

Robert S. Redman, D.D.S., M.S.D., Ph.D.

Oral biology is the study of the oro-facial 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 thus prepare them for employment in dental schools, oral research centers, and other institutions engaged in similar acivities. Students may choose to obtain clinical specialty training concurrently or at some other time. However, clinical training cannot be used to fulfill requirements for oral biology programs.

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 and who has demonstrated exceptional potential for graduate study may be admitted on a combined program. Individuals with Bachelor's or Master's degrees who can demonstrate sufficient background and interest in oral biology will also be considered for admission.

Language Requirement—Will be determined individually for candidates in consultation with their adviser 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 area in which students expect to concentrate their efforts.

Master's Degree—Offered under Plans A and B as described under the General Information section.

Doctor's Degree—During the first year, all students must take for credit OBio 8010 and 8011. During each quarter of their first year, students will work with a faculty member to acquire research experience through quarter-long apprenticeships. These assignments will be the product of negotiation among the director of graduate study, the student, and the faculty members involved, with a view that they reflect the student's interests and provide the student with a breadth of exposure to faculty activities. Registration will be through OBio 8002. Also students will be required to attend a weekly seminar, OBio 8030. Other than these requirements, programs will be individually designed through consultation among students, their adviser, and the director of graduate study. Together with their adviser students will choose a minor or supporting field and choose those areas in the major field of oral biology that will best meet their needs and interests.

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 I. (3 cr) Staff
Basic concepts of cell biology and human biology for dental specialist and/or oral research trainees.

8011. ORAL BIOLOGY II. (3 cr; prereq 8010 or ‡) Staff
Continuation of 8010.

8015. SALIVARY GLANDS AND THEIR SECRETIONS. (2 cr; prereq Anat 5103 and Anat 5104 or Anat 5105 or ‡; offered odd yrs only) Redman
Comparative morphology and functions of salivary glands of man and laboratory animals. Synthesis and secretion of salivary proteins. Analysis of relationships of salivary constitutents to glandular components and variations in secretory stimulation. Effects of salivary constitutents on oral environment.

8016. DEVELOPMENTAL BIOLOGY OF SALIVARY GLANDS. (2 cr; prereq 8015 or ‡; offered even yrs only) Redman
Morphologic and biochemical description of the development of salivary glands, including initiation, morphodifferentiation and cytodifferentiation. Cell proliferation vs. cytodifferentiation. Relationships among gland development, gland function, and the development and environment of the animal. Comparison with development of other exocrine organs. Based largely on material from laboratory animals, but with frequent reference to available human material.

8018. BIOLOGY OF MINERALIZED AND OTHER CONNECTIVE TISSUES. (3 cr; offered spring 1975 and alt yrs) Smith
Lectures and discussions on developmental biology of connective tissues, the 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 diseases processes.

8021, 8022, 8023, 8024. TOPICS IN ORAL BIOLOGY. (1-3 cr [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. (1cr [may be repeated for cr]) Staff
Faculty and student participation in discussion of current topics in oral biology.

Additional major work may be drawn from medical basic sciences and other individually appropriate areas.

ORTHOPEDIC SURGERY (OrSu)

OFFERED AT MINNEAPOLIS

Professor
John H. Moe, M.D., *head*

Clinical Professor
Harry B. Hall, M.D.
Malvin J. Nydahl, M.D., M.S.

Associate Professor
James H. House, M.D., M.S., *director of graduate study*

Clinical Associate Professor
Walter Indeck, M.D.
Edward H. O'Phelan, M.D., M.S.

Assistant Professor
David S. Bradford, M.D.
Charles C. Lai, M.D., Ph.D.

Master's Degree—Four-year fellowships are offered to students working toward a graduate degree in orthopedic surgery. This work is carried on at University Hospitals, Gillette State Hospital for Crippled Children, Shriners Hospital for Crippled Children, etc., and there is an interchange with the Orthopedic Department of 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) House, Moe, and staff
Review of X-rays and case histories of patients on orthopedic inpatient or outpatient services.

8403. FRACTURES (5 cr) Gustilo and staff
The orthopedic fellow acts as house surgeon on fracture service at Hennepin County General Hospital.

8404. FRACTURES. (5 cr) Comfort and staff
The orthopedic fellow acts as house surgeon on fracture service at St. Paul-Ramsey Hospital.

8405. ORTHOPEDIC DIAGNOSIS. (3 cr) Moe, House, and staff
The orthopedic fellow assists in instruction of clinical clerks and interns and studies problems in diagnosis in Outpatient Department and University Hospitals.

8407. PEDIATRIC ORTHOPEDICS. (5 cr) Moe and staff
The orthopedic fellow acts as house surgeon at Gillette State Hospital for Crippled Children.

8408. ORTHOPEDIC PROBLEMS AND MANAGEMENT. (5 cr) Moe, House, and staff
The orthopedic fellow acts as house surgeon at University Hospitals.

8409. ORTHOPEDIC PROBLEMS AND MANAGEMENT. (5 cr) Moe, Winter, House, and staff
The orthopedic fellow acts as house surgeon on fracture service at Fairview Hospital.

8410. ORTHOPEDIC PATHOLOGY. (2 cr) Moe, Premer, House, and staff
Seminar for systematic review of pathology of ossified tissues and soft tissues of extremities.

8411. ORTHOPEDIC OPERATIVE SURGERY. (5 cr) Moe, House, and 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) Moe, 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) Moe, Bradford, Lai
Problems in experimental or clinical surgery. Study at University Hospitals.

ORTHOPEDIC SURGERY

OFFERED AT ROCHESTER

Professor

Mark B. Coventry, M.D., M.S., *chairman*
William H. Bickel, M.D., M.S.
Edward D. Henderson, M.D., M.S.
John C. Ivins, M.D., M.S.
Joseph M. Janes, M.D., M.S.
Einar W. Johnson, Jr., M.D., M.S.
Patrick J. Kelly, M.D., M.S

Associate Professor

Anthony J. Bianco, Jr., M.D., M.S.
Lowell F. A. Peterson, M.D., M.S.

Assistant Professor

Richard S. Bryan, M.D.
James H. Dobyns, M.D.
Ronald L. Lindscheid, M.D., M.S.
Hamlet A. Peterson, M.D., M.S.

Instructor

Franklin H. Sim, M.D., M.S.
Richard N. Stauffer, M.D.

Research in Orthopedics Professor

Jenifer Jowsey, D.Phil.

The residency in orthopedic surgery is designed to prepare the resident for the practice of this specialty in all its phases and is tailored to the specific needs of each resident. Additional training is available in research, hand surgery, children's orthopedics, and orthopedic oncology. Qualified applicants are accepted only for the full 4-year program which meets certification requirements of the American Board of Orthopedic Surgery.

The resident gradually assumes increasing responsibility for the care of orthopedic patients. Approximately 1 year is spent in an orthopedic service of a hospital and in outpatient assignments at the junior residency level. Training includes 1 quarter in a hand surgery clinic. Integrated into this year may be 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 6-month block in basic sciences follows, with no concurrent clinical responsibilities. This period is spent in surgical pathology as it relates to

orthopedics, micronanatomy and pathology of bone, various techniques of research in bone, muscle physiology, musculoskeletal anatomy, and metabolic bone diseases.

A second block assignment provides additional time in children's orthopedics, either at Mayo or at an off-campus affiliation. This assignment comes near the last year of the resident's training, when he can assume considerable responsibility in the care of children, and its purpose is to supplement previous experience in the Mayo Graduate School program. Off-campus affiliations are with Gillette State Hospital for Crippled Children, St. Paul; Kernan Hospital, Baltimore; and Dr. Charles A. Janeway Child Health Center, St. John's, Newfoundland.

At the senior residency level during the last 2 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. The senior resident is 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. There is participation in trauma study throughout the entire period of study. Difficult problems are reviewed before residents and staff at weekly fracture conferences. All fracture problems are under the direction 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 by assignments to services which emphasize hand surgery.

Rochester State Hospital assignments enable residents to be in charge of orthopedic services under staff supervision. Patients from other state institutions are referred to the hospital for definitive orthopedic care.

During the 4-year program outlined above, residents receive training in general surgery, adult orthopedics, children's orthopedics, fractures, and traumatic surgery, and basic sciences required by the American Board of Orthopedic Surgery. As part of the residency program, assignments as chief resident associate are made. Four or five such responsible positions are available on a 6-month basis. The chief resident associate has his own service, with staff supervision. Opportunity is also afforded for research, and additional time for orthopedic research may be provided in certain instances under the guidance of a full-time staff member in research. The resident may secure 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.

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 6-month assignment in the area. In addition, other lectures are given in basic fields related to orthopedic surgery. A basic sciences seminar is presented by a resident each week.

Weekly clinical seminars are presented by residents in consultation with staff members. During the 4-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 period spent in surgical pathology. All orthopedic residents participate in periodic pathologic conferences.

Orthopedic conferences or "grand rounds" are conducted once a week in affiliated hospitals.

Visiting faculty each year 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 8851. ORTHOPEDIC DIAGNOSIS. Coventry 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. Coventry and staff
Includes surgical aspects at the junior and senior residency levels, with more advanced participation in surgery as abilities of the resident develop. Surgical experience every other day with pre- and postoperative evaluation and follow-up on alternate days. Seminars.

M 8853. SURGERY OF THE HAND. (6 cr) Linscheid, Dobyns, and staff
Hand service clinic in Mayo Building, Methodist Hospital operating rooms, and St. Marys 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 is placed on the outpatient management of these problems, the operative treatment, and pre- and postoperative care.

M 8855. ORTHOPEDIC ONCOLOGY. (6 cr per qtr; 2 qtrs required) Ivins, Sim, and staff
History taking, physical examination, surgical, medical, and radiologic management of patients with benign and malignant lesions of bone and soft tissues. In addition to daily care of patients with a wide variety of neoplastic conditions both in and out of the hospital, there are 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 8857. PRINCIPLES OF SOLID MECHANICS. (3 cr, §BPhy M 8881; prereq physics and calculus) Staff
Application of vector mechanics to musculoskeletal systems; experimental methodology in obtaining anatomic and kinematic data.

M 8858. MECHANICS OF DEFORMABLE MATERIALS. (3 cr, §BPhy M 8882; prereq BPhy M 8881) Staff
Stress and strain concepts and method of calculation for biological and implantable materials. Methodology and instrumentation for measuring stress, strain, fracture, and wear.

M 8859. SEMINAR IN BIOMECHANICS. (3 cr) Staff
Current progress in areas of biomechanical research.

ORTHOPEDIC ANATOMY. (See Anatomy)

SURGICAL AND FRESH TISSUE PATHOLOGY. (See Pathology)

Students majoring in orthopedic surgery may also take work in pathology, physiology, neurology, and physical medicine. For details, see these departments.

OTOLARYNGOLOGY (Otol)

OFFERED AT MINNEAPOLIS

Professor

Michael M. Paparella, M.D., *head*
Arndt J. Duvall III, M.D., M.S.
Frank M. Lassman, Ph.D.
W. Dixon Ward, Ph.D.
Henry L. Williams, Jr., M.D., M.S.

Clinical Professor

Jerome A. Hilger, M.D., M.S.
Albert Hohman, M.D.
Conrad J. Holmberg, M.D.
Robert E. Priest, M.D., M.S.

Associate Professor

Mary J. Capps, Ph.D., *director of graduate study*
Lawrence R. Boies, Jr., M.D.
Cedric A. Quick, M.B.

Clinical Associate Professor

John S. Huff, M.D.
Severin H. Koop, M.D.
Hyman M. Paisner, M.D.
Kurt Pollack, M.D.
Robert J. Richardson, M.D.
Melvin E. Sigel, M.D.
George V. Tangen, M.D.

Assistant Professor

Sung K. Juhn, M.D., M.S.

Clinical Assistant Professor

John D. Banovetz, M.D.
David J. Buran, M.D.
Morton C. Kane, M.D.

Clinical Instructor

Ekren Gozum, 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, the Minneapolis Veterans Administration Hospital, St. Paul-Ramsey County Hospital, and Hennepin County General Hospital 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 1 year in general surgery and 4 years in otolaryngology. During the last 4 years, each resident (fellow) is required to spend time in basic or applied research toward preparation of an acceptable thesis for a Master's degree in otolaryngology.

Master's Degree—All residents (fellows) in otolaryngology are required to complete all requirements for a Master's degree. The degree is offered under Plan A.

Doctor's Degree—A Ph.D. degree is offered for the fellow with a strong interest in academic otolaryngology. Additional time will be spent in basic research.

8220. RESEARCH IN OTOLARYNGOLOGY. (18 cr) Paparella

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 the University of Minnesota, St. Paul-Ramsey, Hennepin County General, and Minneapolis Veterans Administration Hospitals.

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 the University of Minnesota, St. Paul-Ramsey, Hennepin County General, and Minneapolis Veterans Administration Hospitals.

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 learned 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, Capps
Instruction and experience in diagnosis and management of otoneurologic problems, including training in electronystagmographic analysis of vestibular function.

8240. **ALLERGY.** (2 cr) Quick
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
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 METHODOLGY.** (2 cr) Ward, Capps, and staff
Basic introduction to such topics as statistical methods, experimental design, and execution of otolaryngologic research. Required for all first-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

OTOLARYNGOLOGY

OFFERED AT ROCHESTER

Professor

Kenneth D. Devine, M.D.
Clifford F. Lake, M.D., M.S.

Associate Professor

Douglas T. R. Cody, M.D.C.M., Ph.D., *chairman*
Arnold Aronson, Ph.D.
Henry A. Brown, M.D., M.S.
LeRoy D. Hedgecock, Ph.D.
Darrell L. Rose, Ph.D.

Assistant Professor

Lawrence W. DeSanto, M.D.
John C. Lillie, M.D., M.S.
James B. McBean, M.D.

Instructor

Lawrence W. Keating, Ph.D.
Eugene B. Kern, M.D.

A 4-year residency program is offered in otolaryngology and rhinology. In addition, a 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 or under other approved programs 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; in non-malignant 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 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. This period is divided between the Rochester State Hospital and the Rochester Methodist Hospital.

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. Among opportunities available are courses in cadaver surgery of the ear, nose, head, and neck and microsurgery of the ear on laboratory material.

Language Requirement—For the Ph.D. degree, either (a) two foreign languages or (b) one foreign language and the option of a collateral field of knowledge.

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. Cody, Brown, Lake, McBean, Devine, Lillie, DeSanto, Kern
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. Brown, Lake, McBean, Cody, Devine, Lillie, DeSanto, Kern
Treatment of complications.

M 8853f,w,s,su. OPERATIVE OTORHINOLARYNGOLOGY. Brown, Lake, McBean, Cody, DeSanto, Kern
Hospital residence, resident in operating service. Cadaver surgery, microsurgery of the ear on fresh anatomic material.

M 8854f,w,s,su. OPERATIVE OTORHINOLARYNGOLOGY. Brown, Lake, McBean, Cody, Devine, Lillie, DeSanto, Kern
Senior residency service.

M 8855f,w,s,su. ADVANCED AUDIOLOGY. Rose, Keating, Hedgecock
Tests of hearing; evaluation of speech disorders for purposes of diagnosis and as a basis for advising use of hearing aids; educational therapy.

SURGICAL AND FRESH TISSUE PATHOLOGY. (See Pathology)

Fellows majoring in otolaryngology may also take work in microbiology, physiology, biophysics, or immunology. For details, see these departments.

PATHOLOGY (Path)

OFFERED AT MINNEAPOLIS

Professor

Ellis S. Benson, M.D., *head*
Jorge J. Yunis, *director of graduate study*
A. B. Baker, M.D., Ph.D.
John I. Coe, M.D.
Jesse E. Edwards, M.D.
Nelson D. Goldberg, Ph.D.
Robert Hebbel, M.D., Ph.D.
Paul H. Lober, M.D., Ph.D.
Takashi Okagaki, M.D., Ph.D.
Kenneth A. Osterberg, M.D.
Andreas Rosenberg, Ph.D.
R. Dorothy Sundberg, M.D., Ph.D.
Alexander C. Templeton, M.D.
Lee W. Wattenberg, M.D.
James White, M.D.
Edmond J. Yunis, M.D.

Associate Professor

W. Robert Anderson, M.D.
Miguel M. Azar, M.D., Ph.D.
Barbara A. Burke, M.D.
Agustin Dalmasso, M.D.
Richard D. Estensen, M.D.
Donald F. Gleason, M.D., Ph.D.
Erhard Haus, M.D., Ph.D.

Assistant Professor

John H. Kersey, M.D.
Walter J. Runge, M.D.
Robert E. T. Rydell, M.D.

Instructor

Frederick H. Lott, M.D.

Prerequisites—Graduate students who desire to take their major work in pathology must present credits for the equivalent of the first 2 years' work of the Medical School of this University. A degree with designation, such as M.S. in pathology, is awarded only to those who have an M.D. degree.

Language Requirement—For the Master's degree, one foreign language. For the Ph.D. degree, either (a) two foreign languages or (b) one foreign language and the option of a collateral field of knowledge. French, German and Russian are acceptable languages.

Master's Degree—Offered only under Plan A.

Master's Degree with Designation in Pathology—Given only after 3 years of work.

Doctor's Degree—The Ph.D. degree with designation in pathology may be awarded after completion of 3 or more years in graduate work and presentation of a thesis of high quality.

5101. PATHOLOGY. (6 cr; prereq regis 1st-yr med school, grad ‡) Templeton, Hebbel, and staff
General pathology.

5104x. AUTOPSIES. (Cr ar; prereq 5102 or 5103) Staff

5105. DISEASES OF THE KIDNEY. (3 cr; prereq 5102 or 5103) Hebbel

5106. DISEASES OF THE HEART. (1 cr; prereq 5102 or 5103) Edwards

5107. INTRODUCTORY CYTOPATHOLOGY. (2 cr; prereq regis Phase B, D med or grad med, others ‡)

5110x. SEMINAR: PATHOLOGY. (1 cr; prereq 5102 or 5103) Benson, J Yunis

5111x. CONFERENCE ON AUTOPSIES. (1 cr; prereq 5102 or 5103) Staff

5112. DIAGNOSIS OF TUMORS. (Cr ar; prereq 5102) Hebbel

5113x. SURGICAL PATHOLOGY. (Cr ar; prereq 5102 or 5103) Hebbel

5120. DISEASES OF THE LUNGS. (1 cr; prereq 5102) Staff

5121. DISEASES OF THE ALIMENTARY TRACT. (1 cr; prereq 5102) Hebbel

5122. BASIC SCIENCE OF CANCER. (3 cr; prereq MdBc 5100 or equiv) Wattenberg

5124. VIRUSES IN THE PATHOGENESIS OF DISEASE. (Cr and hrs ar) Kersey

5127. CLINICAL IMMUNOBIOLOGY. (Cr and hrs ar) E Yunis, Kersey

5128. EXPERIMENTAL IMMUNOPATHOLOGY. (2 cr; prereq regis med or grad med) E Yunis, Azar, Kersey

5130. IMMUNOHEMATOLOGY. (2 cr; prereg regis grad med or ♯) Azar

5134. JOURNAL REVIEW. (1 cr; prereq regis med or grad med)

5140. SEMINAR: EXPERIMENTAL CHRONOBIOLOGY. (1 cr) Halberg

5141. PROBLEMS IN EXPERIMENTAL CHRONOBIOLOGY. (Cr and hrs ar) Halberg

5142. EXPERIMENTAL PATHOBIOLOGY. (Cr ar; prereq ♯)
Biological studies either in laboratory or field in which investigation of disease or disease states may be influenced by factors considered to be variables in the environment.

5143. COMPARATIVE PATHOLOGY. (Cr ar; prereq ♯)
History and philosophy of the disease processes in man and animals. Term paper required.

5154. GYNECOLOGIC HISTOPATHOLOGY. (1 cr; prereq regis Phase D med or grad med) Okagaki
Focus on diagnostic problems of gynecologic oncology and their clinical implications. Materials from gynecologic patients during the week reviewed and discussed.

5160s. HUMAN CYTOGENETICS. (2 cr; prereq ♯; offered 1974-75 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. (3 cr; prereq ♯; offered 1974-75 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 1973-74 and alt yrs) J Yunis, Yasmineh
Molecular and genetic basis of genetic traits in mammals.

5163s. HUMAN BIOCHEMICAL GENETICS LABORATORY. (3 cr; prereq ♯; offered 1973-74 and alt yrs) J Yunis and staff
Biochemical techniques used in the study of human genetic traits.

5164s. CLINICAL GENETICS. (2 cr; prereq ♯) J Yunis
Importance of genetic principles in modern medicine. Specific clinical disorders used to illustrate general concepts and their application to common diseases.

5168f,w. SEMINAR: GENETICS. (1 cr; prereq ♯) J Yunis

5169f,w,s,su. RESEARCH IN HUMAN GENETICS. (Cr ar; prereq ♯) J Yunis, Yasmineh

5170f,w,s,su. ADVANCED PROBLEMS IN MEDICAL GENETICS. (Cr ar; prereq ♯) J Yunis and staff

5267f,w,s,su. MUSCLE CELL STRUCTURE AND FUNCTION. (1 cr; prereq MdBc 5101 or ♯) Benson, Rosenberg
Structure and function of heart and skeletal muscle, including biochemical properties of contractile proteins and their relation to cellular components.

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

5361. FORENSIC PATHOLOGY. (2 cr; prereq 5104 or equiv or △) Coe

8201x. RESEARCH. (Cr and hrs ar; grad students with necessary preliminary training may elect research, either as majors or minors in pathology) Benson, J Yunis

8207. RESEARCH IN EXPERIMENTAL CHRONOBIOLOGY. (Cr and hrs ar) Halberg

8701. ADVANCED NEUROPATHOLOGY. (Cr ar, §Neur 8703) Baker

8702. SURVEY OF NEUROPATHOLOGY. (Cr ar, §Neur 8704)
Examination of specimens from current autopsies.

PATHOLOGY

OFFERED AT ROCHESTER

Professor

Arnold L. Brown, Jr., M.D., *chairman, Pathology and Anatomy*
David C. Dahlin, M.D., M.S., *chairman, Surgical Pathology*
Archie H. Baggenstoss, M.D., M.S.
Robert C. Bahn, M.D., Ph.D.
Malcolm B. Dockerty, M.D., C.M., M.S.
Edgar G. Harrison, Jr., M.D., M.S.
Alfred G. Karlson, D.V.M., Ph.D.
Charles A. Owen, M.D., Ph.D.
Edward H. Soule, M.D.
Lewis B. Woolner, M.D., M.S.

Associate Professor

Haruo Okazaki, M.D.
George P. Sayre, M.D., M.S.
Roy G. Shorter, M.D.

Assistant Professor

George M. Farrow, M.D.
Keith E. Holley, M.D.
Jurgen Ludwig, M.D.

Instructor

John A. Carney, M.B.B.Ch., Ph.D.
Louis H. Weiland, M.D.

Pathology and Anatomy—The activities of this section are service pathology and research. Service pathology includes approximately 1,000 autopsies per year and the interpretation of renal, jejunal, and hepatic biopsies. From these activities, the resident gains a thorough foundation in anatomic pathology. The specific programs may be individualized according to the primary specialty of the resident. Residents in pathology spend 9 months on the autopsy service, which includes neuropathology. Opportunities for study and investigation are provided. Further experiences in any aspect of anatomic pathology or in research activities are available according to the needs and interests of the resident. Residents in specialties other than pathology spend approximately 3 months as junior residents. Their further activities are arranged according to their needs and interests; such programs may be entirely research or entirely service experience or some mixture of these activities.

A large number of teaching conferences and seminars are held in the section. These include: organ review of interesting current cases, weekly liver conferences which include both review of biopsies and didactic instruction in liver diseases, weekly kidney conferences which utilize both review of biopsies and didactic instruction, weekly cardiac conferences at which current cardiac cases are reviewed and clinical-pathologic correlation carried out, semiweekly brain-cutting seminars, weekly neuropathology conferences at which subjects are presented by residents. Each resident carries out a study of a problem of interest to him and presents the results.

Active research programs within the section utilize the techniques of histochemistry, fluorescent microscopy, biochemistry, electron microscopy, tissue culture, computer technology, radioautography, cytogenetics, and animal experimentation including germ-free animals. Available for study is a large collection of operative and postmortem specimens, both gross and microscopic, indexed as to organ and disease, and over 50,000 photomicrographs and photographs of gross specimens.

Surgical Pathology—The laboratories of surgical pathology receive immediately all tissues removed at operations. They are studied both grossly and microscopically while the operation is going on, and the choice of surgical procedure

is not infrequently influenced by the results of the examination. Case records, including operative findings, are reviewed by residents and discussed at daily conferences that correlate clinical symptoms and results of laboratory tests with pathologic findings. All gross specimens are preserved at least 20 years and all microscopic slides are preserved indefinitely so that original material may be available for pathologic research. By means of daily experience in the laboratory in the microscopic examination of tissues supplemented by weekly demonstrations, each resident has an opportunity to study approximately 10,000 surgical specimens over a 9-month period. Material from some 50,000 cytologic smears (annually) are also available for study.

In addition to participation in the many formal seminars and conferences conducted by the staff, residents have the opportunity for investigation.

M 8851f,w,s,su. GENERAL PATHOLOGY. (8 cr) Baggenstoss, Bahn, Brown, Holley, Ludwig, Okazaki, Sayre
Autopsy service.

M 8852f,w,s,su. SEMINAR: PATHOLOGY. (1 cr) Baggenstoss, Bahn, Brown, Holley, Ludwig, Okazaki, Sayre

M 8853f,w,s,su. CONFERENCE ON AUTOPSIES. (1 cr) Baggenstoss, Bahn, Brown, Holley, Ludwig, Okazaki, Sayre

M 8854f,w,s,su. DISEASES OF THE LIVER. (2 cr) Baggenstoss

M 8855f,w,s,su. DISEASES OF THE HEART. (1 cr) Brown

M 8856f,w,s,su. DISEASES OF THE KIDNEY. (1 cr) Holley

M 8857f,w,s,su. PROBLEMS IN EXPERIMENTAL PATHOLOGY. Baggenstoss, Bahn, Brown, Holley, Ludwig, Okazaki, Sayre

M 8858f,w,s,su. NEUROPATHOLOGY. (8 cr) Okazaki, Sayre

M 8859f,w,s,su. PROBLEMS IN NEUROPATHOLOGY. Okazaki, Sayre

M 8860f,w,s,su. COMPUTER APPLICATIONS TO PATHOLOGY. Bahn

M 8861f,w,s,su. ELECTRON MICROSCOPY. Brown, Holley

M 8862f,w,s,su. HISTOCHEMISTRY. Bahn, Holley

M 8866f,w,s,su. PROBLEMS IN COMPARATIVE PATHOLOGY. Karlson and staff

M 8867f,w,s,su. GENERAL PATHOLOGY—SURGICAL PATHOLOGY. (8 cr) Carney, Dahlin, Dockerty, Farrow, Harrison, Soule, Weiland, Woolner

M 8868f,w,s,su. LECTURES: SURGICAL PATHOLOGY. (2 cr) Carney, Dahlin, Dockerty, Farrow, Harrison, Soule, Weiland, Woolner

M 8869f,w,s,su. DEMONSTRATION CONFERENCES ON SURGICAL PATHOLOGY. (4 cr) Carney, Dahlin, Dockerty, Farrow, Harrison, Soule, Weiland, Woolner

M 8870f,w,s,su. CYTOLOGY. (3 cr) Dahlin, Harrison, Soule, Weiland, Woolner

M 8871f,w,s,su. OBSTETRIC AND GYNECOLOGIC PATHOLOGY. (1 cr) Dockerty

M 8872f,w,s,su. BONE PATHOLOGY. (1 cr) Dahlin

M 8873f,w,s,su. ORAL PATHOLOGY. (1 cr) Dahlin

M 8874f,w,s,su. PROBLEMS IN SURGICAL PATHOLOGY. Carney, Dahlin, Dockerty, Farrow, Harrison, Soule, Wieland, Woolner

M 8885f,w,s,su. SOFT TISSUE PATHOLOGY. (1 cr) Soule

PEDIATRICS (Ped)

OFFERED AT MINNEAPOLIS

Professor

John A. Anderson, M.D., Ph.D., *chairman*
Lewis W. Wannamaker, M.D., *director of graduate study*
Ray C. Anderson, M.D., Ph.D.
William Krivit, M.D., Ph.D.
Russell J. Lucas, Jr., M.D.
Alfred F. Michael, M.D.
Bernard L. Mirkin, M.D., Ph.D.
Paul G. Quie, M.D.
Richard B. Raile, M.D.
John W. Reynolds, M.D.
Kenneth F. Swaiman, M.D.
Robert A. Ulstrom, M.D.
Homer D. Venters, M.D.
Robert L. Vernier, M.D.
James G. White, M.D.

Associate Professor

David M. Brown, M.D.
Barbara A. Burke, M.D.
Carlyle C. Clawson, M.D.
John M. Matsen, M.D.
James H. Moller, M.D.
Mark E. Nesbit, M.D.
Arthur R. Page, M.D.
Krishna M. Saxena, M.D., D.C.H.
Harvey L. Sharp, M.D.
Robert W. ten Bensel, M.D.
Warren J. Warwick, M.D.
Francis S. Wright, M.D.

Assistant Professor

Robert Otto Fisch, M.D.
Henry S. Sauls, M.D.

Clinical Assistant 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 traning program permits the candidate to complete the requirements for the specialty of pediatrics established by the American Board of Pediatrics. Highly qualified candidates desiring to pursue a full-time career in teaching and research in the field of pediatrics or to pursue further graduate work in certain subspecialties of pediatrics may extend their clinical training program to include further training in the basic fields of medicine appropriately related to the field of pediatrics.

In general, fellowships are planned for a 3- to 4-year period following completion of an internship. Three years of clinical work satisfies the requirements for certification by the Specialty Board in Pediatrics. An additional 1 to 2 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. The candidate may participate in clinical or laboratory research programs while preparing a thesis on such work and qualifying for examination for the M.S. degree. Candidates desiring advanced basic science training programs may fulfill their minor and major requirements for a Ph.D. degree. Research opportunities will be provided in either the basic science departments or in the laboratories of the Department of Pediatrics. Considerable flexibility in the graduate training program pursued by the candidate is permitted. The 2-year clinical training program may be interrupted in favor of an opportunity for further orientation in the basic fields of medicine. Following completion of minor basic science requirements for the Ph.D. degree, the candidate may then return to the clinical department to complete his specialty requirements.

Following completion of 2 years of clinical training, qualified candidates may extend their clinical program 1 or more years by securing additional training in the fields of pediatric cardiology, endocrinology, neurology, allergy, psychiatry, and pathology.

The clinical experience in pediatrics is obtained in the outpatient and inpatient

services of the University of Minnesota Hospitals and affiliated hospitals. The affiliated hospitals are the Hennepin County General Hospital, the St. Paul-Ramsey Hospital, and the Children's Hospital of St. Paul. Extensive clinical experience in premature and newborn care, communicable and infectious diseases, heart disease, pathology, neurology, child psychiatry, endocrinology and metabolism, immunology, nephrology, hematology, and community pediatrics is provided.

Prerequisites—General understanding of bacteriology, immunology, pathology, physiology, and biochemistry.

Minor—Students are required to carry a minor in one of the fundamental branches or allied fields.

Language Requirement—For the Ph.D. degree, either (a) two foreign languages or (b) one foreign language and the option of a collateral field of knowledge.

Master's Degree—Offered only under Plan A.

Doctor's Degree—Courses leading to the Ph.D. may be arranged with members of the graduate faculty.

8200f,w,s,su. GRADUATE SEMINAR: PEDIATRICS. (1½ cr) J Anderson and staff

8202f,w,s,su. PEDIATRICS CLINICS. (Cr and hrs ar; prereq ‡) J Anderson and staff

8204f,w,s,su. RESIDENCY IN PEDIATRICS. (Cr and hrs ar; prereq ‡) Staff
Two- to 4-month rotations on the outpatient, inpatient, and special pediatric services of the University Hospitals, Hennepin County General Hospital, Children's Hospital of St. Paul, and St. Paul-Ramsey Hospital.

8206f,w,s,su. PEDIATRIC SPECIAL INTEREST. (Cr and hrs 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 ‡) J Anderson, R Anderson, Brown, Krivit, Lucas, Michael, Mirkin, Nesbit, Quie, Raile, Reynolds, Sharp, Ulstrom, Vernier, Wannamaker, Warwick, White

PEDIATRICS

OFFERED AT ROCHESTER

Professor

Edmund C. Burke, M.D., M.S.
James W. DuShane, M.D.
Lloyd E. Harris, M.D.
Alvin B. Hayles, M.D., M.S.
George B. Logan, M.D., M.S.
Gunnar B. Stickler, M.D., Ph.D.
William H. Weidman, M.D., M.S.

Associate Professor

E. Omer Burgert, Jr., M.D., M.S.
Gerald S. Gilchrist, M.D.
Manuel R. Gomez, M.D., M.S.
Stephen D. Mills, M.D., M.S.

Assistant Professor

Mark D. Cloutier, M.D.
Robert H. Feldt, M.D., M.S.
Robert V. Groover, M.D.
Douglas D. Mair, M.D.
Edward J. O'Connell, M.D.
Donald G. Ritter, M.D., M.S.

Instructor

Kathleen A. Nable, 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 internships for 1 year and residencies for 2 years of training are offered as a broad educational background for general pediatrics, fulfilling the requirements of the American Board of Pediatrics for certification in the specialty and equipping the candidate for medical practice in this field.

The program includes experience in the care of acute and chronic diseases of the usual type as well as complex diagnostic problems in hospitalized children. Outpatient clinic services include 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 psychiarty under the direction of the faculty in child psychiatry where experience is gained in evaluating 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 neurology, pediatric nephrology, pediatric hematology, and child psychiatry is available to qualified individuals for 1 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.

Language Requirement—For the Ph.D. degree, either (a) two foreign languages or (b) one foreign language and the option of a collateral field of knowledge.

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 OF MEDICAL AND SURGICAL DISEASES OF INFANTS AND CHILDREN. Staff
Seminar.

M 8852f,w,s,su. HOSPITAL RESIDENCE. Staff
Diagnosis and care of sick infants and children.

M 8853f,w,s,su. CHILD HEALTH
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
St. Marys Hospital newborn nursery and Mayo well-baby clinic.

M 8855f,w,s,su. CARE OF WELL INFANTS AND CHILDREN AND HEALTH SUPERVISION OF PRESCHOOL AND SCHOOL-AGE CHILDREN
City Hall and county well-baby and well-child clinics and schools of city and county.

M 8856f,w,s,su. PEDIATRIC CARDIOLOGY. Staff

M 8857f,w,s,su. PEDIATRIC ALLERGY. Staff

M 8858f,w,s,su. PEDIATRIC HEMATOLOGY

M 8859f,w,s,su. PEDIATRIC ENDOCRINOLOGY

M 8860f,w,s,su. PEDIATRIC NEPHROLOGY

CHILD PSYCHIATRY. (See Psychiatry)

PEDIATRIC NEUROLOGY. Staff

RESEARCH IN PATHOLOGY, BIOCHEMISTRY, OR PHYSIOLOGY. (See these departments)

PHARMACEUTICS (Phm)

OFFERED AT MINNEAPOLIS

Professor

Edward G. Rippie, Ph.D., *head, director of graduate study, pharmaceutics*

Hugh F. Kabat, Ph.D., *head, department of Clinical Pharmacy,* and *director of graduate study, Hospital Pharmacy*

Associate Professor

Robert H. Miller, Ph.D.

John D. McRae, Ph.D.

Assistant Professor

Kenneth W. Miller, Ph.D.

Kenneth G. Nelson, Ph.D.

Ronald J. Sawchuck, Ph.D.

Pharmaceutics is concerned with the elucidation, analysis, and means of control of the physical chemical properties of the drug and its dosage forms as they influence its 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, offering specialization ranging from highly physical to strongly biological orientations.

Program in Hospital Pharmacy

Prerequisites—A degree from a college of pharmacy and an exceptional scholarship record. Evidence of personal capability and fitness for work in the hospital field is likewise necessary in each case and will be 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.

Master's Degree—Either Plan A or Plan B is acceptable.

Program in Pharmaceutics

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 courses satisfy the prerequisites for the graduate courses in pharmaceutics.

The department presents a comprehensive program of course work and research offerings 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 exceptional opportunity to elect a course of study which best meets individual needs and interests. Minor fields which are particularly desirable include physical chemistry, chemical engineering, biochemistry, and pharmacology.

Language Requirement—For the Master's degree, either (a) one foreign language or (b) a collateral field of knowledge with the consent of the director of graduate study. For the Ph.D. degree, the option of (a) two foreign languages, (b) one foreign language and a collateral field of knowledge with the consent of the director of graduate study, or (c) two collateral fields of knowledge with the consent of the director of graduate study.

Minor—The choice of the particular courses to be presented in fulfillment of a minor in graduate work will be made after consultation with the student's adviser.

Master's Degree—Offered under both Plan A and Plan B.

Doctor's Degree—Work leading to the Ph.D. degree is offered.

5520.* VETERINARY SCIENCE. (3 cr; prereq Phsl 3070, Phcl 5102 or equiv)
(Same as VPP 5520) Specialization course. Professional interrelationships between pharmacists and veterinarians, disease problems of domestic animals, and animal pharmacology.

5670-5680. BIOPHARMACEUTICS—DRUG INFORMATION EVALUATION. (4 cr per qtr; prereq 5th-yr, 5640, Phcl 5102; 3 lect hrs, one 2-hr workshop per wk) K Miller, Sawchuck
Consideration of the processes of drug absorption, distribution, metabolism, and excretion *in vivo*. Statistical methods and procedures for critical evaluation of current literature dealing with those subjects.

5690.* COSMETICS AND DERMATOLOGICAL PREPARATIONS. (3 cr; prereq 5640) R Miller
Pharmaceutical aspects of cosmetics and dermatological preparations.

5692-5694.* PHARMACEUTICAL MANUFACTURING. (3-5 cr per qtr; prereq 5640, MedC 5490 or ‡) R Miller
Production and control of pharmaceutical preparations on a pilot plant scale. Formula development and product stabilization.

5696.* PREPARATION OF PARENTERAL PRODUCTS. (3 cr; prereq ‡) Nelson
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.

5700. HOSPITAL PHARMACY ADMINISTRATION I. (2 cr; prereq ‡) Kabat
History, classification, organization, and functions of departments in a hospital in relation to pharmacy service.

5701. HOSPITAL PHARMACY ADMINISTRATION II. (3 cr; prereq 5700, ‡) Kabat
Development, organization, responsibility, and administration of hospital pharmacy services.

5702. HOSPITAL PHARMACY SURVEY. (1 cr; prereq 5701, ‡) Kabat

8100.* SEMINAR: PHARMACEUTICS. (1 cr; required of majors in pharmaceutics) Staff

8200.* RESEARCH PROBLEMS. (Cr ar; prereq ‡) Staff
Experimental investigation of problems in pharmaceutics.

8300-8301. PHARMACEUTICAL DEVELOPMENT. (5 cr per qtr; prereq 5694 or ‡; offered when demand warrants) R Miller
Theoretical and practical problems involved in new product development including F.D.A. regulations, new drug application procedures, patents, and production and control on a pilot plant scale.

8310-8311. EXTRACTION, DISTRIBUTION, AND PARTITION SYSTEMS. (3-5 cr per qtr; prereq ‡; offered when demand warrants) R Miller
Theory and practice of extraction of liquids and solids, countercurrent distribution, solvent and solute effects, and chromatography.

8400-8401. ADVANCED ANALYTICAL METHODS. (3-5 cr per qtr; prereq MedC 5494, Chem 5503 or ‡; offered when demand warrants) Rippie
Special procedures for control of foods, drugs, and cosmetics, e.g., sampling techniques and design of experiments for control of shelf-life, storage conditions, loss of potency, etc.

8410. STABILIZATION OF PHARMACEUTICALS. (3 cr; prereq Chem 5503) McRae
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) K 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) Nelson
Theory of diffusional transport of drug molecules with applications to pharmaceutical dosage forms.

PHARMACOGNOSY (Phcg)

OFFERED AT MINNEAPOLIS

Professor
E. John Staba, Ph.D., *chairman, director of graduate study*

Associate Professor
Yusuf Abul-Hajj, Ph.D.

Assistant Professor
Orval L. Mullen, 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 Master's degree, one foreign language is advised but not required. For the Ph.D., the requirement may be met by either (a) two foreign languages, (b) a higher order of proficiency in one foreign language, or (c) one foreign language selected from French, German, Japanese, or Russian plus a collateral field of study or a special research technique.

5820. INTRODUCTORY PHARMACOGNOSY. (3 cr; prereq MicB 3103, MedC 5440 or ‡)
Principles of immunology and allergy, pathogenic microorganisms, and treatment of disease states with immunizing biologicals.

5830. INTRODUCTORY PHARMACOGNOSY. (3 cr; prereq 5820 or ‡)
Production, constituents, metabolism, and therapeutic uses of drugs containing antibiotics, amino acids, and enzymes.

5840. INTRODUCTORY PHARMACOGNOSY. (4 cr; prereq MedC 5440)
Production, constituents, metabolism, and therapeutic uses of drugs containing hormones, vitamins, and alkaloids.

5860. ANTIBIOTICS. (2 cr; prereq 5830 or ‡) Staba
Natural antibiotic substances. Methods of production, biosynthesis, extraction, and assay; chemical, pharmaceutical, and chemotherapeutic properties.

5870. VITAMINS AND HORMONES. (2 cr; prereq 5840 or ‡) Abul-Hajj
Biosynthesis, chemistry, biochemical functions, mechanisms of actions, production, and uses.

5875. ANTIBIOTICS, VITAMINS, AND HORMONES LABORATORY. (1 cr; prereq 5830, 5840 or ‡) Staff
Introduction to techniques used to produce, isolate, and observe biological effects of these substances.

5880. PHARMACEUTICAL IMMUNOLOGY. (2 cr; prereq ‡) Mullen

5899. SPECIAL PROBLEMS IN PHARMACOGNOSY. (Cr ar; prereq ‡) Staff
Microbiology, chemistry, or biology of medicinal natural products.

8100. MEDICINAL PRODUCT ISOLATION AND IDENTIFICATION. (4 cr; prereq ‡; offered when feasible) Staff
Isolation and identification of a glycoside, pigment (flavonoid, tetracycline, etc.), and a heterocyclic compound (alkaloid, etc.) from either plants or animals.

8200. MEDICINAL PRODUCT ISOLATION AND IDENTIFICATION. (4 cr; prereq ‡; offered when feasible) Staff
Isolation and identification of a triterpene or steroid, terpene (citral, geranoil, etc.), and a phenylpropide (coumarin, chlorogenic acid, etc.) from either plants or animals.

8300. PHARMACEUTICAL FERMENTATION TECHNIQUES. (4 cr; prereq ‡)
Physical and nutritional factors involved in production and biotransformation of antibiotics, steroids, alkaloids, growth regulators, and other useful compounds by microorganisms, tissue cultures, and extracellular enzyme preparations.

8400. SELECTED TOPICS. (3 cr on completion of 3 qtrs) Staff

8500. PHARMACOGNOSY SEMINAR. (1 cr) Staff

8900x. RESEARCH IN PHARMACOGNOSY. (Cr ar; prereq ‡) Staff

PHARMACOLOGY (Phcl)

OFFERED AT MINNEAPOLIS

Professor

Frederick E. Shideman, M.D., Ph.D., *head*
Akira E. Takemori, Ph.D., *director of graduate study*
Nelson D. Goldberg, Ph.D.
Norman O. Holte, D.D.S.
Xenia Machne, M.D.
Gilbert J. Mannering, Ph.D.
Jack W. Miller, Ph.D.
Bernard L. Mirkin, M.D., Ph.D.
Lawrence C. Weaver, Ph.D.
Wallace F. White, Ph.D.
Ben G. Zimmerman, Ph.D.

Associate Professor

Marion W. Anders, Ph.D.
Donald B. Hunninghake, M.D.
Sheldon B. Sparber, Ph.D.

Assistant Professor

James F. Cumming, M.D., Ph.D.
Earl W. Dunham, Ph.D.
Patrick E. Hanna, Ph.D.
Aloysius J. Quebbemann, Ph.D.
Norman E. Sladek, Ph.D.

Pharmacology is a broad science which considers 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 provided. 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.

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 is required to complete pharmacology courses 8203 through 8205, 8211 and 8212, and any three other advanced major courses (Phcl 8206, 8208, 8209 or 8214 through 8218). Prerequisite courses include physiology and biochemistry. Additional requirements are courses in histology, statistics, calculus, microbiology, and such others as may be indicated by the major adviser.

Minor—To meet the requirements for a minor in pharmacology, the student must satisfactorily complete course work representing 22 credits. These courses must include Phcl 8205, 8211, and 8212 and no more than 8 credits of seminar, of which at least 3 credits shall be Phcl 8204.

Language Requirement—For the Master's degree, no foreign language is required. For the Ph.D. degree, either (a) one foreign language or (b) an additional program of course work approved by the department. Routinely acceptable languages for the Ph.D. degree are French, German, Italian, Russian, and Spanish.

Master's Degree—Offered only under Plan A.

Doctor's Degree—Work leading to the Ph.D. degree is offered.

8203. RESEARCH IN PHARMACOLOGY. (Cr and hrs ar; prereq ‡) Shideman and staff

8204. SEMINAR: SELECTED TOPICS IN PHARMACOLOGY. (3 cr on completion of 3 qtrs; prereq 5102 or ‡) Quebbemann, Hanna, and staff

8205. INTRODUCTION TO PHARMACOLOGY. (5 cr; prereq MdBc 5101 or equiv, Phsl 8110 or equiv or ‡) Miller and staff
Lectures on principal pharmacologic effects of major classes of drugs. General principles and mechanisms of action emphasized.

8206. SEMINAR: MICROASSAY OF DRUGS. (1 cr; prereq Chem 3101 or ‡; offered 1973-74 and alt yrs) Holtzman and staff
Review of analytical methods for identification and quantitation of drugs in body fluids, with emphasis on instrument and radiometric technics. Basic principles, applications, and limits of each method discussed. Demonstrations.

8207. SEMINAR: PSYCHOPHARMACOLOGY. (3 cr on completion of 3 qtrs; prereq ‡) Sparber and staff
Selected topics on behavioral aspects of drug action.

8208. PSYCHOPHARMACOLOGY. (2 cr; prereq 8205, Psy 5018, Psy 5062 or ‡; offered 1974-75 and alt yrs) Sparber and staff
Lectures on methodologies currently in use to study relationships between drugs and biochemical and behavioral consequences. Included will be discussions of functional biogenic amine pathways and how specific manipulations result in altered behavior; theories of biochemical feedback activation, induction and inhibition, and theories of tolerance to and/or dependence upon stimulants, hallucinogens, depressants, and opiates.

8209. PHYSIOCHEMICAL CONCEPTS OF DRUG ACTION. (2 cr; prereq 8205 or equiv or ‡; offered 1973-74 and alt yrs) Hanna and staff
Lectures, discussion periods, and outside reading assignments on fundamental principles of chemical-biological interactions with emphasis on molecular mechanisms of drug action.

8211. PHYSIOLOGICAL DISPOSITION OF DRUGS. (3 cr; prereq MdBc 5101 or equiv or ‡; offered 1973-74 and alt yrs) Mannering and staff
Principles underlying absorption, distribution, biotransformation, and excretion of drugs.

8212. PHARMACODYNAMICS. (3 cr; prereq 8205 or ‡) Takemori and staff
Lectures and laboratory experiments for studying physiological, biochemical, and behavioral effects of drugs.

8214. TOXICOLOGY. (3 cr; prereq 8205 or equiv or ‡; offered 1973-74 and alt yrs) Anders and staff
Lectures on toxic effects and mechanisms of intoxication of drugs and foreign chemicals known to adversely alter the health and ecology of man and animals.

8215. CHEMOTHERAPY. (2 cr; prereq 8205 or equiv, MdBc 5101 or equiv, MicB 5105 or equiv or ‡; offered 1974-75 and alt yrs) Sladek and staff
General principles of antimicrobial and antineoplastic chemotherapy with emphasis on mechanisms of action and bases for selective toxicity. Course consists of lectures, outside reading, discussion periods, and demonstrations.

8216. ENDOCRINE PHARMACOLOGY. (2 cr; prereq 8205, MdBc 5101 or equiv, Phsl 8110 or equiv or ‡; offered 1974-75 and alt yrs) Goldberg and staff
Lectures on biochemical and molecular aspects of hormone and neurohormone actions, including mechanism by which pharmacological agents influence these actions. Emphasis placed on pharmacological and biochemical characteristics of plasma membrane receptors, as well as intracellular components involved in expression of hormone actions.

8217. CARDIOVASCULAR-RENAL PHARMACOLOGY. (2 cr; prereq 8205 or equiv or ‡; offered 1974-75 and alt yrs) Zimmerman and staff
Physiological regulation of and pharmacological effects on cardiovascular and renal systems. Neurohumoral modification of cardiac function, peripheral and renal vascular resistance, hypertension, antihypertensive agents, and active transport mechanisms in the kidney.

8218. NEUROPHARMACOLOGY: BIOPHYSICAL ASPECTS. (2 cr; prereq ‡; offered 1974-75 and alt yrs) Machne and staff
Lectures on mechanism of action of drugs on excitable membranes and postsynaptic membrane receptors. Discussion of electrophysiological methods used to evaluate drug action at cellular level and on a population of neurons.

8219. BEHAVIORAL PHARMACOLOGY. (3 cr; prereq 8205 and Psy 5017 or ‡) Pickens and staff
Behavioral effects of drugs.

PHARMACOLOGY

OFFERED AT ROCHESTER

Professor

John R. Blinks, M.D., *chairman*
Frank T. Maher, M.D., Ph.D.

Assistant Professor

William S. Brimijoin, Ph.D.
Joseph H. Szursewski, Ph.D.
Stuart R. Taylor, Ph.D.
Richard Weinshilboum, M.D.

Research programs for the Ph.D. degree may be developed with members of the faculty and will usually involve course work on the Minneapolis Campus.

M 5100, 5101, and 5102. GENERAL PHARMACOLOGY. (3 cr per qtr) Blinks and staff

M 8200. READINGS IN PHARMACOLOGY. (Cr and hrs ar) Staff

M 8201. RESEARCH IN PHARMACOLOGY. (Cr and hrs ar) Staff

M 8202. PHARMACOLOGY OF HEART MUSCLE. (1½ cr) Blinks

M 8203. NEUROPHARMACOLOGY. (1½ cr) Weinshilboum, Brimijoin

M 8880. SEMINARS IN NERVE AND MUSCLE. (1½ cr) Szurszewski and staff

PHARMACY ADMINISTRATION (PhAd)

OFFERED AT MINNEAPOLIS

Professor

Hugh F. Kabat, Ph.D.
Theodore J. Litman, Ph.D.
Lawrence C. Weaver, Ph.D.
Vernon E. Weckwerth, Ph.D.

Associate Professor

Albert Wertheimer, Ph.D., *director of graduate study*

Assistant Professor

James Grogan, Ph.D.
William Hodapp, M.S.
Martin Jinks, Pharm.D.
Thomas Jones, M.P.H.
Thomas McKennell, Ph.D.
Karl Schuttenhelm, Pharm.D.

Graduate work is open to qualified persons who wish to prepare themselves to investigate the relationships between various biological and physical factors and 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 pharmacists 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.

Prerequisites—A degree from a college of pharmacy and 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 and collateral fields and special research techniques may vary considerably depending on the research interest of the student but will be developed in consultation with graduate faculty advisers in that specific area.

Master's Degree—Offered under both Plan A and Plan B.

Doctor's Degree—Work leading to the Ph.D. degree is offered.

8100. SEMINAR. (1 cr per yr) Staff

8200. RESEARCH PROBLEMS. (Cr ar) Staff

8235. LEGISLATIVE CONTROLS. (3 cr; prereq ‡) Kurzman
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 practice of pharmacy.

8255. DRUG MARKETING. (3 cr; prereq ‡) Wertheimer
Historical development of distributive systems, underlying economic principles, marketing channels, agencies, institutions, functions, policies, and practices as they relate to pharmaceutical industry.

8270. CLINICAL CONFERENCES. (2 cr [may be repeated for 6 cr max])
Monitoring of patient drug therapy in a clinical setting.

8290. CLINICAL CLERKSHIP. (2-5 cr; prereq 8270) Staff
Supervised study of pharmaceutical services at University Hospitals or affiliated institutions.

8300, 8301, 8302. CLINICAL THERAPEUTICS. (2 cr per qtr) Schuttenhelm
Clinical lectures on diagnosis and treatment of common diseases.

8400. SPECIAL CLINICAL PROBLEMS. (Cr ar) Staff
Opportunities for study of 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.

8500, 8501. PHARMACY AND ITS ENVIRONMENT. (3 cr per qtr; prereq ‡; offered 1973-74 and alt yrs) Kabat
Cultural foundations of pharmacy. Development of present state of pharmacy practice. Social-psychological factors in drug use, abuse, or nonuse by the patient and practitioner. Role of pharmacist as health practitioner: within the profession, in relation to other health practitioners, and in relation to the general public.

8700. HOSPITAL PHARMACY ADMINISTRATION I. (2 cr) Jones
History, classification, organization, and functions of hospital departments in relation to the pharmacy service.

8701. HOSPITAL PHARMACY ADMINISTRATION II. (3 cr; prereq 8700, ‡) Grogan

8702. HOSPITAL PHARMACY SURVEY. (1 cr; prereq 8701, ‡) Kabat

PHYSICAL MEDICINE AND REHABILITATION (PMed)

OFFERED AT MINNEAPOLIS

Professor
Frederic J. Kottke, M.D., Ph.D., *head*
Essam A. Awad, M.D., Ph.D., *director of graduate study*
Peter F. Briggs, Ph.D.
Glenn Gullickson, Jr., M.D., Ph.D.
William G. Kubicek, Ph.D.

Clinical Professor
Paul M. Ellwood, Jr., M.D.
Miland E. Knapp, M.D., M.S.

Associate Professor
Thomas Anderson, M.D., M.S.
Gary T. Athelstan, Ph.D.
Theodore Cole, M.D.
Daniel Halpern, M.D.
Pearl Rosenberg, Ph.D.

Physical Therapy

Professor
Glenn Gullickson, Jr., M.D., Ph.D.
Frederic J. Kottke, M.D., Ph.D.
William G. Kubicek, Ph.D.

Associate Professor
Wilbur L. Moen, B.A., B.S., *director*
Helen V. Skowlund, M.S., *director of graduate study*
John D. Allison, M.S.
Thomas P. Anderson, M.D.
Gary T. Athelstan, Ph.D.
Theodore M. Cole, M.D.
Martin O. Mundale, M.S.
James F. Pohtilla, M.S.
Pearl P. Rosenberg, Ph.D.

Assistant Professor
Jessie K. M. Easton, M.D.
Mary A. Price, M.D.

Instructor
Donna L. Pauley, B.S.

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, of whom there are an insufficient number, are in great demand in medical schools, private practice, Veterans Administration hospitals, and many state hospitals for the chronically disabled. Physical medicine, therefore, offers unusual opportunity to the young physician.

Opportunity for clinical and fundamental research, as well as clinical experience and training, is offered at University of Minnesota Hospitals. Additional clinical experience is obtained at Hennepin County General Hospital, Minne-

apolis Veterans Hospital, and the Kenny Rehabilitation Institute. Students devote full time to their training program and may not carry on outside practice. The 3-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 adviser. For the minor field of study, anatomy, physiology, biophysics, or pathology are especially recommended.

Language Requirement—For the Ph.D. degree, either (a) two foreign languages or (b) one foreign language and the option of a collateral field of knowledge. Routinely acceptable languages are French, German, Italian, Russian, and Spanish.

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 3 years for completion. Qualified physical therapists with Bachelor's degrees may be accepted for study for the M.S. degree under Plan A. This usually requires 2 years for completion.

Doctor's Degree—The Ph.D. degree in physical medicine is designed for physicians interested in a career of teaching and research. Completion of this program requires approximately 5 years. In addition to the clinical training and the participation in the teaching program, extensive experience is obtained in laboratory and clinical research.

8103f,w,s,su. PHYSICAL THERAPY CLINIC. (Cr and hrs ar; prereq physical therapist) Kottke, Halpern, Gullickson, Cole, Awad, Easton, Anderson)
Clinical physical therapy in adult and pediatric rehabilitation.

8130. CURRENT LITERATURE SEMINAR IN PHYSICAL THERAPY. (1 cr) Staff
Presentation and discussion of current literature in physical therapy and related medical fields.

8135. ADVANCED KINESIOLOGY. (3 cr; prereq undergrad course in kinesiology) 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
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; prereq #) 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) Staff

8170. SPECIAL TOPICS IN PHYSICAL THERAPY. (1 cr; prereq #) Graduate faculty
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 #) Moen
Philosophy and objectives of physical therapy education, administrative structure, curriculum, and accreditation. **8172:** Lectures and discussion. **8173:** Clinical practice; analysis and construction of courses of study.

8180, 8181. PHYSIOLOGICAL BASES FOR THERAPEUTIC EXERCISE. (3 cr per qtr) Kottke
Lectures on therapeutic exercise plus assigned projects.

8185f,w,s,su. PROBLEMS IN PHYSICAL THERAPY. (Cr ar; prereq physical therapist) Allison, Mundale, Pohtilla, Skowlund

8192. RESEARCH DESIGN IN PHYSICAL THERAPY. (3 cr; prereq ‡) Skowlund
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, Pohtilla, Skowlund
Methods of research appropriate to physical therapy. Experimental research study.

8195. RESEARCH IN PHYSICAL THERAPY. (Cr ar; prereq ‡) Kottke, Skowlund, and staff

8200f,w,s,su. PHYSIATRY SERVICE. (Cr and hrs ar) Staff
Service at University Hospitals, Hennepin County General Hospital, Kenny Rehabilitation Institute, Veterans Administration Hospital, and other affiliated hospitals.

8204f,w,s,su. PERIPHERAL VASCULAR DISEASE CLINIC. (Cr and hrs ar; for physicians) Gullickson

8205f,w,s,su. READINSG IN PHYSICAL MEDICINE AND REHABILITATION. (1 cr) Kottke

8206f,w,s. CONFERENCE ON PHYSICAL MEDICINE AND REHABILITATION. (1 cr) Staff
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 basis of physiatry.

8210f,w,s,su. RESEARCH IN PHYSICAL MEDICINE. (Cr and hrs ar) Kottke, Kubicek, Gullickson, Awad, and staff

8211f,w,s,su. ELECTRONICS IN PHYSICAL MEDICINE. (2 cr) Kubicek
Review of principles of electronic circuits, vacuum tubes, power supplies, and their application in physical medicine.

8212f,w,s. ELECTROMYOGRAPHY. (Cr ar; prereq ‡) Awad and staff
Clinical and laboratory training in use and interpretation of electromyograph.

8213f,s. ELECTRODIAGNOSIS CONFERENCE. (Cr ar; prereq 8211 or ‡) Awad
Clinical presentation and discussion of cases examined in the Electrodiagnostic Laboratory.

8220f,w,s. SEMINAR: PHYSICAL MEDICINE AND REHABILITATION. (Cr and hrs ar) Awad

8230. LEADERSHIP TRAINING FOR INTERDISCIPLINARY SETTINGS. (1 cr; offered on S-N only) Rosenberg

PMed 8195. RESEARCH IN PHYSICAL THERAPY. (Cr ar; prereq ‡) Kottke, Skowlund, and staff

PHYSICAL MEDICINE AND REHABILITATION

OFFERED AT ROCHESTER

Professor

Gordon M. Martin, M.D., M.S., *chairman*
G. Keith Stillwell, M.D., Ph.D.

Associate Professor

Donald J. Erickson, M.D., M.S.

Assistant Professor

Joachim L. Opitz, M.D., M.S.

Instructor

Robert R. Sawtell, M.D.
Ann H. Schutt, M.D.
Robert G. Tinkham, M.D.

The 3-year residency program in physical medicine and rehabilitation consists, in the major field, of at least 24 months of supervised clinical practice in the hospital and outpatient departments of physical medicine and rehabilitation (including 3 to 6 months of clinical electromyography), 2 to 3 quarters of related clinical services (which may include such fields as neurology, rheumatology, orthopedics, general medicine, psychiatry). Six to 9 months may be spent working on a degree program in basic sciences such as physiology, anatomy, or biophysics—as a minor field. The program is approved by the Council on Medical Education of the American Medical Association.

A combined internship-residency program of 3-year duration is available to postdoctoral applicants who have not had an internship.

In clinical practice the resident has the opportunity to become proficient in prescribing and supervising all types of physical therapy, occupational therapy, and rehabilitation procedures for outpatients as well as for patients on other services. The resident develops experience in the evaluation and care of patients with physical disabilities such as may be seen in all phases of medical practice.

On the 40-bed service at St. Marys Hospital, where responsibility for the total care of patients is primarily that of the Physical Medicine and Rehabilitation Department, the residents will become proficient in medical and physical management of patients with spinal cord injury, hemiplegia, and other major physical disabilities. They will learn to prescribe various steps involved in the overall rehabilitation program of seriously handicapped patients and will follow their progress. They will also learn to coordinate and utilize services of other medical specialists and of other 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 on clinical problems with a staff of 10 full-time physiatrists make it possible for the resident to obtain wide clinical and theoretical experience in all aspects of physical medicine and rehabilitation, as well as in related medical and surgical fields.

Language Requirement—For the Ph.D. degree, either (a) two foreign languages or (b) one foreign language and the option of a collateral field of knowledge.

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. PHYSICAL MEDICINE AND REHABILITATION. Staff

M 8852f,w,s,su. SPECIAL SERVICE. Staff
Physical medicine and rehabilitation as related to rheumatology, orthopedic surgery, neurology, and various other medical and surgical specialties.

RESEARCH WORK ON SELECTED PROBLEMS IN PHYSIOLOGY. (See Physiology)

PHYSIOLOGICAL HYGIENE (PubH)

OFFERED AT MINNEAPOLIS

Professor
Henry C. Taylor,
director of graduate study
Henry W. Blackburn
Francisco Grande

Associate Professor
Ronald Prineas

Minor—It is suggested that students who major in physiological hygiene present a minor in one of the following fields: epidemiology, biometry, nutrition, physiological chemistry, psychology, or internal medicine.

Language Requirement—For the Master's degree, the language requirement is waived. For the Ph.D. degree, one foreign language (French or German) or competence in a collateral field of knowledge.

Master's Degree—Offered only under Plan A.

Doctor's Degree—Candidates for a Ph.D. in physiological hygiene should have an adequate background in the biological sciences and/or health sciences or an M.D. The plan of study is based on an interdisciplinary group of subjects drawn from physiology, biochemistry, nutrition, biometry, epidemiology, and medicine. Individual plans lead to either a career in research or in preventive cardiology.

5380. APPLIED HUMAN NUTITION. (3 cr; prereq ‡) Grande, Stief, Taylor
See Public Health for description.

5385. PHYSIOLOGY OF EXERCISE. (Cr ar; prereq Phsl 5110 or equiv, ‡; offered when demand warrants) Taylor
Muscular efficiency, training, deconditioning, effects of exercise on physiological systems.

8386. READINGS IN PROBLEMS OF PHYSIOLOGICAL HYGIENE. (Cr ar; prereq ‡) Staff

8387. RESEARCH IN PHYSIOLOGICAL HYGIENE AND RELATED AREAS. (Cr ar) Staff

PHYSIOLOGY (Phsl)

OFFERED AT MINNEAPOLIS

Professor

Eugene D. Grim, Ph.D., *head, director of graduate study*
Marvin B. Bacaner, M.D.
H. Mead Cavert, M.D., Ph.D.
Irwin J. Fox, M.D., Ph.D.
Francisco Grande, M.D.
Franz Halberg, M.D.
Rodney B. Harvey, M.D., Ph.D.
John A. Johnson, M.D., Ph.D.
William G. Kubicek, Ph.D.
Nathan Lifson, M.D., Ph.D.
Victor Lorber, M.D., Ph.D.
Asa Seeds, M.D.
Henry L. Taylor, Ph.D.
Carlo A. Terzuolo, M.D.
Maurice B. Visscher, M.D., Ph.D.

Associate Professor

Jui S. Lee, Ph.D.
Richard E. Poppele, Ph.D.
Richard L. Purple, Ph.D.
Aldo Rescigno, Laurea in Physics

Assistant Professor

James Bloedel, M.D., Ph.D.
Robert L. Evans, Ph.D.
Gordon Kepner, Ph.D.
Charles Knox, Ph.D.
Richard Kronenberg, M.D., Ph.D.
David G. Levitt, M.D., Ph.D.
David E. Shafer, Ph.D.
Richard J. Stish, B.E.E.
O. Douglas Wangensteen, Ph.D.

Lecturer

Maurice W. Meyer, Ph.D.

Prerequisites—For a major or minor in physiology, acceptable background in mathematics, physics, chemistry, and morphology.

Language Requirement—For the Master's degree, the language requirement is waived. For the Ph.D. degree, students, in consultation with their adviser, will elect to demonstrate a reading knowledge in one foreign language or to complete a collateral field of knowledge.

Doctor's Degree—Work for the Ph.D. degree is offered to candidates whose background of training is approved by the graduate faculty. The requirements for the minor program can be satisfied either by the use of a conventional minor or, in appropriate instances, by the use of a supporting program.

5101w. HUMAN PHYSIOLOGY. (8 cr; primarily for dent students; prereq courses in biochemistry and human or mammalian anatomy; 5 hrs lect, 2 hrs conf, and 3 lab hrs per wk)

5102f. HUMAN PHYSIOLOGY. (5 cr; primarily for medical-surgical nursing students; prereq biochemistry and human or mammalian anatomy; 5 lect hrs per wk)

5103f. GENERAL PHYSIOLOGY. (3 cr; prereq ‡; offered even yrs only)
Mechanisms of transport and energy transformation in living organisms.

5104w. NEUROPHYSIOLOGY. (4 cr; prereq neuroanatomy and ‡; offered odd yrs only)

5105s. CARDIOVASCULAR PHYSIOLOGY. (4 cr; prereq ‡; offered odd yrs only)

5106f. RESPIRATORY PHYSIOLOGY. (4 cr; prereq ‡; offered odd yrs only) Kronenberg, Wangensteen

5107w. ALIMENTARY PHYSIOLOGY. (3 cr; prereq ‡; offered even yrs only)

5108s. NEPHROLOGY. (3 cr; prereq ‡; offered even yrs only)

5109f,w,s. SYSTEMS ANALYSIS FOR BIOLOGISTS. (3 cr; prereq calculus through introduction to differential equations, physical chemistry or ‡)

5110s.† HUMAN PHYSIOLOGY. (6 cr; primarily for Phase A3 med students; prereq anatomy, biochemistry)

5111su.† HUMAN PHYSIOLOGY. (5 cr; primarily for Phase A4 med students; prereq 5110)

5113s.† PROBLEMS IN PHYSIOLOGY. (Cr and hrs ar; prereq ‡)
Topics assigned for readings or lab study; conferences.

5114. BIOPHYSICS OF NERVE CELLS. (3 cr; prereq ‡; offered 1974 and alt yrs) Staff
Electrostatics, cable theory, the Hogkin-Huxley model, propagated action potential, theoretical considerations of nerve impulse initiation, generalized Nernst-Goldman equation, noise.

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

8101w. HUMAN PHYSIOLOGY. (8 cr; primarily for dental students; prereq courses in biochemistry, human or mammalian anatomy) Staff

8102f. HUMAN PHYSIOLOGY. (5 cr; primarily for medical-surgical nursing students; prereq course in biochemistry, human or mammalian anatomy) Staff

8103f. GENERAL PHYSIOLOGY. (3 cr; prereq ‡; offered 1974 and alt yrs) Grim, Johnson, Levitt, Lifson
Mechanisms of transport and energy transformation in living organisms.

8104w. NEUROPHYSIOLOGY. (7 cr; prereq 8100, neuroanatomy, ‡; offered 1973 and alt yrs) Poppele, Purple, Terzuolo

8105s. CARDIOVASCULAR PHYSIOLOGY. (4 cr; prereq ‡; offered odd yrs only) Kronenberg, Wangensteen

8106f. RESPIRATORY PHYSIOLOGY. (4 cr; prereq ‡; offered odd yrs only) Kronenberg, Wangensteen

8107w. ALIMENTARY PHYSIOLOGY. (3 cr; prereq ‡; offered even yrs only) Grim

8108s. NEPHROLOGY. (3 cr; prereq ‡; offered even yrs only) Harvey

8109f. SYSTEMS ANALYSIS FOR BIOLOGISTS. (3 cr; prereq calculus through introduction to differential equations or ‡) Rescigno

8110s. HUMAN PHYSIOLOGY. (11 cr; primarily for med students; prereq anatomy, biochemistry; 4 lect and 6 lab hrs per week; course extends 4 wks beyond end of spring qtr) Staff

8113. PROBLEMS IN PHYSIOLOGY. (Cr ar [may be repeated for credit]; prereq ‡)
Arranged with qualified students. Topics assigned for laboratory study, conferences, and reading.

8116. BIOPHYSICAL APPROACHES TO PHYSIOLOGY. (4 cr; prereq 3055 or ‡) Kepner

8201f,w,s. LITERATURE SEMINAR. (1-2 cr)

8202.* READINGS IN PHYSIOLOGY. (Cr and hrs ar)
Topics selected for each student; written rveiews prepared and discussed.

8203.* RESEARCH IN PHYSIOLOGY. (Cr and hrs ar)

8204. HISTORY OF PHYSIOLOGY.** (Cr and hrs ar) Visscher, Wilson

8210. SELECTED TOPICS IN PERMEABILITY.** (Cr and hrs ar; prereq 8103 or equiv, ‡) Grim, Lifson, Johnson
Advanced seminar.

8211. SELECTED TOPICS IN HEART AND CIRCULATION.** (Cr and hrs ar; prereq 8105 or equiv, ‡) Visscher, Bacaner, Fox
One or more seminars in the advanced physiology of heart and circulation.

8212. SELECTED TOPICS IN RESPIRATION.** (Cr and hrs ar; prereq 8106 or equiv, ‡)
Advanced seminar.

8213. SELECTED TOPICS IN ALIMENTARY PHYSIOLOGY.** (Cr and hrs ar; prereq 8107 or equiv, ‡) Grim, Lifson

8214. SELECTED TOPICS IN NEPHROLOGY.** (3 cr; prereq 8108 or equiv) Harvey
Advanced seminar.

8216f,s. SELECTED TOPICS IN NEUROPHYSIOLOGY. (Cr and hrs ar; prereq 8104 or equiv, ‡) Terzuolo, Poppele, Purple
Advanced seminar.

8220. METHODS OF ANALYSIS.** (3 cr; prereq calculus through introduction to differential equations, physical chemistry or ‡) Rescigno
Topics selected from: control theory, compartment analysis, tracer analysis, thermodynamics of irreversible processes, construction and use of models. Applications in physiology.

8227s. METHODS IN PHYSIOLOGY. (3 cr; prereq ‡) Stish

8230, 8231. TRANSPORT PROCESS IN BIOLOGY.** (3 cr per qtr; prereq 8103 or equiv) Grim, Johnson, Lifson
Relatively systematic coverage of biological transport processes.

8234. RESPIRATION, ACID-BASE CHEMISTRY, AND ELECTROLYTE METABOLISM.** (3 cr; prereq 8106 or equiv)

8235. BIOENERGETICS OF CARDIAC CONTRACTION.** (3 cr; prereq 8105 or equiv) Cavert, Lorber

8236. HEMODYNAMIC MEASUREMENTS.** (3 cr; prereq 8100 or equiv within past 8 yrs) Evans
Lectures, experiments, and problems dealing with pulsatile blood flows.

8238. NEURAL AND HUMORAL CONTROL OF CIRCULATION.** (3 cr; prereq 8105 or equiv) Grande

8239w. PHYSIOLOGY OF LYMPHATIC SYSTEM AND MICROCIRCULATION.** (Cr ar) Lee, Meyer

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** Students should consult the department for offerings during any specific quarter.

PHYSIOLOGY

OFFERED AT ROCHESTER

Professor

John T. Shepherd, M.D., D.Sc., *chairman*
Alexander Albert, M.D., Ph.D.
James B. Bassingthwaighte, M.D., Ph.D.
Charles F. Code, M.D., Ph.D.
David E. Donald, D.V.M., Ph.D.
Ward S. Fowler, M.D.
Alan F. Hofmann, M.D.
Robert E. Hyatt, M.D.
Jenifer Jowsey, D.Phil.
Edward H. Lambert, M.D., Ph.D.
Frank T. Maher, Ph.D.
Charles A. Owen, Jr., M.D., Ph.D.
William H. J. Summerskill, M.D.
Earl H. Wood, M.D., Ph.D.

Associate Professor

H. Frederic Helmholz, Jr., M.D.
Franklin G. Knox, M.D., Ph.D.
Sidney F. Phillips, M.B.B.S.
Ralph E. Sturm

Assistant Professor

William P. Baldus, M.D., M.S.
George W. Beeler, Ph.D.
Thomas B. Dousa, M.D., Ph.D.
Ralph A. Nelson, M.D., Ph.D.
Joseph H. Szurszewski, Ph.D.

Instructor

Donald W. Klass, M.D.
Jerry F. Schlegel, B.S.

Within the Mayo Graduate School, physiology and biophysics are combined into one administrative department. The biophysics program is, therefore, rather closely related to the physiology program, and listings under biophysics may be found to be pertinent to the student's interests. Programs may lead to the M.S. or Ph.D. degree or may be used as a minor field for a degree in another discipline. Some of the work toward the Ph.D. degree is commonly done on the Minneapolis Campus.

Language Requirements—For the M.S. degree, no language is required. For the Ph.D., the student may demonstrate either a reading knowledge of one foreign language or competence in a collateral field of knowledge. In the collateral field, the requirement is 9 course credits (or equivalent) comprising a coordinated body of knowledge, these credits being different from those used for the major and minor.

Physiology as a Minor—For programs in nonclinical basic sciences, 9 credits in graduate level courses exclusive of Phsl M 8853 are required in M.S. programs and 18 to 24 credits in Ph.D. programs. For programs in clinical fields, in addition to the course requirements for the minor in the nonclinical fields, 6 to 9 months of work in a laboratory under the sponsorship of a faculty member are also recommended.

Supporting Programs—These are coherent patterns of studies which may be used to substitute for a minor, subject to approval of the department. The total credit requirement is the same as for the minor; a minimum of 6 credits should be obtained in each component of the supporting program. Appropriate programs may be comprised of biochemistry, biophysics, bioengineering, biometrics, and any of the physical, chemical, or mathematical sciences.

M 8851f,w,s. PHYSIOLOGY SEMINARS. (1 cr; prereq regis for readings in physiology or for other listed courses arranged 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. (Cr and hrs ar; 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 and hrs ar) Staff

M 8855f. MAMMALIAN PHYSIOLOGY I—CARDIOVASCULAR TRANSPORT. (3 cr; offered even yrs only) Bassingthwaighte
First of a series of 6 courses, given over a 2-year period covering physiology at an intermediate graduate level. Passive and carrier-mediated transport processes, rheology, intravascular transport, blood flow measurement, blood-tissue exchange mechanisms.

M 8856w. MAMMALIAN PHYSIOLOGY II—NEUROMUSCULAR. (3 cr; offered odd yrs only) Szurszewski, Taylor, and staff
Anatomy and physiology of excitable cells, contractility of muscle, synaptic and neuromuscular transmission, spinal reflex systems, CNS behavior, and electroencephalography.

M 8857s. MAMMALIAN PHYSIOLOGY III—RENAL. (3 cr; offered odd yrs only) Knox
Current concepts in renal physiology reviewed in depth.

M 8858f. MAMMALIAN PHYSIOLOGY IV—RESPIRATORY. (3 cr; offered odd yrs only) Hyatt and staff
Lung mechanics, ventilation-perfusion ratio, gas diffusions, transport and exchange, acid-base balance, control of ventilation.

M 8859w. MAMMALIAN PHYSIOLOGY V—GASTROINTESTINAL. (3 cr; offered even yrs only) Code, Hofmann, Nelson, Phillips, Schlegel, Szurszewski
Salivary, gastric, and pancreatic secretion; bile composition, function, and control; motility and absorption mechanisms, regional differences, and control.

M 8860s. MAMMALIAN PHYSIOLOGY VI—ENDOCRINE. (3 cr; during some qtrs may substitute for Med M 8864; offered even yrs only) Albert, Jowsey, Owen, and staff
Neural-hypophysial systems; reproductive endocrinology; thyroid, parathyroid, and adrenal physiology; mineral metabolism; glucose regulation.

M 8866. BASIC PRINCIPLES OF ELECTRICITY AND ELECTRONICS. (1 cr) Staff
Lectures on basic principles in electricity, electronic components, and circuits afford understanding of research and diagnostic uses of electrical apparatus.

M 8868f,w,s,su. NEUROPHYSIOLOGY. (2 cr) Klass and staff
Seminars in physiology of central nervous systems; electrophysiology and quantitation of neurophysiologic data.

