

Medical Technology

MEDICAL TECHNOLOGY

How to Use This Bulletin

The *Medical Technology Bulletin* for 1969-1971 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.



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.

UNIVERSITY OF MINNESOTA BULLETIN

Published by the University of Minnesota, Office of Admissions and Records, 105 Morrill Hall, Minneapolis, Minnesota 55455, January through September inclusive. One issue in January, one issue in February, two issues in March, four issues in April, four issues in May, three issues in June, four issues in July, two issues in August, and one issue in September. Second class postage paid at Minneapolis, Minnesota. Send change of address notices and other communications to Office of Admissions and Records, Minneapolis, Minnesota 55455.

The contents of this bulletin and of other University bulletins, publications, or announcements are subject to change without notice.

UNIVERSITY OF MINNESOTA

Board of Regents

The Honorable Lester A. Malkerson, Minneapolis, Chairman; The Honorable Marjorie J. Howard (Mrs. C. Edward), Excelsior, Vice Chairman; The Honorable Elmer L. Andersen, St. Paul; The Honorable Lyman A. Brink, Hallock; The Honorable Daniel C. Gainey, Owatonna; The Honorable Harry B. Hall, M.D., Edina; The Honorable Albert V. Hartl, Fergus Falls; The Honorable Herb L. Huffington, M.D., Waterville; The Honorable Fred J. Hughes, St. Cloud; The Honorable William K. Montague, Duluth; The Honorable George W. Rauenhorst, Olivia; The Honorable Otto A. Silha, Edina.

Administrative Officers

Malcolm Moos, President
Donald K. Smith, Vice President, Administration
William G. Shepherd, Vice President, Academic Administration
Laurence R. Lundén, Vice President, Business Administration
Stanley J. Wenberg, Vice President for Educational Relationships and Development
Paul H. Cashman, Vice President for Student Affairs
Robert Edward Summers, Dean of Admissions and Records

MEDICAL TECHNOLOGY

(A division of the Department of Laboratory Medicine)

Administration

Robert B. Howard, M.D., Ph.D., Dean of the College of Medical Sciences
Ellis S. Benson, M.D., Professor and Head, Department of Laboratory Medicine
Gerald T. Evans, M.D.C.M., Ph.D., Professor Emeritus, Department of Laboratory Medicine
Ruth F. Hovde, M.S., Professor and Director, Division of Medical Technology
Verna L. Rausch, M.S., Professor and Associate Director, Division of Medical Technology
Cornelia D. McCune, Ph.D., Professor, Counselor, and Adviser, Division of Medical Technology

Medical Directors

Miguel Azar, M.D., Assistant Professor; Director, Blood Bank Laboratory
G. M. Bradley, M.D., Assistant Professor, Clinical Microbiology
Robert A. Bridges, M.D., Associate Professor; Director, Immunochemistry Laboratory
David M. Brown, M.D., Assistant Professor; Chemistry Laboratory
Richard Brunning, M.D., Associate Professor; Hematology Laboratory
J. Roger Edson, M.D., Assistant Professor; Director, Coagulation Laboratory
John M. Matsen, M.D., Assistant Professor; Director, Microbiology Laboratory

Herbert Polesky, M.D., Assistant Professor; Director, War Memorial Blood Bank
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

Faculty

Sandra Benson, B.S., Instructor, Immunohematology
Donna Blazeovic, M.P.H., Assistant Professor, Microbiology
Patricia Bordewich, M.S., Assistant Professor, Hematology
Ruth Cadwell, M.S., Instructor, Hematology
Mary E. Dempsey, Ph.D., Associate Professor, Chemistry
Grace M. Ederer, M.P.H., Associate Professor, Microbiology
Esther F. Freier, M.S., Professor, Chemistry; Hospital Chemist
Ben Hallaway, M.S., Assistant Professor, Chemistry
Jessie Hansen, B.S., Instructor, Chemistry
Gordon Herbst, M.S., Instructor, Electron Microscopy
Barbara Merritt, M.S., Assistant Professor, Chemistry
Andreas Rosenberg, Ph.D., Associate Professor, Chemistry
Lorraine M. Stewart, M.S., Associate Professor, Hematology
E. Anne Stiene, B.S., Instructor, Hematology
Jane Swanson, B.S., Instructor, Immunohematology

Clinical Staff

Calvin Bandt, M.D., Pathologist, Hennepin County General Hospital
Leonard Crowley, M.D., Pathologist, St. Mary's Hospital
Paul Finley, M.D., Pathologist, Fairview Hospital
Aina Galejs, M.D., Pathologist, Eitel Hospital
Donald Gleason, M.D., Pathologist, VA Hospital
Wendell Hall, M.D., Pathologist, VA Hospital
Seymour Handler, M.D., Pathologist, North Memorial Hospital
Erhard Haus, M.D., Pathologist, St. Paul-Ramsey Hospital
Norman Horns, M.D., Pathologist, Fairview-Southdale Hospital
David Lakatua, M.D., Pathologist, St. Paul-Ramsey Hospital
John Raich, M.D., Pathologist, Fairview-Southdale Hospital
Robert Rydell, M.D., Pathologist, VA Hospital
Wayne Schrader, M.D., Pathologist, St. Paul-Ramsey Hospital
Edward Segal, M.D., Pathologist, Methodist Hospital
Martin Segal, M.D., Pathologist, Methodist Hospital
Robert Strom, M.D., Pathologist, Hennepin County General Hospital
Thomas Swallen, M.D., Pathologist, North Memorial Hospital
Patrick Ward, M.D., Pathologist, Mt. Sinai Hospital
Bertram Woolfrey, M.D., Pathologist, St. Paul-Ramsey Hospital

Laboratory Staff

Administration

Donna Wieb, B.S.
Mary Ringer, B.S.¹
Susan Preston, B.S.²
Sarah Hastings, B.S.³

Blood Bank Laboratory

Clareyse Nelson, B.S.¹
T. Jean Purcelli, B.S.²
Christine Adams, B.S.³
Margaret Bloemendal, B.S.³
Jeanne Olsen, B.S.³
Ruth Peterson, B.S.³
Barbara Ramquist, B.S.³
Barbara Weiblen, B.A.³
Martha Ziehwein, B.S.³

Chemistry Laboratory

Kathleen Hansen, B.S.¹
Mavis Hawkinson, B.S.¹
Grace Anderson, B.S.²
Audrey Bernstein, B.S.²
Lynette Berg, B.S.²
Joanne Biros, B.S.²
Jean Bucksa, B.S.²
E. Mary Damron, B.S.²
Joy Dean, B.S.²
Mary Fowler, B.S.²
Hubert Loewen, B.A.²
Marilyn Olson, B.S.²
Philip St. Louis, B.S.²
Kathleen Berchild, B.S.³
Katherine Charlton, B.S.³
Barbara Ellison, B.S.³
Marilyn Erickson, B.S.³
Katherine Hollanitsch, B.S.³
Gail Hoppenrath, B.S.³
Karen Horning, B.S.³
Ingrid Jonsson, B.S.³
Karen Koski, B.S.³
Joyce Larson, B.S.³
Howard Lee, B.S.³
Margaret Lepley, B.S.³
Pauline Lileng, B.S.³
Jane Mayer, B.S.³
Mary Ann McCartan, B.S.³
Patricia Mortenson, B.S.³
Ruth Mullally, B.S.³
Phyllis Nelson, B.S.³
Toni Okada, B.S.³
Marina Pavuls, B.S.³
Elizabeth Perry, B.S.³
Kathleen Rathmanner, B.A.³
Berta Rau, B.S.³
Mary Severn, B.S.³
Kathleen Sporer, B.S.³
Kay Townsend, B.S.³
Joyce Trembath, B.S.³
Patricia Wells, B.S.³

M. Kim Williams, B.S.³
Janet Winter, B.S.³
Kay Wolfe, B.S.³

Coagulation Laboratory

Ardella Bennett, B.S.²
Sharon Snyder, B.S.³
Cheryl Swinehart, B.S.³

Computer Section

Joan Aldrich, B.S.²

Electrocardiography and Basal Metabolism Laboratory

Margaret Halsted, B.S.²
Eloise Greenwood, B.S.³
Eileen Stangret, B.S.³

Heart Catheterization Laboratory

Frank Gams, B.S.²
Joan Brown, B.S.²
Carol Lehman, B.S.³
Linda Nielsen, B.S.³
Ethel Schneider, B.S.³

Hematology Laboratory

Ruth Rosendahl, B.S.¹
Ella Spanjers, B.S.²
Elizabeth Stone, B.S.²
Kathryn Zieske, B.S.²
Mary Jane Buckman, Ph.D.³
Audrey Christenson, B.S.³
Emily Czajkowski, B.S.³
Dorothy Knutson, B.S.³
Kay Listemaa, B.S.³
Karen Martin, B.S.³
Loreen Nash, B.S.³
Karen Roeller, B.S.³
Paulette Smutka, B.S.³
Mary Jane Stern, B.S.³
Susan Stotz, B.A.³
Judith Syverson, B.S.³
Marion Templeton, B.S.³
Nancy Tofte, B.S.³
Jean Urbank, B.S.³
Betty Weisel, B.S.³
Sandra Williams, B.S.³

Immunology Laboratory

Helen Hallgren, B.S.²

Medical Genetics Laboratory

Wanda Kuhl, B.S.²
Kathleen Jacobson, B.S.³
Karen Lamberg, B.S.³
Leanna Lindquist, B.S.³

¹ Principal Medical Technologist

² Senior Medical Technologist

³ Student Technologist Supervisor

Microbiology Laboratory

Joanne Stemper, B.S.¹
Marcia Weber, B.S.²
Mary Ellen Anderson, B.S.³
Pat Greenup, B.S.³
Marilyn Hopp, B.S.³
Jeanne Licari, B.S.³
Marlys Lund, B.S.³
Mary Lunzer, B.S.³
Nancy Madsen, B.S.³
Lynn Nimmo, B.S.³
Renalda Sather, B.S.³
Norynne Schiminsky, B.S.³
Phyllis Weiss, B.S.³

Pathology Laboratory

Kathleen Kryewinski, B.S.²
Joanne Samuelson, B.S.²
Ingrid McAmis, B.S.³
Marcia Wall, B.S.³

Pulmonary Function Laboratory

Catherine Middleton, B.S.³

Research Laboratories

Ruth Boyd, B.S.⁴
Janet Knutson, B.A.⁴
Sita Pothapragada, M.S.⁴
Karen Schroeder, B.S.⁴
Rasma Upmanis, M.A.⁴
Regina Vijums, B.S.⁴
Barbara Cohen, B.S.³
Jane Mayer, B.S.³
H. Louise Yates, B.S.³
Lois Jean Emme, B.A.⁵
Mary Fredricks, B.S.⁵
Jan Kassulke, B.S.⁵
Marilyn Klein, B.S.⁵
Naomi Quast, B.S.⁵
Joyce Ann Ryan, B.A.⁵
Judith Winter, B.S.⁵
Nancy Wood, B.S.⁵

¹ Principal Medical Technologist
² Senior Medical Technologist
³ Student Technologist Supervisor
⁴ Assistant Scientist
⁵ Junior Scientist

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, the preparation of tissues for microscopic study, and the chemical 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 University of Minnesota is guided by the principle that there shall be no differences in the treatment of persons because of race, creed, color, or national origin and that equal opportunity and access to facilities shall be available to all. This principle is particularly applicable in the admission of students in all colleges, and in their academic pursuits. It is also applicable in University-owned or University-approved housing, in food services, student unions, extracurricular activities, and all other student services. It is a guiding policy 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.

Medical Technology

Admission with Advanced Standing — After 1 or more years of work 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 with a total of 180 grade points.

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 198, C-205 Mayo Memorial, 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.

General Information

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*.

In addition to the physical examination required on admission to the University, 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 may be obtained from the director of University Housing, 180 Wesbrook Hall. Information about private rooming houses is furnished by the Student Housing Bureau, 209 Eddy Hall.

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

Medical Technology

objective. Two quarters of residence at the University is required to attain eligibility for loan assistance from University loan funds, but emergency needs may be given special consideration. Students who are interested in loans provided for under the National Defense Education Acts should apply through the Office of Student Financial Aid, 107 Armory. Applications for National Defense Student Loans should be filed in March for the coming academic year.

In addition to general University loan and scholarship funds, there are two funds especially for students in medical technology: the William A. O'Brien Scholarship Fund and the W. K. Kellogg Foundation Loan Fund.

Complete information about obtaining assistance through scholarships and loans is available from the Office of Student Financial Aid, 107 Armory, 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, C-205 Mayo Memorial Building. 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

A large number and wide variety of student organizations and activities are available for all students. Consult the *General Information Bulletin* and *The Moccasin*. All students are urged to consult with a staff member of the Student Activities Bureau, 4 TNM, or the program consultant in Coffman Memorial Union. In addition, there are certain student organizations that exist exclusively for students in medical technology.

General Information

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 March 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 March 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 certification 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*.

Medical Technology

In the last 2 years, students are registered in the Division of Medical Technology, a unit of the Department of Laboratory Medicine of the College of Medical Sciences, 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.

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

To achieve the goals of liberal education and professional education, the curriculum in medical technology includes required and elective courses in liberal arts in addition to the courses of the major sequence.

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.

Distribution Requirements

A. A minimum of 36 credits in categories 1, 3, and 4 (with no less than 9 credits in any one category) exclusive of Freshman English requirement.

B. Required courses in categories 1 and 2.

1. Communications, Language, and Symbolic Systems (9-12 credits)

Languages
Mathematics

Philosophy
Speech

2. The Natural Sciences

See course requirements in medical technology
Optional: GCB 66, Phsl 60, Zool 93

3. Man and Society (9-12 credits)

Anthropology
Economics
Family Studies
Geography
History

Political Science
Psychology
Sociology
Social Science

4. Literature and the Arts (9-12 credits)

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.

Medical Technology

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)

AnCh 57A-B — Quantitative Analysis (5)	MedT 30-31-32†† — Case Presentations (3)
Anat 4 — Elementary Anatomy (4)	MicB 53 — General Microbiology (5)
Biol 1-2 — General Biology (10)	OrCh 61-62 — Elementary Organic Chemistry (10)
Comm 1-2-3 — Communication (12)	Phys 1-2-3†† — Introduction to Physical Sciences (9)
(or) Engl 1-2-3 — Freshman English (9)	Electives to make a total of 90 credits for 2 years' work following distribution requirements
(or) Exemption from requirement	
GeCh 4-5 — Principles of Chemistry (10)	
GeCh 6 — Principles of Solution Chemistry (4)	
Math 10†† — College Algebra (5)	
MedT 10†† — Orientation in Medical Technology (1)	

Some of the above courses are offered only 1 quarter a year. Therefore, it is essential that the student's program be arranged in such a way as to include these in the proper quarter. The following program arrangement is suggested:

FIRST YEAR

<i>Fall</i>	<i>Winter</i>	<i>Spring</i>
Engl 1 or Comm 1	Engl 2 or Comm 2	Engl 3 or Comm 3
Math 10	Biol 1	Biol 2
GeCh 4	GeCh 5	GeCh 6
MedT 10	Electives	Electives
Electives		

SECOND YEAR

<i>Fall</i>	<i>Winter</i>	<i>Spring</i>
OrCh 61	OrCh 62	AnCh 57A-B
MedT 30	Phys 2	Phys 3
Phys 1	MicB 53	MedT 32
Anat 4	MedT 31	Electives
Electives	Electives	

Junior and Senior Years — Registration is in the Division of Medical Technology. The following courses must be completed to satisfy requirements for graduation.

(Credits are shown in parentheses)

Anat 165 — Hematology (4)	MedT 65 — Clinical Hematology: Methodology (5)
MdBc 106-107 — Biochemistry (9)	MedT 66 — Introduction to Clinical Immunohematology (4)
MedT 62 — Introduction to Clinical Chemistry (4)	MedT 72 — Clinical Chemistry (6)
MedT 63 — Introduction to Urinalysis (2)	

†† 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 42-43-44 and Phys 4-5-6 or Phys 7-8-9.

†† Students who transfer into the medical technology program after the freshman year are exempt from the MedT 10 requirement. Students who transfer into the medical technology program after the sophomore year are exempt from both the MedT 10 and 30-31-32 requirements. Credits do not count toward B.S. degree.

MedT 82 — Applied Clinical Chemistry (4) MedT 86 — Applied Clinical Hematology and Immunohematology (4) MedT 88 — Applied Diagnostic Microbiol- ogy (4) MedT 90 — Special Laboratory Methods (4) MedT 92§§ — Honors Program in Labora- tory Methods (9)	MedT 100 — Basic Electronics (2) MicB 102-102A — Medical Microbiology (6) MicB 116-116A — Immunology (5) Zool 65 — Histology (5) Electives to complete distribution require- ments
--	---

Assignment to Schedule I or Schedule II is made at the time of registration for the fall quarter of the third year. Assignment is based on the student's preference, subject to completion of required preprofessional courses and availability of laboratory space. The following class arrangements are suggested:

SCHEDULE I

THIRD YEAR

<i>Fall</i>	<i>Winter</i>	<i>Spring</i>
Zool 65 Anat 165 MedT 65	MicB 116-116A MedT 66 Electives	MicB 102-102A Electives

FOURTH YEAR

<i>Fall</i>	<i>Winter</i>	<i>Spring</i> ††	<i>Summer</i> ††
MdBc 106 MedT 62 Electives	MdBc 107 MedT 63 MedT 72 Electives	MedT 86 MedT 88	MedT 82 MedT 90

SCHEDULE II

THIRD YEAR

<i>Fall</i>	<i>Winter</i>	<i>Spring</i>
MdBc 106 MedT 62 Electives	MdBc 107 MedT 63 MedT 66 MicB 116-116A	MicB 102-102A MedT 72 Electives

FOURTH YEAR

<i>Fall</i>	<i>Winter</i> ††	<i>Spring</i> ††	<i>Summer</i> ††
Anat 165 Zool 65 MedT 65	MedT 86 MedT 88	MedT 92 Electives	MedT 82 MedT 92

†† Schedules for the clinical courses MedT 82, 86, 88, 90, and 92H are made on an individual basis for each student. These courses can be taken during the Summer Session between the third and fourth years. Several combinations will be used dependent upon clinical facilities.

§§ Optional requirement open only to students with outstanding scholastic ability.

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. Regardless of the ultimate aim, each student spends a period of time in the clinical laboratories of the University of Minnesota Hospitals to familiarize himself with aspects of methodology, research, and teaching including the completion of a preliminary exercise for practice in independent work and study. 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 (1) certification as MT(ASCP) or eligibility for such certification, and (2) 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.

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.

Residency Requirements — Candidates for advanced degrees must be registered at the University 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, prerequisite course work, or special study in foreign language are involved in attaining the degree, students should anticipate and definitely 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 — For the major the requirements include 18 quarter credits in selected courses in the major department with grades not lower than a B. A minimum of 9 quarter credits in courses at the graduate level in any one of subareas in medical technology relating to the thesis problem will satisfy the requirements for the minor. It is likewise expected that the student maintain a B average in courses for the minor.

A reading knowledge of a foreign language is required of all candidates for the Master's degree. This requirement is not a determinant for admission but certification of proficiency in the language must be submitted before the candidate may take the oral examination required for the degree.

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 prob-

lems 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.

The student's progress is reviewed at regular intervals by the graduate faculty in medical technology. Continuance in the program is dependent upon (1) maintaining satisfactory scholastic average in required courses, (2) satisfactory performance in the preliminary laboratory exercise, (3) satisfactory grade in the written examination, and (4) 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.

Examinations — In addition to the usual course examinations the candidate must pass both a written examination and a final oral examination. The written examination will be conducted by the graduate faculty in the Division of Medical Technology and will cover the general field of medical technology in the principal subareas of chemistry, microbiology, hematology, and immunohematology. The written examination will be scheduled within 9 to 12 months after the time of the initial registration in the Graduate School in this program. The written examination must precede the oral examination and will serve as one criterion for recommendation for continuance in the graduate program.

The oral examination 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.

Traineeships — The Division of Medical Technology has a limited number of traineeships made possible by a grant from the U.S. Public Health Service, Division of Health Manpower Educational Services of the U.S. Department of Health, Education, and Welfare for graduate students in medical technology.

Application blanks for traineeships may be obtained from the Graduate School Office, 316 Johnston Hall, but all such applications should be returned to: Director of Division of Medical Technology, Box 198 Mayo Memorial, University of Minnesota, Minneapolis, Minnesota 55455.

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.

DESCRIPTION OF COURSES

Medical Technology (MedT)

10. **Orientation in Medical Technology.** Orientation in the principles and practices in medical technology. (1 cr [no cr toward degree]; prereq fr only)
- 30-31-32. **Case Presentations.** Demonstrations and discussion of clinical laboratory techniques in relation to diagnosis and treatment of disease. (1 cr per qtr [no cr toward degree]; prereq soph only)
62. **Introduction to Clinical Chemistry.** Introduction to fundamental principles of laboratory procedures in clinical chemistry. (4 cr)
63. **Introduction to Urinalysis.** Lectures and laboratory exercises in basic techniques in chemical and microscopic study of urine. (2 cr)
65. **Clinical Hematology: Methodology.** Fundamental techniques in hematology. (5 cr)
66. **Introduction to Clinical Immunohematology.** Introduction to fundamental principles and laboratory techniques in blood grouping and cross matching. (4 cr)
72. **Clinical Chemistry.** Instrumental methods in clinical chemistry. (6 cr)
82. **Applied Clinical Chemistry.** Application of basic methods and techniques in chemistry in the clinical laboratory. (4 cr)
86. **Applied Clinical Hematology and Immunohematology.** Application and use of laboratory methods in hematology. Morphology of blood cells. Application of technical methods in procurement of blood and blood grouping and cross matching for transfusions. (4 cr)
88. **Applied Diagnostic Microbiology.** Identification of bacteria by microbiologic techniques. Correlation with clinical cases. Identification of parasites and fungi. (4 cr)
90. **Special Laboratory Methods.** Special assignment on an individual basis in one of a wide variety of special areas of experience within the clinical laboratory; field experience. (4 cr)
92. **Honors Program in Laboratory Methods.** 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. (9 cr; prereq #)
100. **Basic Electronics of Laboratory Instruments.** A review of the basic laws of electrical currents; detection instruments, power sources, amplifiers, and recorders. (2 cr)

GRADUATE COURSES

105. **Introduction to Biologic Electron Microscopy.** Electron optics, preparative techniques for electron microscopy, recording and interpretation of micrographs. (2 cr; prereq Phys 1-2-3, Zool 65, Δ or #)
106. **Basic Techniques for Electron Microscopy.** Demonstration and experience in preparing biologic material for electron microscopy including microscopic maintenance and operation. (2 cr; prereq Δ , §105, or #)
- 110, 111. **Advanced Clinical Laboratory Techniques.** Assignment on individual basis for observation, study, and practice in special problems; techniques and

Description of Courses

methodology in the units of the Clinical Laboratories (bacteriology, chemistry, hematology, histology, or immunology). (5 cr per qtr)

- 120. Seminar: Medical Technology.** Review and discussion of current literature; presentation and discussion of research being carried on in the department. (cr ar)
- 130, 131. Elements of Administration in Medical Technology.** 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. (2 cr per qtr)
- 140, 141. Educational Administration in Medical Technology.** Development, organization, and administration of educational programs in medical technology with clinical practice in techniques; analysis and construction of courses of study. (3 cr per qtr)
- 145. Development of Medical Technology.** Current problems; topics and research. (3 cr)
- 154. Selected Topics in Advanced Techniques and Theory of Electron Microscopy.** Discussion of new techniques and theory of electron microscopy. (Cr ar; prereq Δ , 106, #)
- 150. Selected Topics in Bacteriology.** Advanced seminar; topics assigned for conferences and reading. (Cr ar)
- 151. Selected Topics in Chemistry.** Advanced seminar; topics assigned for conferences and reading. (Cr ar)
- 152. Selected Topics in Hematology.** Advanced seminar; topics assigned for conferences and reading. (Cr ar)
- 153. Selected Topics in Immunology.** Advanced seminar; topics assigned for conferences and reading. (Cr ar)
- 173, 174. Analytical Techniques in Laboratory Medicine.** (2 cr per qtr)
- 175, 176. Interpretation of Laboratory Data.** Normal values, accuracy, and precision. (2 cr per qtr)
- 185. Clinical Chemistry Seminar.** (1 cr)

Anatomy

- Anat 4. Elementary Anatomy.** Elementary human anatomy. (4 cr; prereq Biol 2)
- Anat 165. Hematology.** Blood and blood-forming organs; emphasis on blood and bone marrow from standpoint of diagnosis and prognosis. (4 cr; prereq Zool 65)

Biochemistry

- MdBc 106-107. Biochemistry.** (9 cr; prereq organic chemistry and physics)

Biology

- Biol 1-2. General Biology.** Introduction to living things both plant and animal, and to the major biological concepts. Structure, function, classification, and evolution of organisms. (10 cr)

Medical Technology

Chemistry

- GeCh 4-5. General Principles of Chemistry.** 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. (10 cr; prereq satisfactory mathematics placement score)
- GeCh 6. Principles of Solution Chemistry.** 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. (4 cr; prereq 5)
- AnCh 57A. Quantitative Analysis.** (Lecture) Survey of modern quantitative methods of analysis. (3 cr; prereq GeCh 5)
- AnCh 57B. Quantitative Analysis.** (Laboratory) Survey of modern quantitative methods of analysis including elementary physicochemical procedures. (2 cr)
- OrCh 61-62. Elementary Organic Chemistry.** Important classes of organic compounds, both aliphatic and aromatic, together with some heterocyclic compounds. Laboratory work includes the preparation of typical substances. (10 cr; prereq GeCh 5)

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.

- Engl 1-2-3. Freshman English.** Course in composition in which literature serves both as reading material and as subject matter for writing. (9 cr)
- Comm 1-2-3. Communication.** The English language and its uses: constant practice in speaking, writing, listening, and reading. (12 cr)

Mathematics

- Math 10. College Algebra and Analytic Geometry.** 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. (5 cr; prereq high school higher algebra and satisfactory mathematics placement test)

Microbiology

- MicB 53. General Bacteriology.** Lectures, demonstrations, and laboratory instruction in the morphology, physiology, taxonomy, and ecology of bacteria. Practical applications of fundamental principles are emphasized. (5 cr; prereq 10 cr in chemistry and 5 cr in biological sciences)
- MicB 102. Medical Bacteriology.** Pathogenic bacteria, fungi and viruses, especially in their relationship to disease; principles of infection and immunity; microbiological techniques for laboratory diagnosis and antibiotic determination. (4 cr; prereq 116)

Description of Courses

MicB 102A. Current Techniques in Diagnostic Microbiology. Principles of diagnostic microbiology with emphasis on application in the clinical laboratory. (2 cr; prereq ¶102)

MicB 116. Immunology. Host-parasite interactions; 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 roles in immunologic phenomena; mechanisms of hypersensitivity; hypersensitivity-like states and immunologic diseases; homotransplantation and tumor immunity; mechanisms of natural and acquired immunity. (3 cr; prereq 53)

MicB 116A. Immunology Laboratory. (2 cr; prereq ¶116)

Physics

Phys 1-2-3. Introduction to Physical Science. Demonstration lectures on the principles of physics and the physical phenomena underlying these principles. (1) Mechanics. (2) Heat and electricity. (3) Sound and light. (9 cr)

Zoology

Zool 65. Histology. Microscopic structure of the tissues and organs. (5 cr; prereq Biol 2)

1969

71

urs-
ing

Volume LXXII

Number 7

April 29, 1969

UNIVERSITY OF MINNESOTA BULLETIN

Published by the University of Minnesota, Office of Admissions and Records, 105 Morrill Hall, Minneapolis, Minnesota 55455, January through September inclusive. One issue in January, one issue in February, two issues in March, four issues in April, four issues in May, three issues in June, four issues in July, two issues in August, and one issue in September. Second class postage paid at Minneapolis, Minnesota. Send change of address notices and other communications to Office of Admissions and Records, Minneapolis, Minnesota 55455.