M 8870. COMPUTER ANALYSIS OF PHYSIOLOGICAL DATA. (3 cr) Staff
Data acquisition systems, concepts of noise, sampled data representation, aliasing, filtering. Principles of analog computation, component description, ordinary differential equations.

M 8874f,w,s,su. NEUROMUSCULAR PHYSIOLOGY. (2 cr) Lambert
Lectures, discussions, and demonstrations in physiology of peripheral nerves and muscles; basic aspects and mechanisms of neuromuscular diseases.

M 8877. MORPHOLOGY AND PHYSIOLOGY OF BONE. (3 cr per qtr; 2 qtrs required) Jowsey and staff
Series of lectures in basic understanding of bone structure and metabolism; includes seminars, journal club, and also lectures and practical work in vascular surgery.

M 8878. CALCIUM AND PHOSPHORUS METABOLISM. (1½ cr) Jowsey and staff
Series of weekly lectures and assigned study on calcium and phosphorus metabolism in health and disease as related to metabolic bone disorders and general mineral and hormone physiology.

M 8880f,w,s. SEMINARS IN NERVE AND MUSCLE. (1½ cr, §BPhy M 8880 and Phcl M 8880; prereq courses in physical sciences and mathematics, ‡) Taylor and staff
Assigned readings, conferences, and demonstrations on excitation and conduction, synaptic transmission, and muscle contraction.

M 8881. HEMODYNAMICS AND RHEOLOGY. (3 cr; prereq M8852, calculus) Bassingthwaighte, Sturm, and staff
Sequence of films, lectures, and seminars covering elementary classical hydrodynamics, rheology of non-Newtonian fluids, including blood, wave transmission, and mass transport in the circulation.

M 8882. CARDIOVASCULAR REGULATION. (3 cr) Donald, Shepherd, Wood
Neural control; cardiac work; effects of exercise; press-volume curves; peripheral vessel responses to autonomic stimuli; abnormal states (hypertension, shock).

M 8883. TRANSMEMBRANE TRANSPORT. (3 cr; prereq M 8855) Bassingthwaighte
Passive transport of solvents and solutes, facilitated and uphill transport, carrier kinetics, and selected aspects of transport across charged and excitable membranes.

Biochem M 5255. ENDOCRINOLOGY AND METABOLISM. (3 cr) Staff

Courses in electroencephalography are listed under neurology.

PLASTIC SURGERY

OFFERED AT ROCHESTER

Professor
John B. Erich, M.D.

Assistant Professor
James K. Masson, M.D., *head*
Thaddeus J. Litzow, M.D.
John E. Woods, M.D., Ph.D.

Residencies in plastic surgery at the Mayo Graduate School of Medicine include training in all aspects of this surgical speciality. Included in the work of this section is the treatment of burns, management of major tumors of the head and neck, operative care of cleft lip and cleft palate, as well as other congenital anomalies of childhood, a wide variety of cosmetic surgery, and the care of traumatic injuries of the maxillofacial region.

Residents in plastic surgery rotate the first 12 months as senior residents on plastic surgical services at both St. Marys and Rochester Methodist Hospitals. Each resident is instructed in pre- and postoperative care and is given the opportunity to operate with supervision. The last year of training is divided into 4-month periods at St. Marys Hospital, Rochester Methodist Hospital, and Rochester State Hospital as chief resident associate, a position of supervised senior responsibility.

Opportunities are available for study in the fundamental sciences (pathology and anatomy), under supervision of members of the faculty. Weekly seminars are held for didactic sessions as well as Journal Club. A bimonthly Cleft Palate Clinic is held in cooperation with other members of the cleft palate team.

Training in plastic surgery at the Mayo Graduate School of Medicine meets the requirements of the American Board of Plastic Surgery for a 2-year program. Although not mandatory, all residents are urged to take a full 4-year residency in general surgery prior to commencement of the plastic surgery training, whether this is done at the Mayo Clinic or elsewhere.

Following 3 years of general surgery training in the Mayo Graduate School program, residents are then eligible for an additional period of 3 years training with combined general surgery-plastic surgery board eligibility.

M 8852f,w,s,su. DIAGNOSTIC AND CLINICAL PLASTIC SURGERY. Staff
Theory and practice of plastic surgery. Diagnosis of diseases and defects requiring plastic repair. Pre- and postoperative care of patients.

M 8853f,w,s,su. OPERATIVE PLASTIC SURGERY. Staff
Hospital residence. Junior residency in operative service.

M 8854f,w,s,su. OPERATIVE PLASTIC SURGERY. Staff
Operative plastic and reconstructive surgery of entire body including cosmetic surgery; also management of burns, tumors of the head and neck, and maxillofacial injuries. Senior residency in operative service.

SURGICAL AND FRESH TISSUE PATHOLOGY. (See Pathology)

ANATOMY. (See Anatomy)

PSYCHIATRY

OFFERED AT MINNEAPOLIS

Professor

William Hausman, M.D., *head*
Peter F. Briggs, Ph.D., *director of graduate study*
Richard W. Anderson, M.D.
John P. Brantner, Ph.D.
A. Jack Hafner, Ph.D.
Donald W. Hastings, M.D.
Gordon Heistad, Ph.D.
David T. Lykken, Ph.D.
Manfred J. Meier, Ph.D.
Wentworth Quast, Ph.D.
Alan H. Roberts, Ph.D.
William Schofield, Ph.D.
Werner Simon, M.D.
Travis I. Thompson, Ph.D.

Clinical Professor

Gove Hambidge, M.D.

Associate Professor

Titus P. Bellville, M.D.
Floyd K. Garetz, M.D., M.S.
Leonard L. Heston, M.D.
William W. Jepson, M.D.
Lloyd K. Sines, Ph.D.
Neil J. Yorkston, M.D.

Master's and Doctor's Degrees—Excellent facilities are available for M.S. (Plan A) and Ph.D. degrees in psychiatry. The minor may be elected in such fields as anthropology, psychology, sociology, philosophy, or related fields which provide a background in broad cultural areas. Under ordinary circumstances the fellowship runs for a period of 3 years, i.e., fulfills the requirements for training of the American Board of Psychiatry and Neurology. A 4-year program offering advanced degrees in child psychiatry is also available. No foreign language is required.

Psychiatry (AdPy)

5606. SPECIAL ASSIGNMENTS. (Cr ar; prereq ‡) Staff

8201. CLINCAL PSYCHIATRY. (Cr ar; prereq MD) Staff

8203. ADVANCED CLINICAL PSYCHIATRY. (Cr ar; prereq MD, 8201, 8202 or equiv) Staff

8205. SPECIAL ASSIGNMENTS IN PSYCHIATRY. (1 cr; prereq MD, 8201, 8203 or equiv) Staff

8206. RESEARCH IN PSYCHIATRY. (Cr ar; prereq ‡) Staff

8208. SURVEY OF PHYSIOLOGICAL TREATMENTS. (2 cr; prereq ‡) Staff

8212. REVIEW OF CURRENT LITERATURE. (1 cr; prereq MD or ‡) Hastings and staff

8215. CURRENT RESEARCH IN PSYCHIATRY. (1cr; prereq ‡) Hambidge

8216. INTRODUCTION TO FAMILY THERAPY. (1 cr; prereq ‡) Hambidge

8218. READINGS IN PSYCHOANALYSIS AND TRANSACTIONAL ANALYSIS. (1 cr; prereq ‡) Lewis

8220. SURVEY OF PSYCHIATRY FOR NEUROLOGY RESIDENTS. (1 cr; offered 1974-75 and every 3rd yr)

8221. SEMINAR: CURRENT LITERATURE. (1 cr; prereq ‡) Simon

8224. INTRODUCTION TO GROUP THERAPY. (1 cr)

8226, 8227.† BIOLOGICAL PSYCHIATRY. (3, 1 cr; prereq MD or ‡) Heston

8229. COMPARISON OF GROUP TECHNIQUES. (1 cr; prereq ‡) Hausman and staff

8230. CASE-CENTERED CONFERENCE ON GROUP THERAPY. (1 cr; prereq ‡) Hausman

8238. CASE CONFERENCE IN PSYCHOLOGICAL MEDICINE. (1 cr; prereq MD or ‡) Wilder

8239. CONTINUOUS CASE SEMINAR: PSYCHOANALYTICALLY-ORIENTED PSYCHOTHERAPY. (1 cr; prereq ‡) London

8240. PSYCHOLOGICAL PROBLEMS OF THE AGED. (2 cr; prereq ‡) Garetz

8243. SEMINAR: INTRODUCTION TO CLINICAL THEORY OF PSYCHOANALYSIS. (1 cr; prereq ‡) London

8244. COMPARATIVE THEORIES OF PSYCHOTHERAPY. (3 cr; prereq ‡) Schofield

8245. READINGS IN THE HISTORY OF PSYCHIATRY. (1 cr; prereq ‡) Schofield

8246. SEMINAR: THE PSYCHOPATHIC PERSONALITY. (3 cr; prereq ‡)

Child Psychiatry (ChPy)

8201. CLINICAL CHILD PSYCHIATRY. (Cr ar; prereq MD)

8202. ADVANCED CLINICAL CHILD PSYCHIATRY. (Cr ar; prereq MD, AdPy 8201, 8202, 8203, ChPy 8201 or equiv)

8203. BASIC READINGS IN CHILD PSYCHIATRY. (1 cr)

8204. PROBLEMS IN CHILD DEVELOPMENT. (2 cr; prereq MD or ‡) Wirt and staff

8205. DIAGNOSTIC AND THERAPEUTIC METHODS IN CHILD PSYCHIATRY. (1 cr)

8206. RESEARCH IN CHILD PSYCHIATRY. (Cr ar)

8207. TOPICS IN CHILD PSYCHIATRY. (1 cr; prereq ‡)

8211. ADOLESCENT PSYCHIATRY. (2 cr; prereq ‡) Malmquist

Health Care Psychology (HCPy)

5101. HUMAN BEHAVIOR IN NEW AND STRESSFUL SITUATIONS. (1 cr) Brantner, Reynolds

5701f,w,s,su. PROJECT IN CLINICAL PSYCHOLOGY. (Cr ar; prereq ‡) Staff
Individual library study or empirical investigation.

8200. DESCRIPTIVE PSYCHOPATHOLOGY. (3 cr; prereq ‡) Roberts

8201. READINGS IN THE HISTORY OF PSYCHIATRY. (1 cr; prereq ‡) Schofield

8202. SPECIAL RESEARCH TOPICS. (Cr ar; prereq ‡) Staff

8203. PSYCHOMETRIC CLERKSHIP. (Cr ar; prereq ‡) Staff

8204. INTERNSHIP IN CLINICAL PSYCHOLOGY. (2 or 4 cr; prereq psychology Ph.D. candidate, 400 hrs clerkship experience) Staff

8206. MEDICAL PSYCHOLOGY LABORATORY. (2 cr; prereq Psy 8611, 8612, 8613, 8614) Staff

8213. ORGANIC THERAPIES IN PSYCHIATRY. (1 cr; prereq ‡) Sines

8214. ORGANIC SYNDROMES IN PSYCHIATRY. Sines

8215. PROFESSIONAL PROBLEMS IN CLINICAL PSYCHOLOGY. Sines

8226. TECHNIQUES OF EVALUATION. (1 cr; prereq ‡)

8227, 8228, 8229. GROUP SUPERVISION OF THERAPY. (1 cr; prereq ‡) Schofield
Intensive group supervision of long-term cases in individual therapy. Use of tapes, role-playing, group discussion.

PSYCHIATRY

OFFERED AT ROCHESTER

Professor

Howard P. Rome, M.D.
Wendell M. Swenson, Ph.D.

Associate Professor

Richard M. Steinhilber, M.D., *chairman*
Alexander R. Lucas, M.D.
Harold R. Martin, M.D.
Maurice J. Martin, M.D., M.S.
David W. Swanson, M.D.
Francis A. Tyce, M.B., M.S.

Assistant Professor

Maurice J. Barry, Jr., M.D., M.S.
Robert C. Colligan, M.A., Ph.D.
James G. Delano, M.D.
Glen Duncan, B.M.B.Ch.
A. Dale Gulledge, M.D., M.S.
Neal E. Krupp, M.D.
Gordon L. Moore II, M.D., M.S.
Robert M. Morse, M.D., M.S.
David Osborne, M.A., Ph.D.

Instructor

Leo J. Davis, Jr., Ph.D.
S. Wendell Obetz, M.D., M.S.
Gerald C. Peterson, M.D.
Mark S. Schwartz, Ph.D.

The practical 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 addicted patients. These provide for individual and group therapies, as well as training in all the standard psychiatric treatment techniques. The hospital psychiatric services are organized as therapeutic communities with their own recreational and occupational therapy facilities. Psychiatric social service and clinical psychological services are available. A minimum of 6 months is devoted to child psychiatry. There is opportunity for long-term intensive psychotherapy of ambulatory adults and children. Incidental to its liaison function to the medical and surgical departments, there is the opportunity to study a wide variety of psychosomatic problems. As an integral part of the residency there are several series of conferences, lectures, and seminars, both formal and informal, dealing with the entire range of clinical psychiatric theory 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.

A minimum of 6 months is also provided at the Comprehensive Mental Health Center in Rochester, Minnesota. The center consists of facilities on the campus of the Rochester State Hospital, which includes the Zumbro Valley Mental Health Clinic, the Day Hospital, and the care of inpatients at the Rochester State Hospital. There is close liaison with the Student Health Service at St. Olaf and Carleton Colleges, Northfield, Minnesota, where the mental health problems of the college-age student are studied. Also there is close affiliation with the local nursery schools and the nearby facilities for the mentally retarded. A new inpatient (24 bed) alcohol unit has been established.

Language Requirement—For the Ph.D. degree, either (a) two foreign languages or (b) one foreign language and the option of a collateral field of knowledge.

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. Staff Research. Seminar.

M 8853f,w,s,su. HOSPITAL RESIDENCE IN PSYCHIATRY. Staff

M 8854f,w,s,su. SPECIAL PSYCHIATRY AT COMPREHENSIVE MENTAL HEALTH CENTER, ROCHESTER STATE HOSPITAL. Staff

M 8855f,w,s,su. CHILD PSYCHIATRY.

M 8856f,w,s,su. CLINICAL PSYCHIATRY. Staff

M 8858f,w,s,su. BASIC NEUROLOGIC SCIENCES. Staff

PUBLIC HEALTH (PubH)**

OFFERED AT MINNEAPOLIS

Professor

Jacob E. Bearman, Ph.D.
Richard G. Bond, M.S., M.P.H.
Velvl W. Greene, Ph.D.
George S. Michaelsen, M.S.
Harold J. Paulus, Ph.D.
Leonard M. Schuman, M.D., M.S.
James W. Stephan, M.B.S.
Conrad P. Straub, M.C.E., Ph.D.

Associate Professor

Lee D. Stauffer, M.P.H., *dean, director of graduate study*
Eleanor M. Anderson, M.P.H.
Donald E. Barber, M.P.H., Ph.D.
Knowlton J. Caplan, M.S.
Norman A. Craig, M.P.H.
Delphie J. Fredlund, M.P.H.
Rexford D. Singer, B.S.C.E., M.S.
Alma G. Sparrow, M.S., M.P.H.
Ruth Edna Stief, M.P.H.
George E. Williams, M.D.

Assistant Professor

E. Charlotte Carver, M.P.H.
Dorothy E. Downey, M.P.H.
Edith D. Leyasmeyer, Ph.D.
Gustave Scheffler, B.S.
Margaret R. Sloan, M.S.
Barbara Spradley, M.N.
Robert L. Veninga, Ph.D.

Lecturer

Henry Bauer, Ph.D.
Lee E. Schacht, Ph.D.

Instructor

Barbara J. Leonard M.S.

Language Requirement—For the Master's degree, knowledge of a foreign language may be waived on recommendation of the adviser. For the Ph.D. degree, reading knowledge of two foreign languages or of one foreign language and the option of a special research technique or a collateral field of knowledge. Acceptable languages are French, German, Norwegian, Russian, Spanish, or Swedish.

Minor—For the Master's degree, PubH 5375, 5007, and courses in biometry and either epidemiology or public health administration.

For the Ph.D. degree, PubH 5375, 5007, and 20 additional credits selected on the basis of the candidate's field of major study.

Master's Degree—Offered under both Plan A and Plan B. All candidates for this degree must take PubH 5375, 5007, and 5751.

Public Health Nursing—Programs under Plan B have public health (including public health nursing) as the major with social science as one related field and the other selected with reference to the student's specific goal. These programs admit qualified nurses with interest in supervision or teaching. It is possible for

** Inquiries concerning other work in public health, including courses of study leading to the degrees of M.P.H., master of public health, and M.H.A., master of hospital administration, should be addressed to: Dean of the School of Public Health, 1325 Mayo Memorial Building, University of Minnesota, Minneapolis, Minnesota 55455.

individual student programs to include extra emphasis in leadership, teaching, supervision/administration, *nurse associate* programs in pediatrics, adult and geriatric health, school nursing, and maternity and family planning.

Physical and Occupational Therapy—The program under Plan B is designed for experienced physical and occupational therapists interested in a professional career in public health or other community agencies. Certain required courses are supplemented by electives based on the student's special interests and individual goals.

Doctor's Degree—Work leading to the Ph.D. degree is offered for majors in biometry, environmental health, epidemiology, hospital and health care administration, and physiological hygiene. For further information on these programs, see the index reference.

General

5005.* TOPICS IN PUBLIC HEALTH. (Cr ar; prereq ‡) Staff
Selected readings in public health with discussion based on these readings.

5006. INTRODUCTION TO COMMUNITY HEALTH. (5 cr, §3003; prereq nursing students, nurses, public health students, other health professionals or ‡) Greene
(Same as Nurs 5625) 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. (3 cr) E Anderson, Sloan, Veninga
Identification of leadership qualities and their resulting effect on organizational behavior. Identification of various theories of change and their practical application to the field of health. Discussion of changing role of the health professional.

8001. SEMINAR: PUBLIC HEALTH. (Cr ar)

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

8003. RESEARCH. (Cr ar)
Opportunities will be offered by the School of Public Health and by various cooperating organizations for qualified students to pursue research work.

Mental Health

5030. MENTAL HEALTH PROGRAM. (1 cr; prereq 5700 or ‡) Williams
Community program for promotion of mental health and care of mentally ill persons.

5031. MENTAL HEALTH. (3 cr; prereq ‡) Williams
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, certified tchr, or school nurse) Fredlund, Schwanke
Basic background 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 school.

5034. TOPICS IN ALCOHOL AND DRUG ABUSE. (Cr ar; prereq ‡) Staff
Selected readings and discussion.

5036. GROUP COUNSELING TECHNIQUES RELATED TO CHEMICAL DEPENDENCY TREATMENT. (Cr ar; prereq ¶3035 or completed internship and ‡)Staff
Focus on small group and role it plays in the recovery process. Specialized readings, group interaction, and video taping.

5040. DEATH EDUCATION IN CONTEMPORARY SOCIETY. (3 cr, §Hlth 5402; limited to 30 students; prereq education sr, certified tchr, school nurse, mortuary science major or ‡) Fredlund
Basic background information on concepts and attitudes toward death, grief, and bereavement, with emphasis on instructional aspects for elementary and secondary schools and role of the school in suicide prevention.

Health Education

5054. FOUNDATIONS IN COMMUNITY HEALTH EDUCATION PRACTICE. (5 cr; prereq ‡)
Introduction to health education principles and methods; role and function of health education specialist; communication theory and process; application of communication models to health education practice.

5055. ORGANIZATION THEORY AND HEALTH EDUCATION PLANNING. (5 cr; prereq 5004)
Elements of comprehensive educational planning; theory and process of health education planning; organization theory; consideration of leadership roles, norms and decision making as related to community health education; examination of theories of organization.

5056. ORGANIZATION, ADMINISTRATION, AND EVALUATION OF COMMUNITY HEALTH EDUCATION. (5 cr; prereq 5054, 5055)
Methods and procedures for organizing and administering health education services; consultant functions; methods for selecting and applying criteria for effective evaluation of health education efforts.

5064. GROUP PROCESS IN COMMUNITY HEALTH EDUCATION. (2 cr; prereq 5054 or 5080, ‡) Craig
Group methodology in problem solving; principles, concepts, and process of group dynamics as a method of community health education.

5065. HEALTH EDUCATION PREPARATION OF HEALTH AND ALLIED PERSONNEL. (2 cr; prereq ¶5056, ‡) Craig
Methods, procedures, and techniques for planning, implementing, and evaluating programs for in-service and short-course preparation in health education for health and allied personnel.

5066. HEALTH EDUCATION AND CONTEMPORARY HEALTH CARE SYSTEMS. (2 cr; prereq 5056, ‡) Craig
Role of health education specialist in traditional and developing health services; factors affecting health education practice in special settings such as hospitals, schools, and industry and in subject matter areas such as mental health, dental health, and injury control.

5067. COMPARATIVE COMMUNITY HEALTH EDUCATION, URBAN AND RURAL. (3 cr; prereq ‡) Craig
Factors affecting community organization in urban and rural settings; population characteristics, agencies, institutional patterns as determinants of health behavior; process of community organization for health.

5068. COMMUNITY HEALTH EDUCATION PRACTICE. (10 cr; prereq 5063, ‡) Craig
Approximately 10 weeks of supervised community health education practice.

5069. COMMUNITY HEALTH EDUCATION LABORATORY. (6 cr; prereq ‡) Craig, Veninga
Offers experience as health educator in selected community health agencies.

5070. COMMUNICATION SKILLS FOR HEALTH PROFESSIONALS. (3 cr) Craig, Veninga
To upgrade knowledge and skills in interpersonal communication for people preparing for or working in health related fields. Development of knowledge and skills in (a) one-to-one communication, (b) small group communication, and (c) organizational communication.

5072. COMMUNITY AND SCHOOL HEALTH EDUCATION. (3 cr; prereq ‡) Craig, Slocum, and staff
Comparative approaches to health education in school and community, current and potential relationships, mutual identification and use of educational resources, procedures for effective coordination, role of school health educator and community health education specialist.

5080. INTRODUCTION TO PUBLIC HEALTH EDUCATION. (2 cr; prereq ‡) Craig
Planning educational components of community health programs; group procedures; community organization; methods and materials.

5082. ADVANCED STUDIES IN HEALTH EDUCATION. (3 cr; prereq 5080 or ‡) Craig
Case studies; planning and educational processes as applied within specific public health disciplines.

5098. TOPICS IN PUBLIC HEALTH EDUCATION. (Cr ar; prereq ‡) Staff

Environmental Health

5150. TOPICS IN ENVIRONMENTAL HEALTH. (Cr ar; prereq ‡) Staff
Selected readings and discussions.

5151.° ENVIRONMENTAL HEALTH. (3 cr; prereq ‡) Bond and staff
Methods for promoting man's health and comfort by controlling environment.

5152. ENVIRONMENTAL HEALTH. (2 cr; prereq ‡) Bond and staff
General principles of environmental health problems; problems encountered by official health agencies.

5153.° INSTITUTIONAL ENVIRONMENTAL HEALTH. (3 cr; prereq hospital administration student or ‡) Michaelsen and staff
Sanitation and safety practices in hospitals and other institutions.

5154. ENVIRONMENTAL HEALTH PROGRAMS. (3 cr; prereq ‡) Bond and staff
Public health supervision of activities in urban and rural sanitation.

5159.° SEMINAR: ENVIRONMENTAL HEALTH. (Cr ar; prereq ‡) Staff

5161.° ADMINISTRATION OF ENVIRONMENTAL HEALTH PROGRAMS. (3 cr, §5154; prereq ‡) Bond
Administrative organization of environmental health activities.

5170. TOPICS IN ENVIRONMENTAL BIOLOGY. (Cr ar; prereq ‡) Staff
Selected readings with discussion of control techniques.

5171.° ENVIRONMENTAL MICROBIOLOGY. (3 cr; prereq 5151, MicB 3103 or ‡) Greene
Survival, dissemination, transportation, and significance of microorganisms, in the environment; application of principles to environmental health problems.

5172. ENVIRONMENTAL MICROBIOLOGY LABORATORY. (2 cr, §5233; prereq 5171, ‡) Greene, Vesley
Laboratory and field exercises in microbiological sampling, detection, enumeration, and control.

5177. ENVIRONMENTAL BIOLOGY. (3 cr; prereq ‡)
Introduction to plant and animal forms important in environmental health and biological aspects of water supply, waste treatment, stream pollution, and special phenomena related to human disease transmission.

5178. VECTORS AND PARASITES IN HUMAN DISEASES. (3 cr; prereq ‡)
Basic biological concepts of parasitic diseases, vectors and application of vector control methods in environmental health programs.

5179. PUBLIC HEALTH BIOLOGY—FIELD INVESTIGATIONS. (3 cr; prereq ‡)
Field studies and laboratory analyses related to special problems in assessment of water supplies, waste treatment facilities, and stream pollution surveys.

5180. TOPICS IN AIR POLLUTION. (Cr ar; prereq ‡) Staff
Selected reading and discussion.

5181. INTRODUCTION TO THE AIR POLLUTION PROBLEM. (3 cr; prereq ‡) Paulus
History, sources, controls, effects, surveys, legal aspects; administration of programs.

5182. AIR POLLUTION CONTROLS AND SURVEYS. (3 cr; prereq 5181 or ‡) Paulus
Public health engineering approach to air pollution controls and surveys.

5183. PROBLEMS OF AIR POLLUTION CONTROL. (Cr ar; prereq 5181, ‡) Paulus
Special supervised studies involving laboratory and field investigation procedures; pertinent literature review.

5184. AIR ANALYSIS I. (3 cr; prereq 5181, 5183 or 5211, ‡) Paulus
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, ‡) Paulus, Caplan
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 ‡) Michaelsen, Scheffler
Directed readings and reports.

5191. PRINCIPLES AND METHODS OF INJURY CONTROL. (Cr ar; prereq ‡) Michaelsen, Scheffler
Accidents as a community public health problem; current concepts of etiology and methodology of control.

5192. HOSPITAL SAFETY. (3 cr; prereq ‡) Michaelsen, Scheffler
Theories and practices in accident and fire prevention and control for hospitals and other medical care facilities.

5193. CHEMICAL LABORATORY SAFETY. (1 cr; prereq ‡) Scheffler
Principles of accident and fire prevention in chemical laboratories.

5194. OCCUPATIONAL SAFETY. (2 cr; prereq ‡) Michaelsen, Scheffler
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 and discussion.

5201. MEASUREMENT AND APPLICATION OF IONIZING RADIATION. (3 cr [lect and lab], 2 cr [lect only]; prereq ‡) Barber
Introduction to principles of measurement and use of radiative sources; emphasis on health hazards.

5202. ENVIRONMENTAL RADIOACTIVITY. (3 cr; prereq ‡) Barber, Straub
Sources, measurement, evaluation, and control of environmental radioactivity; hazards to general population.

5203. LOW-LEVEL RADIOACITIVITY MEASUREMENTS. (3 cr; prereq ‡) Barber
Lecture and laboratory on the assay of low levels of radioactivity in environmental samples.

5207. RADIATION PROTECTION CRITERIA FOR HOSPITALS. (2 cr; prereq ‡) Barber, Wollan
Methods of design, shielding, equipping, and operation of isotope laboratories, X-ray, and other ionizing radiation facilities.

5209. SEMINAR: HEALTH PHYSICS. (1 cr; prereq ‡) Barber
Review and discussion of current problems.

5210. TOPICS IN OCCUPATIONAL HEALTH. (Cr ar; prereq ‡) Staff
Selected readings and discussions.

5211.° INDUSTRIAL ENGINEERING. (4 cr; prereq ‡) Michaelsen, Caplan
Field and laboratory methods used by industrial hygiene engineers in study and control of occupational health hazards.

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

5213. PUBLIC HEALTH ASPECTS OF TOXIC PRODUCTS. (2 cr; prereq 5215) Caplan, Long
Problems of protecting industrial workers and private consumers from useful but potentially harmful products; product testing programs and administration; labeling problems.

5214. AGRICULTURAL OCCUPATIONAL HEALTH. (3 cr; prereq 5211 or ‡) Caplan, Harein
Occupational health problems of agricultural workers, practical and available preventive measures, educational and administrative needs.

5215. ENVIRONMENTAL TOXICOLOGY. (3 cr; prereq 5181 or 5211, ‡) Caplan, Long
Basic toxicology and physiology with emphasis on environmental contaminants. Special consideration given to inhalation toxicology of the work environment and air pollution.

5216. HEALTH ASPECTS OF AIR CONTROL IN HOSPITALS. (2 cr, §5232; prereq ‡) Michaelsen
Basic considerations in control of natural and mechanical air flow in hospitals to avoid spread of infection, to control odors, and to promote patient care.

5220. TOPICS IN FOOD SANITATION. (Cr ar; prereq ‡) Staff
Review of literature and practice to identify association of food sanitation problems to public health.

5221. INSTITUTIONAL FOOD PROTECTION PROGRAMS. (3 cr; prereq ‡) Bond, 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; prereq ‡)
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 ‡) Michaelsen, Vesley, Greene
Environmental health concepts and problems related to isolation techniques; cleaning, disinfection, and sterilization; laundry processes; food service; physical plants; interdepartmental relationships.

5232. ENVIRONMENTAL HEALTH AND SAFETY IN HEALTH CARE FACILITIES II. (4 cr, §5216; prereq ‡) Michaelsen, DeRoos
Ventilation; water supply; plumbing; solid and liquid waste systems; and other environmental engineering problems.

5233. ENVIRONMENTAL HEALTH AND SAFETY IN HEALTH CARE FACILITIES III. (4 cr, §5172; prereq ‡) Vesley, Greene
Microbiological sampling and control; laboratory and field practice in solving environmental health problems.

5239. HOSPITAL ENGINEERING PROBLEMS. (Cr ar; prereq ‡) Michaelsen and visiting lecturers
Application of environmental engineering, sanitation, and maintenance principles to planning, administration, and operation of hospitals.

5241. ENVIRONMENTAL HEALTH ASPECTS OF WATER SUPPLY. (3 cr; prereq ‡) Straub, Singer
Role of water in health of man; physical, chemical, and biological characteristics; evaluation of source, treatment, and distribution systems.

5244. ENVIRONMENTAL HEALTH ASPECTS OF WASTEWATER SYSTEMS. (3 cr; prereq ‡) Straub, Singer
Role of liquid wastes in health of man; physical, chemical, and biological characteristics; evaluation of source, treatment, and disposal facilities.

8150. RESEARCH: ENVIRONMENTAL HEALTH. (Cr ar) Staff
Opportunities to pursue research in the importance to public health of the influence of environmental stresses on the health of man.

8170. RESEARCH: ENVIRONMENTAL BIOLOGY. (Cr ar; prereq ‡) Greene

8180. RESEARCH: AIR POLLUTION. (Cr ar; prereq ‡) Paulus

8190. RESEARCH: INJURY CONTROL. (Cr ar; prereq ‡) Michaelsen

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 ‡) Michaelsen

8211. HEALTH SURVEY OF MANUFACTURING PROCESSES. (2 cr; prereq 5211) Caplan
Survey of occupational disease problems and preventive measures in major industries and in operations common to many industries; field trips.

8218. FIELD PROBLEMS IN OCCUPATIONAL HEALTH. (3 cr; prereq 5211, 5212 or ¶5213, ‡) Caplan
Guided evaluation of actual potential occupational health problems, recommendations, and design criteria for correction if indicated.

8220. RESEARCH: FOOD SANITATION. (Cr ar; prereq ‡) Pflug

8230. RESEARCH: INSTITUTIONAL ENVIRONMENTAL HEALTH. (Cr ar; prereq ‡) Michaelsen, Greene

8248. WATER QUALITY INVESTIGATION AND RESEARCH TECHNIQUES. (6 cr; prereq ‡) Odlaug
Field techniques and special research methods for establishing pollution base lines; recognition and appraisal of advancing eutrophication.

8249. WATER QUALITY RESEARCH. (6 cr; prereq ‡) Odlaug
Design and implementation of independent, short-term research activity. Literature review, statistical design, and data processing.

Veterinary Public Health

5300. COMPARATIVE MEDICINE AND PUBLIC HEALTH. (2 cr; prereq 5002, ‡) Diesch
Comparative medicine in man's relationship to biologic environment, interrelationship between animal and human health, source of animal diseases, ecology of zoonoses; food production and hygiene; laboratory animal medicine.

5303. MENTAL HEALTH—RELATIONSHIP OF ANIMALS AND MAN. (Cr ar; prereq ‡)
Study of principles of animal and human psychology in terms of animal behavior and relationships with man; analysis and evaluation of potential influence of companion animals on the mental health of animal owners; potential role of appropriately qualified veterinarians as participants in the group of professionals serving community mental health programs.

5306. ANIMAL MODELS OF HUMAN DISEASE. (3 cr; prereq 5330 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.

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 U.S. or a foreign country for group evaluation and analysis.

5317. PROBLEMS IN VETERINARY MEDICAL ADMINISTRATION AND SUPERVISION. (3 cr; prereq ‡)
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 AS RELATED TO THE CONSUMER. (3 cr; prereq 5375 or 5070 or ‡)
Consumer's role in protecting wholesomeness of meat from time of purchase by the consumer through transportation, storage, preparation, and serving for 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 VMic 5220 or ‡)
Factors leading to drug residues in food producing animals; residue detection; criteria for determination of tolerance and action levels by governmental agencies; harmful effects of drug residues in relation to human health.

Epidemiology

5330.* EPIDEMIOLOGY I. (4 cr; prereq course in microbiology and 5407 or 5450-5451 or ‡) Schuman
Basic epidemiologic principles applicable to infectious and noninfectious disease; agent-host-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.

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) Fox
Factors involved in epidemic occurrence; clinical response to infection of zoonoses on man; immunologic responses; vaccine evaluation.

5337. SEROLOGIC EPIDEMIOLOGY. (3 cr; prereq basic epidemiology and biostatistics) Evans
Applications of immunologic and biochemical methods to epidemiologic problems of disease.

5340. EPIDEMIOLOGIC SURVEY METHODS. (3 r; prereq 5330, 5407 or equiv, ‡) Schuman, Stebbings
Practical aspects of survey design, execution, analysis, and interpretation.

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 5232, MicB 5216, ‡) Bauer
Bacteriologic and serologic diagnosis, public health laboratory administration and methods.

5345. EPIDEMIOLOGY OF CANCER. (3 cr; prereq basic epidemiology and biostatistics, 5357 or ¶5357) Schuman and visiting lecturers
Epidemiology of selected cancer sites. Emphasis on existing gaps in knowledge.

5346. EPIDEMIOLOGY OF CARDIOVASCULAR DISEASES. (3 cr; prereq basic epidemiolgy and biostatistics, 5357 or ¶5357) Visiting lecturers
Epidemiologic aspects of various types of cardiovascular disease with emphasis on multivariate setting 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, and malignant disease and congenital deformities of the central nervous system.

5349.° EPIDEMIOLOGY OF CHRONIC RESPIRATORY DISEASE. (Cr ar; prereq ‡) Stebbings
Critical review of current status of chronic respiratory disease epidemiology and methods. Design and analysis of longitudinal studies.

5350. EPIDEMOLOGIC BASIS FOR HEALTH SERVICES PLANNING AND EVALUATION. (3 cr; prereq 5330, 5332 or equiv, 5407, 5331 or equiv) Visiting lecturers
Epidemiologic approaches to planning and criteria of evaluation.

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, and advanced statistics) Visiting lecturers
Critical review of epidemiologic studies of biological effects of radiation exposure on man, with emphasis on methodological problems encountered.

5365. EXPERIMENTAL EPIDEMIOLOGY. (Cr ar; prereq 5335 and 5407 or 5450 or equiv and ‡)
Infectious and noninfectious diseases in laboratory animal populations and simulated environmental conditions; effect of alterations in agent-host-environment relationship 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 5407 or 5450 or equiv and ‡)
Application of epidemiologic principles and methods in field studies of outbreaks of disease in cooperation with veterinary medical practitioners, State Livestock Sanitary Board, U.S.D.A., State Health Department and H.E.W. 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 production of disease, infectious and noninfectious, and of maintenance of the healthy state. Illustrative diseases utilized as samples or models.

5379.° TOPICS IN EPIDEMIOLOGY. (Cr ar; prereq ‡) Staff
Selected readings with discussion based on these readings.

8330. RESEARCH: EPIDEMIOLOGY. (Cr ar) Staff
Opportunities offered by the School of Public Health and by various cooperating organizations for qualified students to pursue research work.

8340.° EPIDEMIOLOGY OF NONCOMMUNICABLE DISEASES. (3 cr; prereq 5330) Schuman, Stebbings
Application of basic epidemiologic principles to noncommunicable diseases and to trauma; selected disease examples.

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, etc.

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.

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.

8379. SEMINAR: EPIDEMIOLOGY. (Cr ar; prereq ‡) Schuman, Stebbings
Discussion of selected current epidemiologic problems.

Physiological Hygiene

5380.* APPLIED HUMAN NUTRITION. (3 cr; prereq ‡) Grande, Stief
Food composition, nutrient requirements, nutrition surveys, public health programs in nutrition.

5386. PUBLIC HEALTH ASPECTS OF CARDIOVASCULAR DISEASE. (3 cr; prereq ‡) Grande, Keys, and staff
Etiology, incidence, problems of control, and relationship to mode of life.

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 PROBLEMS OF PHYSIOLOGICAL HYGIENE. (Cr ar; prereq ‡) Staff

8387. RESEARCH: PHYSIOLOGICAL HYGIENE AND RELATED AREAS. (Cr ar) Staff

Biometry

5403. COMPUTER APPLICATIONS IN HOSPITAL AND HEALTH CARE ADMINISTRATION. (3 cr; prereq hospital and health care administration student, others ‡) Johnson
Introduction to digital computer with applications in hospital and health care administration.

5404. INTRODUCTION TO BIOSTATISTICS AND STATISTICAL DECISION. (4 cr; prereq ‡) 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.

5405. BIOMETRIC METHODS IN ENVIRONMENTAL HEALTH I. (3 cr; prereq environmental health student, others ‡) Staff
Variation; frequency distribution; demographic techniques; probability; introduction to data analysis.

5406. BIOMETRIC METHODS IN ENVIRONMENTAL HEALTH II. (3 cr; prereq 5405) Bearman
Estimation; tests of significance; Poisson distribution; serial dilutions and most probable number; elements of bioassay; radiologic statistics.

5407.* VITAL STATISTICS I. (3 cr) Bearman, Kjelsberg
Official sources; population changes; rates; trends; significant differences.

5408. VITAL STATISTICS II. (3 cr; prereq 5407 with grade of A or B) Bearman
Demographic techniques and statistical inference.

5411. INTRODUCTION TO MATHEMATICAL DEMOGRAPHY. (3 cr, §Soc 5561; prereq ‡) DasGupta
See main Biometry section.

5412. SURVEY SAMPLING IN SOCIAL AND HEALTH SCIENCE RESEARCH. (3 cr, §Soc 5970; prereq ‡) DasGupta
See main Biometry section.

5430-5431-5432. BIOMEDICAL COMPUTING I, II, III. (3 cr per qtr; prereq Math 1111) Gatewood
See main Biometry section.

5436. ANALYTICAL TECHNIQUES FOR HEALTH DELIVERY SYSTEMS. (3 cr; prereq calculus, 5450, 5451 or ‡) Johnson
See main Biometry section.

5450. BIOMETRY I. (3 cr; prereq familiarity with basic concepts of calculus desirable and ¶5451) Bartsch, Jeffries
See main Biometry section.

5451. BIOMETRY LABORATORY I. (2 cr; prereq ¶5450) Jeffries
See main Biometry section.

5452. BIOMETRY II. (3 cr; prereq 5450, ¶5453) Bartsch, Jeffries
See main Biometry section.

5453. BIOMETRY LABORATORY II. (2 cr; prereq ¶5452) Jeffries
See main Biometry section.

5454. BIOMETRY III. (3 cr; prereq 5452, ¶5455) Bartsch, Jeffries
See main Biometry section.

5455. BIOMETRY LABORATORY III. (2 cr; prereq ¶5454) Jeffries
See main Biometry section.

5460. DEMOGRAPHY AND HEALTH. (3 cr; prereq biometry major, others ‡) Kjelsberg, McHugh
Needs, sources, collection, and interpretation of data in the areas of population mortality, morbidity, natality, and health services.

5463. MATHEMATICAL DEMOGRAPHY. (3 cr; prereq calculus, 5450, 5451 or ‡) DasGupta
Deterministic and stochastic one- and two-sex models of population growth. Integral equation and matrix approaches to stable population theory. Stochastic models of reproduction.

Public Health Nursing

5500. PUBLIC HEALTH-MENTAL HEALTH NURSING I. (4 cr; prereq ‡) Carver
Critical analysis of selected theories of physical, psychosocial development; emphasis on developmental stages throughout the life span of an individual. Laboratory experiences in selected child care centers. Includes administration and interpretation of selected developmental and psychological screening tests.

5501. PUBLIC HEALTH-MENTAL HEALTH NURSING II. (4 cr; prereq 5500) Carver, Downey, Leonard
(Continuation of 5500) Focus on the family. Provides opportunity to acquire and apply theory and integrate knowledge of human behavior for promotion of health and prevention of illness. Laboatory; interaction with an individual and family; application of nursing process principles.

5502. CLINICAL SEMINAR: PUBLIC HEALTH-MENTAL HEALTH NURSING. (Cr ar; prereq 5501) Carver and staff
(Continuation of 5501) Focus on family. Application of growth and developmental theories to family under stress or crisis; utilization of nursing process. Supervised clinical experience in selected agencies.

5508. DEVELOPMENT OF SELF: THE BASIS FOR HELPING RELATIONSHIPS. (Cr ar; prereq ‡) Downey
Consideration of conceptual framework for self-understanding and personal growth; delineation of personal and professional goals within a rapidly changing societal and health scene; instrumental approach; identification and implementation of behavior facilitating achievement of goals.

5510. RESEARCH METHODOLOGY IN NURSING. (3 cr; prereq 5407) Boen, Sparrow
Selective research studies in nursing and of development of models and theory in nursing research; steps in formulating a research design.

5517. SEMINAR: PATIENT CARE AND REHABILITATION IN THE COMMUNITY. (Cr ar; open to grad students in the health sciences; prereq ‡) E Anderson
Multidisciplinary approach in developing community programs for patient care.

5518. LONG-TERM PATIENT CARE AND REHABILITATION. (Cr ar; prereq ‡) E Anderson
Problems associated with rehabilitation; selected experiences correlated with seminars.

5519. ADULT AND GERIATRIC HEALTH MAINTENANCE, LONG-TERM CARE AND REHABILITATION. (Cr ar; prereq ‡) E Anderson
Independent study. Exploration of a comprehensive multidisciplinary approach in maintenance of wellness and in continuity of care for long-term patients.

5520. FIELD EXPERIENCE: PHYSICAL AND OCCUPATIONAL THERAPY IN COMMUNITY AGENCIES. (Cr ar; prereq ‡) E Anderson
Advisory service and planning in-service programs for nursing staff; selected experiences in local, county, and state health departments.

5535. CONTEMPORARY SCHOOL NURSING. (Cr ar; prereq ‡) Fredlund
Exploration of changes occurring in school health programs, with emphasis on changing role of the public health nurse. Review of related research.

5536. THE TEAM APPROACH IN SCHOOL NURSING. (3 cr; open to RN's employed in schools or to those interested in such employment) Fredlund
To deepen the school nurse's understanding of responsibility for the health of school children in relation to community health teams, to multidisciplinary pupil personnel teams and nursing teams. Consists of lecture-discussions, student projects, films, and field trips.

5538. CHILD-CENTERED SCHOOL NURSING. (3 cr; open to RN's employed in school nursing) Fredlund
Role of school nurse in providing health services and contributing to health education for school children. Some recent trends in school nursing and the team approach in meeting children's health needs. Specific problem areas designated by the class. Lecture-discussions, student projects, and films.

5560. FOUNDATION COURSE IN AMBULATORY CHILD HEALTH CARE. (Cr ar; open only to RN's enrolled in Pediatric Nurse Associate Program; prereq ‡) Leonard, Woodbury
Preparation of the nurse to perform comprehensive health appraisals on children from birth through adolescence; review of anatomy and principles of examination; supervised clinical experience.

5561. FOUNDATION COURSE IN AMBULATORY CHILD HEALTH CARE II. (Cr ar; open only to RN's enrolled in Pediatric Nurse Associate Program; prereq ‡) Leonard
Second course in a three-course series designed to provide foundational knowledge and clinical experience necessary to assess the health of children from birth through adolescence and to manage their health care within their family and community environments. Knowledge, normative criteria, and clinical skills essential for assessing the health of school age children and adolescents.

5562. FOUNDATION COURSE IN AMBULATORY CHILD HEALTH CARE III. (Cr ar; open only to RN's enrolled in Pediatric Nurse Associate Program; prereq ‡) Leonard
Final course in three-course series to prepare the nurse for primary role in ambulatory child health care. Focuses on deepening knowledge and skill in treatment and management of common health care problems of children and their parents. Special emphasis on collaborative role in health care delivery.

5575. TOPICS IN PUBLIC HEALTH NURSING. (Cr ar; prereq ‡) Staff
Selected readings and discussion.

8503. CLINICAL SEMINAR: ADVANCED COMMUNITY NURSING. (3 cr; prereq 5500, 5501, 5502) Fredlund and staff
Families with health problems (maternal and child health, chronic illness), utilizing behavioral and mental health concepts.

8504. PUBLIC HEALTH NURSING OF THE MENTALLY ILL. (Cr ar; prereq ‡) Downey, Fredlund, E Anderson
Selected experiences with mentally ill patients, including a multidisciplinary approach to their total care; related theory.

8505. PUBLIC HEALTH NURSING IN THE GROUP SETTING. (Cr ar; prereq ‡) Sparrow, Fredlund, and associates
Opportunity for working with small groups in the community, with emphasis on the group method of rendering public health nursing services.

8510. DIRECTED RESEARCH. (Cr ar; prereq 5510) Boen, Sparrow
Guided study in research design.

8511. DIRECTED RESEARCH. (6 cr; prereq 5510, 8510) Staff
Guided completion of a research study.

8519. DIRECTED RESEARCH. (6 cr; prereq PMed 8192 or PubH 5510 and 8510) E Anderson
Guided study in research related to occupational or physical therapy in community health programs.

8520. SEMINAR: GERIATRICS—LONG-TERM PATIENT CARE AND REHABILITATION. (Cr ar; prereq 5518 or 5519 or ‡) E Anderson
Development of a project relative to multidisciplinary action affecting patient care; review of current research findings.

8526. PRACTICUM IN TEACHING PUBLIC HEALTH NURSING. (4 cr per qtr [2 qtr course]; prereq ‡) Sloan, Spradley, E Anderson
Students preparing for positions in teaching and community leadership roles pursue theory with students preparing for supervisory positions. Teaching and supervisory skills as components of leadership positions. Selected experiences in schools of nursing.

8531. PROBLEMS AND PRACTICUM IN SUPERVISION AND ADMINISTRATION IN COMMUNITY NURSING. (4 cr per qtr [2 qtr course]; prereq ‡) E Anderson
Pursuit of theory in collaboration with teaching students in public health. Analysis of and experience in selected aspects of the administrative and supervisory process.

8535. SEMINAR: SCHOOL NURSING WITH RELATED FIELD PRACTICE. (Cr ar; prereq ‡) Fredlund
Exploration of nursing in the school setting with emphasis on the school nurse coordinator role.

Nutrition

5380. APPLIED HUMAN NUTRITION. (3 cr; prereq ‡) Grande, Stief
Food composition, nutrient requirements, nutrition surveys, public health programs in nutrition.

5600. FIELD WORK IN PUBLIC HEALTH NUTRITION. (Cr ar; prereq ‡) Stief and associates
Placement in an approved agency with opportunity for experience in nutritional aspects of public health programs.

5601.* SEMINAR: PUBLIC HEALTH NUTRITION. (Cr ar; prereq ‡) Stief

5609. TOPICS: PUBLIC HEALTH NUTRITION. (Cr ar; prereq ‡) Staff
Selected readings and problems.

Maternal and Child Health

5610. MATERNAL AND CHILD HEALTH. (3 cr) Williams
Community health needs and services for mothers and children.

5611. MATERNAL AND CHILD HEALTH PROGRAMS. (1 cr, §5610; prereq hospital administration student, ‡)
Community programs for major maternal and child health problems.

5612. HUMAN GENETICS AND PUBLIC HEALTH. (3 cr; prereq ‡) Schacht
Evaluation of current studies in human genetics and applications to community health.

5613. HANDICAPPED CHILDREN. (Cr ar; prereq 5610, ‡)
Prevention and rehabilitation of handicapping conditions affecting children; community activities related to emotional, physical, and intellectual handicaps.

5649. TOPICS: MATERNAL AND CHILD HEALTH. (Cr ar; prereq ‡) Staff
Selected readings and problems.

8610. HEALTH OF THE SCHOOL-AGE CHILD. (2 cr; prereq 5610 or ‡)
Review of major health problems among children of school age; methods of providing and evaluating school health services.

8611. MATERNAL AND CHILD HEALTH PROBLEMS. (3 cr; prereq 5610) Martens
Problems in administration of health programs for infants, preschool and school-age children, handicapped children, and women of childbearing age.

Dental Public Health

5650. DENTAL HEALTH. (1 cr; 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. (3 cr; prereq ‡) Block
Basic principles of preventive dentistry; relationship between oral and general disease processes; epidemiology of oral diseases; preventive procedures; organizing and evaluating community dental health programs.

5652. SEMINAR: DENTAL HEALTH LITERATURE. (Cr ar; prereq ‡) Block
Current review of literature pertinent to dental public health, critical examination for design, content, and validity of conclusions.

5653. DENTAL HEALTH PROGRAMS. (Cr ar; prereq ‡) Block
Dental health activities and problems in a community situation; observation visits and participation in public and voluntary facilities; preventive, curative, rehabilitative, and research activities of local, state, and federal agencies; problems of dental manpower.

5654. TOPICS IN DENTAL PUBLIC HEALTH. (Cr ar; prereq ‡) Block
Selected readings with discussion based on these readings.

Public Health Administration

5700.° PUBLIC HEALTH ADMINISTRATION. (3 cr; prereq 5002)
Structure, basic functions, and activities of public health agencies.

5701. PUBLIC HEALTH ADMINISTRATION PROBLEMS. (3 cr; prereq 5700)
Budgeting, program planning, and appraisal of public health procedures.

5749.° TOPICS: PUBLIC HEALTH ADMINISTRATION. (Cr ar; prereq ‡) Staff

Hospital and Health Care Administration

5750. PRINCIPLES OF HEALTH ADMINISTRATION. (4 cr; prereq ‡) Dornblaser, Sweetland, and staff
Lectures, seminars. Selected health care organization placement. Management problem solving with emphasis on problem definition.

5751. PRINCIPLES OF ORGANIZATION AND MANAGEMENT IN HEALTH SERVICES ORGANIZATIONS. (3 cr; prereq ‡) Dornblaser and staff
Lectures and case studies on the role of health care services administrators, principles of management, and the administrative process.

5752. CLERKSHIP. (4 cr; prereq 5750) Bieter, Metzner, Moser, Tronnes, Miller, Heinemann
Assignment to local hospital or other health care agency for survey and solution of management problems and preparation of formal report.

5753. MANAGEMENT PROBLEMS IN HOSPITAL AND HEALTH CARE ADMINISTRATION. (4 cr; prereq 5751, 5750, 5752) Dornblaser, Sweetland, Westerman
Assignment and solution of specific managerial problems.

5758. INTERPERSONAL BEHAVIOR IN COMPLEX ORGANIZATIONS. (3 cr; prereq ‡) Gordon, Hamilton
Introduction to major categories and issues in organizational behavior; skills and procedures for observing, analyzing, and interpreting organizational behavior; procedures for self-assessment of interpersonal behavior and learning of new behaviors.

5760. ORIENTATION TO MEDICAL SCIENCES. (3 cr; prereq ‡)
Presentation of method of medical terminology by body system; applied physiology and anatomy; examination of elements of medical practice.

5764. PRINCIPLES OF PERSONNEL AND FINANCIAL MANAGEMENT AND LEGAL ISSUES IN HEALTH SERVICES ORGANIZATIONS. (4 cr; prereq ‡) Bieter, Oszustowicz, and staff
Examination of principles of financial management including basic accounting and statistical tools; analysis of hospital financial statements; sources and uses of operating and capital funds; long-term finances; audits and internal control; cost finding; budgeting; hospital rates, rate setting, and relationships with third-party payors.

5765. HOSPITAL DEPARTMENTAL OPERATIONS. (4 cr; prereq ‡) Brodahl, Columbo, Stephan, and staff
Discussion of selected hospital departments and functions; alternative ways of providing services. Major emphasis on personnel department; extensive examination of principles of personnel administration including labor relations.

5777. EXTERNAL FORCES AFFECTING HEALTH CARE DELIVERY. (25 cr; prereq 3776 or ‡) Weckwerth and staff
Ten-month study program including residential sessions (2 weeks), independent study, regional seminars, and demonstration or research project supported by scholarly paper. Nature, influence, effects, and interrelationships of external forces affecting delivery of health care: social policy, financing, manpower, and organizing.

5790. SOCIAL, ECONOMIC, AND POLITICAL ASPECTS OF MEDICAL CARE. (3 cr; prereq ‡) Litman and staff
Social, economic, and political forces shaping health care systems; possible future impact of these forces.

5791. FINANCIAL ASPECTS OF HEALTH CARE. (3 cr; prereq ‡) Oszustowicz
Examination of financial problems associated with current issues in health care delivery. Emphasis on recent legislation affecting sources of capital and control of expenditure for health programs and facilities.

5792. LEGAL ISSUES IN HEALTH CARE ADMINISTRATION. (3 cr; prereq ‡) Brodahl, Keating
Examination of law and legal liability of hospitals and other health care organizations.

8750-8751.† SEMINAR: ALTERNATIVE PATTERNS OF HEALTH CARE. (3 cr per qtr; prereq ‡; offered 1972-73 and alt yrs) Litman
Alternative approaches to meeting the health care problems of ambulatory care, aging and chronic disease, physical rehabilitation, maternal and child care, mental health, and poverty.

8752. SEMINAR: COMPARATIVE HEALTH CARE SYSTEMS. (3 cr; prereq ‡; offered f 1973 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. (Cr ar; prereq ‡) Dornblaser, Weckwerth
Independent study, with tutorial guidance of selected problems and current issues.

8761. READINGS IN THEORY AND PRINCIPLES OF HOSPITAL AND HEALTH CARE ADMINISTRATION. (Cr ar; prereq ‡) Dornblaser, Weckwerth

8762. CONTEMPORARY PROBLEMS OF HOSPITAL AND RELATED HEALTH SERVICES. (Cr ar; prereq ‡) Weckwerth
Current concepts, problems, principles, and future developments.

8770. HEALTH AND HUMAN BEHAVIOR. (3 cr; prereq Soc 5855; offered s 1974 and alt yrs) Litman
Sociology of health and health care; social and personal components of health and illness behavior; 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 5450 or ‡) Weckwerth
Survey and analysis of application of nonparametric statistics to health care research.

8781. SEMINAR: RESEARCH STUDIES IN HEALTH CARE. (3 cr; prereq ‡; offered s 1973 and alt yrs) Litman, Weckwerth, and staff
Review and appraisal of design, measuring instruments, research methodology, and findings of contemporary studies.

8782. RESEARCH PRACTICUM. (6 cr; prereq ‡) 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. POLITICAL ASPECTS OF HEALTH SERVICES. (3 cr; prereq ‡; offered w 1973 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.

8795. ECONOMIC ASPECTS OF HEALTH CARE. (3 cr; prereq ‡) Bognanno
Economic analysis of America's health care sector, emphasizing problems of pricing, production, and distribution. Evaluation of health care services as one factor contributing to the nation's health.

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.

RADIOLOGY (Rad)

OFFERED AT MINNEAPOLIS

Eugene Gedgaudas, M.D., *professor and head, director of graduate study*

DIVISION OF ROENTGEN DIAGNOSIS

Professor

Kurt Amplatz, M.D.
Samuel B. Feinberg, M.D.
Stephen A. Kieffer, M.D.
Harold O. Peterson, M.D.

Associate Professor

Robert G. B. Bjornson, M.D.
Lawrence H. A. Gold, M.D.
Philippe R. L'Heureux, M.D.

Clinical Associate Professor

Daniel L. Fink, M.D.

DIVISION OF NUCLEAR MEDICINE

Professor

Merle K. Loken, M.D., Ph.D., *director*

Associate Professor

Marvin E. Goldberg, M.D.

Assistant Professor

Jay Thomas Payne, Ph.D.
John Maney Wolff, M.D.

Clinical Assistant Professor

William A. Wilcox, M.D.

DEPARTMENT OF THERAPEUTIC RADIOLOGY

Professor

Seymour H. Levitt, M.D., *head*

Clinical Professor

Donn G. Mosser, M.D.

Assistant Professor

Faiz M. Khan, Ph.D.
Thomas K. Jones, M.D.
Vaughn C. Moore, Ph.D.
Chang W. Song, Ph.D.

Instructor

Jose Feola, M.S.

Graduates of Class A medical schools are eligible for appointment as medical fellow specialists with stipend in radiology upon completion of 1 year of satisfactory internship in a recognized hospital. Medical fellow specialists without stipend are also accepted if places are available.

Previous preparation in internal medicine or in pathology or both is highly desirable although not required. This course itself extends over a period of 3½ to 4 years, excluding any full time devoted to other subjects. For those who have been away from medical practice for a considerable period, a preliminary program of education in the laboratory sciences and general medicine is highly desirable.

The fellowship period is spent in a number of hospitals, and appropriate periods of time are devoted to the physics of radiation, radiobiology, radiation therapy, radiographic technique, roentgen diagnosis, and nuclear medicine. Appropriate periods of time are devoted to the various subdivisions of roentgen diagnosis, including special procedures.

Medical fellows may assist in the teaching of undergraduate 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*—A general referral hospital of approximately 800 beds and a very active outpatient clinic offer unusual clinical material.

There is, in addition, Variety Club Heart Hospital, which is connected directly with University Hospitals and which offers approximately 100 beds for the study of acquired and congenital heart disease and an extensive research program in this field.

Another institution closely connected with University Hospitals is the University Health Service, which permits the study of acute cases, particularly in the field of early tuberculosis, gastrointestinal lesions in their earliest stages, and the more acute problems that occur in relatively young individuals.

Included within the University Hospitals group are (a) Cancer Institute, with an outpatient clinic that offers a wide variety of material for the study of all types of tumors both from the diagnostic and therapeutic standpoints. It is fully equipped with roentgen therapy machines, a cobalt 60 teletherapy unit, an electron linear accelerator, and an adequate radium supply. Work with isotopes both for diagnosis and therapy is available. (b) Eustis Hospital, which offers excellent opportunity for study of orthopedic and pediatric cases. (c) Cancer Detection Clinic, where a large number of apparently well individuals are examined thoroughly for the detection of tumors in an early stage. Opportunity for study of early lesions is thus afforded. (d) Tumor Clinic, an extensive follow-up clinic that permits adequate opportunity for study of the results of radiation and chemotherapy and the evolution of tumors.

2. *Hennepin County General Hospital*—This institution provides valuable experience, particularly in acute pulmonary conditions, in chronic cardiac diseases, and in traumatic lesions of the skeleton. Fellows are assigned to this service for a period of 6 months.

3. *St. Paul-Ramsey Hospital*—Here, as in Hennepin County General Hospital, there is abundant opportunity to observe both acute and chronic processes. Good research facilities are available. Assignment to this service is for a period of 6 months.

4. *Veterans Administration Hospital*—A hospital of approximately 1,000 beds, catering entirely to veterans, participates actively in the graduate program of this department. Here may be seen a very large variety of cases exhibiting practically the entire gamut of disease processes. There is also extensive opportunity for investigation and research.

Language Requirement—For the Ph.D. degree, either (a) two foreign languages or (b) one foreign language and the option of a collateral field of knowledge. Routinely acceptable languages are French, German, Italian, Spanish, and Russian.

Master's and Doctor's Degrees—All fellows may qualify for the degree of master of science in radiology, and where appropriate research is undertaken, they may also meet qualifications for the Ph.D. degree. In the latter case, a minimum of 4 years of training is usually required. In addition to radiology as a major, a minor subject must also be carried—usually chosen from pathology, biophysics, physiology, or anatomy.

Diagnostic Roentgenology

0120f,w,s. X-RAY CONFERENCE. Staff
Weekly departmental meetings at which important cases seen in University, Hennepin County General, St. Paul-Ramsey, and Veterans Administration Hospitals and most of the private hospitals of the Twin Cities are reviewed.

0121f,w,s,su. MEDICAL ROENTGENOLOGIC CONFERENCE. Staff.

0122f,w,s,su. PEDIATRIC ROENTGENOLOGIC CONFERENCE. Staff

0123f,w,s,su. SURGICAL ROENTGENOLOGIC CONFERENCE. Staff

0124f,w,s,su. NEUROSURGICAL-ROENTGENOLOGIC CONFERENCE. Staff

0125f,w,s,su. CARDIOVASCULAR ROENTGENOLOGIC CONFERENCE. Staff

0126f,w,s. ROENTGENOLOGIC CONFERENCE ON CHEST DISEASES. Staff

0127f,w,s,su. ROENTGEN SURGICAL PATHOLOGY CONFERENCE. Staff

5140f,w,s,su. SPECIAL PROBLEMS IN ROENTGENOLOGY. (Cr ar) Staff

8100f,w,s,su. GASTROINTESTINAL ROENTGENOLOGY. (Cr and hrs ar) Staff
In-service training in roentgenological evaluation of the gastrointestinal system.

8101f,w,s,su. UROLOGIC ROENTGENOLOGY. (Cr and hrs ar) Staff
In-service training in roentgenological evaluation of the genitourinary system.

8102f,w,s,su. NEUROLOGICAL ROENTGENOLOGY. (Cr and hrs ar) Staff
In-service training in roentgenological evaluation of the central nervous system.

8103f,w,s,su. CARDIOVASCULAR ROENTGENOLOGY. (Cr and hrs ar) Staff
In-service training in roentgenological evaluation of the cardiovascular system.

8104f,w,s,su. PEDIATRIC ROENTGENOLOGY. (Cr and hrs ar) Staff
In-service training in roentgenological evaluation of infants and children.

8105f,w,s,su. PULMONARY ROENTGENOLOGY. (Cr and hrs 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, intracranial conditions, and in study of spine and spinal canal.

8150f,w,s,su. RESEARCH IN ROENTGENOLOGY. (Cr and hrs ar) Staff
Problems in roentgen diagnosis.

Nuclear Medicine

0220f,w,s,su. NUCLEAR MEDICINE CONFERENCE
Weekly presentations of informative nuclear medicine cases seen in University and affiliated hospitals.

5240f,w,s,su. SPECIAL PROBLEMS IN NUCLEAR MEDICINE. (Cr ar) Staff

8200f,w,s,su. NUCLEAR MEDICINE. (Cr ar) Staff
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) Staff
Lectures and demonstrations on nuclear instrumentation and applications of radioisotopes in medicine.

8250f,w,s,su. RESEARCH IN NUCLEAR MEDICINE. (Cr ar) Staff

Therapeutic Radiology

0320f,w,s. RADIATION THERAPY CONFERENCE. Staff
Weekly presentations of informative cases treated by radiation therapy at University and affiliated hospitals.

0321f,w,s. TUMOR CLINIC CONFERENCE. Staff

5340f,w,s. SPECIAL PROBLEMS IN RADIATION THERAPY. (Cr ar) Staff

8300f,w,s,su. RADIATION THERAPY. (Cr ar) Staff
In-service training in the treatment and management of patients with malignant disease.

8310f,w,s. FUNDAMENTALS OF RADIATION THERAPY. (1 cr) Staff
Lectures on physical and clinical aspects of radiation therapy. Techniques of radiation therapy including radium and other isotopic implants will be discussed.

Radiation Biology

5440f,w,s,su. SPECIAL PROBLEMS IN RADIATION BIOLOGY. (Cr ar)

5450f,w,s,su. RESEARCH IN RADIATION BIOLOGY. (Cr ar)

8410f,w,s,su. SEMINAR: RADIATION BIOLOGY. (1 cr; prereq ‡) Staff
Approaches to problems in radiation biophysics. Recent advances reviewed.

Radiological Physics

5510f,w,s. BASIC PRINCIPLES OF RADIOLOGICAL PHYSICS. (1 cr; offered alt yrs) Staff
Lectures and demonstrations of basic principles in radiology.

5511f,w,s. ROENTGEN TECHNIQUE. (1 cr; offered alt yrs) Staff
Theory and practical application of principles of roentgen technique, including study of X-ray machines and X-ray tubes, exposure, technique, and darkroom work.

5512f,w,s,su. DOSIMETRY OF INTERNAL AND EXTERNAL RADIATION EMITTERS. (1 cr) Staff
Basic principles of radiation dosimetry discussed in detail; clinical applications considered.

5540f,w,s,su. SPECIAL PROBLEMS IN RADIOLOGICAL PHYSICS. (Cr ar) Staff

5770f. RADIOLOGICAL PHYSICS. (3 cr; prereq ‡) Moore, Khan, and staff
Production and properties of ionizing radiations and their interactions with matter. Principles of radiation dosimetry.

5771w. MEDICAL NUCLEAR PHYSICS. (3 cr; prereq ‡) Loken, Payne, and staff
Consideration of natural and induced radioactivity. Nuclear instrumentation and uses of radioactive materials as tracer elements.

5772s. RADIATION BIOLOGY. (3 cr; prereq ‡) Song, Feola, and staff
Basic interactions of ionizing radiations with biological systems.

8550f,w,s,su. RESEARCH IN RADIOLOGICAL PHYSICS. (Cr ar) Staff

RADIOLOGY

OFFERED AT ROCHESTER

Professor

John R. Hodgson, M.D., M.S., *chairman, Diagnostic Roentgenology*
Donald S. Childs, Jr., M.D., M.S.
C. Allen Good, M.D., M.S.
Colin B. Holman, M.D., M.S
Owings W. Kincaid, M.D., M.S.

Associate Professor

Paul W. Scanlon, M.D., M.S., *chairman, Therapeutic Radiology*
Hillier L. Baker, Jr., M.D., M.S.
Harley C. Carlson, M.D., Ph.D.
Malcolm Y. Colby, Jr., M.D., M.S.
George D. Davis, Jr., M.D., M.S.

Assistant Professor

John W. Beabout, M.D.
Glen W. Hartman, M.D.
W. Eugene Miller, M.D., M.S.
David F. Reese, M.D., M.S.
Martin Van Herik, M.D., M.S.

Instructor

Roger E. Cupps, M.D.
Margaret A. Holbrook, M.D.
O. Wayne Houser, M.D.
Robert E. Lee, M.D., M.S.
Patrick F. Sheedy, M.D.
David H. Stephens, M.D.

Diagnostic Radiology

The Department of Diagnostic Radiology carries out approximately 360,000 diagnostic examinations a year. Fully equipped departments are maintained in the Mayo Clinic Building, Methodist Hospital, and St. Marys Hospital. In addition to these clinical facilities, adequate space has been set aside in the department for conferences, and individual residents' study cubicles are available. A complete film library and a library of radiology texts is available in the department. A main clinic library and the research facilities of the Mayo Clinic laboratories are readily available to graduate students working in the field of radiology.

Approximately 24 residencies in radiology are offered in the Mayo Graduate School of Medicine, 8 appointments being made each year. Training may begin in July or October, and in exceptional circumstances in January or April. The graduate training 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, radiologic biology and pathology. Numerous departmental and interdepartmental 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 may, upon

completion of 3¼ years of training, become candidates for the M.S. or Ph.D. degree in radiology. Additional training and experience beyond the required 3 years may be available in some instances.

Therapeutic Radiology

The Department of Therapeutic Radiology participates in consultations regarding the management of patients with malignant disease and administers radiation therapy. The main department is located in the Curie Pavilion of the Damon Building. A smaller department is maintained at St. Marys Hospital. The department works in close cooperation with medical oncologists from the Department of Internal Medicine. Radiation therapy equipment includes four cobalt 60 teletherapy units, one 6 MV medical linear accelerator, orthovoltage and dermatologic X-ray machines, a treatment planning facility, a suite for therapeutic nuclear medicine, and a supply of both radium and radioactive cesium for intracavitary and interstitial therapy.

Nine residencies in therapeutic radiology are offered in the Mayo Graduate School of Medicine, three appointments being made each year. The training program in therapeutic radiology is 3 years, which includes 2 years in clinical therapeutic radiology, 6 months in pathology with emphasis on neoplasia, 3 months in medical oncology, and 3 months elective. A number of prospective clinical investigational studies are ongoing in the department. The residents participate in the consultative and therapeutic aspects of the activities. There are numerous conferences both within the department and between departments. Residents electing to prepare a thesis may spend an additional year for this purpose.

Language Requirement—For the Ph.D. degree, either (a) two foreign languages or (b) one foreign language and the option of a collateral field of knowledge.

Master's Degree—Offered only under Plan A.

Doctor's Degree—Work leading to the Ph.D. degree is offered.

M 8851f,w. RADIOLOGIC PHYSICS. Orvis
Extensive lectures and demonstrations on radiologic physics and its applications in diagnostic and therapeutic radiology and nuclear medicine.

M 8852f,w,s,su. DIAGNOSTIC RADIOLOGY. Hodgson, Good, Davis, Holman, Baker, Kincaid, Carlson, Reese, Miller, Beabout, Hartman, Houser
At least 36 months are spent 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 participation 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
At least 2 years is spent in clinical therapeutic radiology, observing and participating in the treatment of a wide variety of malignant diseases which are amenable to treatment by X- or gamma radiation, electrons, radium, or radioactive isotopes.

M 8854f,w,s,su. DIAGNOSTIC ORTHOPEDIC RADIOLOGY. (1 cr) Beabout and staff
Radiological principles in evaluation of bone pathology and skeletal disorders.

PATHOLOGY. Assignment to surgical pathology and anatomic pathology is required. Additional time may be necessary to qualify for an advanced degree.

Lectures, demonstration, and participation in the work of the pathology laboratories provide unusual opportunity to correlate the pathology of a wide variety of medical and surgical diseases with the gross pathology revealed by the roentgen ray.

SURGERY (Surg)

OFFERED AT MINNEAPOLIS

Professor

John S. Najarian, M.D., *chairman*
M. Michael Eisenberg, M.D.
Claude H. Hitchcock, M.D., Ph.D.
Edward W. Humphrey, M.D., Ph.D.
Arnold S. Leonard, M.D., Ph.D.
Richard C. Lillehei, M.D., Ph.D.
Charles F. McKhann, M.D.
Donald G. McQuarrie, M.D., Ph.D.
Joshua Miller, M.D.
John F. Perry, M.D., Ph.D.
Yoshio Sako, M.D., Ph.D.
Richard L. Simmons, M.D.
Richard L. Varco, M.D., Ph.D.

Clinical Professor

William C. Bernstein, M.D.
Davitt Felder, M.D., Ph.D.
Lyle J. Hay, M.D., Ph.D.
N. Kenneth Jensen, M.D.
William Kelley, M.D., Ph.D.
Arnold J. Kremen, M.D., Ph.D.
Charles E. Rea, M.D., Ph.D.
Earl G. Yonehiro, M.D., Ph.D.

Associate Professor

Henry Sosin, M.D., Ph.D., *director of graduate study*
Henry Buchwald, M.D., Ph.D.
John P. Delaney, M.D., Ph.D.
Robert L. Goodale, M.D., Ph.D.
Theodor B. Grage, M.D., Ph.D.
John J. Haglin, M.D., Ph.D.
Carl M. Kjellstrand, M.D.
Demetre Nicoloff, M.D., Ph.D.
W. Albert Sullivan, M.D., M.S.

Clinical Associate Professor

Stuart W. Arhelger, M.D., Ph.D.
George S. Bergh, M.D., M.S.
Bernard G. Lannin, M.D., Ph.D.

Assistant Professor

Theodore Buselmeier, M.D.
Ronald Dietzman, M.D., Ph.D.
Robert Gilsdorf, M.D., Ph.D.
Albert Mowlem, M.D., Ph.D.
John Schmidtke, Ph.D.

Clinical Assistant Professor

Herman W. Heupel, M.D., Ph.D.
Samuel W. Hunter, M.D., M.S.

Special Lecturer

Victor Gilbertsen, M.D., M.S.

It is the intention of the Residency Program in General Surgery to provide excellent training both on the clinical wards and in the laboratory. Its ultimate aim is to train doctors for both the practice of surgery and academic positions.

The residency training programs of the University of Minnesota Hospitals and the Minneapolis Veterans Administration Hospital merged in 1968. In addition, the program offers rotations at Mount Sinai Hospital, Methodist Hospital, and Northwestern Hospital in Minneapolis and St. Paul-Ramsey County Hospital in St. Paul. Each residency appointment is for 1 year; reappointment is contingent upon superior performance.

All residents in general surgery begin their training with 2 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 interns and after their first year assist in the bedside teaching of the surgical clerks. They act as first assistant in opera-

tions performed by the general surgical staff. As soon as they prove themselves capable, they perform the more simple 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 their ability warrants. Supervision is always given until the staff surgeon is satisfied concerning the fellow's ability to operate independently.

In the second year, residents may rotate on several specialty services, including vascular surgery, plastic and head and neck surgery, cardiothoracic surgery, proctology, and other specialty rotations. In general, residents select some specialty rotations they desire from this group. Approximately two or three of the four second-year rotations are specialty services, with the remaining time spent on general surgical services.

In the third 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, the resident is a chief surgical resident for 12 months on the General Surgical Services of the University, Veterans Administration, or Mount Sinai Hospitals.

The trainees spend approximately 2 to 3 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 then progress through senior residency and chief residency years.

An additional degree, the master of science in experimental surgery, is offered to acceptable candidates from other institutions who are fully trained in clinical surgery. This degree requires 2 to 3 years of training and provides an opportunity to learn modern research techniques, application of the scientific method, and 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 prospective fellow must be able to qualify as a candidate for the Ph.D. degree. (See Requirements for Advanced Degrees.)

The fundamental laboratories of the Medical School offer numerous graduate courses closely related to surgery. (See statements of Departments of Anatomy, Biochemistry, Microbiology, Pathology, Pharmacology, and Physiology.) These departments also offer opportunities for special investigative and research work. Proximity of medical buildings and arrangement of courses permit coordination of clinical and laboratory work.

Supervised work is offered by the Department of Surgery in the Experimental Laboratories of Research, 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, proctology, transplantation, thoracic and cardiovascular surgery.

Medical School surgical fellowships are offered also at Hennepin County General Hospital (10) and St. Paul-Ramsey Hospital (12). Surgical staffs of the affiliated hospitals supervise training of their surgical fellows. Arrangements can be made for rotation between the surgical services of University and various affiliated hospitals.

Language Requirement—None.

Master's Degree—*Master of Science in Experimental Surgery,* Plan A only. Requirements: (a) thesis—research topic; (b) 40 credits (2 years' work), not less than 30 credits of which will be 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) 140 credits (5 years' work)* at least 20 credits of which will be 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. Degree in Surgery—Requirements: (a) thesis—research topic; (b) 170 credits (6 years' work)* at least 40 credits of which will be 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 a Master's degree or certification of department in which minor is obtained (18-24 credits); (e) oral preliminary examination; (f) oral thesis defense.

The following courses are given at participating hospitals unless otherwise indicated. Registrants taking fellowships at Hennepin County General Hospital or St. Paul-Ramsey Hospital should indicate their section by adding after the course number either "Section G" for Hennepin County General Hospital or "Section A" for St. Paul-Ramsey Hospital.

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 are permitted to 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.

8201. SURGICAL-ROENTGENOLOGICAL CONFERENCE. (1 cr) Delaney, Najarian, and staff
Weekly exercise in which films of all surgical patients presenting interesting roentgen findings are reviewed. 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 courses. Current research problems are presented for discussion and critical evaluation.

8204-8205-8206. BIOMEDICAL-ENGINEERING SEMINAR. (Cr ar [1-3 cr per qtr]) Blackshear, Nicoloff
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.

* Two years (40 credits) of clinical training may be transferred from other institutions at departmental discretion.

SURGERY

OFFERED AT ROCHESTER

Professor

Robert B. Wallace, M.D., *chairman*
Oliver H. Beahrs, M.D., M.S.
Philip E. Bernatz, M.D., M.S.
B. Marden Black, M.D., M.S.
O. Theron Clagett, M.D., M.S.
Edward S. Judd, M.D., M.S.
Hugh B. Lynn, M.D.
Dwight C. McGoon, M.D.
Joseph H. Pratt, M.D., M.S.
William H. ReMine, M.D., M.S.
Richard E. Symmonds, M.D., M.S.

Associate Professor

Martin A. Adson, M.D., M.S.
Gordon K. Danielson, M.D.
Keith A. Kelly, M.D., M.S.
Donald C. McIlrath, M.D., M.S.
W. Spencer Payne, M.D., M.S.
John S. Welch, M.D., M.S.

Assistant Professor

Eric P. Lofgren, M.D., M.S.
Karl A. Lofgren, M.D., M.S.
James R. Pluth, M.D., M.S.

Graduate training in general surgery at the Mayo Graduate School of Medicine combines the opportunities for an advanced academic degree and surgical education to fulfill the requirements of the American Board of Surgery.

Appointments to residencies are made quarterly, with yearly reappointment contingent upon satisfactory performance. Assignments during the usual 4-year program are flexible, but may include 1 quarter of surgical diagnosis, 2 or 3 quarters of a wide variety of surgical specialties, 1 quarter of surgical pathology, and 11 or 12 quarters of general surgery at junior and senior levels of responsibility.

There is opportunity for additional assignments to include surgical research, physiology, or experimental pathology. A limited number of 1- to 3-year appointments is available to provide basic surgical experiences prior to surgical specialty training.

Senior residents in operative surgery may be appointed chief surgical residents, with accompanying increased consulting and operating responsibility. Additional chief resident operative assignments may be made to the affiliated Rochester State Hospital.

Operative services are principally located in Rochester Methodist Hospital and St. Marys Hospital, with a total of 600 surgical beds. These patients, together with the outpaient facilities of the Mayo Clinic, ensure a wide exposure to general and special surgical disease.

A large number of integrated group seminars, lectures, and meetings are held each week.

Language Requirement—For the Ph.D. degree, either (a) two foreign languages or (b) one foreign language and the option of a collateral field of knowledge.

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. Staff
Treatment of complications, surgical and medical, and varicose veins.

M 8852f,w,s,su. SURGICAL PROBLEMS AND MANAGEMENT (JUNIOR RESIDENTS) 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). 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. Staff
Chief surgical residency at Mayo Clinic or affiliated Rochester State Hospital. Elective and urgent surgical cases are managed by senior residents appointed by surgical faculty. Faculty direction continues throughout entire management period.

OPERATIVE SURGERY IN SURGICAL SPECIALTIES. (See specific departments)

SURGICAL AND FRESH TISSUE PATHOLOGY. (See Pathology)

PATHOLOGIC ANATOMY. (See Pathology)

RESEARCH ON PROBLEMS IN PHYSIOLOGY. (See Physiology)

RESEARCH ON PROBLEMS IN PATHOLOGIC ANATOMY. (See Pathology)

ANATOMY FOR GENERAL SURGEONS. (See Anatomy)

GENERAL MEDICAL AND SURGICAL DIAGNOSIS. (See Medicine)

DIAGNOSIS IN RELATION TO OBSTETRICS AND GYNECOLOGY. (See Obstetrics and Gynecology)

MEDICAL HOSPITAL RESIDENCE. (See Medicine)

SPECIAL ANESTHESIA. (See Anesthesiology)

Colon and Rectal Surgery/Proctology

Professor
John R. Hill, M.D., M.S., *head*

Assistant Professor
Markham J. Anderson, Jr., M.D., M.S.
Clyde E. Culp, M.D.
Robert J. Spencer, M.D.

Graduate training in colon and rectal surgery/proctology is carried out in conjunction with the Department of Surgery. The residency permits the candidate to complete the requirements for the American Board of Colon and Rectal Surgery and the American Board of Surgery.

The graduate program requires a minimum of 5 years. The major portion of the program, 4 years, is in the field of general surgery (see Department of Surgery), with special reference to abdominal surgery in which emphasis is placed on conditions that involve the colon. Four quarters of the 5-year period are in the field of anorectal surgery and diagnostic proctoscopy. Two of these 4 quarters are spent as chief resident associate, performing surgery under supervision of the proctology staff. (See description of M 8853 below.)

Master's Degree—Offered only under Plan A.

M 8851f,w,s,su. COLON AND RECTAL SURGERY. Hill, McIlrath, and staff

M 8852f,w,s,su. SURGICAL PROBLEMS AND MANAGEMENT (JUNIOR RESIDENTS). Judd, Black, Beahrs, ReMine, Adson, McIlrath, Kelly
Graduate students act as house surgeons. 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). Judd, Black, Beahrs, Re-Mine, Adson, McIlrath, Kelly
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.

GENERAL SURGICAL DIAGNOSIS. (See Surgery)

MEDICAL HOSPITAL RESIDENCE. (See Medicine)

SURGICAL AND FRESH TISSUE PATHOLOGY. (See Pathology)

Fellows majoring in proctology may also take work in physiology and regional anesthesia. For details, see these departments.

UROLOGY (Urol)

OFFERED AT MINNEAPOLIS

Professor
Elwin E. Fraley, M.D., *director of graduate study*
Colin Markland, M.B., Ch.B.

Clinical Professor
Baxter A. Smith, Jr., M.D., M.S.

Associate Professor
Clyde E. Blackard, M.D.

Assistant Professor
Thomas R. Hakala, M.D.

Clinical Assistant Professor
Milton P. Reiser, M.D., M.S.

Instructor
Alexander S. Cass, M.D.

Three-year fellowships, approved by the Council on Medical Education, are offered to students working toward a graduate degree in urology. Work in urology is done at University, Minneapolis Veterans Administration, Hennepin County General, or St. Paul-Ramsey Hospitals.

Master's Degree—Offered under Plan A only.

Doctor's Degree—Work leading to the Ph.D. 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*
Ormond S. Culp, M.D.
James H. DeWeerd, M.D., M.S.
Laurence F. Greene, M.D., Ph.D.

Associate Professor
Panayotis P. Kelalis, M.D., M.S.

Assistant Professor
Frank J. Leary, M.D., M.S.

Instructor
William L. Furlow, M.D.
Reza S. Malek, M.B.B.S., M.S.
Charles C. Rife, M.D.
Joseph W. Segura, M.D.

The Department of Urology at the Mayo Graduate School of Medicine seeks to provide excellent training for the residents in all phases of clinical and experimental urology. The 4-year curriculum as established by the Department of Urology leads to certification by the American Board of Urology. Trainees who have completed 1 year of basic sciences or clinical studies basic to urology or who have completed a residency of 1 year in general surgery or internal medicine on an approved service may complete their urologic training in 3 years.

The care of the urologic patient is paramount in the training program. In achieving this goal, 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 4-year program.

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, pathology, and so forth. Special training in these and other related fields is possible.

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. UROLOGIC DIAGNOSIS AND SPECAL UROLOGIC TREATMENT. 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

M 8853f,w,s,su. GENERAL SURGERY, GYNECOLOGICAL SURGERY. Staff
See these departments.

NECROPSY SERVICE. (See Pathology)

SURGICAL AND FRESH TISSUE PATHOLOGY. (See Pathology)

Fellows majoring in urology may also, if they wish, take work in anatomy, biochemistry, laboratory medicine, physiology, and dermatology. For details, see these departments.

Index

Symbols and Explanations

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

* Courses in which it is possible for graduate students to prepare Plan B papers.

† All the courses preceding the dagger must be completed before credit will be granted for any quarter of the sequence.

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

¶ Means "concurrent registration."

♯ Means "consent of instructor is required."

△ Means "consent of division, department, or school offering course is required."

x Means "course is offered more than one quarter."

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

A hyphen between course numbers (8142-8143-8144) indicates a sequence course which must be taken in the order listed.

A comma between course numbers (5234, 5235, 5236) indicates a series of courses which may be entered any quarter.

Courses numbered 8000 or above are for 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 (prereq 5246) is always in the same department as the course being described.

Prerequisite credits listed by amount only (prereq 6 cr) mean credits which must have been earned in the same department offering the course being described.

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School of Nursing

UNIVERSITY OF MINNESOTA

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School of Nursing

UNIVERSITY OF MINNESOTA

School of Nursing

I. GENERAL INFORMATION

Development of the School—The University of Minnesota School of Nursing was established March 1, 1909, as a result of the interest and effort of Dr. Richard Olding Beard. Although the educational offerings typified the then prevalent 3-year pattern of nurse training, it was the first preparatory program in nursing to be sponsored by a university in the United States. In 1919 a program in nursing leading to a baccalaureate degree was innaugurated. It was conducted concurrently with a shorter, nondegree program until discontinuance of the latter in 1947. The first programs leading to the professional Masters' degrees were initiated early in the 1950's. James Gray has portrayed the first 50 years of the school's history against a backdrop of changing times and evolving educational values in his book, *Education for Nursing*, published in 1960 by the University of Minnesota Press.

The School of Nursing assumes responsibility for the improvement of nursing care through its programs of nursing education, research, and service. The responsibilities related to research and service are fulfilled through activities such as continuing education for a variety of groups within the field of nursing, consultation services to individuals and agencies, and ongoing research in the area of nursing care of patients. In 1958 the University of Minnesota School of Nursing Foundation was established. Its purpose is improvement of 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 quality in the preparation of professional practitioners for such a needed service as nursing.

Philosophy of Nursing—The goal of nursing is to assist an individual, group, or community move toward optimal health. Optimal health may be defined as a dynamic integration of man allowing for maximum human effectiveness.

Nursing is an interpersonal process which takes place in a milieu composed of participants, the climate they generate, and the social forces which affect them. The primary participants in this interpersonal process are the nurse and the recipient. The recipient (individual, group, or community who receives a desired or required service) is responsible for himself within his capabilities and, as such, has the right to both participate in decision making and to accept or reject the service offered. The nurse actively participates in decision making and assumes responsibility for her decisions.

The practitioner is perceived as the individual who delivers the service desired or required by the recipient. The service the nurse practitioner offers is directed toward assisting the recipient to utilize his strengths to attain the goal of optimal health. In an attempt to influence the recipient in moving toward his goal, the nurse participates in the practitioner-recipient relationship. This participation is based upon her breadth of knowledge and her awareness of the milieu. By means of an analytical process, the nurse assesses the health status of the recipient and

formulates, implements, and evaluates a plan of nursing intervention based on the unique health requirements of the recipient.

The nurse has the ability to establish a relationship with the recipient characterized by caring and to initiate and accept change in partnership with the recipient.

Philosophy of Nursing Education—The goal of nursing education is directed toward several dimensions of student development: her maturation toward a fully human person with an investigative orientation and her achievement of competencies as a developing professional in nursing.

Nursing education is a learning process that involves a relationship between student and teacher fostering independence on the part of the learner. It involves a progression of related learning experiences that are contemporary, challenging, and flexible. This process occurs in a milieu which encourages intellectual curiosity and mutual respect. This milieu assures the availability of a wide variety of professional, and academic and community resources.

The student is an active participant with teachers, peers, and others involved in the process of learning. The student is involved in establishing her identity as a nurse and human being. The learner evidences growth: in exercising her rights and responsibilities to challenge and question the educational process; and by being self-directive through utilizing resources, seeking educational experiences, and increasing ability for self-evaluation. The teacher guides the student toward the goal of nursing education. The teacher possesses competencies relevant to nursing education and utilizes the milieu to enhance learning.

Programs—Over the years, the school has conducted various types of nursing programs designed to meet the community's need for nursing services and in keeping with current concepts of exemplary education for nursing. Today, programs in nursing are available which lead to a bachelor of science degree and a master of science degree.

The nursing program leading to the bachelor of science degree is designed to prepare high school graduates and graduates of diploma or Associate degree programs in nursing for the beginning practice of professional nursing. This program is accredited by the Minnesota Board of Nursing. Therefore, students graduating from the program are eligible to write the licensing examination offered by the Minnesota Board of Nursing. Satisfactory performance on the examination is required in order to practice as a registered nurse in Minnesota.

The nursing program leading to the master of science degree provides opportunity for graduates of baccalaureate programs in nursing to gain additional knowledge and skill necessary for the more expert practice of clinical nursing and beginning competence in a functional area of teaching or leadership in nursing services.

All programs in the School of Nursing are accredited by the National League for Nursing which is the body recognized by the National Commission on Accrediting as having this responsibility in nursing education.

Facilities—The School of Nursing is one of the constituent units of the University of Minnesota Health Sciences. The University Hospitals, another unit, serves as a resource for clinical experience for a variety of health science students. Learning experiences for students are also scheduled in many other Twin Cities hospitals and in a variety of community agencies.

ADMISSION (General)

The Board of Regents has committed itself and the University of Minnesota to the policy that there shall be no discrimination in the treatment of persons because of race, creed, color, sex, or national origin. This is a guiding policy in the admission of students in all colleges and in their academic pursuits. It is also to be a governing principle in University-owned and University-approved housing, in food services, student unions, extracurricular activities, and all other student and staff services. This policy must also be adhered to in the employment of students either by the University or by outsiders through the University and in the employment of faculty and civil service staff.

The School of Nursing offers a program leading to the degree of bachelor of science in nursing. Faculty of the School of Nursing holding Graduate School appointments advise and instruct student registered in the Graduate School for programs with a field of concentration in medical-surgical, psychiatric nursing, or childbearing, childrearing family nursing. Applications are accepted from men and women, married or single, and of any age. Specific information regarding admission to each of the programs follows. In concurrence with University policy, the School of Nursing offers opportunities for students from disadvantaged backgrounds. Special arrangements may be made for admission and progression in the program.

UNDERGRADUATE ADMISSIONS

Baccalaureate Program in Nursing

GENERAL INFORMATION

The first year of college prior to entering the School of Nursing may be completed in any accredited institution of higher education. The student who attends the University of Minnesota for the freshman year usually enrolls in the College of Liberal Arts. Any courses accepted by CLA are accepted by the School of Nursing for credit toward graduation. This includes courses given exemption or credit by CLEP or challenge examinations. Extension courses and independent study courses offering degree credit will transfer if they are acceptable to CLA.

A total of 45 credits in liberal arts courses should be completed prior to entering the School of Nursing. Included in the total credits are the first-year course requirements listed on page 22.

The University accepts for transfer a maximum of 4½ quarter credits of religion courses.

Advanced standing will be determined upon review and evaluation of submitted transcripts by the Office of Admissions and Records and the Admissions Committee of the School of Nursing. No unassigned (undesignated) advanced standing credit will be accorded for completion of a diploma or associate degree nursing program. Transcripts from accredited junior or senior colleges must be submitted for evaluation by the Office of Admissions and Records. Transfer credit will be granted on the basis of comparability of content to that of courses offered at the University. Usually, nursing courses taken at another institution do not

transfer to the School of Nursing, and no credit can be given for them. There are available some special examinations for credit for certain required courses.

The selection for admission is based on previous collegiate scholastic achievement and performance on tests of academic ability and achievement. A grade point average of 2.00 (C average) is the minimum accepted for admission. When the number of qualified applicants exceeds the number to be admitted, preference is given to those with highest previous scholastic achievement and academic aptitude test scores.

The School of Nursing admits some minority and/or disadvantaged students in each nursing class. These students should consult the MLK or HELP offices. For these students, entrance requirements may be modified.

ADMISSIONS PROCEDURE

1. Applications to the School of Nursing must be filed by April 15. The April 15 deadline can sometimes be waived for R.N.'s seeking admission. Official transcripts of any prior college achievement in another accredited educational institution should accompany the application.

   a. Students at the University of Minnesota apply for transfer from the college in which they are/were enrolled to the School of Nursing.

   b. Students from other educational institutions may procure application forms from the Office of Admissions and Records, University of Minnesota, Minneapolis, Minnesota 55455. When completed, they should be returned to that office.

2. A preliminary evaluation of credentials is prepared by the School of Nursing and sent to the applicant. This evaluation identifies if any deficiencies in entrance requirements are present.

3. Applicants should have transcripts of any further courses completed by April 15 forwarded directly to the School of Nursing.

4. Applicants should notify the School of Nursing how they plan to complete the required first-year courses during the spring or summer.

5. Consideration of all completed applications by the Admissions Committee follows the April 15 deadline.

6. The School of Nursing will notify applicants of their acceptance or non-acceptance as soon as all records can be processed. The acceptance is provisional, pending satisfactory completion of all entrance requirements.

7. Those students who are accepted will be sent physical examination forms to be completed by their own physicians and forwarded to the University Health Service. Registration materials for fall quarter will be sent to the student during the summer by the Office of Admissions and Records.

8. Accepted students whose educational plans have changed so that they no longer plan to come to the School of Nursing should notify the school promptly so that other candidates may be considered in their places.

Master's Program††

(Master of Science with Major in Nursing and Field of Concentration in one of Three Areas—see program description, pages 25 and 26)

1. Qualified applicants to the graduate program in nursing leading to the master of science degree are admitted to the Graduate School (see *Graduate School Bulletin, Plan B*). School of Nursing faculty holding Graduate School appointments serve as advisers.

2. The desirable time to enter the graduate program is the fall quarter. Applicants who wish to begin study at another time should consult a faculty adviser prior to submitting an application. Prospective students are encouraged to submit an application 9 to 10 months prior to date of desired entrance. Application materials may be obtained from the Graduate School, 322 Johnston Hall, University of Minnesota, Minneapolis, Minnesota 55455.

3. A requisite for admission to the graduate program in nursing leading to the master of science degree will be satisfactory completion of a National League for Nursing accredited nursing program leading to the baccalaureate degree including public health nursing.

4. Scholastic achievement considered desirable for admission to the program is a B average in prior undergraduate work.

5. A limited number of previously earned credits may be transferred toward meeting the requirements for the Master's degree. (See *Graduate School Bulletin* for policies).

6. Personal interviews are highly recommended and two references are required by the School of Nursing.

Adult Special Students

1. By special consideration, selected individuals may be admitted to the School of Nursing as adult special students. This is reserved for those who have particular professional needs which cannot be met through one of the regular program offerings. Adult special students will generally be unable to complete major course sequences.

2. Applicants should arrange to consult with a faculty member about special needs prior to submitting an application.

3. Applicants will be considered individually by the Admissions Committee of the School of Nursing in the light of the individual's needs, previous scholastic records, and work experience.

International Students

1. Applicants from countries other than the United States should submit formal application and credentials to the Office of Admissions and Records, University of Minnesota, Minneapolis, Minnesota 55455.

2. Students from other countries may find it necessary to spend more than the designated time in order to complete requirements of programs.

†† Inquiry about graduate programs in public health nursing should be directed to the School of Public Health.

3. Admission of students from other countries is contingent upon (a) superior previous academic achievement and nursing performance; (b) the ability to read, write, speak, and understand English; (c) a certification of good health; and (d) possession of a student visa or other appropriate visa.

SPECIAL OFFERINGS

Summer Session

The University of Minnesota offers courses during both terms of the Summer Session. It is customary also to offer courses not usually available during the academic year that are of special interest to practicing nurses. Students are encouraged to seek advisement from faculty in the School of Nursing if they plan summer study as a means of meeting degree requirements in any of the school's programs. A special summer announcement describing these courses may be had upon request to the Summer Session Office, University of Minnesota, Minneapolis, Minnesota 55455.

Preparation for first-level positions in public health nursing is available in the summer. (See Nurs 5635-5636 and PubH 3003). Prerequisites are admissibility to senior-level courses in nursing and permission of instructor. For further information, write to the School of Nursing.

Continuing Education and Extension Certificate Credit

Conferences and Institutes—Certificate-credit, short-term courses are offered from time to time by the Department of Conferences and Institutes located in the Nolte Center for Continuing Education. These courses vary in length, but are less than a University quarter. They are made available to interested groups within the field of nursing. Information about such courses is available at the Nolte Center office of the Department of Conferences and Institutes. Instructors are recruited from the regular University staff, supplemented as desirable by guest lecturers.

Evening Classes and Independent Study—The School of Nursing offers through Continuing Education and Extension certain certificate-credit evening classes to meet the needs of employed registered nurses. These are of necessity taught chiefly in Minneapolis and St. Paul. It is only occasionally possible for faculty to make such opportunities available beyond the Twin Cities because of the limitations imposed by the need to travel. No professional nursing courses are offered through independent study.

The liberal arts credit requirements for the bachelor of science in nursing may be earned through continuing education and extension courses. Students are urged to consult a faculty adviser in the School of Nursing when working out their plans for study through extension. (See *Evening Classes Bulletin* and *Independent Study Bulletin*).

HOW TO REGISTER

Registration is the procedure of enrolling in particular courses for the next quarter. Accurate registration is necessary in order to receive credit for courses taken.

Registration for Undergraduate Students

Registration Dates—Registration for *students on campus* begins several weeks before the opening of the quarter and is announced in the Official Daily Bulletin of the *Minnesota Daily*.

Students entering the University for the first time in the fall come to a 2-day orientation-registration program in August or September. Those unable to attend that program may register with their faculty adviser shortly before classes begin. New students receive announcement of registration dates by mail.

Registration Appointments—New students attending the orientation-registration program are given instructions concerning how to make registration appointments with a faculty adviser. Students transferring from CLA or students unable to attend the orientation-registration program are notified by mail that after a certain date they may call or write the School of Nursing for a registration appointment. Students currently enrolled in the school are responsible for making an appointment with their faculty adviser during the registration period.

The faculty adviser will have all necessary registration materials available and assist with program planning.

Change of Registration—Course registration changes may be made in accord with the following procedures:

1. *To cancel a course*—Obtain a Change of Registration ("cancel-add") form from the School of Nursing Educational Records Office, seek approval of adviser, return to the School of Nursing Educational Records Office to have form stamped with I.D. card, and turn in form at Nursing Window in 20 Morrill Hall. After 6 weeks of the quarter a notation by the instructor of your standing in the course is required on the form.
2. *To add a course*—Obtain a Change of Registration ("cancel-add") form from the School of Nursing Educational Records Office, seek approval of adviser, return to the School of Nursing Educational Records Office to have form stamped with I.D. card, and turn in form at Nursing Window in 20 Morrill Hall.

Canceling or Receiving an N in a Required Course—Since many of the required courses in the nursing curriculum are offered only once a year and are often prerequisite for succeeding courses, canceling or receiving an N in such a course may require interruption of the nursing sequence until that course is again offered and successfully completed. If it seems that cancellation or failure of a required course is imminent, students are requested to consult with their faculty adviser to determine if disruption of continuous progress in the nursing curriculum will result and to modify future program plans accordingly.

Canceling Out of the School of Nursing—Students considering canceling out of the School of Nursing are requested to confer with their adviser. Advisers are interested in being of any assistance possible and would appreciate identification of reasons for withdrawal as a means of assisting future students. To cancel out of the school, report to the School of Nursing Educational Records Office for materials necessary to cancel courses for the current or succeeding quarter.

Registration for Graduate Students

(See *Graduate School Bulletin*)

An orientation-registration program is provided during orientation week in Sep-

tember to students newly admitted to programs leading to a Master's degree. Individual advisement in relation to registration is available at this time. Subsequent program planning and registration activities are accomplished through individual appointments with faculty advisers.

SCHOOL OF NURSING REGULATIONS

Undergraduate Program

Petition for Exemption from School Regulations—The faculty has established certain regulations to assist students in achieving sound professional education in nursing and to facilitate the operations of the school. These rules are believed to be in the best interests of most students most of the time, but occasionally they may be disadvantageous to the educational needs of a particular person. In this event, undergraduate students may ask for exemption through a petition to the Student Scholastic Standing Committee.

Regular petition blanks are available in the School of Nursing Educational Records Office. An endorsement by the student's faculty adviser should accompany the completed petition which should be then addressed to the chairman of the Student Scholastic Standing Committee and left at 3313 Powell Hall. If the student desires, she will be given an opportunity to discuss her situation with a committee representative. When the committee has taken action, the decision will be communicated to the student and the student's adviser.

Registration Regulations—See information in preceding section on registration.

Classification of Students—Undergraduate students with less than 90 credits are sophomores. Students in the Upper Division who have less than 135 credits are juniors; those with 135 or more credits are seniors.

Credits—Amount of work is expressed in credits. Each credit demands, on the average, 3 hours a week of a student's time, i.e., 1 class hour with 2 hours of preparation, or 3 hours of laboratory work.

Credit Requirements—A student is required to complete a minimum of 1 academic year in residence while enrolled in the School of Nursing. (If he has only 1 year of residence, it must be his senior year.) As used here, "residence" denotes full-time study at the University interpreted as completion of not less than 12 credits per quarter for undergraduate students and 9 credits per quarter for graduate students.

Credit Distribution—The University of Minnesota believes that all students, whatever their area of specialization or their vocational goals, should hold in common the search for a liberal education. A liberal education asks of us that we seek control over the general intellectual instruments for acquiring and communicating knowledge, primarily the instruments of language and number; that we seek understanding of the ways in which scientists contribute to knowledge of man and his environment; that we seek historical and philosophical perspective on the nature of our own lives and of the world in which we live; and that we seek appreciation of the creative insights into life and nature provided by literature and the arts. To help students achieve the goals of liberal education, the School of

Nursing expects each student to distribute some part of his course work in areas of study other than those most closely linked to his vocational interest.

Students in the baccalaureate program in nursing must fulfill the group distribution requirements of the All-University Council on Liberal Education and must complete 20 elective credits in Upper Division courses (numbered 3000 or above). The distribution requirement calls for completion of English Composition Requirements and 48 credits distributed as follows:

Group A. *Communication, Language, Symbolic Systems*
8-10 credits (normally two courses)

Group B. *Physical and Biological Sciences*
12-15 credits (normally three courses)

Group C. *Man and Society*
16-20 credits (normally four courses)

Group D. *Artistic Expression*
12-15 credits (normally three courses)

College of Liberal Arts courses which are required in the baccalaureate nursing program may be used toward fulfillment of group distribution requirements. Upper Division elective courses may be used to satisfy group distribution requirements.

Maximum and Minimum Credits per Quarter—The maximum number of credits for which a student may register is ordinarily 17 per quarter. After 1 quarter of full-time study in the School of Nursing (not less than 12 credits) the student may register for 18 credits provided he has a grade point average of 2.50 cumulatively overall and in all nursing courses, and no failure for the quarter immediately preceding registration. Registration for credits in excess of these limits must be approved by the faculty adviser and the Student Scholastic Standing Committee.

Grades—The grading system is described in the *Class Schedule* that is published and made available to students during registration for each quarter of study. Every student is accountable for the information contained in this *Class Schedule* as well as that contained in the *School of Nursing Bulletin.*

Undergraduate students may have 50 percent of their total credits presented for graduation on the S-N grading system; 50 percent must be on an A-N system. Students may have 40 percent of their nursing credits (excluding pathophysiology) on the S-N system; 60 percent must be on the A-N system. All nursing courses are offered on both the A-N and S-N grading systems. S means that the student needs no remedial help; he has accomplished the objectives and is able to implement them in practice independently.

For sequential courses in the undergraduate curriculum:

1. An incomplete given for reason of illness, family problems, failure to turn in assignments or to complete specific experiences must be removed by the sixth week of the next quarter.

2. An incomplete given for failure to meet specific learning objectives (e.g., clinical or interpersonal relationships) will be handled by a contract between the student, the instructor for the current quarter, and the instructor for the upcoming quarter. The contract will include (a) experiences necessary to remove the incomplete; (b) time limitation for the contract; (c) stipulation regarding consequences if the terms of the contract are not met.

Grade Points—Quality of work is indicated by grade points. Grade points are assigned to course grades as follows: to each credit with a grade of A, 4 grade points; to each credit with a grade of B, 3 grade points; to each credit with a grade of C, 2 grade points; to each credit with grade of D, 1 grade point. An N carries no grade and is not averaged into the grade point average. For a 3-credit course completed with a grade of A, a student would be assigned 12 grade points.

Grade Point Average—Grade point average is defined as the number of grade points earned divided by the total number of credits for which grades have been recorded.

Class Attendance—Instructors determine and inform students of their own policies and procedures in regard to absences from class, laboratory, and examinations; instructors also determine whether or not a student may make up work missed because of absence from class, laboratory, or examinations. School of Nursing faculty are required to provide make-up opportunities only under the following circumstances: (a) participation in formally approved and scheduled University activities; (b) performance of military or civil duty (such as jury duty) which cannot be deferred; (c) illness or family emergency for which acceptable evidence is available. Instructors are not required to permit make-up of laboratory experiences or examinations to suit a student's personal convenience.

Satisfactory Progress—A faculty committee on Student Scholastic Standing reviews the progress of students each quarter and makes recommendations concerning their continuance in and graduation from the program in which they are enrolled. Satisfactory progress for students enrolled in the program leading to the degree of bachelor of science in nursing is considered to mean maintaining or exceeding a grade point average of 2.00 or C cumulatively in all courses completed, in all courses in nursing, and in each quarter of study.

All courses prerequisite to nursing courses and all those in nursing must be successfully completed before the student can proceed in the given program within the school.

It is the responsibility of the student to keep abreast of her academic progress and to see her instructor or adviser immediately if she believes she is having problems.

When the grade point average (overall and/or in nursing courses) or the grade point average in a given quarter falls below 2.00 (C average) for undergraduate students enrolled in nursing or when D or N grades are received for required courses, the situation is brought to the Student Scholastic Standing Committee and action is taken appropriate to the individual case.

Exclusion from the School of Nursing—Students may be excluded from the School of Nursing under one of the following headings:

1. *A student who fails to make satisfactory progress may not continue in the program.*

2. *Discontinued*—The nature of a nurse's responsibilities to patients and others requires that candidates for graduation from the school's programs have evidenced

to the faculty those personal and behavioral characteristics considered suitable to the discharge of such responsibilities. If a student's progress is being handicapped by conditions other than scholastic ability (ill health, personal or family circumstances, etc.) she may be required to discontinue her registration until these conditions have improved.

Readmission to the School of Nursing—Students who have withdrawn from nursing programs for whatever reason and later wish to be readmitted must seek prior authorization from the school. Petitions for readmission to the baccalaureate program must be submitted to the chairman of the faculty's Student Scholastic Standing Committee ***at least 3 months*** in advance of the quarter in which registration is desired. Each applicant must provide information necessary to support her petition.

Committee action is required on readmission petitions from individuals who have previously been excluded from the school (see previous section) or who voluntarily withdrew in face of limited academic progress. Administrative decision will be made about the readmissibility of students in good standing in terms of current availability of the needed learning opportunities and the school's resources for serving additional students.

Placement on readmission will be based on recommendation of the Undergraduate Curriculum Committee. In view of the changes in curriculum, students must understand that they may be asked to up-date their knowledge in some areas, or to take additional courses which are new requirements.

Graduation and Honors—When students satisfactorily complete requirements in any of the programs described in this bulletin, the conferring of the appropriate degree is recommended by the faculty to the Board of Regents of the University of Minnesota.

Graduation "with distinction" or "with high distinction" is not automatic, but is conferred on eligible students earning their first Bachelor's degree upon favorable recommendation by the faculty. Application by the student is not necessary. In addition to certain residence and performance stipulations that may vary with programs, students recommended for graduation "with distinction" or "with high distinction" must have attained an overall grade point average of at least 3.00 (B average) or 3.50 (B+ average) respectively.

Graduate Program

For policy related to credit requirements and distribution, transfer of credits, satisfactory progression in program, use of adult special and summer special status, filing of program, changes in approved program, and grading, see the *Graduate School Bulletin.* Following are policies of the School of Nursing that extend or replace Graduate School policy.

Credit Distribution for the Master of Science in Nursing—See section of this bulletin on Graduate Curriculum.

Petitioning for Alteration in School of Nursing Degree Requirements—A petition must be approved by the School of Nursing Student Scholastic Standing Committee.

Grading—All School of Nursing courses are offered on both the S-N and A-N grading systems. Students in the program leading to the master of science degree must maintain a B average. No graduate credit is allowed for course work of D quality.

Use of Adult Special and Summer Special Status—These are not intended as trials for graduate study.

DEGREES

Program Leading to Bachelor of Science in Nursing Degree

The degree of bachelor of science in nursing will be recommended for students who have completed all of the required work, have the total number and distribution of credits specified in the undergraduate curriculum, and have a 2.00 (C) minimum grade point average (a) overall, (b) on all work taken after admission to the School of Nursing, and (c) on all courses in nursing numbered 3000 or above.

Program Leading to Master of Science Degree

For the requirements related to continuance in and graduation from this program, see the *Graduate School Bulletin,* Plan B programs.

EXPENSES

For details regarding tuition, fees, maintenance, and other costs, see the current *General Information Bulletin.*

All students provide their own uniforms as necessary and are responsible for having them laundered. Students in the basic program pay approximately $40 for their uniforms. These are ordered and paid for during the first or second quarter of study in the School of Nursing.

Students in all programs are expected to be in appropriate uniform when having experiences in patient care settings. The uniform of students is to be worn only during those experiences that are a part of the educational programs.

All students are responsible for meeting transportation costs to and from off-campus locations where learning experiences are provided, and to and from classes or practice opportunities during off-campus experiences. Certain additional expenses are incurred for books, health care or hospitalization insurance, graduation fees, and School of Nursing pins as necessary.

STUDENT PERSONNEL SERVICES

(See also General Information Bulletin)

Student Orientation—The University's orientation program gives new students an opportunity to become acquainted with one another and with the campus.

Usually this involves a 2-day period and includes activities necessary for enrollment. A notice giving dates for orientation is sent to each new student soon after admission. Welcome Week is an allied program for students entering in the fall quarter. Students are urged to participate in its varied activities which include helpful sessions concerning study skills. Freshman Camp is an optional weekend program where entering freshman students meet and informally discuss with University faculty, staff, and other students, issues pertinent to the new student and his personal development at the University. Williamson Weekends, arranged later in the year, provide an opportunity for freshman students, upperclassmen, and faculty members to meet in small groups to discuss a particular theme. Impact-Listening Groups give the freshman an opportunity to meet and talk with fellow freshmen.

All-University Personnel Services for Students—Several specialized personnel services are provided by the University for all students. Students may avail themselves of such services as the following:

Information, Counseling, and Referrals to Appropriate Offices—Campus Assistance Center, 110 TNM

Professional Help with Personal Problems—Student Counseling Bureau, 101 Eddy Hall or 190 Coffey Hall, or University Mental Health Clinic, 400 Health Service

Health Needs—University Health Service

Problems of Speech or Hearing—Speech and Hearing Clinic, 110 Shevlin Hall

Services for Handicapped Students—Alice Christian at Student Counseling Bureau, 101 Eddy Hall

Informational, Educational, and Organizational Services to Women—Minnesota Women's Center

Improvement of Study Skills—Reading and Study Skills Center, 113 Eddy Hall

Financial Help—Office of Student Financial Aid, 107 Armory

Part-Time Employment—Student Employment Service, 30 Wulling Hall

Residence Hall Contracts and Off-Campus Housing—Housing Office, 312 - 15th Avenue S.E.

Legal Concerns—Legal Aid Clinic, 720 Washington Avenue S.E.

Veterans Benefits—105 Morrill Hall

Foreign Students—Foreign Student Adviser, 717 E. River Road

Student Activities—Student Activities Advisement Centers, 110 TNM, 110 Anderson Hall, 205 Coffman Memorial Union

Faculty Advisers—Advisement is available to students from members of the School of Nursing faculty. Each student is assigned to an adviser at the time of entrance into the School of Nursing. Faculty advisers assist students with registration, selection of courses, planning for part-time employment, and the identification of educational and vocational objectives. They are also available for counseling in relation to problems which may be interfering with the student's academic progress. Any student wishing to change advisers may submit such a request to the dean of the School of Nursing.

Employment—Students are urged to consult with faculty advisers before seeking part-time employment. The schedules carried by students make it desirable for them to think seriously about whether or not part-time employment is compatible with deriving maximal benefit from their studies and participating in over-all University activities.

Part-time employment in nursing is sometimes available for registered nurse students in Minneapolis or St. Paul hospitals. Inquiries about such opportunities

can be made directly to the nursing services of these hospitals or through the Minnesota Nurses' Association, 1821 University Avenue, St. Paul, Minnesota 55104, by association members. The University of Minnesota Hospitals (on the Twin Cities Campus) can usually arrange for a limited number of students to do special or general staff nursing during evening or weekend hours.

Students seeking other employment opportunities are advised to consult with the Student Employment Service.

Residence Accommodations—All students meet their own maintenance costs throughout their stay at the University. Students living within commuting distance of the University campus may elect to live at home while others may want to live in University-maintained residence halls or private housing. Information concerning residence halls for women may be obtained by writing to the Campus Housing Office, 312 - 15th Avenue S.E., Minneapolis, Minnesota 55414, or by consulting the *General Information Bulletin.*

Health—The School of Nursing in conjunction with the University Health Service maintains a program of periodic health examinations and immunizations for students in its programs. A schedule of health requirements is issued to every student upon entrance to the nursing program. It is her responsibility to fulfill the requirements for each quarter before she can register for the next quarter. Those students paying a quarterly student services fee have available to them the health services described in the *General Information Bulletin.* Further information is given in the booklet, *Your Health Service,* that is made available to students by the University Health Service.

All students, but especially those in the basic nursing programs, are encouraged to purchase the optional plan for supplemental Blue Cross-Blue Shield insurance coverage that is made available at a low rate through the University Health Service. This provides payment for certain services not available at the University Health Service and extends protection to students during off-campus learning experiences or vacation periods.

Married students who become pregnant are asked to notify their faculty advisers as early as possible to provide adequate time for educational planning in view of the individual's needs and adherence to maternity policies existing in institutions or agencies where students participate in planned learning experiences.

Student Organizations—There are many University-wide student organizations emphasizing social, cultural, social service, recreational, and religious interest. Within the School of Nursing, the student body elects representatives to the various curriculum committees for the purpose of voicing student ideas and actively participating in the planning for student education.

Alpha Tau Delta, national social sorority in nursing, and Sigma Theta Tau, national honor society in nursing, have active chapters. Membership is by election from among students who meet eligibility requirements.

All nursing students have the opportunity to join the Minnesota Nursing Students Association.

CHIP, the Council on Health Interdisciplinary Participation, is an active student group whose membership is open to students in all of the health science fields.

Student Loans—School of Nursing students enrolled in the professional programs are eligible for a loan and/or scholarship from funds established by the

Nurse Training Act of 1964 and subsequent amendments. The maximum amount available to an individual recipient in an academic year is $2,500 in loan and $2,000 in scholarship.

Freshmen may receive student loans under the Freshman Financial Aid Program. To receive priority consideration, a Freshman Financial Aid Application of the University of Minnesota must be received by the Office of Student Financial Aid of the campus which the applicant will attend. Priority dates are established at the respective campuses, but applications received after the priority date will be considered for financial aid as funds are available. Under the National Direct Student Loan arrangement, loans may not exceed demonstrated need. No interest is charged while the borrower is in at least half-time day attendance at an institution of higher education, or during any period, not exceeding 3 years, that he is serving in the Armed Forces, Peace Corps, or VISTA. Simple interest at the rate of 3 percent per year on the unpaid balance will begin 9 months from the date the borrower ceases to be a half-time student. Repayment will also begin at this time and may be arranged over a 10-year schedule. Full-time teachers in an elementary or secondary school who are in limited specific teaching circumstances, as well as borrowers who served after June 30, 1970, in the Armed Forces of the United States of America, may have partially cancelled the loan principal and interest of their National Direct Student Loans.

The Office of Student Financial Aid also administers University loan funds that have been set up to help students who are making satisfactory progress toward an educational objective. Students pay partial interest on a loan while in school and repay the principal, together with interest payments, after graduation.

Application blanks for additional information about these funds may be obtained from the Office of Student Financial Aid, 107 Armory, University of Minnesota, Minneapolis, Minnesota 55455. Students are urged to consider needs during winter quarter of the previous school year and to make application prior to April.

The Minnesota Nurses' Association administers the Sarah T. Colvin Loan Fund for registered nurses who are members of the association and are enrolled in Bachelors' or Masters' degree programs or specialized short courses. Information and application forms may be obtained from the Minnesota Nurses' Association, 1821 University Avenue, St. Paul, Minnesota 55104.

Freshman Scholarships—Scholarships for entering freshmen, chosen from among top graduates of Minnesota high schools, are offered through the Office of Student Financial Aid in 107 Armory Building. Scholarships which range in amounts from tuition and student services fee to $600 are awarded on the basis of high school academic scholarship, leadership, character, vocational promise, and financial need. One application assures consideration for all freshman scholarships offered by the University. Application blanks should be obtained through high school senior class counselors or principals by December 15.

Under the State of Minnesota Financial Aid Program, students who have or will graduate from an accredited Minnesota high school are eligible for grants, lower 75 percent, or scholarships, upper 25 percent. Both are renewable upon reapplication and continued eligibility. It is strongly advised that all apply for both the State of Minnesota and the University of Minnesota Financial Aid Programs. For information and applications relating to the State of Minnesota Financial Aid Program, contact Minnesota State Higher Education Coordinating Commission, Suite 400, Capitol Square, 550 Cedar Street, St. Paul, Minnesota 55101.

Candidates for state or federal American Indian scholarships who plan to attend the University of Minnesota are advised to file a State of Minnesota Scholarship and Grant Application and a University of Minnesota Financial Aid Application. American Indians who are residents of Minnesota may be eligible for special scholarship assistance. Information regarding opportunities for financial assistance from state and federal sources may be obtained from the Director of Indian Education, State Department of Education, St. Paul, Minnesota 55101, or the U.S. Office of Indian Affairs, 831 Second Avenue S., Second Floor, Minneapolis, Minnesota 55402.

Direct blood descendants of World War I veterans who were in the service 6 months before Armistice may be eligible for the LaVerne Noyes Resident Tuition Scholarship after completing 2 quarters of satisfactory work at the University. Application must be filed each quarter before September 1, December 1, or March 1. Grants are limited to a maximum of 6 quarters.

School of Nursing Scholarships—University scholarship funds for School of Nursing students in the professional programs are administered by the Office of Student Financial Aid. Recommendation of a student to receive scholarships is made by the Student Personnel Services Committee of the faculty of the School of Nursing. Students are eligible to apply for these scholarships after completion of 1 quarter in the School of Nursing. This eligibility requirement may be waived in case of financial difficulty. To receive primary consideration, students should submit their applications by April 1 prior to the academic year for which the scholarship is to be used. Information concerning application for these scholarships appears in the Official Daily Bulletin in winter quarter.

The School of Nursing extends appreciation to all who contribute for scholarships and wishes to acknowledge the assistance of many individuals and groups for their contributions to the support of on-going scholarship awards through the School of Nursing Foundation:

Ruth Thomas Brinker Scholarship in Nursing
Grace B. Dayton Scholarship Fund
Katharine J. Densford Scholarship
Suzanne J. Doehring Memorial Scholarship in Nursing
Freda Kantor Scholarship in Nursing
Alice and Gale Perry Scholarship Fund
National Association of Railway Business Women Scholarship—Twin Cities Chapter
Jennie Siebold Memorial Scholarship Fund
Sigma Theta Tau—Zeta Chapter
Margaret Wahlquist Memorial Scholarship—Women's Auxiliary to the Minnesota State Medical Association

Other Scholarships and Traineeships—The Minnesota State Legislature has enacted a law which provides scholarship funds for residents of Minnesota enrolled in basic professional and practical nursing programs. Students accepting scholarships must agree to practice in the field of nursing in Minnesota for 1 year immediately after graduation. Application forms are available from the Educational Records Office of the School of Nursing, or the Minnesota Board of Nursing, 393 North Dunlap, St. Paul, Minnesota 55104. These forms must be submitted to the Minnesota Board of Nursing after application for admission to the school has been approved and not later than July 1. Scholarship payment will not begin until the third quarter of the nursing major for students enrolled in the baccalaureate program.

The Professional Nurse Traineeship Program of the United States Department of Health, Education, and Welfare provides awards to qualified registered nurses enrolled for full-time study in baccalaureate and Master's degree programs. Eligibility for these traineeships may not exceed 24 months for an individual, including a maximum of 12 months in an undergraduate program, 18 months in a Master's program, or 12 months of post-Master's study. Information and application forms may be obtained from the School of Nursing.

Students planning to pursue a career in psychiatric nursing may write to the School of Nursing for information related to psychiatric and mental health traineeships. These traineeships are awarded to qualified students enrolled in the Master's degree program.

Nurses' Educational Funds provide a limited number of scholarships, fellowships, and loans to registered nurses enrolled in baccalaureate and Master's degree programs. Applicants must be members of the American Nurses' Association and have had at least 1 year of successful nursing experience. Information and application forms may be obtained from Nurses' Educational Funds, Inc., 10 Columbus Circle, New York, New York 10019.

The United States Army has two financial assistance programs for nursing students: (a) The Army Student Nurse Program for selected students enrolled in basic nursing programs leading to a baccalaureate degree. Participants must agree to serve, upon graduation, on active duty as an Army Nurse Corps officer for a period determined by the time spent under this program. Students may apply during the sophomore year for appointment at the beginning of their junior year. (b) The Registered Nurse Student Program for registered nurses enrolled in baccalaureate or Master's degree programs who can complete their program within 12 months. Participants must agree to serve as an Army Nurse Corps officer for at least 3 years. This period includes the time spent in school. These programs are sometimes temporarily discontinued, so current information should be obtained from the Army Nurse Corps counselor at Army recruiting offices.

The United States Navy has one financial assistance program for nursing students: The Navy Nurse Corps Candidate Program is for selected students enrolled in baccalaureate programs in basic professional nursing. Participants must agree to serve, upon graduation, on active duty as a Navy Nurse Corps officer for a period determined by the time spent in the program. Students should initiate application during the first quarter of the sophomore year. Information about this program may be obtained from the Navy Nurse Corps counselor in Navy recruiting offices.

Registered nurses are eligible for assistance from the USAF for the final year of the baccalaureate program. This involves a commitment to active duty in the Air Force Nurse Corps on completion of the program. For further information, contact the Air Force Recruitment Office, 1315-4th Street S.E., Minneapolis, Minnesota 55414.

In many communities some financial aid to students is available through churches, women's clubs, medical and medical auxiliary groups, American Legion, and service groups such as Rotary, Kiwanis, and Zonta. Many of the district and state nursing associations have established scholarship and loan funds for registered nurses wishing further education. Interested students can explore these resources.

II. PROGRAMS OF STUDY

A. Program Leading to Bachelor of Science Degree in Nursing

The faculty in nursing believes that professional nursing provides a direct service to recipients—an individual, group, or community. The goal of nursing is *to assist the recipient to move toward optimal health,* i.e., a dynamic integration of man allowing for maximum human effectiveness. In baccalaureate preparation this goal is stated as follows: to facilitate the recipient's adaptive process so that his maximum potential may be achieved; with movement toward maximum potential, a state of optimal health is approached.

Professional nursing is an interpersonal process which involves the nurse and recipient as primary participants. Integral to this process is the development of a goal-directed relationship. The nurse's relationship with the recipient is characterized by caring. Within the context of this relationship, the nurse endeavors to approach the recipient as a holistic being, assisting him to utilize his strengths to maximize his adaptive potential. The recipient is responsible for himself within his capabilities and, as such, has the right to both participate in decision making and to accept or reject the services offered. The nurse actively participates in decision making and assumes responsibility for her decisions.

In addition to direct service, the professional nurse cooperates with other health professionals in the provision of services for the welfare of the recipient.

The purpose of the baccalaureate program in the School of Nursing is to provide opportunities for the student to learn professional nursing so that upon completion of the program the student will:

1. Have the ability to utilize synthesized principles and theoretical concepts from the natural and behavioral sciences, the adaptation frame of reference, critical and analytical thinking, interpersonal relationships, theory and skills, selected technical skills, and various dimensions of the systematic process to effectively implement nursing care with a variety of recipients.
2. Have actualized a commitment to develop his/her potential as an individual and as a responsible member of society.
3. Have the ability and commitment to influence others in health care.
4. Have sufficient bases in knowledge, learning opportunities and directed experiences, and an awareness of own competencies to enable him/her to function fully in professional practice and to be responsive to societal and technical changes by innovation, extension, and expansion.

Through utilization of adaptation theory, a systematic process, selected tools, and knowledge of helping relationship processes, the student learns to assess the health status of the recipient, to establish a nursing diagnosis, and to formulate, implement, and evaluate a plan of nursing intervention based on the unique health requirements of the recipient. The scope of these learnings and the degree of competency in their application are such that graduates are able upon completion of the program to function in first-level positions in nursing. Elective nursing courses which build upon learnings and competencies integral to the nursing program are offered.

Throughout the program, the student has opportunity to develop individual interests and potentials through elective study in behavioral and natural sciences and nursing. Learnings are provided which are foundations to graduate study.

The learning process in which the student engages involves a relationship between student and teacher fostering independence on the part of the learner. This process occurs in a milieu which encourages intellectual curiosity and mutual respect. Throughout the learning process, the student is also an active participant with teachers, peers, and others.

In accord with the philosophy underlying the program, learnings of progressive complexity are planned to help students attain the following objectives:

1. An ability to apply synthesized principles and theoretical concepts from the natural and behavioral sciences to nursing.
2. An ability to utilize an adaptation frame of reference as a basis for interpreting and influencing human behavior in health care situations.
3. An ability to think critically and analytically in the formulation of nursing judgments.
4. 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.
5. An ability to establish, maintain, and terminate collaborative and/or helping interpersonal relationships with a variety of individuals and groups to accomplish the goal of nursing.
6. Competence in utilizing selected technical and other tools to accomplish the goals of nursing.
7. In an attempt to answer questions, has the ability to carry out clinical study arising from nursing practice and to determine implications for nursing practice and further study.
8. An ability and commitment to influence health care through utilization of principles of change, leadership, and teaching.
9. A commitment to development of his/her potential as an individual.

To assure the student's attainment of these objectives, the following requirements have been established. Note that the requirements contribute to general as well as professional education. It is the student's responsibility, in consultation with a faculty adviser, to determine which specific courses within the liberal arts distribution requirements will most effectively complement her interests and abilities. The total credit requirement maintains a balance between credits in general education and credits in the nursing major and courses related thereto.

BASIC PROFESSIONAL NURSING PROGRAM

Qualified students are admitted to this program after completing the first year of general education requirements in the College of Liberal Arts of the University of Minnesota or at another accredited college or university. (See pages 5 and 6 of this bulletin for information about admission requirements.)

FIRST-YEAR REQUIREMENTS

The minimum quarter-credit requirement for the freshman year is 45. These 45 credits must include:

Course	*Minimum Credits*
English Composition	8
General Chemistry	8
General Biology	4
Cultural Anthropology	3
Introductory Sociology	3

The remaining elective credits must be fulfilled by selections from any of Groups A, B, C, or D. Because School of Nursing requirements are heavy in Groups B and C, it is suggested that students consider Groups A and D for freshman-year electives.

GROUP DISTRIBUTION REQUIREMENTS

All students considering application for admission to the School of Nursing should secure a *College of Liberal Arts Bulletin* to use in choosing courses to meet group distribution requirements. The School of Nursing accepts all courses accepted by the College of Liberal Arts for fulfillment of distribution requirements. The CLA bulletin offers a listing of courses most often used for distribution purposes, and most course descriptions include group classifications.

COURSE REQUIREMENTS IN THE SCHOOL OF NURSING

A. For students who begin the sophomore year in fall 1973 or later.

During the sophomore, junior, and senior years, students enroll for courses in both professional and general education.

Specific Course Requirements

(Minimum Credits in Parentheses)

General Psychology (4)
Human Growth and Development (4)
Abnormal Psychology (4)
Anat 1004—Elementary Anatomy (4)
MicB 5233—Microorganisms, Disease (7)
MdBc 3050—Physiological Chemistry (4)
Phsl 3051—Human Physiology (5)
Phcl 1009—Pharmacology (3)
Group Theory (4)
Nutrition in Health and Disease (3)
Nurs 5400-5401-5402—Pathophysiology of Illness (6)
PubH 3001—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 5407—Systematic Process II (2)
Nurs 5408—Adaptation II (1)
Nurs 5409—Helping Relationships II (2)
Nurs 5403-5404-5405—Tools II (3)
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 (3)
Nurs 5614—Synthesis Incorporating Concepts of Health (3)
Nurs 5615—Synthesis Incorporating Multiple Concepts (3)
Nurs 5816—Leadership, Management (5)
Electives in Nursing (12)

Elective Credits for Sophomore, Junior, and Senior Years

The remainder of the total minimum-credit requirement (180) must be fulfilled by courses accepted by CLA to meet degree and distribution requirements. Twenty (20) elective credits must be earned in Upper Division courses (3000 or above). All students must meet group distribution requirements (see page 11). Freshman-year and Upper Division courses may be applied toward distribution requirements. Students should select elective courses in consultation with their advisers and through reference to the CLA bulletin.

Students may earn the B.S. in nursing and a Bachelor's degree from the College of Liberal Arts concurrently. To do so, it is necessary to meet all requirements of both majors which may involve additional time for study. Students wishing to do so should consult with an adviser in the Upper Division Counseling Office of the College of Liberal Arts.

Plan of Enrollment

The baccalaureate program in nursing requires approximately 8 to 9 quarters for completion. Courses of instruction, usually extending over 5-10 weeks, focus on major areas of emphasis within the nursing major—beginning competence in current and potential roles of nursing and utilization of a systematic process, adaptation theory, helping relationships, and selected communication and technical tools. Each area is examined individually and at increasing levels of complexity, and ultimately synthesized into a meaningful whole to enable the student to achieve the goal of nursing with both individuals and groups in a variety of health care settings.

Variable combinations of the courses may be arranged, not necessarily congruent with the quarter system, subject to stated prerequisites and availability of offerings. Students may consolidate or extend their study in accordance with their particular needs or interests.

B. For students who began the sophomore year prior to fall 1973 and/or who will graduate by spring 1975.

Specific Course Requirements

(Minimum Credits in Parenthesis)

Psy 1001—General Psychology (5)
CPsy 3301—Child Psychology (4)
Psy 5604—Abnormal Psychology (5)
Anat 1004—Elementary Anatomy (4)
MicB 5233—Microorganisms, Disease (7)
MdBc 3050—Physiological Chemistry (4)
Phsl 3051—Human Physiology (5)
Phcl 1009—Pharmacology (3)
Nurs 5220—Nursing in Perspective (4)
Nurs 5230—Perspectives of the Nurse-Patient Relationship (4)
Nurs 5400-5401-5402—Pathophysiology of Illness (6)
Nurs 5410—Core Concepts of Adaptation Theory (8)
Nurs 5420-5430—Integration and Application of Theory and Nursing (16)
PubH 3001—Introduction to Community Health (5)
Nurs 5630-5640-5650—Nursing Synthesis and Nursing Roles (18)

Junior-Year and Senior-Year Elective Credits

The remainder of the total minimum credit requirement (190) must be fulfilled from any courses accepted by CLA. A minimum of 9 credits must be earned in each of Groups A (exclusive of English composition) and D. At least 20 Upper Division credits must be earned. The School of Nursing accepts any courses accepted by CLA for distribution or degree credit.

B. Program Leading to Master of Science Degree

This program offered in the Graduate School usually requires 5-6 quarters for completion. Candidates for admission must meet the general requirements for the master of science degree, Plan B, as listed in the *Graduate School Bulletin.* Approval of the student's planned program by the appropriate review committee of the Graduate School constitutes acceptance for candidacy for the degree.

Requirements for the degree fall in three areas—clinical nursing, related fields, and research and include: minimum of 45 credits in total (18 credits in clinical nursing, 18 credits in related fields, and 7 credits in nursing research). Plan B papers, involving 9 credits of independent investigation with faculty guidance, are required; a minimum of 3 credits of Plan B papers must be in nursing research. It is expected that many students will need to complete more than 45 credits in order to meet the program objectives. Each student, with his School of Nursing adviser, plans his individual program by which he meets the objectives of the M.S. program and his personal objectives.

The nursing major is designed to enable the student to meet the following objectives:

1. Demonstrate ability to develop human relationships characterized by mutual response and responsibility within professional situations. The skill expectation is that of the primary practitioner.
2. Experience one's self, expressed in such areas as biases, values, and potential, being conscious of the influence of one's behavior.
3. Engage in innovative problem solving that reflects:
   a. A refined identification and simple articulation of a problem
   b. The utilization of several frames of reference
   c. Discrimination of:
      (1) Frames of reference
      (2) Courses of action
      (3) Consequences
4. Recognize when change is appropriate and development of skills that result in changes which improve the health of people.
5. Formulate ideas characterized by:
   a. Relevance
   b. Refinement
   c. Orderliness
   d. Expanded knowledge base
   e. Originality

6. Identify a researchable nursing problem, to design and conduct a study; to evaluate and make increasingly discriminating use of research findings.
7. Demonstrate a course of action indicative of a self-directed learner.
8. Demonstrate an evolving and coherent personal nursing framework.

AREAS OF STUDY IN THE NURSING MAJOR

In the first year, the student selects *one* of three fields of concentration. In the second year, there are options in areas of nursing education, clinical nursing leadership, or advanced clinical nursing plus potential for special combinations of these functional areas.

GENERAL PLAN OF PROGRAM

1. FIELDS OF CONCENTRATION IN CLINICAL NURSING—FIRST YEAR

Medical-Surgical Nursing—Emphasis is placed on the identification of characteristics of humanness and health, the effect of selected experiences on states of health, and current and potential roles of nursing in assisting people toward optimal health goals.

Required: Nurs 8100, 8101, 8102 plus humanities and physiology.

Psychiatric and Mental Health Nursing—Purpose of this field is to prepare a mental health nursing specialist who will have a sound foundation in theory of mental illness and in the promotion of mental health. She will have studied and developed skills in therapy (one-one, group, and family therapy) collaborating with other professional and nonprofessional mental health workers, participating in the therapeutic milieu, and participation and intervention in community health planning and programs.

Required: Nurs 8200, 8201, 8202, 8203, 8204, course/work in small-group communication.

Childbearing and Childrearing Family Nursing—Purpose of this field of concentration is to prepare clinical specialists who can directly or indirectly assist a patient and his family in their efforts to attain optimal health for her (or him) during childbearing, childrearing, and childhood. Includes core seminars and concentration in either childbearing or childrearing. The childbearing sequence emphasizes theory and clinical experience in the management of the care of the normal childbearing family, and the nursing care of high-risk mothers and infants. The childrearing sequence emphasizes the development of assessment and counseling skills in the provision of child health care and the nursing management of the care of children with acute or chronic illness. It is anticipated that preparation for national certification in nurse-midwifery may be offered by 1975.

Required: Nurs 8300, 8301, 8302, plus
Either CBF: Nurs 8310, 8311, 8312, 8313, Soc 5505, physiology
(or) CRF: Nurs 8350, 8351, 8352, Soc 5505, CPsy 5331

2. SECOND-YEAR OPTIONS

Advanced Clinical Nursing—This option allows for in-depth concentration in a particular clinical area of nursing chosen by the student in accordance with a special interest. Emphasis is on hypothesis generation and testing for the purpose of developing creative and critical approaches to nursing. This may include special roles such as adult health practitioner or nurse-midwifery.

Required: Nurs 8060 (9-credit minimum)

Nursing Education**—The purpose of study in nursing education is preparation for beginning faculty positions. Emphasis is on teaching in clinical laboratories and on working with individuals and groups. Graduate study in field of concentration and foundational courses in educational theory provide base for study of nursing education. Practicum experiences are included, generally in associate degree and baccalaureate programs.

Required: Nurs 8500, 8501, 8502, PsyF 5120, PsyF 5141

Clinical Nursing Leadership**—This option includes courses and related field experience for nurses interested in effecting change in health care delivery; emphasis is on developing skills in assessing climate and functioning systems within a nursing agency and on investigating means of influencing patient-care services. Each student will be expected to determine individual goals and approaches to achieve these goals utilizing guidance of faculty and preceptors. Field experience in selected health care agencies and seminar discussions as supportive to the learning process will be arranged.

Required: Nurs 8600, 8601, 8602, plus two supportive courses (6 credits) related to organization theory, change process, or communication.

Special combinations of the above second-year options may be arranged—Nurs 8508 (4 credits) plus Nurs 8060 have been used in this way.

Another possibility is for a student to select course work from a second field of concentration with faculty permission.

3. RESEARCH

This component of the nursing major includes required course work plus 9 credits in Plan B papers involving independent investigation; of these 9, at least 3 credits *must* be in nursing research. The student contracts with a graduate faculty member for each Plan B paper. A statistics course is required unless the student can demonstrate adequate knowledge of statistics; this would involve exceeding the minimum number of credits.

Required: Nurs 8021, 8050, and knowledge of statistics

4. RELATED FIELDS

The School of Nursing graduate faculty places high value on the Graduate School requirement of related fields for greater breadth of study. A minimum of 18 credits must be taken in at least *two* related fields, with a minimum of 6 credits in each of two. Courses from different disciplines may constitute a related field if their content relationship can be substantiated.

One of the related fields may be a School of Nursing second-year option designated by **. The rationale for this is that the focus of the ** options is on education and leadership.

** See Related Fields above.

FACULTY

Professor

M. Isabel Harris, Ph.D.
Florence J. Julian, M.N.A.
Barbara K. Redman, Ph.D.

Associate Professor

Florence M. Brennan, M.A.

Assistant Professor

Marilyn R. Backlund, M.S.
Monica M. Bossenmaier, M.A.
Sheila A. Corcoran, M.Ed.
Frances E. Dunning, M.Ed.
Ellen C. Egan, Ph.D.
Grace E. Gohdes, M.Ed.
Helen B. Hansen, M.Ed.
Mary J. Madden, M.S.
Ida M. Martinson, Ph.D.
Dorothy M. Moe, M.Ed.
Virginia A. Pidgeon, M.A.
Julia S. Randall, M.N.A.
Sharon L. Rising, M.S.N.
Florence R. Ruhland, M.Ed.
Muriel B. Ryden, M.A.
Alice Marilyn Sime, Ph.D.
Eugenia R. Taylor, M.A.
Joan M. Tuberty, M.S.
Romana Urueta, M.S.

Instructor

Marie E. Albrecht, M.S.
Mary Ann L. Anglim, M.Ed.
E. Jean Beske, M.Ed.
Dianne L. Brogger, M.S.
Peggy L. Coyne, M.N.
Patricia A. Crerar, M.S.
Ruth C. Enestvedt, M.S.
Alice Mae H. Graner, M.S.
Blossom C. Gullickson
Sharon E. Hoffman, M.S.
Rosemary J. Huerter, M.N.
Sofia M. Landry, M.S.
Gladys L. McCarthy, M.S.
Nancy S. Malcolm, M.P.H.
Jean K. Markley, M.S.
Elizabeth A. Ojala, M.S.
Sharon L. Pontious, M.S.
Carol A. Reese
Linda M. Seppanen, M.S.
Mary G. Weisensee, M.S.
Sharon L. Wilford, M.S.

DESCRIPTION OF COURSES

The following courses are taught by members of the School of Nursing faculty and/or by cooperating faculty in other educational units of the University. Class hours, days, and rooms for these courses are listed in the quarterly *Class Schedule* or are made known to students by the School of Nursing faculty. For summer class schedule, see *Summer Session Bulletin.*

The description of the required courses and electives in the various curricula which are taught by other departments of the University are found in the bulletins of the respective educational units, and in the all-University *Class Schedule.*

Explanations

Course Numbering—A course is designated by an abbreviated departmental prefix and a number, and sometimes followed by a letter. It will have the same number regardless of the quarter in which it is offered. The course number, unless otherwise noted, indicates class standing requirements 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 8999—for graduate students only

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

* Courses in which it is possible for graduate students to prepare Plan B papers.

† All the courses following the dagger must be completed before credit will be granted for any quarter of the sequence.

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

¶ Means "concurrent registration."

♯ Means "consent of instructor is required."

△ Means "consent of division, department, or school offering course is required."

A hyphen between course numbers (3142-3143-3144) indicates a sequence course which must be taken in the order listed.

A comma between course numbers (1234, 1235, 1236) indicates a series of courses which may be entered any quarter.

NURSING (Nurs)

5201. ROLE OF NURSING WITHIN HEALTH CARE. (2 cr; 5 wks)
Introduction to nursing within the context of health and health care delivery systems. Exploration of philosophies of nursing with implications for nursing practice and nursing education.

5202. SYSTEMATIC PROCESS I. (2 cr; 5 wks; prereq 5201 or ¶5201)
Rationale for systematic approach to goal achievement. Development of steps to systematic achievement of identified goal.

5203. ADAPTATION I. (2 cr; 5 wks; prereq 5201, Physiology or ¶Physiology)
Adaptation as a fundamental context of health. Examination of: 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)
Helping relationships as a fundamental context of nursing. Basic concepts related to establishing goal-directed contractual relationships. Designed to increase competence in utilizing interpersonal skills in helping individuals.

5205-5206. TOOLS I. (1 cr each; 10 wks each; prereq 5201 or ‡)
Focus on knowledge and skill with tools of assessment and maintenance of health. Based on principles from the biological, physical, and behavioral sciences.

5207. SYNTHESIS. (2 cr; 5 wks prereq 5202, 5203, 5204, 5205, Growth and Development)
Synthesis of first-level learnings of systematic process, adaptation, helping relationships, and tools to provide nursing care for healthy children and adults.

5400-5401-5402. PATHOPHYSIOLOGY OF ILLNESS. (2 cr each; prereq Phsl 3051, Anat 1004, MicB 5233, MdBc 3050)
Exploration of basic concepts of pathophysiology; integration of concepts into an understanding of common disease entities. Includes discussion of disease process, signs and symptoms, diagnosis and medical plan for prevention and/or treatment.

5407. SYSTEMATIC PROCESS II. (2 cr; 5 wks; prereq 5207 or ¶5207)
Application of systematic process as a tool in nursing. Analysis of effectiveness of use of process. Development of criteria to judge effectiveness of use of process. Introduction of concepts of variables, probability, validity. Provides basis for carrying out clinical studies in subsequent clinical courses.

5408. ADAPTATION II. (1 cr; 5 wks; prereq Group Theory, 5207 or ¶5207)
A study of the significance of the nurse's intervention with groups. Adaptation theory is related to knowledge of group theory.

5409. HELPING RELATIONSHIPS II. (2 cr; 10 wks; prereq Group Theory, 5207 or ¶5207)
Designed to increase competence in utilizing interpersonal skills in helping task-oriented groups. Also focuses on ability to relate to individuals who have difficulty in communication or relationships.

5403-5404-5405. TOOLS II. (1 cr each; 10 wks each; prereq 5206, 5400-5401-5402 or ¶5400-5401-5402)
Focus on understanding of and skills with tools of physical assessment and intervention and patient education with individuals experiencing deviations from health. Builds further on basic biological, physical, and behavioral sciences with specific incorporation of knowledge from pathophysiology, pharmacology, learning theory, systematic process, and adaptation theory.

5410. CORE CONCEPTS OF ADAPTATION THEORY AND NURSING PROCESS.** (8 cr incl lect and clin lab; prereq 5230, CPsy 3301, ¶5400, ¶Phcl 1009)
Significant aspects of adaptive framework and nursing process; holistic assessment of man; formulation of a nursing diagnosis; implementation and evaluation of an effective plan of nursing intervention. Introduction to scientific bases underlying nursing skills.

5420-5430. INTEGRATION AND APPLICATION OF THEORY AND NURSING PROCESS.** (8-8 cr incl lect and clin lab; prereq 5410, ¶5401-5402)
Continued study of adaptive framework and nursing process; opportunity for further development and refinement of interpersonal and technical skills; presentation of illustrative patient situations. The student is involved in the provision of care in increasingly complex situations.

5611. SYNTHESIS INCORPORATING CONCEPTS OF CHRONICITY. (4 cr; 10 wks; prereq 5407 or ¶5407, 5408, 5409, 5403 or 5404 or 5405 or ¶5403 or ¶5404 or ¶5405)
Synthesis of systematic process, adaptation, helping relationships, and tools into nursing care of children, adults, and groups experiencing conditions of long-term nature. Examines the health team's approach and function in institutions and the community for care of those with chronic conditions.

5612. SYNTHESIS INCORPORATING CONCEPTS OF STRESS AND CRISIS. (4 cr; 10 wks; prereq 5407, 5408, 5409...5403 or 5404 or 5405 or ¶5403 or ¶5404 or ¶5405)
Synthesis of systematic process, adaptation, helping relationships, and tools into the care of children and adults experiencing physical and/or psychological stress or crisis. Examines the various facets of the experience of stress or crisis, including potential growth or harm. Focus on nursing interventions for acute, short-term situations.

** 5410 will not be offered after fall 1973; 5420 will not be offered after winter 1974; 5430 will not be offered after spring 1974.

5613. SYNTHESIS INCORPORATING CONCEPTS OF LOSS. (3 cr; 5 wks; prereq 5407, 5408, 5409...5403 or 5404 or 5405 or ¶5403 or ¶5404 or ¶5405)
Synthesis of systematic process, adaptation, helping relationships, and tools in care of individuals and/or families experiencing loss. Examines the various facets of the experience of loss from the perspective of both the recipient and the student.

5614. SYNTHESIS INCORPORATING CONCEPTS OF HEALTH. (3 cr; 10 wks; prereq 5611 or 5612 or 5613)
Examines contemporary and emerging dimensions of nursing role in planning and providing holistic health care to children, adults, and groups. Offers an in-depth perspective of the various ways in which human beings may enhance the experience of health.

5615. SYNTHESIS INCORPORATING MULTIPLE CONCEPTS. (3 cr; prereq 5611, 5612, 5613, 5614)
Synthesis of previous knowledge and skill areas into comprehensive and effective care of individuals and groups with various problems of health and deviations from health. Focus on cooperation and collaboration with others to achieve nursing goals.

5620. INDEPENDENT STUDY IN NURSING TOPICS. (1-9 cr; prereq #)
Learning experiences planned to meet individual student needs beyond required credits.

5630-5640-5650. NURSING SYNTHESIS AND NURSING ROLES.** (6 cr each incl lect and clin lab; prereq 5430, Abnormal Psychology)
Study of adaptation of groups; delivery of nursing care as it relates to contemporary health care systems; nursing intervention directed toward the group; exploration of planned change; legal implications; application of research findings.

5635-5636. INSTRUCTION AND SUPERVISED EXPERIENCE IN COMMUNITY HEALTH NURSING. (3 cr each incl lect and clin lab; prereq △)
Family oriented with focus on nursing assessments and intervention, community health care, and health promotion.

5816. LEADERSHIP/MANAGEMENT. (5 cr; 10 wks; prereq 5615 or ¶5615)
Develops the ability to assume assigned leadership roles in nursing care situations. Analyzes the potential for expanding and fulfilling the role of nursing in a variety of situations. Collaborates with health care professionals in achieving a health care goal.

NURSING ELECTIVES. (12 cr required)
Electives in nursing will be offered beginning in fall 1975.

FOR GRADUATE STUDENTS ONLY

8001. SPECIAL EDUCATIONAL EXPERIENCES IN NURSING

8002. SELECTED EXPERIENCES IN CLINICAL NURSING

8009. SPECIAL TOPICS IN NURSING

8010. PROBLEMS IN PHYSIOLOGY

8020. FOUNDATIONS OF NURSING

8021. RESEARCH IN NURSING

8050. PROBLEMS IN NURSING

8051. SPECIAL TOPICS IN NURSING RESEARCH

8060. ADVANCED CLINICAL NURSING

8062. SEMINAR: INTERDISCIPLINARY HEALTH

8063. NURSING CONSULTATION

8100. NURSING ASSESSMENT FROM A GROWTH-ORIENTED PHILOSOPHY

8101. CRISIS EXPERIENCE: NURSING ASSESSMENT AND INTERVENTION

8102. ASSISTING GROUPS TO IMPROVE THEIR HEALTH

8200. FOUNDATIONS OF PSYCHIATRIC NURSING

** 5630 will not be offered after fall 1974; 5640 will not be offered after winter 1975; 5650 will not be offered after spring 1975.

8201. PSYCHIATRIC NURSING—INDIVIDUAL PATIENTS
8202. PSYCHIATRIC NURSING—GROUPS OF PATIENTS
8203. PSYCHIATRIC NURSING—COMMUNITY
8204. PSYCHOPATHOLOGY
8300-8301-8302. CHILDBEARING AND CHILDREARING FAMILY NURSING
8310. CARE OF THE CHILDBEARING FAMILY
8311. CARE OF THE CHILDBEARING FAMILY II
8312. CARE OF THE CHILDBEARING FAMILY III
8313. CARE OF THE CHILDBEARING FAMILY IN RISK
8314.** NURSE-MIDWIFERY MANAGEMENT DURING CHILDBEARING
8350. CHILDREARING FAMILY IN HEALTH I
8351. CHILDREARING FAMILY IN HEALTH II
8352. CHILDREARING FAMILY IN ILLNESS
8500. NURSING EDUCATION IN THE UNITED STATES
8501. INSTRUCTION IN NURSING
8502. EVALUATION IN NURSING EDUCATION
8508. TEACHING-LEARNING PROCESS IN CLINICAL PRACTICE
8509. SPECIAL TOPICS IN NURSING EDUCATION
8550. PROBLEMS IN NURSING EDUCATION
8600. HEALTH CARE INSTITUTIONS AND NURSING LEADERSHIP
8601. CLINICAL NURSING LEADERSHIP I
8602. CLINICAL NURSING LEADERSHIP II
8609. SPECIAL TOPICS IN NURSING SUPERVISION

** This course *may* be available 1974-75.

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Occupational Therapy/Physical Therapy

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Occupational Therapy
Physical Therapy

UNIVERSITY OF MINNESOTA

Occupational Therapy
Physical Therapy

The University of Minnesota believes that all of its students, whatever their area of specialization or their vocational goals, should hold in common the search search for a liberal education. The following programs offered in the Department of Physical Medicine and Rehabilitation, Medical School, Health Sciences, provide the student with a strong foundation in biological and physical sciences as well as an opportunity to obtain liberal arts courses which serve to develop individual interest and abilities. The therapist, both in occupational and physical therapy, provides to the field of rehabilitation specialized services which require high moral standards, optimum mental and physical wellbeing, and an understanding of the nature of his own life and the world in which he lives. The curricula as planned strive to help the student achieve the following objectives:

1. Understanding of normal growth and development as well as the physical and psychological effects of interruption in the developmental process by genetic aberration, illness, trauma, and social disorganization.
2. Knowledge of the principles of treatment planning based on medical, psychological, physiological, and social theories.
3. Competence in selected technical procedures used for evaluation and treatment.
4. Ability in planning, initiating, coordinating, and evaluating treatment programs designed to meet the individual needs of patients.
5. Effective use of written and verbal communications with patients, the health care team, and others responsible for and interested in the patient's welfare.
6. Development of professional response to pathological conditions and behavior.
7. Appreciation for the scientific method as it is used for solving treatment problems.
8. Responsibility for personal and professional growth through continuing education.
9. Sensitivity to one's own feelings and the impact of one's behavior on others.

Each student is expected to distribute some part of his course work in areas of study other than those most closely related to his specialized area of vocational interest.

Because the nation's health care needs can be met only through the use of multidisciplinary teams of specialists, it is essential that students in these fields experience during their education the integrated approch to comprehensive health care. The Department of Physical Medicine and Rehabilitation offers its students in occupational and physical therapy the opportunity to learn to work together and in collaboration with other health professionals.

Admission Procedure

For detailed information on the procedures necesary for making application to the courses in occupational therapy and physical therapy, see these sections in succeeding pages. Because enrollment in both of these professional programs is limited, it is suggested that all students intending to pursue these majors consider making application to other universities and colleges as well as the University of Minnesota.

New Students—Students with no previous college credits should file application 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. It is also recommended that these students attend quarterly information meetings which are held 1 week previous to the registration period fall and winter quarters. These meetings give students an opportunity to learn more about these professional programs, current recommendations for courses to be taken during the first 2 years, and any changes that have occurred in procedures, requirements, etc. The times and places for the meetings are announced in the *Minnesota Daily*. Students should also register for the preprofessional orientation courses offered at the freshman and sophomore level in occupational and physical therapy.

Students with Advanced Standing—Students transferring from other colleges and universities may be admitted with advanced standing by making application to the University and by having their credits evaluated. Students who have satisfied all preprofessional requirements (see appropriate sections in this bulletin), may apply directly to the University of Minnesota Health Sciences courses in occupational or physical therapy. Advanced standing students who have not satisfied preadmission requirements will usually be admitted to the College of Liberal Arts until they are eligible to apply for the professional curricula. Students who elect to come to the University of Minnesota to make up deficiencies in background should realize that they can receive no assurance of being admitted to the professional programs and should always consider alternate goals.

Advanced Standing Students with Degrees—Students with degrees in other majors may seek admission to the 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 graduate degrees along with basic professional preparation.

Adult Special Students—Graduates and others with proper educational qualifications may be allowed to take courses for the purpose of updating knowledge and skills. Those interested must receive special permission from the directors of the courses to determine eligibility and availability of space in the courses being considered.

Graduate Students—Graduates of curricula in occupational and physical therapy may contact the School of Public Health at the University of Minnesota for information on its graduate program for therapists. Physical therapists may also apply to the Graduate School for the M.S. programs (see Physical Therapy section for details).

Admission Requirements

Selection is made on a competitive basis. Because of limitations in space and facilities, enrollment is limited. Students considering applying should have an average above a C+ in the biological and behavioral sciences.

Although preference is given to residents of the state of Minnesota, non-residents with high scholastic standing will be considered.