The contents of this bulletin and of other University bulletins, publications, or announcements are subject to change without notice.

UNIVERSITY OF MINNESOTA

Board of Regents

The Honorable Lester A. Malkerson, Minneapolis, Chairman; The Honorable Marjorie J. Howard (Mrs. C. Edward), Excelsior, Vice Chairman; The Honorable Elmer L. Andersen, St. Paul; The Honorable Lyman A. Brink, Hallock; The Honorable Daniel C. Gaine, Owatonna; The Honorable Harry B. Hall, M.D., Edina; The Honorable Albert V. Hartl, Fergus Falls; The Honorable Herb L. Huffington, M.D., Waterville; The Honorable Fred J. Hughes, St. Cloud; The Honorable William K. Montague, Duluth; The Honorable George W. Rauenhorst, Olivia; The Honorable Otto A. Silha, Edina.

Administrative Officers

Malcolm Moos, President
Donald K. Smith, Vice President, Administration
William G. Shepherd, Vice President, Academic Administration
Laurence R. Lunden, Vice President, Business Administration
Stanley J. Wenberg, Vice President for Educational Relationships and Development
Paul H. Cashman, Vice President for Student Affairs
Robert Edward Summers, Dean of Admissions and Records
Robert B. Howard, Dean of the College of Medical Sciences

SCHOOL OF NURSING

Administration

_____, Professor and Dean
M. Isabel Harris, Ph.D., Associate Professor
Barbara K. Redman, Ph.D., Associate Professor and Chairman, Curriculum and Instruction
Helen B. Hansen, M.Ed., Assistant Professor and Chairman, Continuing Education
Florence J. Julian, M.N.A., Professor and Director of Nursing Services, University Hospitals

Faculty

Professor

.....

Associate Professor

M. Isabel Harris, Ph.D.
Barbara K. Redman, Ph.D.

Assistant Professor

Marilyne R. Backlund, M.S.
Florence M. Brennan, M.A.
Benita P. Cowlishaw, M.N.
Frances E. Dunning, M.Ed.
Mary L. Freeberg, M.N.A.
Jean Goepfinger, M.S.
Margaret F. Grainger, M.A.
Helen B. Hansen, M.Ed.

Barbara P. Hiblyan, M.S.
Joann R. Hubbard, M.S.
Dorothy M. Moe, M.Ed.
Eugenia R. Taylor, M.A.
Joan M. Tuberty, M.S.N.

Instructor

Laura E. Folden, M.P.H.
Marylee J. Kordosky, M.S.
Frances I. Lewis, M.N.
Gladys L. MacCarthy, M.S.
Dorothy P. Mahlum, M.Ed.
Judith A. Peterson
Carol A. Reese
Romana Urueta, M.S.
Mary G. Weisensee, M.S.

School of Nursing

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 inaugurated. 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.

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 programs leading to the master of science degree provide opportunities 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.

School of Nursing

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 several units that comprise the University of Minnesota Health Sciences Center. The center is located on the Minneapolis Campus and includes the 850-bed University Hospitals. All University services and facilities are available to students in the School of Nursing throughout their entire educational program. Hospitals and health agencies in the community are utilized for selected learning experiences for all students.

ADMISSION (General)

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 students registered in the Graduate School for programs with a field of concentration in either medical-surgical or psychiatric nursing. Applications are accepted from men and women, married or single. Specific information regarding admission to each of the programs follows.

Human Rights — The University of Minnesota is guided by the principle that there shall be no differences in the treatment of persons because of race, creed, color, or national origin and that equal opportunity and access to facilities shall be available to all. This principle is particularly applicable in the admission of students in all colleges, and in their academic pursuits. It is also applicable in University-owned or University-approved housing, in food services, student unions, extracurricular activities, and all other student services. It is a guiding policy 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 (Nursing Programs)

Baccalaureate Program in Nursing

1. Prior to admission to the School of Nursing, applicants will need to fulfill requirements for admission to the College of Liberal Arts of the University of Minnesota or those of another accredited college or university and complete 45 quarter credits in general education (see first-year course requirements on pages 20-23).

2. Upon completion of first-year requirements, qualified applicants are admitted to the nursing major each fall quarter. Prospective students must submit applications by April 15 if they wish to enroll the following fall quarter. Consideration of completed applications is begun in April. However, any action by the Admissions Committee of the School of Nursing will be provisional, pending receipt of evidence that all freshman year requirements have been met. The processing of records may require 12 weeks.

General Information

3. Application forms for admission with advanced standing or transfer to the baccalaureate program in nursing are procured from and returned completed to the Office of Admissions and Records, University of Minnesota, Minneapolis, Minnesota 55455. Official transcripts of any prior college work taken for credit in another educational institution should accompany applications. The University accepts for transfer a maximum of 4½ quarter-credits for religion courses. Advanced standing will be determined upon review and evaluation of these records by the Office of Admissions and Records and the Admissions Committee of the School of Nursing.

- a. Graduates of nursing programs leading to an Associate degree or a diploma should request the nursing school from which they graduated to submit a record of their completed studies to the Office of Admissions and Records at the time the application is submitted. Instructions for submitting these are on the application form.
- b. No unassigned (undesignated) advanced standing credit will be accorded for completion of a diploma or Associate degree 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.
- c. If the graduate of a diploma or Associate degree nursing program desires, she may request special examination for credit for the following courses:

Anat 4 — Elementary Anatomy
MdBc 50 — Physiological Chemistry
Phcl 9 — Pharmacology
Psy 1 and/or 2 — General Psychology
CPsy 80 — Child Psychology

Students wishing to take such examinations must consult with a member of the School of Nursing faculty.

4. The selection for admission is based on previous scholastic achievement and performance on tests of academic ability. 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.

5. Each applicant must submit a current physical examination form completed by her physician. The form is sent from the Office of Admissions and Records with application materials. Students enrolled in the University of Minnesota during the year prior to admission to the School of Nursing must also have a current physical examination which may be scheduled through the University Health Service.

6. Applicants will receive notification of action on their applications and information about initial enrollment procedures from the Office of Admissions and Records.

School of Nursing

Master's Program††

(Master of Science with Field of Concentration in Either
Medical-Surgical or Psychiatric Nursing)

1. The desirable time to begin any 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 application 9 to 10 months prior to date of desired entrance.

2. 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. Exceptions may be made upon review of applicant's credentials. Applicants may be accepted for enrollment in the program without undergraduate preparation for public health nursing; however, this deficiency must be removed before the fall quarter of the second year of the program.

3. Scholastic achievement considered desirable for admission to this program is a B average in prior undergraduate college work.

4. Postbaccalaureate credits earned in other universities will generally not be granted transfer credit toward meeting the requirements for the Master's degree.

5. Qualified applicants to the master of science program are admitted to the Graduate School (see *Graduate School Bulletin*, Plan B). School of Nursing faculty holding Graduate School appointments serve as advisers to these students.

Adult Special Students

1. By special consideration, selected registered nurses may be admitted to the School of Nursing as adult special students. This is reserved for individuals 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.

†† Inquiry about graduate programs in public health nursing should be directed to the School of Public Health.

General Information

2. Students from other countries may find it necessary to spend more than the designated time in order to complete requirements of programs.

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 2 terms of the Summer Session during which students may take as many as 18 credits of study in prerequisite or major courses. 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.

General Extension Division

Conferences and Institutes — Noncredit, 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 communicated to interested groups well in advance of any given offering. 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 the General Extension Division certain noncredit 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 courses are offered through independent study.

A limited number of credits in general education courses earned through the General Extension Division may be applied toward meeting degree requirements. Students are urged to consult a faculty adviser in the School of Nursing when working out their plans for study through the General Extension Division (see the *Evening Classes Bulletin* and the *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 105 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 105 Morrill Hall.

Canceling or Failing a Required Course — Since many of the required courses in the nursing curricula are offered only once a year and are often prerequisite for succeeding courses, canceling or failing 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 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 September 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

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's 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 125 Owre 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.

Graduate students should see the *Graduate School Bulletin* for information about circumstances in which petitions may be submitted to request transfer of selected credits.

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.

Credits in Residence — As used here, "residence" denotes full-time study at the University interpreted as completion of not less than 12 credits per

School of Nursing

quarter for undergraduate students and 9 credits per quarter for graduate students.

For undergraduate students in nursing there is a requirement of resident, full-time study during 4 quarters (a minimum of 12 credits per quarter for a total of 48 credits) of the junior and senior years. During other quarters of the baccalaureate program, students are enrolled for their studies at the University but in some quarters may be carrying less than 12 credits.

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. 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. 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.

Undergraduate Students—Students in the baccalaureate program in nursing must fulfill the distribution requirements of the All-University Council on Liberal Education and take 20 elective credits in Upper Division courses (numbered 50 or above). The distribution requirement requires completion of 9 credits in English composition and 48 additional credits distributed among the following categories of knowledge:

- Group A. Communication, Language, Symbolic Systems
- Group B. Physical and Biological Sciences
- Group C. Man and Society
- Group D. Artistic Expression

No fewer than 9 credits (exclusive of English composition) are to be completed in each of the four categories. The credit floors for Groups B and C are exceeded by required courses in the baccalaureate nursing program. In addition students must earn a minimum of 9 credits in each of Groups A (exclusive of English composition) and D.

Graduate Students—Credit distribution requirements for the program leading to the degree of master of science are given in the program description on pages 24 through 27 of this bulletin.

Maximum and Minimum Credits per Quarter—*Undergraduate*—The maximum number of credits for which you may register is ordinarily 17 per quarter. After 1 quarter of full-time study in the School of Nursing (not less than 12 credits) you may register for 18 credits provided you have a grade point average of 2.50 overall and in all nursing courses, and no failure for

General Information

the quarter immediately preceding registration. Registration for credits in excess of these limits must be approved by your faculty adviser and the Student Scholastic Standing Committee.

Graduate — The average credit load in Graduate School is 12 per quarter. The minimum considered a full-time load is 9 credits per quarter.

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*.

A mark of F is given when a student does not complete successfully the work of a course. A recommendation by the Student Scholastic Committee is necessary to enable a student to repeat a nursing course which has been failed. (Undergraduate students see also the section in this bulletin on Canceling or Failing a Required Course).

P-N Grading System — This grading system is directed toward encouraging students to take a greater variety of elective courses. Freed to some extent from the pressure of grades, legitimate and realistic as those pressures may be in general, students may be encouraged also to pursue their learning more for its own sake, studying for personally motivated inquiry rather than as a response to specific classroom demands.

P stands for "pass" and N for "no credit." Neither counts in the grade point average, but credits of P count toward graduation. The dividing line between P and N is approximately the same as that between D and F.

Election of the P-N system must be indicated for a particular course on the registration blank. There are certain restrictions on who may elect P-N, how many and what courses may be elected, and the like. These restrictions are: (1) all required courses must be taken on the A-F grading system (this includes the required courses in the nursing major); (2) the total number of credits allowed on the P-N grading basis cannot exceed two-thirds of the total elective credits in the sophomore, junior, and senior years (total 28 credits); (3) students on scholastic probation may not take courses on the P-N grading system; (4) P-N registration must be declared at the time of registration and may not be changed on or after the opening day of the quarter. Any request for exception to these policies should be submitted to the Student Scholastic Standing Committee for action on the request.

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 F carries no grade points. 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 (including F's) have been recorded.

Class Attendance — Instructors determine and inform students of their own policies and procedures in regard to absences from class, laboratory, and ex-

School of Nursing

aminations; 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: (1) participation in formally approved and scheduled University activities; (2) performance of military or civil duty (such as jury duty) which cannot be deferred; (3) 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 programs 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 per se, and in each quarter of study. Students in nursing programs leading to the master of science degree must maintain a B average. No graduate credit is allowed for course work of D quality.

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.

A student who believes she is in academic difficulty should see her class instructor or her adviser immediately rather than wait until she has received a poor grade.

Scholastic Probation — 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 F grades are received for required courses, scholastic probation is used to alert students to the need for substantially improving their performance. The receipt of grade reports shall constitute initial notice of probation, although written notification of action will usually be forwarded to student by the Committee on Student Scholastic Standing. More than 1 quarter of study on probationary status is permitted only when such recommendation is made following a review of student's progress by the Scholastic Standing Committee.

Students may also be placed on probation because of frequent cancellations and incompletes as well as below-average (D and F) grades.

Exclusion from the School of Nursing — Students may be excluded from the School of Nursing under one of the following headings:

1. *Dropped for Low Scholarship* — A student who fails to meet the terms of his probation may expect to be dropped.

2. *Discontinued* — 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. When discontinuance takes place at any time other than the end of the quarter, the courses for which she is registered may by action of

the Student Scholastic Standing Committee be recorded as canceled without grade.

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 Committee on Student Scholastic Standing 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.

Continuance, Graduation, and Honors—See also the earlier statement on satisfactory progress. 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. Medical evidence of unsuitability for nursing may also necessitate that students be required to withdraw from nursing programs.

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.

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 per se numbered 50 and above.

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.

Program Leading to Master of Science Degree

For 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. Each student is responsible for the labeling of uniforms and caps for purposes of identification.

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. New students should also avail themselves of the opportunity to tour the Walter, Wilson, and the Biomedical Libraries. The latter is located in Diehl Hall.

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:

Professional Help with Personal Problems — Student Counseling Bureau, 101 Eddy Hall, or University Health Service

Health Needs — University Health Service

Problems of Speech or Hearing — Speech and Hearing Clinic, 110 Shevlin Hall

Improvement of Study Skills — Educational Skills Clinic, 101 Eddy Hall

Financial Help — Office of Student Financial Aid, 107 Armory

Part-Time Employment — Student Employment Service, 30 Wulling Hall

Off-Campus Housing — Student Housing Bureau, 209 Eddy Hall

Student Activities — Student Activities Bureau, 4 TNM

Legal Concerns — Legal Aid Clinic, 133 Fraser Hall

Veterans Benefits — 102 Morrill Hall

Foreign Students — Foreign Student Adviser, 717 East River Road

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 chairman of the Division of Student Services.

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 Counseling and Placement Service of the Minnesota Nurses' Association, 2395 University Avenue, St. Paul, Minnesota, 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 approved rooming houses. For students who are married (or over 21 years of age), University approval of residence is not required. Information concerning residence halls for women may be obtained by writing to the Director of Housing, 180 Westbrook Hall, University of Minnesota, Minneapolis, Minnesota 55455, or by consulting the *General Information Bulletin*.

Health — The School of Nursing in conjunction with the University of Minnesota 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 incidental 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

School of Nursing

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 government association is the Nursing Student Council which centralizes student activities and serves as an intermediary board in working with the faculty on matters of mutual interest and concern. Any student in the School of Nursing is eligible to become a member.

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.

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 \$1,500 in loan and \$1,500 in scholarship. 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 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. An application may be submitted for a loan after completion of 2 quarters at the University. This eligibility requirement may be waived in cases of emergency.

The Minnesota Nurses' Association administers the Sarah T. Colvin Loan Fund for registered nurses who are members of the association and are enrolled in Bachelor's or Master's degree programs. Information and application forms may be obtained from the Minnesota Nurses' Association, 2395 University Ave., St. Paul, Minnesota.

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. Scholarships which range in amounts from tuition and incidental 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.

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. 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
- 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.

Registered nurses enrolled in the baccalaureate program and intending to practice in the field of public health nursing are eligible to apply for United States Public Health Service Public Health Traineeships for the final 12 months of full-time study. Applications are available from the School of Nursing.

School of Nursing

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 three 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 for appointment at the beginning of their junior year. (b) The Army Student Nurse Program for selected registered nurses enrolled in baccalaureate programs. They must have completed their diploma program within the past 30 months and be able to complete the requirements for a degree within 24 months. Participants must agree to serve on active duty as an Army Nurse Corps officer for a period determined by the time spent under this program. (c) 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. Information about these programs may 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 may initiate application at any time after completion of the first quarter of the sophomore year, until completion of the first quarter of the junior year of study. Information about this program may be obtained from the Navy Nurse Corps counselor in Navy recruiting offices.

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.

PROGRAMS OF STUDY

I. Program Leading to Bachelor of Science Degree in Nursing

The faculty in nursing believes that professional nursing provides a direct service to individuals. In baccalaureate study the goal of this service is to enhance adaptation of the individual along the health continuum. This service involves a relationship between nurse and patient in which the nurse endeavors to approach the individual as a total being who operates in an integrated manner. It is believed that the achievement of the goal of enhanced adaptation contributes to the patient's ability to utilize health care services.

In addition to the direct service, professional nursing participates in the provision of the services of other health disciplines. The common goal of all health services is the achievement and maintenance of an optimum state of health for the individual.

The purpose of baccalaureate preparation in the School of Nursing is to provide opportunities for students to gain a body of knowledge, skills, and understanding appropriate to the practice of professional nursing. With the use of a systematic problem solving approach, the student learns to identify nursing problems, select and develop appropriate nursing intervention, and evaluate nursing care. The scope of these learnings and the degree of skill in their application are such that individuals are enabled upon completion of the program to function in first-level positions in nursing.

Throughout her preparation, the student has ample opportunity to develop individual interests and potentialities through elective study in other disciplines. Learnings are provided which are foundational to graduate study.

In accord with the philosophy underlying the program, learnings of progressive complexity are planned to help students attain the following objectives:

1. The ability to communicate effectively.
2. An understanding of human behavior and a sensitivity to the needs of others.
3. An ability to work effectively with others.
4. An understanding of the teaching-learning process and skill in its use.
5. An ability to understand and appreciate the scientific method and to use it in the solution of problems.
6. An appreciation of the value of research in the practice of nursing.
7. Competence in selected technical skills in nursing.
8. An ability to plan, initiate, perform, coordinate, and evaluate nursing care.
9. A continuing development of abilities in accordance with the individual's interest and potentialities.

School of Nursing

10. A continuing development of self-awareness and personal satisfaction.
11. A sense of responsibility characteristic of a member of a profession devoted to the improvement of the health and welfare of individuals, families, and communities.

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 4 and 5 of this bulletin for information about admission requirements.)

First-Year Requirements

(Quarter credits shown in parentheses)

The minimum quarter-credit requirement for the first year is 45 plus a current Red Cross First Aid Certificate for the standard course. These 45 credits must include:

1. Freshman English
Engl 1-2-3 or Comm 1-2-3 or exemption from requirement; all students are required to have an English placement classification before registration for one of these courses
2. GeCh 4, 5** — General Principles of Chemistry
3. NSci 3** — Orientation in the Natural Sciences
4. A course in cultural anthropology††

Any remaining credit requirement must be fulfilled by selections from any of Groups A, B, C, or D described under Group Distribution Requirements. Sixteen (16) quarter credits must be distributed as follows:

1. Cumulative total of 8 credits from:
Group C, Areas 1 and 2
(These credits may include those earned in cultural anthropology)
2. Cumulative total of 8 credits from:
Group A, Areas 1 and 2

** Students who transfer from another college may substitute 8 quarter credits of general chemistry for GeCh 4 and 5; 5 quarter credits of biology for NSci 3.

†† Students who have not taken cultural anthropology will need to complete this requirement through summer enrollment or through Extension Division by end of winter quarter of sophomore year.

(and/or)

Group C, Area 3

(and/or)

Group D, Areas 1 and 2

Group Distribution Requirements

Group A: Communication, Language, Symbolic Systems

Area 1: Linguistics, Rhetoric, Logic, and Philosophic Analysis

CIPh 73G

Classics: Grk 1, 2, 3, 50, 51; Lat 1, 2, 3, 50, 51; MdGk 1, 2, 3, 4, 5, 6

East and South Asian Languages: Ben 1, 2, 3, 51, 52, 53; Guj 1, 2, 3, 5, 51, 52, 53; Indc 10, 11, 12, 61, 63; Jpn 1, 2, 3, 51, 52, 53; Mar 1, 2, 3, 51, 52, 53; Skt 1, 2, 3, 51, 52, 53, 54, 55, 56, 57; Thai 1, 2, 3

English: Comp 27-28; Engl 60

Ger 1, 2, 3, 1A, 2A, 1B, 2B, 3B, 4, 5, 6, 7, 8, 9, 57-58-59, 61-62-63, 64-65-66, 80

Jour 1

Linguistics: Any course numbered below 100

Middle Eastern Languages: Arab 1, 2, 3, 4, 5, 6, 54-55-56, 61-62-63; Hebr 1, 2, 3, 5, 25, 51-52-53; Per 1, 2, 3, 51, 52, 53

Phil 1, 2, 10, 70

Romance Languages: Fren 1, 2, 3, 1A, 2A, 3A, 25, 54, 55, 56, 57, 58; Ital 1, 2, 3, 25, 53; Port 1, 2, 3, 5, 55; Span 1, 2, 3, 1A, 2A, 3A, 25, 54, 55, 56, 57, 58

Scandinavian: Dan 1, 2, 3, 4, 50; Fin 1, 2, 3, 4, 50; Nor 1, 2, 3, 4, 5, 50; Swed 1, 2, 3, 4, 50

Slavic and East European Languages: Blgr 1, 2, 3; Mace 1, 2, 3; Mar 1, 2, 3; Psh 1, 2, 3, 4, 5, 6; Russ 1, 2, 3, 4, 5, 6, 56-57-58, 61-62-63; Serb 1, 2, 3, 4, 5, 6; Slvn 1, 2, 3

Spch 2, 5, 5H, 6, 9, 50, 51, 55, 56, 61, 67, 97

Area 2: Mathematics, Statistics

Math T through 44; QA 52-53-54

Soc 45

Stat 41

Group B: Physical and Biological Sciences

Area 1: Physical Universe

Ast 11 or 51, 52, and 53

Geo 1, 2

Phys 1-2-3

Phys 21-22-23

Area 2: Biological Universe

Biol 1-2†

Any credits from the following: Botany, Genetics, Zoology

Psy 55

Group C: Man and Society

Area 1: Analysis of Human Behavior

Anth 1A, 2A, 42, 68, 80, 85, 90, 99

CD 81

† To receive credit, all courses listed before the dagger must be completed.

School of Nursing

Econ 40, 65, 65T, 66, 66T, 75, 80
FamS 1, 1A, 25
Pol 35
Psy 10, 75, 90
SSci 1, 51
Soc 1, 1A, 1D, 1H, 10, 53, 118, 120, 123

Area 2: Analysis of Social, Economic, and Political Institutions

Econ B, C, 1-2†, 1T-2T†, 20, 50A-B, 62, 63, 67, 68, 69, 103, 104, 154, 160,
164, 174, 184
Geog 1, 4, 41, 61, 63, 64, 65, 66, 67, 71, 73, 78, 79, 90H, 91H, 92H
Jour 3, 90, 109, 111, 121
Phil 4
Pol A-B, D, E, 1-2, 7-8, 25, 26, 30, 51, 52, 53, 60, 61, 80, 81
SSci 2, 3, 52, 53
Soc 2, 3, 14, 140, 144

Area 3: Development of Civilization: Historical and Philosophical Studies

AmSt 90-91-92
Clas 1, 2, 3, 4, 5, 6, plus honors sections of these courses
East and South Asian Languages: Indc 1, 2, 3; Ortl 76, 77
Econ 170
Ger 68, 91, 93
Hist 1 through 24, incl; 50 through 99, exclusive of 83H, 84H; 103 through 159,
exclusive of 100B, 101B, 102B
Hum 1, 2, 3, 4, 1A-2A-3A, 9, 11, 12, 13, 21, 22, 23; 51 through 55, 61, 62,
63, 71, 72, 73, 99, 132, 133
Middle Eastern Languages: Arab 74-75-76, 77-78-79; Hebr 74, 75, 77-78
Phil 3, 50, 51, 52, 53 and honors sections of these courses
Pol 40
Romance Languages: Fren 60, 61, 62; Ital 60-61-62; Span 60, 61, 62, 63, 64
Slavic and East European Languages: Russ 75-76-77

Group D: Artistic Expression

Area 1: Literature

AmSt 90-91-92
Clas 42, 42A, 46, 80, 81, 82, 91, 92, 93
Engl 21, 22, 23, 37, 38, 39, 52, 53, 54, 55-56, 66-67, 72-73-74, 75, 76, 77,
78, 79
East and South Asian Languages: Chin 110-111, 112; Jpn 110, 111, 112; Hndi
57
Fren 65, 66, 67
Ger 53, 54, 55
Hum 1, 2, 3, 4, 1A-2A-3A, 11, 12, 13, 51 through 59, 61, 62, 63, 131, 132, 133
Jour 103
Middle Eastern Languages: Arab 81-82-83

Area 2: The Arts

Anth 166
Arch 21, 51, 52, 53, 54, 55, 56
LA 62-63
ArtH 1, 2, 3, 4, 5, 47, 50, 56, 57, 58, 59, 60, 86-87-88
ArtS 10, 11, 20, 23, 24, 26, 32, 33, 40, 41, 42, 45
Mus 1 through 99, exclusive of 96H; 104-105-106, 124-125-126, 130, 132, 147,
148, 149, 190
Spch 3, 4, 65, 66, 68, 69, 70, 81-82, 83
Th 11, 12, 13H, 21, 22, 23, 24, 34, 61-62, 63, 90, 91, 92

† To receive credit, all courses listed before the dagger must be completed.

A maximum of 4½ quarter-credits of religion will be accepted to meet Group D, Area I requirement.

Course Requirements for the Nursing Major

During most of the quarters of the second, third, and fourth years, the students enroll for courses in both general and professional education. One summer of study follows the third academic year.

Second, Third, Fourth-Year Course Requirements

(Credits shown in parentheses)

Psy 1-2 — General Psychology (6)
Psy 4-5 — Laboratory Psychology (4)
CPsy 80 — Child Psychology (3)
Psy 144-145 — Abnormal Psychology (6)
Anat 4 — Elementary Anatomy (4)
MicB 53 — General Bacteriology (5)
MdBc 50 — Physiological Chemistry (4)
Phcl 9 — Pharmacology (3)
Phsl 51 — Human Physiology (5)
NPsy 172 — Human Behavior in Threatening Situations (3)
PubH 53 — Introduction to Public Health (5)
Nurs 30 — Nursing in Perspective (3)

Nurs 40 — Perspectives of the Nurse-Patient Relationship (4)
Nurs 57 — Core Concepts of Adaptation Theory (6)
Nurs 62 — Integration of Theory into a Nursing Process (6)
Nurs 72 — Nursing Theory and Application (6)
Nurs 82A-B — Advanced Clinical Application of Nursing Theory (8)
Nurs 92A — Nursing Synthesis (6)
Nurs 92B — Nursing Synthesis in the Community (6)
Nurs 102 — Nursing Roles (7)

Second, Third, Fourth-Year Electives

The remainder of the total minimum credit requirement (194) must be fulfilled by selections from any of Groups A, B, C, or D described under Group Distribution Requirements. A minimum of 9 credits must be earned in each of Groups A (exclusive of freshman English) and D. Credits earned during the freshman year may be used to fulfill this requirement. Twenty (20) of these elective credits must be earned in Upper Division courses. There are additional Upper Division courses, not listed under Group Distribution Requirements, which may be used to fulfill this requirement. Consult your School of Nursing adviser to determine these courses.