Human Rights—The Board of Regents has committed itself and the University of Minnesota to the policy that there shall be no discrimination in the treatment of persons because of race, creed, color, sex, or national origin. This is a guiding policy in the admission of students in all colleges and in their academic pursuits. It is also to be a governing principle in University-owned and University-approved housing, in food services, student unions, extracurricular activities, and all other student and staff services. This policy must also be adhered to in the employment of students either by the University or by outsiders through the University and in the employment of faculty and civil service staff.

Registration

Advisers—During the freshman year, students will be assigned advisers in the College of Liberal Arts Lower Division Offices. See the *College of Liberal Arts Bulletin* for further information. Sophomore students should read both the College of Liberal Arts and Occupational and Physical Therapy bulletins carefully. They should also attend quarterly meetings where most of their registration questions will be answered.

Advisers in Occupational and Physical Therapy—Students in the professional programs will be assigned to a faculty adviser within the Department of Physical Medicine and Rehabilitation. These advisers are available to assist students in their professional development. Students should see their advisers whenever they are concerned about scholastic or personal matters. Advisers can direct students to sources of assistance when problems requiring this kind of help arise.

College Expenses

Fees—Since fees are subject to change, check with the *General Information Bulletin* for current information. The following is an estimate of school expenses for the professional programs:

Tuition and Student Services Fees—See the *General Information Bulletin*

Uniforms—$50

Books and laboratory manuals—$200

Locker fee—$5

Laboratory fee—$4 (charged for those laboratory courses where expendable materials are used for classwork)

The above information does not include room and board, costs involved in travel, and miscellaneous personal and recreational expenses. For information regarding both on-campus and off-campus residence write the Housing Office, 312 - 15th Avenue S.E., Minneapolis, Minnesota 55455. Students will have some

additional travel expense during clinical education, but this expense will vary according to individual plans. No student need leave the Twin Cities area. Some occupational therapy clinical education centers provide students with small stipends or maintenance, but this can never be guaranteed and no student should make plans that depend on this kind of support.

Books may be purchased at the Medical Bookstore, 123 Millard Hall. Some laboratory manuals are available through the department office.

Financial Aid—Students needing financial assistance for the following school year should file an application on or before April 1 with the Office of Student Financial Aid, 107 Armory Building.

A limited number of scholarships and traineeships has been available for students at the junior and senior levels. For information about any of the following, students should see an adviser or the directors of the courses in occupational and physical therapy:

Rehabilitation Services Administration Traineeships—for 1 or 2 years. For information write or call the directors of the programs.

State of Minnesota Scholarships—for 1 or 2 years. Applications should be filed before April 1 of each year and can be obtained from the Department of Public Welfare, Centennial Building, St. Paul, Minnesota 55101.

Crippled Child Relief, Inc., Loan Fund—The fund is intended for very short-term loans and is provided without interest in emergency situations.

In addition, the armed services have programs at the professional level which support students during their academic preparation. Current information may be obtained through local Air Force, Army, and Navy recruiting offices.

Awards and Scholarships—In addition to the scholarships and awards mentioned previously, there are other awards made to students on the basis of academic achievement and professional promise, some of which are listed below:

Crippled Child Relief, Inc. Scholarship
Minnesota Occupational Therapy Association Scholarship
Borghild Hansen Memorial Scholarship (occupational therapy)
Eleanor Funk Memorial Scholarship (occupational therapy)
Minnesota Chapter APTA Scholarship (physical therapy)
Mary McMillan Scholarship (physical therapy)

Educational Facilities

Most of the professional courses are taught in the classrooms located on the second floor of the Children's Rehabilitation Center. The offices of the occupational and physical therapy advisers are on the second and third floors. The school secretary is in room 282 and can be called at 373-9024 for making appointments. The directors of the two courses have their offices in the Children's Rehabilitation Center and may be reached through their secretary at 373-9199.

Occupational Therapy—Mr. Marvin Lepley, Room 378
Physical Therapy—Mr. Wilbur Moen, Room 377

Seminars, lectures, recitations, group discussions, and group assignments are used for learning concepts appropriately taught by these methods. Skills needed for the profession are taught in laboratory sessions. Some courses use programmed

textbooks. Video tape and many other audio-visual aids are used in classroom teaching. Free communications between students and teachers are encouraged.

As part of an outstanding health sciences center, the teaching programs in the Department of Physical Medicine and Rehabilitation can call upon faculty from all health sciences to assist in preparing students with broad medical knowledge. When needed, patients are available for classroom demonstration and for student clinical education. Clinical therapists with specialized knowledge also aid in the teaching of students.

The University of Minnesota libraries rank among the 10 largest in the country and include over 2 million volumes. The new Wilson Library is easily reached by crossing the enclosed bridge over the Mississippi River. The Diehl Hall Bio-Medical Library is located in the Health Science complex and its open shelves hold over 200,000 volumes. Both of these libraries have excellent study facilities.

Student Services—The following University agencies are available to help students. They may be consulted directly or by a faculty adviser's referral.

Students Religious Activities Office—16 Morrill Hall
Foreign Student Adviser—717 East River Road
Health Service and Mental Hygiene Clinic—University Health Service
Reading and Study Skills Center—101 Eddy Hall
Speech and Hearing Clinic—110 Shevlin Hall
Student Activities Center—110 Temporary North of Mines
Student Counseling Bureau—101 Eddy Hall
Student Employment Service—30 Wulling Hall
Opportunities in Health for Minorities—1-168 Frontier Hall

Department Regulations

A-N Grading System—According to University regulations, there are four permanent passing grades that are used to compute the student's grade point average. A is the highest grade and indicates superior work, B shows above-average work, C is average work, and D indicates substandard work and is the lowest passing grade. The grade N indicates that the student did not successfully complete the course.

S-N Grading System—A student may elect to take courses outside of his major field S-N (Satisfactory—No credit). The credits earned in this manner are not used in computing the student's grade point average. During the first 2 years, certain required prerequisite courses for the professional programs may not be taken S-N. Students should be very selective in deciding what course to take S-N since it is often to the student's advantage to take a course A-N when a good grade can favorably influence his grade point average.

A temporary grade of I (incomplete) is assigned when the instructor has insufficient information to permit a permanent grade. To remove a grade of I, the student must arrange to complete the course work within the next quarter. If not completed within the next quarter, the grade becomes an N. A student who has an I on his record in a professional course is not eligible for graduation.

If a student officially cancels a course prior to the sixth week of a quarter, no record of registration will appear on the student's record. If officially canceled after the sixth week, a registration symbol W (withdrawal) will appear on the student's record.

A registration symbol V (visitor) indicates registration as an auditor or visitor.

The symbol X is used to indicate that work is still in progress for that course. When the course is completed, the X is changed to a permanent grade.

Grade Points—Students earn grade points according to the quality of work and the number of credits involved. Grade points are assigned to course grades in the following way:

1 credit of A earns 4 grade points
1 credit of B earns 3 grade points
1 credit of C earns 2 grade points
1 credit of D earns 1 grade point
An N earns no credit or grade points.

Grade Point Average—Grade point average is defined as the number of grade points earned divided by the total number of credits for which grades (A, B, C, D) have been recorded.

Attendance—Students are expected to be regular and punctual in class attendance and clinical education. 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 take the initiative in making up any work that he may have missed. Failure to appear for an examination without a previous excuse from the instructor will usually mean that the student will not be allowed to make it up.

Clinical Education—Within the limits of the available clinical training centers, the student is allowed some choice in planning his clinical education experiences. Once the student has accepted assignment for clinical education, as arranged by the University and the center, the student agrees to abide by the regulations of dress and conduct as stipulated by the center. The policies and procedures for each center will be provided for the students. Written agreements of affiliation between the University and the Clinical Training Center are reviewed by the students before clinical education begins.

Students must provide white uniforms for use when participating in clinical education. Female students will also need white duty shoes. Information on suitable kinds of uniforms will be given students early in the fall quarter of the junior year. Although the white uniform is standard in many centers, there are some institutions where modifications of this kind of uniform are worn. At some centers, students wear street clothes rather than uniforms. Students will be issued name pins which can be worn with either street clothes or uniforms. (Additional information on physical therapy clinical education is in the physical therapy section of this bulletin.)

Satisfactory Progress and Probation—Evidence of satisfactory progress in the professional programs is indicated by achievement of a quarterly grade point average of at least 2.00 with no grade less than a C. Failure to maintain this standard may result in probation or dismissal from the program. A student placed on probation with a quarterly grade point average of below 2.00 will be required to petition for continuation in the program.

During the junior and senior years, a Scholastic Committee reviews the progress of each student at the end of each quarter. Receipt of the grade report constitutes initial notification of probationary status but an official letter may also be sent. Every student is afforded special aid in discovering the reasons for his dif-

ficulty. He should see his instructor or adviser early for help in courses in which he is having difficulty. After completion of the next quarter's work, the Scholastic Committee may take the student off probationary status, continue on probation for an additional quarter, or the student may be dropped.

Unsatisfactory standards of professional conduct may also be considered grounds for placing students on probation or dismissal. Disregard for patient's welfare, disinterest in studies as shown by frequent tardiness or absence, failure to cooperate in class assignments and discussions, and dishonesty in written assignments or examinations are examples of the kind of behavior that indicates lack of professional interest. In matters of conduct, the policies of the All-University Committee on Student Behavior will be enforced.

Exclusion—Students may be excluded from the courses in occupational and physical therapy if there has been no improvement following probationary status. Students may appeal any policies or decisions made by following the appeals procedure as outlined by the University Senate and available to all students through the University Appeals Committees.

Discontinuation—If a student's academic progress is being hampered by poor health or personal or family problems, he may be asked to discontinue his academic work until these conditions have improved.

Canceling Out—Students who are considering canceling out of school should discuss these plans with their advisers or the course directors.

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 previous to the time they wish to return.

Graduation—The bachelor of science degree will be recommended for students who have successfully completed their courses of study with a minimum grade point average of 2.00 both overall and in the courses of the professional curriculum. In addition they must have satisfied the distribution requirements in liberal studies as established by the Council on Liberal Education.

The faculty recommends graduation with honors for those students who have achieved high scholastic standing. Students whose record at the University of Minnesota indicates a grade point average of 3.50 (B+) or better will be graduated *with high distinction*. Those with a grade point average of 3.00 (B) will be graduated *with distinction*.

During the fall quarter of the senior year it is the responsibility of the student to file an application for degree at the Office of Admissions and Records, Morrill Hall.

Student Affairs

The University of Minnesota offers students many cultural, social, and athletic activities. For example, the Minnesota Orchestra plays concerts almost weekly during the school year, often presenting world-renowned artists. As a member of the "Big Ten" the University's athletic teams compete with outstanding teams from throughout the country. In addition to social events available to all students, there are, because of the small classes in the professional programs, informal activities arranged by students and faculty.

The University encourages student participation in planning and decision making. The professional programs have student participants on faculty-student committees. For example, the occupational therapy curriculum committee has had student members for several years.

Memberships—Students are encouraged to become student members of their professional organizations. There are student memberships in the American Occupational Therapy Association, the American Physical Therapy Association, and the Minnesota Occupational Therapy Association. The University of Minnesota has a Student Occupational Therapy Association as well as a Council for Health Interdisciplinary Participation (CHIP) which is composed of students from all areas of the health sciences.

OCCUPATIONAL THERAPY

Professor

Frederic J. Kottke, M.D., *Head,* Department of Physical Medicine and Rehabilitation

Associate Professor

Helen M. Dahlstrom, B.S.
Dortha L. Esch, B.S., *assistant director*
Marvin G. Lepley, B.S., *director*

Assistant Professor

Marian L. Eliason, B.S.
A. Joy Huss, M.S.

Instructor

Louvain G. Arndts, B.S.
Robert L. Bollinger, B.S.
Barbara A. Nelson, B.S.
Clarence A. Sicard, B.S.
Lorraine M. Wolfe, B.S., M.S.W.

Clinical Instructor

Mary J. Almasi, B.S.
Marion A. Calph, B.S.
Anita A. Folch, B.S.
Sally A. Johnson, B.S.
Kathleen M. McFarland, B.S.
Karen L. Orth, B.S.
Diane L. Spring, B.S.
Norma J. Steinke, B.S.
Mary Jo Thorsheim, B.S.

Occupational therapists use purposeful activities to help persons help themselves to arrive at their highest level of independence through improvement of their physical, emotional, and social well-being. In work with patients with physical or psychosocial dysfunction, the therapist is a vital member of the treatment team and works in consultation with physicians, physical and speech therapists, nurses, social workers, psychologists, vocational counselors, teachers, and other specialists.

The objectives of an occupational therapy program are determined according to the individual patient's or client's needs which are based on an evaluation of his level of functioning. An evaluation of an individual's physical abilities must be made before a specific program can be devised to improve his condition through exercise and the use of adapted equipment. Because social adjustment and physical well-being are affected by an individual's emotional problems, it is also necessary to evaluate his methods of handling these problems before he can be helped to function at his highest level.

The occupational therapy profession offers many and varied employment opportunities for qualified therapists. Graduates, both men and women, are employed in rehabilitation centers, psychiatric, general, and children's hospitals, schools for the blind, deaf, and exceptional children, and homes for the aged. Some therapists work with homebound patients. There are opportunities for consultation and work in newly developing community-centered programs. Therapists may also receive commissions in the Air Force, Army, Navy, and U.S. Public Health Service.

Because of the demand for men in the field of occupational therapy, male students are being actively recruited.

History—During World War I, the University of Minnesota was one of the institutions in the country that offered a short training course for what were then called "reconstruction aides." These people, mostly artists, were given instructions 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. This program was discontinued during the early 1930's. 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. Miss 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 University of Minnesota offers an occupational therapy curriculum of 4¼ years, including field work. Upon completion of the prescribed course of study, students receive a bachelor of science degree.

Accreditation—The Course in Occupational Therapy is approved by the Council on Medical Education of the American Medical Association and the American Occupational Therapy Association. Graduates are eligible to become registered occupational therapists by successfully writing the American Occupational Therapy Association's national registration examination.

Admission Requirements—Applicants for admission to the freshman and sophomore years of the Course in Occupational Therapy must meet the entrance requirements of the College of Liberal Arts. Students who have satisfied admission requirements and have completed 90 credits may apply for transfer to the University of Minnesota Health Sciences, Course in Occupational Therapy. Applications should be received by April 15 in order to be considered for the junior year which begins each fall quarter. As part of the admission procedure, students are requested to take the Minnesota Multiphasic Personality Inventory and the Strong Vocational Interest Blank; arrangements for taking them can be made through the director of the course. Each applicant should also write a letter to the director of the Course in Occupational Therapy—he should introduce himself, explain his interest in occupational therapy, his reason for selecting it as a career, and describe his plans for using his education. He should also include information on previous work and volunteer experience, especially those experiences related to work with people. Any courses taken which might apply to occupational therapy but which do not appear on a transcript (such as art and craft courses) should be described. In addition, a personal interview may be requested by the Admissions Committee. Because of the necessity of a limited enrollment, it should be emphasized that students entering the course should seriously intend to complete the program.

Personal Qualifications—Students must be in good health and have the physical capacity to do the work of a therapist. Students planning to enter a health profession should also consider whether they have the necessary maturity for working closely with people and for dealing with their problems. If a student questions whether or not he meets these qualifications, he should consult the director of the course or his adviser. The occupational therapy curriculum is designed to assist students in experiencing both personal and professional growth.

American Occupational Therapy Association—For further information regarding other universities and colleges offering courses in occupational therapy, career opportunities, and other sources of financial aid, write:

American Occupational Therapy Association, Inc.
6000 Executive Boulevard, Suite #200
Rockville, Maryland 20852

Preprofessional Curriculum

The preprofessional program is continuously being reviewed and subject to change. Students are responsible for attending quarterly meetings where program changes are explained. The time and place of these meetings is announced in the Minnesota *Daily*.

GROUP DISTRIBUTION REQUIREMENTS

Students will meet distribution requirements for graduation by selecting courses from the following groups (courses may be taken S-N unless otherwise indicated):

Communication, Language, Symbolic Systems—18-22 credits
- Composition—8-12 credits
  - Engl 1001-1002
  - (or) Comm 1001-1002-1003
- Additional Courses—8-10 credits
  - Highly recommended:
    - Spch 1101, 1102, 1105H
    - Phar 5210—Terminology of the Health Sciences (2)
  - Recommended:
    - Clas 1048—Technical Terms of Science, Medicine, Humanities (3)
    - Languages

Physical and Biological Sciences—21-23 credits (all courses in this category must be taken A-N)
- Biology—5 credits
  - Biol 1011—General Biology (5)
- Chemistry—4-5 credits
  - Either GC 1166 or MdBc 1030 (prereq high school chemistry and consent of O.T. office—enrollment limited)
- Anatomy—4 credits
  - Anat 1004—Elementary Anatomy (4)
- Physiology—4 credits
  - Phsl 1002—Human Physiology (4)
- One additional course—4-5 credits
  - Highly recommended:
    - Biol 1101—Heredity and Human Society (4)
    - Biol 1102—Microbes and Man (4)
    - Biol 1103—General Botany (5)
    - Biol 1104—Ecology and Man (4)
    - Biol 1105—Introduction to Evolutionary Biology (4)
    - Biol 1106—General Zoology (4)
    - Bot 1009—Minnesota Plant Life (4)
    - Bot 1012—Plants Useful to Man (4)
    - GCB 3022—Genetics (4)

Man and Society—21-23 credits (all psychology courses must be taken A-N)
- General psychology—5 credits
  - Psy 1001—General Psychology (5)
- Abnormal Psychology—4 credits
  - Psy 3604—Introduction to Abnormal Psychology (4)
- Two additional courses—8-10 credits
  - Highly recommended:
    - CPsy 3301—Child Psychology (4)
    - CPsy 5303—Adolescent Psychology (4)
    - Anth 1002—Introduction to Anthropology (5)

Recommended:
- Soc 1001—Introduction to Sociology (4)
- CPsy 5313—Psychology of Atypical Children (4)
- CPsy 5315—Introduction to Mental Retardation (4)
- Hum 1001-1002-1003—Modern World I-III (15)
- Geo 1301—Human Geography (5)

Artistic Expression—12 credits

Aesthetic and Applied Arts

Highly Recommended:
- ArtS 1801—Ceramic Processes (4)
- ArEd 3010—Introduction to Weaving (3)
- ArEd 3020—Contemporary Crafts (3)

Recommended:
- ArEd 3009—Weaving Without a Loom (4)
- ArtS 1101—Basic Drawing (4)
- ArtH 1001-1008-1015-1016-3009-3011-3012-3013-3014—Art Histories
- Th 1101—Introduction to the Theatre Arts (4)

Total Distribution Credits—72-80

Total Credits Required—90

SUGGESTED PROGRAM

(For Students Attending the University of Minnesota)

FRESHMAN YEAR

Fall		*Winter*		*Spring*	
Engl 1001 (or) Comm 1001°°	4	Engl 1002 (or) Comm 1002°°	4	Man and Society G.D.R.††	4
Biol 1011	5	Physical and Biological Sciences G.D.R.††	5	Anat 1004	4
Artistic Expression G.D.R.††	4	Comm, Lang, Symb Systems G.D.R.††	4	Phar 5210	2
	13	Electives	4	Electives	5
			17		15

SOPHOMORE YEAR

Fall		*Winter*		*Spring*	
Psy 1001	5	Psy 3604	4	Elective (Psychology)	4
GC 1166 or MdBc 1030	5	Phsl 1002	4	Man and Society G.D.R.††	4
Artistic Expression G.D.R.††	4	Man and Society G.D.R.††	4	Comm, Lang, Symb Systems G.D.R.††	4
PMed 1003	2	Artistic Expression G.D.R.††	4	Elective	3
	16		16		15

SAMPLE PROGRAM

(For Students Attending Other Colleges and Universities)

FRESHMAN YEAR

	Approx. Qtr. Cr.
English Composition	8-12
Biology	10
Human Anatomy	4
Chemistry	5
General Psychology	5
Art courses	6
Electives	3

SOPHOMORE YEAR

	Approx. Qtr. Cr.
Human Physiology	4
Child Psychology	4
Abnormal Psychology	4
Elective (Psychology)	4
Sociology, Anthropology	10
Speech or Language	10
Art courses	6
Medical Terminology	2

°° It is suggested that students who elect to take a language instead of a speech course take Comm 1001-1002-1003 which includes speech.

†† Group Distribution Requirement.

Professional Curriculum

JUNIOR YEAR

Fall		*Winter*		*Spring*	
PMed 5100	3-4	PMed 5161	3	PMed 5162	3
PMed 5311	4	PMed 5182	5	PMed 5342***	8
PMed 5330	6	PMed 5340	6	PMed 5393	4
Path 3060	3	AdPy 5121	2	Neur 5121	2

SENIOR YEAR

Fall		*Winter*		*Spring*	
PMed 5312**	3	PMed 5375	3	PMed 5396	15
PMed 5343***	7	PMed 5380	2		
PMed 5370	4	PMed 5392**	3		
		PMed 5394	3		
		Electives	4		

SUMMER SESSION

I and II Terms

PMed 5397 15

CLINICAL EDUCATION IN OCCUPATIONAL THERAPY

(PMed 5396-5397)

A minimum of 6 months of clinical education is required. During this period the student has field experience which includes practice in both physical and psychosocial dysfunction. For some students it may also include community experience in nonmedical settings.

Students are individually assigned to cooperating hospitals such as the University of Minnesota Health Sciences Center and to community agencies. The student pays tuition during the field experience; however, the student services fee may be waived for those whose assignments take them out of the Twin Cities area.

** These courses are offered both fall quarter and winter quarter with half of the class taking PMed 5312 and the other half taking PMed 5392 fall quarter. The sequence is reversed for winter quarter.

*** These courses are offered both spring and fall quarter with half of the class taking PMed 5342 and the other half taking PMed 5343 spring quarter. The sequence is reversed fall quarter.

PHYSICAL THERAPY

Professor

Frederic J. Kottke, M.D., Ph.D., *head,* Department of Physical Medicine and Rehabilitation

Associate Professor

John D. Allison, M.S.
Wilbur L. Moen, B.A., B.S., *director*
Martin O. Mundale, M.S.
Helen V. Skowlund, M.S., *director of graduate study*

Instructor

Corinne T. Ellingham, M.S.
Vivian C. Hannan, B.S.
Donna L. Pauley, B.S.
Glenn N. Scudder, M.S., *assistant director*

Clinical Instructor

JoAnn Battaglia, B.S.
Joyce A. Jensen, B.S.
Barbara E. Linderman, B.S.
Lorraine M. Stone, B.S.
Marilyn J. Thompson, B.S.

Physical therapy is concerned with the prevention of disability and the restoration of function following disease, injury, or loss of a bodily part. The goal is to help the patient reach his maximum performance and to assume his due place in society while learning to live within the limits of his capabilities. Upon referral by a physician, the physical therapist evaluates the patient, carries out the prescribed treatment, and plans the program which will be most effective. The therapeutic properties of exercise, heat, cold, electricity, ultraviolet, ultrasound, and massage are used to achieve this goal. Changes are made according to the patient's reactions; this requires a thorough background in biological and physical sciences and in pathology.

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, the curriculum changed to a 4-year degree program under the direction of Ruby Green Overmann, educational director, and Frederic J. Kottke, M.D., medical director. After Mrs. Overmann's retirement in 1957, Wilbur L. Moen became educational director.

Throughout its history, the Course in Physical Therapy has been approved by the American Physical Therapy Association and Council on Medical Education of the American Medical Association.

The educational program in physical therapy is a 4-year curriculum leading to a bachelor of science degree with a major in physical therapy. A minimum of 180 quarter credits is required for the degree. The student spends his first 2 years in a pre-physical therapy program which emphasizes a liberal education and includes a foundation in the behavioral, biological, and physical sciences. At the end of the sophomore year, students are admitted to the professional program which takes 2 years and 1 summer session. Graduates are eligible for state registration or licensure according to the laws of the various states.

Admission Requirements—To be eligible for admission to the junior year in the professional program, 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 the physical, biological, and behavioral sciences is required as indication of probable success in the professional program.

A student planning to enter a health profession such as physical therapy should seriously consider whether he has the necessary personal qualifications for working closely with people and for dealing with their problems. The student must be in good physical and mental health to achieve success in physical therapy. Applicants are requested to take the following tests: Minnesota Multiphasic Personality In-

ventory, Strong Vocational Interest Blank, Minnesota Importance Questionnaire. Arrangements for taking the tests may be made through the director of the program.

Each applicant should submit a letter of introduction presenting a résumé of his background, training, experiences, accomplishments, especially those which would add to his knowledge and understanding of physical therapy. A personal interview may be requested by the Admissions Committee.

In selection of students, Minnesota residents are given first priority. The non-resident student will be considered if he resides in the border areas of adjacent states, if he is from a state with no physical therapy school, or if he has completed his pre-physical therapy preparation at the University of Minnesota.

Deadline for application is April 15 for the class beginning professional study in September. To allow ample time for application reviewal, students are urged to file application in January or at completion of the fall term.

Required courses and electives are listed below. Courses may be taken S-N unless otherwise indicated. (Quarter credits are indicated in parentheses.)

Freshman English Requirement:
Comp 1001-1002 (8); Comm 1001-1002 (8); or exemption

Public Health Requirement:
PubH 3004 (4)

Physical and Biological Sciences (all courses in this category must be taken A-N):
Biol 1011—General Biology (5); Biol 1106—General Zoology (4)
Anat 1004 (4)
Phsl 3051 (5)
Chem 1004-1005 (10)
(or) MdBc 1030 (5) (prereq high school chemistry and consent of P.T. office—enrollment limited)
Phys 1014-1024 (8)
(or) Phys 1031-1032 (10)
(or) GC 1163 (5)

Behavioral Sciences (all courses in this category must be taken A-N):
Psy 1001—General Psychology (5)
Psy 3604—Introduction to Abnormal Psychology (4)
These behavioral science courses fulfill the minimum credit requirement in the Man and Society category for graduation.

Communication, Language, Symbolic Systems—Minimum of 8 credits
Foreign language, philosophy, mathematics, speech or statistics

Artistic Expression—Minimum of 8 credits
Art, music, theatre arts, literature, classics, humanities

Since the professional program in physical therapy has heavy concentration in science and medical courses, the prospective student is encouraged to select electives in the communication, social science, and artistic categories to complete the total of 86-90 credits.

Clinical Education—A minimum of 15 weeks of clinical education is required. Clinical experience is divided into three periods of 5 weeks each chosen from the following areas:

General Hospital—acute care
Pediatrics
Geriatrics
Rehabilitation

Transportation, board, and room will be the responsibility of the student unless stated otherwise by the center to which the student is assigned. The student may miss 1 full day of clinical education for a legitimate reason without having to make it up. Anything beyond 1 full day, for any reason, must be made up. The clinical instructor at the center will decide what constitutes a "legitimate absence."

Clinical Education courses (PMed 5215, 5255, and 5295) carry academic credit and are graded S-N (Satisfactory—No Credit). The student pays regular tuition and fees during clinical education. However, since students may be assigned away from the Minneapolis Campus, they may be exempted from paying the Student Services Fee providing the student assumes full responsibility for health care and other services provided by that fee. Evaluation of clinical practice performance is reviewed by the student and his clinical instructor. Unsatisfactory performance in the clinical setting may be grounds for academic probation and/or dismissal from the program. A grade of N would necessitate repeating that clinical education course before graduation. Students may appeal any policies or decisions made by the center and/or the University by following the appeals procedure as outlined by the University Senate and available to all students through the University Appeals Committees. (Additional information regarding clinical education is in the Department Regulations section of this bulletin.)

Curriculum

The following program for the first 2 years is suggested in order to include courses which are offered only once a year.

FRESHMAN YEAR

Fall		*Winter*		*Spring*	
English Composition or Communication	4	English Composition or Communication	4	Anatomy	4
Biology	5	Biology	4	Chemistry	5
PMed 1002	1	Chemistry	5	Electives	
Electives					

SOPHOMORE YEAR

Fall		*Winter*		*Spring*	
Physics	4-5	Physics	4-5	Psychology	4
Psychology	5	Physiology	5	Public Health	4
Electives		Electives		Electives	

All prerequisite physical, biological, and behavioral science courses must be completed before admission to the professional program. Professional courses are offered only once a year and must be completed in sequence. It is very difficult to carry elective courses or general education requirements for the 4-year degree during the junior or senior years.

JUNIOR YEAR

Path 3060—Pathology 3
Anat 3058—Anatomy of the Extremities .. 5
PMed 5100—Orientation to Rehabilitation Ar
Neur 5121—Descriptive Neurology 2
PMed 5161-5162—Medical Science Lectures 6
PMed 5182—Functional Neuroanatomy and Neurophysiology 5
PMed 5215—Introduction to Clinical Education 1
PMed 5220—Therapeutic Procedures I ... 4
PMed 5221—Therapeutic Procedures II ... 3
PMed 5222—Therapeutic Procedures III .. 4
PMed 5230—Theory and Technique of Muscle Function; Tests and Measurements 5
PMed 5283—Techniques of Therapeutic Exercise 4
PMed 5287—Evaluation Procedures I 2

SUMMER SESSION
(Terms I or II)

PMed 5255—Clinical Education 3

SENIOR YEAR

AdPy 5121—Descriptive Psychiatry 2
PMed 5240—Human Growth and Development 3
PMed 5270—Rehabilitation Procedures .. 3
PMed 5275—Applied Anatomy 3
PMed 5281-5282—Theory of Therapeutic Exercise 6
PMed 5284—Techniques of Therapeutic Exercise 4
PMed 5288—Evaluation Procedures II ... 3
PMed 5289—Patient Assessment 3
PMed 5290—Administration 2
PMed 5292—Introduction to Scientific Research 3
PMed 5295—Clinical Education 15

Graduate Study for Physical Therapists

Master's degree programs for physical therapists are offered by the Graduate School. Requirements include a Bachelor's degree and completion of a course in physical therapy accredited by the Council on Medical Education of the American Medical Association and the American Physical Therapy Association. 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 recommended.

Graduate study leading to a master of science degree with a major in physical therapy is provided under the Department of Physical Medicine and Rehabilitation. The student may select either Plan A (with thesis) or Plan B (without thesis). Under Plan A a minor field appropriate to his background and goals is selected by the student in consultation with his major adviser. Examples of minors include education, educational psychology, anatomy, psychology, public health, business administration, sociology, counseling. Under Plan B two related fields are chosen rather than a minor. Further details regarding the programs and application procedures may be found in the *Graduate School Bulletin* and in the *Graduate Programs in the Health Sciences Bulletin.*

Graduate study for physical therapists interested in a professional career in public health is provided by the School of Public Health. The course of study leads to a degree of master of public health or master of science. Further details may be found in the *School of Public Health Bulletin.*

DESCRIPTION OF COURSES

Physical Medicine and Rehabilitation (PMed)

1002. ORIENTATION TO PHYSICAL THERAPY. (1 cr; offered each qtr, S-N only)
For students planning on entering the field of physical therapy. Lectures, demonstrations, and field trips serve to acquaint prospective students with the role of the physical therapist in the health care of individuals in hospitals, schools, and the community.

1003. ORIENTATION TO OCCUPATIONAL THERAPY. (2 cr; for fr and soph; offered fall and spring qtrs)
Survey of the profession through lecture, films, and tours. Methods of treatment including demonstrations. Observation in clinics.

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.

5161-5162. MEDICAL SCIENCE LECTURES. (3 cr per qtr; prereq regis OT or PT)
Lectures include related fields of 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)
A study of the neuroanatomic structures as functional systems and the basic neurophysiologic concepts with emphasis on application for understanding and treating physical dysfunction.

5215. INTRODUCTION TO PHYSICAL THERAPY CLINICAL EDUCATION. (1 cr; prereq regis PT)
Basic principles and skills in patient care, observational skills; orientation to the clinic and supervised clinical education.

5220. THERAPEUTIC PROCEDURES I. (4 cr; prereq regis PT)
Theory and techniques of thermotherapy, hydrotherapy, phototherapy, and cryotherapy. Study of the physiologic basis for treatment with water, heat, cold, radiation, diathermy, and ultra sound.

5221. THERAPEUTIC PROCEDURES II. (3 cr; prereq regis PT)
Methods and principles of bandaging. Methods of applying various types of massage; therapeutic indications; physiological effects.

5222. THERAPEUTIC PROCEDURES III. (4 cr; prereq regis PT)
Medical asepsis for cleansing and dressing wounds and isolation procedures for contagious diseases. Study of the physiological basis for treatment with ultraviolet. Theory and technique of electrotherapy.

5230. THEORY AND TECHNIQUE OF MUSCLE FUNCTION, TESTS, AND MEASUREMENTS. (5 cr; prereq regis PT)
Review of muscles and joints on regard to anatomical and physiological function; analysis of body mechanics, coordinated movement, and strength. Evaluative procedures in assessment of body function.

5240. HUMAN GROWTH AND DEVELOPMENT. (3 cr; prereq regis PT)
A study course designed to acquaint the student with the physical, psychological, and social development of the human being throughout the life span. A basis for understanding future study of physical therapy evaluation procedures and treatment.

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 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. (3 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)
Instruction in the application of the principles and techniques of therapeutic exercise.

5287. EVALUATION PROCEDURES I. (2 cr; prereq regis PT)
Techniques used in measuring patients' responses to treatment. Utilization of goniometry, muscle testing techniques, and knowledge of functional kinesiology in problem-solving situations. Introduction to quantitative muscle testing and ambulation training.

5288. EVALUATION PROCEDURES II. (3 cr; prereq regis PT)
Techniques of electrodiagnosis, gait analysis, and assessment of gross motor-related reflexes. 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)
Principles of professional practice related to organization and administration of out-of-hospital physical therapy services. Planning and organization of a hospital department; training and use of supportive personnel.

5292. INTRODUCTION TO SCIENTIFIC RESEARCH. (Cr ar; prereq regis PT)
Fundamentals of research design; elementary statistical concepts; techniques of scientific writing.

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)
Laboratory instruction in craft skills; adaptation of these to specific disabilities.

5312. TECHNIQUES OF OCCUPATIONAL THERAPY. (3 cr; prereq regis OT)
Laboratory instruction in the operation of power woodworking equipment, safety precautions, and maintenance of power tools.

5330. FUNCTIONAL ANATOMY. (6 cr; prereq regis OT)
Study of structure and function of the musculo-skeletal, peripheral nervous and vascular systems. Analysis of body mechanics and coordinated movement. Includes anatomy laboratory, kinesiology laboratory, lecture, and demonstration.

5340. THEORY: HUMAN DEVELOPMENT AND THE PATIENT. (6 cr; prereq PMed 5100)
The physical, psychological, and social development of the human being. A basis for understanding the effects of hospitalization and/or institutionalization on the developing individual. Preclinical experience in general medicine.

5342. THEORY: PSYCHOSOCIAL DYSFUNCTION. (8 cr; prereq regis OT)
Treatment of psychiatric patients. Application of theory through problem solving and clinical experience. Experience in group development: analysis of group behavior and member roles.

5343. THEORY: PHYSICAL DYSFUNCTION. (7 cr; prereq regis OT)
Techniques of evaluation and treatment of patients with physical diabilities. Lectures, laboratory, and clinical experience.

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. (3 cr; prereq regis OT)
Introduction to the role of the community and community agencies in the total rehabilitation process.

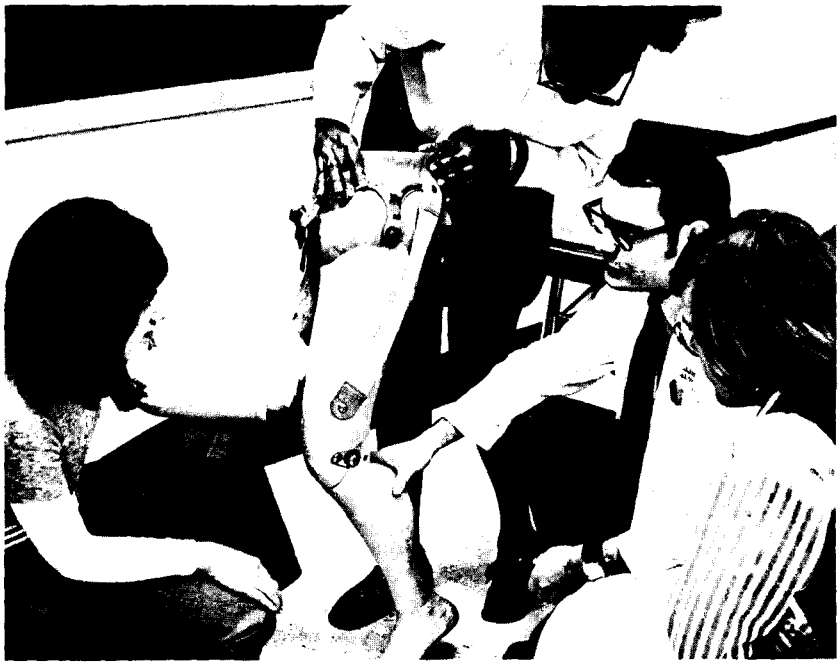
5380. ADMINISTRATION AND SUPERVISION. (2 cr; prereq regis OT)
Principles of administration, supervision, and organization of the occupational therapy department. Interdepartmental relationships.

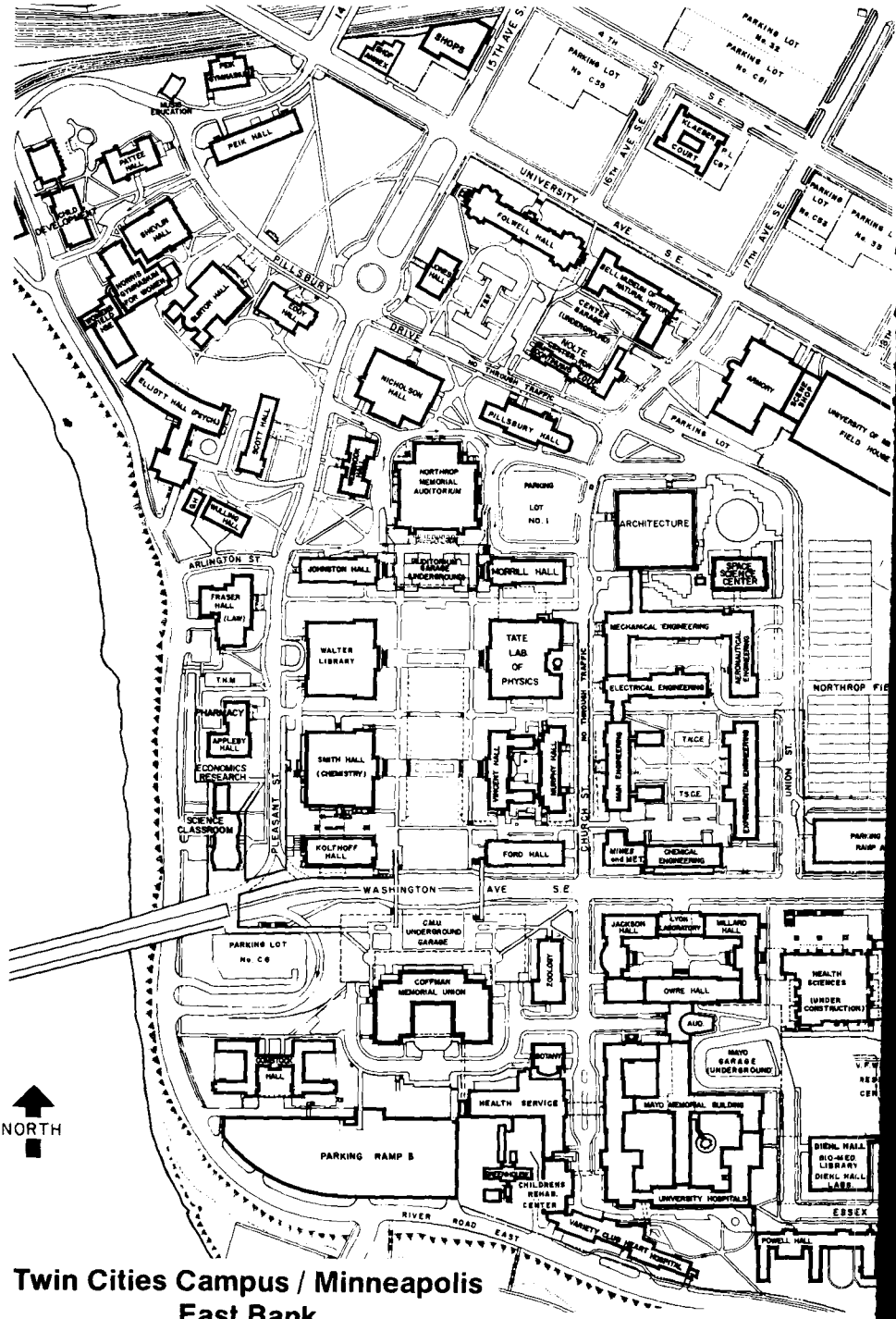
5392. METHODS OF SCIENTIFIC RESEARCH. (3 cr; prereq regis OT)
Fundamentals of research design; evaluation and presentation of data; preparation of manuscript.

5393. EVALUATION TECHNIQUES I. (4 cr; prereq PMed 5182)
Application of evaluative procedures in physical and psychosocial dysfunction.

5394. EVALUATION TECHNIQUES II. (3 cr; prereq PMed 5393)
Application of evaluative procedures in physical and psychosocial dysfunction.

5396-5397. CLINICAL EDUCATION IN OCCUPATIONAL THERAPY. (15 cr for each; prereq regis OT)
A total of 6 months of supervised training in affiliated hospitals and community agencies.





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Medical Technology

UNIVERSITY OF MINNESOTA

Volume LXXVI, Number 8 June 11, 1973

UNIVERSITY OF MINNESOTA BULLETIN

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Medical Technology

A Division of the

Department of Laboratory Medicine and Pathology

UNIVERSITY OF MINNESOTA

HOW TO USE THIS BULLETIN

The *Medical Technology Bulletin* for 1973-1975 is divided into three major parts:

General Information —All students and prospective students should read this section carefully. It contains information relating to the following topics:

Admission Requirements	Counseling Aids
Registration Procedures	Placement
Fees	Student Organizations
Health Examinations	Degrees
Residences	National Certification
Student Aid	College Regulations

Curricula—This section contains specific course requirements and quarterly programs.

Medical Technology
Graduate Program

Description of Courses—This section gives a brief description of required courses.

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All students and prospective students will need to refer to the *General Information Bulletin* and the *College of Liberal Arts Bulletin.* These bulletins are available at the information booth in Morrill Hall or may be obtained by writing to the Office of Admissions and Records, University of Minnesota, Minneapolis, Minnesota 55455.

Days and hours when classes meet and the place of meeting are contained in the *Class Schedule* published just before the registration period each quarter.

Information about classes during Summer Session can be obtained by writing the Summer Session Office, 135 Johnston Hall, University of Minnesota, Minneapolis, Minnesota 55455.

Medical Technology

GENERAL INFORMATION

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 aims to provide both a strong foundation in basic sciences and experience in the clinical laboratory.

A medical technologist is trained in the performance of various diagnostic procedures used by physicians. The work includes hematology, urinalysis, bacteriology, serology, parasitology, blood group serology, and the clinical analysis of body fluids. This work requires intelligence, accuracy, and reliability of a high order. 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 hematology, bacteriology, or chemistry. There are opportunities for graduates with sufficient ability to work in research and teaching laboratories associated with larger clinics, foundations, and universities.

Human Rights—The Board of Regents has committed itself and the University of Minnesota to the policy that there shall be no discrimination in the treatment of persons because of race, creed, color, sex, or national origin. This is a guiding policy in the admission of students in all colleges and in their ecademic pursuits. It is also to be a governing principle in University-owned and University-approved housing, in food services, student unions, extracurricular activities, and all other student and staff services. This policy must also be adhered to in the employment of students either by the University or by outsiders through the University and in the employment of faculty and civil service staff.

Admission Requirements

Admission to the Freshman Class—The requirements for admission to preprofessional work of this course of study are the same as those for admission to the College of Liberal Arts. For complete information consult the *General Information Bulletin.* Qualified applicants, men or women, may enter at the beginning of any quarter, but the curriculum outlined is based on entrance in the fall quarter. If a student enters at any other quarter, Summer Session attendance may be necessary to make up the irregularities in the student's program.

It is recommended that prospective students take mathematics, physics, chemistry, and biology in high school.

Admission with Advanced Standing—After 1 or more years at an accredited college or university, admission with advanced standing can be made by filing an application, together with complete official college transcripts from each college attended, with the Office of Admissions and Records. This application should be made well in advance of the beginning of the quarter you plan to enter.

Admission to the Junior Class—For admission to the Division of Medical Technology, the student must have completed 90 credits including the required courses. The major criterion for admission is satisfactory academic performance as judged by grade point average in required courses.

Students in residence at the University of Minnesota who expect to complete the requirements for admission to the junior year should file an application for change of college with the Office of Admissions and Records 1 quarter in advance of date of transfer. Those with sufficient credits but having 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 which are equivalent to those given at the University of Minnesota are accepted to satisfy the requirements for entrance 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 and Records. These applications should be filed with the Office of Admissions and Records 6 weeks or more before the quarter a student plans to enter.

It is necessary for all students to earn at least 45 credits in residence at the University of Minnesota before they are eligible to receive a degree. It is strongly advised that transfer students ascertain their status by writing to the Director, Division of Medical Technology, Box 70 Powell Hall, University of Minnesota, Minneapolis, Minnesota 55455, before May 1 so that, if necessary, they may take courses during the Summer Session.

Admission as an Adult Special Student—Men and women with proper qualifications of education and experience who may want individual courses or groups of courses to meet special personal needs may be admitted as "adult special" students. In such cases credit earned as an adult special may be applicable toward a degree upon recommendation of the Administrative Committee in Medical Technology. Application for admission as an adult special is made to the Office of Admissions and Records.

Registration Procedures

Students registering for the first time in the University of Minnesota in the preprofessional program as new freshmen or as transfer students with less than 2 full years of previous college work are expected to participate in a special 2-day orientation-registration program. (See the *General Information Bulletin* for a description of this program.) As one part of this 2-day program, students will consult with an adviser in the Medical Technology Office for selection of courses and approval of their registrations.

Students registering for the first time in the University of Minnesota as juniors in the medical technology program should present their admission certificates to

the Office of Admissions and Records, Morrill Hall, before proceeding with registration at the Medical Technology Office.

For students already in attendance, dates for registration and specific procedures to be followed are published each quarter in the Official Daily Bulletin of the *Minnesota Daily.*

Note that all students in either the preprofessional curriculum in the College of Liberal Arts or later in the professional curriculum in the Division of Medical Technology are expected to plan their registrations each quarter with an adviser in the Medical Technology Office.

Fees

For complete information about fees and expenses, consult the *General Information Bulletin.*

Health Service and Health Examinations

Complete facilities for general medical and infirmary type hospital care are provided for students by the University Health Service. A brief description of these health services and other health and hospital benefits appears in the *General Information Bulletin.*

All students in the medical technology program are expected to arrange for appointments at the University Health Service for necessary immunizations before assignment to the clinical courses of the junior and senior years. This procedure is required as a protection for the student.

Residences

Information about residence halls or private off-campus housing may be obtained from the Director of Housing, 312 - 15th Avenue S.E., Minneapolis, Minnesota 55455.

Student Aid

The University of Minnesota offers many opportunities to those students in need of financial assistance to meet the expenses of their education. The usual criteria by which the merits of requests for financial assistance are considered are scholastic record, financial need, character, and vocational promise in the student's chosen field.

Several scholarships for entering freshmen chosen from among graduates of Minnesota high schools are supported by alumni and friends of the University. Applications should be made through Minnesota high school counselors by December 15. There are also other scholarships and merit awards offered annually to students in recognition of outstanding achievement records.

For students needing financial assistance, loan funds have been established to help any student who is making normal progress toward an educational objective.

Complete information about obtaining assistance through scholarships and

loans is available from the Office of Student Financial Aid, 107 Armory Building, University of Minnesota, Minneapolis, Minnesota 55455.

For students needing part-time employment to meet school expenses, the Student Employment Service, 30 Wulling Hall, is maintained. It should be pointed out that the curriculum in the Division of Medical Technology includes several courses which require many hours of work in the laboratory, and it is advised that only students who are proficient in their studies should attempt to do part-time work.

The state professional societies in clinical pathology and medical technology offer scholarships for junior- and senior-year students in programs in medical technology. Further information about these awards may be obtained in the Medical Technology Office.

Counseling Aids

Program planning and advising with reference to registration and progress toward the degree are provided for the students in the preprofessional program in medical technology in the College of Liberal Arts as well as for students in the professional curriculum. These advisers are available in the Medical Technology Office, 5307 Powell Hall. These advisers are also available to discuss with students other aspects of student life, student adjustment, or personal and individual concerns. Students are urged to consult the *General Information Bulletin* for further information.

Placement

Graduates of this program are assisted in finding employment by consultation with advisers in the Medical Technology Office. Notices of employment opportunities in this field from all parts of the country are received in the office and are posted for the information of the students.

Student Organizations

Many and varied student organizations and activities are available for all students. Consult the *General Information Bulletin.* All students are urged to consult with a staff member of the Student Activities Bureau, 110 TNM, or the program consultant in Coffman Memorial Union. In addition, there are certain student organizations that exist exclusively for students in medical technology.

Students in medical technology or in the preprofessional program in the College of Liberal Arts are represented by elected members from each class on the Medical Technology Council. 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 this course.

Orbs is the honorary scholastic association for seniors in medical technology who have attained an overall B average. The purpose of this organization is to stimulate and promote high scholarship among the students in medical technology.

Alpha Delta Theta is a professional sorority open to students in medical technology after the first quarter of the sophomore year. The purpose of this organization is to promote fellowship and understanding among the students in medical

technology, to broaden the students' personal background, and to provide a mechanism for participation with other campus organizations in University functions.

Students in the undergraduate program in medical technology are eligible for student membership in the American Society of Medical Technologists.

Degrees

The requirements for graduation are the completion of all the required courses or their equivalents, and a total of 180 credits and 360 grade points—an average of 2 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 course with an average of 3 grade points for each credit may graduate "with distinction" and those with an average of 3.50 grade points for each credit may graduate "with high distinction."

Application for degree must be filed with the Office of Admissions and Records 3 quarters before the time of graduation. Students completing the hospital clinical courses any time after the date of the June graduation and before the date of the December graduation will be eligible to apply for the June graduation. Students completing requirements at other times will be eligible for graduation in December and August as determined by the date of completion of the senior year.

National Certification

Graduates from the Division of Medical Technology of the University of Minnesota are eligible to take the national examination for ceritfication as a medical technologist conducted by the Board of Registry of the American Society of Clinical Pathologists. Many hospitals require this certification for employment.

College Regulations

All students in the first 2 years of this curriculum are registered in the College of Liberal Arts and are subject to the regulations of that college. For full information about these regulations, consult the *College of Liberal Arts Bulletin.*

In the last 2 years, students are registered in the Division of Medical Technology, a unit of the Department of Laboratory Medicine and Pathology of the Medical School, and are subject to the regulations established for this program.

Any student not making satisfactory progress in the curriculum may be placed on scholastic probation upon recommendation of the Administrative Committee. This committee is composed of members of the faculty of the Division of Medical Technology and student representatives.

Unsatisfactory work is defined as an average less than C (2 grade points for each credit) for all credits earned in any 1 year or in any 1 quarter. Students who fail to make satisfactory grades after being on probation for 1 quarter are in danger of being 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, his record will be reviewed by the Administrative Committee for recommendation for action. If, in the opinion of this committee after due investigation

and conference with the student, it is judged inadvisable for the student to continue in this curriculum, he will be discontinued.

Satisfactory performance implies not only a passing level in technical skill and knowledge but also complete personal integrity and honesty.

CURRICULA

Bachelor of Science Program in Medical Technology

The University of Minnesota believes that all of its students, whatever their area of specialization or their vocational goals, should hold in common the search for a liberal education. In the broadest sense, a liberal education is one which frees us from the limitations placed by ignorance on our powers of judgment and choice. More specifically, a liberal education asks of us that we seek control over the general intellectual instruments for acquiring and communicating knowledge, primarily the instruments of language and number; that we seek understanding of the ways in which scientists contribute to man's knowledge of himself and his environment; that we seek historical and philosophic perspective on the nature of our own lives and the world in which we live; and that we seek appreciation of the creative insights into life and nature provided by literature and the arts. To help students achieve the goals of a liberal education, the Division of Medical Technology expects each student to distribute some part of his course work in areas of study other than those most closely linked to his specialized or vocational interests.

To achieve the goals of both a liberal and a professional education appropriate to a curriculum for a baccalaureate degree in medical technology, the program stresses a vigorous training in the physical and biological sciences, with special emphasis on acquiring knowledge of chemistry which is basic to all facets of laboratory medicine. The program is designed to include not only factual information but also a thorough instruction in scientific attitudes and methods. Finally, training in technical skills is added to a broad base of knowledge in general and specific areas of the natural sciences.

DISTRIBUTION REQUIREMENTS

Credits for required courses for the Program in Medical Technology total 134. An additional 46 credits will therefore be elective. Distribution requirements are such that 8-10 credits and a minimum of two courses are to be selected from each of the three categories.

Communications, Language, and Symbolic Systems

Languages
Mathematics
Philosophy
Speech

Man and Society

Anthropology
Economics
Family Studies
Geography
History
Political Science
Psychology
Social Science
Sociology

Literature and the Arts

Art
Classics
English Literature
Humanities
Music
Theatre Arts

Courses satisfying the distribution requirements may be taken at any time before graduation. They do not have to be completed within the first 2 years of matriculation in the College of Liberal Arts.

Freshman and Sophomore Years—Registration is in the College of Liberal Arts. The following courses or their equivalents should be completed before admission to the third year.

(Credits are shown 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 (10)
Comm 1001, 1002—Communication (8)
(or) Comp 1001, 1002—Introductory Composition (8)
(or) Exemption from requirement
Math 1111 or Math 1201*—College Algebra (5)
MedT 1010**—Orientation in Medical Technology (1)
MedT 1030, 1031, 1032**—Introduction to Clinical Medicine (3)
Phys 1031, 1032*—Introductory Physics (10)

Electives following distribution requirements to make a total of 90 credits.

The following program arrangement is suggested:

FIRST YEAR

Fall	*Winter*	*Spring*
Comp 1001 or Comm 1001	Comp 1002 or Comm 1002	Biol 1106
Math 1111 or Math 1201	Biol 1011	Chem 1006
Chem 1004	Chem 1005	Electives
MedT 1010	Electives	

SECOND YEAR

Fall	*Winter*	*Spring*
Chem 3301	Chem 3302	Chem 3100
Phys 1031	Phys 1032	Chem 3101
MedT 1030	MedT 1031	Anat 1004
Electives	Electives	MedT 1032
		Electives

Junior and Senior Years—Registration is in the Division of Medical Technology. The following courses must be completed to satisfy requirements for graduation.

* Other courses which are equivalent or more comprehensive may be substituted for the required courses. It is suggested that students planning to pursue graduate programs should take Math 1211, 1221, 1231 and Phys 1104, 1105, 1106 or Phys 1271, 1281, 1291.

** Students who transfer into the medical technology program after the freshman year are exempt from the MedT 1010 requirement. Students who transfer into the medical technology program after the sophomore year are exempt from both the MedT 1010 and 1030-1031-1032 requirements. These credits do not count toward a B.S. degree.

(Credits are shown in parentheses)

Anat 5765—Hematology (4)
MdBc 5300, 5301—Biochemistry (9)
MedT 5063—Introduction to Urinalysis (2)
MedT 5065—Clinical Hematology; Methodology (5)
MedT 5066—Introduction to Clinical Immunohematology (5)
MedT 5067—Hemostasis (2)
MedT 5082—Applied Clinical Chemistry (4)
MedT 5086—Applied Clinical Hematology and Immunohematology (4)
MedT 5088—Applied Diagnostic Microbiology (4)
MedT 5090—Special Laboratory Methods (4)
MedT 5092*—Honors Program in Laboratory Methods (9)
MedT 5102—Diagnostic Microbiology (3)
MedT 5108—Clinical Chemistry (10)
MicB 5233—Microorganisms and Disease (7)
Zool 5066—Histology (5)

The following class arrangements are suggested.

THIRD YEAR

Fall	*Winter*	*Spring*
MdBc 5300	MdBc 5301	MedT 5108
MedT 5065	MedT 5066	Electives
MicB 5233	MedT 5102	

FOURTH YEAR

Fall	*Winter*	*Spring*	SS
Anat 5765	Clinical courses**	Clinical courses**	Clinical courses**
MedT 5063	or	or	or
MedT 5067	Electives	Electives	Electives
Zool 5066			

Master of Science Program with Major in Medical Technology

Graduate work in the field of medical technology is available for the qualified candidate who wishes to prepare himself for a career of investigation and teaching in the area of clinical laboratory methods. Only Plan A (Master's degree with thesis) is available to students in this program. Therefore, each student is required to complete a thesis problem of independent research in one of the subareas of this field under the direction of his adviser.

Admission Requirements—Admission requirements include (a) certification as MT(ASCP) or eligibility for such certification, and (b) 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 desirable.

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* Optional requirement open only to students with outstanding scholastic ability.

** The clinical courses (MedT 5082, 5086, 5088, and 5090) 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 in the summer terms. Assignment for these courses is made on an individual basis for each student and is contingent on the availability of space in the clinical facilities as well as satisfactory completion of prequisite course work.

Registration for courses in Continuing Education and Extension concurrently with registration for clinical courses requires the consent of the director of the Division of Medical Technology.

Application forms for admission to the Graduate School are available upon request from the Graduate School Office, 316 Johnston Hall. The applications should be filed with the dean of the Graduate School at least 4 weeks before the opening of the quarter in which the student matriculates and must be accompanied by official transcripts of undergraduate work and of graduate work that may have been completed.

Three letters of reference for each applicant from employers or teachers should be sent to the Director of Graduate Study, Division of Medical Technology, 5307 Powell Hall.

Residency Requirements—Candidates for advanced degrees must be registered at the University of Minnesota for a minimum of 3 quarters before receiving the degree. This residency requirement does not necessarily mean registration in consecutive quarters.

The completion of a Master's program ordinarily requires 5 to 6 quarters in residence. Students should take into account this customary rate of progress. If such matters as self-support or prerequisite course work are involved in attaining the degree, students should anticipate and plan for a period longer than the customary time. It has been established that an interrupted program of graduate study has generally proved unsatisfactory.

Academic Requirements—The work leading to a Master's degree includes (a) 3 quarter credits in MedT 5120 in addition to a minimum of 18 quarter credits in courses at the graduate level in the major department with grades not lower than B; (b) a minimum of 9 quarter credits in courses at the graduate level in the minor department relating to the thesis problem with grades not lower than B; (c) a substantial thesis based upon independent research; (d) a final oral examination. There is no foreign language requirement.

The thesis should be on a topic falling within one of the subareas in the field of medical technology, namely, chemistry, microbiology, hematology, or immunohematology. The thesis must show ability to work independently and give 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 9 weeks before the end of the quarter in which the student takes his degree.

In addition to the usual course examinations the candidate must pass a final oral examination which will cover the exposition of the thesis problem and subject matter or theory fundamental to the thesis topic. This examination must be held not later than 5 weeks before the end of the quarter in which the student takes his degree. This examination will be conducted by a committee (of which the student's adviser is the chairman) 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 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.

Complete detailed information with respect to the structure and rules of the Graduate School, the programs of study, a list of courses offered, and fees can be found in the *Graduate School Bulletin* which is available upon request to the Graduate School Office. All inquiries concerning admission should be addressed to: Dean of the Graduate School, 316 Johnston Hall, University of Minnesota, Minneapolis, Minnesota 55455.

Master of Science Program with Major in Laboratory Medicine

Graduate work in the Department of Laboratory Medicine and Pathology offers opportunities to physicians, medical technologists, and other qualified students to prepare themselves for careers of teaching and research in the field. Only Plan A (Master's degree with thesis) is available to students in the program.

Academic Requirements—The program requires a minimum of 18 credits with emphasis in one major area of laboratory medicine (chemistry, genetics, hematology, immunology, or microbiology). The minor subject (9 credits) may be chosen from among one of the basic fields of science such as anatomy, biochemistry, genetics, or pathology. The student is expected to maintain a B average in courses for both the major and minor. There is no foreign 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. Application forms for admission to the Graduate School are available upon request from the Graduate School Office, 316 Johnston Hall. The application should be filed with the dean of the Graduate School at least 4 weeks before the opening of the quarter in which the student matriculates and must be accompanied by official transcripts of undergraduate work and of graduate work that may have been completed.

Residency Requirements—Candidates for the Master's degree must be registered at the University for a minimum of 3 quarters before receiving the degree. The student is also encouraged to file his program by the end of his first quarter of graduate work in order to be reviewed by the departmental graduate committee.

Student's Progress and Examinations—The student's progress is reveiwed 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 the candidate must pass an oral final examination which will cover the conceptual aspects of the subject covered in the thesis and graduate courses taken. This examination will be held not later than 5 weeks before the end of the quarter in which the student takes his degree. This examination will be conducted by a committee appointed by the Graduate School to examine the thesis.

DESCRIPTION OF COURSES

Medical Technology (MedT)

1010. ORIENTATION IN MEDICAL TECHNOLOGY. (1 cr [no cr toward degree]; prereq fr only)
Orientation in the principles and practices in medical technology.

1030-1031-1032. INTRODUCTION TO CLINICAL MEDICINE. (1 cr per qtr [no cr toward degree]; prereq soph only)
Demonstrations and discussion of clinical laboratory techniques in relation to diagnosis and treatment of disease.

5063. INTRODUCTION TO URINALYSIS. (2 cr)
Lectures and laboratory exercises in basic techniques in chemical and microscopic study of urine.

5065. CLINICAL HEMATOLOGY: METHODOLOGY. (5 cr)
Fundamental techniques in hematology.

5066. INTRODUCTION TO CLINICAL IMMUNOHEMATOLOGY. (5 cr; prereq MicB 5233)
Introduction to fundamental principles and laboratory techniques in blood grouping and cross matching.

5067. HEMOSTASIS. (2 cr)
Lectures and laboratory exercises in basic theory and techniques in hemostasis including platelet function and disorders, plasma coagulation system, inherited and acquired hemostatic disorders.

5082. APPLIED CLINICAL CHEMISTRY. (4 cr; prereq MedT 5108)
Application of basic methods and techniques in chemistry in the clinical laboratory.

5086. APPLIED CLINICAL HEMATOLOGY AND IMMUNOHEMATOLOGY. (4 cr; prereq MedT 5065, MedT 5066)
Application and use of laboratory methods in hematology. Morphology of blood cells. Application of technical methods in proceurement of blood; grouping and cross matching of transfusions.

5088. APPLIED DIAGNOSTIC MICROBIOLOGY. (4 cr; prereq MedT 5102)
Identification of bacteria by microscopic techniques. Correlation with clinical cases. Identification of parasites and fungi.

5090. SPECIAL LABORATORY METHODS. (4 cr)
Special assignment on an individual basis in one of a wide variety of special areas of experience within the clinical laboratory; field experience.

5092. HONORS PROGRAM IN LABORATORY METHODS. (9 cr)
Individual assignment on special projects or research with more intensive treatment in theory in one of the clinical areas of chemistry, hematology, immunohematology, or microbiology.

5102. PRINCIPLES OF DIAGNOSTIC MICROBIOLOGY. (3 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.

5108. INTRODUCTION TO CLINICAL CHEMISTRY. (10 cr; prereq MdBc 5300-5301, Chem 3100-3101)
Lecture and laboratory course in basic techniques and methods in clinical chemistry. Topics include spectrophotometry, electrolytes, proteins, enzymes, toxicology, and quality control. Both manual and instrumental methods are presented.

GRADUATE COURSES (Medical Technology)

5105. INTRODUCTION TO BIOLOGIC ELECTRON MICROSCOPY. (2 cr; prereq Phys 1030, Zool 5066)
Electron optics, preparative techniques for electron microscopy, recording and interpretation of micrographs.

5106. BASIC TECHNIQUES FOR ELECTRON MICROSCOPY. (2 cr; prereq MedT 5105)
Demonstration and experience in preparing biologic material for electron microscopy including microscopic maintenance and operation.

5120. SEMINAR: MEDICAL TECHNOLOGY. (Cr ar)
Review and discussion of current literature; presentation and discussion of research being carried on in the department.

5125. PRACTICUM: TEACHING. (Cr ar [3 cr max])
Supervised experience in teaching; development of skills in effective use of instructional materials, tests, and measurements.

5130, 5131. ELEMENTS OF ADMINISTRATION IN MEDICAL TECHNOLOGY. (2 cr per qtr)
Organization and role of the laboratory service in hospitals; job analysis and classification; personnel assignments and evaluation; plant, supplies, and equipment with assignment of specific problems in management.

5133. MEDICAL MYCOLOGY. (3 cr)
Laboratory diagnosis of infections caused by yeasts, dermatophytes, and systemic fungi.

5135. ADVANCED CLINICAL MICROBIOLOGY. (5 cr)
Observation, study, and practice in special problems, advanced techniques and methodology in clinical microbiology.

5138. CLINICAL MICROBIOLOGY SEMINAR. (1 cr)

5140, 5141. EDUCATIONAL ADMINISTRATION IN MEDICAL TECHNOLOGY. (3 cr per qtr)
Development, organization, and administration of educational programs in medical technology with clinical practice in techniques; analysis and construction of courses of study.

5145. DEVELOPMENT OF MEDICAL TECHNOLOGY. (Cr ar)
Current problems; topics and research.

5154. SELECTED TOPICS IN ADVANCED TECHNIQUES AND THEORY OF ELECTRON MICROSCOPY. (Cr ar; prereq MedT 5106)
Discussion of new techniques and theory of electron microscopy.

5155. ADVANCED CLINICAL HEMATOLOGY. (5 cr)
Observation, study, and practice in special problems, advanced techniques and methodology in clinical hematology.

5165. ADVANCED CLINICAL IMMUNOHEMATOLOGY. (5 cr)
Observation, study, and practice in special problems, advanced techniques and methodology in clinical immunohematology.

5173. ANALYTIC TECHNIQUES IN LABORATORY MEDICINE

5175. ADVANCED CLINICAL CHEMISTRY. (5 cr)
Observation, study, and practice in special problems, advanced techniques and methodology in clinical chemistry.

5179. CHEMISTRY SEMINAR. (1 cr)

5268. TECHNIQUES IN IMMUNOCHEMISTRY. (1 cr; prereq MdBc 5300, 5301)
The antigen-antibody reaction applied to quantitative and qualitative analysis of specific patterns of clinical significance. Preparation of antigens and of antisera. Nature of antigen-antibody complexes. Application of precipitin, neutralization, radioimmune, double antibody, and hemolysin techniques.

5269. TECHNIQUES IN IMMUNOCHEMISTRY. (1 cr; prereq MdBc 5300, 5301) Laboratory.

GRADUATE COURSES (Laboratory Medicine)

5103. PRINCIPLES OF DIAGNOSTIC MICROBIOLOGY. (3 cr)

5138. CLINICAL MICROBIOLOGY SEMINAR. (1 cr)

5139. ADVANCED MICROBIOLOGY. (Cr ar)

5160. HUMAN CYTOGENETICS. (2 cr)
Chromosome structure and function and genetic and clinical problems associated with study of human chromosomes.

5161. HUMAN CYTOGENETICS LABORATORY. (3 cr)
Techniques for study of mammalian and human chromosomes; cell culture, autoradiography, new techniques for chromosome identification, and chromosome isolation techniques.

5162. HUMAN BIOCHEMICAL GENETICS. (2 cr)
Molecular and genetic basis of human genetic traits.

5163. HUMAN BIOCHEMICAL GENETICS LABORATORY. (3 cr)
Biochemical techniques used in study of human genetic traits.

5164. CLINICAL GENETICS. (2 cr)
Importance of genetic principles in modern medicine. Specific disorders used to illustrate general concepts and their application to common diseases.

5168. GENETICS SEMINAR. (1 cr)

5169. RESEARCH IN HUMAN GENETICS. (Cr ar)

5170. ADVANCED PROBLEMS IN MEDICAL GENETICS. (Cr ar)

5172. HUMAN GENETIC TRAITS INCLUDING BLOOD GROUPS AND SERUM PROTEIN POLYMORPHISM. (3 cr)

5173. ANALYTICAL TECHNIQUES IN LABORATORY MEDICINE. (2 cr)

5176. INTRODUCTION TO CLINICAL CHEMISTRY. (4 cr)
Fundamental principles and techniques in clinical chemistry.

5177. CLINICAL CHEMISTRY. (6 cr)
Principles of modern clinical chemistry techniques with emphasis on instrumental methods.

5179. CHEMISTRY SEMINAR. (1 cr)

5180. ADVANCED CHEMISTRY. (Cr ar)

5267. MUSCLE CELL STRUCTURE AND FUNCTION. (1 cr)
Structure and function of heart and skeletal muscle, including the biochemical properties of contractile proteins and their relation to cellular components.

5268. TECHNIQUES IN IMMUNOCHEMISTRY. (1 cr)
Antigen-antibody reaction applied to quantitative and qualitative analysis of specific patterns of clinical significance. Preparation of antigens and of antisera. Nature of antigen-antibody complexes. Applications of precipitin, neutralization, radioimmune, double antibody and hemolysin techniques.

5269. TECHNIQUES IN IMMUNOCHEMISTRY LABORATORY. (1 cr)

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

5271. IMMUNOHEMATOLOGY LABORATORY. (2 cr)

5272. IMMUNOLOGY SEMINAR. (1 cr)

5273. ADVANCED IMMUNOLOGY. (Cr ar)

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

5765, 5766. HEMATOLOGY. (4 cr)
Blood and blood forming organs; blood and bone marrow from the standpoint of diagnosis and prognosis.

5767. SEMINAR: HEMATOLOGY. (1 cr)

5768. ADVANCED HEMATOLOGY. (Cr ar)

5864. RESEARCH SEMINAR. (1 cr)

5865. DEPARTMENTAL SEMINAR. (1 cr)

8235. ADVANCED CLINICAL LABORATORY MEDICINE. (See *Graduate School Bulletin*)

8236. RESEARCH ON CLINICAL LABORATORY PROBLEMS. (See *Graduate School Bulletin*)

Courses from Other Departments

ANATOMY

Anat 1004. ELEMENTARY ANATOMY. (4 cr; prereq Biol 1011)
Elementary human anatomy.

Anat 5765. HEMATOLOGY. (4 cr; prereq Zool 5066)
Blood and blood-forming organs; emphasis on blood and bone marrow from standpoint of diagnosis and prognosis.

BIOCHEMISTRY

MdBc 5300, 5301. BIOCHEMISTRY. (9 cr; prereq organic chemistry and physics)

BIOLOGY

Biol 1011. GENERAL BIOLOGY. (5 cr)
An introduction to biology, its importance and relationship to the life of man.

Biol 1106. GENERAL ZOOLOGY. (5 cr; prereq Biol 1011)
Survey of animal phyla; considerations of structure, function, behavior, adaptation, and evolutionary relationships.

CHEMISTRY

Chem 1004, 1005. GENERAL PRINCIPLES OF CHEMISTRY. (10 cr; prereq satisfactory mathematics placement score)
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 equilibrium.

Chem 1006. PRINCIPLES OF SOLUTION CHEMISTRY. (4 cr; prereq Chem 1005)
Lecture and laboratory work related to chemistry of selected cations and anions; detection and behavior of these ions; heterogeneous and homogeneous equilibria systems. Attention given to oxidation-reduction systematics, complex ion formation as it relates to aqueous solution chemistry, and general chemical phenomena interrelated with structure.

Chem 3100. QUANTITATIVE ANALYSIS. (3 cr; prereq Chem 1005)
(Lecture) Survey of modern quantitative methods of analysis.

Chem 3101. QUANTITATIVE ANALYSIS. (2 cr)
(Laboratory) Survey of modern quantitative methods of analysis including elementary physicochemical procedures.

Chem 3301, 3302. ELEMENTARY ORGANIC CHEMISTRY. (10 cr; prereq Chem 1005)
Important classes of organic compounds, both aliphatic and aromatic, together with some heterocyclic compounds. Laboratory work includes the preparation of typical substances.

ENGLISH

No student may register for any course in Freshman English without taking a placement test. Assignment to a particular course in Freshman English will depend on the student's record in this placement test.

Comp 1001, 1002. INTRODUCTORY COMPOSITION. (8 cr; prereq assignment to Category 1, 1A, or 2)
Extensive guided practice in the structural and stylistic features of exposition and argumentation. Not an introduction to literary studies or to humanities.

Comm 1001, 1002. COMMUNICATION. (8 cr)
The English language and its uses; constant practice in speaking, writing, listening, and reading.

MATHEMATICS

Math 1111. COLLEGE ALGEBRA AND ANALYTIC GEOMETRY. (5 cr; prereq high school higher algebra and satisfactory mathematics placement test)
Functions and 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.

Math 1201. PRE-CALCULUS. (5 cr; prereq hs higher algebra, hs trigonometry or Math 1008, mathematics placement score)
Inequalities, analytical geometry; complex numbers, binomial theorem; mathematical induction; functions and graphs; trigonometric, exponential, and logarithmic functions.

MICROBIOLOGY

MicB 5233. MICROORGANISMS AND DISEASE. (7 cr; prereq 10 cr in chemistry and 5 cr in biological sciences)
The nature of microorganisms, immunology, medical bacteriology, virology, mycology, parasitology, and principles of disease control.

PHYSICS

Phys 1031, 1032. INTRODUCTORY PHYSICS: MEASUREMENT AND APPLICATIONS. (10 cr)
Demonstration lectures, problem sessions, and laboratory exercises. Applications of physics: mechanics, random processes, gases and fluids, electric circuits, feedback and control, waves, light, optical instruments, atoms and spectra, nuclei, radioactivity. Primarily for students interested in topics useful in technical areas.

ZOOLOGY

Zool 5066. HISTOLOGY. (5 cr; prereq Biol 1106)
Microscopic structure of the tissues and organs.

MEDICAL TECHNOLOGY FACULTY AND STAFF

Faculty

Donna Blazevic, M.P.H., Associate Professor, Microbiology
Sandra Carter, M.S., Assistant Professor, Immunohematology
Carol Cox, Ph.D., Assistant Professor, Chemistry
Mary Beth Dempsey, Ph.D., Associate Professor, Chemistry
Grace Mary Ederer, M.P.H., Associate Professor, Microbiology
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Ben Hallaway, M.S., Associate Professor, Chemistry
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John Pollak, M.A., Instructor, Instructional Media
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Medical Directors

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G. Mary Bradley, M.D., Assistant Professor; Clinical Pathology Education
Robert A. Bridges, M.D., Associate Professor; Director, Immunochemistry Laboratory
David M. Brown, M.D., Associate Professor; Director, Clinical Laboratories
Richard Brunning, M.D., Associate Professor; Associate Director, Hematology Laboratory
J. Roger Edson, M.D., Associate Professor; Director, Coagulation Laboratory
John M. Matsen, M.D., Associate Professor; Director, Microbiology Laboratory
Jeffrey McCullough, M.D., Assistant Professor; Director, Blood Bank Laboratory
R. Dorothy Sundberg, M.D., Ph.D., Professor; Director, Hematology Laboratory
Edmond Yunis, M.D., Professor; Director, Histocompatibility Center
Jorge Yunis, M.D., Professor; Director, Medical Genetics Laboratory and Director, Graduate Studies in Laboratory Medicine and Pathology

Clinical Staff

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Miguel Azar, M.D., Veterans Administration Hospital
Calvin Bandt, M.D., Hennepin County General Hospital
Michael D. Burke, M.D., Mt. Sinai Hospital
John T. Crosson, M.D., Hennepin County General Hospital
Leonard Crowley, M.D., St. Mary's Hospital
Agustin Dalmasso, M.D., Veterans Administration Hospital
E. Marie Damman, B.S., Veterans Administration Hospital
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Seymour Handler, M.D., North Memorial Hospital
Erhard Haus, M.D., St. Paul-Ramsey Hospital
Norman Horns, M.D., Fairview-Southdale Hospital
Charles Horwitz, M.D., Mt. Sinai Hospital
Charles Jarvis, M.D., Childrens Hospital
David Lakatua, M.D., St. Paul-Ramsey Hospital

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Edward Segal, M.D., Methodist Hospital
Martin Segal, M.D., Methodist Hospital
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Nancy Staley, M.D., Veterans Administration Hospital
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Laboratory Staff

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Kay Malerich, B.S.[3]
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Marleen Tauer, B.S.[3]
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Eileen Streufert, B.S.[3]
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Jean Bucksa, B.S.[2]
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Marilyn Olson, B.S.[2]
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Vicki Day, B.A.[3]
Rachel Eklund, B.S.[3]
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Kay Hollenbeck, B.S.[3]
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Karen Koski, B.S.[3]
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Alice Reineke, B.S.[3]
Barbara Reinhardt, B.S.[3]
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Ann Schreckenberger, B.S.[3]
Alana Speckman, B.S.[3]
Brenda Spitzer, B.S.[3]
Gloria Strandberg, B.S.[3]
Darrel Taylor, B.S.[3]
Jeanne Targeon, B.S.[3]
Elizabeth Vaura, B.S.[3]
Tan Wang, B.S.[3]
Mary Wise, B.S.[3]
Susan Zinschlag, B.S.[3]

Coagulation Laboratory

Ardella Bennett, B.S.[1]
Sharon Aeilts, B.S.[3]
Marsha Cusulos, B.S.[3]
Linda Kirchhoff, B.S.[2]

Karen Meyer, B.S.[3]
Susan Nippert, B.S.[3]
Elizabeth Plumhoff, B.S.[3]
Cynthia Strub, B.S.[3]
Susan Wendlund, B.S.[3]

Electrocardiography and Basal Metabolism Laboratory

Margaret Halsted, B.S.[2]
Eloise Greenwood, B.S.[3]
Eileen Samplawski, B.S.[3]

Heart Catheterization Laboratory

Frank Gams, B.S.[2]
Maureen Bell, B.S.[3]
Carol Lehman, B.S.[3]
Marlene Stephenson, B.S.[3]
Sandra Stubstad, B.S.[3]

Hematology Laboratory

Ruth Rosendahl, B.S.[1]
Ella Spanjers, B.S.[1]
Audrey Christenson, B.S.[2]
David Mundschenck, B.S.[2]
Elizabeth Stone, B.S.[2]
Betty Weisel, B.S.[2]
Katherine Calander, B.S.[3]
Janet Carsten, B.S.[3]
Sandra Dale, B.S.[3]
Kay Emmons, B.S.[3]
Mary Engman, B.S.[3]
Jill Grokett, B.S.[3]
Judith Isaacson, B.S.[3]
Myrna Katzer, B.S.[3]
Karen Roeller, B.S.[3]
Kathleen Schultz, B.S.[3]
Jean Urbank, B.S.[3]
Janice Welter, B.S.[3]
Sandra Williams, B.S.[3]

Immunology Laboratory

Helen Hallgren, B.S.[2]
Susan Anderson, B.S.[3]
Charyl Dotson, B.S.[3]
Nancy Reinsmoen, B.A.[3]
Nancy Wood, B.S.[3]

Medical Genetics Laboratory

Joan Aldrich, B.S.[2]
Leanna Lindquist, B.S.[3]
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Kathleen Moran, B.S.[3]
Kathleen Newell, B.S.[3]

Microbiology Laboratory

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Marlys Lund, B.S.[2]
Marcia Weber, B.S.[2]
Mary Ellen Anderson, B.S.[3]
Evelyn Busch, B.S.[3]
Miriam Ebeling, B.S.[3]
Mary Engelbrecht, B.S.[3]
Mary Herrmann, B.S.[3]
Barbara Holmen, B.S.[3]
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Susan Menge, B.S.[3]
Mary Riter, B.S.[3]
Karin Rittgers, B.S.[3]
Jean Rysavy, B.S.[3]

Pathology Laboratory

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Joanne Samuelson, B.S.[2]
Janet Flemming, B.S.[3]
Lynda Stien, B.S.[3]

Pulmonary Function

Catherine Anderson, B.S.[2]

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[1] Principal Medical Technologist
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[3] Student Technologist Supervisor

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College of Pharmacy

UNIVERSITY OF MINNESOTA

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College of Pharmacy

UNIVERSITY OF MINNESOTA

College of Pharmacy

I. GENERAL INFORMATION

The objectives of the College of Pharmacy are (a) to educate men and women of ability, integrity, and character to identify, prepare, formulate, and distribute drugs and other health aids; (b) to disseminate information about the uses and value of scientific medicine; (c) to win, and deservedly keep, public confidence and respect for the profession of pharmacy; (d) to aid the state and federal governments to control habit-forming drugs and to enforce all laws for public welfare; (e) to encourage original work and study by qualified persons who will make unselfish use of their services in the interest of the health sciences; and (f) to assist public health agencies in the prevention and control of diseases.

The Bachelor of Science Program

Beginning in 1892, the University of Minnesota awarded the Ph.G. degree for 2 years of professional pharmaceutical study. A minimum of 3 years of study with the degree pharmaceutical chemist (Phm.C.) was adopted in 1915-16 but was abolished in 1927-28 when a 4-year course leading to a bachelor of science in pharmacy (B.S. in Pharm.) was initiated. Increasing responsibilities of the pharmacist and expanding opportunities for the graduate of a college of pharmacy made necessary a further extension of the curriculum. Through actions taken by the American Association of Colleges of Pharmacy and by the National Association of Boards of Pharmacy, a minimum 5-year curriculum became mandatory in all colleges of pharmacy for the degree of bachelor of science in pharmacy, starting in 1960.

Pharmaceutical education has progressed rapidly and soundly while keeping pace with advances made in medicine, dentistry, veterinary medicine, and the other health sciences. Progress in pharmaceutical education made necessary an extended program with the following objectives: (a) a greater emphasis on cultural courses which "broaden" the student's knowledge and enhance the prestige of the profession and (b) reduction in the clock-hour load which in the 4-year curriculum was too heavy because of the large number of laboratory courses. In the 5-year curriculum, the student has the opportunity to elect a wide variety of courses and to engage in many of the beneficial extracurricular activities of the University. By these means, the student can enjoy the intellectual and social growth that will be so important in his future position as a professional member of society.

The Doctor of Pharmacy Program

The doctor of pharmacy professional degree program was approved in 1971. This professional degree will be offered to those selected candidates who, upon completion of the program (4 years beyond the 2-year preprofessional requirement) in such areas as patient orientation in a variety of clinical settings, will be

qualified to perform such health services as are required of them in the modern system of team approach to the delivery of health care. Students interested in this degree program will make their decision early in their professional program in pharmacy so that specialized course work can be integrated into their schedule.

The Graduate Program

Graduate study with major work in medicinal chemistry, pharmaceutics, hospital pharmacy, pharmacognosy, pharmacology, or pharmacy administration, leading to the degrees of master of science (M.S.) and doctor of philosophy (Ph.D.), is offered through the Graduate School. Graduate work is open to those students who have shown exceptional scholarship and ability in the undergraduate program of this or of some other college of pharmacy of equal standing. Consideration will be given to the applications of those students who are not graduates in pharmacy but whose pattern of undergraduate work includes training in such allied or related subjects as would qualify them to pursue work successfully at the graduate level. Detailed information on graduate courses in medicinal chemistry, pharmaceutics, hospital pharmacy, pharmacology, pharmacognosy, and pharmacy administration is contained in the *Graduate Programs in the Health Sciences Bulletin.*

Prospective Students

General — The 3-year program leading to the B.S. degree in pharmacy is open to men and women. The beginning class is admitted once a year, in the fall. However, students planning to enter the College of Pharmacy can begin their liberal arts pre-pharmacy program at any time.

High school students who are contemplating a health science career should take a sound academic program with emphasis on mathematics through trigonometry and solid geometry and such science courses as are offered in biology, chemistry, and physics. Other courses such as foreign languages and social and behavioral studies are recommended.

Students who have completed their high school program and wish to enroll in the pre-pharmacy curriculum at another college or university in preparation for the professional program should arrange their course work so as to include all the required subjects in the pre-pharmacy years. Those who desire to gain admission to the College of Liberal Arts at the University of Minnesota for their pre-pharmacy program must meet the requirements for admission as found in the University of Minnesota *General Information Bulletin.*

The pharmacy curriculum consists of 240 credit hours of work in professional, scientific, and pharmacy administration courses and general electives.

Satisfactory academic progress in the professional curriculum will permit the student to engage only in such outside activities or work as will not interfere with his efforts in class or laboratory or with his outside study. A student who finds it necessary to support himself wholly or partially is advised to take more time in which to complete the requirements for the B.S. in pharmacy degree. Arrangements to do this can be made with the dean of the College of Pharmacy or the chairman of the Committee on Admissions and Academic Standing.

Adult Special Students

Persons of mature age and experience who desire a specific and/or limited course of study and who are not at present candidates for a professional degree, or persons who hold Bachelor degrees, may, upon approval of the dean of the college concerned, be admitted as adult special students. An adult special student may not become a candidate for a degree without the approval of his college, nor will advanced standing be allowed while the student is in the adult special classification. Applicants for adult special standing are subject to the ruling on residency. Registered pharmacists who desire to pursue the work of any one or more of the courses offered in the curriculum may do so with approval of the dean.

Human Rights

The Board of Regents has committed itself and the University of Minnesota to the policy that there shall be no discrimination in the treatment of persons because of race, creed, color, sex, or national origin. This is a guiding policy in the admission of students in all colleges and in their academic pursuits. It is also to be a governing principle in University-owned and University-approved housing, in food services, student unions, extracurricular activities, and all other student and staff services. This policy must also be adhered to in the employment of students either by the University or by outsiders through the University and in the employment of faculty and civil service staff.

Fees and Expenses

For a detailed statement of fees and expenses, see the *General Information Bulletin.*

Bachelor of Science in Pharmacy

The bachelor of science degree will be granted to all students in the College of Pharmacy who have satisfactorily completed 2 years in the pre-pharmacy curriculum in a liberal arts college and 3 years of the professional program in pharmacy.

Pre-Pharmacy Curriculum

The University of Minnesota believes that all students, whatever their area of specialization or their vocational goals, should hold in common the search for a liberal education. In the broadest sense, a liberal education is one which frees us from the limitations placed on our powers of judgment and choice by ignorance. To this end, the all-University policy establishes distribution requirements in

liberal studies for all programs leading to a B.S. degree. All students entering the College of Pharmacy should fulfill the requirements in the following categories prior to their admission:

Group A — Communication, Language, Symbolic Systems

Group B – Biological and Physical Sciences

Group C — Man and Society

Group D — Artistic Expression

The required courses in the pre-pharmacy program as listed on page 15 of this bulletin will fulfill groups A and B so that electives should be selected in the pre-pharmacy program that can be used to fulfill groups C and D. Consult your adviser for courses in these areas.

Students who present 2 or more years of accredited collegiate work (90 quarter or 60 semester credits) on admission to the College of Pharmacy can expect to complete the professional program, including the distribution requirements, in 3 additional years.

Course work applicable toward fulfilling the pre-pharmacy requirements should be evaluated with the A-N letter grading system except for the electives or when a college does not offer a course under that grading system or when advanced placement (exemption) is given. A maximum of 5 credits in ROTC courses will be accepted as part of the 90-quarter credit minimum. Credits for graphics, personal orientation, physical education, and slide rule learning are not acceptable.

Admission to the Professional Program

Students interested in entering the College of Pharmacy should apply for admission through the Office of Admissions and Records, Morrill Hall, University of Minnesota, Minneapolis, Minnesota 55455.

Applications should be filed after October 15 of the academic year prior to the fall quarter the applicant desires to enroll in the College of Pharmacy.

Applications should be accompanied by two official transcripts of the student's record. The Admissions Committee uses such criteria as honesty, industry, leadership ability, maturity, motivation, sound moral character, among other personal attributes, in making judgments on the admissibility of students where possible in addition to the individual's record in the pre-professional curriculum.

These applications will be reviewed and all applicants will be notified, usually within 30 days after complete application and transcript have been received. All resident applicants who have an average of C+ or above and who meet all other prerequisites are likely to be admitted.

Nonresident applicants presenting above-average records will be considered individually. Other applicants (those with lower averages and those removing deficiencies) will be considered individually and will be notified of their admission status either before or shortly after August 15.

While a personal interview with each applicant is not required, candidates may be requested to appear for an interview at the discretion of the Admissions Committee. Students are encouraged to request an interview if they wish to discuss matters relative to their applications and their pre-pharmacy program.

It is suggested that they write the dean's office for an appointment to assure a faculty member will be available.

Students who expect to complete preprofessional courses during a summer session should proceed as indicated above for admission, being sure to supply information concerning: (a) courses to be completed; (b) the college at which the courses will be taken; (c) the dates of the summer session; and (d) two official transcripts of the completed summer session work forwarded to the College of Pharmacy.

Pre-pharmacy and other University of Minnesota students desiring to transfer to the College of Pharmacy should make application at the proper window at the Office of Admissions and Records.

Students from other institutions who desire admission with advanced standing should likewise file application forms and credentials with the Office of Admissions and Records.

Advanced Standing

A candidate for graduation must spend the required time in residence, either at this college or at some other college which is a member of the American Association of Colleges of Pharmacy. A student coming from another college must have the preliminary education required for admission to this college and must spend at least 1 year in attendance at the University before he can qualify for a degree. Advanced standing will be given only to students with promising records, and credit may be withdrawn because of poor work in this college. Candidates should forward a transcript of their records in both pre-pharmacy and pharmacy work.

Requirements for Graduation

Satisfactory performance in the required and elective courses in the curriculum is a requirement for graduation. Scholastic averages for graduation will be based only on work completed while enrolled in the College of Pharmacy at the University of Minnesota. In addition, the candidate must have been recommended by the faculty of the College of Pharmacy for the degree of bachelor of science in pharmacy.

Pharmacy Law Requirements

Section 151.10 Qualifications of Applicants

To be entitled to examination by the board as a pharmacist the applicant shall be a citizen of the United States, 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 an intern. 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 not less than 1 year of the pre-pharmacy program and be enrolled in an accredited college of pharmacy. Students in a 2-year preprofessional curriculum must have successfully completed not less than 1 year of that curriculum and must be satisfactorily progressing toward the completion of the 2-year pre-pharmacy program.

In order that internship experience obtained during summer vacations may be properly credited toward the 1-year requirement, a student must file four documents with the Board of Pharmacy: (a) within 5 days, a notice of employment form showing the date employment began; (b) within 5 days of completion of employment, a progress report describing internship training experiences; (c) within 30 days after termination of employment, an affidavit by his pharmacist preceptor showing the date on which employment began and ended, this regardless of the length of time employed; and (d) within 5 days of the completion of each internship training period, pharmacist-internship experience reports. Instructions for completion of these reports and other required forms may be obtained from the secretary of the Minnesota State Board of Pharmacy.

Internship experience is divided into three phases — beginning, intermediate, and advanced — based on the intern's educational level. Duties of the intern are prescribed for each of the three levels of training.

The Minnesota State Board of Pharmacy requires that an official or certified transcript of scholastic work must accompany the application for examination for licensure to practice pharmacy in this state. Transcripts of Minnesota graduates may be obtained from the Office of Admissions and Records of the University. Requests for transcripts should be made not later than 10 days prior to the date upon which the application is to be filed with the Board of Pharmacy.

Any student wishing to obtain employment is invited to confer with the Minnesota State Pharmaceutical Association or the office of the dean of the College of Pharmacy.

Minnesota State Board of Pharmacy

The State Board of Pharmacy meets at the college at least twice each year to examine candidates for registration. For information concerning all matters coming under the jurisdiction of the State Board, address: Secretary of the Minnesota State Board of Pharmacy, 1965 Ford Parkway, St. Paul, Minnesota 55116.

Medicinal Plant Laboratory and Garden

The facilities of the medicinal plant garden, plant laboratory, and greenhouse afford opportunity for instruction in methods of cultivating, collecting, and processing plant drugs. Many plants of medicinal and economic importance are grown in the garden and greenhouse for study.

Reserve Officers Training Corps

Consult the *General Information Bulletin* for programs available at the University, and for detailed information see the *Army-Navy-Air Force ROTC Bulletin.*

Continuing Education Program

In a time of great technological and social change, practicing pharmacists have a need to update and expand their professional competencies. The College of Pharmacy accepts responsibility for offering meaningful programs to help pharmacists meet their learning needs. It is also accepted that the pharmacist as learner must have access to the programs and must have some choice as to when, where, and how he will be involved in them.

A variety of methods such as lectures, workshops, audio cassette tapes with program outlines, video tapes with discussion leaders, and programmed texts are used to present the programs.

Special Lectures

From time to time throughout the school year, outstanding men in the fields of pharmacy and related sciences address the students of the College of Pharmacy. Students are required to attend.

Libraries

Students of the College of Pharmacy have access to the Minneapolis Campus collections of the University Library, totaling approximately 3 million volumes. Materials in fields related to pharmacy are in the Biomedical and Chemistry Libraries, with 205,000 and 24,000 volumes, respectively. Materials in the fields of clinical pharmacy, medicinal chemistry, pharmaceutics, pharmacognosy, pharmacology, and hospital pharmacy are located in the Pharmacy Library, with a collection of over 16,000 volumes. The Pharmacy Library receives 270 serial titles and maintains indexes to domestic, foreign, and experimental drugs. The library subscribes to a drug information retrieval service, has a microfilm reader-printer, and photocopying facilities.

Honor Society

Rho Chi, the national honor society of pharmacy, is represented at Minnesota by the Mu Chapter. Students are elected to membership in the second professional year by the members of the society on the bases of scholarship, character, and conduct. Not more than 25 percent of the class is eligible.

Programs and Projects

Melendy Memorial Lectures

Annually a pharmacist of national reputation delivers a lecture sponsored by the College of Pharmacy 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

During the spring vacation, an opportunity is afforded fourth- and fifth-year students in the College of Pharmacy to visit the laboratories of at least one pharmaceutical and/or biological manufacturer. Students are urged to make at least one of these trips.

The William D. and Ruth Nelson Educational Fund

Proceeds of this fund are used to improve the pharmaceutical education at the College of Pharmacy.

The Pharmaceutical Education and Research Fund

This fund provides resources on an emergency basis to new programs or to areas in which there are pressing needs.

The Pharmacy Century Mortar Club

Annual contributions by members provide funds which are used for special projects to improve the College of Pharmacy for which state or federal funds are not available.

Student Affairs

At the beginning of each school year, the students will elect their class officers. These officers will comprise the College Board which serves as the liaison between the students and faculty. The College Board convenes with the administration to discuss matters of mutual concern to the students and faculty.

Information on student affairs and faculty and staff activities appears in the *College Bull,* published occasionally during the school year and distributed to the college staff and student body.

Kappa Psi Pharmacy Fraternity has taken upon itself the publication of the annual, *Pharmacopa,* which contains articles of interest as well as pictures of the graduating class, faculty, and staff.

Pharmacy students are urged to become student members of the American Pharmaceutical Association and the Minnesota State Pharmaceutical Association. The membership fees for each organization are nominal.

Three professional pharmacy fraternities are active on this campus, Kappa Epsilon for women and Kappa Psi and Phi Delta Chi for men. A faculty member serves as adviser for these organizations. Among other purposes, they serve their membership through activities involving the student, the college, the profession, and the public.

Textbooks

Textbooks used in all courses may be obtained after coming to the University.

Loans, Scholarships

Loans — The following loan funds have been established for the benefit of students in the College of Pharmacy:

Minnesota State Pharmaceutical Association Loan Fund
North Minneapolis Pharmacists Club Loan Fund
Women's Auxiliary of the American Pharmaceutical Association
Women's Auxiliary of the Minnesota State Pharmaceutical Association

Further information can be obtained from the dean of the college.

Applications for loans are made to the Office of Student Financial Aid, 107 Armory, University of Minnesota, Minneapolis, Minnesota 55455. The college office will supply information about other loan funds such as the Student Loan Fund of the Women's Auxiliary of the American Pharmaceutical Association, the John W. Dargavel Foundation, and others.

Scholarships and Grants-in-aid — Students in the pre-pharmacy years or in any of the 3 professional years of the pharmacy curriculum are eligible for financial aid as stated in the following descriptions. The faculty of the College of Pharmacy will award scholarships only to students who apply, unless otherwise specified. Usually no student will be awarded more than one scholarship. The scholarships are awarded on the bases of scholastic achievement, financial need, vocational intention, and other criteria. Additional information and application forms may be obtained from the dean of the College of Pharmacy. For information about all-University scholarships, refer to the section on financial aids in the *General Information Bulletin.*

One *Benjamin M. Cohen Memorial Scholarship* ($250) is awarded annually to a student enrolled in the College of Pharmacy.

One *Cecil A. Krelitz Memorial Scholarship* ($250) is awarded annually to a student enrolled for the pre-pharmacy years or the first professional year at the University of Minnesota.

One *Claude A. Mather Memorial Scholarship* ($300) is awarded annually to a student from the Iron Range, with preference to students in pharmacy.

One *John W. Dargavel Foundation Scholarship* ($200) is awarded annually to a student who is enrolled in any of the 3 years of the pharmaceutical curriculum.

One or more *Druggists Mutual Insurance Company Scholarships* ($100) to help a student or students complete the course in pharmacy.

One *Kappa Psi Fraternity, Minnesota Graduate Chapter Scholarship* is awarded to a third-year student who is a member of Epsilon Chapter.

One *Keith K. Keller Memorial Scholarship* ($400) is awarded annually to a student in the pre-pharmacy or pharmacy program at the University.

One *McKesson and Robbins Scholarship* ($525) is awarded annually to a student in the College of Pharmacy with preference for a student who was recipient of the scholarship in the preceding year.

One *Minnesota State Pharmaceutical Association Scholarship* ($525) is awarded annually to the third-year student achieving the highest scholastic average for the first 2 years of professional study. No application is necessary.

One *Northwestern Drug Company Scholarship* ($525) is awarded annually to a student in the first professional year or to a student in an upper class of the College of Pharmacy who held the scholarship during the preceding year.

Four *Samuel W. Melendy Grants-in-Aid* ($400) are awarded to recognized, designated pre-pharmacy students of minority background.

Six *Samuel W. Melendy Memorial Scholarships* ($525) are awarded annually to students in the College of Pharmacy. Not more than three scholarships are awarded to students in any 1 of the last 2 professional years.

Four *Samuel W. Melendy Undergraduate Research Scholarships* are awarded annually to qualified student applicants. Upperclassmen will be given preference. The terms of the scholarships will run for the calendar year.

One *Sarah Lavintman Mark Scholarship* (1-quarter tuition) is awarded annually to a capable young pharmacy student interested in hospital pharmacy entering the last year.

One *William M. and Mildred E. Peters Scholarship* ($250) is awarded annually to a student enrolled in the College of Pharmacy.

Awards and Honors

The following prizes are awarded 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 following brief descriptions:

John Y. Breckenridge Memorial Book Award — Sponsored by the late Mrs. John Y. Breckenridge, in memory of her husband, class of 1908. Awarded to the second-year student in the College of Pharmacy in recognition of outstanding scholastic achievement, professional promise, and leadership ability.

Bristol Laboratories Award — Sponsored by Bristol Laboratories, Inc., Division of Bristol-Meyers Company. Awarded to the outstanding graduate recognized for his extracurricular contributions to the spirit of his class, improvement of his community, or his 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. Awarded to that member of the graduating class who has achieved an outstanding record in clinical pharmacy.

College of Pharmacy Alumni Award — Sponsored by the College of Pharmacy Alumni Association. Awarded to a member of the graduating class for general excellence of scholastic and extracurricular records.

Dean's Award — Sponsored by L. C. Weaver, dean. Awarded occasionally to a graduating student who has made contributions to the goals of the college through his efforts outside the academic area.

Druggist Mutual Award — Sponsored by the Druggist Mutual Insurance Company. Awarded to a first-year student in recognition of scholastic achievement and extracurricular involvement.

Ole Gisvold Medicinal Chemistry Award — Sponsored by the friends and associates of Professor Ole Gisvold. Awarded to the graduating student in the College of Pharmacy who has earned an exceptional grade point average in all medicinal chemistry courses and who has demonstrated unusual interest and/or potential for graduate study in the field.

Johnson & Johnson Mortar and Pestle Award — Sponsored by Johnson & Johnson, New Brunswick, New Jersey. Awarded to the member of the College of Pharmacy graduating class in recognition of outstanding work in the area of pharmacy and business administration.

Kappa Epsilon Prize — Sponsored by the Alumnae Chapter of Kappa Epsilon, National Women's Pharmacy Sorority. Awarded to the woman student member who has rendered outstanding service to the College of Pharmacy.

Kappa Psi Pharmacopa Award — Sponsored by the Epsilon Chapter of Kappa Psi Pharmaceutical Fraternity. Awarded to the editor of *Pharmacopa* for his dedication to promoting interest and providing information in possible careers in pharmacy.

Kappa Psi Scholarship Award — Sponsored by the Minnesota Graduate Chapter. Awarded to the graduating student member who has qualified for the award based on scholastic performance.

Lilly Achievement Award — Sponsored by Eli Lilly and Company, Indianapolis, Indiana. Awarded to a third-year student in the College of Pharmacy in recognition of superior scholastic and professional achievement.

McKesson & Robbins Award — Sponsored by McKesson & Robbins, Inc., New York, New York. Awarded to the president, Student Chapter of the American Pharmaceutical Association.

Merck Award — Sponsored by Merck and Company, Inc., Rahway, New Jersey. Awarded to the graduating student in the College of Pharmacy who has earned the highest scholastic average during the professional years.

Minnesota Council of Hospital Pharmacists Award — Sponsored by the Central Minnesota Society of Hospital Pharmacists. Awarded to the graduate who has demonstrated outstanding qualities as a registered hospital pharmacy intern.

Minnesota State Pharmaceutical Association Key Award — Sponsored by the Minnesota State Pharmaceutical Association. Awarded to the second-year student showing the highest academic average and excellence scholastically.

Harold R. Popp Leadership Award — Sponsored by the family and friends of Harold R. Popp. Awarded to that graduating student showing leadership in extracurricular activities in the college.

Rexall Mortar and Pestle Award — Sponsored by the Rexall Drug Company, Los Angeles, California. Awarded to the member of the graduating class of the College of Pharmacy who has shown outstanding leadership and interest in the field of retail pharmacy.

Rho Chi Award — Sponsored by Mu Chapter, Rho Chi, Pharmacy Honor Society. Awarded to the first-year student in the College of Pharmacy 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. Awarded to that student in the graduating class who has contributed to and shown promise of excellence in research in pharmaceutical science.

Upjohn Achievement Award — Sponsored by the Upjohn Company, Kalamazoo, Michigan. Awarded to the graduate who has distinguished himself through his services to the public.

F. J. Wulling Third-Year Student Award — Sponsored by Mrs. Frederick J. Wulling in memory of her husband, dean of the College of Pharmacy, 1892-1936. Awarded to that student in the College of Pharmacy who has earned the second highest scholastic average during the professional years.

F. J. Wulling Second-Year Student Award — Sponsored by Mrs. Frederick J. Wulling, in memory of her husband, dean of the College of Pharmacy, 1892-1936. Awarded to that student in the College of Pharmacy who has shown outstanding promise based on the professional courses.

F. J. Wulling First-Year Student Award — Sponsored by Mrs. Frederick J. Wulling, in memory of her husband, dean of the College of Pharmacy, 1892-1936. Awarded to that student in the College of Pharmacy who has excelled in the first professional year.

Communications

Correspondence relating to registration or advanced standing should be addressed to the Office of Admissions and Records, University of Minnesota, Minneapolis, Minnesota 55455. Official transcripts for advanced standing will be evaluated by the Office of Admissions and Records only when accompanied by a completed Application for Admission form. All other inquiries should be addressed to Office of the Dean, College of Pharmacy, University of Minnesota, Minneapolis, Minnesota 55455.

II. PHARMACY CURRICULA

Bachelor of Science in Pharmacy Program

(2 Years Pre-Pharmacy — 3 Years Pharmacy)

A 5-year curriculum for the bachelor of science in pharmacy degree prepared and recommended by the faculty of the college in cooperation with an *ad hoc* committee of the University was endorsed by the Administrative Committee of the Senate and approved by the Board of Regents on June 13, 1953. The curriculum became effective in the fall of 1954. Beginning in the fall of 1960, all accredited colleges of pharmacy initiated curricula equivalent to not less than 5 academic years as a result of actions taken by the American Association of Colleges of Pharmacy and the National Association of Boards of Pharmacy.

High school graduates should enroll as pre-pharmacy students in the College of Liberal Arts of the University of Minnesota or of any other accredited institution. Upon satisfactory completion of the required pre-pharmacy courses, students are eligible to apply for admission to the College of Pharmacy.

Students should consult their advisers, especially in regard to choice of elective subjects. Careful planning of programs throughout the 5 years will expedite considerably the students' progress in preparation for one of the areas of pharmaceutical specialization, preparation for graduate study, or completion of the program in pharmacy in minimum time.

Applicants who have completed satisfactorily 2 or more years of college in a pre-pharmacy program will be eligible to apply for admission to the 3-year professional curriculum in the College of Pharmacy, provided their preprofessional curriculum includes the following courses or their equivalent.

PRE-PHARMACY MINIMUM COURSE REQUIREMENT**

	Approximate Credits	
	Semester	Quarter
General Biology Biol 1011, 1106	7	10
Chemistry — General, Qualitative, and Organic Chem 1004, 1005, 1006, 3301, 3302, 3303	18	28
Economics Econ 1001, 1002	4	8
English, Communications, or Composition Engl 1001, 1002 or Comm 1001, 1002 or Comp 1001, 1002	6	8
Mathematics — College Algebra Math 1141	5	5
Physics Phys 1014, 1015, 1024, 1025 or 1031, 1032	8	10
Electives — Social, Behavioral, Humanities, and the Arts	12	21
	60	90

** University of Minnesota courses are designated by course name and number. Advanced first aid and personal health courses are also recommended.

FIRST PROFESSIONAL YEAR

(51 Credits)

Anatomy (4)
Biochemistry of Medicinals (6)
Fundamental Principles and Processes (3)
Human Physiology (7)
Introductory Calculus (5)
Microbiology (5)
Advanced First Aid (2)
Pathology (3)
Personal and Community Health (4)††
Quantitative Medicinal Chemistry (6)
Orientation (2)
General Electives (4)

SECOND PROFESSIONAL YEAR

(50 Credits)

Fundamental Principles and Processes (4)
General Pharmacology (7)
Introductory Pharmacognosy (10)
Organic Medicinal Agents (13)
Dosage Form Design (9)
Management of Pharmaceutical Services (4)§§
General electives (3)

THIRD PROFESSIONAL YEAR

(49 Credits)

Biopharmaceutics — Drug Information Evaluation (8)
Economics of Professional Practice (3)§§
Dispensing Pharmacy (6)
Environmental Sanitation (3)††
Clinical Conferences (2)
Clinical Clerkships (2)**
Clinical Therapeutics (6)
Pharmaceutical Jurisprudence (3)
Toxicology (2)
Management of Pharmaceutical Systems (3)§§
Organic Medicinal Agents (3)
General electives (8)

General Electives — Each student may choose to enroll in such courses so as to distribute part of his course work in areas of study other than those most closely linked to his vocational interests.

Professional Electives — In addition to those areas of study under general electives, a student may elect to register for such advanced courses in the areas listed.

Clinical Pharmacy:
- Health Sciences Terminology (2)
- Contemporary Pharmacy (1)
- Over-the-Counter Preparations (1)
- Drug Abuse and Society (1-3)
- Drug Abuse and Society Workshop (1-3)
- Special Problems (3)

Medicinal Chemistry:
- Instrumentation (3)
- Modern Concepts (3)
- Special Problems (Cr ar)

Pharmaceutics:
- Cosmetics and Dermatological Preparations (3)
- Parenteral Products (3)
- Pharmaceutical Manufacturing (6)
- Special Problems (Cr ar)
- Veterinary Science (3)

Pharmacognosy:
- Antibiotics (2)
- Immunology (2)
- Vitamins and Hormones (2)
- Vitamins and Hormones Laboratory (1)
- Special Problems (Cr ar)

§§ Students contemplating graduate studies may substitute by petition pregraduate courses.
†† An equivalent number of credits may be substituted for other courses in public health or interdisciplinary health science areas.
** An enriched course (5 cr) may be taken in lieu of Economics of Professional Practice.

The Doctor of Pharmacy Program

GOAL OF PROGRAM

The primary goal of the Pharm.D. program is to initiate the training of a clinical therapeutics specialist with a genuine, sustained interest in patient care. The student's training will include an introduction to the preventive, behavioral, sociologic, environmental, epidemiologic, diagnostic, therapeutic, and rehabilitative aspects of health care. The program is not designed to provide training in the area of drug distribution systems or pharmacy management.

ADMISSION REQUIREMENTS

Pharmacy students who have completed the fourth year of the 5-year curriculum in an accredited college of pharmacy and individuals who have been awarded the B.Sc. or advanced degrees in pharmacy and/or related fields may apply for admission to the doctor of pharmacy program. Candidates for admission will be evaluated on the bases of prior academic and professional achievement, letters of recommendation, and personal interviews, whenever feasible.

CURRICULUM

The doctor of pharmacy program usually consists of 2 years of study in addition to the B.Sc. degree. As well as the required course work, elective courses in collateral fields are available from the health sciences-related schools and colleges on campus.

Objectives of program design —

Promote the "student as learner" concept to foster student independence.
Provide curriculum flexibility.
Demonstrate the relevance of the program to patient care.
Open communication lines between student and faculty to provide for individual guidance and feedback.
Provide access to multiple patient care settings that demonstrate the spectrum of patient needs.

Required course work — The following course work will be required unless the student has already fulfilled the requirement or can demonstrate competency in the subject material:

FIRST YEAR

1. *Pathophysiology of Disease* (4 quarters, 12 credits per quarter). This course, taught by Medical School faculty for medical students, is attended by Pharm.D. students. The material is structured around an organ system approach to disease and therapeutic management. In addition, Pharm.D. students attend weekly tutorial sessions that review this course material and emphasize its relevance to patient care.
2. *Immunology* (2 credits) and *Medical Microbiology* (3 credits). Immunology is now offered by the College of Pharmacy, and the course is tailored for the Pharm.D. program. Both of these courses are pertinent to an understanding of disease states and the management of disease.

3. *Biometry* (2 quarters, 3 credits per quarter). This course, offered by the School of Public Health, is designed specifically to allow health professionals to evaluate clinical experimental design.
4. *Biopharmaceutics — Drug Information Evaluation* (2 quarters, 3 credits per quarter). This course, offered by the College of Pharmacy, examines the duration and intensity of drug action through an analysis of the factors governing drug absorption and disposition. The evaluation of drug products through critical review of the literature is emphasized.

SECOND YEAR

Clinical residencies consist of a 2-quarter core rotation which may include, among others, medicine, pediatrics, neurology, drug information, and renal services. The Pharm.D. student spends full time working with physicians and other health professionals, monitoring drug therapy and serving as a drug consultant. These activities are guided by a faculty member practicing clinical pharmacy. Students attend weekly in-depth seminars on individual therapeutic problems. The third quarter is unstructured to allow the student to pursue a project on his own, such as the monitoring of drug plasma levels, or to specialize in a clinical area of interest.

RESOURCES AND FACILITIES

University of Minnesota, Health Sciences Center
Drug Information Center
Cambridge State Hospital
Hennepin County General Hospital
St. Paul-Ramsey County Hospital
Mt. Sinai Hospital
Stillwater State Prison
Family Practice Clinic and various community clinics
Nursing Home Review

For additional information about the Pharm.D. program at the University of Minnesota and application materials, contact the dean. Applications should be submitted by March 1 for admission to the program the following September (fall quarter).

III. DESCRIPTION OF COURSES

Following each course number and title is a statement in parentheses of credits, enrollment limitations, prerequisites, and number of lecture and laboratory hours per week. The symbol ‡ indicates that "consent of instructor is required" for enrollment in a course. A hyphen between course numbers (3142-3143-3144) indicates a sequence course which must be taken in the order listed.

All students are required to purchase $5 Pharmacy Deposit Cards from the bursar. Breakage and supplies will be deducted from these deposits.

Clinical Pharmacy (Phar)

Professor

Hugh F. Kabat, Ph.D., *head*
Wallace F. White, Ph.D.

Associate Professor

Albert I. Wertheimer, Ph.D.

Assistant Professor

James E. Grogan, Ph.D.
William J. Hodapp, M.A.
Martin I. Jinks, Pharm.D.
Thomas F. Jones, B.S. in Pharm., M.H.A.
Marc Kurzman, B.S. in Pharm., J.D.
Thomas McKennell, B.S. in Pharm., Ph.D.
Roger D. Schroeder, B.S. in Pharm., M.S.
Karl M. Schuttenhelm, Pharm.D.

Instructor

James Anthony, B.A.
John T. Bush, B.S. in Pharm.
James C. Clinite, B.S. in Pharm., M.S.
Gail Gamble, B.A.
Suzanne Geisler, B.A.
Sharon Lundin, Pharm.D.
Henri Manasse, B.S. in Pharm., M.A.
Marie L. Perreault, B.S. in Pharm.
Barry Rupp, Pharm.D.
John T. Stanich, B.S. in Pharm.
Robert Weibert, Pharm.D.
Robert E. Williamson, B.S. in Pharm., M.S.

Clinical Instructor

Raymond A. Anderson, B.S. in Pharm.
William F. Appel, B.S. in Pharm.
Donald A. Dee, B.S. in Pharm., M.S.
Paul G. Grussing, B.S. in Pharm.
Michael Hanson, B.S. in Pharm., M.S.
Leonard A. Lang, B.S. in Pharm., M.S.
Charles F. Richards, B.S. in Pharm., M.S.
Greg Schwartz, B.S. in Pharm.
William A. Strohbeck, B.S. in Pharm., M.S.

Lecturer

Neal W. Schwartau, B.S. in Pharm.

5201. ORIENTATION: OPPORTUNITIES AND HISTORY. (2 cr; 2 lect hrs per wk)
Career opportunities in the profession; historical development of pharmacy.

5210. TERMINOLOGY OF THE HEALTH SCIENCES. (2 cr; 5 review and exam sessions per qtr)
An elective programmed learning course familiarizing students with the language of the health sciences.

5220. ADVANCED FIRST AID. (2 cr; 3 lect hrs per wk)
First aid procedures, including those in the American Red Cross course.

5230. PHARMACEUTICAL JURISPRUDENCE. (3 cr; 3 lect hrs per wk)
Law and legal procedures, responsibilities of a pharmacist; federal and Minnesota state laws and regulations, legal problems of practical importance to the pharmacist.

5240. ECONOMICS OF PROFESSIONAL PRACTICE. (3 cr; prereq Econ 1001-1002; 2 lect and 2 lab hrs per wk)
Decision making and policy planning, utilizing fiscal records; data processing.

5250. MANAGEMENT OF PHARMACEUTICAL SERVICES. (4 cr; 3 lect and 2 lab hrs per wk)
Management functions, personnel and patient management.

5260. MANAGEMENT OF PHARMACEUTICAL SYSTEMS. (3 cr; 3 lect hrs per wk)
The health care system, drug distribution, drug use control, and dissemination of drug information.

5270. CLINICAL CONFERENCES. (2 cr [may be repeated for 6 cr max]; 3-hr conf per wk)
Monitoring of patient drug therapy. Offered at University and affiliated hospitals with rotation to several services.

5280. CONTEMPORARY PHARMACY. (1 cr; prereq 2nd or 3rd-yr pharmacy student, ‡; 2 hrs per wk)
Elective seminar on contemporary topics in pharmacy.

5281. OVER-THE-COUNTER PREPARATIONS. (1 cr; prereq 3rd-yr pharmacy student; 1 conf hr per wk)

5285. DRUG ABUSE AND SOCIETY. (1-3 cr; prereq ‡; 1 lect and 1 disc hrs per wk)
Social, psychological, and pharmacological aspects of drug use and misuse. The role of professionals in the community as they deal with society's problems, with particular emphasis on the drug "problem."

5286. DRUG ABUSE AND SOCIETY WORKSHOP. (1-3 cr; prereq 5285, ‡)
Independent projects implementing programs developed in 5285.

5290. CLINICAL CLERKSHIP. (Cr ar [may be repeated for cr]; prereq 5270)
Supervised study of pharmaceutical services at University Hospitals, affiliated institutions, or other practice settings.

5299. SPECIAL PROBLEMS. (Professional Elective) (Cr ar)
Elementary investigation of elements of professional practice.

5300-5301-5302. CLINICAL THERAPEUTICS. (2 cr per qtr; prereq 3rd-yr pharmacy student; 2 lect hrs per wk)
Clinical therapeutics of common disease entities.

5399. CLINICAL RESIDENCY. (No cr; hr ar; prereq 5310, 5311, 5312, 5313 or ‡)
Monitoring of patient drug therapy in University Hospitals or other affiliated institutions.

Medicinal Chemistry (MedC)

Professor
Taito O. Soine, Ph.D., *head*
Frank E. DiGangi, Ph.D.
Herbert T. Nagasawa, Ph.D.
Philip S. Portoghese, Ph.D.

Associate Professor
Robert E. Ober, Ph.D.
Robert Vince, Ph.D.

Assistant Professor
Mahmoud Abdel-Monem, Ph.D.
Earl W. Dunham, Ph.D.
Dwight S. Fullerton, Ph.D.
Patrick E. Hanna, Ph.D.

Student Pharmacist Supervisor
Jan Johnson, B.A.

5410-5420. QUANTITATIVE MEDICINAL CHEMISTRY. (3 cr per qtr; 2 lect, 1 conf, and 3 lab hrs per wk)
Principles, procedures of gravimetric, volumetric, and instrumental methods of analyses of inorganic and organic medicinal agents.

5430-5440. BIOCHEMISTRY OF MEDICINALS. (3 cr per qtr; prereq Chem 3303 or ‡; 3 lect hrs per wk)
Selected topics in biochemistry required as a basis for understanding of the pharmacodynamic action and therapeutic use of medicinal agents.

5460-5470-5480-5490. ORGANIC MEDICINAL AGENTS. (5/4/4/3 cr; prereq 5440 or ‡)
Consideration of factors involved in drug absorption, distribution, excretion, metabolism, mechanism of action, receptor interaction, and rational drug design prefaces a treatment of the individual pharmacological drug categories from a structure-activity standpoint. Agents used as pharmaceutical aids and adjuncts also considered.

5494. INSTRUMENTATION IN MEDICINAL CHEMISTRY. (Professional Elective) (3 cr; prereq Chem 3303 or ‡; 1 lect and 6 lab hrs per wk)
Modern approaches to drug analysis.

5496. MODERN CONCEPTS IN MEDICINAL CHEMISTRY. (Professional Elective) (3 cr; prereq 5490; 3 lect hrs per wk)
Basic principles and concepts in the design of medicinal agents, drug transport, molecular concepts of drug action, chemotherapeutic agents, and analysis of drug-receptor interactions.

5499. SPECIAL PROBLEMS IN MEDICINAL CHEMISTRY. (Professional Elective) (Cr ar; prereq 3rd- or 4th-yr pharmacy student, #)
Elementary investigation of the analysis, synthesis, and phytochemistry of medicinal agents.

Pharmaceutics (Phm)

Professor
Edward G. Rippie, Ph.D., *head*

Associate Professor
John D. McRae, Ph.D.
Robert H. Miller, Ph.D.

Assistant Professor
Kenneth W. Miller, Ph.D.
Kenneth G. Nelson, Ph.D.
Ronald J. Sawchuk, Ph.D.
Dietrich K. Schuppan, Ph.D.
Paul W. Willard, Ph.D.

Student Pharmacist Supervisor
Leslie W. Collins, B.S. in Pharm.
Esther Magadan, B.S. in Pharm.

5610-5620. FUNDAMENTAL PRINCIPLES AND PROCESSES. (3/4 cr; prereq Math 1142; 3 lect hrs per wk for 5610, 3 lect and 3 lab hrs per wk for 5620)
Introduction to the principal laws of physical chemistry and their applications to the quantitative aspects of pharmaceutical systems.

5630-5640. DOSAGE FORM DESIGN. (5/4 cr; prereq 5620; 2 lect and 6 lab hrs per wk)
Applied theory of dosage form design for optimal drug activity and bioavailability.

5650-5660. DISPENSING PHARMACY. (3 cr; prereq 5640; 2 lect and 3 lab hrs per wk)
The technology, record systems, interprofessional relationships, drug use control, etc., involved in dispensing prescription medication.

5670-5680. BIOPHARMACEUTICS — DRUG INFORMATION EVALUATION. (4 cr per qtr; prereq 5640, Phcl 5102; 3 lect hrs, one 2-hr workshop per wk)
Consideration of the processes of drug absorption, distribution, metabolism, and excretion *in vivo*. Statistical methods and procedures for critical evaluation of current literature dealing with those subjects.

5690. COSMETICS AND DERMATOLOGICAL PREPARATIONS. (Professional Elective) (3 cr; 2 lect and 3 lab hrs per wk)
Pharmaceutical aspects of cosmetics and dermatological preparations.

5692-5694. PHARMACEUTICAL MANUFACTURING. (Professional Elective) (3 cr per qtr; prereq 5640; 1 lect and 6 lab hrs per wk)
Problems in the production of pharmaceutical preparations on a pilot plant scale. Formula development and product stabilization.

5696. PARENTERAL PRODUCTS. (Professional Elective) (3 cr; prereq 5640, MicB 3103 or #; 2 lect and 3 lab hrs per wk)
Principles and procedures involved in the manufacture of parenteral products.

5699. SPECIAL PROBLEMS IN PHARMACEUTICS. (Professional Elective) (Cr ar)
Problems in the formulation, production, and evaluation of pharmaceutical products.

5520. VETERINARY SCIENCE. (Professional Elective) (3 cr; prereq Phcl 5102 or equiv; 3 lect hrs per wk)
(Same as VPP 5520) Professional interrelationships between pharmacists and veterinarians, disease problems of domestic animals, and animal pharmacology.

Pharmacognosy (Phcg)

Professor
E. John Staba, Ph.D., *head*

Associate Professor
Yusuf J. Abul-Hajj, Ph.D.

Assistant Professor
Orval L. Mullen, Ph.D.

Instructor
Lance Crombie, Ph.D.
Thomas K. Rice, Ph.D.
Stephen R. Rohlfing, Ph.D.

Gardener
Onie J. Benson
Clarence Stoltman

5820. INTRODUCTORY PHARMACOGNOSY. (3 cr; prereq MicB 3103, MedC 5440 or ‡; 3 lect hrs per wk)
Study of the principles of immunology and allergy, pathogenic microorganisms and the treatment of disease states with immunizing biologicals.

5830. INTRODUCTORY PHARMACOGNOSY. (3 cr; prereq 5820 or ‡; 3 lect hrs per wk)
Consideration of the production, constituents, metabolism, and therapeutic uses of drugs containing antibiotics, amino acids, and enzymes.

5840. INTRODUCTORY PHARMACOGNOSY. (4 cr; prereq 5830 or ‡; 3 lect and 3 lab hrs per wk)
Consideration of the production, constituents, metabolism, and therapeutic uses of drugs containing vitamins, hormones, and alkaloids.

5860. ANTIBIOTICS. (Professional Elective) (2 cr; prereq 5830 or ‡; 2 lect hrs per wk)
Natural antibiotic substances. Methods of production, biosynthesis, extraction, and assay, together with chemical, pharmaceutical, and chemotherapeutic properties.

5870. VITAMINS AND HORMONES. (Professional Elective) (2 cr; prereq 5840 or ‡; 2 lect hrs per wk)
These substances will be discussed with regard to biosynthesis, chemistry, biochemical functions, mechanisms of actions, productions, and uses.

5875. ANTIBIOTICS, VITAMINS, AND HORMONES LABORATORY. (Professional Elective) (1 cr; prereq 5830, 5840 or ‡; 4 lab hrs per wk)
Introduction to techniques used to produce, isolate, and observe biological effects of these substances.

5880. PHARMACEUTICAL IMMUNOLOGY. (Professional Elective) (2 cr; prereq ‡; 2 lect hrs per wk)
A consideration of fundamental principles of immunology, emphasizing clinical and pharmaceutical applications.

5899. SPECIAL PROBLEMS IN PHARMACOGNOSY. (Professional Elective) (Cr ar; prereq 4th-yr student, ‡)
Problems dealing with the microbiology, chemistry, or biology of medicinal natural products.

UNIVERSITY OF MINNESOTA BULLETIN 1973-75

College of Veterinary Medicine

UNIVERSITY OF MINNESOTA

Volume LXXVI, Number 18 September 27, 1973

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College of Veterinary Medicine

UNIVERSITY OF MINNESOTA

College of Veterinary Medicine

I. GENERAL INFORMATION

The College of Veterinary Medicine at the University of Minnesota is located in the southeast quarter of the St. Paul Campus, between Fitch and Commonwealth Avenues, and extends from Boyd Avenue on the west to the State Fair Grounds on the east.

Veterinary Medicine as a Career—Veterinary Medicine is the science and art dealing with the prevention, cure, or alleviation of diseases of animals. Students of veterinary medicine learn the fundamental biological and physical sciences as they relate to animal health and disease. In the clinical training, this knowledge is applied in the study and treatment of animal diseases. With his broad biological knowledge and clinical training, the veterinarian may choose a career in many challenging and interesting fields. Individuals interested in animals and biology can find rewarding careers in veterinary medicine.

Professional Service and Activities—About 80 percent of the veterinarians in the United States are engaged in private clinical practice, either general or specialized. Veterinarians in general practice care for farm animals or companion animals. Veterinarians in specialized practice usually care for primarily one species of animal, such as cattle, horses, poultry, dogs, or cats. To an increasing extent, veterinarians are also specializing in clinical areas, such as obstetrics and surgery.

Veterinarians are also engaged in laboratory animal medicine, zoo animal practice, wildlife animal practice, public health, food inspection, teaching, and research. Many veterinarians complete postgraduate training in order to specialize in clinical teaching, research, or other fields.

A sizable number of veterinarians serve as specialists, administrators, and research scientists in industry and in governmental agencies—local, state, national, and international. Veterinary medical knowledge and skills contribute to the advancement of science and to the preservation of the health of animals and man in such agencies as the Public Health Service, Department of Agriculture, United States Army, United States Air Force, Atomic Energy Commission, National Aeronautics and Space Administration, and the Food and Drug Administration. Industry is employing an increasing number of veterinarians in research and development and as specialists, consultants, and executives.

Future Opportunities in the Profession—At present, the demand for doctors of veterinary medicine far exceeds the supply. New areas such as space biomedical programs, comparative medical research, and public health are constantly expanding, and other areas of opportunity are emerging. With the tremendous growth in population, more food-producing animals are needed, and the expansion in size of herds and flocks offers new challenges and opportunities. More families and more children will inevitably result in a greater number of companion animals which will require veterinary care. In addition, with a longer life span, many people have acquired pets for companionship after their families have left home, again resulting in a greater number of animals which will require care. It has been estimated that we will need to increase the number of veterinarians in the

United States from 26,000 to 42,000 by the year 1980 to keep pace with the expected demand for veterinary medical services.

Historical Highlights—Veterinary medicine developed contemporaneously with the domestication of animals. There is historical evidence that ancient people practiced this science and art. Records of formal education in veterinary medicine date back to 1761 when a school for the study of the anatomy and diseases of animals was established at Lyon, France. In 1852 the first veterinary college in North America, the Veterinary College of Philadelphia, was granted a charter. Since 1852, veterinary colleges have been established throughout the United States. At present, there are 19 colleges of veterinary medicine enrolling approximately 6,000 students in programs leading to the doctor of veterinary medicine degree.

Veterinary Medical Education in Minnesota—The College of Veterinary Medicine was established at the University of Minnesota in 1947 as a result of the need of the livestock industry for increased veterinary services and research in animal diseases and student demand for veterinary medical education. The first class, admitted for the fall quarter of 1947, was graduated in the spring of 1951. From 1947 to 1954, veterinary medicine was administered as a unit composed of the College of Agriculture, Forestry and Home Economics, and Veterinary Medicine. In 1954 the School of Veterinary Medicine became a separate unit within the Institute of Agriculture, and in 1957 the College of Veterinary Medicine was established as a separate college of the University of Minnesota.

Accreditation—The College of Veterinary Medicine at the University of Minnesota is accredited by the Council on Education of the American Veterinary Medical Association.

Instructional Facilities and Services

Veterinary Science Building and Veterinary Anatomy—The Veterinary Science Building chiefly houses classrooms, teaching laboratories, research laboratories, the library, and administrative and faculty offices. It houses most of the lecture and laboratory courses which are offered in the first 2 years of the veterinary curriculum. Some additional classroom, office, and laboratory space is available in the Veterinary Anatomy Building. The library of the College of Veterinary Medicine is located on the fourth floor of the Veterinary Science Building. The library contains current veterinary journals as well as many books and current periodicals from related fields such as medicine, animal science, and the biological sciences.

University Veterinary Hospitals—The University Veterinary Hospitals provide facilities for the medical and surgical treatment and hospitalization of household pets and domestic animals. Facilities are available to hospitalize cattle, horses, sheep, and swine, as well as dogs, cats, and other small animals. Clinical laboratories and radiologic services are available within the building. The faculty of the college participates in the daily teaching program carried out in the University Veterinary Hospitals. The diagnosis and treatment of diseases of animal patients, under staff supervision, enables students to learn the applied aspects of medicine, surgery, radiology, and obstetrics. In the clinical laboratories, students

apply the principles and methods of parasitology, pathology, microbiology, and chemistry to the diagnosis and treatment of diseases of animals.

Veterinary Diagnostic Laboratory—This laboratory serves as the official veterinary diagnostic laboratory for the State of Minnesota. Diagnostic laboratory techniques and procedures are taught to graduate and undergraduate students.

Ambulatory Clinics—Ambulatory clinics take veterinary medical care to animals on farms. They are designed to provide experience for students in handling cases on the farm and to supplement the training received in the veterinary hospital. Ambulatory clinics are an essential and integral part of the clinical training in veterinary medicine to prepare students for large animal practice. Through this service, veterinary medical care is provided to animals on University farms and to animals on farms within reasonable distance from the St. Paul Campus.

Preventive Veterinary Medical Programs—Preventive veterinary medical programs provide students with experience in the applied aspects of preventive medicine and diseases of reproduction. Total herd health programs are provided in the care of beef, swine, dairy cattle, poultry, as well as horses. All the programs serve as model systems to teach the principles of preventive veterinary medicine.

Continuing Education Programs—The college regularly schedules continuing education courses for members of the veterinary medical profession. These courses are designed to bring members of the profession up-to-date on current advances in the field through the presentation of new concepts and recent developments in research and of innovative clinical procedures.

Constituent veterinary medical associations may also request the offering of specific courses for their organizations. Sessions include 1- or 2-day conferences, seminars, or laboratory workshop sessions, regularly scheduled meetings, and the opportunity to register for fourth-year elective courses.

Other Facilities—The facilities of the Minneapolis and St. Paul Health Departments, Minnesota Livestock Sanitary Board, Veterinary Services of the United States Department of Agriculture, and food industries in the State are also utilized in the teaching of the public health aspects of veterinary medicine.

Departments

Veterinary Biology—Professor Harold E. Dziuk, D.V.M., Ph.D., chairman. The Department of Veterinary Biology consists of faculty and staff who are primarily concerned with teaching and research activities related to basic knowledge in veterinary science. Courses are offered in gross anatomy, histology, neuroanatomy, clinical anatomy, comparative anatomy, microbiology, biochemistry, pathology, parasitology, physiology, and pharmacology. In general, these courses are taken by veterinary students during the first 2 years of the professional curriculum and by graduate students in other fields such as animal science, nutrition, and fisheries and wildlife management.

Veterinary Clinical Sciences—Professor Dale K. Sorensen, D.V.M., Ph.D., chairman. The Department of Veterinary Clinical Sciences includes faculty in the disciplines of medicine, surgery, radiology, obstetrics, public health, and diagnostic

veterinary medicine. Courses are offered in obstetrics, reproductive diseases, surgery, medicine, anesthesiology, radiology, preventive medicine, ophthalmology, dermatology, cardiology, urology, toxicology, clinical microbiology, epidemiology, food hygiene, public health, business methods, forensic veterinary medicine, and hereditary diseases of animals. These courses are principally taught to third- and fourth-year professional students enrolled in the College of Veterinary Medicine. Some of these courses are available to students enrolled in other collegiate units of the University.

Student Affairs

Student Council—The purpose of this council, composed of five elected representatives of the undergraduate and graduate student bodies of the College of Veterinary Medicine, is to advise the dean on matters which are of student concern, elect student representatives to certain faculty committees, and serve in a consultative capacity in matters of individual student grievances.

Honor System—Under the provisions of the Student Self-Government Honor System, the students of the College of Veterinary Medicine, rather than the faculty, monitor examinations and quizzes. The honor system is operated on the assumption that honesty prevails among the students. Students place themselves on their honor not to give or receive aid during examinations. Therefore, students are responsible for their own honesty.

If a student should observe dishonesty during an examination period, he may take some appropriate step at the time to halt the dishonest act or may report the incident later to the Honor Case Commission of the college. The Honor Case Commission, comprised of students from the various classes, considers confidentially the various aspects of the situations reported. If scholastic dishonesty has occurred, the commission recommends to the Committee on Admissions and Scholastic Standing of the faculty an appropriate penalty to be levied against the offending student.

The honor system is essentially a preventive rather than punitive system. New students are provided with an explanatory brochure on the honor system, and the system is explained during the program for new students by a member of the Honor Case Commission. Students may discuss the honor system further with members of the Honor Case Commission.

University of Minnesota, Student Chapter, American Veterinary Medical Association—This is the students' professional organization which performs a variety of functions on behalf of the student body and the college. Some of the major activities of the Student Chapter AVMA include: (1) sponsoring the annual College of Veterinary Medicine Open House (a Sunday in May); (2) sponsoring a Minnesota State Fair Booth; (3) maintaining a Speakers' Bureau which provides speakers for groups within 60 miles of the campus; (4) publishing semiannually *The Minnesota Veterinarian;* (5) sponsoring lectures by prominent scientists; and (6) sponsoring social events. In most instances, the Student Chapter AVMA activities represent joint efforts with the college, the alumni, and/or the Minnesota Veterinary Medical Association.

Phi Zeta—This national honor society of veterinary medicine, which recognizes and promotes scholarship and research in matters pertaining to the welfare

and diseases of animals, is known as Phi Zeta. The local chapter, among its activities, sponsors lectures by outstanding scientists in fields related to veterinary medicine.

St. Paul Board of Colleges—The board 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 attention of the colleges, and discusses matters of general interest to students and faculty.

St. Paul Campus Student Center—The Student Center Board of Governors (SCBG) guides the activities of the Student Center, the focal point of social activities on the St. Paul Campus. A varied recreational program is provided which enables the student to exercise and improve special skills and hobbies. Membership is drawn from the five colleges on the campus and includes graduate students and faculty.

St. Paul Campus Gymnasium—The St. Paul Campus Gymnasium provides extensive facilities including a swimming pool, tennis courts, basketball courts, handball courts, and equipment for a great variety of other sports. Students and their families may avail themselves of these facilities.

Other Activities—Students enrolled in the College of Veterinary Medicine have available to them a varied program of extracurricular activities. In a large institution such as the University of Minnesota, organized groups and facilities may be found which satisfy the needs and interests of all.

Student Services

The agencies listed below are available to provide student services at any time and may be consulted directly or by referral from a faculty adviser.

Student Housing Bureau — For help in finding a suitable room or apartment, a student may consult this bureau. The St. Paul Campus office is located at 190 Coffey Hall.

Student Counseling Bureau — This bureau provides help with and advice on personal problems and on problems of vocational choice. Representatives are available at 190 Coffey Hall. The Minneapolis Campus office is located in 101 Eddy Hall.

Student Activities Bureau — This bureau has offices in the Temporary North of Mines Building (Minneapolis Campus) and 190 Coffey Hall (St. Paul Campus). Representatives and program consultants from the St. Paul Campus Student Center, Coffman Memorial Union, and West Bank Union are helpful in planning and carrying out extracurricular activities.

Office of Student Financial Aid — If a student is in need of financial counseling or aid, he may contact the office located in 190 Coffey Hall.

Student Employment Service — For a part-time job on- or off-campus, a student may apply to the Student Employment Service, 30 Wulling Hall (Minneapolis Campus).

Study Skills — Help may be obtained for improvement of study skills such as reading at the Reading and Study Skills Center, 190 Coffey Hall (St. Paul Campus); 106 Eddy Hall (Minneapolis Campus); or at the Department of Rhetoric, 230 Agricultural Engineering Building (St. Paul Campus). The center can assist students who wish to improve their ability of concentration and ability in test taking.

Speech and Hearing Problems — A student who feels he has problems with his speech or hearing may contact the Speech and Hearing Clinic for consultation. Appointments for appraisal of problems or for clinical treatment can be made through the secretary at 190 Coffey Hall.

Veterans' Benefits — Office of Admissions and Records, 130 Coffey Hall (St. Paul Campus) and 105 Morrill Hall (Minneapolis Campus).

Adviser to Foreign Students — Foreign students should keep in contact with the adviser for foreign students, 190 Coffey Hall.

Health Problems — Consult the Health Service staff, University Health Service (St. Paul or Minneapolis Campuses).

Coordinator of Religious Activities — 190 Coffey Hall (St. Paul Campus) and 306 Walter Library (Minneapolis Campus).

Oasis — A student-sponsored service for help in finding special educational or curricular opportunities, 190 Coffey Hall.

Housing Facilities on the St. Paul Campus

The Off-Campus Housing Office, 190 Coffey Hall on the St. Paul Campus, has information about all types of housing available for students in the Twin Cities area. Listings of vacancies available in private homes, rooming houses, and apartments are provided.

Off-campus apartment rent varies from $110 to $275 per month for furnished or unfurnished units. A married student may find it advisable to come to the campus alone and take temporary housing until suitable quarters for his family are found.

Rents for single sleeping rooms range from $40 to $65 per month, and double rooms range from $40 to $50 per student per month. Eating accommodations are available in the University-operated Dining Center on a per-meal basis and in student-operated cooperatives close to campus.

Application forms for information concerning University-owned residence halls (Bailey Hall on the St. Paul Campus) are available. The average rental rate for 1973-74 is $401 per quarter. Further information may be secured by writing to the Housing Office, 312 15th Avenue Southeast, Minneapolis, Minnesota 55455.

Commonwealth Terrace Cooperative (University-owned, student-operated, married student housing) is located close to the St. Paul Campus. Applications for the cooperative are available at 190 Coffey Hall as well as at 1295 Gibbs Avenue, St. Paul, Minnesota. The one-bedroom units rent for $92 per month and the two-bedroom units for $106 per month, based on the 1973-1974 rates. The units are unfurnished except for stove and refrigerator. Rent includes all utilities, except telephone.

Mobile home parking space is not provided at the University, but there are private mobile home parks outside the Twin Cities limits and, upon request, a list of their locations will be provided.

Counselors in the Off-Campus Housing Office will assist students in locating suitable housing or students may use the listing service independently. Those with problems concerning their living environment should also talk with a counselor.

Estimated Yearly Expenses

Tuition, Student Services, and Laboratory Fees:

Resident ($493 per quarter)	$1,479
Nonresident ($1,073 per quarter)	$3,219
Microscope, Dissecting Set, Insurance on Equipment (first year only)	$400-600
Books, Laboratory Equipment, and Notes	$200-250

The above expenses do not include room and board, laundry and clothing expenses, as well as costs for recreation, travel, and other incidentals. For more information, see the current University of Minnesota *General Information Bulletin.*

Awards and Scholarships

Students in the College of Veterinary Medicine are eligible to compete for specific awards and scholarships in veterinary medicine as well as for scholarships available to all University students.

For additional information concerning awards and scholarships, contact either the Associate Dean for Professional Education, College of Veterinary Medicine, 301 Veterinary Science Building or the Office of Student Financial Aid, 107 Armory (Minneapolis Campus) or 190 Coffey Hall (St. Paul Campus).

Those awards and scholarships which are limited to veterinary medical students include the following:

Bob Monico Memorial Awards — Plaques are awarded to two senior students for excellence in equine medicine. These awards are in memory of Bob Monico, a senior student who was fatally injured in the summer of 1970 while vacationing in Norway.

Diamond Service Award — An annual award to a senior student, based on contributions to the Student Chapter of the AVMA, contributions to the College of Veterinary Medicine, and attainment of academic objective through persistence, tenacity, and perseverance.

Lee McDonald Memorial Award in Feline Medicine — Cash award to a senior student with expertise in feline medicine.

Veterinary Medicine General Award Fund — Awarded to a student in the College of Veterinary Medicine for outstanding scholarship.

Steve Gilbertson Award — Granted to a freshman student who is a member of a minority race.

Allen Products Scholarship — Awarded to assist a needy and deserving freshman student through his/her veterinary medical education.

Caleb Dorr — Annual cash awards are presented to the individual with the highest accumulative grade point average in the freshman, sophomore, and junior classes. The highest ranking individual in the graduating class is awarded a gold medal.

Minnesota Veterinary Medical Association — Two awards are given by the state association annually. A plaque is awarded to the outstanding senior student in clinical veterinary medicine. In addition, an annual cash award is given to a student based on need and scholarship.

Women's Auxiliary to the American Veterinary Medical Association — An annual cash award to the senior student who has made outstanding contributions to the student activities on the campus.

Women's 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.

Auxiliary to the Student Chapter of the American Veterinary Medical Association — Annual cash awards to students whose wives are members of the auxiliary.

Duluth Kennel Club Award — Cash awards made to outstanding junior students showing the most promise and interest in small animal medicine.

Carl Schlotthauer Memorial Surgery Award — This award is made to a senior veterinary student demonstrating outstanding ability in veterinary surgery.

H. C. H. Kernkamp Student Award — This fund, provided through the generosity of the alumni of the college, awards an engraved plaque to a senior in recognition of student contributions to the profession of veterinary medicine.

Harvey H. Hoyt Memorial Scholarship Award — An annual award granted 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.

Ned E. Olson Memorial Scholarship Award — An annual award granted in memory of Dr. Ned E. Olson to the senior student in the College of Veterinary Medicine who has demonstrated the greatest proficiency and professional promise in the field of large animal medicine.

R. Steven Kufrin Memorial Award in Veterinary Surgery — An award for the outstanding junior student in the field of large animal surgery.

Merck Veterinary Medicine Award — A *Merck Veterinary Manual* is awarded to a junior and a senior student in the College of Veterinary Medicine on the basis of their scholastic records and dedication to clinical veterinary medicine.

Caleb Dorr Special Scholarship Prizes — An award is presented to all students in the Colleges of Agriculture, Forestry, Home Economics, and Veterinary Medicine who have had 2 or more quarters of work in these colleges with an accumulative GPA of 3.50 or better.

Alpha Zeta Traveling Scholarship — When a veterinary medical student receives this award, it is used to help defray the expenses of sending the president of the student chapter to the annual meeting of the American Veterinary Medical Association.

Twin Ports Dog Training Club Award — An annual cash award to a senior student who intends to specialize in the care of small animals.

Women's Auxiliary to the Wisconsin Veterinary Medical Association — A scholarship is awarded to a Wisconsin resident who is enrolled as a junior in a college of veterinary medicine. The selection is made on the basis of grade point average.

Upjohn Awards — A cash award is presented to each of two senior students, one for proficiency in large animal clinical medicine and one for proficiency in small animal clinical medicine.

Pfizer Award — This is a cash award presented to a junior student on the basis of scholarship, leadership, and financial need.

Minneapolis Kennel Club Scholarship in Veterinary Medicine — This scholarship was established to provide recognition and financial assistance to qualified students in veterinary medicine at the University of Minnesota. Preference is given to (a) residents of Minnesota with (b) special interest in the treatment of small animals.

Loans and Financial Aids

In general, it is the responsibility of the interested student to obtain, to complete, and to submit appropriate application forms for loans and financial aids. Loans and scholarships which are administered by the Office of Student Financial Aid of the University of Minnesota or by the Women's Auxiliary of the American Veterinary Medical Association are as follows:

The Women's Auxiliary of the American Veterinary Medical Association has funds for loans which may be made to junior, senior, or graduate students in veterinary medicine. The limit of indebtedness is $1,000. The interest rate is 4 percent per annum.

The Reuel Fenstermacher Student Loan Fund for Veterinary Medicine has been established to provide loan assistance to needy students in the College of Veterinary Medicine who are making satisfactory progress toward a degree from the college and who indicate a sincere intention of completing the requirements for the degree. The limitations and interest rate are the same as those listed under University of Minnesota student loan funds.

Health Professions Student Loan Program — Federal Health Professions Student Loans are available to students in the College of Veterinary Medicine. Maximum loans under the federal program are $3,500 per year, but the average loan generally will be less than this amount. Information and application forms may be obtained from the Office of Student Financial Aid, 107 Armory (Minneapolis Campus) or 190 Coffey Hall (St. Paul Campus).

Health Professions Scholarship Program — These funds are intended to provide assistance "to students of exceptional financial need who need such financial assistance to pursue a course of study . . ." Maximum scholarships are $3,500 per year, with the average award considerably smaller than this. This aid is "packaged" with Health Professions loans, and it is not necessary to file separate applications for each. It is possible for a student to be eligible for Health Professions loans but not for Health Professions scholarships. However, students should not expect to receive a scholarship without taking a loan.

Federally Insured Student Loans — Loans of up to $2,500 per year are often available from your local lending agency if it participates in the Federally Insured Student Loan Program. It is the applicant's responsibility to complete arrangements with his lender. Many lending agencies limit these loans to regular customers or dependents of regular customers, and not all participate in the program. The federal government will pay the 7 percent simple interest while the student is in school if the student qualifies via a uniform needs analysis system. Repayment installments and 7 percent simple interest are paid by the student beginning 9 to 12 months after graduation or termination of study. Application forms are provided by the Office of Student Financial Aid, 107 Armory (Minneapolis Campus) or 190 Coffey Hall (St. Paul Campus), and by your lending institution. If you obtain the basic application forms from your lending institution, you will need additional forms provided by the University offices named above.

The Women's Auxiliary to the Minnesota Veterinary Medical Association provides funding for loans which can be arranged on short notice for students enrolled in the college in amounts up to $500.

A **University of Minnesota Loans Fund** was established by the Board of Regents in 1973 providing loans to students in the health professions. These loans are limited to the amount of the differential between the 1972-73 tuition and current tuition. The interest rate is 7 percent per annum. Those who apply for regular financial aid need not apply, as the differential will be covered in needs analysis. Apply at 190 Coffey Hall, St. Paul Campus.

II. CURRICULA AND ADMISSION REQUIREMENTS

Preparation for a career in veterinary medicine requires completion of the minimum course requirements of the preprofessional curriculum and the 4-year professional curriculum for the doctor of veterinary medicine (D.V.M.) degree granted by the College of Veterinary Medicine. The preprofessional curriculum may be completed at the University of Minnesota or at any accredited college that offers the required courses.

Human Rights—The Board of Regents has committed itself and the University of Minnesota to the policy that there shall be no discrimination in the treatment of persons because of race, creed, color, sex, or national origin. This is a guiding policy in the admission of students in all colleges and in their academic pursuits. It is also to be a governing principle in University-owned and University-approved housing, in food services, student unions, extracurricular activities, and all other student and staff services. This policy must also be adhered to in the employment of students either by the University or by outsiders through the University and in the employment of faculty and civil service staff.

High School Preparation

The student who plans to enter college in a pre-veterinary medical program should give consideration to taking all the mathematics and science courses available to him in his high school program of studies. In addition, completion of trigonometry while in high school is recommended as the student with an acceptable performance will not be required to take trigonometry at the college level. The prospective student is also encouraged to include biology, chemistry, and physics in his high school program.

Pre-Veterinary Curriculum

A minimum of 90 quarter-credit hours of college-level course work is required of all students prior to entrance into the College of Veterinary Medicine. All course work applicable toward meeting the minimum pre-veterinary requirements should be evaluated with the A-N letter grading system, except when a college does not offer a course under that grading system or advanced placement (exemption) is given.

Distribution Requirements—The University of Minnesota believes that all of its students, whatever their area of specialization or their vocational goals, should hold in common the search for a liberal education. In the broadest sense, a liberal education is one which frees us from the limitations placed on our powers of judgment and choice by ignorance. More specifically, a liberal education asks of us that we seek control over the general intellectual instruments for acquiring and communicating knowledge, primarily the instruments of language and number; that we seek understanding of the ways in which scientists contribute to man's knowledge of himself and of his environment; that we seek historical and philosophical perspective on the nature of our own lives and of the world in which we live; and that we seek appreciation of the creative insights into life and

nature provided by literature and the arts. To help students achieve the goals of liberal education, the College of Veterinary Medicine expects that some part of each student's preprofessional course work be in areas of study other than those most closely related to veterinary medicine.

Distribution requirements in liberal 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. All students entering the College of Veterinary Medicine fulfill these requirements prior to admission because the area requirements are incorporated in the minimum pre-veterinary requirements.

Required Areas of Study—The required areas of study, including the number of quarter credits for admission to the College of Veterinary Medicine, are as follows:

1. **Communication, Language, Symbolic Systems**

   Freshman English, Communication (8-12 credits)

   Normally the requirement for graduation of the college the student is attending.

   Mathematics (5-15 credits)

   Trigonometry (high school course is acceptable); college algebra (with prerequisite high school higher algebra) or pre-calculus or calculus.

   Public Speaking (3-5 credits)

2. **Physical and Biological Sciences**

   Chemistry (25-30 credits)

   The substantial equivalent of 3 quarters of general chemistry, 1 quarter of analytical chemistry, and 2 quarters of organic chemistry. All courses must include laboratory.

   Physics (10-15 credits)

   To include mechanics, heat, sound, light, electricity, magnetism, and atomic physics.

   Biology (10-12 credits)

   To include general biology and animal biology or animal biology and plant biology.

3. **Man and Society** (8 or more credits)

   Economics

   An introductory course.

   Other

   Additional courses chosen from anthropology, economics, geography, history, political science, psychology, social science and/or sociology.

4. **Artistic Expression** (8 or more credits)

   Art, literature, music, humanities, or theatre.

5. **Electives**

   Electives may be selected on the basis of the student's interest in a broad educational program. Courses in literature, history, humanities, linguistics, and related areas would help students to strengthen their understanding of their fellowman and to broaden their enjoyment of literature and the arts. Courses in animal nutrition and business management would be useful for those planning to enter practice. Additional science and mathematics courses would help prepare one for academic or research careers. Those lacking experience and knowledge of food-producing animals may wish to elect courses in the animal sciences.

Recommended Pre-Veterinary Courses—Twin Cities Campuses, University of Minnesota:

1. **Communication, Language, Symbolic Systems**
   Freshman English — Communication required of the college in which you are enrolled
   Math 1008 — Trigonometry and Math 1111 — College Algebra, Analytic Geometry
   (or) Math 1141 — Algebra Probability, Pre-Calculus
   (or) Math 1142 — Introduction to Calculus
   Rhetoric 1222 — Public Speaking
   (or) Spch 1101 — Fundamentals of Speech
2. **Physical and Biological Sciences**
   Chem 1004, 1005 — General Principles of Chemistry
   Chem 1006 — Principles of Solution Chemistry
   Chem 3100, 3101 — Quantitative Analysis
   Chem 3301, 3302 — Elementary Organic Chemistry
   Phys 1031, 1032 — Introductory Physics
   Biol 1011 — General Biology
   Biol 1106 — General Zoology
3. **Man and Society**
   AgEc 1020 — Principles: Macroeconomics
   (or) Econ 1001 — Principles: Macroeconomics
   (or) Econ 1002 — Principles: Microeconomics
   For additional courses to total 8 or more credits, see Group Distribution Course List, *College of Liberal Arts Bulletin.*
4. **Artistic Expression**
   See Group Distribution Course List, *College of Liberal Arts Bulletin,* for selection of courses to total 8 or more credits.
5. **Electives**
   For additional courses, see suggestions listed above.

Special Services For Prospective Students

Special Meetings for Applicants—The University of Minnesota Pre-Veterinary Medicine Club arranges two meetings each year which are of special interest to applicants to the College of Veterinary Medicine. Prior to November 15, the deadline for application, a panel discussion on admission to the College of Veterinary Medicine is presented. During the winter quarter, microscopes presently in use by the first-year class are on display, and specifications of this required piece of equipment are reviewed.

Applicants interested in attending these meetings should write directly to:

The Vice President
Pre-Veterinary Medicine Club
301 Veterinary Science Building
University of Minnesota
St. Paul, Minnesota 55101

Prospective Student Advising—Faculty advising for students enrolled in the College of Agriculture is provided by the Office of the Associate Dean for Professional and Undergraduate Education, 301 Veterinary Science Building. This office also provides assistance in program planning for students in high school or

in other colleges who plan to apply for admission to the College of Veterinary Medicine. High school counselors and collegiate advisers are urged to contact this office for advising assistance regarding preparation for admission to the College of Veterinary Medicine.

Professional Curriculum

Procedure for Applying for Admission—Enrollment in the professional curriculum of the College of Veterinary Medicine is limited. Admission requirements must be satisfied before or during the academic year in which the student makes application. Students enter the professional program only at the beginning of the fall quarter each year. Application materials should be obtained from the Office of Admissions and Records, 130 Coffey Hall, University of Minnesota, St. Paul, Minnesota 55101. The prospective student should request the application packet used specifically for application to the College of Veterinary Medicine, which is available only from the St. Paul Campus Office of Admissions and Records. Graduate School and/or Advanced Standing applications used by other programs at the University are not appropriate and use of such forms only causes delays in processing until the correct materials are submitted.

All candidates are required to take the Veterinary Aptitude Test (Psychological Corporation) and the Minnesota Multiphasic Personality Inventory. Further information concerning these tests will be provided with admission materials.

The completed application form for admission should be returned to the Office of Admissions and Records as soon as possible, but not later than November 15 preceding the fall quarter the student wishes to enroll (approximately 1 year prior to desired entrance).