Suggested Plan of Enrollment

SOPHOMORE YEAR

<i>Fall</i>	<i>Winter</i>	<i>Spring</i>
Anat 4 (4)	Phsl 51 (5)	MicB 53 (5)
MdBc 50 (4)	Psy 2 (3)	CPsy 80 (3)
Psy 1 (3)	Psy 5 (2)	Nurs 40 (4)
Psy 4 (2)	Nurs 30 (3)	NPsy 172 (3)
Electives (2-3)	Electives (2)	

School of Nursing

JUNIOR YEAR

<i>Fall</i>	<i>Winter</i>	<i>Spring</i>	<i>Summer I</i>
Nurs 54 (2)	Nurs 55 (2)	Psy 145 (3)	Nurs 82A (4)
Nurs 57 (6)	Psy 144 (3)	Nurs 56 (2)	Electives (3)
Phcl 9 (3)	Nurs 62 (6)	Nurs 72 (6)	
Electives (4-5)	Electives (4-5)	Electives (4)	<i>Summer II</i>
			Nurs 82B (4)
			Electives (3)

SENIOR YEAR

<i>Fall</i>	<i>Winter</i>	<i>Spring</i>
Nurs 92A (6)	Nurs 92B (6)	Nurs 102 (7)
PubH 53 (5)	Electives (9)	Electives (9)
Electives (4-5)		

II. Program Leading to Master of Science Degree

For this program, the bases of nursing are seen to be derived from beliefs about the nature of humanness and health. To be human is to be a single unity acting and reacting as a unit. As such the human seeks rational, goal-directed change. He also seeks personal identity and experiences a will-to-meaning. Health is a state of being and a process of becoming which encompasses these aspects of humanness to the greatest extent possible within the individual's self-world experience. Nursing focuses on the individual in his experience of health. Within this context nursing supports and maximizes the individual's strengths to assist him in maintaining his state of being and enhancing his state of becoming.

Graduate education in nursing aims to assist the student in the development of individual potential, to become self-directive and responsible for making continued contributions to the improvement of the profession and changing health needs of society. Graduate education in nursing embodies a search for knowledge and encourages the examination of ideas and values and the development of creativity. Graduate education in nursing aims to develop an attitude of commitment to expanding the scope of nursing knowledge through providing an educational environment of inquiry and investigation.

In accord with these beliefs, the master of science program is developed to provide opportunity for students to grow toward achievement of the following objectives:

1. Ability to practice nursing with a degree of expertness that goes beyond the expectations held of beginning professional practitioners.
2. Functional knowledge and beginning competence in one of the following fields of nursing; advanced clinical nursing, teaching, or leadership.
3. Attitude of critical assessment of situations as a basis for formulation of judgments and decisions.
4. Ability to participate intelligently in research projects and to make discriminating use of research findings.
5. Commitment to a responsibility for health needs of society and beginning skill in discharging this professional obligation.

6. Increased understanding and ability to function interdependently as a professional person.
7. Assumption of responsibility and skill in utilization of resources for continuing growth.

The 6-quarter program offered in the Graduate School extends over 2 academic years and provides the option of a field of concentration in either medical and surgical or psychiatric nursing. During the second year, students may elect preparation in clinical leadership, teaching, or may continue clinical nursing study. Candidates for admission must meet the general requirements for the master of science degree, Plan B, as listed in the *Graduate School Bulletin*. In addition to the clinical major, the program must include a minimum of 18 credits in related fields. Approval of the program by the Medical Sciences Group Committee of the Graduate School constitutes acceptance for candidacy for the degree. Papers involving 9 credits of independent work under faculty supervision are required.

CLINICAL NURSING MAJORS

Medical-Surgical Nursing

In this major, emphasis is placed on the identification of characteristics of humanness and health, the effect of selected diseases on states of health, and current and potential roles of nursing in assisting people toward optimal health goals. A minimum of 35 credits must be completed in the field of concentration: 24 in nursing, and 11-13 in courses supportive to the nursing major. The following courses are required of all candidates and are arranged in a 4-quarter sequence:

Nurs 190 — Foundations of Nursing (3)	Statistics (3)
Nurs 185A-B-C — Medical-Surgical Nursing (18)	Physiology (5)
Nurs 181 — Nursing Research (3)	Humanities (3-5)

Related fields suggested for students majoring in medical-surgical nursing are anthropology, educational psychology, humanities, history and philosophy of education, education, physiology, biochemistry, genetics, physiological hygiene, microbiology, zoology, psychology, child psychology, sociology, philosophy, nursing education, nursing leadership, curriculum and instruction, educational administration, public health, and speech and communication.

Psychiatric Nursing

Emphasis in this major is placed on concepts of mental health as well as on the development of competence in providing expert nursing care to mentally ill persons. Study and experience focus on individual, group, and family therapy. Study of the therapeutic process involves developing increased understanding of the patient as a person and skill in assisting him with current human relationships. It also involves the students' developing increased awareness of self and ways in which to utilize that knowledge in nurse-patient relationships. The program includes exploration of the nursing role in com-

School of Nursing

munity mental health. A minimum of 38 credits comprises the field of concentration, 29 in nursing and 9 in courses supportive to the nursing major. The following courses, arranged in a 4-quarter sequence, are required of all students electing this major:

Nurs 190 — Foundations of Nursing (3)	Statistics (3)
Nurs 191, 192A-B-C — Psychiatric Nursing (20)	Spch 169 — Language in Human Behavior (3)
Nurs 193 — Psychopathology (3)	Group Dynamics (3)
Nurs 181 — Nursing Research (3)	

Related fields considered appropriate to this major are anthropology, educational psychology, child psychology, humanities, history and philosophy of education, education, genetics, psychology, sociology, speech and communication, philosophy, nursing education, nursing leadership, curriculum and instruction, educational administration, public health.

Second-Year Options in Clinical Nursing Majors

During the second year, students enrolled in either clinical major may elect related fields in nursing education or in clinical nursing leadership or may continue to study advanced clinical nursing.

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 her special interest. Emphasis is on hypotheses generation and testing for the purpose of developing creative and critical approaches to nursing. A 9-credit course (Nurs 196A and B, Advanced Clinical Nursing) constitutes this option.
2. *Clinical Nursing Leadership* — This sequence is designed for nurses interested in the study of the concept of change — specifically, external change in relation to health care institutions, and the internal change within individuals, necessary if any real change is to occur. Emphasis is placed on testing and strengthening student's convictions and strengths, on developing a sense of awareness of what is, and on what is happening in the present. Import is also placed on how the nurse can effect what is happening in relation to communication with health care workers and in working to create changes in patient care services.

The following courses constitute this related field:

NCL 190 — Societal Effects Upon Health Care and Nursing (3)
NCL 191 — Internal and External Change in Nursing and Health Care Institutions (6)
NCL 192 — Nurse Leader as Change-Agent (3)
Spch 116 — Communications in Human Organizations (3)

3. *Nursing Education* — The purpose of the 3-quarter concentration in nursing education is preparation for beginning faculty positions. Emphasis is on teaching in clinical laboratories, and on working with individuals and small groups. Graduate study in clinical nursing and foundational courses in education theory provide a base for study of nursing

Programs of Study

education generally and baccalaureate education in particular. Practicum experiences are included in each quarter.

The following courses constitute this related field:

- EPsy 193 — Psychological Analysis of Instruction (3)
- EPsy 110 — Educational Measurement in Classroom (3)
- NuEd 190 — Nursing Education in the United States (3)
- NuEd 191 — Instruction in Nursing (6)
- NuEd 192 — Evaluation in Nursing Education (3)

Suggested Plans of Enrollment

FIRST YEAR

MEDICAL-SURGICAL NURSING

Fall

- Nurs 190 (3)
- Statistics (3)
- Humanities (3-5)
- Related field (3)

Winter

- Nurs 185A (6)
- Physiology (5)
- Related field (0-3)

Spring

- Nurs 185B (6)
- Nurs 181 (3)
- Related field (3)

PSYCHIATRIC NURSING

Fall

- Nurs 190 (3)
- Nurs 191 (3)
- Statistics (3)
- Related field (3)

Winter

- Nurs 192A (8)
- Nurs 193 (3)
- Spch 169 (3)

Spring

- Nurs 192B (5)
- Nurs 181 (3)
- Group dynamics (3)
- Related field (3)

SECOND YEAR

CLINICAL

Fall

- Nurs 185C (6)
- (or) Nurs 192C (4)
- Nurs 195 (3)
- Related field (3)

Winter

- Nurs 195 (3)
- Nurs 196A (3-6)
- Related field (3)

Spring

- Nurs 196B (3-6)
- Related field (3-6)

LEADERSHIP

Fall

- Nurs 185C (6)
- (or) Nurs 192C (4)
- NCL 190 (3)
- Related field (0-3)

Winter

- NCL 191 (6)
- Nurs 195 (3)
- Related field (0-3)

Spring

- NCL 192 (3)
- Nurs 195 (3)
- Spch 116 (3)
- Related field (0-3)

TEACHING

Fall

- Nurs 185C (6)
- (or) Nurs 192C (4)
- NuEd 190 (3)
- EPsy 193 (3)
- Related field (0-3)

Winter

- NuEd 191 (6)
- EPsy 110 (3)
- (or) EPsy 117 (3)
- Nurs 195 (3)
- (or) NuEd 195 (3)

Spring

- NuEd 192 (3)
- Nurs 195 (3)
- (or) NuEd 195 (3)
- Related field (3-6)

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: 1 to 49 for freshmen and sophomores; 50 to 99 for juniors and seniors; 100 to 199 for juniors, seniors, and graduate students; 200 and over for graduate students only.

Note — The 5-000 and 8-000 course numbering designation (in parentheses following current course number) is included because of anticipated changes in the University course numbering system. The new course numbers are *for information only*, and students should NOT use these new numbers in registering for courses until notified to do so by the School of Nursing.

Abbreviated Departmental Prefixes in use in the School of Nursing:

Nurs — Nursing

NuEd — Nursing Education

NCL — Clinical Nursing Leadership

Symbols — The following symbol code, applicable to all University of Minnesota bulletins, is used throughout the course descriptions and will not carry any page footnotes:

* Courses through which it is possible for graduate students to prepare Plan B papers.

† To receive credit, all courses listed before the dagger must be completed.

§ No credit if credit received for equivalent course after the symbol.

¶ Means "concurrent registration in."

Means "consent of instructor."

△ Means "consent of department or school offering the course."

NURSING (Nurs)

30 (5-220). Nursing in Perspective. Study of relationship of nursing philosophy to nursing practice; goals of nursing and their differentiation from those of other health disciplines. (3 cr; prereq regis in nursing, Psy 5 or ¶Psy 5)

Description of Courses

- 40 (5-230). Perspectives of the Nurse-Patient Relationship.** The nurse-patient relationship as the fundamental context of nursing. The development of knowledge, skills, and attitudes which facilitate the establishment, maintenance, and termination of nurse-patient relationship. (4 cr; prereq 30, Anat 3, MdBc 50, Phsl 51, cultural anthropology, ¶NPsy 172)
- 54-55-56 (5-400/5-401/5-402). Pathophysiology of Illness.** Pathologic conditions which stimulate alterations in physiologic behaviors, the body's attempt to control these conditions, and the rationale of medical intervention. (2 cr per qtr; prereq Phsl 51, ¶Nurs 57, ¶Nurs 62, ¶Nurs 72)
- 57 (5-410). Core Concepts of Adaptation Theory.** Orientation to adaptation theory: study of general adaptive responses to disturbances in organism's internal and external environment, agent eliciting the responses and various factors influencing adaptive capacity. Continued emphasis on interpersonal relationships. (6 cr; prereq 40, NPsy 172, CPsy 80, ¶Nurs 54)
- 62 (5-420). Integration of Theory into a Nursing Process.** Introduction to the nursing process with beginning application of adaptation theory to the clinical setting. Exploration of the individual's responses to physical and psychological stress in illness and injury. (6 cr; prereq 57, ¶Psy 144, ¶Nurs 55)
- 72 (5-430). Nursing Theory and Application.** Continued study and application of the nursing process with further examination of current concepts and theories related to patterns of adaptive responses to biophysical and psychosocial disturbances. (6 cr; prereq 62, MicB 53, ¶Psy 145, ¶Nurs 56)
- 82A-B (5-610/5-620). Advanced Clinical Application of Nursing Theory.** Further integration of various dimensions of adaptation into a holistic approach to patient situations. Emphasis on formulation, implementation, and evaluation of comprehensive care in increasingly complex situations. (8 cr; prereq 72, Psy 145, Phcl 9)
- 92A (5-630). Nursing Synthesis.** Study of selected adaptive responses of patients encountering acute illness and continuing health problems. Further opportunity for synthesis of concepts of adaptation theory to the provision of comprehensive patient care. (6 cr; prereq 82B)
- 92B (5-640). Nursing Synthesis in the Community.** Study of selected adaptive responses of patients encountering acute illness and continuing health problems within the community setting. Further opportunity for synthesis of concepts of adaptation theory to the providing of comprehensive patient care. (6 cr; prereq 82B)
- 102 (5-650). Nursing Roles.** Concepts and practice essential to understanding nursing roles in complex settings. Focus on discussion and application of principles of leadership and group dynamics. (7 cr; prereq 92A)
- 111 (8-001). Special Educational Experiences in Nursing.** Various learning experiences planned to meet individual needs. (1-6 cr; for persons registering for irregular dates of attendance [maximum of 12 wks]; prereq grad nurse and Δ)
- 151A-B (8-002). Selected Experiences in Clinical Nursing.** Identification of nursing needs of patients; application of selected scientific principles and concepts to the solution of nursing care problems. (1-6 cr; for persons registering for irregular dates of attendance [maximum of 12 wks]; prereq grad nurse and Δ)
- 181 (8-021). Research in Nursing.** Exploration of needs for research and discussion of possible ways in which selected research efforts might be undertaken. (3 cr; prereq statistics or ‡)

School of Nursing

- 185A (8-100). Medical-Surgical Nursing.** Exploration of characteristics of humanness and of health and their relationship with the nursing framework. (6 cr; prereq humanities course, ¶advanced physiology)
- 185B (8-101). Medical-Surgical Nursing.** Exploration of the effects of acute health problems on man's state of health and nursing interventions; includes the hospital as the clinical laboratory. (6 cr; prereq 185A)
- 185C (8-102). Medical-Surgical Nursing.** Exploration of the effects of chronic health problems on man's state of health and nursing interventions; includes the outpatient clinic and community as the clinical laboratory. (6 cr; prereq 185B)
- 186A-B^o (8-010). Problems in Physiology.** Individual study of a problem in physiology relevant to nursing. (2-6 cr; prereq regis in grad program and Δ)
- 190 (8-020). Foundations of Nursing.** Investigation of the roles of nursing in society; recruitment to and preparation for these roles; potential for role innovation. (3 cr)
- 191 (8-200). Seminar: Foundations of Psychiatric Nursing.** Concepts and criteria for mental health. Societal influence upon the development of psychiatric nursing and the care and treatment of the mentally ill. (3 cr; prereq 190 or ¶190)
- 192A (8-201). Seminar and Practicum: Psychiatric Nursing.** Nurse-patient relationships; examination of effective and ineffective interpersonal relationships. Supervised clinical experience with individual patients, planning dynamic nursing care, and participation on the interdisciplinary team. (8 cr; prereq 191)
- 192B (8-202). Seminar and Practicum: Psychiatric Nursing in Group Relationships.** Supervised experience working with groups. Concepts of development, leadership, cohesiveness, goals, and functions of therapeutic groups. Examination of the use of various group methods in meeting therapeutic goals. (3 cr; prereq 192A or #)
- 192C (8-203). Seminar and Practicum: Psychiatric Nursing in the Community.** Examination of community mental health problems, community health resources and the psychiatric nurse's role in the community. Supervised experience with a patient and his family in the community. (4 cr; prereq 192B or #)
- 193 (8-204). Psychopathology.** Eclectic approach to the dynamics of mental illness. (3 cr; prereq ¶192A)
- 195^o (8-050). Problems in Nursing.** Individual study of a problem in the field of nursing. (1-9 cr; prereq regis in grad program and Δ)
- 196A-B (8-060/8-061). Advanced Clinical Nursing.** Hypothesis generation and testing in general nursing for the purpose of developing creative and critical approaches to nursing. (9 cr; prereq 185C or 192C)
- 197 (8-062). Seminar: Interdisciplinary Health.** Exploration of the relationship of health care to the goal of health. (3 cr; prereq #; offered when feasible)
- 198 (8-063). Nursing Consultation.** Study of the consultative process; practice in consultation relative to nursing care. (3 cr; prereq #; offered when feasible)
- 199 (8-009). Special Topics in Nursing.** (Cr ar)

NURSING EDUCATION (NuEd)

- 190 (Nurs 8-500). Nursing Education in the United States.** Study of educational programs in nursing within higher educational institutions. Examination of the

Description of Courses

relationship between professional and liberal education. (3 cr; prereq grad and ¶EPsy 193 or 293)

- 191 (Nurs 8-501). Instruction in Nursing.** Identification of the role of the teacher in a clinical setting; use of resources of the clinical area; selected experiences in a school of nursing. (6 cr; prereq 190)
- 192 (Nurs 8-502). Evaluation in Nursing Education.** Evaluation of student learning based on learning objectives. (3 cr; prereq 191 and ¶EPsy 110)
- 195° (Nurs 8-550). Problems in Nursing Education.** Individual study of a problem in the field of nursing. (1-9 cr; prereq regis in grad program and Δ)
- 199 (Nurs 8-509). Special Topics in Nursing Education.** (Cr ar)

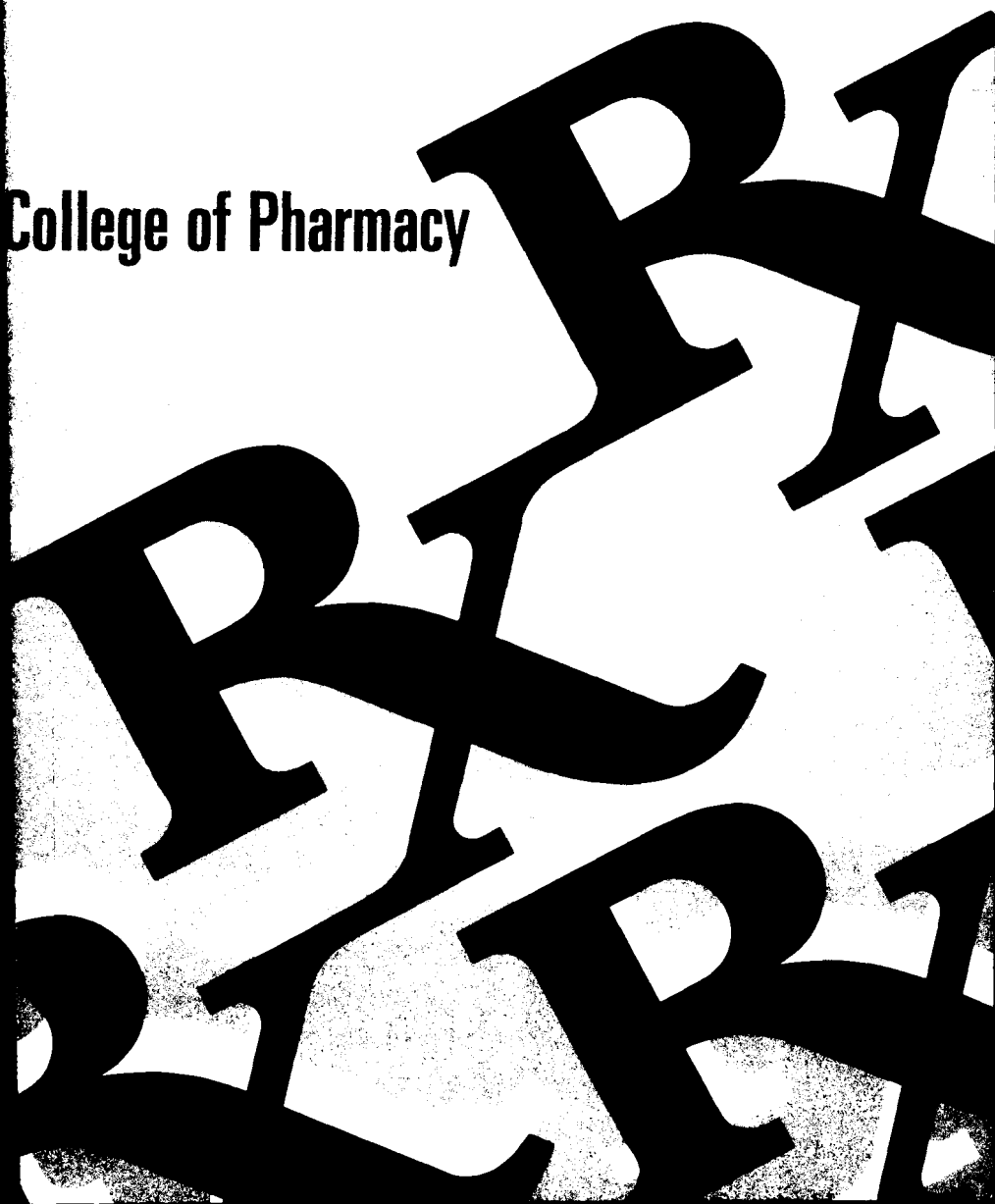
CLINICAL NURSING LEADERSHIP (NCL)

- 190 (Nurs 8-600). Societal Effects Upon Health Care and Nursing.** Inquiry into the nature of experiencing and its modes, man's relatedness to others, and his responsibility to the human community; investigation of characteristics of American society and their demonstration in health care institutions. (3 cr)
- 191 (Nurs 8-601). Internal and External Change in Nursing and Health Care Institutions.** Investigation of the aspects conducive to creating an atmosphere for change. Clinical experience in an area delivering health care services to observe and participate in individual and group work. Involves personal risk-taking in attempting to create trust relationships with health care personnel. (6 cr; prereq 190)
- 192 (Nurse 8-602). Nurse Leader as Change-Agent.** Examination of the concepts of leadership, helping relationships, and clinical nurse specialist; emphasis placed on the individual as a change-agent in these roles and relationships. (3 cr; prereq 191)
- 199 (Nurs 8-609). Special Topics in Nursing Leadership.** (Cr ar)

2 *Mull*
UNIVERSITY OF MINNESOTA BULLETIN

FEBRUARY 28, 1969

College of Pharmacy



Volume LXXII

Number 2

February 28, 1969

UNIVERSITY OF MINNESOTA BULLETIN

Published by the University of Minnesota, Office of Admissions and Records, 105 Morrill Hall, Minneapolis, Minnesota 55455, January through September inclusive. One issue in January, one issue in February, two issues in March, four issues in April, four issues in May, three issues in June, four issues in July, two issues in August, and one issue in September. Second class postage paid at Minneapolis, Minnesota. Send change of address notices and other communications to Office of Admissions and Records, Minneapolis, Minnesota 55455.

The contents of this bulletin and of other University bulletins, publications, or announcements are subject to change without notice.

UNIVERSITY OF MINNESOTA

Board of Regents

The Honorable Lester A. Malkerson, Minneapolis, Chairman; The Honorable Marjorie J. Howard (Mrs. C. Edward), Excelsior, Vice Chairman; The Honorable Elmer L. Andersen, St. Paul; The Honorable Lyman A. Brink, Hallock; The Honorable Daniel C. Gainey, Owatonna; The Honorable Harry B. Hall, M.D., Edina; The Honorable Albert V. Hartl, Fergus Falls; The Honorable Herb L. Huffington, M.D., Waterville; The Honorable Fred J. Hughes, St. Cloud; The Honorable William K. Montague, Duluth; The Honorable George W. Rauenhorst, Olivia; The Honorable Otto A. Silha, Edina.

Administrative Officers

Malcolm Moos, President
Donald K. Smith, Vice President, Administration
William G. Shepherd, Vice President, Academic Administration
Laurence R. Lunden, Vice President, Business Administration
Stanley J. Wenberg, Vice President for Educational Relationships and Development
Paul H. Cashman, Vice President for Student Affairs
Robert Edward Summers, Dean of Admissions and Records
Edmund G. Williamson, Dean of Students

COLLEGE OF PHARMACY

Administration

Lawrence C. Weaver, Ph.D., Dean of the College of Pharmacy and Professor of Pharmacology
Frank E. Di Gangi, Ph.D., Assistant Dean of Student Affairs and Professor of Medicinal Chemistry
William J. Hodapp, B.S., Assistant to the Dean and Instructor in Clinical Pharmacy

Faculty

Yusuf J. Abul-Hajj, Ph.D., Assistant Professor of Pharmacognosy
William F. Appel, B.S., Clinical Instructor in Pharmaceutics
John T. Bush, B.S., Instructor in Clinical Pharmacy
James C. Clinite, B.S., Instructor in Clinical Pharmacy
Donald A. Dee, M.S., Clinical Instructor in Clinical Pharmacy
Ole Gisvold, Ph.D., Professor and Head, Department of Medicinal Chemistry
Patrick E. Hanna, Ph.D., Instructor in Medicinal Chemistry
Phillip A. Harris, Ph.D., Assistant Professor of Pharmaceutics
Thomas F. Jones, M.H.A., Instructor in Clinical Pharmacy
Hugh F. Kabat, Ph.D., Professor and Head, Department of Clinical Pharmacy
Janet A. Krieger, M.L.S., Instructor, Librarian
Harvey J. Kupferberg, Ph.D., Assistant Professor of Pharmacology
John D. McRae, Ph.D., Associate Professor of Pharmaceutics

Robert H. Miller, Ph.D., Associate Professor of Pharmaceutics
Herbert T. Nagasawa, Ph.D., Associate Professor of Medicinal Chemistry
Kenneth G. Nelson, Ph.D., Assistant Professor of Pharmaceutics
Marie Perreault, B.S., Instructor in Clinical Pharmacy
Philip S. Portoghese, Ph.D., Professor of Medicinal Chemistry
Edward G. Rippie, Ph.D., Professor and Head, Department of Pharmaceutics
Darwin Sarnoff, Ph.D., Assistant Professor of Clinical Pharmacy
Roger D. Schroeder, M.S., Instructor in Clinical Pharmacy
Neal W. Schwartz, B.S., Lecturer
Taito O. Soine, Ph.D., Professor of Medicinal Chemistry
E. John Staba, Ph.D., Professor and Head, Department of Pharmacognosy
William Strohbeck, M.S., Instructor in Clinical Pharmacy
Robert Vince, Ph.D., Assistant Professor of Medicinal Chemistry
Jan C. Wenger, M.S., Instructor in Clinical Pharmacy
Wallace F. White, Ph.D., Professor of Pharmacology

COLLEGE OF PHARMACY

GENERAL INFORMATION

The objectives of the College of Pharmacy are (1) to educate men and women of ability, integrity, and character to identify, prepare, formulate, and distribute drugs and other health aids; (2) to disseminate information about the uses and value of scientific medicine; (3) to win, and deservedly keep, public confidence and respect for the profession of pharmacy; (4) to aid the state and federal governments to control habit-forming drugs and to enforce all laws for public welfare; (5) to encourage original work and study by qualified persons who will make unselfish use of their services in the interest of health sciences; and (6) to assist public health agencies in the prevention and control of diseases.

Beginning in 1892, the University of Minnesota awarded the Ph.C. degree for 2 years of professional pharmaceutical study. A minimum of 3 years 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.) began. 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 a degree 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.

Students will be admitted to the 4-year professional course in the College of Pharmacy on completion of 1 year of accredited collegiate work (see Pre-pharmacy Year). Students who present 2 or more years of accredited collegiate work on admission to the college usually can complete their professional training in 3 years. Students applying for the 3-year professional course must have completed, in addition to the courses of the prepharmacy year, courses in basic biological sciences (botany and zoology or equivalent course in general biology), physics, organic chemistry, and general economics which are equivalent to those listed in the pharmacy curriculum.

College of Pharmacy

Students who complete either the 1-4 (1 year of prepharmacy work plus 4 years of professional study) or the 2-3 programs are awarded the degree, bachelor of science in pharmacy.

Graduate study with major work in medicinal chemistry, pharmaceuticals, hospital pharmacy, pharmacognosy, or pharmacology, 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 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, pharmaceuticals, hospital pharmacy, pharmacology, and pharmacognosy is contained in the *Graduate School Bulletin*.

Prospective Students

Applicants for both pharmacy and prepharmacy should apply to the Office of Admissions and Records in accordance with procedures set forth in the *General Information Bulletin*.

It is recommended that those students who are still in high school and who plan to apply for admission to the College of Pharmacy after completion of their prepharmacy year in the College of Liberal Arts or other accredited institution should attempt to incorporate, in their high school training, courses in higher algebra, solid geometry, trigonometry, biology, chemistry, physics, modern foreign language, and typing.

Students who have graduated from high school and wish to complete the prepharmacy curriculum at another college or university in preparation for the professional curriculum in the College of Pharmacy should arrange their programs so as to include all subjects in the prepharmacy year.

The pharmacy curriculum consists of 238-240 credit hours of work in professional, scientific, and pharmacy administration courses and general electives.

Satisfactory academic progress in the prepharmacy or 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 Student Scholastic Standing.

Adult Special Students

Persons of mature age and experience who desire a specific and/or a limited course of study and who are not at present candidates for an undergraduate 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

General Information

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 University of Minnesota is guided by the principle that there shall be no differences in the treatment of persons because of race, creed, color, or national origin and that equal opportunity and access to facilities shall be available to all. This principle is particularly applicable in the admission of students in all colleges, and in their academic pursuits. It is also applicable in University-owned or University-approved housing, in food services, student unions, extra-curricular activities, and all other student services. It is a guiding policy 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.

Examinations and Standings

For information on examinations and standings, see the *General Information Bulletin*.

Fees and Expenses

For a detailed statement of fees and expenses, see the *General Information Bulletin*.

Admission of High School Graduates

Evidence of high school graduation or its equivalent is required for admission to the prepharmacy course in the College of Liberal Arts. For details concerning the requirements for admission, consult the *General Information Bulletin*.

Admission by Examination

Students who do not meet the requirements for admission by certificate may qualify for admission on the basis of entrance tests as described in the *General Information Bulletin*.

Admission to the Professional Work of the College of Pharmacy

Students interested in entering the College of Pharmacy should apply for admission as soon as possible after completion of the required prepharmacy work (page 13). Applications should be accompanied by an official transcript of the student's record. 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 with an average of C+ or above, and meeting all prerequisites, will be admitted to the college. Nonresident applicants presenting above-average records will be considered individually. Other applicants (those with lower averages and those removing defi-

College of Pharmacy

ciencies) will be considered individually and will be notified of their admission status either before or shortly after September 1.

Students who plan to complete prerequisite courses during a Summer Session should proceed as indicated above, being sure to supply information on: (a) courses to be completed; (b) the dates of Summer Sessions at which work will be taken; (c) the college at which the courses will be pursued; and (d) application for admission to the professional work in pharmacy.

Prepharmacy and other University of Minnesota students desiring to transfer to the College of Pharmacy should make application at the proper window, 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 such other college must have the preliminary education required for admission to this college and must spend at least 1 year in attendance at this college 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 prepharmacy and pharmacy work.

Requirements for Graduation

An overall C average (grade point average = 2.00 or above) 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 Minnesota Statutes Annotated, reads as follows:

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 at least one year of practical experience in pharmacy.

On July 18, 1941, the Minnesota State Board of Pharmacy adopted the following resolution dealing with the above passage:

(The applicant) must be a graduate of a recognized college of pharmacy. Under the Minnesota Pharmacy Law, a recognized school is one that is recognized and accredited by the American Council on Pharmaceutical Education.

General Information

The College of Pharmacy is not only specifically named in the law but also accredited by the American Council on Pharmaceutical Education.

Regulation 26 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 prepharmacy training 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 prepharmacy 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.

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 Board of Pharmacy, 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, drying, and milling many official and nonofficial drugs. Many species of plants of medicinal and economic importance grown in the garden and greenhouse provide ample and varied material for study.

College of Pharmacy

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*.

Continuation Study Program

Pharmacy, like all modern sciences, is characterized by constant change. Today's pharmacist must continue to learn or his education will quickly become outdated. The college has an active continuing education program to fill the needs of the practicing pharmacist.

Both University resources and outside sources are utilized in a program which includes the use of almost every modern teaching tool. Closed circuit television, self teaching courses, and traveling seminars are some of the methods used. The basic concept is to meet the needs of the pharmacist in any of his areas of professional practice.

Special Lectures

From time to time through 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 2.5 million volumes. Materials in fields related to pharmacy are in the Biomedical and Chemistry Libraries, with 191,000 and 21,000 volumes, respectively. Materials in the fields of medicinal chemistry, pharmaceuticals, pharmacognosy, pharmacology, and hospital pharmacy are located in the Pharmacy Library, with a collection of over 10,000 volumes. The Pharmacy Library receives 205 journal titles and maintains indexes to domestic, foreign, and experimental drugs.

Melendy Memorial Lectures

Annually some 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.

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 junior year by the members of the society on the basis of scholarship, character, and conduct. Not more than 25 percent of the class is eligible.

Pharmaceutical Education Trip

During the spring vacation, an opportunity is afforded junior and senior 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.

Electives in Other Colleges of the University

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 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 liberal education, the College of Pharmacy 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.

Textbooks

Textbooks used in all courses may be obtained after coming to the University.

Loans, Scholarships, Fellowships, and Prizes

Loans — The following loan funds have been established for the benefit of students in the College of Pharmacy:

- Ladies Drug Auxiliary of Minneapolis Loan Fund
- Minnesota State Pharmaceutical Association Loan Fund
- North Minneapolis Pharmacists Club Loan Fund

Applications for loans are made to the Bureau of Student Loans and Scholarships. 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 — Students in the prepharmacy year or in any of the 4 professional years of the pharmacy curriculum are eligible for scholarships 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 infor-

College of Pharmacy

mation about all-University scholarships, refer to the section on Financial Aids in the *General Information Bulletin*.

Three AMERICAN FOUNDATION FOR PHARMACEUTICAL EDUCATION SCHOLARSHIPS (\$200) are awarded annually to students in the last 3 years of the 5-year curriculum.

One BENJAMIN M. COHEN MEMORIAL SCHOLARSHIP (\$250) is awarded annually to a student enrolled in the College of Pharmacy.

One C. EARL DOUGHERTY MEMORIAL SCHOLARSHIP (\$250), sponsored by the Mando Photo Company, is awarded annually to a student in the final 3 years of the curriculum of the College of Pharmacy.

One CECIL A. KRELITZ MEMORIAL SCHOLARSHIP (\$250) is awarded annually to a student enrolled for the prepharmacy year 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 last 3 years of the pharmaceutical curriculum.

One KEITH K. KELLER MEMORIAL SCHOLARSHIP (\$400) is awarded annually to a student in the prepharmacy years at some other unit of the University.

One McKESSON AND ROBBINS SCHOLARSHIP (\$300) 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 SENIOR SCHOLARSHIP (\$400 and a key) is awarded annually to the junior student achieving the highest scholastic average for the first 8 quarters of professional study. No application is necessary.

Two or more MINNESOTA STATE PHARMACEUTICAL ASSOCIATION SCHOLARSHIPS (\$250) are awarded annually to students entering the University of Minnesota for the prepharmacy year or the first professional year of the pharmacy curriculum.

One or more MINNESOTA STATE PHARMACEUTICAL ASSOCIATION WOMEN'S AUXILIARY SCHOLARSHIPS (\$250) are awarded annually to women students enrolled in the last 3 years of the pharmacy curriculum.

One NORTHWESTERN DRUG COMPANY SCHOLARSHIP (\$400) 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.

One OLSON DRUG STORE SCHOLARSHIP (\$250) is awarded annually to a student in the prepharmacy years.

One ROWELL LABORATORIES INCORPORATED SCHOLARSHIP (\$300) is awarded annually to a student who is enrolled in any of the last 3 years of the pharmaceutical curriculum.

Twelve SAMUEL W. MELENDY MEMORIAL SCHOLARSHIPS (\$400) are awarded annually to students in the College of Pharmacy. Not more than four scholarships are awarded to students in any 1 of the 4 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 (\$1,000) 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 senior year.

Two SNYDER'S DRUG STORES, INC., SCHOLARSHIPS (\$250) are awarded annually to students in the prepharmacy year who intend to complete the pharmacy curriculum at the University of Minnesota.

General Information

One WILLIAM M. AND MILDRED E. PETERS SCHOLARSHIP (\$250) is awarded annually to a student enrolled in the College of Pharmacy.

The college office will supply additional information about the Walgreen Pharmacy Scholarships, etc.

Fellowships — Graduate students in the professional departments of the College of Pharmacy (medicinal chemistry, pharmaceuticals, pharmacognosy, and pharmacology) are eligible for the following fellowships:

American Foundation for Pharmaceutical Education Fellowships
Samuel W. Melendy Memorial Fellowships

Additional information and application forms are available at the office of the Graduate School, University of Minnesota, and at the American Foundation for Pharmaceutical Education, 777 14th Street N.W., Washington, D.C. 20005.

Prizes — 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:

BRISTOL LABORATORIES PRIZE — Bristol Laboratories, Inc., New York, awards annually an embossed copy of *Modern Drug Encyclopedia* to that senior student having the highest numerical average in the course in compounding and dispensing.

COLLEGE OF PHARMACY ALUMNI AWARD — Sponsored by the College of Pharmacy Alumni Board and alumni of the college. Awarded annually to a member of the graduating class for general excellence of scholastic and extracurricular records.

HALLIE BRUCE MEMORIAL AWARD — Sponsored by the family and friends of Hallie Bruce, class of 1916, and by alumni of the college. Awarded annually to the member of the graduating class who has achieved an outstanding record in hospital pharmacy.

KAPPA EPSILON PRIZE — The Alumnae Chapter of Kappa Epsilon, national women's pharmacy fraternity, offers the interest on the endowed funds as a prize to the senior woman student who has rendered outstanding service to the college. The sum is to be used to defray the expenses of the State Board examination and registration.

JOHN Y. BRECKENRIDGE MEMORIAL BOOK AWARD — Mrs. John Y. Breckenridge established a fund which provides an appropriate award in memory of her husband, class of 1908, to be given to a junior student in the College of Pharmacy in recognition of outstanding scholastic achievement, professional promise, and leadership ability.

JOHNSON AND JOHNSON AWARD — Awarded annually to the member of the graduating class who has made an outstanding record in the required and elective courses in the area of business administration.

LILLY ACHIEVEMENT AWARD — Eli Lilly and Company, Indianapolis, Indiana, awards annually a gold medal trophy to the graduating senior who has distinguished himself through superior scholastic and professional achievement. Leadership qualities, as well as professional attitude, are considered along with academic performances in selection of the recipient.

McKESSON AND ROBBINS AWARD — McKesson & Robbins, Inc., New York, awards a plaque to the President, Student Chapter of the American Pharmaceutical Association.

MERCK AWARD — Merck and Company, Inc., manufacturing chemists of Rahway, New Jersey, offers annually the Merck Award to two senior students in the College of Pharmacy who have earned the highest scholastic average in the 4 years of professional work. This award consists of the *Merck Index* and *Merck Manual*.

College of Pharmacy

REXALL MORTAR AND PESTLE AWARD—The Rexall Drug Company offers annually a reproduction of a Spanish mortar and pestle to a member of the graduating class chosen by the faculty for outstanding service to the college.

RHO CHI AWARD—Mu Chapter of the Rho Chi Society, a national honorary pharmacy organization, annually presents to the highest ranking sophomore student a membership for 1 year in the American Pharmaceutical Association. This includes a 1-year subscription to the *Journal of the American Pharmaceutical Association*.

F. J. WULLING SENIOR AWARD—The Wulling Club Key and a suitable framed certificate depicting this award in addition to a full-year membership in the American Pharmaceutical Association and a check in the amount necessary to cover the cost of the examination for licensure in this state shall be awarded to that student in the College of Pharmacy who graduates with the degree of B.S. in Pharmacy and who has earned the second highest average.

F. J. WULLING JUNIOR AWARD—Based on the professional courses, a book award shall be made to the student showing the most outstanding professional promise. The books to be awarded are *The Dispensatory*, *Merck Index*, *Merck Manual*, or *Drugs of Choice*.

F. J. WULLING SOPHOMORE AWARD—To the sophomore student who has excelled in the professional courses shall be awarded the book *Remington's Practice of Pharmacy*.

F. J. WULLING FRESHMAN AWARD—To the freshman student who has attained the highest grade point average shall be presented the *United States Pharmacopia* and the *National Formulary*.

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.

PHARMACY CURRICULUM

(1 Year Prepharmacy — 4 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 prepharmacy students in the College of Liberal Arts of the University of Minnesota or in any other accredited institution. Upon satisfactory completion of the required prepharmacy courses, students are eligible to apply for admission to the College of Pharmacy. Students who undertake prepharmacy work away from the Minneapolis Campus of the University will defer the orientation course, Phm 1, to their first year in 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 will be eligible to apply for admission to a 3-year professional curriculum in the College of Pharmacy provided their previous training includes the following courses or their equivalent in addition to the courses of the prepharmacy year.

(Credits shown in parentheses)

General Biology (10) or equivalent in bot- any and zoology	Elementary Organic Chemistry (13)
Introductory Physics (12)	Principles of Economics (7)
	General electives (5-8)

PREPHARMACY YEAR

(In the College of Liberal Arts or any accredited college)

General Chemistry (14)	Orientation and History of Pharmacy (2)
Trigonometry (3)	General electives (9-12)
College Algebra and Analytical Geometry (5)	Total Prepharmacy Year = 43-45 credits
Communications (12) or English (9)	

FIRST PROFESSIONAL YEAR

General Biology (10)	Pharmaceutical Calculations (3)
Introductory Physics (12)	General electives (4)
Elementary Organic Chemistry (13)	
Principles of Economics (7)	Total First Professional Year = 51
Advanced First Aid (2)	

College of Pharmacy

SECOND PROFESSIONAL YEAR

Quantitative Medicinal Chemistry (6)	Human Physiology (7)
Biochemistry of Medicinals (6)	Microbiology (5)
Inorganic Medicinal Agents (4)	Pathology (5)
Fundamental Principles and Processes (3)	General electives (3)
Personal and Community Health (3)	
Introductory Calculus (5)	
Elementary Anatomy (4)	
	Total Second Professional Year = 51

THIRD PROFESSIONAL YEAR

Organic Medicinal Agents (11)	General Pharmacology (7)
Introductory Pharmacognosy (10)	General electives (5)
Fundamental Principles and Processes (4)	
Pharmaceutical Preparations (8)	
Drug Marketing (3) ^{oo}	
	Total Third Professional Year = 48

FOURTH PROFESSIONAL YEAR

Dispensing Pharmacy (6)	Toxicology (2)
Pharmaceutical Jurisprudence (3)	Social Psychology (3)
Economics of Professional Practice (4) ^{oo}	General electives (9)
Elements of Community Practice (3) ^{oo}	
Biopharmaceutics (3)	
Drug Information Evaluation (3)	Total Fourth Professional Year = 45
Environmental Sanitation (3)	
Clinical Pharmacy (6)	Grand Total Including Prepharmacy Year =
	238-240 credits

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 (see page 9 in this bulletin).

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.

Instrumentation in Medicinal Chemistry (3)	Veterinary Science (3)
Special Problems in Medicinal Chemistry (cr ar)	Biological Assay of Drugs (3)
Modern Concepts in Medicinal Chemistry (3)	Pharmacometrics (3)
Cosmetics and Dermatological Preparations (3)	Terminology of the Health Sciences (2)
Special Problems in Pharmaceutics (cr ar)	Pharmaceutical Manufacturing (6)
Antibiotics (2)	Parenteral Products (3)
Special Problems in Pharmacognosy (cr ar)	Vitamins and Hormones (2)
	Vitamins and Hormones Laboratory (1)

^{oo} Students contemplating graduate studies may substitute by petition pre-graduate courses.

DESCRIPTION OF COURSES

The four-digit number in parentheses after the course number is the new course number which will not be used prior to Fall, 1970.

Following each course title and description is a statement in parentheses of credits, enrollment limitations, prerequisites, and number of lecture and laboratory hours per week. "Consent of instructor" for enrollment in a course is indicated by the symbol ‡. Course numbers punctuated by diagonal marks are *sequence courses* and 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 cards.

CLINICAL PHARMACY (Phar)

Professor

Hugh F. Kabat, Ph.D., head

Assistant Professor

Darwin Sarnoff, Ph.D.

Instructor

John T. Bush, B.S. in Pharm.
James C. Clinite, B.S. in Pharm.
William J. Hodapp, B.S. in Pharm.
Thomas F. Jones, B.S. in Pharm., M.H.A.
Marie L. Perreault, B.S. in Pharm.

Roger D. Schroeder, B.S. in Pharm., M.S.
William A. Strohbeck, B.S. in Pharm.,
M.S.

Jan C. Wenger, B.S. in Pharm., M.S.

Clinical Instructor

William F. Appel, B.S. in Pharm.
Donald A. Dee, B.S. in Pharm., M.S.

Lecturer

Neal W. Schwartau, B.S. in Pharm.

- 1 (5-201). **Orientation: Opportunities and History.** Career opportunities in the profession; historical development of pharmacy. (2 cr; 2 lect hrs per wk)
- 11 (5-210). **Terminology of the Health Sciences.** An elective programmed learning course familiarizing students with the language of the health sciences. (2 cr; 5 review and exam sessions per qtr)
- 70 (5-220). **Advanced First Aid.** First aid procedures including those in the American Red Cross course. (2 cr; 3 lect hrs per wk)
- 64 (5-230). **Pharmaceutical Jurisprudence.** Law and legal procedures, responsibilities of a pharmacist; federal and Minnesota state laws and regulations, legal problems of practical importance to the pharmacist. (3 cr; 3 lect hrs per wk)
- 66 (5-240). **Economics of Professional Practice.** Decision making and policy planning, utilizing fiscal records; data processing. (4 cr; prereq Econ 1-2; 3 lect and 2 lab hrs per wk)
- 72 (5-250). **Drug Marketing.** Economic principles, institutions, channels of distribution, functions, policies, and practices. (3 cr; 3 lect hrs per wk)
- 73 (5-260). **Elements of Community Practice.** Planning, organizing, and controlling professional practice. (3 cr; prereq Phm 66; 3 lect hrs per wk)
- 150 (5-270). **Clinical Pharmacy.** Contemporary therapeutics lectures and monitoring of patient drug therapy. Offered at University and affiliated hospitals with rotation to several services. (6 cr; prereq 5th yr student; lect and conf)

College of Pharmacy

MEDICINAL CHEMISTRY (MedC)

Professor

Ole Givold, Ph.D., *head*
Frank E. Di Gangi, Ph.D.
Taito O. Soine, Ph.D.
Philip S. Portoghesse, Ph.D.

Assistant Professor

Robert Vince, Ph.D.

Instructor

Patrick E. Hanna, Ph.D.

Associate Professor

Herbert T. Nagasawa, Ph.D.

Student Pharmacist Supervisor

Kathleen Roberts, B.S. in Pharm.

- 52-53 (5-430/5-440).** **Biochemistry of Medicinals.** Selected topics in biochemistry required as a basis for the understanding of the pharmacodynamic action and therapeutic use of medicinal agents. (3 cr per qtr; prereq OrCh 63 or #; 3 lect hrs per wk)
- 54-55 (5-410/5-420).** **Quantitative Medicinal Chemistry.** Principles, procedures of gravimetric and volumetric methods of analyses of inorganic and organic medicinal agents. (3 cr per qtr; prereq GeCh 6, OrCh 62; 2 lect and 1 conf hr and 3 lab hrs per wk)
- 58-59 (5-450/5-460).** **Inorganic Medicinal Agents.** Histories, sources, commercial manufacture, properties, and medicinal uses of inorganic chemicals. (2 cr per qtr; prereq GeCh 6 or equiv; 2 lect hrs and 1 conf hr per wk)
- 161-162-163 (5-470/5-480/5-490).** **Organic Medicinal Agents.** Sources, production, properties, reactions, structure-activity relationships, and uses of natural and synthetic organic compounds. The courses include not only the simple organic compounds (hydrocarbons, alcohols, amines, etc.) but also the vitamins, hormones, alkaloids, organometallics, etc. (3 cr for 161, 4 cr for 162, 4 cr for 163; prereq 53)
- 165 (5-494).** **Instrumentation in Medicinal Chemistry.** (Professional Elective) Modern approaches to drug analysis. (3 cr; prereq OrCh 63 or #; 1 lect and 6 lab hrs per wk)
- 167 (5-496).** **Modern Concepts in Medicinal Chemistry.** (Professional Elective) 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. (3 cr; prereq 165; 3 lect hrs per wk)
- 173 (5-499).** **Special Problems in Medicinal Chemistry.** (Professional Elective) Elementary investigation of the analysis, synthesis, and phytochemistry of medicinal agents. (Cr ar; prereq 3rd- or 4th-yr pharmacy student and #)

PHARMACEUTICS (Phm)

Professor

Edward G. Rippie, Ph.D., *head*

Assistant Professor

Phillip A. Harris, Ph.D.
Kenneth G. Nelson, Ph.D.

Associate Professor

John D. McRae, Ph.D.
Robert H. Miller, Ph.D.

Student Pharmacist Supervisor

Leslie W. Collins, B.S. in Pharm.
Esther Magadan, B.S. in Pharm.

- 3 (5-603).** **Pharmaceutical Calculations.** Mathematical procedures and statistical methods in pharmaceutical practice. (3 cr; 3 lect hrs per wk)

Description of Courses

- 53-54 (5-610/5-620). Fundamental Principles and Processes.** Introduction to the principal laws of physical chemistry and their applications to the quantitative aspects of pharmaceutical systems. (3 cr for 53, 4 cr for 54; prereq Math 40, Phys 1, Phm 3, OrCh 61; 3 lect hrs per wk for 53, 3 lect and 3 lab hrs per wk for 54)
- 55-56 (5-630/5-640). Pharmaceutical Preparations.** Official and nonofficial dosage forms and preparations. (4 cr per qtr; prereq 54; 2 lect and 6 lab hrs per wk)
- 58-59 (5-650/5-660). Dispensing Pharmacy.** The technology, record systems, inter-professional relationships, drug use control, etc., involved in dispensing prescription medication. (3 cr; prereq 56, MedC 163; 2 lect and 3 lab hrs per wk)
- 160. (5-670). Biopharmaceutics.** Drug absorption, distribution, metabolism, and excretion in the human. (3 cr; prereq Phm 56, Phl 70 or equiv; 3 lect hrs per wk)
- 161 (5-680). Drug Information Evaluation.** Critical evaluation of data on drug effectiveness. (3 cr; prereq Phcl 102, Phm 160; 3 lect hrs per wk)
- 165 (5-690). Cosmetics and Dermatological Preparations.** (Professional Elective) Pharmaceutical aspects of cosmetics and dermatological preparations. (3 cr; 2 lect and 3 lab hrs per wk)
- 166-167 (5-692/5-694). Pharmaceutical Manufacturing.** (Professional Elective) Problems in the production of pharmaceutical preparations on a pilot plant scale. Formula development and product stabilization. (3 cr per qtr; prereq 56; 1 lect and 6 lab hrs per wk)
- 168 (5-696). Parenteral Products.** (Professional Elective) Principles and procedures involved in the manufacture of parenteral products. (3 cr; prereq 56, MicB 53, or #; 2 lect and 3 lab hrs per wk)
- 173 (5-699). Special Problems in Pharmaceutics.** (Professional Elective) Problems in the formulation, production, and evaluation of pharmaceutical products. (Cr ar)
- 123 (5-520) (VPP 123). Veterinary Science.** (Professional Elective) Professional interrelationships between pharmacists and veterinarians, disease problems of domestic animals, and animal pharmacology. (3 cr; prereq Phcl 102 or equiv; 3 lect hrs per wk)

PHARMACOGNOSY (Phcg)

Professor

E. John Staba, Ph.D., *head*

Assistant Professor

Yusuf J. Abul-Hajj, Ph.D.