Students who have taken their pre-veterinary work at colleges or universities other than the University of Minnesota must submit or have forwarded to the Office of Admissions and Records two complete transcripts at the time of application. All applications submitted (unless the applicant was previously registered at the University of Minnesota) must be accompanied by a $10 credentials examination fee. Applications which are not submitted with the credentials examination fee will not be considered. Remittance by check, money order, or bank draft should be made payable to the University of Minnesota and be securely attached to the application form. Please do *not* send cash. Each term, as subsequent course work is completed, the applicant is responsible for submitting additional transcripts to the Office of Admissions and Records.

Selection of Candidates—Students are selected for admission to the first year of the professional curriculum on the basis of their scholastic attainment, their performance on tests required for admission, as well as their interest in and character and personal fitness for a career in veterinary medicine. Preference is given to residents of Minnesota, followed by residents of adjoining states which do not have veterinary medical schools. Applications of other nonresidents who have special reasons for attending the College of Veterinary Medicine at the University of Minnesota may be considered.

In the selection of candidates for admission to the College of Veterinary Medicine, a personal interview by members of the veterinary faculty or other persons designated by the dean of the college may be required. Candidates may be granted a final acceptance, a provisional acceptance, a delay in decision pend-

ing receipt of further information (grades, references, test results), or may be informed that their application is no longer being considered for admission to the class.

If, after having been granted a provisional acceptance, the candidate maintains an academic record of at least the quality exhibited at the time of provisional acceptance and in all other respects gives promise of becoming a successful student, the committee will authorize a final acceptance. A final decision will not be made on an applicant in this category until a transcript showing the completion of the pre-veterinary medical requirements has been received and evaluated.

Procedure Following Application—All correspondence relative to any application or to admission requirements of the College of Veterinary Medicine should be sent, in writing, to the Office of Admissions and Records, 130 Coffey Hall, University of Minnesota, St. Paul, Minnesota 55101. Accepted applicants will receive a statement for a preliminary fee of $50 to be applied to the tuition for the first quarter. This fee must be paid within a specific period of time after receipt of the statement and is nonrefundable after July 1.

Registration—If you are accepted for admission, the dates and detailed instructions for registering will be included in the information that is sent to you. New students who do not register within 24 hours of the announced deadline for registration will be dropped from the admission list.

Equipment—Each student is required to provide his own microscope and will receive information as to the necessary minimum specifications of the microscope at the time of acceptance. If a used microscope is being considered for purchase, it is necessary to have the equipment examined and approved by the college. In addition to a microscope and textbooks, the student will be expected to purchase certain special items of clothing and some instruments.

Degrees Offered—The College of Veterinary Medicine will recommend students for the following degrees:

Bachelor of Science (B.S.) Degree. Major: Veterinary Science. Awarded following completion of the first 2 years of studies in veterinary medicine with a grade point average of 2.00 or above and completion of a minimum of 200 credit hours, of which 110 credits are completed in the College of Veterinary Medicine. Students taking the B.S. degree must have completed the distribution requirements in liberal studies established by the Council on Liberal Education of the University of Minnesota and recommended for all programs leading to the Bachelor's degree conferred by the University.

Doctor of Veterinary Medicine (D.V.M.) Degree. Awarded following satisfactory completion of the 4 years of the professional curriculum with a grade point average of 2.00 or above and completion of a minimum of 245 credit hours in the professional curriculum.

Honors—Students completing the first 2 years in the college may graduate "with distinction" if they have maintained a grade point average of 3.00 or above and "with high distinction" if they have maintained a grade point average of 3.50 or above while enrolled in the college.

Course Requirements—All members of a given class follow a 4-year curriculum based on the standards established by the Council on Education of the

American Veterinary Medical Association. The course requirements for the first 3 years are similar for a given class, the first 2 of which are devoted to courses in the basic sciences, including anatomy, biochemistry, pathology, parasitology, pharmacology, physiology, and microbiology.

Beginning with the second year, clinical experience is gained, and examination of the fundamentals of normal and abnormal functions of the body is integrated into the course of study and expanded upon in relation to the prevention of diseases. Summer clinics are required between the third and fourth years. Elective credits in the fourth year are selected on the basis of the student's interest in food-producing or companion-type animals as well as other fields of special interest. Required courses for the D.V.M. degree and elective courses available to fourth-year students are identified in this bulletin in the Description of Courses section.

Animal Technician Program—The College of Veterinary Medicine does not offer an animal technician program. Interested students should contact the University of Minnesota Technical College—Waseca, Waseca, Minnesota 56093 for information on its 2-year program.

III. DESCRIPTION OF COURSES

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

§ Credit will not be given if the equivalent course listed after the section mark has been taken for credit.
♯ Means "consent of instructor is required."
△ Means "consent of division, department, or school offering course is required."
f,w,s,su Following course number indicate fall, winter, spring, or summer quarters.

A hyphen between course numbers (3142-3143-3144) indicates a sequence of courses which must be taken in the order listed.

A common between course numbers (1234, 1235, 1236) indicates a series of courses which may be entered any quarter.

Courses required for the D.V.M. degree are listed according to the departments which offer them, with the exception of the following two courses which must be completed in the first year.

GCB 3022. GENETICS. (4 cr)
Offered by the Department of Genetics and Cell Biology, College of Biological Sciences.

MdBc 5600, 5601. PHYSIOLOGICAL CHEMISTRY. (12 cr)
Offered by the Department of Biochemistry, Medical School.

Elective courses available to fourth-year students are identified in groupings entitled "Other Course Offerings" and are listed by departments.

Department of Veterinary Biology (VB)

Professor

Sidney A. Ewing, D.V.M., Ph.D., *dean*
Benjamin S. Pomeroy, D.V.M., Ph.D., *associate dean, research and graduate education*
Everett C. Short, D.V.M., Ph.D., *associate dean, professional and undergraduate education*
Harold E. Dziuk, D.V.M., Ph.D., *chairman*
Donald M. Barnes, D.V.M., Ph.D.
Thomas F. Fletcher, D.V.M., Ph.D.
Archie L. Good, V.M.D., Ph.D.
Henry J. Griffiths, D.V.M., Ph.D.
Kenneth H. Johnson, D.V.M., Ph.D.
Robert K. Lindorfer, Ph.D.
Keith I. Loken, D.V.M., Ph.D.
Victor Perman, D.V.M., Ph.D.
Alvin F. Weber, D.V.M., Ph.D.

Associate Professor

William J. Bemrick, Ph.D.
Caroline Czarnecki, Ph.D.
Wendell J. DeBoer, Ph.D.
Gary E. Duke, Ph.D.
Grace W. Gray, Ph.D.
Everett H. Heath, V.M.D., Ph.D.
Edward F. Jankus, D.V.M., Ph.D.
Sally E. Jorgensen, Ph.D.
Harold J. Kurtz, D.V.M., Ph.D.
John C. Schlotthauer, D.V.M., Ph.D.
Richard E. Shope, Jr., D.V.M., Ph.D.
Jerry B. Stevens, D.V.M., Ph.D.
John P. Sullivan, D.V.M., Ph.D.

Assistant Professor

Sushil K. Gomer, Ph.D.
Robert F. Hammer, D.V.M., Ph.D.
Walter J. Mackey, D.V.M., M.P.H.
S. K. Maheswaran, D.V.M., Ph.D.
Terrance P. O'Leary, D.V.M., Ph.D.
Kent M. Van De Graaff, Ph.D.

Research Associate

Domadar R. Deshmukh, B.V.S., Ph.D.
Mahesh C. Kumar, D.V.M., Ph.D.

Instructor

Taisan Chiu, D.V.M., M.S.
Keith A. Johnson, D.V.M.
Gary R. Kuehn, D.V.M.
James A. Majka, D.V.M.

Assistant Instructor

Charles J. Smith, D.V.M.
Norman J. Wilsman, D.V.M., M.S.

Research Fellow

James L. Wilkus, D.V.M., M.P.V.M.

Lecturer

Donald W. Luchsinger, D.V.M.
Francis E. Siegfried, D.V.M.

REQUIRED COURSE OFFERINGS

5100. ANATOMY OF THE DOG. (5 cr; prereq ‡)
Detailed study of gross anatomic structure and function. The dog is utilized as a type species to introduce nomenclature and principles of mammalian gross anatomy; comparisons are made with the cat.

5101. VETERINARY COMPARATIVE ANATOMY. (5 cr; prereq 5100, ‡)
Comparative study of the structural and functional gross morphologic features of domestic animals, including horses, cattle, sheep, and swine. A survey of the structure of the chicken is included.

5102. VETERINARY NEUROANATOMY. (3 cr; prereq ‡)
Structural and functional features underlying the organization of the central nervous system and special senses. The dog is utilized as a type species in studying gross and microscopic relationships.

5103. COMPARATIVE PRENATAL DEVELOPMENT OF DOMESTIC ANIMALS. (3 cr; prereq ‡)
Fundamental concepts of embryonic development; microscopic and gross anatomic studies of the origin and development of organ systems; morphologic considerations of fetal-maternal relationship; study of developmental anomalies.

5104-5105-5106. MICROSCOPIC ANATOMY OF DOMESTIC ANIMALS. (4 cr for 5104, 5 cr for 5105, 2 cr for 5106; prereq ‡)
Light microscopic and relevant ultrastructural studies of cells, tissues, and organ systems.

5126. VETERINARY CLINICAL ANATOMY. (3 cr; prereq 5100, 5101, ‡)
Topographical anatomy of domestic animals relating structure to clinical veterinary medicine and surgery.

5127. TOPICS IN CLINICAL ANATOMY. (1 cr; prereq 5126, ‡)
Each student will prepare a paper based on a morphologic investigation of clinical interest.

5306-5307-5308-5309. ANIMAL PHYSIOLOGY. (4 cr for 5306 [lect], 2 cr for 5307 [lab], 3 cr for 5308 [lect], 2 cr for 5309 [lab]; prereq 5120, MdBc 5601, or equiv or ‡)
Physiology of the circulatory, respiratory, digestive, urinary, and nervous systems, and special senses in animals.

5310. MAMMALIAN ENDOCRINOLOGY AND REPRODUCTION. (3 cr; prereq 1300 or 6 cr systemic physiology or ‡)
(Same as AnSc 5310, Zool 5310) Physiological effects of the endocrine organs and hormones.

5400-5401. VETERINARY PHARMACOLOGY. (6 cr for 5400, 4 cr for 5401; prereq 5309 or equiv or ‡ for 5400...5400 or equiv or ‡ for 5401)
General principles of drug action; pharmacology of ions, autonomic drugs, neuromuscular drugs, gastrointestinal drugs, antihistamines, cardiovascular drugs, diuretics, steroids, local and general anesthetics, analgesics, analeptics, tranquilizers, antibiotics, anthelmintics, antiprotozoan drugs, others; applications to domestic animals.

5501. GENERAL VETERINARY PATHOLOGY. (5 cr; prereq ‡)
Study of basic mechanisms and concepts relating to reaction of tissue to injury, with emphasis on gross and microscopic interpretation of retrogressive cellular changes, cell death, cellular infiltrations, inflammation, and neoplasia.

5502-5503. SPECIAL VETERINARY PATHOLOGY. (5 cr for 5502, 4 cr for 5503; prereq 5501 or ‡)
Study of reactions of specific systems to injury, with emphasis on 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 laboratory tests used in clinical diagnosis.

5601. VETERINARY PARASITOLOGY. (5 cr; prereq 5501 or ‡)
Systemic and biologic study of the protozoan and arthropod parasites of animals. Emphasis placed on their relationships to diseases and principles of parasite control.

5602 VETERINARY PARASITOLOGY. (4 cr; prereq ‡)
Helminth parasites and parasitic diseases of animals, with emphasis on principles of control.

5701. GENERAL VETERINARY MICROBIOLOGY AND IMMUNOLOGY. (5 cr; prereq 10 cr chemistry, 4 cr biological sciences)
Lectures and laboratory on the classification, morphology, taxonomy, genetics, physiology, and ecology of microorganisms. Practical application of fundamental principles of microbiology to other phases of science and industry.

5702. PATHOGENIC BACTERIA AND FUNGI. (5 cr; prereq 5701 or equiv or ‡)
Lectures and laboratory on animal pathogens, with emphasis on basic mechanisms of infection.

5703. VETERINARY VIROLOGY. (5 cr; prereq 5702 or equiv or ‡)
Lectures and laboratory on basic techniques of virology; emphasis on viral and rickettsial agents causing animal diseases.

5704. POULTRY DISEASES. (3 cr; prereq 5703, 5503 or equiv or ‡)
Advanced lectures dealing with diseases, management, and feeding practices of current poultry production.

OTHER COURSE OFFERINGS

1120. ESSENTIALS OF VERTEBRATE DEVELOPMENT AND STRUCTURE. (5 cr; not open to veterinary medical students; prereq Biol 1106 or ‡)
Principles and patterns of vertebrate anatomy, based on the developmental approach.

1300. SYSTEMIC PHYSIOLOGY. (6 cr; not open to veterinary medical students; prereq Biol 1106, BioC 1301 or equiv)
(Same as AnSc 1300) Introduction to animal physiology, emphasizing the function of organs.

3103. GENERAL MICROBIOLOGY. (5 cr; not open to veterinary medical students; prereq 10 cr chemistry, 4 cr biological sciences)
Lectures and laboratory exercises concerning the morphology, taxonomy, genetics, physiology, and ecology of microorganisms. Practical application of fundamental principles of microbiology to other phases of science and industry.

3305. REPRODUCTIVE PHYSIOLOGY, ARTIFICIAL INSEMINATION AND LACTATION. (5 cr; prereq 1300)
(Same as AnSc 3305) Functions of the reproductive organs, fertilization, the estrous cycle and its endocrine control, reproductive efficiency, and problems and principles of artificial insemination. Anatomy, physiology, and biochemistry of the mammary gland. Mammary growth, initiation and maintenance of lactation, milk synthesis, and factors influencing the lactation curve.

5120. ESSENTIALS OF VERTEBRATE DEVELOPMENT AND STRUCTURE.
Same as 1120.

5134. CANINE CLINICAL NEUROLOGY. (1 cr; prereq regis vet med, 4th yr or grad or ‡)
Anatomic and physiologic bases for the neurological examination of the dog discussed.

5140. COMPARATIVE VERTEBRATE MICROSCOPIC ANATOMY. (5 cr; prereq 5120 or ‡)
Comparative studies of tissues and organs of representative examples of vertebrates.

5314. BEHAVIORAL PHYSIOLOGY. (3 cr; prereq 1300 or 6 cr systemic physiology, Biol 5051 or ‡)
(Same as AnSc 5320) Current concepts of neurological and neurochemical bases of animal behavior, including reception, coding, transmission, and storage of information; levels of integration, central control of input and output; spontaneity, development, and learning.

5320w. AVIAN PHYSIOLOGY. (3 cr; prereq 1300 or 6 cr systemic physiology or equiv, ‡; offered 1974 and alt yrs)
(Same as AnSc 5313, Zool 5313) Physiology of various species of wild and domestic birds.

5321s. ADVANCED AVIAN PHYSIOLOGY. (1 cr; offered 1974 and alt yrs)
(Same as AnSc 5321) Survey of the physiology of some phenomena characteristic of nondomestic avian and mammalian species; annual reproductive cycles, circadian rhythms, hibernation, and torpidity.

5322. PHYSIOLOGY OF REPRODUCTION. (5 cr; prereq 6 cr systemic physiology)
(Same as AnSc 5322) Principles of reproductive physiology, with emphasis on endocrinologic aspects.

5323w. COMPARATIVE PATTERNS OF VERTEBRATE REPRODUCTION. (4 cr; prereq 5322 or ‡; offered 1974 and alt yrs)
(Same as AnSc 5323) Comparative patterns, endogenous and exogenous rhythms, and the control of estrus cycles.

5324s. SEMEN PRESERVATION AND ARTIFICIAL INSEMINATION. (4 cr; prereq 5322 or ‡; offered 1974 and alt yrs)
(Same as AnSc 5324) Chemistry of gametes and reproductive secretions; preservation of spermatozoa, with emphasis on cryogenic methods; artificial insemination; and factors influencing reproductive performance.

5325w. PHYSIOLOGY OF FERTILIZATION AND GESTATION. (4 cr; prereq 5322 or ‡; offered 1975 and alt yrs)
(Same as AnSc 5325) Physiological events occurring during gametogenesis, capacitation, fertilization, the period of embryo, the period of fetus, and parturition discussed.

5326s. IMMUNOREPRODUCTION. (4 cr; prereq 5322 or ‡; offered 1975 and alt yrs)
(Same as AnSc 5326) Blood groups and polymorphic proteins affecting reproduction, immunoglobulin formation, antigens of semen, ova and genital secretions, immunopathology, maternal-fetal incompatibility, antibodies to hormones.

5511. DISEASES OF THE PIG. (2 cr; prereq regis vet med, 4th yr or grad or ‡)
Illustrated lectures on the pathogenesis and pathology of porcine diseases, with emphasis on the differential etiologic diagnosis of common clinical disease syndromes.

5512. INFECTIOUS AND NONINFECTIOUS DISEASES OF THE CAT. (1 cr; prereq regis vet med, 4th yr or grad or ‡)
Illustrated discussions of the gross and microscopic pathology and pathogenesis of common nutritional, viral, bacterial, mycotic, and neoplastic diseases of cats.

5513. DISEASES OF FUR-BEARING ANIMALS. (2 cr; prereq 5503, regis vet med, 4th yr or grad or ‡)
Etiology, symptomatology, and treatment of diseases of fur-bearing animals.

5514. DIAGNOSTIC POULTRY PATHOLOGY. (2 cr; prereq regis vet med, 4th yr or grad or ‡)
Diagnosis of spontaneous diseases of chickens, turkeys, ducks, geese, and captive and wild gamebirds.

5515. DIAGNOSTIC GROSS PATHOLOGY OF INFECTIOUS DISEASES IN LARGE ANIMALS. (2 cr; prereq regis vet med, 4th yr or grad or ‡)
Diagnostic procedures relating to gross lesions and background of disease outbreak.

5603. PARASITES OF WILDLIFE. (3 cr; prereq ‡)
Economic and biologic relationships of animal parasites and disease to regional wildlife.

5604. DISEASES OF WILDLIFE. (3 cr; prereq ‡)
Economic and biologic relationships of infectious and noninfectious diseases of wildlife.

5706. LABORATORY ANIMAL MEDICINE. (2 cr; prereq regis vet med, 4th yr or grad or ‡)
A series of lectures, discussions, and demonstrations on various aspects of care and management of the numerous species of laboratory animals found in a research situation. Subject matter includes diseases, nutrition, zoonoses, gnotobiotics, restraint, anesthesia, and environmental practices. Tours made of laboratory animal colonies, both commercial and institutional.

5707. POULTRY DISEASE CONTROL. (3 cr; not open to veterinary medical students; prereq Biol 1002 and AnSc 1100, MicB 3103 or equiv)
General anatomy; physiology of digestion and reproduction; prevention and control of the more important diseases affecting poultry.

5709. POULTRY DISEASE PREVENTION AND NUTRITION. (3 cr; prereq regis vet med, 4th yr or grad or ‡)
Principles and applications of preventive poultry disease programs; management and nutrition.

5748. PROBLEMS IN VETERINARY MICROBIOLOGY AND PUBLIC HEALTH. (Cr ar; prereq 5703 or equiv, ‡)

ADVANCED CREDIT COURSE OFFERINGS

5148. SEMINAR: VETERINARY ANATOMY
5149. TOPICS OF ORGANOLOGY
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
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
8330. SEMINAR: PHYSIOLOGY AND/OR PHARMACOLOGY
8335. PHYSIOLOGICAL AND PHARMACOLOGICAL RESEARCH TECHNIQUES IN LARGE ANIMALS
8349. RESEARCH IN PHYSIOLOGY
8448. PROBLEMS IN VETERINARY PHARMACOLOGY
8500. SEMINAR: VETERINARY PATHOLOGY
8530. ONCOLOGY
8531. VETERINARY NECROPSIES
8532. COMPARATIVE NEUROPATHOLOGY
8533. PROBLEMS: PATHOLOGY
8534. PROBLEMS: CLINICAL PATHOLOGY
8600. ADVANCED VETERINARY PARASITOLOGY
8648. PROBLEMS IN VETERINARY PARASITOLOGY
8700. SEMINAR: VETERINARY MICROBIOLOGY
8720. ADVANCED VETERINARY MICROBIOLOGY
8721. ADVANCED POULTRY DISEASES
8722. ADVANCED COMPARATIVE IMMUNOCHEMISTRY AND IMMUNOBIOLOGY
8723. ADVANCED METHODS IN VETERINARY IMMUNOLOGY
8724. ADVANCED VETERINARY DIAGNOSTIC MICROBIOLOGY
8725. CELL CULTURE TECHNIQUES

Department of Veterinary Clinical Sciences (VCS)

Professor

Timothy H. Brasmer, D.V.M., Ph.D., *associate dean, veterinary medical services*
James O. Hanson, D.V.M., *director, continuing education and project leader, veterinary extension*
Dale K. Sorensen, D.V.M., Ph.D., *chairman*
Robert K. Anderson, D.V.M., M.P.H.
John P. Arnold, D.V.M., Ph.D.
Stanley L. Diesch, D.V.M., M.P.H.
Griselda F. Hanlon, D.V.M., M.S.
John M. Higbee, D.V.M.
Donald W. Johnson, D.V.M., Ph.D.
George W. Mather, D.V.M., Ph.D.
Glen H. Nelson, D.V.M.
Jay H. Sautter, D.V.M., Ph.D.
Leonard M. Schuman, M.D.
Wesley W. Spink, M.D.
Francis A. Spurrell, D.V.M., Ph.D.
Hannis L. Stoddard, D.V.M., D.T.V.M.
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

John F. Anderson, D.V.M., M.S.
Kirk N. Gelatt, V.M.D.
Carl R. Jessen, D.V.M., Ph.D.
LaRue Johnson, D.V.M., Ph.D.
Vaughn L. Larson, D.V.M., Ph.D.
James A. Libby, D.V.M., M.S.
Victor S. Myers, D.V.M., M.S.
Carl A. Osborne, D.V.M., Ph.D.
Larry J. Wallace, D.V.M., M.S.

Assistant Professor

Louis F. Archbald, D.V.M., Ph.D.
Terrance D. Braden, D.V.M., M.D.
Ralph J. Farnsworth, D.V.M., M.S.
Steve C. Haskins, D.V.M., M.S.
Jerry D. Hilgren, D.V.M., M.S.
E. Hunt McCauley, D.V.M., M.S.
Patrick J. McKeever, D.V.M., M.S.
Phillip N. Ogburn, D.V.M., Ph.D.
Raymond B. Solac, D.V.M.
Ronald E. Werdin, D.V.M., Ph.D.

Clinical Assistant Professor

Robert A. Wescott, D.V.M.

Research Associate

Kem A. Pomeroy, Ph.D.
Loren A. Will, D.V.M.

Instructor

Loren H. Appell, D.V.M.
Frank C. Cassidy, D.V.M.
Robert M. Hardy, D.V.M.
John P. Hurtgen, D.V.M.
Raymond J. McClure, Jr., D.V.M.
Kenneth R. Torrey, D.V.M.

Assistant Instructor

Paul C. Gambardella, D.V.M.
Jill R. McClure, D.V.M.
J. B. Miller, D.V.M.
D. Michael Rings, D.V.M.

Veterinary Medical Associate

Robert R. Bruner, Jr., D.V.M.
Scot L. Eustis, D.V.M.
J. C. Foor, D.V.M.
David L. Kolde, D.V.M.
S. H. Krum, D.V.M.

Lecturer

Pedro N. Acha, D.V.M., M.P.H.
Thornton Anderson, LL.B.
Paul J. Cox, D.V.M., M.P.H.
Jack C. Flint, D.V.M.
Clare C. Hamilton, D.V.M.
Alfred G. Karlson, D.V.M., Ph.D.
Robert Nelson, D.V.M.
Richard L. Parker, D.V.M., M.P.H.

REQUIRED COURSE OFFERINGS

5150. VETERINARY PHYSICAL DIAGNOSIS. (2 cr; prereq ‡)
Fundamentals of clinical veterinary medicine, procedures of physical diagnosis, and restraint of animals.

5151, 5152. DIAGNOSTIC AND THERAPEUTIC TECHNIQUES. (2 cr for 5151, 1 cr for 5152; prereq ‡)
Demonstration and application of diagnostic techniques and procedures. Discussions of therapeutic regimens and demonstrations of therapeutic procedures.

5160. LARGE ANIMAL MEDICINE. (6 cr; prereq 5150 or ‡)
Study of diseases of the cutaneous, musculoskeletal, respiratory, cardiovascular, hemic, and lymphatic systems of large domestic animals.

5161. LARGE ANIMAL MEDICINE. (6 cr; prereq 5160 or ‡)
Study of diseases of the digestive, urinary, endocrine, and nervous systems, and organs of special sense of large domestic animals.

5162. LARGE ANIMAL MEDICINE. (6 cr; prereq 5161 or ‡)
Study of 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.

5170. SMALL ANIMAL MEDICINE. (4 cr; prereq 5150 or ‡)
Introductory discussions of breeds, care, feeding, nutritional problems, and management of companion animals. Study of diseases of the cutaneous, musculoskeletal, respiratory, and cardiovascular systems of companion animals.

5171. SMALL ANIMAL MEDICINE. (3 cr; prereq 5170 or ‡)
Diseases of the hemic, lymphatic, digestive, urinary, genital, endocrine, and nervous systems of companion animals.

5172. SMALL ANIMAL MEDICINE. (4 cr; prereq 5171 or ‡)
Diseases of organs of special sense and discussion of infectious and toxic diseases of companion animals. Also includes discussions of diseases affecting pet birds and laboratory animals.

5180. PREVENTIVE MEDICINE AND APPLIED IMMUNOLOGY. (2 cr; prereq regis vet med, 4th yr or grad or ‡)
Principles and applications of preventive medical procedures for specialized practices. Includes a review of the principles of immunology and the clinical application of these principles.

5270. A SURVEY OF LAW AND BUSINESS METHODS. (3 cr; prereq ‡)
Business and legal procedures applicable to veterinary practice. Responsibilities of the veterinarian to the client, the public, and the profession.

5350. PRINCIPLES OF VETERINARY SURGERY. (4 cr; prereq 5150 or ‡)
General fundamentals of surgery as applied to the various tissues and systems of the body; principles of anesthesia; preoperative evaluation; postoperative care. Includes laboratory application.

5351. VETERINARY SURGERY. (5 cr; prereq 5350 or ‡)
Common surgical procedures of large and small animals.

5352. VETERINARY SURGERY. (3 cr; prereq 5351 or ‡)

5355. LARGE ANIMAL SURGERY LABORATORY.** (1 cr; prereq 5352 or ‡)

5356. SMALL ANIMAL SURGERY LABORATORY.** (1 cr; prereq 5352 or ‡)

5380. ANESTHESIOLOGY. (2 cr; prereq 5150)
Students learn the fundamentals of anesthesia of animals as used in veterinary hospitals and clinics.

5450. VETERINARY RADIOLOGY. (3 cr; prereq 5150 or ‡)
Preparation and interpretation of radiographs and fluoroscoptic examinations; consideration of radiant energy as a therapeutic agent; discussion of protective measures against radiation hazards.

5550. VETERINARY OBSTETRICS. (4 cr; prereq 5150 or ‡)
Lectures covering physiology and pathology of pregnancy, obstetrics, and diseases of the newborn. Laboratory practices in manipulative obstetrics.

5560. CLINICAL DIAGNOSIS IN ANIMAL REPRODUCTION. (4 cr; prereq 5150 or ‡)
Lectures, demonstrations, and laboratory practices covering diagnostic techniques and procedures.

5570. REPRODUCTIVE DISEASES OF DOMESTIC ANIMALS. (4 cr; prereq 5150 or ‡)
Lectures covering physiology and pathology of reproduction, artificial insemination, and breeding management.

5650. VETERINARY EPIDEMIOLOGY. (4 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 PUBLIC HEALTH. (4 cr; prereq VB 5703, 5503, or equiv or ‡)
Principles and practices of environmental health and food hygiene; includes meat, poultry, milk, and other foods as related to animal and human health. Selected diseases transmitted between animals and man.

5750-5751. CLINICS. (1 cr for 5750, 2 cr for 5751; prereq 5151, 5152, ‡)
An introduction to the medical, obstetrical, radiological, surgical, and laboratory examination of animals.

5760 or 5761-5762-5763. CLINICS. (6 cr for 5760 or 5761, 8 cr for 5762, 8 cr for 5763; prereq 5751 or ‡)
Laboratories for the application of principles and techniques of medicine, surgery, obstetrics, radiology, pathology, clinical pathology, parasitology, pharmacology, and physiology to the diagnosis, prognosis, treatment, prevention, and eradication of disease in domestic animals. 5760, 5761, 5763 also include clinical programs on the application of principles of public health.

** Either 5355 or 5356 is required for the D.V.M. degree.

5770. SPECIAL CLINICS. (8 cr; prereq 5763 or ‡)
Same as 5763 except that students may elect large animal clinics, small animal clinics, or a combination of both.

5780-5781-5782. CLINIC ROUNDS. (No cr; prereq ‡)
Discussion of clinical material in various areas within the University Veterinary Hospitals.

OTHER COURSE OFFERINGS

3502. ANIMAL HYGIENE. (5 cr; not open to veterinary medical students)
Principles of animal health and disease, with emphasis on prevention, control, and eradication.

5181. HERD HEALTH MANAGEMENT OF DAIRY CATTLE. (3 cr; prereq regis vet med, 4th yr or grad or ‡)
Principles and applications of programmed veterinary service to dairy herds.

5182. HERD HEALTH MANAGEMENT OF BEEF CATTLE, SWINE, SHEEP, AND HORSES. (3 cr; prereq regis vet med, 4th yr or grad or ‡)
Principles and applications of programmed veterinary service to these species of animals.

5183. PREVENTION AND CONTROL OF BOVINE MASTITIS. (1 cr; prereq 5162 or ‡)
A discussion of the principles and procedures used in the prevention and control of mastitis in dairy cattle. Includes the role of the milking machine, the use of laboratory procedures and their interpretation in solving herd problems.

5250. SMALL ANIMAL DERMATOLOGY. (2 cr; prereq regis vet med, 4th yr or grad or ‡)
Detailed discussions of the pathogenesis, clinical features, diagnosis, and therapy of skin diseases of dogs and cats.

5255. DISEASES OF THE KIDNEY. (1 cr; prereq regis vet med, 4th yr or grad or ‡)
Illustrated discussions integrating lesions, pathogenesis, and signs of diseases of the kidney.

5256. DISEASES OF THE LIVER AND PANCREAS. (2 cr; prereq regis vet med, 4th yr or grad or ‡)
Illustrated discussions integrating lesions, pathogenesis, and signs of diseases of the liver and pancreas.

5260. VETERINARY OPHTHALMOLOGY. (2 cr; prereq regis vet med, 4th yr or grad or ‡)
Lectures, seminars, and laboratory exercises on diseases of the animal eye. Subjects include ocular anatomy, physiology, pharmacology, and therapeutics; pathology examination procedures; and medical and surgical treatment of common ophthalmic diseases.

5265. COMPARATIVE CLINICAL CARDIOLOGY. (2 cr; prereq 4th yr or grad or ‡)
Lectures, laboratories, assigned readings, and discussions on diseases of the cardiovascular system in animals. Comparative similarities and differences of cardiovascular disease in common species emphasized.

5266. COMPARATIVE ELECTROCARDIOGRAPHY. (1 cr; prereq 4th yr or grad or ‡)
Lectures and discussion on the basis for the use of electrocardiography in common animal species. Special emphasis placed on the use of electrocardiography for diagnosis and therapy of cardiac disease in animals.

5271. HOSPITAL MANAGEMENT. (1 cr; prereq regis vet med, 4th yr or grad or ‡)
Lectures on the management of a small animal hospital; including zoning restrictions, employee supervision, drug purchases, facilities, fees, and other information pertinent to the operation of a modern veterinary medical hospital.

5272. INVESTMENTS AND INSURANCE. (1 cr; prereq regis vet med, 4th yr or grad or ‡)
The fundamentals of investments in bonds, common and preferred stocks and mutual funds, and the fundamentals of general and life insurance.

5275. DISEASES OF ZOO ANIMALS AND EXOTIC PETS. (1 cr; prereq regis vet med, 4th yr or grad or ‡)
Discussions of common disease problems and management procedures of reptiles, fish, primates, felines, rodents, and large and small mammals. Includes procedures utilized in the restraint and medication of and diagnosis of disease in these animals.

5276. POISONOUS PLANTS. (1 cr; prereq regis vet med, 4th yr or grad or ‡)
Important plants poisonous to animals; identification, toxicology, diagnosis, and treatment.

5280. SEMINAR: WORLD FOOD SUPPLY PROBLEMS. (4 cr; limited enrollment; prereq major in agriculture, veterinary medicine, nutritional sciences, social sciences or ‡...grad student by △ only)
(Same as AgEc 5790, FScN 5664, PlPa 5220, and Soc 5675) A multidisciplinary approach examines the social, economic, and technical problems of feeding the world's growing population. Principles are sought from the social and economic sciences, the plant sciences, the animal sciences, and the nutritional sciences for their application to food problems.

5360. SMALL ANIMAL ORTHOPEDICS. (3 cr; prereq regis vet med, 4th yr or grad or ‡)
Discussion of small animal orthopedic problems, with the application of surgical procedures to effect their correction.

5365. LARGE ANIMAL ORTHOPEDICS. (2-3 cr; prereq regis vet med, 4th yr or grad or ‡)
A general discussion of equine gaits and lameness is followed by detailed discussions of specific types of lameness. Signs, causes, diagnostic principles, and treatments covered. Visual aids used.

5366. ABDOMINAL SURGERY IN THE BOVINE AND EQUINE SPECIES. (2 cr; prereq regis vet med, 4th yr or grad or ‡)
Specific diagnosis, diagnostic procedures, and surgical treatments of abdominal diseases in the cow and horse.

5367. SURGICAL DISEASES OF THE MAMMARY GLAND. (2 cr; prereq regis vet med, 4th yr or grad or ‡)
Etiology, diagnosis, and treatment of congenital and acquired surgical diseases of the mammary gland, with emphasis on the bovine species.

5451. ROENTGEN DIAGNOSIS OF DISEASES OF THE SKELETAL SYSTEM OF SMALL ANIMALS. (1 cr; prereq VB 5604, regis vet med, 4th yr or grad or ‡)

5452. ROENTGEN DIAGNOSIS OF DISEASES OF THE SKELETAL SYSTEM OF LARGE ANIMALS. (1 cr; prereq VB 5604, regis vet med, 4th yr or grad or ‡)

5561. INFERTILITY CLINICS. (Cr ar; prereq 5560, 5570 or ‡)
Investigation of hospital cases and field problems of infertility in domestic animals. Includes 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 or ‡)
Lectures and demonstrations involving reproductive patterns, breeding practices, management, artificial insemination, economics of reproductive performance, and infertility in horses.

5572. REPRODUCTIVE PATERNS AND INFERTILITY IN THE DOG AND CAT. (1 cr; prereq 5570, regis vet med, 4th yr or grad or ‡)
Lectures and demonstrations involving reproductive patterns, management, artificial insemination, and infertility in dogs and cats.

5573. BREEDING PATTERNS, BREEDING TECHNOLOGY, AND INFERTILITY IN CATTLE. (2 cr; prereq 5550, 5560, 5570, regis vet med, 4th yr or grad or ‡)
Lectures and demonstrations involving breeding patterns, breeding practices, artificial insemination, synchronization of heat, economics of reproductive performance, and infertility in cattle. Emphasis placed on diagnosis, prognosis, and therapy.

5574. REPRODUCTION AND INFERTILITY IN THE BULL. (1 cr; prereq 5570, regis vet med, 4th yr or grad or ‡)
Lectures and demonstrations covering reproductive patterns, management, fertility, and infertility in the bull. Emphasis placed 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 or ‡)
Lectures and demonstrations involving reproductive patterns, breeding practices, management, artificial insemination, synchronization of estrus, economics of reproductive performance, and infertility in swine.

5580. HEREDITY IN ANIMAL DISEASE. (3 cr; prereq GCB 3022 or equiv or ‡)
Application of genetic principles of animal disease problems with emphasis upon specific inheritable and familial conditions in domesticated species.

5660. EPIDEMIOLOGY OF ZOONOSES I. (1 cr; prereq regis vet med, 4th yr or grad 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 or ‡)
Zoonotic diseases of food-producing animals. Reservoirs, sources, transmssion, and specific prevention and control programs emphasized.

5670. COMPARATIVE MEDICINE AND PUBLIC HEALTH. (2 cr; prereq PubH 5002 or ‡)
Man's 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.

5675. VETERINARY DIAGNOSTIC MICROBIOLOGY. (2 cr; prereq regis vet med, 4th yr or ‡)
Lectures and laboratory on techniques of diagnostic microbiology utilizing clinical material from veterinary hospital and diagnostic laboratories.

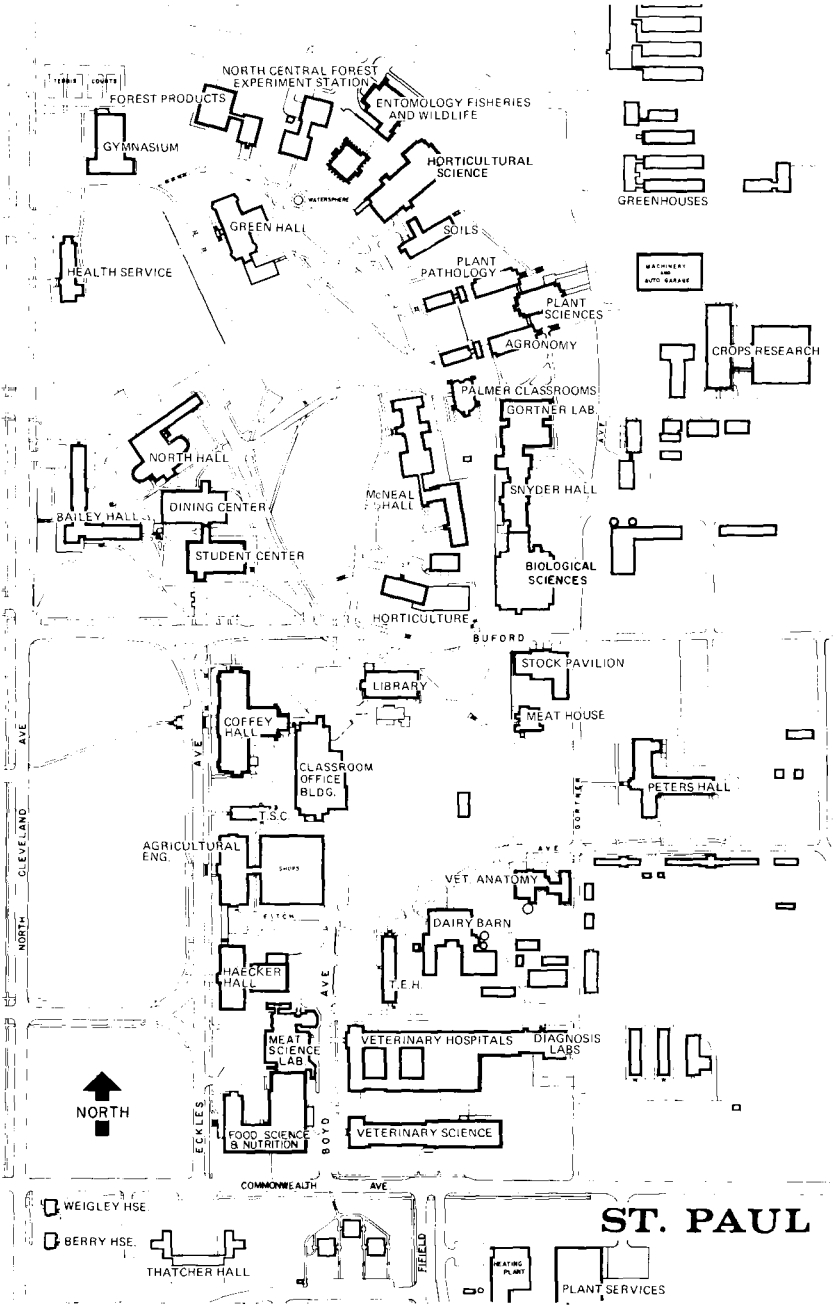
5680. PROBLEMS IN VETERINARY EPIDEMIOLOGY AND PUBLIC HEALTH. (Cr ar; prereq 5650 or equiv or ‡)
Individual study arranged with faculty member.

5681. VETERINARY SCIENCE. (3 cr; prereq pharmacy sr or Phsl 3070, Phcl 5102, or equiv or ‡)
(Same as Phm 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 or ‡)
Discussion of clinical problems which students experience during their externship with veterinarians in private practice. Major emphasis placed on discussions of diseases of food-producing animals and horses.

ADVANCED CREDIT COURSE OFFERINGS

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
8295. COMPARATIVE VETERINARY MEDICAL OPHTHALMOLOGY
8390. SEMINAR: VETERINARY SURGERY
8391. ADVANCED SMALL ANIMAL SURGERY
8392. ADVANCED LARGE ANIMAL SURGERY
8393. PROBLEMS IN LARGE ANIMAL ORTHOPEDICS
8394. SURGERY OF THE GASTROINTESTINAL SYSTEM
8395. SURGICAL DISEASES OF THE MAMMARY GLAND OF DOMESTIC ANIMALS
8396. ADVANCED VETERINARY ANESTHESIA
8397. LARGE ANIMAL ANESTHESIA
8490. ADVANCED VETERINARY RADIOLOGY
8491. FUNDAMENTALS OF NUCLEAR MEDICINE
8492. RADIATION BIOLOGY
8590. ADVANCED DIAGNOSTIC METHODS IN REPRODUCTIVE DISEASES
8591, 8592, 8593. ADVANCED ENDOCRINOLOGY OF REPRODUCTION
8594. SPECIAL PROBLEMS IN ANIMAL REPRODUCTION
8690. ZOONOSES AND COMPARATIVE MEDICINE


NORTH CENTRAL FOREST EXPERIMENT STATION
FOREST PRODUCTS
ENTOMOLOGY FISHERIES AND WILDLIFE
GYMNASIUM
HORTICULTURAL SCIENCE
GREENHOUSES
GREEN HALL
SOILS
HEALTH SERVICE
PLANT PATHOLOGY
MACHINERY AND AUTO GARAGE
PLANT SCIENCES
AGRONOMY
CROPS RESEARCH
PALMER CLASSROOMS
GORTNER LAB.
NORTH HALL
McNEAL HALL
SNYDER HALL
BAILEY HALL
DINING CENTER
STUDENT CENTER
BIOLOGICAL SCIENCES
HORTICULTURE
BUFORD
STOCK PAVILION
LIBRARY
MEAT HOUSE
COFFEY HALL
CLASSROOM OFFICE BLDG.
PETERS HALL
I.S.C.
AGRICULTURAL ENG.
VET ANATOMY
DAIRY BARN
HAECKER HALL
T.E.H.
MEAT SCIENCE LAB
VETERINARY HOSPITALS
DIAGNOSIS LABS
NORTH
FOOD SCIENCE & NUTRITION
VETERINARY SCIENCE
COMMONWEALTH AVE
WEIGLEY HSE
BERRY HSE.
THATCHER HALL
HEATING PLANT
PLANT SERVICES
ST. PAUL

UNIVERSITY OF MINNESOTA BULLETIN 1973-75

Medical School

UNIVERSITY OF MINNESOTA

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UNIVERSITY OF MINNESOTA BULLETIN

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Medical School

UNIVERSITY OF MINNESOTA

Medical School

I. GENERAL INFORMATION

History of the Medical School

The first classes in medicine at the University 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 Regents assumed responsibility on behalf of the people of the State of Minnesota for medical education. In 1908 the remaining proprietary school was incorporated into the University of Minnesota Medical School, which has continued as the only school of medicine in Minnesota. In 1969 the legislature appropriated planning funds for a 2-year medical basic science program at the University of Minnesota, Duluth, and in 1971 provided additional support for the Duluth school development and endorsed an additional undergraduate medical program at Rochester, to be designated as the Mayo Medical School of the University of Minnesota. The inaugural class in each of these two new medical schools entered 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, the Cancer and Christian gifts, Eustis Hospital, Mayo Memorial, Variety Club Heart Hospital, Masonic Memorial Hospital, Veterans of Foreign Wars Cancer Research Center, Children's Rehabilitation Center, and the newly added Variety Club Cardiovascular Research Training Center — all designated collectively as the University Hospitals.

The history of the Medical School at Minnesota is rich in a tradition of research and clinical excellence. The origins of the strength of the Medical School can be traced to strong departments in the basic medical sciences. This strength has pervaded the clinical departments and has fostered a tradition of clinical research and a spirit of inquiry.

Medical School Administration

The Medical School is one of several health science units organized through the office of the Vice President for the Health Sciences. The other units include the School of Dentistry, the School of Nursing, the College of Pharmacy, the School of Public Health, and the University Hospitals. The principal administra-

tive officer of the Medical School is the dean. He 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 center of the Medical School is located in 1360 Mayo Memorial Building in the Health Sciences Center on the Minneapolis Campus, telephone 373-8141.

The Faculty of the School

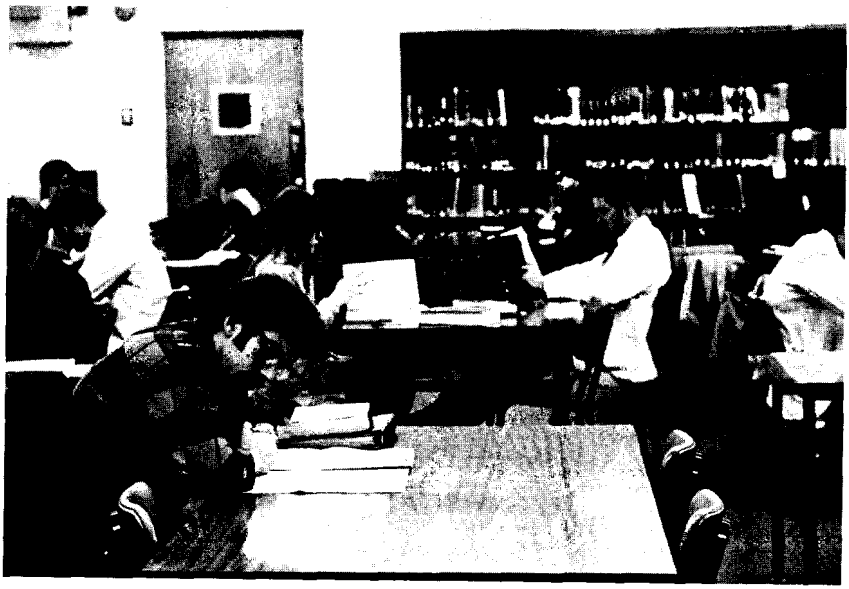
The full-time faculty of the Medical School numbers approximately 700. The executive faculty, consisting of the full-time professors and associate professors and 10 members elected from the instructor and assistant professor ranks, numbers approximately 350 and is the faculty governing body responsible for policy making. The executive faculty has delegated to its appropriate constituted committees the responsibility for determining student qualifications for admission and readmission and for decisions pertaining to student scholastic standing and dismissal from Medical School.

The Medical School Admissions Committee is responsible for selection of each year's entering class and for approving applications for transfer to the Medical School. The Admissions Committee is also responsible for readmission of students to Medical School. The Committee on Student Scholastic Standing evaluates each student's academic and professional performance and general suitability for medicine periodically throughout his Medical School work. It is the decision of this committee which permits each student to continue to progress yearly to the succeeding class and to the goal of the M.D. degree. Decisions made by this committee are subject to appeal by the student. Another committee of the executive faculty is the Educational Policy Committee, which is responsible for developing and evaluating undergraduate and graduate educational programs and for ongoing curriculum review. Recommendations for curriculum change are made to the executive faculty. Each of these major committees includes within its membership at least one student representative.

Physical Facilities

The basic science complex of the Medical School is located in a four-story quadrangle of buildings immediately adjacent to the Mayo Memorial Building and to the newly completed Building A which contains shared classrooms, health science student areas, some basic medical science laboratories, and Medical School and School of Dentistry departmental space. The other medical center units, each close to and connected with the complex, include the several units of University Hospitals, the Variety Club Heart Hospital, the Masonic Memorial Hospital, the Veterans of Foreign Wars Cancer Research Center, and the Children's Rehabilitation Center. The close physical relationship of the Medical School and its associated facilities favors professional and scientific communication across departmental lines. The Medical School maintains affiliate relationships with a substantial number of hospitals in the Twin Cities metropolitan area and with the two hospitals in Rochester, Minnesota. These affiliations provide an invaluable resource which affords access by medical students to a wide spectrum of health care institutions which provide medical care to patients with a variety of medical problems.

The Learning Resources Center is a focal point of student activity.



Library facilities and services of the Bio-Medical 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 material and subscribes regularly to more than 2,500 periodicals. There are in excess of 230,000 volumes in the library, almost all of which are shelved on open stacks. Photoduplication services, computer-produced literature searches, and interlibrary loans are available. The operations of the library are facilitated by a helpful, warm spirited staff. Departmental libraries within the Medical School are maintained to supplement the Bio-Medical Library collections. The Walter Library on the East Bank and the Wilson Library on the West Bank are available for the free use of students and faculty. The History of Medicine and Rare Book Collection, which contains many unique items, is located in the comfortably appointed, spacious new Owen H. Wangensteen Historical Library just above the main Bio-Medical Library area.

The Learning Resources Center is located in the Bio-Medical Library. Learning carrels, equipped with audio-tape players and slide and/or film strip projectors, are available for student use. The growing collection of audio-visual instructional resources are housed in this center, which is open 95 hours per week. Other resources incorporated in the Learning Resources Center include models, viewing areas for motion picture and video tapes, and also texts, test files, and a variety of print materials organized to serve the several instructional programs. Terminals for computer-assisted instruction are also available.

ADMISSION

The Board of Regents has committed itself and the University of Minnesota to the policy that there shall be no discrimination in the treatment of persons because of race, creed, color, sex, or national origin. This is a guiding policy in the admission of students in all colleges and in their academic pursuits. It is also to be a governing principle in University-owned and University-approved housing, in food services, student unions, extracurricular activities, and all other student and staff services. This policy must also be adhered to in the employment of students either by the University or by outsiders through the University and in the employment of faculty and civil service staff.

Academic Requirements

Admission to the Medical School is based on individual qualifications, the most important of which are apparent aptitude for and interest in becoming a physician and potential or proven intellectual ability. Race, sex, and color are not factors in determining eligibility for admission.

The school encourages students to obtain a Bachelor's degree before entering the Medical School. The equivalent of 3 academic years (135 quarter credits or 90 semester hours) of college course work must be completed before matriculation. Credits in physical education, military science, and religion courses should not be included in this total.

Physicians have an increasing responsibility to understand and deal with the social, cultural, and psychological forces in the environment which may adversely affect their patients. Scientific background and training alone are not sufficient

to meet this need and, therefore, studies in humanities and social and behavioral sciences are required in addition to preparation in physical and biological sciences. The student should plan to prepare himself in liberal arts courses, including English, history, psychology, social sciences, and literature. The outline presented should be recognized as suggesting minimum requirements only. It is to the applicant's advantage to go beyond these minimum requirements in his or her college career.

Those students with special interest in basic science subjects or those with aspirations to the Ph.D. in addition to the M.D. as well as those considering a career in academic medicine are encouraged to pursue their studies at advanced levels in preparation for entering Medical School. The following table lists *minimum* course requirements and credits. Students are expected to add to the required credit hours indicated in various ways, depending on their own special interests, the requirements of their college, and the counsel of their college advisers.

MINIMUM REQUIREMENTS

	Approximate Semester Hours	Approximate Quarter Hours
General Biology or Zoology	7	10
Chemistry	15	22
General or inorganic, quantitative, and organic required (should include laboratory exercises)		
English and Literature	8	12
Mathematics	7	10
College algebra, trigonometry, and introductory calculus required		
Physics	8	12
Should include laboratory exercises; college algebra and trigonometry must be prerequisite		
Social and Behavioral Sciences and Humanities	18	27
As examples, psychology, anthropology, history, sociology, economics, philosophy, or a modern language		
Additional academic courses to bring total credits to required minimum	90	135

Medical School representatives in the Medical School Student Affairs Office, 1305 Mayo Memorial Building, are prepared to discuss pre-medical programs with college students, teachers, and advisers, either in person or through correspondence. A useful reference booklet, summarizing the admission requirements and application procedures of each of the medical schools in the United States and Canada, can be purchased for $4 from the Association of American Medical Colleges, 1 Dupont Circle N.W., Washington, D.C. 20036, and is available in most college reference libraries.

Residence

Preference for admission to the Medical School is given to residents of Minnesota and for transfer to admission with advanced standing to residents of neighboring states which lack 4-year medical schools. Nonresidents accepted from other areas have demonstrated outstanding scholarship and other qualifications indicating unusual promise for a career in medicine.

Other Admission Requirements and Procedure for Application

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 must be processed through AMCAS, and application forms with detailed instructions for their completion can be obtained from AMCAS, 1776 Massachusetts Avenue N.W., Washington, D.C. 20036. Application request cards can be obtained from the pre-medical adviser's office of most colleges or from the Admissions Office of the Medical School. Applications should be completed during the *year before* the student plans to enter the Medical School; they may be sent in any time after May 1 and must be returned to AMCAS before November 15. It is suggested that applicants complete application as soon as possible after receipt of the spring quarter or semester grades. Since all first-year students begin the course of medical study in September, the application is made a little more than a year before matriculation. In most instances, students will not have completed all undergraduate studies at the time of application, but they are encouraged to have completed all the science course requirements before submitting an application.

Applicants should indicate and describe those aspects of their personal medical history which could have a bearing on suitability for medical training or the eventual practice of medicine.

Letters of recommendation are an important part of the student's application. Each applicant is asked to supply the names of three or four persons (not relatives) who will submit recommendations. Personal acquaintances, employers, professional workers, and family friends, in addition to the student's teachers, are particularly suitable, since the objective is to obtain information about the student's personal characteristics. It is to an applicant's advantage to select persons who can provide a knowledgeable and detailed report.

Several testing procedures are required of all applicants to the University of Minnesota Medical School, with the exception of students transferring following completion of 2 years of medical school elsewhere. These are standard tests of personality characteristics and of aptitude for scientific and medical study. In addition, a personal interview is necessary. With the exception of the Medical College Admission Test (MCAT), the admissions office arranges for testing to be done at the student's own college *after* the application form has been returned to the University of Minnesota Medical School. In common with the MCAT, these tests not only measure the individual's factual knowledge but help the Admissions Committee learn more about the candidate's aptitudes and suitability for a career in medicine.

The MCAT — Pre-medical students must make individual arrangements for the Medical College Admission Test which is required of all applicants. This test is given throughout the country at many colleges in May and September of each year. Those students planning to enter Medical School in September 1974 should plan to take the MCAT in May 1973. This test is administered by the Psychological Corporation, and the results of testing are sent to the student. There is a $20 fee for the examination which entitles the student to have his scores sent to several medical schools. The student is responsible for making arrangements with the testing agency. An announcement booklet giving application deadlines, dates

of the tests, sample questions, and instructions as to where the test will be given can be obtained by writing to Medical College Admission Test, The American College Testing Program, P.O. Box 414, Iowa City, Iowa 52240.

In accordance with the acceptance procedures approved by the Association of American Medical Colleges, applicants may be notified of the decision of the Admissions Committee as early as February of the year preceding matriculation.

Foreign Students

Because of the strong preference for admission given to Minnesota residents, very few foreign student applicants are offered places in the entering class in medicine each year. While there is no firm rule against the admission of students trained exclusively in other countries, it is strongly recommended that graduates of foreign colleges plan to study at an American university for at least 1 year and preferably 2 years before applying for admission to this Medical School. One or 2 years of study in the United States will give the foreign student some exposure to the teaching methods of this country, the language, and the general social and cultural environment. Without such acquaintance, the foreign student is at a distinct disadvantage in pursuit of a medical education. The foreign student must, of course, provide satisfactory evidence that he has completed the prerequisite course of study required of all other applicants and must follow the application procedure outlined above.

The Medical College Admission Test often presents a special problem for the foreign student who is unaccustomed to multiple choice, objective examination procedures. Students should familiarize themselves with the nature and purpose of this type of examination before attempting to take the admission examinations.

Transfers

Transfers to the University of Minnesota Medical School in Minneapolis are accepted from the accredited 2-year medical schools in the United States with preference being given to students enrolled at the University of Minnesota, Duluth, the University of North Dakota, and the University of South Dakota Medical Schools. Special arrangements are in effect for students of these 2-year medical schools, and students of these schools should consult their dean and the University of Minnesota Medical School Student Affairs Office for additional information. The University of Minnesota Medical School, Minneapolis has agreed to participate in the program sponsored by the Association of American Medical Colleges (AAMC) in which an Early Decision Program of acceptance will be in effect for students choosing this Medical School. Application dates and acceptance dates will determined by the AAMC each year for the Early Decision Program. Students not participating in the Early Decision Program may submit applications after the acceptances for the program have been made.

Transfers from 4-year medical schools in the United States and Canada will be considered under only the most unusual and extenuating circumstances, with preference being given to legal residents of the State of Minnesota. Transfers from foreign medical schools are not considered.

Baccalaureate Degree Requirements

The Medical School and the University strongly recommend that all students obtain a Bachelor's degree in either arts or sciences before entering the third year of study in the Medical School. Students may qualify for the baccalaureate degree in either of two ways if they have not obtained the degree before admission to Medical School. Some colleges and universities, including the College of Liberal Arts of the University of Minnesota, award a bachelor of arts degree to their own students after satisfactory completion of the first year of medical school, providing the student meets distribution requirements and other regulations of the parent college. The bachelor of arts degree is not awarded by the Medical School.

For further details and specific requirements related to the earning of this bachelor of arts degree, students should consult the appropriate bulletin or administrative office of the parent college.

Other students who cannot meet the requirements for the B.A. degree from their parent school can qualify for the B.S. degree by successful completion of the first 2 years of the Medical School curriculum. This B.S. degree is awarded by the Medical School.

The Council on Liberal Education of the University of Minnesota has established University-wide distribution requirements in liberal studies for all programs leading to a Bachelor's degree conferred by the University. Candidates for the degree of bachelor of science in medicine from the Medical School must meet these University requirements regardless of their college or courses of undergraduate, pre-medical study. In general, completion of the courses and credits stated as minimum requirements for admission to the University of Minnesota Medical School will also meet the University-wide distribution requirements in liberal studies. The baccalaureate degree requirement for liberal studies includes appropriate distribution of courses and credits in four broad areas of knowledge: (1) communication and symbolic systems, (2) physical and biological sciences, (3) man and society, and (4) artistic expression. Transcripts of baccalaureate degree candidates will be reviewed for fulfillment of these requirements. Additional and specific, detailed information is available in the Medical School office or in the *College of Liberal Arts Bulletin.*

FINANCIAL CONSIDERATIONS

Tuition and Fees

Students enrolled at the University of Minnesota Medical School pay tuition at the rate of $435 per quarter for residents of Minnesota for the academic year 1973-74. Nonresident tuition is $1,015 per quarter. An additional fee, the student services fee of $45.50 per quarter, is required of both residents and nonresidents. Students who elect to take the 4-year Medical School curriculum and who make satisfactory progress will be able to arrange 2 free or vacation quarters, for which tuition will not be assessed.

Books, instruments, and other necessary equipment are to be provided by the student. A microscope which is equipped with three objectives, including an oil immersion lens and substage lighting, is required for the first full year of Medical School and is desirable for the second year as well. Students with questions concerning purchase of a particular miscroscope should consult Mr. Harry Andre in the Department of Anatomy in Jackson Hall.

The Minnesota Medical Alumni Association, through the Minnesota Medical Foundation award program, provides microscopes for shared use by students. This program is integrated with the student-initiated requests for financial assistance, which are administered through the Office of Student Financial Aid, 107 Armory Building, Minneapolis Campus. Students awarded shared use of a microscope through this program are required to pay a nominal fee for instrument upkeep and insurance. Details of the microscope program are announced late in the summer, before Medical School enrollment for fall.

Loan Funds, Scholarships, and Prizes

Financial aid to students is available in the form of regional scholarships, federal loans to students of the health professions, special loan funds, and designated prizes. With few exceptions, students must be accepted for admission and be regularly enrolled to qualify for these grants. Most financial assistance is administered by the University's Office of Student Financial Aid or by the Minnesota Medical Foundation. The prospective student should obtain a copy of the *Handbook of Financial Aids for Medical Students at the University of Minnesota* for detailed information on sources of funds available for assistance in completing his undergraduate medical education program.

A limited number of student research grants are awarded for vacation or free-time work within the Medical School. These fellowships enable a student to supplement his or her income while pursuing serious medical or basic science research interests. Research fellowships have the added advantage that Medical School facilities and laboratory equipment may be utilized as well as faculty advice and counsel in designing and executing the student's investigative work.

Some students may elect to obtain part-time employment, although the student who does so should consider the nearly full-time obligation of his medical studies. Limited part-time work becomes available from time to time in some departmental research laboratories. Students with special training in education may be able to pursue special projects in medical education and curriculum evaluation.

Minnesota Medical Foundation

The Minnesota Medical Foundation (MMF) is a publicly supported nonprofit organization operating in support of the Medical School. The foundation receives and distributes gifts and grants for various purposes at the Medical School and is supported itself by gifts from alumni and friends. Assets of the foundation exceeded $6 million in 1972, most of which is earmarked for support of medical research. MMF offices are located at 5412 Powell Hall, telephone 373-8023, and are under the supervision of Eivind O. Hoff, executive director. The foundation's Board of Trustees is made up of more than 35 distinguished volunteer members, most of them physicians.

MMF's cash grant fund for students is now administered under a reciprocal aid policy based on need alone. Students selected for MMF Reciprocal Aid Bank grants pledge to repay their aid to perpetuate the fund for the benefit of future medical students. Actual repayment is often deferred for several years due to advanced study, and no interest is charged.

The foundation also operates several student loan funds. The Emergency Loan Fund provides cash loans available on short notice for up to 90 days, with no interest or carrying charges. The foundation's long-term loan program allows the student 5 years after completion of Medical School to repay. Simple interest of 4 percent begins accruing after graduation. No interest is charged while the recipient is in Medical School, and no payments are required until 1 year after graduation.

Achievement awards of up to $1000 are also offered once a year to students nominated for exceptional merit in academic excellence, community service, or student leadership.

Research fellowships are available to medical students interested in medical research at the University of Minnesota. These fellowships, usually in the amount of about $400 per month, should be applied for 6 months in advance of need under the MMF granting program. Generally, only full-time projects during free or elective periods are considered.

The foundation publishes the *Medical Bulletin,* a bimonthly publication for alumni of the Medical School, other physicians in the state, and friends of the foundation.

CONTINUING MEDICAL EDUCATION

The Medical School is keenly aware that the granting of a degree is only a step in a lifelong continuum of medical education. In 1936 a Center for Continuation Study, unique for its time, was opened at the University of Minnesota, and in 1937 this nation's first organized Department of Continuing Medical Education was founded to offer a regularly recurring program of short post-graduate courses for physicians.

Today the Office of Continuing Medical Education fills a catalytic role in bringing together the knowledge and expertise available in the Health Sciences Center to serve the educational needs of the physician in his role as lifelong student of medicine.

The program consists of about 25 individual courses conducted each year, employing lectures combined with workshops, seminar sessions, and individual instruction. New and innovative programs are being developed to meet the changing needs of those in the medical profession and to utilize technological advances in the use of the various media. Emphasis is placed on developing programs which can reach the physician in his own community and involve each individual as an active participant in his own learning.

Close liaison with the other medical schools in the state allows the Medical School to offer a strong, well-rounded continuing medical education program to enable each physician to determine and to attain his own educational goals.

Students at work

and play in the Adytum.

THE MEDICAL STUDENT

The (Medical Student) Adytum

A major center of medical student activities is the Medical Student Adytum. This spacious, comfortably appointed unit is centrally located on the first floor of University Hospitals and contains facilities for eating and relaxation as well as 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 and are reserved exclusively for medical students and their guests. A second center for medical students is located in Building A.

Living Arrangements

Dormitory housing with meals in University-operated residence halls conveniently located near the Medical Center is available to medical students on a quarterly contract basis through the University Housing Office. The cost of a single room is approximately $440 per quarter. The several medical fraternities are located nearby, and board and living quarters are available in these on a space-available basis. Privately owned apartments adjacent to the campus are rented by students, often on a cooperative basis.

Students may purchase meals in the University Hospitals cafeteria, in facilities in University residence halls, the student unions, fraternity houses, or individually. The lunch shop in the University Hospitals is used chiefly by outpatients and visitors. Several sandwich and beverage vending machines are located in the Adytum.

The University Health Service

The University Health Service provides medical care for full-time students and maintains outpatient clinic facilities close to the Medical Center. The unit for hospital care of students is in a newly constructed hospital care facility for students in the Health Service Complex which was completed in 1972. Each student receives health service coverage as part of the student services fee portion of the quarterly fee payment. Additional health service benefits, including hospital coverage during summer vacation, extended hospital benefits, and family coverage, are available through a group plan for a nominal additional charge. Application for this coverage must be made annually in the early fall.

Employment

Students are urged not to engage extensively in work outside of their Medical School studies. The prospective student should carefully scrutinize his projected financial needs through the 4 years of Medical School and make appropriate arrangements to meet these through the help of parents, personal savings, and loans when needed. Medical School days are crowded with the business of learning as much of medicine as possible. It does not behoove the student to abridge this critical and important experience with excessive outside commitments for limited financial gain.

Medical Student Government and Student Societies

The Medical Student Council is the student governing body. Representatives from each class are elected each year and meet regularly and frequently for discussions of problems common to the student body and to plan projects and a variety of service activities. The council represents the interests of the medical students to the administration and the faculty. The medical students have adopted an honor code covering examination procedures. After suitable briefing, each student signs a statement on admission to Medical School indicating that he 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 investigation of reports of any suspected violations of this code.

There are several medical fraternities organized for men and one sorority for women. These organizations play a major role in the social life of many medical students.

The national medical scholastic society, Alpha Omega Alpha, selects academically high-ranking students from the junior and senior classes for election to membership. The James Moore Society is composed of 25 students elected by the membership on the basis of research interest and achievement. The group meets monthly at the home of one of several faculty members for discussions of medical subjects and other topics of current interest. 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 Student American Medical Association (SAMA) is an integral part of the Medical Student Council, incorporated as one of the major committees of the council. The committee chairman acts as local SAMA chapter president. This group sponsors certain schoolwide 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.

RESEARCH OPPORTUNITIES AND GRADUATE STUDY PROGRAMS

In addition to the prescribed course of study leading to the degree of doctor of medicine, there are additional opportunities for qualified students to obtain the Master's and Ph.D. degrees in the medical sciences. Medical School facilities are available for original investigations and for students to work with established faculty investigators as assistants and co-workers. The formally established programs are outlined here; other programs of study are arranged individually within the department in which the student's work is to be done.

Nonmedical graduate students register and enroll in the Graduate School of the University. The *Graduate School Bulletin* should be consulted for information on requirements for admission.

Dr. Koerner at work in his research laboratory.

The combined M.D.-Ph.D. program is planned especially for academically superior medical students with interests in graduate study in a fundamental medical science, leading to a graduate degree (Ph.D.) and the M.D. degree. 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, thus extending the period for completion of both degrees over 5 or more years. The program emphasizes flexibility and is adaptable to each student's individual requirements and research interests. Students are usually accepted for the M.D.-Ph.D. program after completion of the first year of the core Medical School curriculum and on

the basis of the quality of the work done during that year. Application is made to the Combined Medical-Graduate Program Committee through the Medical School office. Students must be eligible or accepted for admission to the Graduate School in a basic medical science.

All of the basic medical science departments conduct active and extensive graduate research and study programs under the aegis of the Graduate School of the University of Minnesota, 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. Further inquiry should be directed to a faculty member in the basic medical science department of the student's interest or to the appropriate departmental office.

Various opportunities for experience in medical research, both basic and clinical, are offered to medical students as 3-month (1-quarter) research fellowships, provided from various funds granted to faculty members of departments of the Medical School, usually through federal agencies or voluntary health foundations. Fellowships may be held during any free quarter in the individual student's program.

Many medical students obtain a stimulating introductory experience in medical research through employment on an hourly or part-time basis during the academic year, or a full-time basis during vacation or free quarters. Such opportunities for employment are arranged individually with faculty members at the Medical Center or at the Veterans Administration Hospital, Hennepin County General Hospital, St. Paul-Ramsey Hospital, or other affiliated hospitals. Students with satisfactory academic standing are encouraged to seek these opportunities to supplement their formal medical education and to augment their financial resources as needed.

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

Approximately 400 physicians are enrolled each year in the postdoctoral or residency training programs in the clinical departments of the Medical School and its affiliated hospitals. These doctors are being trained as specialists in their various fields. The majority have qualified for registration in the Graduate School and are receiving graduate credit for residency training.

For the physician already in practice, the Office of Continuing Medical Education organizes short courses on special topics of current interest. These courses are usually presented in concentrated form over a period of 1 week or less. Medical School faculty members participate with visiting lecturers in bringing information on recent medical advances to the registrants in these courses.

Through cooperation between various community health agencies and Medical School faculty, efforts are being made to utilize newer communications media (and outreach programs) to extend the consultation services and information sources of the Health Sciences Center to the community hospitals and physicians in the state.

II. THE COURSE OF STUDY

The Medical School is responsible for providing the facilities and faculty for instruction of students in the course of medicine. The primary goal of medical education is to produce good physicians. A good physician must possess sound training in quantitative biology as it applies to man. This solid educational grounding will serve as the basis for continuing professional and scholarly growth. Much of the measure of ultimate success of student learning depends on the concept of student as learner, and, therefore, independence and individual responsibility are encouraged.

The course of study for the M.D. degree consists of a core program of 8 academic quarters and a track (pathway, elective) program of from 3 to 5 academic quarters in length. Within the core program, the first 4 quarters are termed Phase A and include course work in basic medical sciences, behavioral science, and introductory experiences with patients. The remaining 4 academic quarters of the core program, termed Phase B, consist of integrated interdepartmental presentations along organ, system, and topical lines. In the track portion of the curriculum in Phase D, some students have the option of completing study in 3 quarters, to be followed by an internship in a teaching hospital. Alternatively, the student may complete Medical School in 5 quarters in Phase D with no restriction as to type of internship. Students are required to take and pass parts I and II of the National Board Examinations at suitable times prior to graduation.

Grades

Examinations and other forms of evaluation of performance of medical students are administered by the various departments and interdepartmental teaching sections. According to provisions of the honor code, there is no faculty monitoring during examinations, and students are strictly on their individual honor. Grades are reported as O (outstanding), S (satisfactory), and I (incomplete) and appear as such on the official University transcript. The student may be dismissed from Medical School work if, in the opinion of the Committee on Student Scholastic Standing, he has not performed at a satisfactory level academically in individual courses or in all courses or if there are other factors (such as personality, attitude, and emotional stability) which, in the opinion of the committee, would be sufficiently unfavorable to keep an individual from being granted the M.D. degree. Academic probationary status is one mechanism used by the Scholastic Standing Committee to signal to the student that his standing as a medical student is in jeopardy.

Phase A

In the first 4 quarters of the Medical School program, the student is afforded the opportunity to study 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. This program is intended to involve the student physician in his own 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:

Fall Quarter and Winter Quarter (A-1 and A-2)

Gross Anatomy (Anat 5100-5101)
Human Histology (Anat 5103-5104)
Embryology (Anat 5106-5107)
Medical Biochemistry (MdBc 5100-5101)
Introduction to Clinical Medicine (InMD 5100-5101)
Behavioral Science (AdPy 5107-5108)

Spring Quarter and Summer Quarter (A-3 and A-4)

Medical Physiology (Phsl 5110-5111)
Pathology (Path 5101)
Neuroanatomy (Anat 5111)
Introduction to Clinical Medicine (InMd 5102-5103)
Microbiology (MicB 5205-5206)
Pharmacology (Phcl 5110)

Phase B

The 4-quarter sequence of Phase B begins in fall. There is an emphasis on correlated, integrated interdepartmental teaching designed to highlight fundamental principles and stress pathophysiologic concepts. The courses are organized in relation to organs, systems, or topics. Two additional classes in the Phase B sequence, Student as Physician and Behavior of Man, are important courses designed to increase the student's clinical skills and knowledge and to enhance his awareness of psychopathology and psychological factors related to illness.

The Phase B program is not traditionally organized, and required classes are reduced to a minimum. The core program comprises approximately 45 percent of the student's available daytime schedule. The remaining 55 percent is "free" or unscheduled time in which the student arranges his own activities, with maximum opportunities for the exercise of independence and maturity in the learning process. Thus, more than half of the regular daytime hours are unscheduled. This arrangement furnishes the student an opportunity to order his own activities and develop maturity and independence as he seeks to broaden his medical knowledge and skills and develop professional attitudes and interests. The student may utilize this time in optional activities such as study in the Learning Center, participation in additional clinical experiences, or in elective courses available to students in Phase B. The formal Medical School activities in Phase B are thus divided into three categories.

Core Time—Basic didactic lectures or discussions related to specific organ, system or topic, scheduled in a particular time block (usually 1st and 2nd hours each day) and in weekly clinical tutorials. Attendance is expected.

Optional Activities—Supplementary scheduled activities, such as lectures (expanding didactic material offered in Core Time), films, supplementary clinical experiences, laboratories, demonstrations, clinical rounds, teaching rounds, clinical-pathological conferences. Different activities are scheduled each week at various times. Attendance is on a voluntary basis. Some activities, because only a limited number can attend, require sign-up by students.

Electives—Courses offered throughout the year covering various topics of interest to medical students but not necessarily related to Core Time work.

The required program in Phase B consists of the following Interdepartmental Medicine (InMD) courses:

REQUIRED PHASE B COURSES

	Fall B-1	Winter B-2	Spring B-3	Summer B-4
Student as Physician	5202	5203	5204	5205
Behavior of Man		5212		
Pharmacology	5111			
Cardiovascular	5220			
Respiratory	5221			
Fluid and Electrolytes	5222			
Kidney and Urinary Tract	5223			
Endocrine and Metabolic			5224	
Reproduction			5225	
Blood		5226		
Skin			5227	
Ear, Nose, and Throat			5228	
Eye			5229	
Nervous System and Muscle Disorders				5230
Gut		5231		
Bones, Connective Tissue, and Joints				5232
Human Sexuality		5233		

TYPICAL WEEKLY SCHEDULE — PHASE B

Week of September 10

MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
Cardiovascular	**Respiratory**	**Cardiovascular**	No scheduled classroom work. Time available for individual learning activity, family practice tutorials, Student as Physician, clinical lab medicine.	**Respiratory**
Cardiovascular	**Respiratory**	**Cardiovascular**		**Pharmacology**
Cardiovascular Pathology Laboratory (Optional)		Respiratory Case Conference (Optional)		
		Cardiosimulator (Optional)		
Student	**Pharmacology**	**Student**		Cardiovscular Case Conference. (Optional)
as		**as**		
Physician (Patient Work-up)		**Physician (Tutorial)**		

Core (required) Optional

Phase D

Students will be given the option of completing Phase D in 3 or 5 academic quarters depending on approval by the Scholastic Standing Committee. Depending on the span of the student's entire medical curriculum, it is possible to fulfill requirements for the degree of doctor of medicine in 11 academic quarters.

Phase D is designed to extend the curriculum goals of relevance, flexibility, and student as learner. During the quarter in which the student completes the final work of Phase B, he will be asked to select a track and an adviser within that track for the balance of his Medical School program. Students are reminded not to confuse their need to select a track at this point with their eventual need to choose a special method of practice. The six broadly defined career pathways or tracks, encompassing all disciplines and providing adequate options for all students, are the following:

1. Medicine—Pediatrics, Medical Specialties including Obstetrics
2. Surgical Specialties
3. Psychiatry and Behavioral Sciences
4. Neurological Sciences
5. Family Medicine
6. Medical Sciences

The student, with the help of his adviser, develops an elective program of individualized study related to his particular interests and career goals. Each student's program will be approved and supervised by the appropriate Track Committee.

The required or strongly recommended electives are different in the several tracks. In general, and as a logical sequence to the core material and tutorial format in Phase B, each student is most strongly urged to spend 12 to 18 weeks in externship-type electives such as those offered by the medical, neurological, obstetrical, pediatric, psychiatric, and surgical disciplines. In addition, the need to "return to basic sciences" is emphasized in the recommended curriculum plan in each of the tracks. Students may engage in these basic science activities on a full-time basis or as part-time or seminar work. The balance of the individual programs is planned by the student with his adviser from the extensive elective offerings listed by each Medical School department. Students may consider elective work in other medical schools, in the United States or elsewhere. The flexibility of the elective program and the general nature of the pathways provide an opportunity for the creative and interested student to avail himself of the widest possible spectrum of educational activities to further his own professional growth.