Gardeners

Onie J. Benson
Clarence Stoltman

- 111 (5-830). Introductory Pharmacognosy.** Study of natural drug products. Consideration of the production, constituents, metabolism, and uses of drugs containing enzymes, carbohydrates, antibiotics, and biologicals. (5 cr; prereq Biol 2, MedC 53, MicB 53 or #; 4 lect and 4 lab hrs per wk)
- 121 (5-840). Introductory Pharmacognosy.** Continuation of the study of natural products. Consideration of the production, constituents, metabolism, and uses of drugs containing vitamins, hormones, terpenes, lipids, phenylpropides, and alkaloids. (5 cr; prereq 111, or #; 4 lect and 4 lab hrs per wk)

College of Pharmacy

- 221 (5-860). **Antibiotics.** (Professional Elective) Natural antibiotic substances. Methods of production, biosynthesis, extraction, and assay, together with chemical, pharmaceutical, and chemotherapeutic properties. (2 cr; prereq 111, or #; 2 lect hrs per wk)
- 231 (5-870). **Vitamins and Hormones.** (Professional Elective) These substances will be discussed with regard to biosynthesis, chemistry, biochemical functions, mechanisms of actions, productions, and uses. (2 cr; prereq 121, or #; 2 lect hrs per wk)
- 232 (5-875). **Antibiotics, Vitamins, and Hormones Laboratory.** (Professional Elective) Introduction to the techniques used to produce, isolate, and observe the biological effects of these substances. (1 cr; prereq 111 and 121, or #; 4 lab hrs per wk)
- 241 (5-899). **Special Problems in Pharmacognosy.** (Professional Elective) Problems dealing with the microbiology, chemistry, or biology of medicinal natural products from plants, animals, insects, etc. (Cr ar; prereq 4th yr student, #)

PHARMACOLOGY (Phcl)

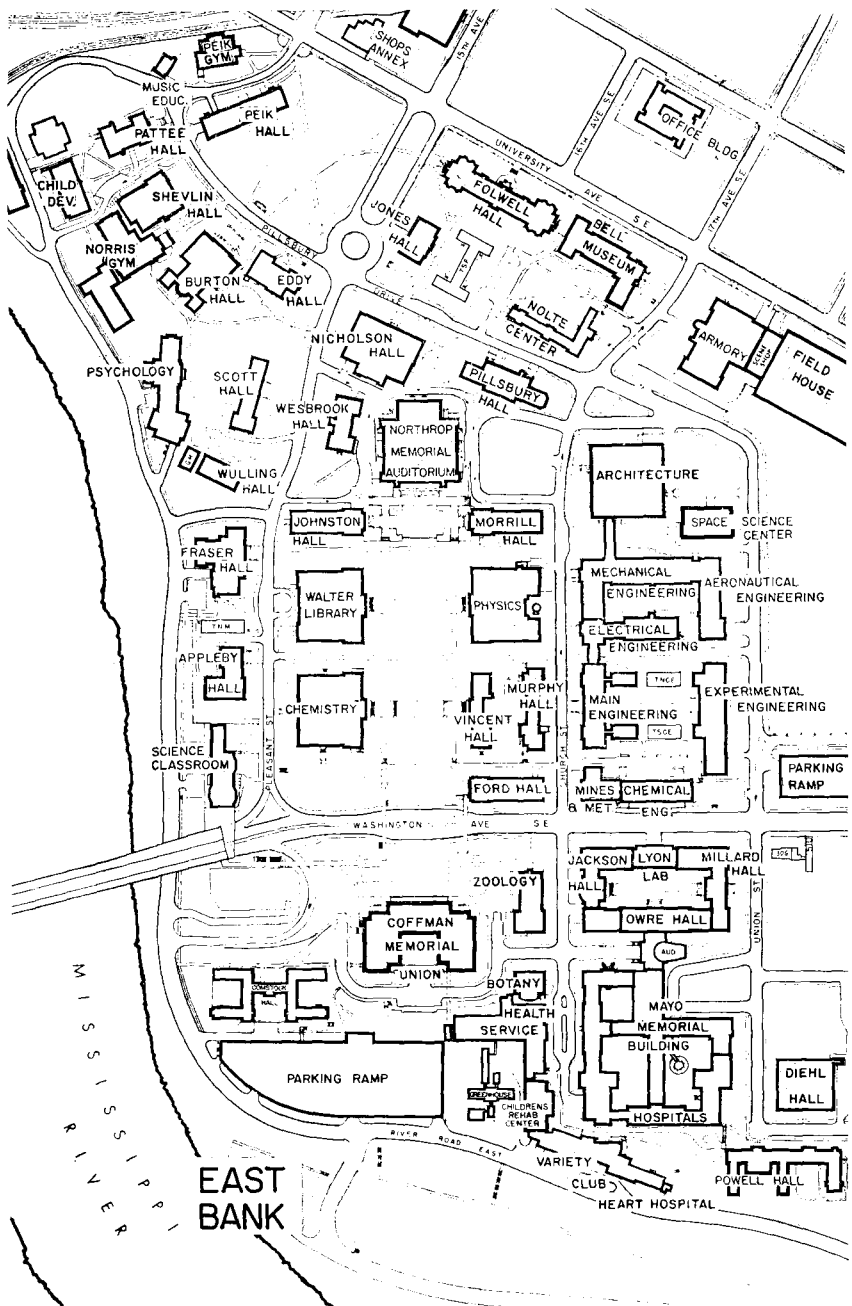
Professor

Lawrence C. Weaver, Ph.D.
Wallace F. White, Ph.D.

Assistant Professor

Harvey J. Kupferberg, Ph.D.

107. **Pharmacometrics.** Lectures and laboratory exercises on the principles and applications used in the evaluation of drug activity. (3 cr; prereq 102 or #)
162. **Biological Assay of Drugs.** (Professional Elective) Quantitative pharmacological procedures with an introduction to biostatistics. (3 cr; 1 lect hr and 6 lab hrs per wk)



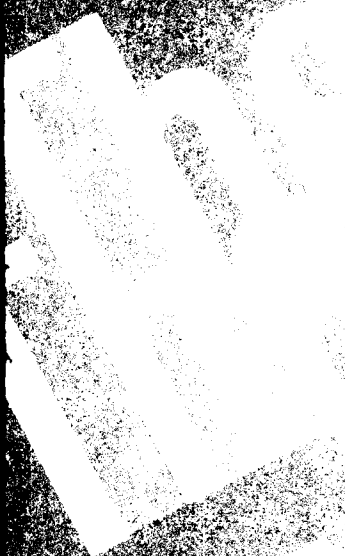
UNIVERSITY OF

M49
MJ

1968

71

Occupational
Physical Therapy



Volume LXXII

Number 17

July 29, 1969

UNIVERSITY OF MINNESOTA BULLETIN

Published by the University of Minnesota, Office of Admissions and Records, 105 Morrill Hall, Minneapolis, Minnesota 55455, January through September inclusive. One issue in January, one issue in February, two issues in March, four issues in April, four issues in May, three issues in June, four issues in July, two issues in August, and one issue in September. Second class postage paid at Minneapolis, Minnesota. Send change of address notices and other communications to Office of Admissions and Records, Minneapolis, Minnesota 55455.

The contents of this bulletin and of other University bulletins, publications, or announcements are subject to change without notice.

UNIVERSITY OF MINNESOTA

Board of Regents

The Honorable Lester A. Malkerson, Minneapolis, Chairman; The Honorable Marjorie J. Howard (Mrs. C. Edward), Excelsior, Vice Chairman; The Honorable Elmer L. Andersen, St. Paul; The Honorable Lyman A. Brink, Hallock; The Honorable Fred A. Cina, Aurora; The Honorable Daniel C. Gainey, Owatonna; The Honorable Albert V. Hartl, Fergus Falls; The Honorable Herb L. Huffington, M.D., Waterville; The Honorable Fred J. Hughes, St. Cloud; The Honorable George W. Rauenhorst, Olivia; The Honorable Neil C. Sherburne, Lakeland Township; The Honorable John A. Yngve, Plymouth.

Administrative Officers

Malcolm Moos, President

Donald K. Smith, Vice President, Administration

William G. Shepherd, Vice President, Academic Administration

Laurence R. Lunden, Vice President, Business Administration

Stanley J. Wenberg, Vice President for Educational Relationships and Development

Paul H. Cashman, Vice President for Student Affairs

Robert Edward Summers, Dean of Admissions and Records

DEPARTMENT OF PHYSICAL MEDICINE AND REHABILITATION

Administration

Robert B. Howard, M.D., Ph.D., Dean, College of Medical Sciences

Robert A. Ulstrom, M.D., Associate Dean, College of Medical Sciences

Robert O. Mulhausen, M.D., Assistant Dean, College of Medical Sciences

Frederic J. Kottke, M.D., Ph.D., Head, Department of Physical Medicine and Rehabilitation

Marvin G. Lepley, B.S., Director, Course in Occupational Therapy

Wilbur L. Moen, B.A., B.S., Director, Course in Physical Therapy



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 for a liberal education. The following programs offered in the Department of Physical Medicine and Rehabilitation, Medical School, College of Medical 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 well-being, 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. The ability to communicate effectively.
2. The ability to understand others and to work effectively with them.
3. The ability to plan, initiate, coordinate, and evaluate treatment programs designed to meet the individual needs of the patient.
4. Competence in selected technical skills.
5. An appreciation of the scientific method as it is used in solving treatment problems and of the necessity for continued research.
6. An appreciation of the value of continuing education for personal and professional growth.

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 or vocational interests.

Admission Procedure

New Students — Students with no previous college credits must make application for admission to the College of Liberal Arts and declare a major in occupational or physical therapy. Students already enrolled at the University who wish to change into one of these programs should see an adviser as early as possible.

Students With Advanced Standing — Students transferring to the University from other colleges or universities may be admitted with advanced stand-

Occupational Therapy/Physical Therapy

ing by making application to the University and by having their credits evaluated. Because of differences in available courses, any student attending another college or university should contact the director of either occupational or physical therapy as soon as he has decided on a major. In some situations, the student should transfer to the University for the sophomore year in order to complete the prerequisite courses.

See section on Admission of Nonresidents in the *General Information Bulletin* for nonresidency requirements.

Application for Admission to the College of Medical Sciences, Courses in Occupational or Physical Therapy — See procedures described in the following sections on Occupational Therapy or Physical Therapy.

Because of limitations in space and facilities, it is necessary to limit the number of students that can be accepted into each junior class. Selection is made on a competitive basis. A student should have an average above C+ in the basic sciences for physical therapy and an overall C+ average with better than a C average in the basic sciences for occupational therapy. In addition, these criteria are followed in determining preference on the basis of residency and preparation (listed in order of priority):

1. Minnesota residents attending the College of Liberal Arts at the University of Minnesota or any of its branches.
2. Minnesota residents attending other colleges or universities.
3. Nonresidents attending the College of Liberal Arts at the University of Minnesota or any of its branches.
4. Nonresidents attending other colleges and universities.

Although preference is given to residents of the state of Minnesota, nonresidents with high scholastic standing are encouraged to apply.

Human Rights — The University of Minnesota is guided by the principle that there shall be no differences in the treatment of persons because of race, creed, color, or national origin and that equal opportunity and access to facilities shall be available to all. This principle is particularly applicable in the admission of students in all colleges, and in their academic pursuits. It is also applicable in University-owned or University-approved housing, in food services, students unions, extracurricular activities, and all other student services. It is a guiding policy 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

Each student is assigned to a permanent faculty adviser and students are responsible for seeing their advisers early in each registration period. The advisers have at their disposal a limited number of class reservation cards for courses offered in the College of Liberal Arts and in the College of Education.

Students who have urgent needs for class reservation cards should speak to their advisers regarding requests for cards.

During the junior and senior years, registration is scheduled by the directors of the courses in physical and occupational therapy.

College Expenses

Fees — See the *General Information Bulletin* since fees are subject to change.

Financial Aids — During the freshman and sophomore years, students should consult the Office of Student Financial Aid. At the junior and senior levels, a limited number of federal traineeships through the Rehabilitation Services Administration are available and are awarded to students with financial need and professional promise. The state of Minnesota offers 1- or 2-year scholarships for junior and senior students. Applications for these scholarships should be made with the Department of Public Welfare, Centennial Building, St. Paul, Minnesota 55101 before April 1 of each year.

Honors — Each year outstanding students in physical therapy are awarded scholarships from the Minnesota Chapter of the American Physical Therapy Association. The Minnesota Occupational Therapy Association makes similar awards to students in occupational therapy.

Students whose record at the University of Minnesota indicates a grade point average of 3.00 (B) or better will be graduated *with distinction*. Those with a grade point average of 3.50 or higher will be graduated *with high distinction*.

Educational Facilities

At the present time the majority of 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 and faculty are also on the second floor. The department secretary is in room 282 and can be reached by calling 373-9024. The directors of the two courses have their offices in 860 Mayo (the main office of the Department of Physical Medicine and Rehabilitation) and may be reached by calling the following numbers:

Occupational Therapy — Mr. Marvin G. Lepley, 373-8992

Physical Therapy — Mr. Wilbur L. Moen, 373-8993

All modern teaching methods are used. Courses that are taught to large numbers of students employ the lecture method, but free communication between students and teachers is encouraged. Laboratory facilities are used for developing the skills needed for the profession. Seminars and group discussions are held. Video tape, closed circuit television, and other forms of audio-visual aids are utilized.

As part of an outstanding medical center, the Department of Physical Medicine and Rehabilitation can call upon knowledgeable physicians in all

Occupational Therapy/Physical Therapy

medical areas for its teaching program. When needed, patients are available for classroom demonstration and for student clinical education. 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 Medical Center complex and its open shelves hold over 195,000 volumes. Both of these libraries have excellent study facilities.

Department Regulations

Credits — There are four permanent passing grades, A (highest), B, C, and D (lowest), showing the quality of work in a course. Though D is a passing grade, any D must be balanced by a grade of B or better in order to maintain the C average required for graduation. A grade of F (failure) indicates that the student did not successfully complete the course.

A temporary grade of I (incomplete) is assigned when the instructor has insufficient information to permit a permanent grade. It indicates that some required work is unfinished or that the student, though officially registered, did not appear or left without officially canceling. (If the student drops out or cancels after the sixth week while failing, an F is assigned.) A student receiving an instructor's permission to make up an I must do so by the end of the sixth week in the next quarter of his residence. An I may be made up while a student is not in residence.

A registration symbol W (withdrawal) indicates that a student has been permitted to cancel officially without a grade. It is assigned during the first 6 weeks irrespective of the student's class standing. After that time W is recorded only if he is doing passing work; if failing, he receives an F.

There is a symbol X which may be reported in continuation courses for which a grade cannot be determined until the sequence is completed. When the sequence is completed the X is changed to a permanent grade.

A registration symbol V (visitor) indicates registration as an auditor or visitor.

P-N Grading System — Some courses may be taken P (pass) or N (no credit). Neither counts in the grade point average but credits of P count toward graduation. The dividing line between P and N is similar to that between D and F. When a course is to be taken P-N, this must be indicated on the registration blank. For specific information on courses that may be taken P-N, students should see their advisers.

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 a grade of D, 1 grade point. An F carries no grade points. Thus for a 3-credit course with a grade of B a student would be assigned 9 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, F) have been recorded. A grade point ratio of 2.00 (C average) is the minimum standard required for satisfactory progress toward a degree.

Probation — A student may be admitted to the junior year with a probationary status if:

1. He is transferring directly from another college or university.
2. He has fewer than 45 credits earned at the University of Minnesota in the College of Liberal Arts.
3. His G.P.A. is less than 2.50 in the basic science courses (Physical Therapy).
4. His G.P.A. is less than 2.50 overall (Occupational Therapy).

Following successful completion of 1 quarter, the students will be removed from probation and will be notified.

During the junior and senior years a student may be placed on probation if his work at the end of any quarter indicates serious scholastic difficulty. Every student is afforded special aid in discovering the reasons for his difficulty and in finding ways of overcoming it. Usually the probationary period will not be extended beyond 2 quarters.

Canceling Out of College — Students should discuss plans for discontinuing with their advisers or with the course directors.

Memberships — Students are encouraged to become student members of their professional organizations.

Those in occupational therapy may become members of the American Occupational Therapy Association and the Minnesota Occupational Therapy Association. There is also a student organization at the University affiliated with the Student Committee of the American Occupational Therapy Association.

Physical therapy students may become members of the American Physical Therapy Association and participate in activities of the Minnesota Chapter and the Student Section at the National Conferences.

Student Affairs — At a great university, there are many cultural, social, and athletic events for those who would like to participate. Because of the small classes in the professional programs, informal social activities are arranged for students and faculty. The students in occupational and physical therapy have an annual spring banquet to which they invite faculty, staff, and friends.

Housing — Information about residence halls may be obtained from: Director of University Housing, 180 Wesbrook Hall, University of Minnesota, Minneapolis, Minnesota 55455. Information about private rooming houses is furnished by the Student Housing Bureau, 209 Eddy Hall.

Uniforms — During the junior year, students are expected to provide uniforms for clinical practice.

OCCUPATIONAL THERAPY

Professor

Frederic J. Kottke, M.D., Ph.D., *head*, Department of Physical Medicine and Rehabilitation

Assistant Professor

Helen M. Dahlstrom, B.A.
Marian L. Eliason, B.S.
Dortha L. Esch, B.S.
Marvin G. Lepley, B.S., *director*

Instructor

Robert L. Bollinger, B.S.
Mary K. Cowan, B.S., M.A.
Clarence A. Sicard, B.S.
Lorraine M. Wolfe, B.S., M.S.W.

Occupational therapists use purposeful activities as treatment in the rehabilitation of persons with physical or emotional dysfunction. The therapist is a vital member of the rehabilitation team and works in consultation with physicians, physical and speech therapists, nurses, social workers, psychologists, vocational counselors, teachers, and other specialists.

The objectives of the patient's treatment program in occupational therapy are determined according to his individual needs. These objectives may include an evaluation of the patient's physical abilities before a specific program is devised to improve his condition through exercise and the use of adapted equipment. In the same way, it may be necessary to evaluate a patient's methods for handling his emotional problems before he can be helped in dealing with them more effectively. It can be said that the aim of occupational therapy is to help patients help themselves to arrive at their highest level of independence through improvement of their physical, emotional, and social well-being.

The occupational therapy profession offers unlimited opportunities for qualified therapists because there are more available positions than there are therapists to fill them. 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. Opportunities for consultation in newly developing community-centered programs are numerous. Therapists may also receive commissions in the Army, Navy, Air Force, and U.S. Public Health Service.

Because of the great need 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; however, 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 4½ years including clinical education. 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 taking the national registration examination given by the American Occupational Therapy Association.

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 (see page 3 for general admission procedure). Students who have satisfied admission requirements and have completed 90 credits may apply for transfer to the College of Medical Sciences, Course in Occupational Therapy. Applications should be received by June 1 in order to be considered for the junior year which begins each fall quarter. When filing for admission, a student should arrange for a personal interview with the director of the course unless he has been currently attending the University of Minnesota. As part of the admission procedure, students are requested to take the Minnesota Multiphasic Personality Inventory, and arrangements for taking it can be made through the director of the course. 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 must have the physical capacity to do the work of a therapist. Students planning to enter a medical 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.

Curriculum

To be eligible for admission to the junior year of the Course in Occupational Therapy, a student must have completed the following courses during the freshman and sophomore years. It is important to note that some of these courses are offered only once a year. Those listed apply to courses offered at the University of Minnesota. Students attending other colleges must contact the director of occupational therapy for information regarding acceptable substitutions or exemptions.

Occupational Therapy

FRESHMAN YEAR

<i>Fall</i>	<i>Winter</i>	<i>Spring</i>
English** 3	English** 3	English** 3
Biology 5	Biology 5	Speech 3
Art History 3-5	Speech 3	Human Anatomy 4
Elective	Sociology 3	Art (ceramics) 1-3
		Introduction to Occupational Therapy 1

SOPHOMORE YEAR

<i>Fall</i>	<i>Winter</i>	<i>Spring</i>
Chemistry 3-5	General Psychology ... 3	General Psychology ... 3
Medical Terminology .. 3	Physiology 4	Child Psychology/ Human Development 3
Art (weaving) 1-3	Woodworking 3	Creative Problem Solving 4
Graphic Arts 3	Public/Personal Health 2	Therapeutic Recreation 2
Orientation to Occupational Therapy 2	Electives	Electives

** A minimum of 9 credits of composition is required.



Electives — Students should choose electives which fulfill the requirements for the following categories under the system developed by the Council on Liberal Education (electives should be approved by the adviser):

Communications, Languages, Symbolic Systems (credit requirement fulfilled if above curriculum is followed; suggested additions below)

- Foreign Language
- Philosophy
- Journalism
- Mathematics
- Statistics

Artistic Expression (credit requirement fulfilled if above curriculum is followed; suggested additions below)

- Art
- Humanities
- Theatre Arts
- Music
- Literature

Physical and Biological Sciences (credit requirement fulfilled if above curriculum is followed; suggested additions below)

- Natural Science
- Physics
- Astronomy
- Botany
- Geology

Man and Society (credit requirement fulfilled if above curriculum is followed; suggested additions below)

- History
- Social Science
- Political Science
- Economics
- Anthropology
- Geography

JUNIOR YEAR

<i>Fall</i>	<i>Winter</i>	<i>Spring</i>
Anat 58 5	PMed 61 3	PMed 62 3
PMed 2B 1	PMed 72 4	PMed 77** 7
PMed 57 2	PMed 75 2	PMed 84 3
PMed 66 2	PMed 82 5	AdPy 171A 2
PMed 71 3	PMed 83B 5	Neur 171B 2
PMed 74 3		

** These courses will be offered both spring and fall quarters with the class divided — half of the class will take PMed 77 during spring quarter, and PMed 67, 76, and 78 during fall quarter. For the other half of the class the sequence will be reversed.

Occupational Therapy

SENIOR YEAR

<i>Summer Session — Term I</i>		<i>Summer Session — Term II</i>	
Psy 144 and 145	6	PMed 73	6
<i>Fall</i>		<i>Winter</i>	<i>Spring</i>
PMed 55	3	PMed 94	PMed 95
PMed 67**	2		
PMed 76**	3		
PMed 78**	3		
PMed 79	3		
PMed 93	2		
<i>Summer Session — Term I</i>			
PMed 96			

Clinical Education — A total of 8 months of clinical education is required. The clinical experience is divided as follows:

- 3 months — Patients with psychiatric conditions
- 3 months — Adult patients with physical handicaps and general medical and surgical conditions
- 2 months — Children with physical handicaps and general medical and surgical conditions

Three of the eight months are assigned at the University of Minnesota Hospitals. The remaining 5 months may be arranged with cooperating hospitals throughout the United States. The regular tuition rates apply to the clinical training experience. Students training outside of the state of Minnesota may be exempt from the incidental fee.

Clinical education must be completed within 2 years of academic preparation.

** These courses will be offered both spring and fall quarters with the class divided — half of the class will take PMed 77 during spring quarter, and PMed 67, 76, and 78 during fall quarter. For the other half of the class the sequence will be reversed.

PHYSICAL THERAPY

Professor

Frederic J. Kottke, M.D., Ph.D., *head*, Department of Physical Medicine and Rehabilitation

Assistant Professor

John D. Allison, M.S.
Wilbur L. Moen, B.A., B.S., *director*
Martin O. Mundale, M.S.
James F. Pohntilla, M.S.
Helen V. Skowlund, M.S., *director of graduate study*

Instructor

Shelby J. Clayton, M.S.
Vivian Hannan, B.S.
Jane E. Olson, M.A.
Donna L. Pauley, B.S.
Glenn N. Scudder, B.S.

Physical therapy is concerned with the restoration of function and the prevention of disability 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.

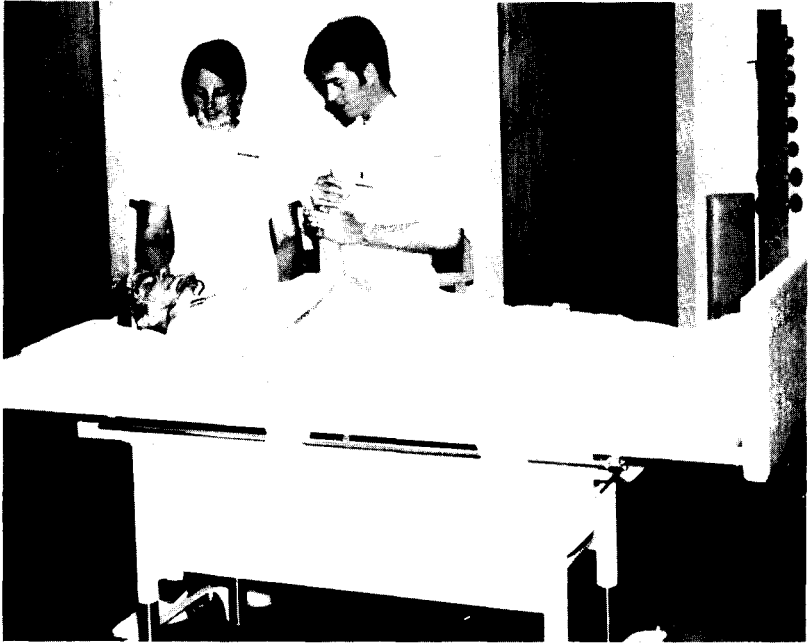
Because of increasing demands for registered physical therapists, the curriculum was revised in 1966 to allow admission of a second class each year. The first Plan A students were admitted spring quarter 1967 and since that time two classes of 25 students per class have been admitted each year.

Throughout its history, the Course in Physical Therapy has been approved by the American Physical Therapy Association and the 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. The student spends his first 2 years in a pre-physical therapy program which emphasizes a liberal education and includes a foundation in the basic sciences. At the end of the sophomore year, qualified students are admitted to the College of Medical Sciences for their 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 90 quarter credits, including the required courses or their equivalents. A minimum grade point average of 2.50 (C+) in the basic sciences is required as indication of probable success in the professional program.

Physical Therapy



Required courses and electives are listed under the categories established by the Council of Liberal Education for graduation requirements. Quarter credits are shown in parentheses.

Freshman English

Engl 1-2-3 or Comm 1-2-3 or exemption; satisfactory completion of Freshman English requirement

Public Health

PubH 3 or PubH 50

Communication, Language, Symbolic Systems

Electives: Foreign language, philosophy, mathematics, statistics, or speech (minimum of 9)

Physical and Biological Sciences

Biol 1-2 (10)
Anat 4 (4)
Phsl 51 (5)
GeCh 4-5 (10)
Phys 1-2 (6) or GC 7A (5)

Man and Society

Psy 1-2 (6)
Plus one elective course (3)
Child or Adolescent Psychology is recommended

Electives

Sociology, social science, anthropology, psychology, history, political science or economics

Artistic Expression

Electives

Art, music, humanities, theatre arts, literature, classics (minimum of 9)

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 90 credits.

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

<i>Fall</i>	<i>Winter</i>	<i>Spring</i>
English 3-4	English 3-4	English 3-4
Biol 1 5	Biol 2 5	Anat 4 5
Electives	Electives	PMed 2A 1
		PubH 2
		Electives

SOPHOMORE YEAR

<i>Fall</i>	<i>Winter</i>	<i>Spring</i>
GeCh 4 5	GeCh 5 5	Psychology 3
Phys 1 3	Phys 2 3	Electives
Psy 1 3	Psy 2 3	
Electives	Phsl 51 5	

During the sophomore year, prospective students will be considered for admission to the spring or fall class. Deadline for applications for the spring class which begins in March of each year is January 15. Deadline for applications for the fall class beginning in September is May 15.

Selection of students for the junior year will be based on scholastic standing and upon character and personal fitness as disclosed by personal interview. Each student must pass a physical examination in the University Health Service of the University of Minnesota.

Plan A — Curriculum for students entering the professional program in March:

JUNIOR YEAR

<i>Spring</i>	<i>Fall</i>	<i>Winter</i>
Anat 58 5	PMed 57 2	Path 60 3
PMed 54 2	PMed 59 4	PMed 60A 4
PMed 83A 5	PMed 82 5	PMed 61 3
PMed 87 1	PMed 80A-81A 6	PMed 80B-81B 6
Elective 3		

Physical Therapy

SENIOR YEAR

<i>Spring</i>	<i>SS I or II</i>	<i>Winter</i>
PMed 4 1	PMed 88 6	PMed 89 15
PMed 58 2		
PMed 70 3	<i>Fall</i>	
PMed 62 3	PMed 68 3	
PMed 81C 2	PMed 85 3	
AdPy 171A 2	PMed 90 2	
Neur 171B 2	PMed 98 3	
	PMed 101 3	

Plan B — Curriculum for students entering the professional program in September:

JUNIOR YEAR

<i>Fall</i>	<i>Winter</i>	<i>Spring</i>
Anat 58 5	Path 60 3	PMed 58 2
PMed 54 2	PMed 61 3	PMed 62 3
PMed 57 2	PMed 82 5	PMed 70 3
PMed 87 1	PMed 60A 4	PMed 83A 5
PMed 59 4		AdPy 171A 2
	<i>SS I or II</i>	Neur 171B 2
	PMed 88 6	

SENIOR YEAR

<i>Fall</i>	<i>Winter</i>	<i>Spring</i>
PMed 4 1	PMed 85 3	PMed 89 15
PMed 68 3	PMed 80B-81B 6	
PMed 98 3	PMed 81C 2	
PMed 80A-81A 6	PMed 90 2	
Elective 3	PMed 101 3	

DESCRIPTION OF COURSES

Note — The University will change to a new numbering system in the fall of 1970. In the following course descriptions, the *present* numbering system is used, with the *new* course numbers listed in parentheses.