The length of Phase D should be determined by a review of the student's personal needs. Some will plan careers which no longer require an internship, or at least one with classical content; these students probably will prefer a 5-quarter Phase D. Others may see that their educational continuum beyond receipt of the M.D. includes activities likely to duplicate substantial parts of the standard 5-quarter Phase D program, and these students may opt for a 3-quarter program. Students desiring to complete Phase D in 3 quarters must make satisfactory progress in their course work and 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. There are no restrictions on type of internship or first-year training program for students graduating in 4 years, in the 13-quarter curriculum.

III. DESCRIPTION OF COURSES

Symbols and Explanations

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

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

¶ Means "concurrent registration."

Means "consent of instructor is required."

△ Means "consent of division, department, or school offering course is required."

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

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

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

ANATOMY (Anat)

Arnold Lazarow, M.D., Ph.D., Professor and Head

Professor

Anna-Mary Carpenter, M.D., Ph.D.
Padmakar Dixit, Ph.D.
Carl B. Heggestad, M.D., Ph.D.
Morris Smithberg, Ph.D.
R. Dorothy Sundberg, M.D., Ph.D.

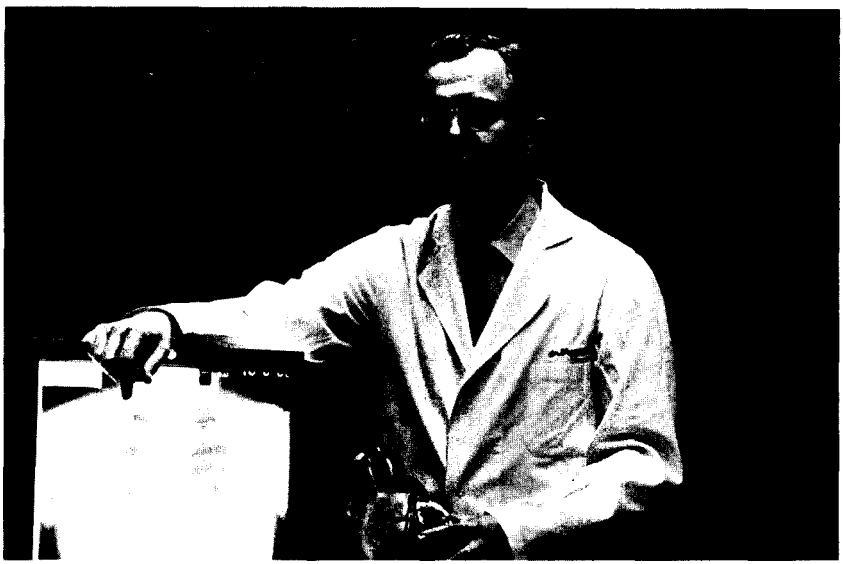
Associate Professor

G. Eric Bauer, Ph.D.
Donald Robertson, Ph.D.
Robert Sorenson, Ph.D.

Assistant Professor

David Coulter, Ph.D.
Orion Hegre, Ph.D.
Lucille J. Hoilund, M.D.
Joseph L. Rigatuso, Ph.D.

The course work in the Department of Anatomy provides an opportunity for examining the structure of the human body. In gross anatomy, the three-dimensional architecture in all body regions is studied by 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. Thus, the student may enhance his powers of observation, his ability to communicate using specific terminology, and his synthesis of morphology with biochemistry and physiology. Greater depth in any of the subjects can be obtained through advanced course work on elective time.



Dr. Heggestad correlates anatomy with clinical medicine for the students in Phase A.

REQUIRED COURSES

5100-5101. GROSS HUMAN ANATOMY. (6/5 cr; prereq regis med fr)
Dissection of the human body.

5103-5104. HUMAN HISTOLOGY. (3 cr; prereq regis med fr)
Microscopic structure, cytochemical and functional aspects of cells, tissues, and organs.

5106-5107. HUMAN EMBRYOLOGY. (2 cr; prereq regis med fr)
Development of the human body.

5111. HUMAN NEUROANATOMY. (3 cr; prereq regis med fr)

ELECTIVE COURSE

5190. ADVANCED ANATOMY. (Cr ar; prereq regis med, 5104)
Instruction in teaching methods or supervision of student's original research or combination of both.

ADVANCED CREDIT COURSES

5765-5766. HEMATOLOGY. (4 cr; 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.

8100-8101. GROSS HUMAN ANATOMY

8103-8104. HUMAN HISTOLOGY

8106-8107. HUMAN EMBRYOLOGY

8111. HUMAN NEUROANATOMY

8135. BIOLOGICAL ELECTRON MICROSCOPY — TECHNIQUES

8137. BIOLOGICAL ELECTRON MICROSCOPY — INTERPRETATION

8153, 8154, 8155, 8156. ADVANCED ANATOMY

8160. INTRODUCTION TO HISTOLOGIC AND MORPHOLOGIC-HISTOCHEMICAL TECHNICS

8161, 8162, 8163. METHODS IN ANATOMICAL RESEARCH

8168. CYTOLOGICAL ASPECTS OF PROTEIN BIOSYNTHESIS

8201, 8202, 8203, 8204. RESEARCH IN ANATOMY

8205, 8206, 8207. SEMINAR: ANATOMY

8211. NEUROCYTOLOGY

ANESTHESIOLOGY (Anes)

Frederick H. Van Bergen, M.D., M.S., Professor and Head

Professor

Joseph J. Buckley, M.D., M.S.
John R. Gordon, M.D.

Clinical Professor

Russell Bagley, M.D.
J. Albert Jackson, M.D.

Clinical Associate Professor

Irving S. Greenfield, M.D.
Hugh D. Westgate, M.D.
C.T. Wier, M.D.

Assistant Professor

James F. Cumming, M.D., Ph.D.
Edward C. Hanisch, M.D.
Russell H. Larsen, M.D.
Ji-Chia Liao, M.D., Ph.D.

Clinical Assistant Professor

Norman P. Johnson, M.D.
Alan R. Kahn, M.D.
John S. Rydberg, M.D.

Instructor

Luis E. Giron, M.D.

Clinical Instructor

Joseph Belshe, M.D., M.S.
Ju Hao Lee, M.D.
Josephine Lo, M.D.
Harold McClung, M.D.
Po Myaya, M.D.
Josef K. Wang, M.D.

ELECTIVE COURSES

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

5182. EXTERNSHIP IN RESPIRATORY PROBLEMS. (Cr ar; prereq regis med)

5183. EXTERNSHIP IN PEDIATRIC ANESTHESIOLOGY. (Cr ar; prereq regis med)

5184. EXTERNSHIP IN OBSTETRIC ANESTHESIOLOGY. (Cr ar; prereq regis med)

5185. EXTERNSHIP IN ANESTHESIOLOGY FOR SURGICAL SPECIALTIES. (Cr ar; prereq regis med)

ADVANCED CREDIT COURSES

8265. GENERAL ANESTHESIA

8266. REGIONAL ANESTHESIA

8267. PRE- AND POSTANESTHETIC EVALUATION

8268. SEMINAR: ANESTHESIOLOGY

8269. RESEARCH IN ANESTHESIA

BIOCHEMISTRY (MdBc)

Wallace D. Armstrong, M.D., Ph.D., Professor and Head

Professor

Robert W. Bernlohr, Ph.D.
Charles W. Carr, Ph.D.
Ivan D. Frantz, Jr., M.D., Ph.D.
Helmut R. Gutmann, Ph.D.
Ralph T. Holman, Ph.D.
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.
Donald B. Wetlaufer, Ph.D.
Finn Wold, Ph.D.

Associate Professor

James W. Bodley, Ph.D.
Mary E. Dempsey, Ph.D.
Ronald D. Edstrom, Ph.D.
Ernest D. Gray, Ph.D.

Assistant Professor

Charles H. Blomquist, Ph.D.
James B. Howard, Ph.D.
Sally E. Jorgensen, Ph.D.
Albert D. Notation, Ph.D.
Venkateswarlu Pothapragada, Ph.D.
Robert J. Roon, Ph.D.
Everett C. Short, Jr., D.V.M., Ph.D.
Quenton T. Smith, Ph.D.

Lecturer

Charles F. Schachtele, Ph.D.
Ulysses S. Seal, 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. A major emphasis is on the integration of biochemical processes and on the regulation and coordination of metabolic reactions. Biochemical abnormalities in disease are employed to fortify the understanding of normal processes and to indicate 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 through 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 Phases B and D of the medical curriculum.

REQUIRED COURSES

5100. BIOCHEMISTRY. (6 cr; prereq regis med fr, physics, organic chemistry)
5101. BIOCHEMISTRY. (4 cr; prereq regis med fr, 5100)

ELECTIVE COURSE

5053. PROBLEMS IN BIOCHEMISTRY. (Cr ar [may be repeated for cr]; prereq 5101)

ADVANCED CREDIT COURSES

8150. SEMINAR: BIOCHEMISTRY
8300. RESEARCH IN BIOCHEMISTRY
8206. ADVANCED ENDOCRINOLOGY AND STEROID CHEMISTRY
8211. NUCLEIC ACID AND PROTEIN METABOLISM
8215. TOPICS IN LIPID METABOLISM
8217. PROTEIN CHEMISTRY
8218. CURRENT TOPICS IN BASIC AND APPLIED ENZYMOLOGY
8219. BIOCHEMISTRY OF SPECIALIZED TISSUES
8220. CARBOHYDRATE METABOLISM
8236. SEMINAR: RADIOACTIVE ISOTOPES

DERMATOLOGY (Derm)

Robert W. Goltz, M.D., Professor and Chairman

Professor

Francis W. Lynch, M.D.

Clinical Professor

Isadore Fisher, M.D.
Kenneth P. Manick, M.D.
Milton Orkin, M.D.
Harold G. Ravits, M.D.

Clinical Associate Professor

Manuel Jaffe, M.D.
Irvine M. Karon, M.D.
Sheldon L. Mandel, M.D.
Willard C. Peterson, Jr., M.D.
John G. Rukavina, M.D.
William Schorr, M.D.

Assistant Professor

William C. Gentry, Jr., M.D.

Clinical Assistant Professor

David W. Anderson, M.D.
Bruce J. Bart, M.D.
Burrel R. Deaton, M.D.
LeRoy Geis, M.D.
Elmer Hill, M.D.
Thomas Kalb, M.D.
Harry I. Katz, M.D.
Elmer M. Rusten, M.D.
Nadine Smith, M.D.

Clinical Instructor

Elmer T. Ceder, M.D.
Dennis Leahy, M.D.
Orville Ockuly, M.D.
Edwin G. Rice, 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

5182. EXTERNSHIP IN DERMATOLOGY. (Cr ar)

5183. PROBLEMS IN DERMATOLOGY. (Cr ar)

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

FAMILY PRACTICE AND COMMUNITY HEALTH (FPCH)

Edward W. Ciriacy, M.D., Professor and Head

Professor

John E. Verby, M.D.
Vernon E. Weckwerth, Ph.D.

Clinical Professor

John F. Flinn, M.D.

Associate Professor

Richard P. Bendel, M.D.
Eldon B. Berglund, M.D.
Robert Breitenbucher, M.D.
Joseph P. Connolly, M.D.
Vincent R. Hunt, M.D.
Harold R. Ireton, Ph.D.
John T. Kelly, M.D.
John B. O'Leary, M.D.
Stuart V. Thorson, M.D.

Clinical Associate Professor

Harold D. Miller, M.D.

Assistant Professor

Donald S. Asp, M.D.
Robert F. Avant, M.D.
James L. Canine, M.D.
Frank J. Carthey, M.D.
Michael L. Daly, M.D.
Michael Danyluk, M.D.
Robert A. Derro, M.D.
Louis J. Filiatrault, M.D.
Ray C. Hippchen, M.D.
John W. McConnell, M.D.
John A. McLeod, M.D.
Edward Nelson, M.D.
Rev. Elof G. Nelson, S.T.D.
Leon J. Nesvacil, M.D.
Charles R. Peluso, M.D.
David R. Preston, M.H.A.
Harley J. Racer, M.D.
David L. Spencer, M.D.
Ralph P. Tharp, M.D.
Charles D. Townes, M.D.

Clinical Assistant Professor

Robert C. Ahlstrom, M.D.
Werner W. Amerongen, M.D.
Franklin C. Anderson, M.D.
Jo E. Anderson, M.D.

Dr. Ciriacy and student advisee Blatti work on scheduling.

John W. Anderson, M.D.
Richard W. Anderson, M.D.
Frank R. Arko, M.D.
Frederick D. Arny, M.D.
Byron C. Backus, M.D.
Lloyd B. Backus, M.D.
Ernest L. Bade, M.D.
Jean L. Bader, M.D.
John W. Balkins, M.D.
Patrick J. Barrett, M.D.
Charles J. Beck, M.D.
Alphonso A. Belsito, M.D.
Meyer S. Belzer, M.D.
Thomas G. Birkey, M.D.
William A. Black, M.D.
Frank E. Boyd, M.D.
Thomas G. Briggs, M.D.
Harold R. Broman, M.D.
Glen W. Brown, M.D.
William B. Buege, M.D.
Robert E. Bundt, M.D.
Dayton D. Burkholder, M.D.
Edgar C. Burseth, M.D.
William J. Carr, M.D.
Leland R. Christenson, M.D.
William L. Christian, M.D.
Bruce T. Clayton, M.D.
George M. Crow, M.D.
James H. Dokken, M.D.
Edward P. Donatelle, M.D.
John L. Durkin, M.D.
Paul J. Dyrdal, M.D.
Stephen H. Earl, M.D.
William P. Eder, M.D.
Myles E. Efteland, M.D.
Joseph S. Emond, M.D.
Paul H. Engebretson, M.D.
E. Duane Engstrom, M.D.
Carl E. Erling, M.D.
David W. Feigal, M.D.
Albert D. Fetzek, M.D.
George Fortier, M.D.
Donald B. Frane, M.D.
Bayard T. French, M.D.
Edgar R. Gamm, M.D.
LeRoy F. Geis, M.D.
Joseph L. Gendron, M.D.
David L. Gilbertson, D.O.
Gary D. Good, M.D.
John C. Grant, M.D.
Carl V. Griesy, M.D.
Paul T. Grimes, M.D.
David W. Grube, M.D.
Joseph J. Gutenkauf, M.D.
Norman L. Hagberg, M.D.
William G. Halverson, M.D.
George W. Haugen, M.D.
Robert J. Havel, M.D.
James K. Heid, M.D.
Carl R. Heinzerling, M.D.
Edgar E. Heller, M.D.
Terrance P. Henderson, M.D.
Kenneth V. Hodges, M.D.
Douglas J. Holt, M.D.
John R. Holten, M.D.
Murray H. Hunter, M.D.
William C. Jackson, M.D.
Dennis R. Jacobson, M.D.
William L. Jefferies, M.D.
Alan R. Johnson, M.D.
Bradley D. Johnson, M.D.
O. Guy Johnson, M.D.
Stanley M. Johnson, M.D.
Joseph E. Keenan, M.D.
Robert T. Kelly, M.D.
James F. Knapp, M.D.
Gary G. Kohls, M.D.
Peter S. Koontz, M.D.
William Kosiak, M.D.
Michael J. Kozak, M.D.
Walter E. Krafft, M.D.
Albert E. Krieser, M.D.
James N. Kvale, M.D.
Eric John Larson, M.D.
Roland R. Larter, M.D.
Gordon E. Lee, M.D.
Richard J. Lessard, M.D.
Raymond J. Lindeman, M.D.
Olaf Lukk, M.D.
Roger A. MacDonald, M.D.
Raymond C. Magnuson, M.D.
J. Anthony Malerich, M.D.
Merle S. Mark, M.D.
Frederick F. Martin, M.D.
Donald J. Maus, M.D.
David K. McAfee, M.D.
Samuel K. McHutchinson, M.D.
Eva E. McKenzie, M.D.
David W. McQuoid, M.D.
Frederick A. Melms, M.D.
Donald D. Metz, M.D.
Gilbert T. Midboe, M.D.
George M. Miks, M.D.
William P. Miller, M.D.
Charles J. Mishek, M.D.
Robert E. Molenar, M.D.
Albrecht E. Muller, M.D.
Theodore P. Myers, M.D.
Timothy E. Nealy, M.D.
Delbert R. Nelson, M.D.
Leo K. Nelson, M.D.
Robert P. Nelson, M.D.
Ronald J. Nelson, M.D.
Thomas O. Nichols, M.D.
Neil D. Nickerson, M.D.
David J. Nielson, M.D.
Kenneth O. Nimlos, M.D.
Joseph L. Norquist, M.D.
Dean O. Nywall, M.D.
Olin M. Odland, M.D.
Richard E. Olson, M.D.
Eugene C. Ott, M.D.
Peter H. Overgaard, M.D.
James J. Pattee, M.D.
Charles R. Pelzl, M.D.
Roy F. Pierson, M.D.
Rolland D. Pistulka, M.D.
David A. Pope, M.D.
Robert L. Powers, M.D.
Ricard R. Puumala, M.D.

John R. Ragan, 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.
Pat Rollins, M.D.
David L. Rosenbaum, M.D.
Robert J. Rotenberg, M.D.
Harry M. St. Cyr, M.D.
John H. Sargent, M.D.
Martin J. Schirber, M.D.
Ruben F. Schmidt, M.D.
Milton H. Seifert, Jr., M.D.
Richard J. Sells, M.D.
Odean M. Severseike, M.D.
Franklin D. Sidell, M.D.
Richard K. Simmons, M.D.
Kathleen K. Simo, M.D.
James W. Sipe, M.D.
George R. Smith, M.D.
John E. Smith, M.D.
Ernest J. Sowada, M.D.
Paul M. Spilseth, M.D.
Keith H. Stolen, M.D.
Herbert S. Strait, M.D.
Richard E. Streu, M.D.
Robert L. Sturges, M.D.
John E. Sutherland, M.D.
Lawrence J. Swanson, M.D.
Orville P. Swenson, M.D.
Leslie A. Syverson, M.D.
Ralph P. Tharp, M.D.
Cyril R. Tifft, M.D.
James E. Trow, M.D.
Horatio P. VanCleve, M.D.
Thomas W. Votel, M.D.
Fred Walker, M.D.
Stuart B. Walker, M.D.
Richard M. Warhol, M.D.
Marwood E. Wegner, M.D.
Joseph F. Wethington, M.D.
Lloyd A. Whitesell, M.D.
Norman P. Wigg, M.D.
Richard E. Williams, M.D.
Elton G. Wing, M.D.
Donald L. Wright, M.D.
Matthew D. Yelle, M.D.
John D. Zapf, M.D.
Leo A. Zaworski, M.D.
Robert L. Zemke, M.D.

Instructor

Donald M. Cassata, M.A.
Luis A. deCubas, M.D.
Edward J. Hughes, M.S.W.
James G. Lawson, B.S.
Eugene V. Lenarz, B.A.
Robert W. Reif, M.D.

Clinical Instructor

Irene G. Cass, M.D.
Joseph C. Kovacs, M.D.

The responsibility of the Department of Family Practice and Community Health is to introduce the student to the fundamentals of continuing and comprehensive patient care within the context of the patient's family and community environment. Consistent with the breadth of interest of the family physician, adequate training in all basic areas of medical knowledge is stressed. Emphasis is placed on the preventive medicine and behavioral science aspects of patient care.

In the Phase A program, the Department of Family Practice and Community Health participates in teaching Introduction to Clinical Medicine which includes instruction in obtaining medical history, physical diagnosis, and interview techniques.

In the Phase B program, the student spends 1 day each month with a family physician as he cares for his office and hospital patients. This gives the student the opportunity to actually visualize and understand the role of the family physician in our health care system.

In the Phase D program, the student has multiple opportunities to participate in the Family Practice Programs. He may elect to spend a year with a rural family physician as part of the Rural Physician Associate Program before completing his M.D. requirements. This is a combined educational-service program of the Medical School administered by the Department of Family Practice and Community Health and designed to acquaint students with the advantages of the world of rural family practice. For more limited experience, the Phase D student may elect to take a 6-week preceptorship with a rural family physician.

Model Family Practice Units have been established within the University Medical School and five additional sites are located either within or close-by our affiliated community hospitals. These units are designed primarily for the graduate education of residents in the Family Practice Training Program. In addition, they serve as major departmental classrooms for teaching the concepts of continuing and comprehensive primary health care to medical students. The patient populations represent a cross section of age levels and socioeconomic status. Students participate in the ongoing care of patients in these Model Family Practice Units.

Additional educational opportunities in the Department of Family Practice and Community Health are made available through the individual practicing physician's offices 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 clinical medical care as performed by the practitioner within the community.

5501. RURAL PHYSICIAN ASSOCIATE PROGRAM. (36 cr; prereq minimum, completion of Phase A and B curricula, University of Minnesota Medical School)
Twelve-month program in which student contributes to care of a population of patients in a rural community while learning principles of primary health care delivery. Stipend of $10,000.00.

5520. RURAL HEALTH CARE MODEL, ONAMIA, MINNESOTA. (9 cr; prereq regis med)
Participation in delivery of clinical medical care as performed by the practitioner, with emphasis on team health and disease care in a small town setting.

5530. CLINICAL PROBLEMS IN FAMILY PRACTICE. (9 cr; prereq regis med)
Participation in primary health care in the Family Practice Clinic at the University while studying problems involved in comprehensive health and disease care delivery.

5540. FAMILY PRACTICE CLINICAL LABORATORY. (4.5 cr; prereq regis med)
Correlating laboratory information with clinical conditions. Emphasis on normal values, normal variations, sources of error, multiphasic screening, and quality control. Course conducted at North Memorial Hospital. Includes daily seminars on laboratory medicine topics, student presentation of cases, CPC cases, autopsies and regular hospital conferences and student seminars.

5541. RETURN TO BASIC SCIENCES. (4 cr; prereq regis med)
Family practice seminar. Clinical correlation stressing common clinical situations and related core basic science data.

5550. SURGERY FOR FAMILY PRACTICE. (Cr ar; prereq regis med)
A surgical clerkship at St. Paul-Ramsey Hospital with supervised responsibility for inpatients with surgical diseases. Patients assigned are selected to demonstrate diseases and injuries encountered in family practice.

5560. ALCOHOL AND DRUG ADDICTION TREATMENT CENTER. (4.5 cr; prereq regis med)
An intensive exposure to current methods and approaches to therapy and rehabilitation of drug-dependent patients.

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

5565. HUMAN RELATIONS FOR THE PHYSICIAN. (3 cr; prereq regis med or ♯)
An exploration of the interpersonal dynamics of human relationships, focusing primarily on the interpersonal relationships of the practicing physician.

5575. MANAGEMENT CONCEPTS AND APPLICATIONS IN MEDICAL PRACTICE. (2 cr; prereq regis med)
The objectives are to develop knowledge and understanding in basic management areas such as accounting, finance, personnel management, and operations analysis; focusing on aspects specific to clinic management.

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

ADVANCED CREDIT COURSES

8201. CLINICAL FAMILY MEDICINE

8202. DYNAMICS OF MARRIAGE AND FAMILY

8204. QUANTITATIVE LOGIC IN CLINICAL JUDGMENT

8206. PSYCHOLOGY IN MEDICINE

8207. SEMINAR: COMMON DISEASES SEEN IN FAMILY PRACTICE

8208. FAMILY MEDICINE CONFERENCES

8210. FAMILY MEDICINE GRAND ROUNDS

8211. PRACTICE MANAGEMENT

8226. MEDICAL SOCIOLOGY SEMINAR

8228. INTERDISCIPLINARY HEALTH SEMINAR

8240. COMMUNITY RESOURCES

8242. ECONOMICS OF HEALTH CARE DELIVERY SYSTEMS

8245. ANALYSIS OF INSTRUCTION AND EDUCATIONAL EVALUATION

8253. RESEARCH PROBLEMS

HISTORY OF MEDICINE (HMed)

Leonard G. Wilson, M.Sc., Ph.D., Professor and Head

Assistant Professor
Toby Gelfand, 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 make him aware of the strengths and weaknesses of his own knowledge and enables him to view medicine in historical perspective.

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

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

ELECTIVE COURSES

5024f, 5025w, 5026s. HISTORY OF MEDICINE. (4 cr per qtr) Gelfand
The interaction of medicine and society in historical context; the role of historical factors — social, economic, philosophical and scientific — in shaping medicine and its institutions. Students learn that the way a given society deals with problems of health and disease is conditioned by broad historical factors as well as by developments within medicine.

5400. 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 at Alexandria, Galen and Greek medicine at Rome, the transmission of Greek medicine through the Arabic and Byzantine cultures, medical theory and practice in the Middle Ages.

5401. 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, the emergence of new chemical and mechanical theories of medicine, the classification of disease, the rise of medical teaching.

5402. 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; the 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
This seminar allows students to study the development of modern medicine through reading and discussion and to pursue a selected problem in greater depth than would normally be possible. Ordinarily, students do general reading during fall quarter. During winter quarter, they select a topic for more intensive study and write the first draft of a paper on it. During spring quarter, they revise first draft and submit their paper in final form. This course is 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
The development of biological concepts from ancient Greece to the early twentieth century.

INTERDISCIPLINARY MEDICINE (InMD)

The courses listed in this category are an integral part of the core curriculum for undergraduate medical students and are offered in Phase B, except for Introduction to Clinical Medicine, the first quarter of Student as Physician, and portions of Man in His Community, and Behavior of Man which are within Phase A. Direct administrative responsibility for these programs is vested in the individual course directors; planning, execution, and evaluation of these courses and of student performance is carried out by interdepartmental committees.

REQUIRED COURSES

5100f, 5101w, 5102s, 5103su. INTRODUCTION TO CLINICAL MEDICINE. (Cr ar) Fortuny
Patient demonstrations and correlation clinics in Phase A.

5202f, 5203w, 5204s, 5205su. STUDENT AS PHYSICIAN. (Cr ar; prereq regis med) Staff
Clinical tutorials in Phase B.

5211w. BEHAVIOR OF MAN. (Cr ar; prereq regis med) Cline and staff
In Phase B, study of normal development and the manner in which deviations lead to disordered behavior. Treatment methods and clinical presentations included. Patient interview techniques stressed. Coordinated with 5201.

5220f. CARDIOVASCULAR. (Cr ar; prereq regis med) Lucas and staff
Fundamental concepts in cardiovascular system pathophysiology and clinical application in diagnosis and management.

5221f. RESPIRATORY. (Cr ar; prereq regis med) Drage and staff
Clinical and laboratory applications of respiratory anatomy, pathology, physiology, pharmacology, and microbiology; essentials of normal respiration and respiratory disease.

5222f. BLOOD I. (Cr ar; prereq regis med) Mosler and staff
Fluid, electrolytes, and acid-base balance.

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

5224s. ENDOCRINE AND METABOLIC. (Cr ar; prereq regis med) Ungar and staff
Integrated basic science and clinical presentations in endocrinology and metabolism, with emphasis on self-learning and group discussions.

5225s. REPRODUCTION. (Cr ar; prereq regis med) Bendel and staff
Human reproductive physiology, clinical problems and management, including practical consideration of contraception and population control.

5226w. BLOOD II. (Cr ar; prereq regis med) Cardemone and staff
Homeostatic mechanisms influencing cellular elements of blood and hemostasis. Pathophysiology and study of hematologic disease, with emphasis on morphology. Includes laboratory studies and group discussions.

5227s. SKIN. (Cr ar; 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.

5228s. EAR, NOSE, AND THROAT. (Cr ar; prereq regis med) Quick and staff
Pathophysiological mechanisms in relation to clinical medicine and the ear, nose, and throat.

5229s. EYE. (Cr ar; prereq regis med) Letson and staff
Anatomy, embryology, and physiology of the human eye; discussion of common ocular problems and management of the patient.

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

5231w. GUT. (Cr ar; prereq regis med) Levitt and staff
Normal function, pathophysiology, and clinical aspects of the gastrointestinal tract, liver, and pancreas.

5232su. BONES, CONNECTIVE TISSUE, JOINTS. (Cr ar; prereq regis med) Kottke 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.

5233w. HUMAN SEXUALITY. (Cr ar; prereq regis med) Chilgren and staff

LABORATORY MEDICINE AND PATHOLOGY (LaMP)

Ellis S. Benson, M.D., Professor and Head

Professor

Eugene Ackerman, Ph.D.
John I. Coe, M.D.
Esther F. Freier, M.S.
Franz Halberg, M.D.
Robert Hebbel, M.D., Ph.D.
Paul H. Lober, M.D., Ph.D.
Kenneth A. Osterberg, M.D.
Andreas Rosenberg, Ph.D.
R. Dorothy Sundberg, M.D., Ph.D.
Alexander Templeton, M.D.
Lee W. Wattenberg, M.D.
Edmond J. Yunis, M.D.
Jorge J. Yunis, M.D.

Clinical Professor

Jesse E. Edwards, M.D.

Associate Professor

W. Robert Anderson, M.D.
Miguel Azar, M.D., Ph.D.
Donna Blazevic, M.P.H.
G. Mary Bradley, M.D.
Robert A. Bridges, M.D.
David M. Brown, M.D.
Richard D. Brunning, M.D.
Barbara A. Burke, M.D.
Agustin Dalmasso, M.D.
Stacey B. Day, M.D., Ph.D.
Grace Mary Ederer, M.S.
J. Roger Edson, M.D.
Richard D. Estensen, M.D.
Donald F. Gleason, M.D., Ph.D.
Leonard Greenberg, Ph.D.
Erhard Haus, M.D., Ph.D.
Arnold Lindall, M.D.
John M. Matsen, M.D.
Herbert Polesky, M.D.
Lorraine G. Stewart, M.S.
Patrick C. J. Ward, M.D.
Walid G. Yasmineh, Ph.D.

Clinical Associate Professor

Paul A. Alexander, M.D.
Martin Segal, M.D.

Assistant Professor

Thomas Amsden, M.D.
Henry Balfour, M.D.
Calvin Bandt, M.D.
Philip Blume, M.D.
M. Desmond Burke, M.D.
Kazimiera Gajl-Peczalska, M.D.
Laël Gatewood, Ph.D.
Charles Horwitz, M.D.
F. Donald Kapps, M.D.
John H. Kersey, M.D.
David Lakatua, M.D.
Toni Mariani, Ph.D.
Zoltan Posalaky, M.D.
Walter J. Runge, M.D.
Robert E. Rydell, M.D.
Robert E. Scott, M.D.
Robert Strom, M.D.
Bertram Woolfrey, M.D., Ph.D.

Clinical Assistant Professor

Seymour Handler, M.D.
Edward Segal, M.D.
Thomas Semba, M.D.

Instructor

Verne A. Schulberg, M.D.
Charles E. Weigent, M.D.

Clinical Instructor

Richard W. Anderson, M.D.
Thomas R. Arlander, M.D.
Charles H. Chedister, M.D.
William A. Foley, M.D.
Craig Freeman, M.D.
J. Roald Fuglestad, M.D.
Ellery James, M.D.
Allen Judd, M.D.
Nicola D. Kostich, M.D.
John E. Kyllo, M.D.
Stanley V. Lofsness, M.D.
Frederick H. Lott, M.D.
Richard P. Lynch, M.D.
Ellias N. Manoles, M.D.
Robert J. McClellan, M.D.
Ronald Munkittrick, M.D.
Frederick Muschenheim, M.D.C.M.
John G. Popowich, M.D.
Marshall H. Short, M.D.
Clarence M. Strand, M.D.
Walter Subby, M.D.
Thomas O. Swallen, M.D.
John O. Swanson, 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 provide a common thread relating to all parts of the curriculm of study. In Phase A, a course on the principles of pathologic mechanisms (inflammation, degeneration, neoplasia, circulatory disorders) is taught during spring quarter. In Phase B, laboratory personnel contribute to most of the courses offered

during both core and elective time. In Phase D, the department contributes to all tracks as well as provides its own pathway within the field of medical subspecialties. An understanding of pathologic principles is implicit in much of the learning acquired at this time. It is expected that each student will learn and develop the ability to interpret laboratory data concerning the management of patients throughout his training and professional life.

The major areas of the department are comprised by clinical chemistry, blood banking, hematology (with coagulation), diagnostic microbiology, surgical pathology, autopsy pathology, genetics, immunology, and computer medicine. In addition, there are numerous more specialized laboratory divisions and research activities in which study is available to the student if he so wishes.

In summary, all students will gain experience in many areas of pathology during the first 2 years of Medical School. In Phase D, every student would benefit from further exposure to this field, either in general or more specialized course offerings. We believe that in the following list of courses every student will find something of value to him in his development as a physician.

REQUIRED COURSE

5101s. GENERAL PATHOLOGY. (Cr ar; prereq regis med fr or grad, #) Templeton and staff

ELECTIVE COURSES

General Courses in Anatomic Pathology

5150. ANATOMIC PATHOLOGY IN A HOSPITAL SETTING — University Hospitals. (Cr ar; prereq Phase B) Templeton
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 General Hospital. (Cr ar; prereq Phase B) Coe, Anderson, Osterberg
The student works in the Anatomic Pathology Department taking part in autopsy pathology, surgical pathology, and clinicopathology correlation sessions.

5152. ANATOMIC PATHOLOGY IN A HOSPITAL SETTING — Veterans Administration Hospital. (Cr ar; prereq Phase B) Gleason, Rydell
The student works in the Anatomic Pathology Department taking part in autopsy pathology, surgical pathology, and clinicopathology correlation sessions.

5153. ANATOMIC PATHOLOGY IN A HOSPITAL SETTING — St. Paul-Ramsey Hospital. (Cr ar; prereq Phase B) Haus, Lakatua
The student works in the Anatomic Pathology Department taking part in autopsy pathology, surgical pathology, and clinicopathology correlation sessions.

5154. ANATOMIC PATHOLOGY IN A HOSPITAL SETTING — North Memorial Hospital. (Cr ar; prereq Phase B) Handler
The student works in the Anatomic Pathology Department taking part in autopsy pathology, surgical pathology, and clinicopathology correlation sessions.

5155. ANATOMIC PATHOLOGY IN A HOSPITAL SETTING — Methodist Hospital. (Cr ar; prereq Phase B) Manoles, Fuglestad
The student works in the Anatomic Pathology Department taking part in autopsy pathology, surgical pathology, and clinicopathology correlation sessions.

General Courses in Clinical Pathology

5186. CLINICAL PATHOLOGY EXTERNSHIP — Hennepin County General Hospital. (Cr ar; prereq #) Strom, Bandt, Crosson
Students study a variety of laboratory analyses in hematology, microbiology, and chemistry and accompany laboratory physicians on ward rounds. Individual cases studied. Laboratory and clinical conferences. One week at Minneapolis War Memorial Blood Bank is an optional portion of this program.

5187. CLINICAL PATHOLOGY EXTERNSHIP — 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 of cytology, surgery, and pathologic anatomy studied. Daily laboratory and weekly clinical conferences.

5193. CLINICAL PATHOLOGY EXTERNSHIP — Hibbing. (Cr ar; prereq ‡) Alexander
The student works directly with hospital pathologists in all phases of laboratory practice. Emphasis placed 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 held with clinicians and radiologists.

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

5203. CLINICAL PATHOLOGY EXTERNSHIP — North Memorial Hospital. (Cr ar; prereq ‡) Handler
(See also FPCH 5540) Clinical cases and didactic presentations used to broaden the student's understanding of clinical and laboratory problems.

Courses in Specialized Subjects

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

5114. SURGICAL PATHOLOGY — Hennepin County General Hospital. (Cr ar; prereq Phase B) Anderson
The student gains experience in the macroscopic and microscopic diagnosis of biopsy and surgical material.

5115. SURGICAL PATHOLOGY — Veterans Administration Hospital. (Cr ar; prereq Phase B) Gleason
The student gains experience in the macroscopic and microscopic diagnosis of biopsy and surgical material.

5118. ENDOCRINE PATHOLOGY — St. Paul-Ramsey Hospital. (Cr ar; prereq Phase B, △) Haus, Lakatua
This course emphasizes the correlation between clinical presentation, laboratory investigation, and pathologic findings concerning endocrine problems.

5123. PULMONARY PATHOLOGY — St. Paul-Ramsey Hospital. (Cr ar; prereq Phase B, △) Woolfrey
Pathologic anatomy of the lung correlated with physiologic findings of the pulmonary function laboratory and other parameters of pulmonary pathology.

5125. CHRONOBIOLOGY. (Cr ar; prereq Phase B, ‡) Halberg
Students are invited to take part in the work of this unit, and programs are arranged to fit individual needs.

5141. PROBLEMS IN EXPERIMENTAL PATHOLOGY. (Cr ar; prereq Phase B, ‡)
An opportunity to 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 be delighted to discuss a project on these topics.

5158. CARDIAC PATHOLOGY — Miller Hospital. (Cr ar; prereq Phase B, ‡)
An opportunity to work with Dr. Jesse Edwards in the cardiac pathology laboratory.

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

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

5183. CLINICAL AND LABORATORY IMMUNOLOGY. (Cr ar; prereq ‡) E Yunis
Laboratory experience includes immunohematologic tests; immunologic tests for syphilis, infectious mononucleosis, lupus erythematosus, rheumatoid arthritis. The use of blood and blood derivatives in transfusion therapy and laboratory immunological problems of organ transplant studied. Discussion sessions, ward rounds, and seminars.

5184. IMMUNOHEMATOLOGY IN BLOOD BANKING. (Cr ar; prereq ‡) McCullough
Blood donor evaluation, blood collection, storage, and the clinical use of blood components. Suspected transfusion reactions, hemolytic diseases of the newborn, and other clinical problems are studied using immunohematologic methods. Experience at the St. Paul Regional Red Cross Blood Center available.

5185. LABORATORY PROBLEMS IN 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.

5189. 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 studied; clinical problems included. Conferences, study of individual cases, and investigation of practical problems.

5191. GENERAL CLINICAL MICROBIOLOGY. (Cr ar; prereq ‡) Matsen, Blazevic, Ederer
Students are oriented to microbiology using audio-visual aids. New culture techniques, blood culture, and antibody testing techniques practiced. According to interests, time will be distributed between general bacteriology, mycology, parasitology, virology, tuberculosis culture, and immunology. Daily rounds.

5194. COMPUTER APPLICATIONS IN MEDICINE. (Cr ar; prereq ‡) Ackerman, Gatewood
Discussion of current and anticipated uses of electronic computers. Students have an opportunity to use a variety of computer terminals, but emphasis is placed 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 ‡) Ackerman, 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 in reading and in special seminars.

5197. CLINICAL CHEMISTRY — St. Paul-Ramsey. (Cr ar; prereq ‡) Lakatua, Haus
A specific area of clinical biochemistry will be correlated in a clinicopathologic setting. The student will summarize the methodology and experience of the laboratory with this section.

5198. HEMATOLOGY — St. Paul-Ramsey. (Cr ar; prereq ‡) Kapps
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 included.

5199. CLINICAL GENETICS. (Cr ar; prereq ‡) J Yunis
The application of genetic principles in modern medicine, with stress on consultations, walking rounds, and clinic exposure. Daily discussions and a working knowledge in chromosome techniques, dermatoglyphics, and biochemical genetics included.

5202. CLINICAL CHEMISTRY. (Cr ar; prereq ‡) Blume
Individual instruction in the basic principles of methodology and pathophysiology underlying various tests. Relative precision and reliability of tests is related to their clinical significance. Emphasis placed on tests of acid-base balance and enzyme analysis. A limited clinical investigation is possible.

5746. PEDIATRIC PATHOLOGY. (Cr ar; prereq Phase B) B Burke

Lecture Courses and Seminars — Predominantly for Phase D Basic Science Track and Students 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

5105. DISEASES OF THE KIDNEY. (3 cr; prereq Phase B) Hebbel

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) Templeton

5112. DIAGNOSIS OF TUMORS. (Cr ar; prereq Phase B) Hebbel

5116. DEMONSTRATION OF GROSS PATHOLOGY. (Cr ar) Templeton

5131. 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 yeasts, 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

5160s. HUMAN CYTOGENETICS. (2 cr; prereq ‡; offered 1974-75 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 1974-75 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. (2 cr; prereq ‡; offered 1973-74 and alt yrs) J Yunis
Molecular and genetic basis of genetic traits in mammals.

5163s. HUMAN BIOCHEMICAL GENETICS LABORATORY. (Cr ar; prereq ‡; offered 1973-74 and alt yrs) J Yunis and staff

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

5177w,s. CLINICAL CHEMISTRY. (6 cr; prereq ‡) Freier and staff
Principles of modern clinical chemistry techniques, with emphasis on instrumental methods.

5268s. TECHNIQUES IN IMMUNOCHEMISTRY. (1 cr; prereq MdBc 5300 or 5301 or ‡) Bridges, Stewart
Antigen-antibody reaction applied to quantitative and qualitative analysis of specific patterns of clinical significance. Preparation of antigens and of antisera. Nature of antigen-antibody complexes. Applications of precipitin, neutralization, radioimmune, double antibody, and hemolysin techniques.

5270f. IMMUNOHEMATOLOGY. (3 cr) Azar, E Yunis
The immune response. Blood cells as antigens. Antibodies to 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 5272 or ‡) Azar, McCullough, Swanson, E Yunis

5272s. IMMUNOBIOLOGY. (2 cr; prereq ‡) E Yunis, Greenberg, Kersey
Current concepts of immunogenetics — immune responsiveness, transplant and tumor immunology.

5274w. 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, §Anat 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)

Richard V. Ebert, M.D., Professor and Head

Professor

Carl S. Alexander, M.D.
Henry W. Blackburn, Jr., M.D.
Howard B. Burchell, M.D., Ph.D.
Richard P. Doe, M.D., Ph.D.
William R. Fifer, M.D.
Ivan D. Frantz, Jr., M.D.
Benjamin F. Fuller, Jr., M.D.
N. L. Gault, Jr., M.D.
Frederick C. Goetz, M.D.
Wendell H. Hall, M.D., Ph.D.
Ben I. Heller, M.D.
Robert B. Howard, M.D.
Harry S. Jacob, M.D.
B. J. Kennedy, M.D., M.S.
Frank M. MacDonald, M.D.
Robert O. Mulhausen, M.D., M.S.
M. John Murray, M.D.
Alvin L. Schultz, M.D.
Samuel Schwartz, M.D., Ph.D.
Louis Tobian, Jr., M.D.
Russell M. Wilder, M.D., Ph.D.
C. Paul Winchell, M.D.
Leslie Zieve, M.D., Ph.D.
Horace H. Zinneman, M.D.

Clinical Professor

Rolf L. Andreassen, M.D.
Reuben Berman, M.D., M.S.
Paul J. Bilka, M.D.
Robert D. Blomberg, M.D.
James C. Dahl, M.D.
John H. Flinn, M.D.
Robert A. Green, M.D.
Albert J. Greenberg, M.D.
Mark C. L. Hanson, M.D.
Howard L. Horns, M.D.
Martin E. Janssen, M.D.
John W. LaBree, M.D.
Harold E. Miller, M.D.
J. C. Miller, M.D.
Herbert F. R. Plass, M.D., M.S.
Dean K. Rizer, M.D.
Werner Simon, M.D.
A. Boyd Thomes, M.D.
Lowell W. Weber, M.D.

Associate Professor

Jonathan S. Bishop, M.D.
Robert B. Breitenbucher, M.D.
Ignacio E. Fortuny, M.D.

Dr. Ebert and house staff on rounds.

Fredarick L. Gobel, M.D.
Donald B. Hunninghake, M.D.
Maynard E. Jacobson, M.D.
J. Richard Johnson, M.D.
Manuel E. Kaplan, M.D.
Carl M. Kjellstrand, M.D.
Michael D. Levitt, M.D., M.S.
F. Bruce Lewis, M.D.
James P. Lillehei, M.D.
Arnold D. Lindall, M.D., Ph.D.
Robert J. McCollister, M.D.
Frank Q. Nuttall, M.D., Ph.D.
A. MacDonnell Richards, M.D.
Harold J. Richman, M.D.
Fred L. Shapiro, M.D.
Luigi Taddeini, M.D.
Athanasios Theologides, M.D., Ph.D.
Naip Tuna, M.D., Ph.D.
Jack A. Vennes, M.D.
Yang Wang, M.D.
I. Dodd Wilson, M.D.
Neil J. Yorkston, M.D.

Clinical Associate Professor

Donald S. Amatuzio, M.D.
Alfred F. Anderegg, M.D.
Paul F. Bowlin, M.D.
John H. Brown, M.D.
David M. Craig, M.D.
Robert E. Doan, M.D.
Richard J. Frey, M.D.
A. S. Gilbertsen, M.D.
Wilbert J. Henke, M.D.
William H. Hollinshead, M.D.
Wayne L. Hoseth, M.D.
Milton M. Hurwitz, M.D., M.S.
Kjeld O. Husebye, M.D.
Wyman E. Jacobson, M.D.
Herbert W. Johnson, M.D.
John W. Johnson, M.D.
David G. Jones, M.D.
Dennis J. Kane, M.D.
James N. Karnegis, M.D.
John I. Levitt, M.D.
Paul T. Lowry, M.D.
James C. Mankey, M.D.
Dwight L. Martin, M.D.
Frank E. Martin, M.D.
James L. McKenna, M.D.
Burtis J. Mears, M.D.
H. Dawes Miller, M.D.
James G. Myhre, M.D.
O. L. Norman Nelson, M.D.
William A. O'Brien, M.D.
William E. Petersen, M.D.
David A. Randall, M.D.
Paul D. Redleaf, M.D.
Fred A. Rice, M.D.
George C. Roth, M.D.
Raymond W. Scallen, M.D.
Philip H. Soucheray, M.D.
Francis B. Tiffany, M.D.
Richard B. Tregilgas, M.D.
Frank A. Ubel, Jr., M.D.
A. Cabot Wohlrabe, M.D.

Assistant Professor

Arnold Adicoff, M.D.
Thomas W. Amsden, Jr., M.D.
Silvia H. Azar, M.D.
John E. Bond, Jr., M.D.
David C. Brown, M.D.
Theodore J. Buselmeier, M.D.
Brian C. Campion, M.D.
Erskine M. Caperton, M.D.
Joseph M. Cardamone, M.D.
Christina M. Comty, M.D.
Robert A. Derro, M.D.
Alfred Doscherholmen, M.D., Ph.D.
Charles W. Drage, M.D.
Donn R. Driver, M.D.
Cristobal G. Duarte, M.D.
John W. Eaton, Ph.D.
Arthur H. L. From, M.D.
Joyce L. Funke, M.D.
Russell F. Hanson, M.D., Ph.D.
James E. Hoffman, M.D.
Robert B. Howe, M.D.
Charles L. Jacobson, M.D.
Gerhard J. Johnson, M.D.
Paul B. Johnson, M.D.
Charles R. Jorgensen, M.D.
Mohammed Y. Khan, M.D.
Richard S. Kronenberg, M.D.
Robert T. Kunau, Jr., M.D.
Arthur Leonard, M.D.
Gilbert Lowenthal, M.D.
Andrew Mallory, M.D.
Donald S. Masler, M.D.
Charles F. Moldow, M.D.
Martin M. Oken, M.D.
Gerald R. Onstad, M.D.
Claus A. Pierach, M.D.
Leopoldo Raij, M.D.
Thomas J. Rose, M.D.
George A. Sarosi, M.D.
Rex B. Shafer, M.D., M.S.
Stephen E. Silvis, M.D.
Roger R. Stenlund, M.D.
William R. Swaim, M.D.
George A. Tagatz, M.D.
Ronald L. Wathen, M.D.
Edward T. Wong, M.D.
Yoshihito Yawata, M.D.

Clinical Assistant Professor

Robert L. Altman, M.D.
Thomas B. Arnold, M.D.
David A. Berman, M.D.
Malcolm N. Blumenthal, M.D.
Max A. Boller, M.D.
Rene Braun, M.D.
John M. Burns, M.D.
John B. Cardle, M.D.
Thaddeus Chao, M.D.
Malcolm D. Clark, M.D.
Ephraim B. Cohen, M.D.
Henry W. Cohen, M.D.
Roger S. Colton, M.D.
Curtis E. Davis, M.D.
Jerome W. Dougan, M.D.

Donald A. Duncan, M.D.
Jean R. Eckerly, M.D.
Ronald W. Ellis, M.D.
John G. Fee, M.D.
William D. Flory, M.D.
Vincent L. Fromke, M.D.
Benjie L. Goldfarb, M.D.
A. Stuart Hanson, M.D.
William L. Hedrick, M.D.
Stanton A. Hirsh, M.D.
Neil R. Hoffman, M.D.
Randall L. Johnson, M.D.
Harold B. Kaiser, M.D.
Arnold P. Kaplan, M.D.
Everett H. Karon, M.D.
Joseph R. Kelly, M.D.
Allan C. Kind, M.D.
Douglas L. Kjellsen, M.D.
Jerrold V. Larson, M.D.
Elliot M. Latts, M.D.
Irving J. Lerner, M.D.
Michael Levy, M.D.
Robert E. Lindell, M.D.
Charles M. E. Lindemann, M.D.
Russell C. Lindgren, M.D.
Jeanette K. Lowry, M.D.
Aaron L. Mark, M.D.
Robert A. Maslansky, M.D.
William F. Mazzitello, M.D.
Charles N. McCloud, Jr., M.D.
Winston R. Miller, M.D.
Gerald T. Mullin, Jr., M.D.
Thomas F. Mulrooney, M.D.
Charles L. Murray, M.D.
S. Scott Nicholas, M.D.
Franklin C. Norman, M.D.
William F. Nuessle, M.D.
Bruce C. Nydahl, M.D.
Robert E. Olson, M.D.
William J. Paule, M.D.
Richard A. Pfohl, M.D.
Frank S. Preston, Jr., M.D.
Thomas M. Recht, M.D.
William D. Remole, M.D.
James F. Reynolds, M.D.
Eugene Rinkey, M.D.
Rudolph J. Ripple, M.D.
Lawrence A. Savett, M.D.
Leonard D. Schloff, M.D.
William F. Schoenwetter, M.D.
Marvin S. Segal, M.D.
Terry C. Shackleford, M.D.
Andrew W. Shea, M.D.
Henry T. Smith, M.D.
Maurice L. Straus, M.D.
Donald B. Swenson, M.D.
Wayne H. Thalhuber, M.D.
William B. Torp, M.D.
Donald G. Vellek, M.D.
Frederic E. Walker, Jr., M.D.
Harold M. Wexler, M.D.
Harold E. Windschitl, M.D.
Richard C. Woellner, M.D.
Donald W. Woodley, M.D.
Solomon J. Zak, M.D.
Stephen L. Zuckerman, M.D.

Instructor

Mohammed Ahmed, M.D.
Clara D. Bloomfield, M.D.
Milton L. Bullock, M.D.
Robert W. Burmaster, M.D.
Cecil H. Chally, M.D.
G. Jeelani Dhar, M.D.
Hans H. Engman, M.D.
James D. Fett, M.D.
John R. Hoidal, M.D.
David T. Kiang, M.D., Ph.D.
Richard A. King, M.D.
Leonard I. Mastbaum, M.D.
Lawrence R. McEvoy, M.D.
John M. McMillin, M.D.
Richard B. Moore, M.D.
Patrick E. Mottram, M.D.
Richard R. Nelson, M.D.
David A. Pfaff, M.D.
Jeffrey L. Probstfield, M.D.
Teresa Rattazi, M.D.
Michael T. Spilane, M.D.
John E. Stevenson, M.D.
Pradub Sukhum, M.D.
Kenneth F. Tempero, M.D., Ph.D.
Joseph M. Tombers, M.D.
Erika F. Trapp, M.D.
W. Kent Warren, M.S.

Clinical Instructor

Madeline M. Adcock, M.D.
Frederick D. Arny, M.D.
Thomas C. Bagnoli, M.D.
John Baumgartner, M.D.
John G. Bergstrom, M.D.
William J. Bergstrom, M.D.
Conrad S. Butwinick, M.D.
David J. Carlson, M.D.
Wilfred A. Corson, M.D.
Clarke G. Daniels, M.D.
Kenneth L. Dedeker, M.D.
Thomas B. Dunkel, M.D.
William S. Eisenstadt, M.D.
Mark I. Hewitt, M.D.
Jui-Sung Hung, M.D.
Rodger L. Johnson, M.D.
Charles P. Kolars, M.D.
Herbert Lauritzen, M.D.
John W. Lawrow, M.D.
Michael Lobell, M.D.
Francis N. Lohrenz, M.D.
Thomas D. Maher, M.D.
John W. McBride, M.D.
Todd C. Miller, M.D.
Beatrice A. Mulford, M.D.
Charles R. Peterson, M.D.
Phillip J. Ranheim, M.D.
Rudolph J. Rosenquist, M.D.
Kusum Saxena, M.D.
Robert H. Scott, M.D.
James R. Shanks, M.D.
Richard R. Sturgeon, M.D.
Gerald E. Swanson, M.D.

Robert A. Van Tassel, M.D.
William E. Walsh, M.D.
Helen H. Wang, M.D.
Kyuhyun Wang, M.D.
Richard M. Warhol, M.D.
Stephen C. Weisberg, M.D.
F. Douglas Whiting, M.D.

Lecturer

Agustin P. Dalmasso, M.D.

ELECTIVE COURSES

5501. MEDICAL ONCOLOGY EXTERNSHIP AT UNIVERSITY HOSPITALS. (9 cr per period; offered all periods; report to 411 Masonic on first day of elective) Kennedy
Designed to provide training in internal medicine, with emphasis on the total care of patients with cancer by assuming direct patient responsibilities as a co-intern.

5502. MEDICINE EXTERNSHIP. (9 cr per period; offered all periods; report to Department of Medicine of assigned hospital at 8:30 am on first day of elective) Sarosi
Designed to introduce students to the diagnosis, treatment and management of patients on medical wards, allowing as much individual patient care responsibility as possible.

5504. SUBSTITUTE INTERNSHIP AT NORTHWESTERN HOSPITAL. (9 cr per period; offered all periods; prereq 5502; report to Dr. Howard's office at 9:00 am on first day of elective) Howard
Student is assigned duties of a regular medical intern.

5510. RESEARCH IN INFECTIOUS DISEASE. (9 cr per period; offered all periods) Hall
Research may be carried out under the supervision of Dr. Wendell Hall or Dr. Horace Zinneman of the Veterans Administration Hospital.

5511. RESEARCH IN GASTROENTEROLOGY. (9 cr per period; offered all periods; hrs ar) Arrangements made with Dr. Blackwood at Veterans Administration Hospital. Students are assigned to a staff member and participate in some aspects of his program.

5512. RESEARCH IN HEMATOLOGY AT UNIVERSITY HOSPITALS. (18 cr per period; offered all periods; report to C313 Mayo on first day of elective) Jacob
Course acquaints the student who is specifically interested in research with a problem or problems currently under investigation in hematology.

5522. MEDICAL GASTROENTEROLOGY. (9 cr per period; offered all periods; report to GI Section, VFW Building, fourth floor, University Hospitals) Bond
This elective provides the opportunity for the student to do work-ups and attend teaching rounds working with patients with gastrointestinal disease; to attend conferences at the assigned hospital as well as attend interhospital conferences, and to gain outpatient clinical experience. Students may express a preference for base hospital when registering.

5523. MEDICAL ENDOCRINOLOGY, METABOLISM AND CLINICAL PHARMACOLOGY. (9 cr per period; offered all periods; report to Room C338 Mayo at 8:15 am on first day of elective) Rose
This elective provides an introductory experience in clinical endocrinology and metabolic disease. Emphasis placed on clinical diagnosis, efficient and incisive work-ups, and clinical management in both inpatient and outpatient settings. Students may express a preference for base hospital when registering. A clinical externship is available in the Clinical Research Center of University Hospitals each period.

5524. CLINICAL INFECTIOUS DISEASES. (9 cr per period; offered all periods; report to Room 111, Bldg 1, Veterans Administration Hospital at 8:30 am on first day of elective) Hall
Emphasis placed on in-patients with clinical problems related to infection on all hospital services. Students become familiar with antibiotic use, relevant laboratory procedures, and approach to the patient with infectious disease. Students may express a preference for base hospital when registering.

5525. CARDIOVASCULAR MEDICINE. (9 cr per period; offered periods 3-8; hrs ar) Richman
The first week of each period includes 4 half-day introductory sessions on basic cardiology for all students. Students initially report to the Cardiology Section at the Veterans Administration Hospital for an orientation session. Each student spends all elective time other than the introductory session at one of the participating hospitals. Student preference for a base hospital will be honored in accordance with positions available at each hospital.

5526. ELECTROCARDIOGRAPHY AT UNIVERSITY HOSPITALS. (4.5 cr per period; offered periods 3-8; hrs ar) Tuna
This course consists of full-time instruction in clinical electrocardiography.

5528. CLINICAL HEMATOLOGY. (9 cr per period; offered all periods; report to C313 Mayo at 8:30 am on first day of elective) Howe
Clinical and research aspects of hematology. Course will be 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. Students may express a preference for base hospital when registering.

5531. CLINICAL RHEUMATOLOGY AT UNIVERSITY HOSPITALS. (9 cr per period; offered periods 3-8; hrs ar) Caperton
Emphasis placed 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.

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

5554. FLUID, ELECTROLYTE, ACID-BASE METABOLISM AT VETERANS HOSPITAL. (9 cr per period; offered all periods; report to the Dialysis Unit, Bldg 1, fifth floor, Veterans Administration Hospital, at 8:00 am on first day of elective) Masler, Brown, Mulhausen, Rose
Prevention, diagnosis, and treatment of acid-base (A/B) and fluid and electrolyte (F/E) disorders. The student will be a member of a consulting team which evaluates patients with A/B and F/E abnormalities associated with a variety of medical and surgical diseases.

5562. MEDICAL NEPHROLOGY. (9 cr per period; offered all periods; report to H118 Diehl Hall at least 1 week prior to start of period) Kunau
Evaluation and treatment of patients with acute and chronic renal disease, acid-base and electrolyte disturbances and hypertension. Students may express a preference for base hospital when registering.

5590. PRECEPTORSHIPS IN INTERNAL MEDICINE. (9 cr per period; offered all periods; hrs ar) Fuller
The student works with physicians by arrangement, either in rural or city clinics.

5595. INTRODUCTION TO PSYCHOLOGICAL ASPECTS OF MEDICAL CARE. (Cr ar; offered all periods; hrs ar) Wilder, Simon, and others
An introductory program which includes student-patient interviews on closed-circuit TV, reading seminars, diagnostic conferences, and supervised psychotherapy. The focus will be on patients characteristic of a medical practice population.

MICROBIOLOGY (MicB)

Dennis W. Watson, Ph.D., Professor and Head

Professor

Robert W. Bernlohr, Ph.D.
K. Gerhard Brand, M.D.
Francis Busta, Ph.D.
Martin Dworkin, Ph.D.
V. W. Greene, Ph.D.
W. H. Hall, M.D., Ph.D.
Howard M. Jenkin, Ph.D.
Robert K. Lindorfer, Ph.D.
Charles F. McKhann, M.D.
Palmer Rogers, Ph.D.
Edwin L. Schmidt, Ph.D.
Henry M. Tsuchiya, Ph.D.
Lewis W. Wannamaker, M.D.
Horace Zinneman, M.D.

Associate Professor

Dwight L. Anderson, Ph.D.
Peter Chapman, Ph.D.
Russell C. Johnson, Ph.D.
John M. Matsen, M.D.
Gerald Needham, Ph.D.
Peter G. W. Plagemann, Ph.D.
James T. Prince, M.S.

Assistant Professor

P. Paul Cleary, Ph.D.
A. Y. Elliott, Ph.D.
Beulah Homes Gray, Ph.D.
Dolph Klein, Ph.D.
William Liljemark, D.D.S., Ph.D.
Larry McKay, Ph.D.
David Peterson, B.A.
Jon Schmidtke, Ph.D.
Lea I. Sekely, Ph.D.
Sara Sudo, Ph.D.
James Zissler, Ph.D.

Lecturer

Henry Bauer, Ph.D.
Donna J. Blazevic, M.P.H.
Grace Mary Ederer, M.S.
Allan B. Hooper, Ph.D.
A.G. Karlson, D.V.M., Ph.D.

Dr. Brand and a student in microbiology laboratory.

Microbiology for freshman medical students educates the future practicing physician in principles and techniques which will help him to understand host-parasite relationships and pathogenesis of infectious diseases. The application of modern 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 is trained to interpret laboratory results as well as to appreciate his role in, and the need for, cooperation between the modern physician and the diagnostic laboratory.

Elective courses are offered to medical students during their second through fourth years of school. These courses are designed for advanced studies and in-depth treatment of such topics as diagnostic microbiology, immunobiology and immunochemistry, preventive microbiology, epidemiology and pathogenesis of infectious diseases, and tropical medicine.

REQUIRED COURSES

5205s. MICROBIOLOGY FOR MEDICAL STUDENTS.** (6 cr; prereq regis med fr or grad) Brand and staff
Immunology, parasitology, mycology, and medical bacteriology, virology with emphasis on pathogenesis. Principles and techniques enabling diagnosis, treatment (especially chemotherapy), and prevention of infectious disease.

5206suI. 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,w,s. BIOLOGY OF MICROORGANISMS.** (4 cr, §3013, §Biol 3013; prereq 5 cr biological sciences, Chem 3302 or ‡) Dworkin, Chapman, Klein
Lectures, demonstrations, and laboratory exercises in taxonomy, anatomy, physiology, biochemistry, and ecology of microbes. Some emphasis on molecular structure in relation to bacterial function.

5216w. IMMUNOLOGY. (4 cr; prereq 3103 or 5105 or Biol 3013) Gray
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.

5218w. IMMUNOLOGY. (3 cr; prereq 3103 or 5105 or Biol 3013) Gray
Same as 5216 without laboratory.

5232s. MEDICAL MICROBIOLOGY.** (4 cr; not open to med students; prereq 5216) Cleary
Pathogenic bacteria, fungi, and viruses, with emphasis on mechanisms of pathogenicity and virulence. Properties of microorganisms and their animal hosts which influence the fate of host-parasite relations analyzed from genetic and metabolic points of view. Includes laboratory.

** Microscope required. Students may obtain use of microscope by purchasing $3 microscope cards from the bursar.

5233f. MICROORGANISMS AND DISEASE.** (7 cr; not open to microbiology majors; prereq 10 cr chemistry and 5 cr biological sciences or ‡) Johnson
Lectures, demonstrations, and laboratory instruction in nature of microorganisms, immunology, medical bacteriology, virology, mycology, parasitology, and principles of disease control.

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) 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.

5612s. ECOLOGY OF SOIL MICROORGANISMS. (4 cr; prereq 3103 or 5105 or Biol 3013, ‡; offered 1974-75 and alt yrs) Schmidt
(Same as Soil 5612) Soil as a microhabitat; nature of microbial population of soil; interactions among microorganisms in soil ecosystem; significant activities of soil microorganisms.

5970f,w,s,su. DIRECTED READINGS. (Cr ar; prereq ‡) Staff

ADVANCED CREDIT COURSES

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

8110f. BIOLOGY OF MICROORGANISMS

8112suII. MICROBIAL GENETICS

8120f. MICROBIOLOGY LABORATORY

8218f. IMMUNOCHEMISTRY AND IMMUNOLOGY

8234. ADVANCED MEDICAL MICROBIOLOGY

8242f,w,s. DIAGNOSTIC MICROBIOLOGY

8323f. REGULATION OF METABOLISM

8910f,w,s. SEMINAR

8911f,w,s. COLLOQUIUM IN MICROBIOLOGY

8920f,w,s. ADVANCES IN IMMUNOLOGY

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

** Microscope required. Students may obtain use of microscope by purchasing $3 microscope cards from the bursar.

NEUROLOGY (Neur)

A. B. Baker, M.D., Ph.D., Regents' Professor and Head

Professor

Milton Alter, M.D.
James Berry, Ph.D.
William Bradley, M.D.
Milton Ettinger, M.D.
George Flora, M.D.
Robert J. Gumnit, M.D.
William R. Kennedy, M.D.
Joseph A. Resch, M.D.
Joo Ho Sung, M.D.
Kenneth Swaiman, M.D.
Fernando Torres, M.D.
Arthur G. Waltz, M.D.
David Webster, M.D.

Clinical Professor

Harold Berris, M.D.
Robert L. Meller, M.D., M.S.
Zondal Miller, M.D.
Harold H. Noran, M.D., Ph.D.
Sidney Shapiro, M.D.

Associate Professor

Giovanni-Francesco Ayala, M.D.
Harold P. Cohen, Ph.D.
Arthur Klassen, M.D., M.S.
Sping Lin, Ph.D.
Ruth B. Loewenson, Ph.D.
Emanuel Stadlan, M.D.
Francis S. Wright, M.D.

Clinical Associate Professor

William Chalgren, M.D.
Paul Elwood, M.D.
Lawrence Farber, M.D.
Ernest M. Hammes, Jr., M.D.
Andrew Leemhuis, M.D.
Paul Silverstein, M.D.
Robert Stoltz, M.D.

Assistant Professor

Khurshed A. Ansari, M.D.
Charles S. Bland, M.D.
Ronald E. Cranford, M.D.
Anna Ellington, M.D.
W. Allen Hauser, M.D.
William B. Hosfield, M.D.
Robert Kriel, M.D.
Myoung C. Lee, M.D.
Lawrence Lockman, M.D.
William E. Martin, M.D., Ph.D.
Angeline Mastri, M.D.
Jerrold Milstein, M.D.
James A. Moriarty, M.D.
Gerald K. Morley, M.D.
Manuel Ramirez-Lassepas, M.D.
Alan B. Rubens, M.D.
Robert Soll, M.D., Ph.D.
Gerald W. Timm, Ph.D.
Gilbert Westreich, M.D.
John A. Whitaker, M.D.
James Zeese, M.D.

Clinical Assistant Professor

James R. Allen, M.D.
Lowell Baker, M.D.
Ivan Brodsky, M.D.
Terrance Capistrant, M.D.
Richard Foreman, M.D.
Richard Galbraith, M.D.
Brian Krasnow, M.D.
Glenn Sawyer, M.D.
V. Richard Zarling, M.D.

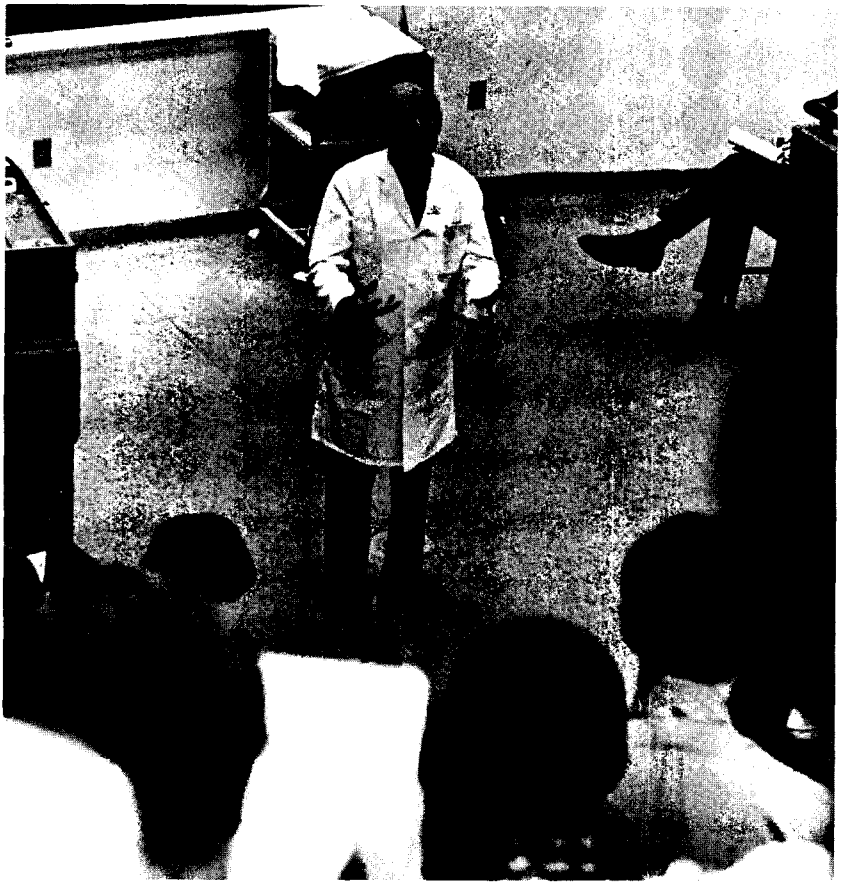
Instructor

Govin T. Vatassery, M.D.

Clinical Instructor

C. Camak Baker, M.D.
Michael Bromer, M.D.
Roger Farber, M.D.
Hsien-Hwa Hsieh, M.D.
Maland C. Hurr, M.D.
Richard V. Johnson, M.D.
John McKelvey, M.D.
Lawrence J. Schut, M.D.
Louise Town, M.D.

The Department of Neurology provides undergraduate medical education in clinical neurology as well as an interface with other departments to present an interdisciplinary approach to the neurosciences. This is achieved in the second year by the provision of clinical correlations, by the teaching of the technique of the neurological examination in lectures and demonstrations, and, finally, by a series of clinical demonstrations which provides a didactic approach to the field of clinical neurology. To the foregoing is added the opportunity for externships in neurology which provide supervised clinical experience with inpatients as well as outpatients suffering from neurological disorders.



Dr. Baker gives a dynamic lecture on clinical neurology.

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) Baker and staff

5540. NEUROCHEMISTRY. (Cr and hrs ar; prereq regis med) Berry, Cohen, Lin

5541. PEDIATRIC NEUROLOGY-NEUROCHEMISTRY. (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

5550. NEUROPATHOLOGY. (4.5 cr; hrs ar; prereq regis med) Sung, Mastri

5555. CLINICAL NEUROPHYSIOLOGY — St. Paul-Ramsey Hospital. (Cr and hrs ar; prereq regis med) Gumnit

5565. PATHOLOGICAL AND BIOCHEMICAL CORRELATES OF NEUROLOGY — Veterans Administration Hospital. (Cr and hrs ar; prereq regis med) Vatassery, Stadlan

5570. IMMUNOLOGY — Veterans Administration Hospital. (Cr and hrs ar; prereq regis med) Ansari

ADVANCED CREDIT COURSES

(For description of 8000-level courses, see *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

8223. NEUROLOGICAL COMPLICATIONS OF INTERNAL DISEASE

8226. NEUROMUSCULAR DISEASE

8227. NEUROLOGICAL SPEECH DISORDERS

8228. NEUROGENETICS

8229. CLINICAL CORRELATIVE NEUROANATOMY

8230. INFECTIOUS DISEASE OF THE NERVOUS SYSTEM

8231. ADVANCED CLINICAL NEUROLOGY

8233. NEUROLOGICAL-CLINICAL-PATHOLOGICAL CONFERENCE

8234. NEUROPSYCHOLOGY CONFERENCE

8235. ADVANCED NEUROPSYCHOLOGY

8236. RESEARCH IN NEUROPATHOLOGY

8240. NEUROENGINEERING RESEARCH SEMINAR

8241. DERMATOGLYPHICS

8242. NEUROLOGY FOR PSYCHOLOGISTS AND PSYCHIATRISTS

8701. NEUROOPHTHALMOLOGY

8702. NEURORADIOLOGY

8703. ADVANCED NEUROPATHOLOGY

8704. SURVEY OF NEUROPATHOLOGY

8705. NEUROLOGICAL-NEUROSURGICAL CONFERENCE

8706. STIMULATION AND ELECTRODES

8707. ENERGY SOURCES FOR BIOMEDICAL APPLICATIONS

NEUROSURGERY (NSur)

Shelley N. Chou, M.D., Ph.D., Professor and Head

Professor
Lyle A. French, M.D.

Clinical Professor
Harold Buchstein, M.D., M.S.
Leonard Titrud, M.D., Ph.D.

Associate Professor
Edward L. Seljeskog, M.D., Ph.D.
James R. Bloedel, M.D., Ph.D.

Clinical Associate Professor
C. Norman Shealy, M.D.

Assistant Professor
Donald L. Erickson, M.D.
Jesse C. Yap, M.D.

Clinical Assistant Professor
Paul S. Blake, M.D.
Robert L. Merrick, M.D., Ph.D.
Michael P. Sperl, M.D., M.S.
Erich S. Wisiol, M.D.

Instructor
Robert E. Maxwell, M.D.
James I. Ausman, M.D., Ph.D.
Max Zarling, M.D.
Heinrich Bantli, Ph.D.

The courses for medical students in neurological surgery are designed to introduce 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 by 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 neurological sciences.

ELECTIVE COURSES

5500. EXTERNSHIP AT THE UNIVERSITY HOSPITALS. (Cr ar; prereq regis med)

5510. EXTERNSHIP AT VETERANS HOSPITAL. (Cr ar; prereq regis med)

5511. EXTERNSHIP AT HENNEPIN COUNTY GENERAL HOSPITAL. (Cr ar; prereq regis med)

5512. EXTERNSHIP AT ST. PAUL-RAMSEY HOSPITAL. (Cr ar; prereq regis med)

5520. NEUROSURGICAL INVESTIGATION. (Cr ar; prereq regis med)

5530. NEUROPSYCHOLOGY. (Cr ar; prereq regis med)

5540. NEUROSURGICAL CONFERENCE. (Cr ar; prereq regis med)

ADVANCED CREDIT COURSES

8300. OUTPATIENT CLINIC IN NEUROSURGERY

8305. NEUROSURGICAL DIAGNOSIS

8308. NEUROSURGICAL SERVICE

8311. OPERATIVE NEUROLOGICAL SURGERY

8316. NEUROSURGICAL RESEARCH

8318. NEURORADIOLOGICAL CONFERENCE

8320. NEUROSURGICAL CONFERENCE

8322. SEMINAR: NEUROSURGERY-OPHTHALMOLOGY — PART I

8323. SEMINAR: NEUROSURGERY-OPHTHALMOLOGY — PART II

OBSTETRICS AND GYNECOLOGY (Obst)

John J. Sciarra, M.D., Ph.D., Professor and Head

Professor

Harry Foreman, M.D., Ph.D.
Robert Gorlin, D.D.S.
Curtis J. Lund, M.D.
Takashi Okagaki, M.D., Ph.D.
Konald A. Prem, M.D.
Asa E. Seeds, Jr., M.D.

Clinical Professor

Alex Barno, M.D.
Irving C. Bernstein, M.D.
Mancel T. Mitchell, M.D.
William B. Stromme, M.D.

Associate Professor

Leon L. Adcock, M.D.
Richard P. Bendel, M.D.
Richard A. Chilgren, M.D.
Donald W. Freeman, M.D.
Erick Y. Hakanson, M.D., M.S.
George E. Tagatz, M.D.

Clinical Associate Professor

Melvin P. Baken, Jr., M.D.
Milton E. Baker, M.D.
Fred A. Lyon, M.D.

Assistant Professor

Julius C. Butler, Jr., M.D.
Laura Edwards, M.D.
Luis A. Escarcena, B.S.
Edward C. Hanisch, Jr., M.D.
Robert D. Hilgers, M.D.
Charles S. Mahan, M.D.
Albert D. Notation, Ph.D.
Preston P. Williams, M.D.

Clinical Assistant Professor

Maxwell M. Barr, M.D.
John A. Beeman, M.D.
James R. Bergquist, M.D.
Thomas C. Carrier, M.D.
Joseph A. Cella, M.D.
Charles E. Crutchfield, M.D.
Robert A. Diamond, M.D.
Peter E. Fehr, M.D.
Howard W. Fisher, M.D.
Joseph Goldsmith, M.D.
Joseph I. Hamel, M.D.
John A. Haugen, M.D.
David L. Hill, M.D.
Jane Hodgson, M.D.
George W. Janda, M.D.
Alec L. Janes, M.D.
Anatol Lysyj, M.D.
Edward C. Maeder, Jr., M.D.
F. J. McCaffrey, M.D.
Fred E. Mecklenburg, M.D.
Henry C. Meeker, M.D.
Edward H. Neira, M.D.
Gunnard Nelson, M.D.
Bruce J. O'Brien, M.D.
Jay R. Olsen, M.D.
Mitchell Pincus, M.D.
James F. Shandorf, M.D.
Clark A. Shattuck, M.D.
Gaius Slosser, M.D.
Loren A. Smeby, M.D.
Samuel B. Solhaug, Jr., M.D.
Anton F. Spraitz, Jr., M.D.
Arthur R. Thelemann, M.D.
Robert N. Wagner, M.D.
John W. Warren, M.D.
P. Theodore Watson, M.D.
Martin G. Weisberg, M.D.
Earl V. Wetzel, M.D.