Physical Medicine and Rehabilitation (PMed)

- 1 (1-001). **Introduction to Occupational Therapy.** Orientation. Demonstration of occupational therapy by clinical therapists. Films, lectures, and discussion. Tours of hospitals and rehabilitation centers. (1 cr; offered spring qtr only)
- 2A (1-002). **Orientation to Physical Therapy.** 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. (1 cr; offered each qtr)
- 2B (5-201). **Orientation to Physical Therapy and Rehabilitation.** Physical therapy and rehabilitation procedures; techniques of application; observation of treatment in the physical therapy clinic. (1 cr; prereq regis OT)
- 3 (1-003). **Orientation to Occupational Therapy.** Survey of the profession through lectures, films, and tours. Methods of treatment including demonstrations. Observation in clinics. (2 cr; offered fall qtr only)
- 4 (5-301). **Orientation to Occupational Therapy.** For physical therapy students in the professional program. Introduction to treatment techniques and their application. Observation of treatment in occupational therapy clinics. (1 cr; prereq regis PT)
- 5 (1-004). **Therapeutic Recreation.** Instruction in application of recreational activities for hospital and convalescent patients. (2 cr; offered spring qtr only)
- 54 (5-105). **Medical Terminology.** Building of medical words from Greek and Latin prefixes, suffixes, word roots, and combining forms; recognizing medical words from the Greek and Latin parts; spelling medical words correctly; and intelligent use of a medical dictionary. (2 cr)
- 55 (5-375). **Community Resources.** Introduction to the role of the community and community agencies in the total rehabilitation process. (3 cr; prereq regis OT)
- 57 (5-100). **History and Philosophy of Rehabilitation Medicine.** History of medicine and rehabilitation. History and development of occupational and physical therapy, structure and function of professional organizations, certification for practice. (2 cr; prereq regis OT or PT)
- 58 (5-223). **Bandaging, Aseptic, and Isolation Techniques.** Methods and principles of bandaging, splinting, and taping; medical asepsis for cleansing and dressing of wounds; isolation procedures for contagious diseases. (2 cr; prereq regis PT)
- 59 (5-220). **Therapeutic Procedures I.** Theory and technique of thermotherapy, hydrotherapy, phototherapy, and cryotherapy. Study of the physiologic basis for treatment with water, heat, cold, ultraviolet radiation, and ultrasound. (4 cr; prereq regis PT)

Occupational Therapy/Physical Therapy

- 60A (5-221). **Therapeutic Procedures II.** Theory and technique of diathermy, electrotherapy, and electrodiagnosis. (4 cr; prereq regis PT)
- 61-62 (5-161/5-162). **Medical Science Lectures.** Lectures include related fields of surgery, orthopedics, pediatrics, dermatology, medicine, neurology, and speech. Correlation clinic includes presentation of patients and discussion of treatment problems. (6 cr; prereq regis OT or PT)
- 66 (5-391). **Introduction to Scientific Literature.** Use of source material; evaluation of medical literature; elementary statistics; techniques of scientific writing. (2 cr; prereq regis OT)
- 67 (5-392). **Methods of Scientific Research.** Fundamentals of research design; evaluation and presentation of data; preparation of manuscript. (2 cr; prereq 66)
- 68 (5-275). **Applied Anatomy.** Review of joint structures, muscles, nerves, and function. Diseases and injuries causing impairment of function and deformities. (3 cr; prereq regis PT)
- 70 (5-222). **Theory and Technique of Massage.** Methods of applying various types of massage; therapeutic indications; physiological effects. (3 cr; prereq regis PT)
- 71 (5-340). **Theory: Human Development.** The physiological, psychological, and social development of the human being. A basis for understanding future study of occupational therapy evaluation procedures and treatment. (3 cr; prereq regis OT)
- 72 (5-341). **Theory: General Medical and Surgical Conditions.** Principles of treatment for patients with medical and surgical conditions. Occupational therapy for the pediatric patient, the blind, and the deaf. Clinical practice. (4 cr; prereq regis OT)
- 73 (5-342). **Theory: Psychosocial Dysfunction.** Treatment of psychiatric patients. Application of theory through problem solving and clinical experience. (6 cr; prereq regis OT)
- 74-75 (5-310/5-311). **Therapeutic Activities.** Laboratory instruction in craft skills; adaptation of these to specific disabilities. (5 cr; prereq regis OT)
- 76 (5-312). **Techniques of Occupational Therapy.** Laboratory instruction in the operation of power woodworking equipment; safety precautions and maintenance of power tools. (3 cr; prereq regis OT)
- 77 (5-343). **Theory: Physical Dysfunction.** Techniques of evaluation and treatment of patients with physical disabilities. Lectures, laboratory, and clinical experience. (7 cr; prereq regis OT)
- 78 (5-360). **Group Process Seminar.** Experience in group development; analysis of group behavior and member roles. (3 cr; prereq regis OT)
- 79 (5-393). **Advanced Evaluation Techniques.** Application of evaluative procedures in physical and psychosocial dysfunction. (3 cr; prereq regis OT)
- 80A-B (5-281/5-282). **Theory of Therapeutic Exercise.** Fundamental principles of physiology, physics, and neurology as a basis for therapeutic exercise. (6 cr; prereq regis PT)
- 81A-B (5-283/5-284). **Techniques of Therapeutic Exercise.** Instruction in the application of the principles and techniques of therapeutic exercise. (6 cr; prereq 80 A-B)

Description of Courses

- 81C (5-285). Techniques of Therapeutic Exercise.** Instruction in application of principles and techniques of special therapeutic exercise as related to specific disabilities. (2 cr; prereq 81 A-B)
- 82 (5-182). Functional Neuroanatomy and Neurophysiology.** A study of the neuroanatomic structures as functional systems and the basic neurophysiologic concepts with emphasis on application for understanding and treating physical dysfunction. (5 cr; prereq regis OT or PT)
- 83A (5-230). Theory and Technique of Muscle Function; Tests and Measurements.** Review of muscles and joints in regard to anatomical and physiological function; analysis of body mechanics, coordinated movement and strength. Evaluative procedures in assessment of body function. (5 cr; prereq regis PT)
- 83B (5-330). Theory and Technique of Muscle Function, Tests, and Measurements.** Review of muscles and joints in regard to anatomical and physiological function. Analysis of body mechanics and coordinated movement. Theory and technique of activity analysis, muscle testing, and joint measurement. Lectures, laboratory demonstration, and practice. (5 cr; prereq regis OT)
- 84 (5-370). Rehabilitation Procedures.** Theoretical and practical knowledge of activities of daily living as they apply to occupational therapy. Lectures, demonstrations, and practice. (3 cr; prereq regis OT)
- 85 (5-270). Rehabilitation Procedures.** 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. (3 cr; prereq regis PT)
- 87 (5-215). Introduction to Physical Therapy Clinical Education.** Basic principles and skills in patient care; observational skills; orientation to the clinic and supervised clinical education. (1 cr; prereq regis PT)
- 88 (5-255). Clinical Education in Physical Therapy.** Supervised clinical practice at affiliated hospitals. (6 cr; prereq regis PT; offered either summer term)
- 89 (5-295). Clinical Education in Physical Therapy.** Supervised clinical practice at affiliated hospitals. (15 cr; prereq regis PT)
- 90 (5-290). Administration.** 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. (2 cr; prereq regis PT)
- 93 (5-380). Administration and Supervision.** Principles of administration, supervision, and organization of the occupational therapy department. Interdepartmental relationships. (2 cr; prereq regis OT)
- 94-95-96 (5-396/5-397/5-398). Clinical Education in Occupational Therapy.** A total of 8 months of supervised training in affiliated hospitals. (18 cr [w,s], 12 cr [summer]; prereq regis OT)
- 98 (5-292). Introduction to Scientific Research.** Fundamentals of research design; elementary statistical concepts; techniques of scientific writing. (cr ar; prereq regis PT)
- 101 (5-289). Patient Assessment.** Assessment of clinical patients and rationale of treatment to attain rehabilitation goals. (3 cr; prereq regis PT)

OF MINNESOTA BULLETIN

JULY 30, 1969

1969
71

College of
Veterinary Medicine



How to Use This Bulletin

This bulletin is the basic source of information about the College of Veterinary Medicine. Prospective students should read it carefully and keep it at hand for ready reference. It is arranged in the following major sections:

General Information — Contains information applicable to all students.

Curricula and Admission Requirements — Contains information on course requirements and admission policies for the Preveterinary and Professional programs.

Description of Courses — Gives a brief description of required and suggested courses.

In addition to this particular bulletin, the student should also consult the *General Information Bulletin* which tells about the University as a whole. For more information regarding the preveterinary curriculum at the University of Minnesota, the student is referred to the *Agriculture Bulletin*. These bulletins can be obtained by writing to the Office of Admissions and Records, University of Minnesota, St. Paul, Minnesota 55101.

Explanation of Symbols Used

The following symbols are used throughout the course description section and will carry no page footnotes:

- Courses through which it is possible for graduate students to prepare Plan B papers.
- † All courses listed before dagger must be completed before credit is granted.
- § No credit is given if credit has been received for equivalent course listed after section mark.
- ‡ Means "concurrent registration in."
- § Means "consent of instructor."
- △ Means "consent of the division, department, or school offering course."
- x After a course number means "course is offered more than 1 quarter."

UNIVERSITY OF MINNESOTA

Board of Regents

The Honorable Lester A. Malkerson, Minneapolis, Chairman; The Honorable Marjorie J. Howard (Mrs. C. Edward), Excelsior, Vice Chairman; The Honorable Elmer L. Andersen, St. Paul; The Honorable Lyman A. Brink, Hallock; The Honorable Fred A. Cina, Aurora; The Honorable Daniel C. Gainey, Owatonna; The Honorable Albert V. Hartl, Fergus Falls; The Honorable Herb L. Huffington, M.D., Waterville; The Honorable Fred J. Hughes, St. Cloud; The Honorable George W. Rauenhorst, Olivia; The Honorable Neil C. Sherburne, Lakeland Township; The Honorable John A. Yngve, Plymouth.

Administrative Officers

Malcolm Moos, President
Donald K. Smith, Vice President, Administration
William G. Shepherd, Vice President, Academic Administration
Laurence R. Lunden, Vice President, Business Administration
Stanley J. Wenberg, Vice President for Educational Relationships and Development
Paul Cashman, Vice President for Student Affairs
Robert Edward Summers, Dean of Admissions and Records

COLLEGE OF VETERINARY MEDICINE

Administration

William T. S. Thorp, D.V.M., M.S., Professor and Dean (256 Veterinary Science Building)
Robert K. Anderson, D.V.M., M.P.H., Professor and Associate Dean (256 Veterinary Science Building)
Wendell J. DeBoer, Ph.D., Associate Professor and Assistant to the Dean (301E Veterinary Science Building)

Special Services

Hannis L. Stoddard, D.V.M., D.T.V.M., Professor; Director of International Programs (301D Veterinary Science Building)
James O. Hanson, D.V.M., Associate Professor; Director, Continuing Education; Project Leader, Agricultural Extension Service (301B Veterinary Science Building)
Raymond B. Solac, D.V.M., Assistant Professor; Extension Veterinarian (301C Veterinary Science Building)



College of

VETERINARY MEDICINE

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 modern medical science applied to animals. The study of veterinary medicine is concerned with providing the student with a thorough knowledge of the fundamental biological and physical sciences as they relate to animal functions in health and disease. In the clinical years, one correlates and applies this knowledge to the many areas of professional service. With this broad biological knowledge and clinical training, the veterinarian may choose a career from many challenging and interesting opportunities. Individuals interested in animals and biology can find rewarding careers in the profession.

Professional Service and Activities — About 60 percent of the veterinarians in the United States are engaged in private practice, either general or specialized. At present, this usually means caring for farm animals in rural areas or companion animals in urban areas, or both, as in a general practice. There is a growing tendency to develop specialty practice concerned with only one species such as cattle or horses. Other specialty areas, such as obstetrics and surgery, are also developing in both large and small animal practices. Although practice may mean long hours and difficult work at times, it offers professional independence, a sense of satisfaction, and a rewarding career.

A growing percentage of veterinarians in the United States are engaged in fields other than private practice. Many have found careers in biomedical research. An increasing number of veterinarians are preparing themselves through graduate training to specialize in careers devoted to research and teaching in colleges and universities.

A large number of veterinarians serve as specialists, administrators, and research scientists in industry and governmental agencies — state, national, and international. Veterinary medical knowledge and skill contribute to the advancement of science and 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 of service are

General Information

constantly developing and expanding, such as space biomedical programs, comparative medical research, and public health. 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 mean a greater number of household pets which will need veterinary medical care. It has been estimated that we will need to increase the number of veterinarians in the United States from 22,000 to 47,000 by the year 1980 to keep pace with the expected demand for veterinary medical service.

Historical Highlights — It has been said that veterinary medicine developed contemporaneously with the domestication of animals. There is historical evidence that ancient peoples practiced this science and art. Records of formal education in veterinary medicine go back to 1761 when a school for the study of anatomy and diseases of animals was established at Lyons, France. The first veterinary college was established in England late in the 18th century. 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 18 colleges of veterinary medicine with approximately 4,000 students in attendance.

Veterinary Medical Education in Minnesota — The College of Veterinary Medicine at the University of Minnesota came into existence as a result of a combination of several factors. For a number of years the livestock industry of the state of Minnesota had expressed the opinion that a college of veterinary medicine was needed in this region. In 1945 many students from this state were interested in obtaining an education in veterinary medicine. A combination of student demand for veterinary medical education and the need of the livestock industry for increased veterinary services and research in animal diseases led to the appropriation of funds by the 1947 Minnesota State Legislature for the establishment of the School of Veterinary Medicine on the St. Paul Campus of the University. The first class, admitted in the fall quarter of 1947, was graduated in the spring of 1951. From 1947 to 1954 veterinary medicine was administered as a unit of the College of Agriculture, Forestry, Home Economics, and Veterinary Medicine. In 1954 the School of Veterinary Medicine became a separate unit of the Institute of Agriculture; in 1957 the College of Veterinary Medicine was established as a separate college of the University of Minnesota.

In 1956 the College of Veterinary Medicine at the University of Minnesota was accredited by the Council on Education of the American Veterinary Medical Association, subject to continued development and maintenance of standards comparable to other accredited colleges of veterinary medicine.

Departments

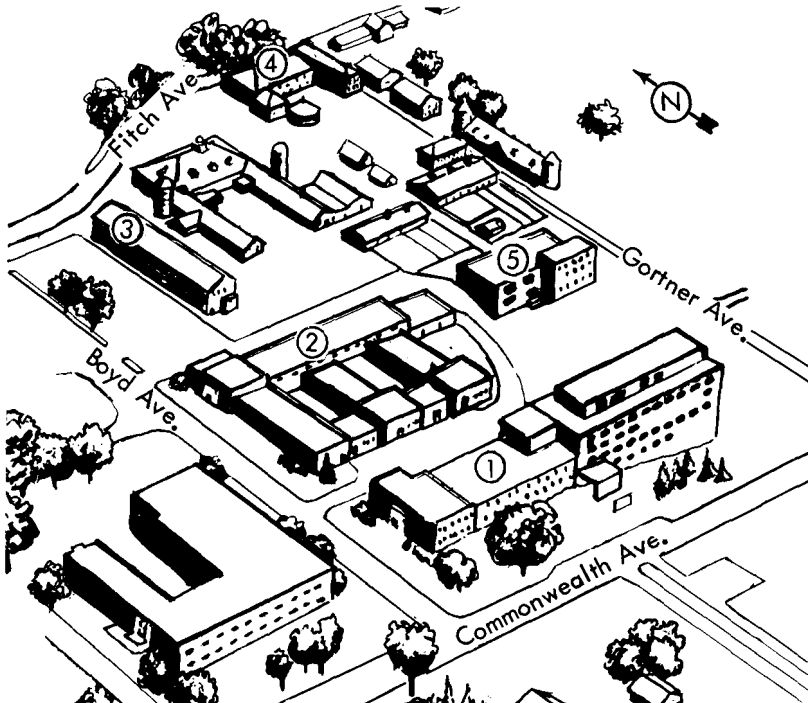
The teaching and research activities of the College of Veterinary Medicine, University of Minnesota, are housed in five major and several minor buildings. Some of the buildings and facilities will be discussed briefly in the following paragraphs. (The number in parentheses following the unit name gives the numbered location on the accompanying map.)

Departments

Veterinary Anatomy (1)— This department is located on the first and second floors of the Veterinary Science Building and offers courses in anatomy, histology, embryology, and neuroanatomy. The laboratory housing an electron microscope is also located in this department.

Veterinary Medicine (2) (3) (4)— This department is located in the Veterinary Clinic Building, Temporary East of Haecker Building, and Veterinary Anatomy Building. Courses in diagnosis, prevention, and treatment of animal diseases are taught to third- and fourth-year students. Business methods and forensic veterinary medicine and other related courses are also taught in this department.

Veterinary Microbiology and Public Health (1)— This department occupies the third floor of the Veterinary Science Building and is concerned with teaching and research in the areas of bacteriology, immunology, mycology, virology, epidemiology, food hygiene, and public health.



Location of Facilities — College of Veterinary Medicine

- 1) Veterinary Science Bldg.
- 2) Veterinary Clinic Bldg.
- 3) Veterinary Diagnostic Laboratories Bldg.
- 4) Temporary East of Haecker Hall
- 5) Old Veterinary Science Bldg.

General Information

Veterinary Obstetrics and Gynecology (2) — Located in the Veterinary Clinic Building, this department offers courses in obstetrics and reproductive diseases to third- and fourth-year veterinary students.

Veterinary Pathology and Parasitology (1) — Courses in animal pathology and parasitology are offered by this department which occupies the second floor of the Veterinary Science Building. The department also operates the clinical laboratories and necropsy laboratory which are located in the Veterinary Clinic.

Veterinary Physiology and Pharmacology (3) — Located in a large temporary building (Temporary East of Haecker) adjacent to the Veterinary Clinic and on the first floor of the Veterinary Science Building, this department is responsible for teaching courses in physiology, pharmacology, and toxicology.

Veterinary Surgery and Radiology (2) — This department is located in the Veterinary Clinic Building. Courses in surgery, radiology, hereditary diseases, and radiobiology are offered by this department.

Veterinary Diagnostic Laboratories (5) — Located in the Veterinary Diagnostic Laboratory Building, this laboratory serves as the official veterinary diagnostic laboratory for the state of Minnesota. Diagnostic laboratory techniques and procedures are taught to fourth-year students.

University Veterinary Hospitals (2) — The University Veterinary Hospitals provide facilities for the medical and surgical treatment and the 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. Faculty from most departments in the college participate in the daily teaching program carried out in the University Veterinary Hospitals. The diagnosis and treatment of animal patients, under staff supervision, enable students to learn the applied aspects of medicine, surgery, and obstetrics. The clinical laboratories provide opportunities for learning the application of principles of parasitology, pathology, bacteriology, and chemistry to diagnosis and treatment of diseases of animals.

Ambulatory Clinics — Ambulatory clinics bring veterinary care to animals on farms. Of the several aspects of this service, one consists of providing veterinary medical care to animals on University farms and to animals on farms within reasonable distance from the St. Paul Campus. Another service, staffed by members of the Department of Veterinary Obstetrics and Gynecology, is designed to provide clinical training and experience in diseases of reproduction. A third service is located at Maple Plain, Minnesota. Facilities include a modern clinic building and housing for students assigned to this service. Laboratory facilities are also provided at this clinic. Veterinary service is provided to livestock owners in the surrounding area. Farm calls are dispatched by two-way radio to provide for maximum efficiency of service.

Preventive veterinary medical programs are another service designed to provide students with experience in the applied aspects of preventive medicine. Total herd health programs have been augmented in beef, swine, and dairy

Continuing Education Programs

herds as well as horse stables which serve as model systems to teach the principles of preventive veterinary medicine.

Ambulatory clinics are designed to provide experience to students in handling cases on the farm. They supplement the training received in the veterinary hospital and are an essential and integral part of the clinical training in veterinary medicine to prepare students for large animal practice.

Other Facilities — The library of the College of Veterinary Medicine is located on the fourth floor of the Veterinary Science Building. The library contains all current veterinary journals as well as many books and current periodicals from related fields such as medicine and animal science.

The facilities of the Minneapolis Health Department, Minnesota Livestock Sanitary Board, the Animal Disease Eradication Division 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.

Special Services

Faculty Advisers — In the College of Veterinary Medicine, each class has an adviser. In addition, each incoming student is assigned to a faculty adviser having a limited number of advisees in order to provide more individual attention. The faculty adviser assists the student in all aspects of his professional development and makes use of faculty and University personnel agencies available to further this development. Students are urged to consult their advisers regarding any matter of concern.

Preveterinary Medicine Advisers — Faculty advising for students enrolled in the preveterinary medicine curriculum in the College of Agriculture, Forestry, and Home Economics is provided by the Office of the Assistant to the Dean, 301 Veterinary Science Building. This office also provides assistance in program planning for high school students and students in other colleges who plan to apply for admission to the College of Veterinary Medicine.

International Veterinary Medicine — The college is involved in courses and programs for the education of both national and foreign students in international veterinary medicine with special emphasis being given to animal health and to increasing animal production on a world-wide basis. Faculty advising in terms of academic programs and special services are provided to the students involved. Special emphasis is given to needs of graduate students.

Continuing Education Programs

The College of Veterinary Medicine regularly schedules continuing education courses for members of the veterinary medical profession in medicine, surgery, clinical and laboratory diagnosis, and public health. These courses are intended to update the profession through the presentation of new developments in research, clinical procedures, and concepts.

Course offerings are announced by special brochures mailed to members of the profession. Constituent veterinary medical associations may also request

General Information

specific courses for their organizations. Sessions include 1- or 2-day conferences or seminars; regularly scheduled meetings once each week, and the opportunity to register for fourth-year elective courses (see Description of Courses, pages 20-33). For further information, please contact: Director, Continuing Education, College of Veterinary Medicine, University of Minnesota, St. Paul, Minnesota 55101.

Student Services

The agencies listed below are available to provide student services at any time and may be consulted directly or by referral of a faculty adviser.

Student Housing Bureau — For help in finding a suitable room or apartment a student may consult this bureau. The St. Paul office is located at 190 Coffey Hall, St. Paul Campus.

Student Counseling Bureau — This bureau provides help and advice on personal problems and on problems of vocational choice. Representatives are available at 190 Coffey Hall, St. Paul Campus. The Minneapolis Campus office is located in 101 Eddy Hall.

Student Activities Bureau — This bureau has offices in Temporary North of Mines Building, Minneapolis Campus, and 190 Coffey Hall, St. Paul Campus. Representatives and the program consultants from the St. Paul Campus Student Center, the Coffman Memorial Union, and the West Bank Union are helpful in the planning and carrying out of extracurricular activities.

Office of Student Financial Aid — If a student is in need of financial counseling or aid, he may apply at the office located in 107 Armory, Minneapolis Campus. (See section on loans and financial aids for veterinary medical students, page 12.)

Student Employment Service — For a part-time job on or off campus a student may apply to the Office of the Dean, 301 Veterinary Science Building, College of Veterinary Medicine, or to the Student Employment Service, 30 Wullung 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.

Speech and Hearing Problems — A student who feels he has problems with his speech or hearing should contact the Speech and Hearing Clinic for consultation. Appointments for appraisal or clinical treatment can be made through the secretary at 190 Coffey Hall, St. Paul Campus.

Veterans' Benefits — Office of Admissions and Records, 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, 717 East River Road, Minneapolis Campus. Those interested in making arrangements for an appointment on the St. Paul Campus should call 373-4094.

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.

Student Affairs

Dean's Student Advisory Committee — The purpose of this committee, composed of one elected representative from each class in the college and the president of the Student Chapter of the American Veterinary Medical

Association, is to provide communication and act as an advisory group to the Office of the Dean on matters affecting the welfare of students, faculty, and the University.

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. The responsibility of honesty is between students, as the faculty does not place the student on his honor.

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 a punitive system. New students are provided with an explanatory brochure and the system is explained to new students during orientation 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) annual College of Veterinary Medicine Open House (Sunday in May); (2) a Minnesota State Fair Booth; (3) maintaining a Speakers' Bureau which provides speakers for groups within 60 miles of the campus; (4) publishing semi-annually the *Minnesota Veterinarian*; (5) sponsoring lectures by prominent scientists; (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 is the national honor society of veterinary medicine whose objective is to recognize and promote scholarship and research in matters pertaining to the welfare and diseases of animals. The local chapter, among its activities, sponsors lectures by outstanding scientists in fields related to veterinary medicine.

St. Paul Campus Student Council — The council directs and coordinates student activities on the St. Paul Campus and encourages student leadership. Its membership is drawn from the College of Agriculture, Forestry, and Home Economics, the College of Veterinary Medicine, the College of Biological Sciences, faculty, and graduate students. The council 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.

General Information

St. Paul Campus Student Center — The Student Center Board of Governors guides the activities of the Student Center, the focal point for 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. The membership of the S.C.B.G. is drawn from the three 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.

Housing Facilities on the St. Paul Campus

Single students attending the University of Minnesota on the St. Paul Campus may live in University residence halls, in private homes, rooming houses, or apartments. Information about all housing facilities may be obtained from the Student Housing Bureau, 190 Coffey Hall, St. Paul Campus.

Bailey Hall, a coeducational residence, is the residence hall on the St. Paul Campus. Residents of Bailey Hall are served meals in the Dining Center which is included in a required contract for the academic year (3 quarters). Residence hall rates for 1969-70 range from \$305 to \$343 per quarter. Further information may be secured by writing directly to: Director, Bailey Hall, University of Minnesota, St. Paul, Minnesota 55101.

Married students may live in University-operated housing in Commonwealth Terrace, an apartment development on the St. Paul Campus. The one-bedroom units rent for \$80 per month, the two bedroom units for \$90 per month based on 1968-69 rates. The units are unfurnished. Rent includes all utilities, except telephone. Further information and applications may be secured by writing to: Family Housing, 1295 Gibbs Avenue, St. Paul, Minnesota 55108.

Counselors in the Student Housing Bureau will assist students in locating suitable housing in approved off-campus locations. Counselors are also available for service to students with problems concerning their living environment.

Rents for single rooms range from \$30 to \$50 per month and double rooms range from \$25 to \$40 per month per student. Eating accommodations are available in the University-operated Dining Center on the St. Paul Campus and in student-operated cooperatives close to campus.

Off-campus apartment rents vary from \$80 to \$200 per month and may be furnished or unfurnished. Listings of apartment vacancies throughout the Twin Cities are available. A married student may find it advisable to come to the campus alone and take temporary housing until suitable quarters for the entire family are found.