Instructor

M. Ismail Barrada, M.D.
Rafael F. Valle, M.D.

Clinical Instructor

Neil I. Arnold, M.D.
Arthur H. Bearon, M.D.
Stephen J. Berestka, M.D.
John M. Brown, M.D.
Eugene Diefenbach, M.D.
John C. Ellis, Jr., M.D.
John D. Farr, M.D.
Russell N. Frys, M.D.
Ernest Goodman, M.D.
Edward M. Hanton, M.D.
Albert F. Hayes, M.D.
Arthur J. Horowitz, M.D.
John R. Huberty, M.D.
Richard L. Jackson, M.D.
Beni Katz, M.D.
James B. Lannon, M.D.
Stephen L. Larson, M.D.
David C. Lees, M.D.
Howard M. Levine, M.D.
Joseph S. Massee, M.D.
Charles J. McCarthy, M.D.
Nicholas M. Mensheha, M.D.
Thomas W. Milroy, M.D.
Robert K. Nolan, M.D.
William J. O'Hanlon, M.D.
Hardin E. Olson, M.D.
Robert A. Olson, M.D.
Ernest W. Orr, M.D.
Dwain J. Paal, M.D.
Oliver H. Peterson, M.D.
Peter Popadiuk, M.D.
John A. Reichert, M.D.
Owen F. Robbins, M.D.
George E. Schaffhausen, M.D.
Jerome J. Scherek, M.D.
Richard C. Schissel, M.D.
Melvin B. Sinykin, M.D.

William A. Treat, M.D.
Dirk J. A. Van Oppen, M.D.
James O. Wall, M.D.

Research Fellow
DeVerille A. Huston

The field of obstetrics and gynecology encompasses all aspects of human reproduction. The course of study in Medical School provides the student with a basic knowledge of the reproductive process and an understanding 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, in the evaluation of the status of the fetus *in utero*, in the supervision of labor, and in the 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 and includes 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 which will enable the student to master the fundamentals of the human reproductive process at a level consistent with his ultimate career goals. Accordingly, a series of clinical and investigative elective courses are available to interested students.

ELECTIVE COURSES

5500. EXTERNSHIP IN OBSTETRICS AND GYNECOLOGY. (Cr ar; prereq regis med) Sciarra, Bendel, and staff

A 6-week experience in clinical obstetrics and gynecology to be spent in one of the following hospitals: University, Hennepin County General, St. Paul-Ramsey, St. Joseph's, and St. Mary's. The student may express a preference for one of the five hospitals, but final assignments will be made by the course coordinator, Dr. Richard Bendel. This is the core clinical course in obstetrics and gynecology for Phase D students selecting a tract in medicine, surgery, pediatrics, family practice, or obstetrics. Graded responsibility will be assigned so that the student will, by the end of the externship, be able to manage and deliver normal pregnancies, perform minor gynecologic procedures, and be familiar with and have observed most common obstetrical and gynecologic problems. All students meet at University Hospitals Wednesday and Friday mornings for didactic presentations.

5520. OBSTETRICS AND GYNECOLOGY EXTERNSHIP IN CLINICAL PRACTICE. (Course ar; cr ar; prereq 5500) Sciarra, Bendel, and staff

A practical community experience in obstetrics and gynecology under the preceptorship of one or more practicing members of the clinical staff. Both office and hospital practice included. During this time, the student has no other assignments so that he may devote full energy to his association with a busy specialist. This externship is to be arranged individually with the Department of Obstetrics and Gynecology.

5530. WEEKLY SEMINARS IN SELECTED ASPECTS OF HUMAN REPRODUCTION. (Cr and hrs ar; prereq regis med) Sciarra, Tagatz, and staff

This course provides the basic science requirements for the Phase D student interested in obstetrics and gynecology or in a related discipline. Included are medical genetics, developmental biology and teratology, reproductive endocrinology and pharmacology, reproductive biochemistry and physiology, obstetrical physiology, fetal and neonatal physiology, human sexuality, demography, and social obstetrics. These seminars last approximately 2 hours per week and are conducted as round-table discussions.

5540. ADVANCED EXTERNSHIP IN OBSTETRICS AND GYNECOLOGY. (Cr ar; limited to two students each period; prereq 5500) Sciarra, Bendel, and staff

A full-time clinical experience on the obstetrical and gynecological service at either Hennepin County General Hospital or St. Paul-Ramsey Hospital. Students may express

a preference for either hospital; however, final assignments will be made by the course coordinator, Dr. Richard Bendel. Emphasis is on the total care of obstetrical patients and on management of major gynecological conditions. Students who have been in the Rural Physician Associate Program are eligible to take this course without having taken 5500.

5550. PSYCHIATRIC ASPECTS OF OBSTETRICS AND GYNECOLOGY. (Cr ar; prereq regis med) Sciarra, Bernstein
A clinical course for students interested in psychiatric problems relating to the reproductive system. Pertinent reading suggested and individual patients assigned for interview, evaluation, and therapy. May be taken concurrently with other courses.

5560. RESEARCH IN REPRODUCTION. (Cr and hrs ar) Sciarra, Notation
Topics selected for each student. This course may be used to fulfill the Return to Basic Sciences requirement.

5570. FELLOWSHIP IN REPRODUCTION. (Cr ar) Sciarra
Limited opportunities for study at other institutions, some of which provide a travel stipend. Applications should be prepared as early as possible by personal conference with Dr. Sciarra.

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 (Opth)

John E. Harris, Ph.D., M.D., Professor and Head

Clinical Professor

Robert H. Monahan, M.D.
John P. Wendland, M.D.

Associate Professor

David E. Eifrig, M.D.
William L. Fowlks, Ph.D.
William H. Knobloch, M.D.
Robert D. Letson, M.D.
William R. Rathbun, Ph.D.

Clinical Associate Professor

Llewellyn Christensen, M.D.
Robert J. Fink, M.D.
Harry Friedman, M.D.
Walter Hoffman, M.D., M.S.
Richard Horns, M.D.
Bourne Jerome, M.D.
Douglas Johnson, M.D.
Richard Leavenworth, Jr., M.D.
Vernon Lindberg, M.D.
Winston Lindberg, M.D.
Malcolm McCannel, M.D.
Sidney Nerenberg, M.D.
Harry Plotke, M.D.
Thomas K. Rucker, M.D.
Karl Sandt, M.D.
Howard Shaw, M.D.
Irving Shapiro, M.D.
Donald Sterner, M.D.
George Tani, M.D.
Frederic F. Wippermann, M.D.

Assistant Professor

Donald J. Doughman, M.D.

Clinical Assistant Professor

Frank Adair, M.D.
James P. Brown, M.D.
Martin Bruhl, M.D.
Bruce Clark, M.D.
Robert R. Cooper, M.D.
Richard Ellingson, M.D.
Joseph L. Garten, M.D.
Charlotte W. Hill, M.D.
Leslie Jacobson, M.D.
Yale Kanter, M.D.
Ernest Latson, M.D.
Murray Lufkin, M.D.
John A. McNeill, M.D.
Lydia Neibergs, M.D.
Thomas O'Kane, M.D.
Rene Pelletier, M.D.
Brooks Poley, M.D.
John Riley, M.D.
Robert Rocknem, M.D.
Leander Simons, M.D.
Richard Student, M.D.
James Thompson, M.D.
Robert Wohlrabe, M.D.
Fred Wuest, M.D.

Clinical Instructor

Peter D. Arny, M.D.
John E. Bergstedt, M.D.
Dwayne Broe
Christopher Brown, M.D.
David Chizek, M.D.
Donald Herrick, M.D.
Herbert T. Hobday, M.D.
James Householder, M.D.
Allen Larson, M.D.
James Layer, M.D.
Richard Olson, M.D.
Charles Ostrov, M.D.
Charles Roach, M.D.
Robert J. Sigelman, M.D.
Wesley Sondreal, M.D.
James Standifer, M.D.
Byron Teska, M.D.
Jon Tierney, M.D.
Elliott Troup, M.D.
Paul Wicklund, M.D.

ELECTIVE COURSES

5180. EXTERNSHIP IN OPHTHALMOLOGY. (Cr ar; prereq regis med)

5190. OPHTHALMOLOGY RESEARCH PROBLEMS. (Cr ar; prereq regis med)

ADVANCED CREDIT COURSES

8101. CLINICAL OPHTHALMOLOGY

8102. EXTERNAL DISEASES

8103. MEDICAL OPHTHALMOLOGY

8104. RADIOLOGY OF THE EYE, ORBIT, AND HEAD

8106. STRABISMUS MANAGEMENT

8107. OCULAR ANATOMY

8121. REFRACTION
8122. PHYSIOLOGIC OPTICS
8131. PRACTICAL OCULAR SURGERY
8132. DIDACTIC OCULAR SURGERY
8141. OCULAR PATHOLOGY CONFERENCE
8142. OPHTHALMIC PATHOLOGY LABORATORY
8143. PATHOLOGY OF THE EYE
8151. BASIC AND APPLIED OPHTHALMOLOGY
8152. OPHTHALMOLOGY LABORATORY
8153. RESEARCH IN OPHTHALMOLOGY
8154. SEMINAR IN OPHTHALMOLOGY
8701. NEUROOPHTHALMOLOGY

ORTHOPEDIC SURGERY (OrSu)

Professor

John H. Moe, M.D.

Clinical Professor

Harry B. Hall, M.D.
Melvin J. Nydahl, M.D.

Associate Professor

James H. House, M.D., M.S.
Robert F. Premer, M.D.
Robert B. Winter, M.D.

Clinical Associate Professor

Lester W. Carlander, M.D.
Frederick D. Drill, M.D.
Ramon B. Gustilo, M.D.
Walter Indeck, M.D.
Richard H. Jones, M.D.
Harvey E. O'Phelan, M.D.

Assistant Professor

David S. Bradford, M.D.
Thomas H. Comfort, M.D.
David W. Florence, M.D.
Charles C. Lai, M.D.

Clinical Assistant Professor

Frank S. Babb, M.D., M.S.
Robert M. Barnett, M.D.
Vincent E. Eilers, M.D.
Arnold L. Hamel, M.D.
Edward H. Kelly, M.D.
Lowell H. Kleven, M.D.
Sheldon M. Laggard, M.D.
Donald R. Lannin, M.D., M.S.
Joseph M. Tamborino, M.D.
Wayne W. Thompson, M.D.

Instructor

John E. Lonstein, M.D.

Clinical Instructor

Michael W. Davis, M.D.
Richard B. Edwards, M.D.
James R. Gage, M.D.
Daniel Gaither, M.D.
John A. Hartwig, M.D.
James E. Johanson, M.D.
Richard J. Johnson, M.D.
John Larkin, M.D.
Dick R. Lavendar, M.D.
Lloyd Leider, M.D.
William R. Leslie, M.D.
Thomas Litman, M.D.
Donald Madsen, M.D.
George E. Reisdorf, M.D.
Edward L. Salovich, M.D.
Elmer R. Salovich, M.D.
Francis J. Trost, M.D.

The major goals of the orthopedic surgery courses available to the medical student are to provide him with a foundation for performing a basic neuromusculoskeletal examination of the patient, for correlating the clinical expressions of disease with his basic science knowledge, and for acquainting him with those patient situations which require immediate appraisal and resolution. In a number of clinical electives, the student also has the option of participating in the diagnostic and therapeutic management of patients with orthopedic and traumatic disabilities; this advanced introduction provides an understanding of fundamental orthopedic principles, a recognition of the scope of orthopedic surgery, and a realization of 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 Hospital. (Cr ar; prereq regis med)

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

5189. EXTERNSHIP IN ORTHOPEDIC SURGERY AND FRACTURES — **Fairview-St. Mary's Hospitals.** (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 GENERAL HOSPITAL. (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

Mary J. Capps, Ph.D., Associate Professor and Director of Graduate Study

Professor

Arndt J. Duvall III, M.D., M.S.
Frank M. Lassman, Ph.D.
W. Dixon Ward, Ph.D.
Henry L. Williams, Jr., M.D., M.S.

Clinical Professor

Ernest Anderson, Ph.D.
Jerome A. Hilger, M.D., M.S.
Albert Hohmann, M.D.
Conrad J. Holmberg, M.D.
Robert E. Priest, M.D., M.S.

Associate Professor

Lawrence R. Boies, Jr., M.D.
Cedric A. Quick, M.D.

Clinical Associate Professor

John D. Banovetz, M.D.
John S. Huff, M.D.
Severin Koop, M.D.
Craig O. Linnell, Ph.D.
Hyman M. Paisner, M.D.
Kurt Pollak, M.D.
Robert J. Richardson, M.D.
Melvin E. Sigel, M.D.
George V. Tangen, M.D.

Assistant Professor

George L. Adams, M.D.
J. Michael Dennis, Ph.D.
Richard Hoel, Ph.D.
Sung K. Juhn, M.D., M.S.
Robert H. Mathog, M.D.
David A. Nelson, Ph.D.

Clinical Assistant Professor

Benjamin Bofenkamp, M.D.
David Buran, M.D.
Richard B. Carley, M.D.
Barclay M. Cram, M.D.
Timothy Doyle, Ph.D.
James P. Dunn, M.D.
Gary Garvis, M.D.
John Glaeser, M.D.
Ekrem Gozum, M.D.
Morton C. Kane, M.D.
Robert L. Koller, M.D.
Bradley Kusske, M.D.
Douglas Kusske, M.D.
Richard Lund, M.D.
C. Randall Nelms, M.D.
Evan Nelson, Jr., M.D.
Richard Schlorf, M.D.
Leighton G. Siegel, M.D.
Graham Smith, M.D., M.S.
Harold Ulvestad, M.D.

Instructor

David W. Johnson, Ph.D.

The medical student first becomes acquainted with otolaryngology through a series of didactic lectures which emphasize broad aspects of the field and discussions of basic principles when applicable. This provides the necessary first step in familarization with the content of the specialty. The essence of course work in the Department of Otolaryngology consists of active student participation in the clinical examination of patients with otolaryngological disorders. This work is supplemented by discussions and seminars with the faculty. During this time, the student develops skills in examination (especially indirect laryngoscopy) and in interpretation of findings. The student is also 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

5502. NEUROLOGICAL SCIENCES 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

PEDIATRICS (Ped)

John A. Anderson, M.D., Ph.D., Professor and Head

Professor

Ray C. Anderson, M.D.
William Krivit, M.D., Ph.D.
Russell V. Lucas, M.D.
Alfred F. Michael, M.D.
Bernard Mirkin, M.D., Ph.D.
Paul G. Quie, M.D.
Richard B. Raile, M.D.
John W. Reynolds, M.D.
Kenneth F. Swaiman, M.D.
Robert A. Ulstrom, M.D.
Homer D. Venters, M.D.
Robert L. Vernier, M.D.
Lewis W. Wannamaker, M.D.
James G. White, M.D.

Clinical Professor

Paul M. Ellwood, M.D.

Associate Professor

Barbara Burke, M.D.
David M. Brown, M.D.
Richard A. Chilgren, M.D.
C. Carlyle Clawson, M.D.
Robert O. Fisch, M.D.
Ernest D. Gray, Ph.D.
John Matsen, M.D.
James H. Moller, M.D.
Mark E. Nesbit, M.D.
Arthur R. Page, M.D.
Krishna M. Saxena, M.D.
Harvey L. Sharp, M.D.
Robert W. tenBensel, M.D.
Warren J. Warwick, M.D.
Francis S. Wright, M.D.

Clinical Associate Professor

D. P. Amren, M.D.
Arnold S. Anderson, M.D.
Stuart L. Arey, M.D.
D. D. Etzwiler, M.D.
A. J. Hafner, M.D.
Stanley A. Leonard, M.D.
A. J. Schroeder, M.D.
T. S. Smith, M.D.

Assistant Professor

Forrest Bessinger, M.D.
Douglas Biggar, M.D.
Yong Choi, M.D.
Amos S. Deinard, M.D.
Rolf R. Engel, M.D.
Patricia Ferrieri, M.D.
Alfred J. Fish, M.D.
Lloyd A. Fish, M.D.
Margaret J. Horrobin, M.D.
Carl E. Hunt, M.D.
Lawrence Lockman, M.D.
Edward Kaplan, M.D.
John Kersey, M.D.
S. Michael Mauer, M.D.
Jerrold Milstein, M.D.
George R. Noren, M.D.
Ben Park, M.D.
Thomas Rolewicz, M.D.
Leon Satran, M.D.
Henry S. Sauls, M.D.
Jean Smelker, M.D.
Rachel Trockman, M.D.

Clinical Assistant Professor

Northrup Beach, M.D.
William D. Bevis, M.D.
Heinz H. Bruhl, M.D.
John Cich, M.D.
John J. Galligan, M.D.
George W. Lund, M.D.
Jack M. Markovitz, M.D.
Edward N. Nelson, M.D.
Theodore C. Papermaster, M.D.
Francis E. Schaar, M.D.
Sidney S. Scherling, M.D.
Charles L. Steinberg, M.D.
Edward K. Strem, M.D.
John D. Tobin, M.D.

Lecturer

A. J. Hafner, M.D.
Elliott B. Karpeles, D.D.S.
Lawrence H. Meskin, D.D.S., M.S.D., Ph.D.
Wentworth Quast, Ph.D.

Instructor

Eunice A. Davis, M.D.
Richard Gatti, M.D.
Carolyn Levitt, M.D.
Jack Resnick, M.D.
Barbara Schulte, M.D.
John Tobin, M.D.
Norman Virnig, M.D.

Clinical Instructor

Sol Austrian, M.D.
David Bloom, M.D.
Robert Bugenstein, M.D.
James G. Cardle, M.D.
Richard C. Cohan, M.D.
Robert Coifman, M.D.
Richard T. Cushing, M.D.
Robert T. Dooley, M.D.
Mitchell Einzig, M.D.
Sergio Franco-Vasquez, M.D.
Robert Gibbs, M.D.
Clayton R. Green, M.D.
Terrill Hart, M.D.
Byron Johnson, M.D.
Harold Katkov, M.D.
George Kimmel, M.D.

Wallace Lueck, M.D.
Richard Matus, M.D.
William Mulholland, M.D.
Lloyd Nelson, M.D.
Charles A. Pitzele, M.D.
Richard E. Sand, M.D.
Sylvester Sanfilippo, M.D.
Lewis Sher, M.D.
Lawrence J. Sholler, M.D.
Lawrence Singher, M.D.
Norman Sterrie, M.D.
Jack L. Strobel, M.D.
Richard Tudor, M.D.
R. James Vaccarella, M.D.
Loren Vorlicky, M.D.
Walter Wilder, 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 disease in children. Background information concerning pediatric diseases is learned by the student in the interdisciplinary organ system courses offered during Phase B. Application of this knowledge to pediatric-aged patients and the acquisition of skills in assessing and utilizing growth and developmental aspects is learned through the pediatric tutorials in "Student as Physician." The student examines, studies, and discusses, with the faculty tutor, children representing the following pediatric problems: normal newborn, sick infant, respiratory disease, genetic disease, congenital malformation, fluid and electrolyte, failure to thrive, neurologic, and adolescent.

In Phase D, students may choose several types of pediatric experience. They may actively 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 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

Inpatient Clinical Externship

5501. INPATIENT EXTERNSHIP. (Cr ar)
Assignment to one of the following hospitals: University Hospitals, Hennepin County General Hospital, St. Paul-Ramsey Hospital, or St. Paul Children's Hospital.

Outpatient Clinical Externship

5510. OUTPATIENT EXTERNSHIP AT MINNEAPOLIS PUBLIC HEALTH DEPARTMENT. (Cr ar)

5511. OUTPATIENT EXTERNSHIP AT UNIVERSITY HOSPITALS. (Cr ar)

5512. OUTPATIENT EXTERNSHIP AT HENNEPIN COUNTY GENERAL HOSPITAL. (Cr ar)

5513. OUTPATIENT EXTERNSHIP AT COMMUNITY UNIVERSITY HEALTH CARE CENTER. (Cr ar)

5515. OUTPATIENT HEALTH CARE AT ST. PAUL-RAMSEY HOSPITAL. (Cr ar)

5516. CLINICAL PEDIATRICS AT THE MAYO CLINIC. (Cr ar)

Subspecialty Externship

5517. PRECEPTORSHIP IN CLINICAL PEDIATRICS. (Cr ar)

5520. BASIC SCIENCES IN PEDIATRICS. (Cr ar)

5521. DIABETES MELLITUS IN ADULTS AND CHILDREN, PART I. (Cr ar)

5522. DIABETES MELLITUS IN ADULTS AND CHILDREN, PART II. (Cr ar)

5531. NEO-INFANT PROGRAM. (Cr ar)

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

5533. PEDIATRIC CARDIOLOGY AT THE MAYO CLINIC. (Cr ar)

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

5535. INFECTIOUS DISEASE. (Cr ar)

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

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

5538. PEDIATRIC GASTROENTEROLOGY. (Cr ar)

5539. NEONATAL MEDICINE EXTERNSHIP (ICU). (Cr ar)

5540. PEDIATRIC NEUROLOGY AT UNIVERSITY HOSPITALS. (Cr ar)

5541. PEDIATRIC NEUROLOGY AT THE MAYO CLINIC. (Cr ar)

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

5543. NEPHROLOGY AT UNIVERSITY HOSPITALS. (Cr ar)

5544. PULMONARY DISEASE IN PEDIATRICS. (Cr ar)

5545. CHILD PSYCHIATRY AT THE MAYO CLINIC. (Cr ar)

5546. PEDIATRIC PATHOLOGY. (Cr ar)

Research

5573. RESEARCH IN IMMUNOCYTOLOGY. (Cr ar)

PHARMACOLOGY (Phcl)

Frederick E. Shideman, M.D., Ph.D., Professor and Head

Professor

Nelson D. Goldberg, Ph.D.
Norman O. Holte, D.D.S.
Xenia Machne, M.D.
Gilbert J. Mannering, Ph.D.
Jack W. Miller, Ph.D.
Bernard L. Mirkin, M.D., Ph.D.
Akira E. Takemori, Ph.D.
Ben G. Zimmerman, Ph.D.

Associate Professor

Marion W. Anders, Ph.D.
Jordan L. Holtzman, M.D., Ph.D.
Donald B. Hunninghake, M.D.
Sheldon B. Sparber, Ph.D.

Assistant Professor

James F. Cumming, M.D., Ph.D.
Earl W. Dunham, Ph.D.
Patrick E. Hanna, Ph.D.
Aloysius J. Quebbemann, Ph.D.
Norman E. Sladek, Ph.D.

Clinical Assistant Professor

Faruk S. Abuzzahab, M.D., Ph.D.

Instructor

James I. Ausman, M.D., Ph.D.

Lecturer

Donald C. Kvam, Ph.D.

The purpose of the medical courses in pharmacology is to provide students with a fundamental understanding, in depth, of underlying principles upon which rational therapy is based. Emphasis is placed on the mechanisms of action, absorption, distribution, biotransformation, and excretion of drugs, both in general and in specific terms. Laboratories and therapeutic conferences are included as adjuncts to lectures so that actions of drugs in health and disease can be illustrated. Opportunity is provided through elective courses to obtain a more basic coverage of various areas of pharmacology. The clinical use of drugs is also emphasized. Clinical pharmacologists attempt to show, by means of ward rounds and clinical conferences, how principles of pharmacology are applied to treatment of disease in patients.

REQUIRED COURSES

5110su. PHARMACOLOGY. (3 cr; for Phase A medical students; prereq regis med or ‡)

5111f. PHARMACOLOGY. (4 cr; for Phase B medical students; prereq regis med or ‡)

ELECTIVE COURSES

5105. FORENSIC MEDICINE AND MEDICAL JURISPRUDENCE. (1 cr; prereq regis med or ‡)
Lectures on legal aspects of medicine and laws governing practice of medicine.

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/or abnormal CNS function.

5504. SELECTED TOPICS IN CLINICAL PHARMACOLOGY. (2 cr)
General problems related to the therapeutic management of pathophysiologic states in man. Some topics to be considered include the following: chemotherapy, antiarrhythmic agents, antihypertensive agents, anticonvulsants, cardiac glycosides, drug disposition in man under normal conditions and during pathophysiologic states.

5506. MOLECULAR BASIS OF ENDOCRINE DISORDERS. (1 cr)
The biochemical and molecular bases of metabolic and functional cellular defects deriving from disorders of the endocrine system.

5507. DRUG INTERACTIONS. (1 cr)
Lectures illustrating 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 is considered as the basis for an intelligent clinical use of these agents.

5509. CHEMOTHERAPY OF NEOPLASTIC DISEASES. (1 cr)
Lectures, discussions, and readings on principles of tumor chemotherapy and preclinical and clinical evaluation of newer 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 which affect kidney function and metabolism discussed.

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

5515. CLINICAL PHARMACOLOGY AT THE UNIVERSITY HOSPITALS. (6 cr)
This course deals with 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 inpatient and outpatient management of individuals experiencing therapeutic problems. An opportunity to participate in ongoing clinical research programs within the Division of Clinical Pharmacology also provided.

ADVANCED CREDIT COURSES

8203. RESEARCH IN PHARMACOLOGY

8204. SEMINAR: SELECTED TOPICS IN PHARMACOLOGY

8205. INTRODUCTION TO PHARMACOLOGY

8206. SEMINAR: MICROASSAY OF DRUGS

8207. SEMINAR: PSYCHOPHARMACOLOGY

8208. PSYCHOPHARMACOLOGY

8209. PHYSIOCHEMICAL CONCEPTS OF DRUG ACTION

8211. PHYSIOLOGICAL DISPOSITION OF DRUGS

8212. PHARMACODYNAMICS

8214. TOXICOLOGY

8215. CHEMOTHERAPY

8216. ENDOCRINE PHARMACOLOGY

8217. CARDIOVASCULAR-RENAL PHARMACOLOGY

8218. NEUROPHARMACOLOGY: BIOPHYSICAL ASPECTS

8219. BEHAVIORAL PHARMACOLOGY

PHYSICAL MEDICINE AND REHABILITATION (PMed)

Frederic J. Kottke, M.D., Ph.D., Professor and Head

Professor

Essam A. Awad, M.D., Ph.D.
Glenn Gullickson, Jr., M.D., Ph.D.
William G. Kubicek, Ph.D.
Frank M. Lassman, Ph.D.
Alan Roberts, Ph.D.

Clinical Professor

Paul M. Ellwood, Jr., M.D.
Miland E. Knapp, M.D., M.S.

Associate Professor

John Allison, M.S.
Thomas P. Anderson, M.D., M.S.
Gary T. Athelstan, Ph.D.
Theodore M. Cole, M.D.
Helen Dahlstrom, B.A.
Dortha L. Esch, B.S.
Daniel Halpern, M.D.
Marvin G. Lepley, B.S.
Wilbur L. Moen, B.S., B.A.
Martin O. Mundale, M.S.
James F. Pohtilla, M.S.
Pearl Rosenberg, Ph.D.
Helen Skowlund, M.S.

Clinical Associate Professor

Bror Troedsson, M.D.

Assistant Professor

Nancy M. Crewe, Ph.D.
Jessie Easton, M.D.
Marian L. Eliason, B.S.
Judith Garrard, Ph.D.
A. Joy Huss, M.S.
Jerry Martin, Ph.D.
Garland K. Meadows, M.Ed.
Mary Price, M.D.

Clinical Assistant Professor

Alan Bensman, M.D.
W. John Dawson, Jr., M.D.
Sarah Gault, M.D.
Roger P. Hallin, M.D.
Michael Kosiak, M.D.
Loren R. Leslie, M.D.
Philip L. Mossman, M.D.
Ruby G. Overmann, M.A.
Richard R. Owen, M.D.
John E. Quast, M.D.
Herbert A. Schoening, M.D.
Keith B. Sperling, M.D.
Richard M. Steidl, M.D.

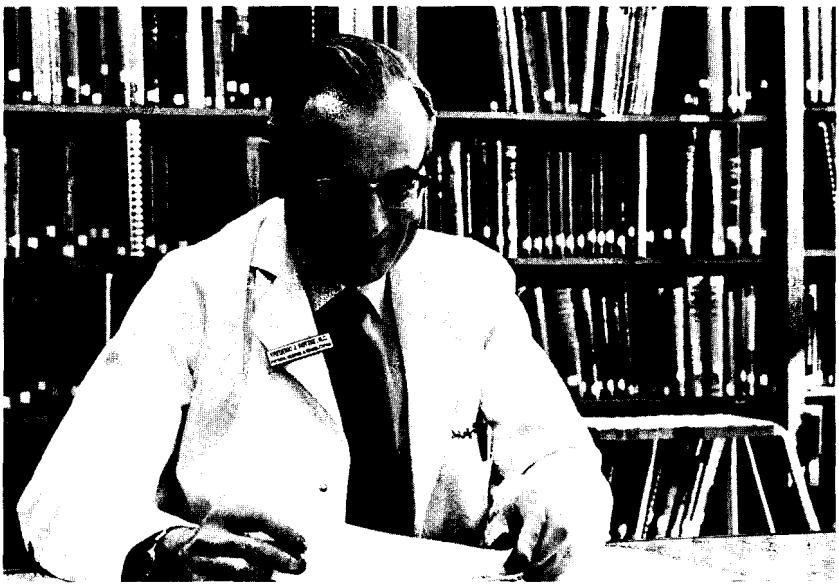
Instructor

Louvain G. Arndts, B.S.
Robert L. Bollinger, B.S.
Corinne T. Ellingham, M.S.
Vivian C. Hannan, B.S.
Barbara A. Nelson, B.S.
Donna K. Pauley, B.S.
Glenn Scudder, B.S.
Clarence A. Sicard, B.S.
Lorraine M. Wolfe, M.A.

Clinical Instructor

JoAnn Battaglia, B.S.
Joseph P. Engel, M.D.
Rollin J. Houle, M.D.
Joyce A. Jensen, B.S.
Sally A. Johnson, B.S.
Barbara E. Linderman, B.S.
Kathleen M. McFarland, B.S., B.A.
Arthur B. Quiggle, M.D.
Norma J. Steinke, B.S.
Lorraine M. Stone, B.S.
Marilyn S. Thompson, 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 which may be utilized to restore him to useful function again. Rehabilitation may require the use of multiple types of therapy. The allied health professions participates with the physician in a coordinated rehabilitation program. In the Rehabilitation Center, this multidisciplinary approach is used in the treatment of patients. The student may learn the comprehensive care of disabled patients and participate in the program of rehabilitation. By active involvement in the management of patients, the student may learn the methods of coordination of care, communication, leadership, and administration as they will apply in his own 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.



Dr. Kottke at work in the PM and R Library.

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)

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.
H. Mead Cavert, M.D., Ph.D.
Irwin J. Fox, M.D., Ph.D.
Francisco Grande, M.D.
Rodney B. Harvey, M.D., Ph.D.
John A. Johnson, M.D., Ph.D.
Nathan Lifson, M.D., Ph.D.
Asa Seeds, M.D.
Henry O. Taylor, Ph.D.
Carlo Terzuolo, M.D.

Associate Professor

James Bloedel, M.D., Ph.D.
Jui S. Lee, Ph.D.
David Levitt, M.D., Ph.D.
Maurice Meyer, D.D.S., Ph.D.
Richard Poppele, Ph.D.
Richard Purple, Ph.D.
Aldo Rescigno, M.D.

Assistant Professor

Gordon Kepner, Ph.D.
Charles Knox, Ph.D.
Richard Kronenberg, M.D.
David E. Schafer, Ph.D.
Richard Stish, B.E.E.
O. Douglas Wangensteen, Ph.D.

Lecturer

Ida M. Martinson, Ph.D.
Clyde Wilkes, Ph.D.

REQUIRED COURSES

5110s. HUMAN PHYSIOLOGY. (6 cr; prereq anatomy, biochemistry)

5111s. HUMAN PHYSIOLOGY. (5 cr; prereq 5110)

ELECTIVE COURSES

5103f. GENERAL PHYSIOLOGY. (3 cr; prereq ‡; offered 1974 and alt yrs)

5104w. NEUROPHYSIOLOGY. (4 cr; prereq neuroanatomy, ‡; offered 1975 and alt yrs)

5105s. CARDIOVASCULAR PHYSIOLOGY. (4 cr; prereq ‡; offered 1975 and alt yrs)

5106f. RESPIRATORY PHYSIOLOGY. (4 cr; prereq ‡; offered 1975 and alt yrs)

5107w. ALIMENTARY PHYSIOLOGY. (3 cr; prereq ‡; offered 1974 and alt yrs)

5108s. NEPHROLOGY. (3 cr; prereq ‡; offered 1974 and alt yrs)

5109f,w,s. SYSTEMS ANALYSIS FOR BIOLOGISTS. (3 cr; prereq calculus through introduction to differential equations, physical chemistry or ‡)

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

5114f. BIOPHYSICS OF NERVE CELLS. (3 cr; prereq ‡; offered 1974 and alt yrs)

5115f. MATHEMATICAL NEUROPHYSIOLOGY. (4 cr; prereq calculus through ordinary differential equations, Stat 8501 or ‡; offered 1973 and alt yrs)

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

ADVANCED CREDIT COURSES

5551f,w,s. LITERATURE SEMINAR. (1-2 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.°° HISTORY OF PHYSIOLOGY. (Cr and hrs ar)

5560.°° SELECTED TOPICS IN PERMEABILITY. (Cr and hrs ar; prereq 5103 or equiv, ‡)
Advanced seminar.

°° Students should consult the department for offerings during any specific quarter.

5561. 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. SELECTED TOPICS IN RESPIRATION.** (Cr and hrs ar; prereq 5106 or equiv, ‡)
Advanced seminar.

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

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

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

5567s. PROPERTIES OF RECEPTOR SYSTEMS. (3 cr; prereq ‡; offered 1975 and alt yrs)

5568w. PHYSIOLOGY OF VISUAL SYSTEMS. (3 cr; prereq ‡; offered 1974 and alt yrs)

5569s. SPINAL CORD PHYSIOLOGY AND MOTOR CONTROL. (3 cr; prereq ‡; offered 1974 and alt yrs)

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

5577. METHODS IN PHYSIOLOGY.** (3 cr; prereq ‡)

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

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

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

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

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

** Students should consult the department for offerings during any specific quarter.

PSYCHIATRY

William Hausman, M.D., Professor and Head

The teaching program in psychiatry is designed to help the student understand the emotional aspect of illness, both in the identified psychiatric patient and in other medical disorders. It also serves to demonstrate to the student the various treatment methods now available for helping patients with emotional problems. The psychiatry program is designed to help the student recognize and understand the varieties of human behavior as they relate to a spectrum of patients suffering from emotional distress and to his role as physician.

In the first year, the student is offered an opportunity to learn some of the fundamentals underlying the development of both normal and deviant behavior.

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 treatment of these disorders. It also deals with problems of the doctor-patient relationship and with psychological testing procedures. During the Phase B year, a medical student rotates through a tutorial in psychiatry. This experience is one of meeting with a psychiatrist in the metropolitan community and, under his tutelage, evaluating psychiatric patients. The student is expected to be able to describe the psychological components of a patient's problem based upon a holistic evaluation of the patient. Such an evaluation includes a general history, physical examination, mental status examination, and social history of the patient and the formulation of a problem list, integration of the data, formulation of a diagnosis, and planning of a therapeutic program. The student also gains experience in working with people with emotional disorders and learns to work 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 comprises 1½ days per week for an 8-week period and is part of the Student as Physician course.

In Phase D, the student is offered supervised clinical experience, which may be selected from a variety of different settings, as an opportunity to learn to relate appropriately to emotionally disturbed individuals, to evaluate psychiatric problems of medical and other patients, and to carry out psychiatric treatment.

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 student and to augment his medical education with the study of specific issues in the field.

Adult Psychiatry (AdPy)

Donald W. Hastings, M.D., Professor

Professor

Richard W. Anderson, M.D.
William Hausman, M.D.

Clinical Professor

Irving C. Bernstein, M.D.
Philip Feinberg, M.D.
Gove Hambidge, Jr., M.D.
Frank Kiesler, M.D.
Robert L. Meller, M.D.
Otto N. Raths, Jr., M.D.
Clarence J. Rowe, M.D.
Werner Simon, M.D.

Associate Professor

Titus P. Bellville, M.D.

Floyd K. Garetz, M.D.
Leonard L. Heston, M.D.
William W. Jepson, M.D.
Roberta Simmons, Ph.D.
Vicente B. Tuason, M.D.
George Williams, M.D.
Neil J. Yorkston, M.D.
Ronald C. Young, M.D.

Clinical Associate Professor

Faruk S. Abuzzahab, M.D.
Jerome M. Bach, M.D.
Robert Bush, M.D.
Wilfred A. Cassell, M.D.
Robert Clark, M.D.
Donald Daggett, M.D.
Walter Gardner, M.D.
Charles Haberle, M.D.
James Janecek, M.D.
Glenn J. Lewis, M.D.
Nathaniel J. London, M.D.
J. Benjamin Lund, M.D.
Donald M. Mayberg, M.D.
Ilgvars Nagobads, M.D.
John J. Regan, M.D.

Assistant Professor

Edward J. Bardon, M.D.
David W. Cline, M.D.
Charles E. Dean, M.D.
Elke Eckert, M.D.
Daniel Ferguson, M.D.
Stephen M. Greenwald, M.D.
James Guerrero, M.D.
Richard O. Heilman, M.D.
G. Wendell Hopkins, M.D.
Randall A. LaKosky, M.D.
Joyce S. Lewis, Jr., M.D.
John R. Malban, M.S.
Myron Messenheimer, M.D.
Anthony J. Pollock, M.D.
Edward W. Posey, M.D.
Gerald Ronning, M.D.
Jean Sauer, M.D.
John M. Scanlan, M.D.
Edwin Smelker, M.D.
James H. Stephans, M.D.
Richard Teeter, M.D.
Thomas Weier, M.D.
Joseph J. Westermeyer, M.D.
Sonja Williams, M.D.

Clinical Assistant Professor

Burton Abramson, M.D.
Curtis Carlson, M.D.
John Docherty, M.D.
George Dorsey, M.D.
Robert Fischer, M.D.
Howard Fisher, M.D.
Louis Flynn, M.D.
James Garvey, M.D.
Joseph Gendron, M.D.
Leonard Goldman, M.D.
Malka Goodman, M.D.
Hildegard Graber, M.D.
Fred Gross, M.A.
John Haas, M.D.
Murray Locke, M.D.
William T. Luckey, M.D.
Timothy Magee, M.D.
Deane Manolis, M.D.
Charles McCafferty, M.D.
John Mulvahill, M.D.
Kenneth Nimlos, M.D.
Martin Orbuch, M.D.
Henry Osekowsky, M.D.
Martin C. Peper, M.D.
Jennings Peteler, M.D.
Loren Pilling, M.D.
John Rauenhorst, M.D.
James Swenson, M.D.
John C. Whitacre, M.D.
Lowell C. Wigdahl, M.D.
Frederic Wilson, M.D.

Instructor

Thomas Dredge, Jr., M.D.
David Foat, M.S.T.
Suck Won Kim, M.D.
Roger C. Kollmorgen, M.D.
Velta H. Mikelsons, M.D.
Abbas Nahas, M.D.
Mary Pennington, M.D.
Dennis Philander, M.D.

Clinical Instructor

David Auran, M.D.
Ronald N. Berry, M.D.
Thomas Burton, M.D.
Willem Dieperink, M.D.
William Goodchild, M.D.
Bruce H. Hiller, M.D.
Richard G. Lunzer, M.D.

REQUIRED COURSE

5107, 5108. BEHAVIORAL SCIENCE

ELECTIVE COURSES

5111, 5112. SOCIAL BEHAVIOR

5121. DESCRIPTIVE PSYCHIATRY

5500. ADULT PSYCHIATRY — Hennepin County General Hospital

5501. PSYCHIATRY AND COMMUNITY MENTAL HEALTH — St. Paul-Ramsey Hospital

5503. CLINICAL PSYCHIATRY — Fairview-St. Mary's Hospitals

5506. ADULT PSYCHIATRY — Day Treatment Unit, Hennepin County General Hospital

5507. ADULT PSYCHIATRY — University Hospitals, Station 60

5508. ADULT PSYCHIATRY — University Hospitals, Station 62

5509. CLINICAL PSYCHIATRY — Veterans Administration Hospital

5511. CONSULTATIONS — University Hospitals

5513. DRUG ABUSE, ALCOHOLISM — Fairview-St. Mary's Hospitals

5514. DRUG ABUSE, ALCOHOLISM — Veterans Administration Hospital

5515. NEUROPSYCHOLOGY — University Hospitals

5521. COMMUNITY PSYCHIATRY — Dakota County Mental Health Center

5522. ADOLESCENT AND YOUNG ADULT PSYCHIATRY — University Hospitals, Station 61

5523. ADULT AND COMMUNITY PSYCHIATRY — Metropolitan Mental Health Center. (Prereq Phase D student and one rotation through internal medicine)

5549. CHILD/ADOLESCENT PSYCHIATRY — Hennepin County General Hospital

5600. CASE CONFERENCES

5601. COMMUNICATION IN FAMILIES

5602. CLINICAL PSYCHOPHARMACOLOGY SEMINAR

5604. BIOLOGICAL BASES OF BEHAVIOR

5605. PHARMACOLOGY OF SYNAPTIC TRANSMISSION

5606. SPECIAL ASSIGNMENTS

5607. SURVEY OF PHYSIOLOGIC TREATMENTS IN PSYCHIATRY

ADVANCED CREDIT COURSES

8201. CLINICAL PSYCHIATRY

8203. ADVANCED CLINICAL PSYCHIATRY

8205. SPECIAL ASSIGNMENTS

8206. RESEARCH

8208. SURVEY OF PHYSIOLOGICAL TREATMENTS IN PSYCHIATRY

8212. REVIEW OF CURRENT LITERATURE

8215. CURRENT RESEARCH IN PSYCHIATRY

8216. INTRODUCTION TO FAMILY THERAPY TECHNIQUES

8218. READINGS IN PSYCHOANALYSIS II

8220. SURVEY OF PSYCHIATRY FOR NEUROLOGY RESIDENTS

8221. SEMINAR: CURRENT LITERATURE

8224. INTRODUCTION TO GROUP THERAPY

8226. BIOLOGICAL PSYCHIATRY

8229. COMPARISON OF GROUP TECHNIQUES

8230. CASE-CENTERED CONFERENCE ON GROUP THERAPY

8238. CASE CONFERENCE IN PSYCHOLOGICAL MEDICINE

8239. CONTINUOUS CASE SEMINAR: PSYCHOANALYTICALLY-ORIENTED PSYCHOTHERAPY

8240. PSYCHOLOGICAL PROBLEMS OF THE AGED

8243. SEMINAR: INTRODUCTION TO CLINICAL THEORY OF PSYCHOANALYSIS
8244. COMPARATIVE THEORIES OF PSYCHOTHERAPY
8245. READINGS IN THE HISTORY OF PSYCHIATRY

Child and Adolescent Psychiatry (CAPy)

William M. Easson, M.D., Professor and Director

Professor
Jack A. Hafner, Ph.D.
Wentworth Quast, Ph.D.

Clinical Professor
Roy Knowles, M.D.

Associate Professor
David W. Cline, M.D.

Clinical Associate Professor
Marvin Ack, Ph.D.
Jerome M. Bach, M.D.
Paul Bransford, M.D.

Assistant Professor
Phillip Edwardson, M.D.
Michael Koch, M.D.
James J. Lawton, M.D.
Sue Petzel, Ph.D.
Uwe Stuecher, Ph.D.

Clinical Assistant Professor
Dorothy Bernstein, M.D.
Joel Finkelstein, M.D.
Dean Hempel, M.D.
Ronald Kyllonen, M.D.

Instructor
Rodger C. Kollmorgen, M.D.
Phyllis Meloff, M.D.
Abbas D. Nahas, M.D.

ELECTIVE COURSES

5500. CHILD AND ADOLESCENT PSYCHIATRY — **University Hospitals, Stations 61 and 64**
5522. ADOLESCENT AND YOUNG ADULT PSYCHIATRY
5601. TOPICS IN CHILD, ADOLESCENT, AND FAMILY THERAPY
5602. FAMILY THERAPY

ADVANCED CREDIT COURSES

8201. CLINICAL CHILD PSYCHIATRY
8202. ADVANCED CLINICAL CHILD PSYCHIATRY
8203. READINGS IN CHILD AND ADOLESCENT PSYCHIATRY
8204. CURRENT LITERATURE IN CHILD AND ADOLESCENT PSYCHIATRY
8206. RESEARCH IN CHILD AND ADOLESCENT PSYCHIATRY
8211. ADOLESCENT PSYCHIATRY

Health Care Psychology (HCPy)**

Robert D. Wirt, Professor and Director

Regents' Professor
Paul Meehl, Ph.D.

Professor
John P. Brantner, Ph.D.
Peter F. Briggs, Ph.D.
James N. Butcher, Ph.D.
Norman Garmezy, Ph.D.
Harold Gilberstadt, Ph.D.
Irving Gottesman, Ph.D.
A. Jack Hafner, Ph.D.
Gordon Heistad, Ph.D.
David Lykken, Ph.D.

** Formerly the Department of Clinical Psychology.

Manfred Meier, Ph.D.
Roy Pickens, Ph.D.
Wentworth Quast, Ph.D.
Alan Roberts, Ph.D.
William Schofield, Ph.D.
Auke Tellegen, Ph.D.
Travis Thompson, Ph.D.
Harold Williams, Ph.D.

Clinical Professor

Hermann Buegel, Ph.D.
Daniel N. Wiener, Ph.D.

Associate Professor

Gary Athelstan, Ph.D.
Harold Ireton, Ph.D.
James Kincannon, Ph.D.
Thomas Kiresuk, Ph.D.
Gayle Lumry, Ph.D.
Pearl Rosenberg, Ph.D.
Roberta Simmons, Ph.D.
Lloyd Sines, Ph.D.
Donald Stieper, Ph.D.

Clinical Associate Professor

Marvin Ack, Ph.D.
Seymour Gross, Ph.D.
Robert Harlow, Ph.D.
Sherman Nelson, Ph.D.
Roland Peek, Ph.D.
Samuel Scher, Ph.D.

Assistant Professor

Donald Backus, Ph.D.
Dean E. Beaulieu, Ph.D.
Gordon Braatz, Ph.D.
Malcolm Burdick, Ph.D.
Nancy Crewe, Ph.D.
Ann D. Duncan, Ph.D.
Edward Ells, Ph.D.
Paula Fox, Ph.D.
Kenneth Hampton, Ph.D.
Ada G. Hegion, Ph.D.
David A. Heiberg, Ph.D.
Charles Imm, Ph.D.
James Jacobson, Ph.D.
Jeanne Jones, Ph.D.
Jeffrey Kassel, Ph.D.
Willard Kehrberg, Ph.D.
Robert Lushene, Ph.D.
James Maddock, Ph.D.
Jerry A. Martin, Ph.D.
Garland Meadows, M.A.
Eric Noble, Ph.D.
Sue Petzel, Ph.D.
Phyllis Reynolds, Ph.D.
John Sineps, Ph.D.
L. Alan Sroufe, Ph.D.
Zigfrids Stelmachers, Ph.D.
H. Uwe Stuecher, Ph.D.
Robert Thomas, Ph.D.

Clinical Assistant Professor

Lorna M. Anderson, Ph.D.
Adrienne Barnwell, Ph.D.
Patricia Good, Ph.D.
Leo Hanvik, Ph.D.
Mary A. Mattoon, Ph.D.
Mary L. Maxwell, Ph.D.
Murray Reed, Ph.D.
Warren Shaffer, Ph.D.
Michael Shea, Ph.D.
Alice Wagstaff, Ph.D.
Jon Weinberg, Ph.D.
Marlin Wiemer, Ph.D.

Instructor

Richard Coder, M.A.
Peter Peth, M.A.

ELECTIVE COURSES

5601. DESCRIPTIVE PSYCHOPATHOLOGY

5602. EVIDENCE IN PSYCHOPATHOLOGY

5603. PSYCHOMETRICS

5604. PSYCHOLOGY OF PHYSICAL DISABILITY

5605. DISORDERS OF COMMUNICATION

5607. PARENT COUNSELING: APPROACHES TO PARENTS OF DISTURBED CHILDREN

5608. MENTAL RETARDATION

5609. CLINICAL USES OF RESPONDENT TECHNIQUES AND CLINICAL APPLICATIONS

5610. FAMILY DIAGNOSTIC INTERVIEWING IN A HOSPITAL SETTING

ADVANCED CREDIT COURSES

5101. HUMAN BEHAVIOR IN NEW AND STRESSFUL SITUATIONS

5701. PROJECT IN CLINICAL PSYCHOLOGY

8200. DESCRIPTIVE PSYCHOPATHOLOGY
8201. READINGS IN THE HISTORY OF PSYCHIATRY
8202. SPECIAL RESEARCH TOPICS
8203. PSYCHOMETRIC CLERKSHIP
8204. INTERNSHIP IN CLINICAL PSYCHOLOGY
8205. ADVANCED SEMINAR
8206. MEDICAL PSYCHOLOGY
8211. SEMINAR: BASIC PRINCIPLES OF CLINICAL PSYCHOLOGY
8212. PSYCHOPHYSIOLOGY FOR PSYCHIATRISTS
8213. ORGANIC THERAPIES IN PSYCHIATRY
8214. ORGANIC SYNDROMES IN PSYCHIATRY
8215. PROFESSIONAL PROBLEMS IN CLINICAL PSYCHOLOGY
8226. TECHNIQUES OF EVALUATION
8227. GROUP SUPERVISION OF THERAPY
8228. GROUP SUPERVISION OF THERAPY
8229. GROUP SUPERVISION OF THERAPY

SCHOOL OF PUBLIC HEALTH

Lee D. Stauffer, M.P.H., Associate Professor and Dean
(Staff giving instruction to medical students. For complete announcement of staff and courses in public health, see *School of Public Health Bulletin.*)

Professor

Jacob E. Bearman, Ph.D.
Henry Blackburn, M.D.
Richard G. Bond, M.S., M.P.H.
Bright Dornblaser, M.H.A.
Francisco Grande, M.D.
Velvl Greene, Ph.D.
Eugene A. Johnson, Ph.D.
Theodor Litman, Ph.D.
Richard B. McHugh, Ph.D.
George S. Michaelsen, M.Ch.E.
Harold Paulus, Ph.D.
Leonard Schuman, M.D.
Conrad Straub, Ph.D.
Henry Taylor, Ph.D.
Vernon Weckwerth, Ph.D.

Associate Professor

Donald E. Barber, Ph.D.
James Boen, Ph.D.
Marcus Kjelsberg, Ph.D.
Ronald Prineas, M.D.

Assistant Professor

Knowlton Caplan, M.Ch.E.
Gustave L. Scheffler, B.S.C.E.
James Stebbings, Ph.D.
Donald Vesley, Ph.D.

Biometry

ELECTIVE COURSES

5400. INTRODUCTION TO QUANTITATIVE METHODS IN THE LIFE SCIENCES. (3 cr; prereq Biol 1011, Chem 1005, Math 1231, ‡)

5401. QUANTITATIVE METHODS IN MEDICINE. (3 cr; prereq 5400 or ‡)

5430. BIOMEDICAL COMPUTING. (3 cr; prereq Math 1110)

5436. ANALYTICAL TECHNIQUES FOR HEALTH DELIVERY SYSTEMS. (3 cr; prereq calculus, 5450, 5451 or ‡)

Environmental Health

ELECTIVE COURSES

5151. ENVIRONMENTAL HEALTH. (3 cr; prereq ‡)

5153. INSTITUTIONAL ENVIRONMENTAL HEALTH. (3 cr; prereq ‡)

5171. ENVIRONMENTAL MICROBIOLOGY. (3 cr; prereq 5151, MicB 3103 or ‡)

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

5191. PRINCIPLES AND METHODS OF INJURY CONTROL. (Cr ar; prereq ‡)

5192. HOSPITAL SAFETY. (3 cr; prereq ‡)

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

5207. RADIATION PROTECTION CRITERIA FOR HOSPITALS. (2 cr; prereq ‡)

5211. INDUSTRIAL HYGIENE ENGINEERING. (3 cr; prereq ‡)

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

5213. PUBLIC HEALTH ASPECTS OF TOXIC PRODUCTS. (2 cr; prereq 5215, ‡)

5216. HEALTH ASPECTS OF AIR CONTROL IN HOSPITALS. (2 cr; prereq ‡)

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

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

8218. FIELD PROBLEMS IN OCCUPATIONAL HEALTH. (3 cr; prereq 5211 or ¶5213, ‡)

Epidemiology

ELECTIVE COURSES

5330. EPIDEMIOLOGY I. (3 cr; prereq 5375, and 5405, 5407 or 5450, 5451, or #)

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

5349. EPIDEMIOLOGY OF CHRONIC RESPIRATORY DISEASE. (Cr ar; prereq #)

8340. EPIDEMIOLOGY OF NONCOMMUNICABLE DISEASES. (3 cr; prereq 5330)

Hospital and Health Care Administration

ELECTIVE COURSES

5785. QUANTITATIVE METHODS APPLIED TO HEALTH ADMINISTRATIVE PROBLEMS. (3 cr; prereq #)

5790. SOCIAL, ECONOMIC, AND POLITICAL ASPECTS OF MEDICAL CARE. (3 cr; prereq #)

8750-8751. ALTERNATIVE PATTERNS FOR MEETING HEALTH CARE NEEDS. (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. (Cr ar; prereq #)

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

8781. SEMINAR: RESEARCH STUDIES IN HEALTH CARE. (3 cr; prereq #)

8790. POLITICAL ASPECTS OF HEALTH SERVICES. (3 cr; prereq #)

Maternal and Child Health

ELECTIVE COURSES

5610. MATERNAL AND CHILD HEALTH. (3 cr; prereq #)

5611. MATERNAL AND CHILD HEALTH PROGRAM. (1 cr; prereq #)

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

5613. HANDICAPPED CHILDREN. (Cr ar; prereq 5610, #)

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

8610. HEALTH OF THE SCHOOL-AGE CHILD. (2 cr; prereq 5610 or #)

8611. MATERNAL AND CHILD HEALTH PROBLEMS. (3 cr; prereq #)

Physiological Hygiene

ELECTIVE COURSES

5380. APPLIED HUMAN NUTRITION. (3 cr; prereq #)

5386. PUBLIC HEALTH ASPECTS OF CARDIOVASCULAR DISEASE. (3 cr; prereq #)

Public Health Administration

ELECTIVE COURSES

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

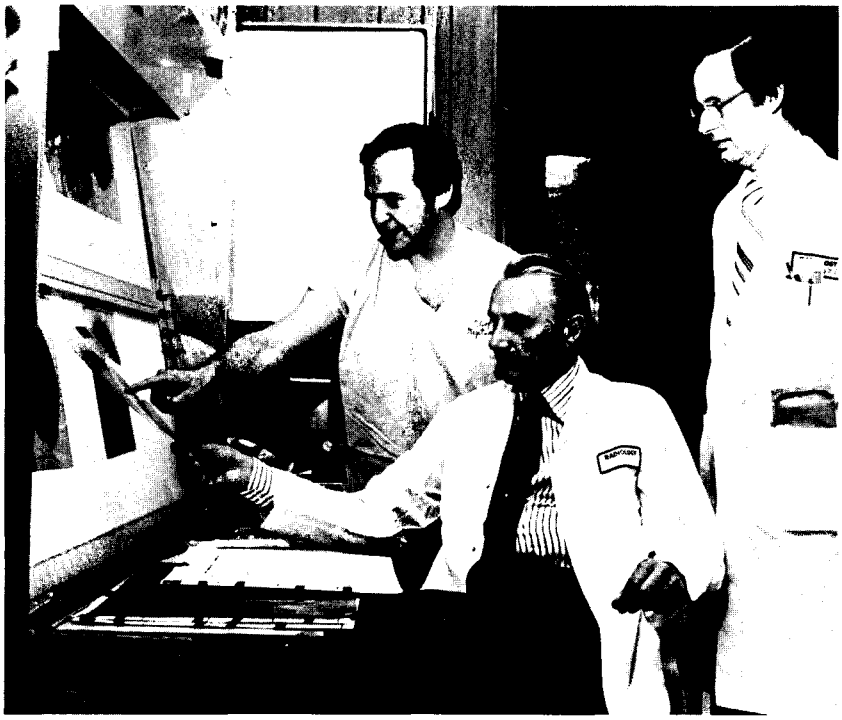
5006. INTRODUCTION TO COMMUNITY HEALTH. (5 cr; prereq #)

RADIOLOGY (Rad)

Eugene Gedgaudas, M.D., Professor and Head

Division of Roentgen Diagnosis

Eugene Gedgaudas, M.D., Professor and Director



Dr. Gedgaudas ponders a difficult diagnostic problem.

Professor

Kurt Amplatz, M.D.
Samuel B. Feinberg, M.D.
Stephen A. Kieffer, M.D.
Harold O. Peterson, M.D.

Associate Professor

Robert G. B. Bjornson, M.D.
Lawrence Harvey A. Gold, M.D.
Philippe R. L'Heureux, M.D.
Richard Moore, Ph.D.
Shih Hao Tsai, M.D.

Clinical Associate Professor

Daniel L. Fink, M.D.
Sewell Gordon, M.D.
Leonard O. Langer, M.D.
Donald H. Peterson, M.D.
Hugh Jones Williams, M.D.

Assistant Professor

Helmut Carl Diefenthal, M.D.

Augustin Formanek, M.D.
Walter C. Hildebrandt, M.D.
Douglas B. Ketcham, M.D.
J. Paul Leonard, M.D.
Donald Gene Marsh, M.D.
Paul Neibergs, M.D.
Robert D. Pilgrim, M.D.
Mario Pliego, M.D.
Joaquim Vieira, M.D.
Cornelius Walter Wiens, M.D.

Clinical Assistant Professor

Eugene Ahern, M.D.
Heino Alari, M.D.
Manouchehr Azad, M.D.
O. J. Baggenstoss, M.D.
Chauncey N. Borman, M.D.
Stanford Calin, M.D.
John B. Coleman, M.D.
Glen G. Cramer, M.D.
Charles W. Frye, M.D.
Milton R. Gilchrist, 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.
Thomas B. Merner, M.D.
Harry W. Mixer, M.D.
David L. Moody, M.D.
John A. Tobin, M.D.

Instructor

Erling Albin Kloppedal, M.D.
Robert R. McClelland, M.D.
Donovan Blake Reinke, M.D.
Charles Albert Rohrmann, Jr., M.D.
Daryl Paul Williamson, 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.
Erik Philip Eselius, M.D.
Robert R. Foley, M.D.
Jule Jerome Hopperstad, M.D.
Richard S. Johnson, M.D.
Thomas E. Johnson, M.D.
Warren L. Kump, M.D.
Leonard Herbert Levitan, M.D.
Frank E. Mork, Jr., M.D.
Paul C. Olfelt, M.D.
Robert L. Pedersen, M.D.
James L. Purdie, M.D.
Arnold O. Rholl, M.D.
Norman F. Stone, M.D.
Richard C. Tucker, M.D.
Peter Helmuth Ullrich, M.D.
Stanley C. Von Drashek, M.D.
Gilbert S. Wheeler, M.D.

Division of Nuclear Medicine

Merle K. Loken, M.D., Ph.D., Professor and Director

Associate Professor

Marvin E. Goldberg, M.D.

Clinical Associate Professor

Elmer Paulson, M.D.

Assistant Professor

Norbert S. Domek, Ph.D.
Jay Thomas Payne, Ph.D.
John M. Wolff, M.D.

Clinical Assistant Professor

William A. Wilcox, M.D.

Instructor

Rex B. Shafer, M.D.

Clinical Instructor

John B. Marta, M.D.

ELECTIVE COURSES

5100. EXTERNSHIP: NUCLEAR MEDICINE. (Cr ar; prereq regis med)

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 General Hospital. (Cr ar; prereq regis med)

5104. EXTERNSHIP: DIAGNOSTIC RADIOLOGY — St. Paul-Ramsey Hospital. (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

5440. SPECIAL PROBLEMS: RADIATION BIOLOGY. (Cr ar; prereq regis med)

5511. ROENTGEN TECHNIQUE. (1 cr)

5512. DOSIMETRY OF INTERNAL-EXTERNAL RADIATION EMITTERS. (1 cr)

5540. SPECIAL PROBLEMS: RADIOLOGICAL PHYSICS. (Cr ar; prereq regis med)

5570, 5571, 5572. RADIATION PHYSICS. (3 cr; 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

Professor

M. Michael Eisenberg, M.D.
Claude R. Hitchcock, M.D., Ph.D.
Edward W. Humphrey, M.D., Ph.D.
Arnold S. Leonard, M.D., Ph.D.
Richard C. Lillehei, M.D., Ph.D.
Charles F. McKhann, M.D.
Donald G. McQuarrie, M.D., Ph.D.
John F. Perry, Jr., M.D., Ph.D.
Yoshio Sako, M.D., Ph.D.
Richard L. Varco, M.D., Ph.D.

Clinical Professor

Tague C. Chisholm, M.D.
Davitt A. Felder, M.D., Ph.D.
Lyle J. Hay, M.D., Ph.D.
N. Kenneth Jensen, M.D.
Frank E. Johnson, M.D.
William D. Kelly, M.D., Ph.D.
Arnold J. Kremen, M.D., Ph.D.
Fletcher Miller, M.D.
Frederick M. Owens, Jr., M.D.
Charles T. Rea, M.D., Ph.D.
Jacob H. Strickler, M.D.
Robert W. Utendorfer, M.D., M.S.
Earl G. Yonehiro, M.D., Ph.D.

Associate Professor

Henry Buchwald, M.D., Ph.D.
John P. Delaney, M.D., Ph.D.
Robert Goodale, M.D., Ph.D.
Theodor B. Grage, M.D., Ph.D.
John J. Haglin, M.D., Ph.D.
Carl M. Kjellstrand, M.D.
Joshua Miller, M.D.
Demetre Nicoloff, M.D., Ph.D.
Frank Quattlebaum, M.D., M.S.
Henry Sosin, M.D., Ph.D.
W. Albert Sullivan, M.D., M.S.

Clinical Associate Professor

Stuart W. Arhelger, M.D., Ph.D.
George S. Bergh, M.D., Ph.D.
Harrison H. Farley, M.D.
David Gaviser, M.D., M.S.
David F. Hickok, M.D.
James LaFave, M.D.
Bernard G. Lannin, M.D., Ph.D.
Donald C. MacKinnon, M.D.
Stanley R. Maximer, M.D., M.S.
Daniel Moos, M.D.
Maynard C. Nelson, M.D., M.S.
Nathan C. Plimpton, M.D., M.S.
William R. Scott, M.D., M.S.
Bernard J. Spencer, M.D.
William E. Stephens, M.D.

Assistant Professor

Robert C. Anderson, M.D., Ph.D.
Theodore Buselmeier, M.D.
Ronald H. Dietzman, M.D., Ph.D.
Robert Gilsdorf, M.D., Ph.D.
Hovald Helseth, M.D., Ph.D.
Albert Mowlem, M.D., Ph.D.
Ernest Ruiz, M.D.

Clinical Assistant Professor

John F. Alden, M.D., M.S.
Samuel G. Balkin, M.D., Ph.D.
Robert B. Benjamin, M.D.
John B. Brainerd, M.D., M.S.
Coleman J. Connolly, M.D.
John A. Culligan, M.D.
Harrison Farley, M.D.
William G. Gamble, M.D.
Paul G. Gannon, M.D.
Joseph J. Garamella, M.D., Ph.D.
Bernard Goott, M.D., Ph.D.
Jerome T. Grismer, M.D.
Herman Heupel, M.D.
Laurence D. Hilger, M.D.
Samuel Hunter, M.D., M.S.
Thomas L. Huseby, M.D.
Lyle V. Kragh, M.D.
Richard E. Larson, M.D.
Louis G. Lick, M.D., M.S.
John H. Llinner, M.D.
Felix A. McParland, M.D.
Glen D. Nelson, M.D.
Theodore A. Peterson, M.D.
David E. Raab, M.D.
Walter R. Schmidt, M.D.
Lee Simso, M.D.
Abbott Skinner, M.D., M.S.
Vernon D. Smith, M.D.
Joseph L. Sprafka, M.D.
Lyle A. Tongen, M.D., M.S.
Neil A. Trotman, M.D.
John F. Waldron, M.D.
Darrell E. Westover, M.D.
Richard E. YaDeau, M.D.

Instructor

Ernesto Eusebio, M.D.
John Foker, M.D., Ph.D.
Charles Murray, M.D.
Richard Orahood, M.D.

Clinical Instructor

Frank J. Anker, M.D.
Manuel R. Binder, M.D.
Norman B. Bloom, M.D.
Donald A. Bolt, M.D.
Merrill D. Chesler, M.D.
Charles T. Eginton, M.D., M.S.
Cassius Ellis, M.D.
Robert S. Flom, M.D.
Leroy J. Fox, M.D.
Donald W. Hannon, M.D.
Max E. Harris, M.D.

Charles W. Hauser, M.D.
Carter W. Howell, M.D.
Harry A. Johnson, Jr., M.D.
Joseph Kiser, M.D.
Clarence V. Kusz, M.D.
Donald L. Lamb, M.D.
Michael F. Lynch, M.D.
Walter L. Lynn, M.D.
Charles H. Manlove, M.D.
Elmer J. Martinson, M.D.
Robert McCornack, M.D.
Berton D. Mitchell, M.D.
Harvey M. Moral, M.D.
Frank Pilney, M.D.
John H. Rosenow, M.D.
John Stafne, M.D.
Shin Tanaka, M.D.
Robert Telander, M.D.
Robert A. VanTyn
Richard J. Webber, M.D.
George Werner, M.D.

Special Lecturer
Victor Gilbertsen, M.D., M.S.

Dr. Najarian conducts a seminar.

The courses for medical students are designed to provide the student with a basic knowledge of the pathophysiology of disease and to encourage application of basic science knowledge to clinical surgical diseases in both the general and surgical subspecialties. The student is exposed to basic pathophysiology and study the etiology, pathogenesis, and diagnosis of various surgical disease entities and how they relate to clinical surgery. In the third year, the student is given an opportunity to apply physiological knowledge to surgical diseases through direct patient contact during the surgical externship at the University Hospitals and at affiliated hospitals. In addition to the inpatient surgery externship, small group seminar sessions with individual members of the full-time staff are offered in the

mornings when the student is not involved in the operating room, to provide close contact between the students and staff for review of basic surgical problems. Particular emphasis is placed upon the acquisition of basic diagnostic skills and upon development of a sound physiological knowledge of surgical diseases. In addition, the student receives instruction in operating room asepsis and pre- and postoperative care of surgical patients.

Elective courses are offered in general surgery and in all the surgical subspecialties, primarily to increase the scope of clinical exposure and give the student an opportunity to participate in the fundamentals of surgical research.

ELECTIVE COURSE

5500. EXTERNSHIP IN GENERAL SURGERY — University Hospitals and Affiliated Hospitals. (Cr ar; prereq regis med)
An opportunity to work as a member of the house staff functioning as a surgical intern, with responsibilities on the wards and in the operating and emergency rooms. The student has the responsibility of the initial work-up of new patients and of determining a proposed course of therapy. He may then follow the patient through diagnostic procedures and into the operating room where he may participate in the surgical procedure and have an important role in the post operative management. Opportunities for learning surgical techniques in the experimental laboratories available. Staff tutorial sessions held each week to review the student's case material and to discuss diagnostic and therapeutic approaches to surgical conditions.

Colon and Rectal Surgery

Stanley M. Goldberg, M.D., Director

Clinical Associate Professor
Loren E. Nelson, M.D.
Charles E. Neumeister, M.D.
Lloyd F. Sherman, M.D.
William T. Smith, M.D.
Robert J. Tenner, M.D.

Clinical Assistant Professor
Emmanuel G. Balcos, M.D.

Clinical Instructor
Emerson E. Hoppe
George Hottinger
Jerry L. Schottler
Paul E. Schultz

ELECTIVE COURSE

5523. EXTERNSHIP IN COLON AND RECTAL SURGERY — Veterans Administration Hospital. (Cr ar; prereq regis med) Goldberg and staff

THERAPEUTIC RADIOLOGY

Seymour H. Levitt, M.D., Professor and Head

Clinical Professor
Donn G. Mosser, M.D., M.S.

Associate Professor
Thomas K. Jones, Jr., M.D.

Clinical Associate Professor
Hans Kuisk, M.D.
Arnolds Veinbergs, M.D.

Assistant Professor
Faiz M. Khan, Ph.D.
Vaughn C. Moore, Ph.D.
David G. Smith, M.D.
Chang W. Song, Ph.D.
John A. Stryker, M.D.

Instructor
Donald J. Buchsbaum, Ph.D.
Jose M. Feola, M.S.
Judith A. Unger, R.N.

Clinical Instructor
Virgil T. Fallon, M.D.
John Matthews, 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)

ADVANCED CREDIT COURSES

0321f,w,s,su. TUMOR CLINIC CONFERENCE (No cr)

5340f,w,s,su. SPECIAL PROBLEMS IN RADIATION THERAPY. (Cr ar)

5510f,w,s,su. BASIC PRINCIPLES OF RADIOLOGICAL PHYSICS. (1 cr)

5512f,w,s,su. DOSIMETRY OF INTERNAL AND EXTERNAL RADIATION. (1 cr)

5540f,w,s,su. SPECIAL PROBLEMS IN RADIOLOGICAL PHYSICS. (Cr ar)

5770f. RADIOLOGICAL PHYSICS. (3 cr)

5771w. MEDICAL NUCLEAR PHYSICS. (3 cr)

5772s. RADIATION BIOLOGY. (3 cr)

8300f,w,s,su. RADIATION THERAPY. (Cr ar)

8310f,w,s,su. FUNDAMENTALS OF RADIATION THERAPY. (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 Director

Professor

Colin Markland, M.D.

Clinical Professor

Baxter A. Smith, M.D., M.S.

Associate Professor

Clyde Blackard, M.D.
Arthur Y. Elliott, Ph.D.

Clinical Associate Professor

Samuel S. Beirstein, M.D.
Milton P. Reiser, M.D., M.S.
Richard S. Rodgers, M.D.

Assistant Professor

Alexander S. Cass, M.D.
Anthony Castro, Ph.D.
Thomas R. Hakala, M.D.
Daniel C. Merrill, M.D.

Clinical Assistant Professor

David M. Anderson, M.D.
Robert W. Geist, M.D.
Paul R. Hartig, M.D.
Gerald W. Koos, M.D.
Bruce E. Linderholm, M.D.
Hugo Miller, M.D., M.S.
William E. Price, M.D.
Edward J. Richardson, M.D.
Edgar A. Webb, M.D.

Instructor

David Bronson, Ph.D.
Gerald W. Ireland, M.D.
Athanase Nicolaidis, M.D.

Clinical Instructor

Stanley J. Antolak, M.D.
William H. Card, M.D.
John P. Cooper, M.D.
David J. Dunlap, M.D.
Everette J. Duthoy, M.D.
Robert A. Flynn, M.D.
George L. Garske, M.D.
Roger R. Lundblad, M.D.
Gerald D. McEllistrem, M.D.
Ahmad Orandi, M.D.
Harold A. Reif, M.D., M.S.
John Soucheray, M.D.
Gordon W. Strom, M.D.
Theodore H. Sweetser, Jr., M.D.
Shin Tanaka, M.D.
Joseph E. Twidwell, M.D.

ELECTIVE COURSE

5180. EXTERNSHIP IN UROLOGY. (Cr ar; prereq regis med)

ADVANCED CREDIT COURSES

8250. UROLOGICAL SURGERY

8251. CYSTOSCOPY AND UROLOGY DIAGNOSIS

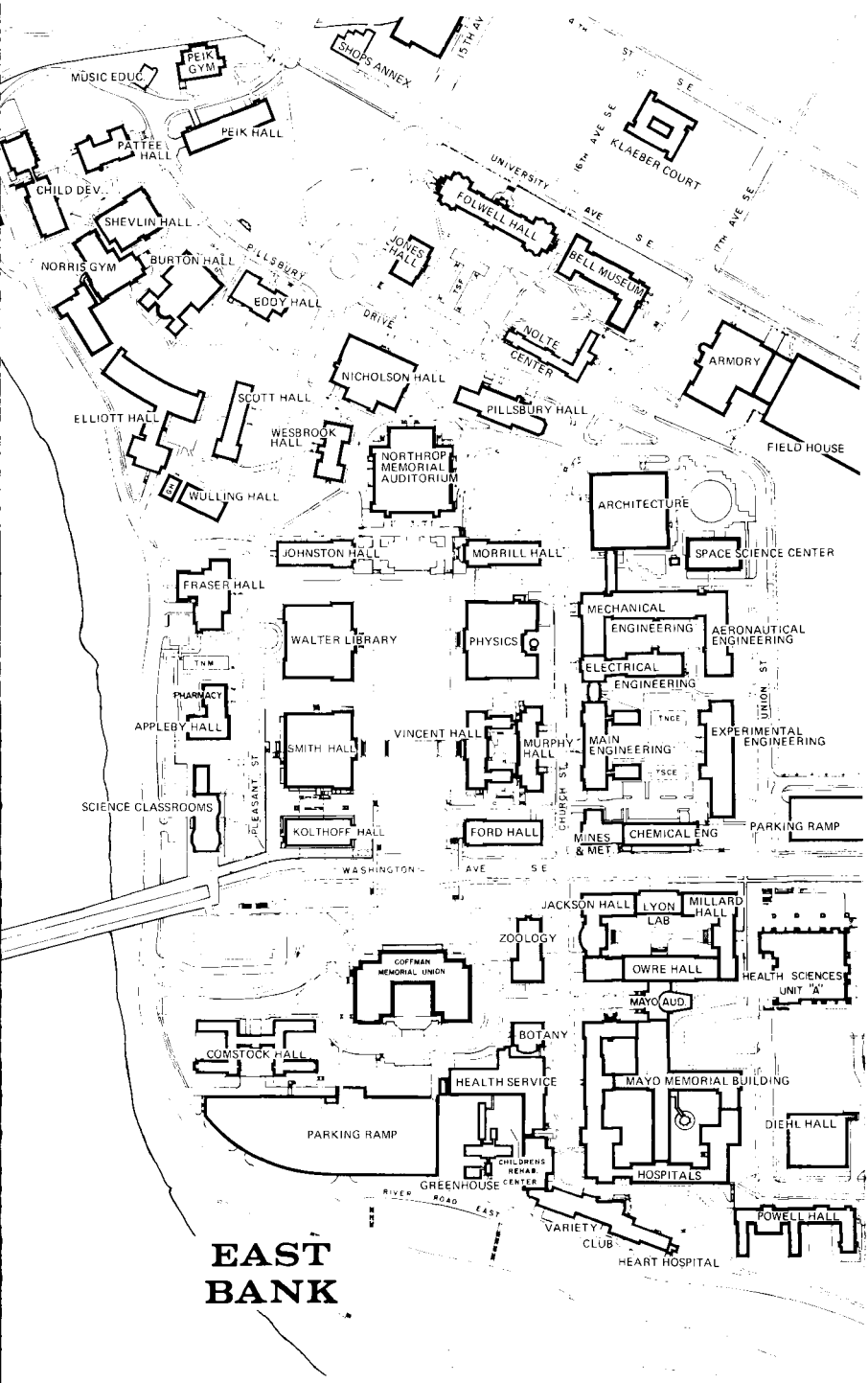
8252. UROLOGICAL CONFERENCE

8253. RESEARCH: UROLOGY

8254. UROLOGICAL SEMINAR

8255. UROLOGICAL-RADIOLOGICAL CONFERENCE

8256. UROLOGICAL-PATHOLOGICAL CONFERENCE


MUSIC EDUC.
PEIK GYM
SHOPS ANNEX
15TH AV
4TH ST SE
PEIK HALL
PATTEE HALL
CHILD DEV.
KLAEBER COURT
16TH AVE SE
UNIVERSITY AVE SE
FOLWELL HALL
17TH AVE SE
SHEVLIN HALL
PILLSBURY DRIVE
JONES HALL
BELL MUSEUM
NORRIS GYM
BURTON HALL
EDDY HALL
NOLTE CENTER
ARMORY
NICHOLSON HALL
SCOTT HALL
PILLSBURY HALL
ELLIOTT HALL
WESBROOK HALL
NORTHROP MEMORIAL AUDITORIUM
FIELD HOUSE
WULLING HALL
ARCHITECTURE
JOHNSTON HALL
MORRILL HALL
SPACE SCIENCE CENTER
FRASER HALL
MECHANICAL ENGINEERING
AERONAUTICAL ENGINEERING
WALTER LIBRARY
PHYSICS
TNM
ELECTRICAL ENGINEERING
PHARMACY
UNION ST
APPLEBY HALL
VINCENT HALL
TNCE
EXPERIMENTAL ENGINEERING
SMITH HALL
MURPHY HALL
MAIN ENGINEERING
TSCE
SCIENCE CLASSROOMS
PLEASANT ST
CHURCH ST
KOLTHOFF HALL
FORD HALL
MINES & MET
CHEMICAL ENG
PARKING RAMP
WASHINGTON AVE SE
JACKSON HALL
LYON LAB
MILLARD HALL
ZOOLOGY
COFFMAN MEMORIAL UNION
OWRE HALL
HEALTH SCIENCES UNIT "A"
MAYO AUD.
BOTANY
COMSTOCK HALL
HEALTH SERVICE
MAYO MEMORIAL BUILDING
PARKING RAMP
DIEHL HALL
CHILDRENS REHAB CENTER
HOSPITALS
GREENHOUSE
RIVER ROAD EAST
POWELL HALL
VARIETY CLUB
HEART HOSPITAL

EAST BANK