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 including their locations will be sent.

Estimated Expenses per School Year

	<i>Total</i>
Tuition and Incidental Fee:	
Resident (\$245 per quarter)	\$ 735
Nonresident (\$553 per quarter)	1659
Microscope, Dissecting Set, Insurance on Equipment (first year only)	400-600
Books and Laboratory Equipment	125-150

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 scholarships available to all University students.

For additional information concerning awards and scholarships, contact either the Office of the Dean, College of Veterinary Medicine, 301 Veterinary Science Building, or the Office of Student Financial Aid, 107 Armory, Minneapolis Campus. In general, it is the responsibility of the interested student to obtain, to complete, and to submit the application by February 1 of each year. The award winners are announced in April or May.

Those awards and scholarships which are limited to veterinary medical students include the following:

Caleb Dorr — Annual cash awards of \$100-\$150 are presented to the individual with the highest cumulative grade point average in the freshman, sophomore, and junior classes. The highest ranking individual in the graduating class is awarded a gold medal.

Minnesota State Veterinary Medical Association — An annual award of \$25 to the outstanding senior student in clinical veterinary medicine.

Women's Auxiliary to the American Veterinary Medical Association — An annual award of \$50 to the senior student who has made outstanding contributions to student activities on the campus.

Women's Auxiliary to the Minnesota State Veterinary Medical Association — An award of \$25 made annually to the 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 — Two or three cash awards made to outstanding junior students showing the most promise and interest in small animal medicine.

Carl Schlotthauer Award — This award is made to a senior veterinary student demonstrating outstanding ability in veterinary surgery.

Veterinary Medical Scholarship Fund — This fund, provided through the generosity of alumni of the College of Veterinary Medicine, provides scholarship aid to worthy students enrolled in or eligible for admission to the College of Veterinary Medicine.

Harvey H. Hoyt Memorial Scholarship Award — An annual award to be made 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 with a preference to be made for students with interests in clinical veterinary medicine.

Ned E. Olson Memorial Scholarship Award — An annual award will be made in the memory of Dr. Ned E. Olson to the senior student in the College of Veterinary Medicine

General Information

who has demonstrated the most proficiency and professional promise in the field of large animal medicine.

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, usually a book, is presented to all students in the College of Agriculture, Forestry, and Home Economics and in the College of Veterinary Medicine who have had 2 or more quarters of work in these colleges and who have an accumulative GPA of 3.50 or better.

Alpha Zeta Traveling Scholarship—When a veterinary 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.

AVMA Foundation Undergraduate Scholarship Awards—Scholarship awards are made by the American Veterinary Medical Association to undergraduate veterinary students to stimulate interest in research. For further information contact: Office of the Dean, College of Veterinary Medicine, 301 Veterinary Science Building.

Women's Auxiliary to the Wisconsin Veterinary Medical Association—A \$100 scholarship is awarded to a Wisconsin resident who is enrolled as a junior in a school 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 is established to provide recognition and financial assistance to qualified students in veterinary medicine at the University of Minnesota. Preference shall be given to (a) residents of Minnesota with (b) special interest in the treatment of small animals.

Ralston Purina Summer Work Scholarships—Awarded to two students of veterinary medicine who have completed their junior year. This award is based on scholarship and participation in extracurricular activities.

Loans and Financial Aids

In general it is the responsibility of the interested student to obtain, to complete, and to submit appropriate application forms. Loans which are administered by the Office of Student Financial Aid of the University of Minnesota or 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 and senior veterinary students or to graduate students. The limit of indebtedness allowed is \$1,000. The interest rate is 2 percent per annum. Repayment of principal may be deferred until 2 years after graduation.

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 \$2,500 per year, but the average loan generally will be less than this amount. Information and application forms may be obtained from the Office of the Dean, 301 Veterinary Science Building, College of Veterinary Medicine, or the Office

Loans and Financial Aids

of Student Financial Aid, 107 Armory (Minneapolis Campus). The priority deadline for applications for financial aid for each coming school year is June 15, except for the incoming class. Notification of the loan awards is usually not made until late summer. Late applications are considered if funds are available.

Health Professions Scholarship Program — Veterinary medicine students will be eligible for Health Professions scholarships for the first time in the 1969-70 school year. 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 \$2,500 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.

Guaranteed Student (Bank) Loans — Loans of up to \$1,500 per year are available from your local bank if it participates in the Guaranteed Student (Bank) Loan Program. It is the applicant's responsibility to complete arrangements with the lender of his choice. Many banks limit these loans to regular customers, or dependents of regular customers, and not every bank participates. The federal government will pay the 7 percent simple interest while the student is in school if the family adjusted income is less than \$15,000, or if the student has been independent of family support and tax exemption claims for the preceding 12 months. Repayment installments and 7 percent simple interest are paid by the student beginning 9 to 12 months after termination of study or graduation. It is recommended that applicants use the forms provided by the Office of Student Financial Aid, 107 Armory (Minneapolis Campus), or Office of the Dean, 301 Veterinary Science Building. Forms are often available at banks, but they do not have the helpful instruction sheet provided by the University.

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 can be completed in the College of Agriculture, Forestry, and Home Economics or at any accredited college that offers the required courses. Faculty advising for students enrolled in the College of Agriculture, Forestry, and Home Economics is provided by the Office of the Dean of the College of Veterinary Medicine.

Human Rights — The University of Minnesota is guided by the principle that there shall be no differences in the treatment of persons because of race, creed, color, or national origin, and that equal opportunity and access to facilities shall be available to all. This principle is particularly applicable in the admission of students in all colleges, and in their academic pursuits. It is also applicable in University-owned or University-approved housing, in food services, student unions, extracurricular activities, and all other student services. It is a guiding policy 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 preveterinary medical program should give consideration to taking all the mathematics and science courses available to him in his high school program of studies. Students who desire to gain admission to the College of Agriculture, Forestry, and Home Economics must meet the general requirements listed in the University of Minnesota *General Information Bulletin*.

The following high school units are required for admission to the College of Agriculture, Forestry, and Home Economics:

3 units in English, 3 units in mathematics (1 unit in elementary algebra, 1 unit in plane geometry, and 1 unit in higher algebra or equivalent), and 1 or more units in natural science or agriculture.

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 students are also encouraged to include biology, chemistry, and physics in their high school programs.

Preveterinary 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 preveterinary requirements should be evaluated with the A-F 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 All-University Council on Liberal Education has established distribution requirements in liberal studies 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 their admission as the area requirements are incorporated in the minimum preveterinary requirement.

Required Areas of Study — The required areas of study, including number of credits for admission to the College of Veterinary Medicine, are as follows:

1. **Communication, Language, Symbolic Systems**
 - English, Communication (9-12 credits)
 - Mathematics (5-15 credits)
 - Trigonometry, college algebra, or equivalent (number of credits will depend on high school math background)
 - Public Speaking (3 or more credits)
2. **The Physical and Biological Sciences**
 - Chemistry (25-30 credits)
 - General inorganic and qualitative, quantitative, and organic (not terminal); all courses must include laboratory
 - Physics (12-15 credits)
 - Should include mechanics, heat, electricity, sound, and light; all courses must include laboratory
 - Biology (10-12 credits)
 - General biology, zoology, or zoology and botany; all courses must include laboratory
3. **Man and Society** (9 or more credits)
 - May be selected from the following areas:
 - Agricultural economics or economics, anthropology, geography, history, political science, psychology, social science, or sociology.
4. **Artistic Expression** (9 or more credits)
 - May be selected from the following areas:
 - Art, literature, or music
5. **Electives**
 - Sufficient additional electives should be chosen to total 90 quarter credits of college work. These electives may be selected on the basis of the student's interest in a broad educational program. Students planning a career in academic or research fields are encouraged to take additional courses in chemistry, physics, and mathematics. Students lacking experience with farm animals may wish to elect courses in the animal sciences.

Recommended Preveterinary Courses — Suggested courses for the preveterinary medical student enrolled in the College of Agriculture, Forestry, and Home Economics that meet the minimum requirements listed above are as follows:

1. **Communication, Language, Symbolic Systems** (20 credits)
 - Rhet 1,2,3, — Freshman Communication requirement (9)
 - Rhet 22 — Public Speaking (3)
 - Math T, 10 — Trigonometry, College Algebra, Analytic Geometry (8)
2. **The Physical and Biological Sciences** (51 credits)
 - GeCh 4, 5 — General Principles of Chemistry (10)
 - GeCh 6 — Principles of Solution Chemistry (4)
 - Anch 57A, 57B — Quantitative Analysis (5)
 - OrCh 61, 62 — Organic Chemistry (10)
 - Phys 1, 1A, 2, 2A, 3, 3A — Introduction to Physics (12)
 - Biol 1, 2 — General Biology (10)

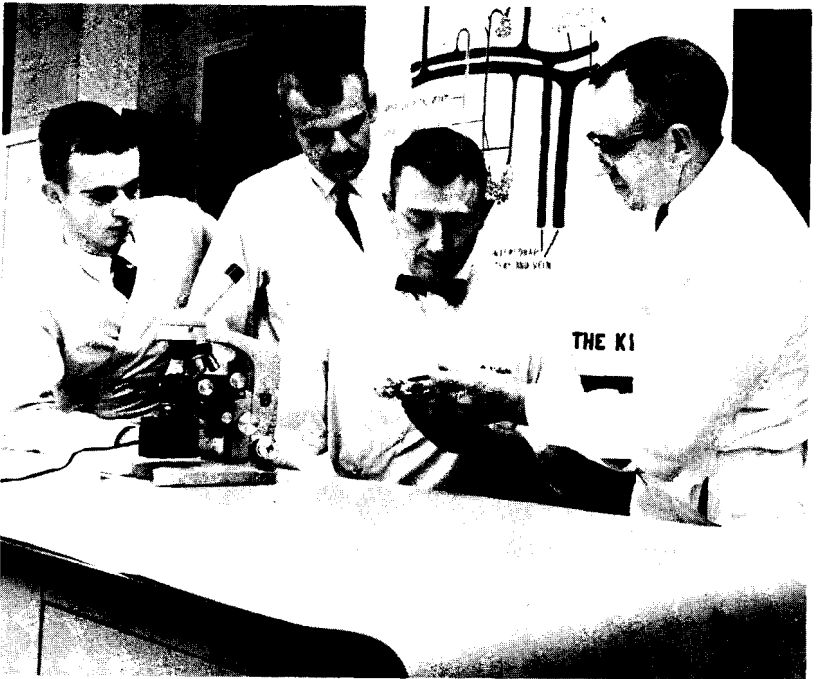
Curricula and Admission Requirements

3. **Man and Society** (9 or more credits)
See 3 above
4. **Artistic Expression** (9 or more credits)
See 4 above
5. **Electives**
See above

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. Application materials should be obtained from the Office of Admissions and Records, Coffey Hall, University of Minnesota, St. Paul, Minnesota 55101.

All candidates are required to take the Veterinary Aptitude Test (Psychological Corporation) and other selected tests. Further information concerning these tests will be provided with admission materials or mailed to applicants



Dr. Alvin F. Weber, Professor and Head, Department of Veterinary Anatomy, and students look at schematic diagram of cardiovascular system

by the Student Counseling Bureau, University of Minnesota. The results of these tests will be forwarded to the Office of Admissions and Records.

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 you wish to enter (*approximately 1 year prior to desired entrance*).

Students who have taken their preveterinary 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 applicant was previously registered in the University of Minnesota) must be accompanied by a \$10 credential examination fee. *Consideration will not be given to applications not accompanied by the credential examination fee.* Remittance by check, money order, or bank drafts 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 until the completion of all preveterinary course requirements is recorded.

Selection of Candidates — Students are selected for admission to the first year of the professional curriculum on the basis of their scholastic attainment in the required preveterinary courses, their performance on tests required for admission, as well as their interest, 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. Selection of candidates will be made as rapidly as possible following receipt of the application, transcripts, references, and test scores. If preveterinary courses are in progress, admission will be provisional, subject to their satisfactory completion. Candidates will be notified of the status of their application not later than March 15. At this time candidates may be granted a final acceptance, a provisional acceptance, a hold for 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 and a professional person, the committee will authorize a final acceptance. A final decision will not be made on an applicant until a transcript showing the completion of the preveterinary medical requirements has been received and evaluated.

Procedure Following Application — All applicants will be informed by approximately March 15 as to the status of their application. All correspondence relative to any application or to admission requirements of the College

Curricula and Admission Requirements

of Veterinary Medicine should be sent, in writing, to the Office of Admissions and Records, University of Minnesota, St. Paul, Minnesota 55101. Accepted applicants will receive a statement for a preliminary fee of \$10 to be applied on the tuition for the first quarter. This fee must be paid within 2 weeks after receipt of the statement and will not be returned if the applicant fails to matriculate.

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 and forfeit their \$10 preliminary deposit fee.

Equipment — All students are required to provide their 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 Department of Veterinary Anatomy. This microscope is required in many courses in the professional curriculum. In addition to a microscope and textbooks, the student will be expected to purchase certain special items of clothing and some instruments.

Special Meetings for Applicants to College of Veterinary Medicine — The University of Minnesota Preveterinary Medicine Club arranges two meetings each year which are of special interest to applicants to the College of Veterinary Medicine. Prior to November 15 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
Preveterinary Medicine Club
301 Veterinary Science Building
University of Minnesota
St. Paul, Minnesota 55101

Degrees Offered

The College of Veterinary Medicine will recommend students for the following degrees:

Bachelor of Science (B.S.) degree without designation, 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 199 credit hours, of which 109 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, 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 244 credit hours in the professional curriculum.

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 of the first 3 years are identical 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 knowledge of the fundamentals of normal and abnormal functions of the body are integrated and expanded in relation to prevention of diseases. Summer clinics (9 credits) are required between the third and fourth year. Elective credits (15) 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 the fourth-year student are identified in this bulletin in the Description of Courses section.

DESCRIPTION OF COURSES

Courses required for the D.V.M. degree are listed according to the departments which offer them with the exception of the following courses which must be completed in the first year:

GCB 66 — Principles of Genetics (3 cr)

Offered by the Genetics and Cell Biology Department of the College of Biological Sciences.

MdBe 102, 103 — Physiological Chemistry (12 cr)

Offered by the Biochemistry Department of the Medical School.

Elective courses available to the fourth-year students are identified in groupings entitled *Other Course Offerings*, also listed by departments.

Department of Veterinary Anatomy (VAnA)

Professor

Alvin F. Weber, D.V.M., Ph.D., *head*

Associate Professor

Thomas F. Fletcher, D.V.M., Ph.D.

Assistant Professor

Caroline M. Czarniecki, Ph.D.
Everett Heath, D.V.M., Ph.D.
James C. Vanden Berge, Ph.D.

Instructor

Robert F. Hammer, D.V.M.
William D. Martin, M.S.

Teaching Assistant

Barbara H. Dickinson, B.A.

REQUIRED COURSE OFFERINGS

- 101 (5-201). Anatomy of the Dog.** 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. A survey of the structure of the chicken will be included. (5 cr; prereq #)
- 102 (5-202). Veterinary Comparative Anatomy.** Comparative study of the structural and functional gross morphologic features of domestic animals, including: horses, cattle, sheep, swine, and selected laboratory animals. (5 cr; prereq #)
- 106 (5-406). Veterinary Clinical Anatomy.** Regional study of gross anatomy of domestic animals relating structure and function to clinical veterinary medicine and surgery. The course is presented in two sections: (a) Anatomy of dogs, cats, and pet birds, and (b) Anatomy of horses, cattle, swine, sheep, and poultry. (4 cr; prereq 101, 102, #)
- 130 (5-230). Veterinary Neuroanatomy.** 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. (3 cr; prereq #)
- 150 (5-250). Comparative Prenatal Development of Domestic Animals.** 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. (3 cr; prereq #)

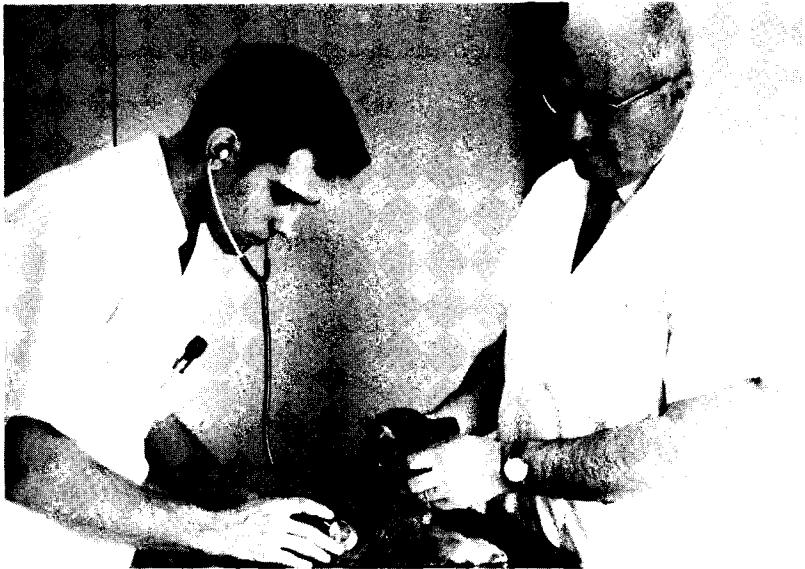
- 151-152-153 (5-261/5-262/5-263). Microscopic Anatomy of Domestic Animals.** Light microscopic and relevant ultrastructural studies of cells, tissues, and organ systems. (3 cr for 151, 4 cr for 152, 4 cr for 153; prereq #)

OTHER COURSE OFFERINGS

- 120 (5-120). Essentials of Vertebrate Development and Structure.** Principles and patterns of vertebrate anatomy, based on the developmental approach. (5 cr; not open to veterinary medical students; prereq Biol 2 or 50 or #)
- 121 (5-140). Comparative Vertebrate Microscopic Anatomy.** Comparative studies of tissues and organs of representative examples of vertebrates. (5 cr; prereq Biol 2 or 50 and VAna 120 or #)
- 134 (5-534). Canine Clinical Neurology.** The anatomic and physiologic basis for the neurologic examination of the dog is discussed. (1 cr; prereq regis Vet Med, 4th yr or grad, or #)

ADVANCED CREDIT COURSE OFFERINGS

- 190° (5-780). Seminar: Veterinary Anatomy**
- 191° (5-791). Topics of Organology**
- 201, 202 (8-201, 8-202). Comparative Veterinary Neurology**
- 203 (8-230). Experimental Comparative Veterinary Neurology**
- 250 (8-261). Morphology of Animal Cells and Intercellular Substances**
- 251 (8-280). Histologic and Ultrahistologic Techniques**



*Dr. George W. Mather, Professor, Department of Medicine,
and student examine a dog*

Description of Courses

Department of Veterinary Medicine (VM)

Professor

Dale K. Sorensen, D.V.M., Ph.D., *head*
Donald G. Low, D.V.M., Ph.D., *head*,
University Veterinary Hospitals
Donald W. Johnson, D.V.M., Ph.D.
George W. Mather, D.V.M., Ph.D.

Assistant Professor

Alex A. Ardans, D.V.M., M.S.
Delmar Finco, D.V.M., Ph.D.
LaRue W. Johnson, D.V.M., Ph.D.
Vaughn L. Larson, D.V.M., Ph.D.
Richard E. Shope, Jr., D.V.M., Ph.D.

Research Associate

Victor Dirks, B.S., M.S.
Sukanta K. Dutta, D.V.M., Ph.D.

Instructors

John F. Anderson, D.V.M.
Ralph Farnsworth, D.V.M.
Carl A. Osborne, D.V.M.
Ronald Werdin, D.V.M.

Lecturer

Thornton Anderson, B.A., LL.B.

REQUIRED COURSE OFFERINGS

- 101 (5-101). Veterinary Physical Diagnosis.** Fundamentals of clinical veterinary medicine, procedures in physical diagnosis, and restraint of animals. (2 cr; prereq #)
- 102 (5-201). Large Animal Medicine.** Study of the diseases of the cutaneous, musculoskeletal, respiratory, cardiovascular, hemic and lymphatic systems of large domestic animals. (5 cr; prereq 101 or #)
- 103 (5-202). Large Animal Medicine.** Study of the diseases of the digestive, urinary, endocrine and nervous systems, and organs of special sense of large domestic animals. (7 cr; prereq 102 or #)
- 104 (5-203). Large Animal Medicine.** Study of nutritional, metabolic, and infectious diseases of large domestic animals. (6 cr; prereq 103 or #)
- 106 (5-301). Small Animal Medicine.** Introductory discussions of breeds, care, feeding, nutritional problems, and management of companion pet animals. Study of diseases of the cutaneous, musculoskeletal, respiratory and cardiovascular systems of companion animals. (3 cr; prereq 101 or #)
- 107 (5-302). Small Animal Medicine.** Diseases of the hemic, lymphatic, digestive, urinary, genital, endocrine, and nervous systems of companion animals. (4 cr; prereq 106 or #)
- 108 (5-303). Small Animal Medicine.** 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. (3 cr; prereq 107 or #)
- 110-111 (5-102/5-103). Diagnostic and Therapeutic Techniques.** Demonstration and application of diagnostic techniques and procedures. Discussions of therapeutic regimens and demonstrations of therapeutic procedures. (2 cr for 110, 2 cr for 111; prereq #)
- 120-121 (5-501/5-502). Clinics.** An introduction to medical, obstetrical, radiological, surgical, and laboratory examination of animals. (No cr; required course; prereq 110, 111, #)
- 122A,B-123-124 (5-510, 5-511/5-512/5-513). Clinics.** Laboratory for the application of principles and technics 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. 122A,B and 123 also include laboratories on the application

of principles of public health. (3 cr for 122A or B, 8 cr for 123, 8 cr for 124; prereq 121 or #)

- 125 (5-520). Special Clinics.** Same as VM 124 except that students may elect large animal clinic, small animal clinic, or a combination of both. (8 cr; prereq 124 or #)
- 126-127-128 (5-530/5-531/5-532). Clinic Rounds.** Discussion of clinical material in the various areas within the Veterinary Clinic. (No cr; prereq #)
- 130 (5-401). A Survey of Law and Business Methods.** Business and legal procedures applicable to veterinary practice. Responsibilities of the veterinarian to the client, the public, and the profession. (3 cr; prereq #)
- 131 (5-210). Preventive Veterinary Medicine.** Principles and applications of preventive veterinary medical procedures for specialized practice. (3 cr; prereq #)

OTHER COURSE OFFERINGS

- 52 (3-502). Animal Hygiene.** Principles of animal health and disease with emphasis on prevention, control, and eradication. (5 cr; not open to veterinary medical students)
- 133 (5-320). Hospital Management.** Consists of lectures on managing a small animal hospital, including zoning restrictions, employee supervision, drug purchases, facilities, fees, and other information pertinent to a modern veterinary medical hospital. (1 cr; prereq regis Vet Med, 4th yr or grad, or #)
- 134 (5-402). Investments and Insurance.** Consists of the fundamentals of investments in bonds, common and preferred stocks and mutual funds, and the fundamentals of general and life insurance. (1 cr; prereq regis Vet Med, 4th yr or grad or #)
- 137 (5-220). Poisonous Plants.** Important plants poisonous to animals; identification, toxicology, diagnosis, and treatment. (2 cr; prereq regis Vet Med, 4th yr or grad or #)
- 141 (5-325). Medical and Surgical Ophthalmology.** Consists of sixteen 1-hour lectures on medical and surgical ophthalmology, and four 3-hour laboratories on the examination of the eye, special techniques, and surgical exercises. (2 cr)
- 144 (5-330). Acid-Base, Electrolyte, and Fluid Therapy in Small Animal Practice.** Consists of a review of the theoretical aspects of water, electrolyte, and acid-base balance, and an application of these principles both to general situations of imbalance, and to individual uses in which imbalance exists. (1 cr; prereq regis Vet Med, 4th yr or grad or #)
- 146 (5-410). Applied Immunology.** Consists of a review of the principles of immunology and the clinical applications of these principles. Emphasis will be placed on practical methods of vaccination against viral diseases of domestic animals. (2 cr; prereq regis Vet Med, 4th yr or grad or #)
- 148 (5-230). Diseases of Zoo Animals and Exotic Pets.** Consists of discussions of common disease problems and management procedures of reptiles, fish, primates, felines, rodents, large and small mammals. Includes procedures utilized in the restraint, medication, and diagnosis in these animals. (1 cr; prereq regis Vet Med, 4th yr or grad or #)
- 149 (5-340). Small Animal Dermatology.** Consists of detailed discussions of the pathogenesis, clinical features, diagnosis, and therapy of skin diseases of dogs and cats. (1 cr; prereq regis Vet Med, 4th yr or grad or #)

Description of Courses

- 150 (5-790). **Seminar: World Food Supply Problems.** (Same as AgEc 179, HE 172, PIPa 170, and Soc 264) A multidisciplinary approach will examine the social, economic, and technical problems of feeding the world's growing population. Principles will be sought from the social and economic sciences, the plant sciences, the animal sciences, and the nutritional sciences for their application to food problems. (3 cr; limited enrollment; prereq major in agriculture, veterinary medicine, nutritional sciences, social science field or ♫...grad students by Δ only)
- 170 (5-335). **Diseases of the Kidney, Liver, and Pancreas.** (Same as VPAP 170) Illustrated discussions integrating lesions, pathogenesis, and signs of the diseases of the liver, kidney, and pancreas. (3 cr; prereq regis Vet Med, 4th yr or grad or ♫)

ADVANCED CREDIT COURSE OFFERINGS

- 201 (8-210). **Advanced Veterinary Medicine**
- 202 (8-220). **Advanced Diagnosis and Therapeutics and Animal Diseases**
- 203 (8-230). **Seminar**
- 204 (8-240). **Medical Conference**

Department of Veterinary Microbiology and Public Health (VMic)

Professor

Benjamin S. Pomeroy, D.V.M., Ph.D., *head*
Robert K. Anderson, D.V.M., M.P.H.,
associate dean
R. K. Lindorfer, Ph.D.

Instructor

S. K. Maheswaran, M.R.C.V.S., M.S.,
Ph.D.
Robert A. Robinson, B.D.Sc., Dipl.
Micro.

Associate Professor

Stanley L. Diesch, D.V.M., M.P.H.
Keith I. Loken, D.V.M., Ph.D.

Lecturer

Pedro N. Acha, D.V.M., M.P.H.
Lester H. Burkert, D.V.M.
Paul J. Cox, D.V.M., M.P.H.
Jack G. Flint, D.V.M.
James H. Steele, D.V.M., M.P.H.
Daniel F. Werring, D.V.M.

Assistant Professor

James A. Libby, D.V.M., M.S.
Richard E. Shope, Jr., D.V.M., Ph.D.

REQUIRED COURSE OFFERINGS

- 101 (5-101). **General Veterinary Bacteriology and Immunology.** Lectures and laboratory on the classification, morphology, taxonomy, genetics, physiology, and ecology of microorganisms. Practical application of the fundamental principles of microbiology to other phases of science and industry. (5 cr; prereq 10 cr chemistry, 4 cr biological science)
- 102 (5-102). **Pathogenic Bacteria and Fungi.** Lectures and laboratory on animal pathogens with emphasis on basic mechanisms of infection. (5 cr; prereq 101 or equiv, or ♫)
- 103 (5-103). **Veterinary Virology.** Lectures and laboratory on the basic techniques of virology; emphasis on viral and rickettsial agents causing animal diseases. (5 cr; prereq 102 or equiv, or ♫)

Veterinary Microbiology and Public Health

- 125 (5-210). Veterinary Epidemiology.** Principles of epidemiology, ecology, and veterinary public health. Biostatistics applied to the measurement of health and disease in populations. (4 cr; prereq 10 cr biology, 12 cr chemistry, or #)
- 126 (5-220). Veterinary Public Health.** Principles and practice of environmental health and food hygiene including meat, poultry, milk, and other foods as related to animal and human health. Selected diseases transmitted between animals and man. (4 cr; prereq 103, VPAP 153, or equiv, or #)
- 131 (5-331). Poultry Diseases.** Advanced lectures dealing with diseases, management, and feeding practices in current poultry production. (3 cr; prereq 103, VPAP or equiv, or #)

OTHER COURSE OFFERINGS

- 53 (3-103). General Microbiology.** Lectures and laboratory exercises concerning the morphology, taxonomy, genetics, physiology, and ecology of microorganisms. Practical application of the fundamental principles of microbiology to other phases of science and industry. (5 cr; not open to veterinary medical students; prereq 10 cr chemistry, 4 cr biologic sciences)
- 123 (5-520). Veterinary Science.** (Same as VPP 123 and PhmT 123) Professional interrelationships between pharmacists and veterinarians; disease problems of domestic animals; veterinary pharmacotherapeutics. (3 cr; prereq pharmacy sr, or Phsl 70, Phcl 102, or equiv, or #)
- 128 (5-410). Problems in Veterinary Bacteriology and Public Health.** (Cr ar; prereq 103 or equiv, #)
- 130 (5-300). Poultry Disease Control.** General anatomy; physiology of digestion and reproduction; prevention and control of the more important diseases affecting poultry. (3 cr; not open to veterinary medical students; prereq Biol 2, and AnSc 1, MicB 53 or equiv)
- 132 (5-332). Poultry Disease Prevention and Nutrition.** Principles and applications of poultry disease preventive programs; management and nutrition. (3 cr; prereq regis Vet Med, 4th yr or grad, or #)
- 140 (5-230). Laboratory Animal Medicine.** Consists of a series of lectures, discussions, and demonstrations on the various aspects of the care and management of the numerous species of laboratory animals found in a research situation. The subject matter to be covered would include diseases, nutrition, zoonoses, gnotobiotics, restraint, anesthesia, and environmental practices. Tours of laboratory animal colonies, both commercial and institutional, will be included. (2 cr; prereq regis Vet Med, 4th yr or grad, or #)
- 150 (5-240). Epidemiology of Zoonoses.** Zoonotic diseases of major importance will be discussed. Reservoirs, sources, transmission, and the specific prevention and control programs of diseases will be emphasized. (2 cr; prereq regis Vet Med, 4th yr or grad, or #)
- 188 (5-320). Comparative Medicine and Public Health.** Man's relationship to biologic environment. Interrelationships of animal and human health; occurrence of animal diseases, ecology of zoonoses, food production and hygiene, laboratory animal medicine. (2 cr; prereq PubH 100A or #)

Description of Courses

ADVANCED CREDIT COURSES

- 201 (8-210). Advanced Poultry Diseases**
- 205 (8-205). Advanced Veterinary Bacteriology**
- 211 (8-211). Seminar: Veterinary Bacteriology**
- 221 (8-221). Zoonoses and Comparative Medicine**

Department of Veterinary Pathology and Parasitology (VPaP)

Professor

Henry J. Griffiths, D.V.M., Ph.D., *head*
Victor Perman, D.V.M., Ph.D.
J. H. Sautter, D.V.M., Ph.D.
W. T. S. Thorp, D.V.M., M.S., *dean*

Assistant Professor

H. J. Kurtz, D.V.M., Ph.D.
J. C. Schlotthauer, D.V.M., Ph.D.

Instructor

John F. Quast, D.V.M.

Associate Professor

D. M. Barnes, D.V.M., Ph.D.
William J. Bemrick, Ph.D.
K. H. Johnson, D.V.M., Ph.D.

REQUIRED COURSE OFFERINGS

- 101 (5-101). Veterinary Parasitology.** Systemic and biologic study of the protozoan and arthropod parasites of animals. Emphasis is placed on their relationships to disease and the principles of parasite control. (5 cr; prereq ¶151 or #)
- 102 (5-102). Veterinary Parasitology.** Helminth parasites and parasitic diseases of animals with emphasis on principles of control. (4 cr; prereq #)
- 151 (5-201). General Veterinary Pathology.** 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. (5 cr; prereq #)
- 152-153 (5-202/5-203). Special Veterinary Pathology.** 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. (5 cr for 152, 4 cr for 153; prereq 151 or #)
- 154 (5-204). Veterinary Clinical Pathology.** Technique, application, and interpretation of laboratory tests used in clinical diagnosis. (3 cr; prereq 153 or #)

OTHER COURSE OFFERINGS

- 103 (5-103). Diseases and Parasites of Wildlife.** Economic and biologic relationships of animal parasites and disease to regional wildlife. (3 cr; prereq #)
- 156 (5-308). Diseases of Fur-Bearing Animals.** Etiology, symptomatology, and treatment of diseases of fur-bearing animals. (2 cr; prereq 153, VMC 122, regis Vet Med, 4th yr or grad, or #)
- 170 (5-301). Diseases of the Kidney, Liver, and Pancreas.** (Same as VM 170) Illustrated discussions integrating lesions, pathogenesis, and signs of the diseases of the liver, kidney, and pancreas. (1-3 cr; prereq regis Vet Med, 4th yr or grad, or #)



Students in the Department of Veterinary Microbiology and Public Health examine cultures of pathogenic bacteria

- 171 (5-302). **Diseases of the Pig.** Illustrated lectures on the pathogenesis and pathology of porcine diseases with emphasis on the differential etiologic diagnosis of common clinical disease syndromes. (2 cr; prereq regis Vet Med, 4th yr or grad, or #)
- 172 (5-303). **Infectious and Noninfectious Diseases of the Cat.** Illustrated discussions of the gross and microscopic pathology and pathogenesis of common nutritional, viral, bacterial, mycotic, and neoplastic diseases of cats. (1 cr; prereq regis Vet Med, 4th yr or grad, or #)
- 173 (5-304). **Skin Diseases of Small Animals Resulting from Parasitic Infestations.** A morphological study of the ectoparasites of dogs, cats, rabbits, and birds with histopathological study of some lesions resulting from parasitic infestations. (1 cr)
- 174 (5-305). **Internal Parasites of Sheep and Cattle.** A morphological and biological study of the endoparasites with emphasis on identification, bionomics, prevention, and control. (1 cr)
- 175 (5-306). **Tumors of Domestic Animals.** Tumors of domestic animals will be discussed and illustrated. (1 cr; prereq regis Vet Med, 4th yr or grad, or #)
- 176 (5-307). **Diseases of the Central Nervous System.** Selected diseases involving the central nervous system will be discussed and illustrated. (2 cr; prereq regis Vet Med, 4th yr or grad, or #)

Description of Courses

- 177 (5-309). Diagnostic Poultry Pathology.** Diagnosis of spontaneous diseases of chicken, turkey, ducks, geese, captive and wild gamebirds. (2 cr; prereq regis Vet Med, 4th yr or grad, or #)
- 178 (5-310). Diagnostic Gross Pathology of Infectious Diseases in Large Animals.** Diagnostic procedures relating to gross lesions and background of disease outbreak. (2 cr; prereq regis Vet Med, 4th yr or grad, or #)

ADVANCED CREDIT COURSE OFFERINGS

- 155x (5-205). Veterinary Clinical Pathology**
- 157x (5-401). Veterinary Necropsies**
- 158x (5-402). Surgical Pathology**
- 159 (5-403). Oncology**
- 160x (5-404). Diagnostic Pathology**
- 161 (5-405). Pathology of Spontaneous Diseases of Laboratory Animals**
- 162 (5-406). Pathology of Spontaneous Diseases of Poultry**
- 163 (5-407). Comparative Neuropathology**
- 202x (8-801). Seminar: Veterinary Pathology**
- 240x (8-802). Advanced Veterinary Parasitology**
- 241x (8-803). Problems in Veterinary Parasitology**

Department of Veterinary Physiology and Pharmacology (VPP)

Professor

Clarence M. Stowe, D.V.M., Ph.D., *head*
Harold E. Dziuk, D.V.M., Ph.D.
Archie L. Good, D.V.M., Ph.D.
Paul B. Hammond, D.V.M., Ph.D.

Assistant Professor

Gary E. Duke, Ph.D.
Grace W. Gray, Ph.D.
Edward F. Jankus, D.V.M., Ph.D.
Garth E. Miller, Ph.D.
Everett C. Short, D.V.M., Ph.D.
John P. Sullivan, D.V.M., Ph.D.

REQUIRED COURSE OFFERINGS

- 105-106-107-108 (5-150/5-160/5-170/5-180). Animal Physiology.** Physiology of the circulatory, respiratory, digestive, urinary, and nervous system, and special senses in animals. (4 cr for 105 [lect], 2 cr for 106 [lab], 3 cr for 107 [lect], 2 cr for 108 [lab]; prereq VAna 120, MdBc 103, or equiv, or #)
- 109 (5-310). General Endocrinology.** (Same as AnSc 109, Zool 109) The physiological effects of the endocrine organs and hormones. (3 cr; prereq 45 or 6 cr systemic physiology, or #)
- 151 (5-650). Veterinary Pharmacology.** Local and general anesthetic, analgesic, antipyretic, analeptic, and autonomic drugs. (6 cr; prereq 108, or equiv, or #)
- 152 (5-660). Veterinary Pharmacology.** Cardiovascular, chemotherapeutic, anthelmintic, and gastrointestinal drugs. (4 cr; prereq 151, or equiv, or #)

Veterinary Physiology and Pharmacology

- 181 (5-960). Veterinary Toxicology.** Toxicology of minerals, pesticides, herbicides, poisonous plants, venoms, and miscellaneous toxicants. (3 cr; prereq 152 or equiv, or #)

OTHER COURSE OFFERINGS

- 45 (1-300). Systemic Physiology.** (Same as AnSc 45) Introduction to animal physiology, emphasizing the function of organs. (6 cr, §41, §42, §Poul 105, §Poul 106; not open to veterinary medical students; prereq Biol 2, BioC 1 or equiv)
- 110 (5-312). Physiology of Lactation.** (Same as AnSc 110) Anatomy, physiology, and biochemistry of the mammary gland; hormonal and neural factors responsible for mammary growth; initiation and maintenance of lactation; physiology of suckling and milking; milk synthesis and factors influencing the lactation curve. (3 cr, §DyHu 121; prereq 45, or #)
- 111 (5-311). Physiology of Reproduction.** (Same as AnSc 111, Zool 111) Fundamentals of reproductive physiology including functions of the reproductive organs, fertilization, estrous cycle and its endocrine control, reproductive efficiency and problems, and principles of artificial insemination. (3 cr, §DyHu 49, §DyHu 149; prereq 45 or 6 cr systemic physiology, or #)
- 123 (5-520). Veterinary Science.** (Same as VBac 123, PhmT 123) Professional interrelationships between pharmacists and veterinarians; disease problems of domestic animals; veterinary pharmacotherapeutics. (3 cr; prereq pharmacy sr, or Phsl 70, Phcl 102, or equiv, or #)
- 134 (5-313). Avian Physiology.** (Same as AnSc 134, Zool 134) Physiology of various species of wild and domestic birds. (3 cr; prereq 45 or 6 cr systemic physiology or equiv, or #; offered winter qtr 1969-70 and alt yrs)
- 150 (5-314). Behavioral Physiology.** (Same as AnSc 150, Zool 150) 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. (3 cr; prereq 45 or 6 cr systemic physiology, Biol 110, or #)
- 191 (5-440). Canine Cardiology.** The clinical application of physiological and radiological parameters for diagnosing congenital and acquired cardiovascular diseases of the dog. (1 cr; regis Vet Med, 4th yr or grad, or #)

ADVANCED CREDIT COURSE OFFERINGS

- 120 (8-120). Seminar: Animal Physiology.** (2 cr; prereq 109 or #)
- 161 (8-620). Seminar: Veterinary Pharmacology.** (Cr ar; prereq 152 or equiv, or #)
- 171 (8-920). Problems in Veterinary Pharmacology.** (Cr ar; prereq 152 or equiv, or #)
- 205 (8-510). Physiological and Pharmacological Research Techniques in Large Animals**
- 231 (8-830). Research in Physiology**

Description of Courses

Department of Veterinary Obstetrics and Gynecology (VObs)

Professor

Raimunds Zemjanis, D.V.M., Ph.D., *head*
Francis A. Spurrell, D.V.M., Ph.D.

Associate Professor

Richard H. Schultz, D.V.M., Ph.D.

Assistant Professor

Melvyn L. Fahning, D.V.M., Ph.D.

Instructor

Charles D. Gibson, D.V.M.

Research Fellow

John C. Ellery, D.V.M., M.S.

REQUIRED COURSE OFFERINGS

- 101 (5-001). **Veterinary Obstetrics.** Lectures covering physiology and pathology of pregnancy, obstetrics, and diseases of the newborn. Laboratory practices in manipulative obstetrics. (4 cr; prereq VM 101 or #)
- 102 (5-211). **Reproductive Diseases of Domestic Animals.** Lectures covering physiology and pathology of reproduction, artificial insemination, and breeding management. (4 cr; prereq VM 101 or #)
- 103 (5-103). **Clinical Diagnosis in Animal Reproduction.** Lectures, demonstrations, and laboratory practices covering diagnostic techniques and procedures. (4 cr; prereq VM 101 or #)

OTHER COURSE OFFERINGS

- 105 (5-105). **Infertility Clinics.** Investigation of hospital cases and field problems of infertility of domestic animals. Includes clinical examination, discussion of diagnosis, prognosis, and therapy. Assignment of special study of certain reproductive disorders. (Cr ar; prereq 102, 103 or #)
- 120 (5-120). **Heredity in Animal Disease.** Application of genetic principles of animal disease problems with emphasis upon specific inheritable and familial conditions in domesticated species. (3 cr; prereq GCB 66 or equiv, or #)
- 121 (5-305). **Breeding Patterns, Breeding Technology, and Infertility in Cattle.** 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. (2 cr; prereq 101, 102, 103, regis Vet Med 4th yr or grad or #)
- 123 (5-310). **Reproduction and Infertility in the Bull.** Lectures and demonstrations covering reproductive patterns, management, fertility, and infertility in the bull. Emphasis is on a clinical approach to diagnosis, prognosis, and treatment. (1 cr; prereq VObs 102 and regis Vet Med, 4th yr or grad or #)
- 124 (5-324). **Reproduction and Infertility in Swine.** Lectures and demonstrations involving reproductive patterns, breeding practices, management, artificial insemination, synchronization of estrus, economics of reproductive performance, and infertility in swine. (1 cr; prereq VObs 102 and regis Vet Med, 4th yr or grad or #)
- 125 (5-405). **Reproduction and Infertility in the Horse.** Lectures and demonstrations involving reproductive patterns, breeding practices, management, artificial insemination, economics of reproductive performance, and infertility in horses. (1 cr; prereq VObs 102 and regis Vet Med, 4th yr or grad or #)

Veterinary Surgery and Radiology

126 (5-505). Reproductive Patterns and Infertility in the Dog and Cat. Lectures and demonstrations involving reproductive patterns, management, artificial insemination, and infertility in dogs and cats. (1 cr; prereq VObs 102 and regis Vet Med, 4th yr or grad or #)

ADVANCED CREDIT COURSE OFFERINGS

201 (8-100). Advanced Diagnostic Methods

204 (8-600). Special Problems in Animal Reproduction

210, 211, 212 (8-210, 8-211, 8-212). Advanced Endocrinology of Reproduction

Department of Veterinary Surgery and Radiology (VSR)

Professor

John P. Arnold, D.V.M., Ph.D., *head*
Donald L. Piermattei, D.V.M., Ph.D.
Edward A. Usenik, D.V.M., Ph.D.

Instructor

Eberhard Rosin, D.V.M.
Bernard E. Wall, D.V.M.

Associate Professor

Griselda F. Hanlon, D.V.M., M.S.

Lecturer

Raymond J. Boge
Robert Nelson, D.V.M.

Assistant Professor

Carl R. Jessen, D.V.M., Ph.D.
Victor S. Myers, Jr., D.V.M., M.S.

REQUIRED COURSE OFFERINGS

101 (5-001). Introduction to Surgical and Radiological Clinics. (1 cr; prereq VM 101 or #)

102 (5-011). Principles of Veterinary Surgery. 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. (5 cr; prereq VM 101 or #)

103 (5-021). Veterinary Surgery. Common surgical procedures of large and small animals. (5 cr; prereq 102 or #)

104 (5-101). Small Animal Surgery.** (3 cr; prereq 102 or #)

105 (5-201). Large Animal Surgery.** (3 cr; prereq 102 or #)

121 (5-401). Veterinary Radiology. Preparation and interpretation of radiographs and fluoroscopic examinations; consideration of radiant energy as a therapeutic agent; discussion of protective measures against radiation hazards. (3 cr; prereq VM 101 or #)

OTHER COURSE OFFERINGS

124 (5-421). Roentgen Diagnosis of Diseases of the Skeletal System of Small Animals. (1 cr; prereq 121, regis Vet Med, 4th yr or grad, or #)

** Either VSR 104 or 105 is required.

Description of Courses

- 125 (5-431). **Roentgen Diagnosis of Diseases of the Skeletal System of Large Animals.** (1 cr; prereq 121, regis Vet Med, 4th yr or grad, or #)
- 131 (5-301). **Heredity in Animal Disease.** Application of genetic principles on animal disease problems with emphasis upon specific inheritable and familial conditions in domesticated species. (3 cr; prereq GCB 66 or equiv or #)
- 141 (5-111). **Medical and Surgical Ophthalmology of Small Animals.** Consists of sixteen 1-hour lectures on medical and surgical ophthalmology, and four 3-hour laboratories on the examination of the eye, special techniques, and surgical exercises. (1 or 2 cr; prereq regis Vet Med, 4th yr or grad, or #)
- 151 (5-121). **Small Animal Orthopedics Surgery.** Discussion of small animal orthopedic problems with the application of surgical procedures to effect their correction. (2 or 3 cr; prereq regis Vet Med, 4th yr or grad, or #)
- 161 (5-231). **Large Animal Orthopedics.** A general discussion of equine gaits and lamenesses will be followed by detailed discussions of specific lamenesses. Signs, causes, diagnostic principles, and treatments will be covered. Visual aids will be used. (2 or 3 cr; prereq regis Vet Med, 4th yr or grad, or #)
- 165 (5-241). **Abdominal Surgery in the Bovine and Equine Species.** Specific diagnosis, diagnostic procedures, and surgical treatments of abdominal diseases in the cow and horse. (2 cr; prereq regis Vet Med, 4th yr or grad, or #)
- 169 (5-251). **Surgical Diseases of the Mammary Gland.** Etiology, diagnosis, and treatment of congenital and acquired surgical diseases of the mammary gland with emphasis on the bovine species. (2 cr; prereq regis Vet Med, 4th yr or grad, or #)



A student, Mr. Ben Agborbesong, examines a horse in the large animal clinic

Veterinary Diagnostic Laboratories

191 (5-440). **Canine Cardiology.** The clinical application of physiological and radiological parameters for diagnosing congenital and acquired cardiovascular diseases of the dog. (1 cr; prereq 121, regis Vet Med, 4th yr or grad, or #)

ADVANCED CREDIT COURSE OFFERINGS

- 208 (8-110). **Seminar: Veterinary Surgery**
210x (8-401). **Advanced Veterinary Radiology**
219 (8-421). **Fundamentals of Nuclear Medicine**
220 (8-501). **Anesthesia**
223 (8-541). **Large Animal Anesthesia**
225 (8-121). **Advanced Small Animal Surgery**
230 (8-221). **Advanced Large Animal Surgery**
231 (8-231). **Problems in Large Animal Orthopedics**
233 (8-241). **Surgery of the Gastrointestinal System**
235 (8-441). **Radiation Biology**
240 (8-251). **Surgical Diseases of the Mammary Gland of Domestic Animals**

Department of Veterinary Diagnostic Laboratories

Professor

John M. Higbee, D.V.M., *head*

Associate Professor

Martin E. Bergeland, D.V.M., Ph.D.
Glen H. Nelson, D.V.M.

The faculty members of the Veterinary Diagnostic Laboratories participate in the teaching program, in clinical, lecture, and laboratory courses offered in other departments of the college.

University Veterinary Hospitals

Professor

Donald G. Low, D.V.M., Ph.D., *head*

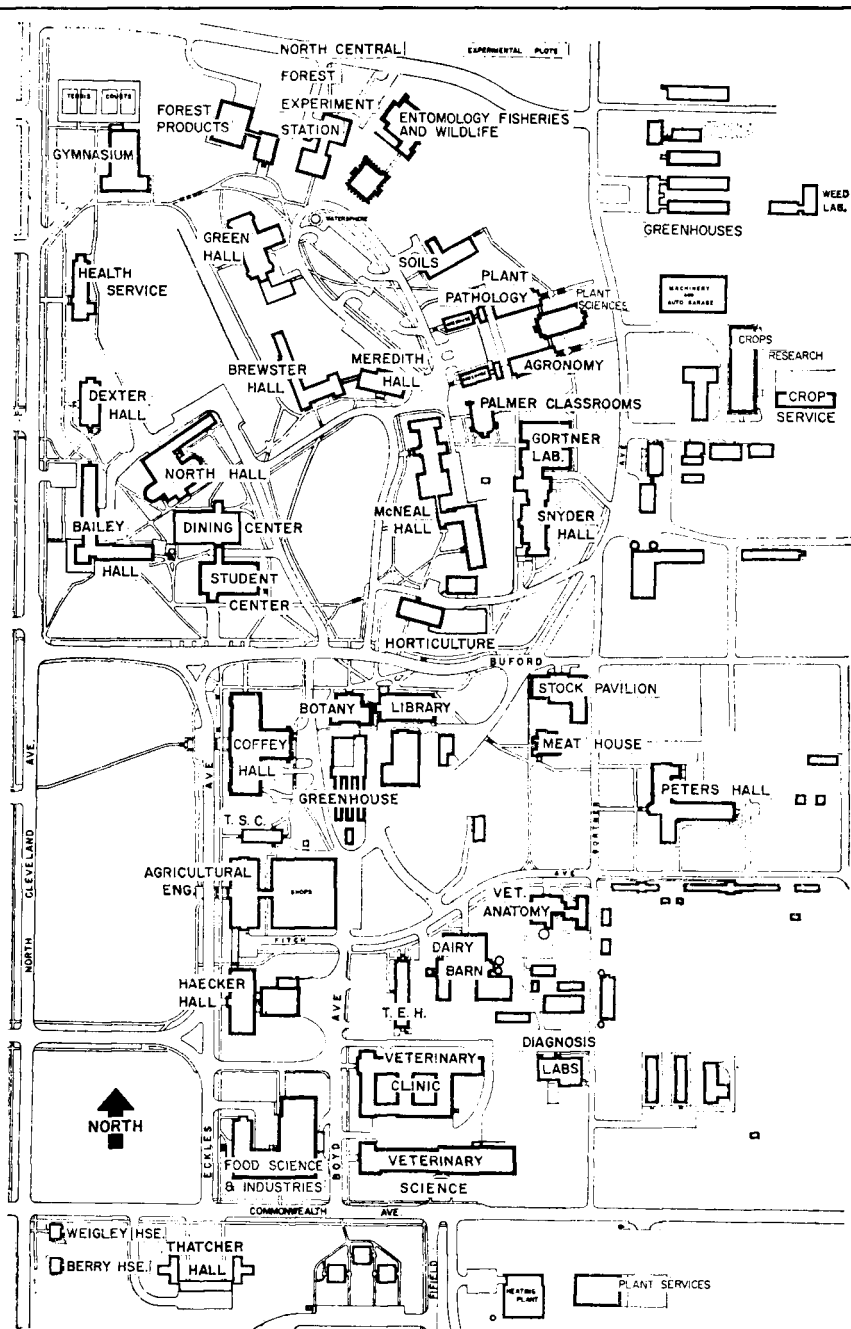
Interns

Thomas G. Bell, D.V.M.
Kenneth E. Dougan, D.V.M.
Lauren E. Dunaway, D.V.M.
Peter F. Haynes, D.V.M.

The faculty members of the University Veterinary Hospitals participate in the teaching program, in clinical, lecture, and laboratory courses offered in other departments of the college.

Index

	Page
Accreditation	4
Administration	1
Admission Requirements	
Preveterinary	14-16
Professional	16-18
Awards and Scholarships	11-12
Career in Veterinary Medicine	3-4
Continuing Education Programs	7-8
Course Descriptions	20-33
Curriculum	
Preveterinary	14-16
Professional	16-19
Degrees Offered	18-19
Departments and Facilities	4-7
Estimated Expenses	11
Faculty	20-33
General Information	3-13
Graduate Study	3-4
History of Veterinary Education	4
Housing — Student	10
Loans and Financial Aids	12-13
Special Services	7
Student Affairs	9-10
Student Government	8-10
Student Services	8



ST. PAUL CAMPUS

UNIVERSITY OF MINNESOTA

1969
71

Graduate Programs in
Medicine, Dentistry, and Pharmacy

Graduate Programs

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 8; for the Ph.D. degree, page 12).

(2) The paragraphs headed "Time Limit for Earning the Ph.D. degree," page 14.

(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.

UNIVERSITY OF MINNESOTA BULLETIN

Published by the University of Minnesota, Office of Admissions and Records, 105 Morrill Hall, Minneapolis, Minnesota 55455, January through September inclusive. One issue in January, one issue in February, two issues in March, four issues in April, four issues in May, three issues in June, four issues in July, two issues in August, and one issue in September. Second class postage paid at Minneapolis, Minnesota. Send change of address notices and other communications to Office of Admissions and Records, Minneapolis, Minnesota 55455.

The contents of this bulletin and of other University bulletins, publications, or announcements are subject to change without notice.

UNIVERSITY OF MINNESOTA

Board of Regents

The Honorable Lester A. Malkerson, Minneapolis, Chairman; The Honorable Marjorie J. Howard (Mrs. C. Edward), Excelsior, Vice Chairman; The Honorable Elmer L. Andersen, St. Paul; The Honorable Lyman A. Brink, Hallock; The Honorable Fred A. Cina, Aurora; The Honorable Daniel C. Gaaney, Owatonna; The Honorable Albert V. Hartl, Fergus Falls; The Honorable Herb L. Huffington, M.D., Waterville; The Honorable Fred J. Hughes, St. Cloud; The Honorable George W. Rauenhorst, Olivia; The Honorable Neil C. Sherburne, Lakeland Township; The Honorable John A. Yngve, Plymouth.

Administrative Officers

Malcolm Moos, President
Donald K. Smith, Vice President, Administration
William G. Shepherd, Vice President, Academic Administration
Laurence R. Lunden, Vice President, Business Administration
Stanley J. Wenberg, Vice President for Educational Relationships and Development
Paul H. Cashman, Vice President for Student Affairs
Robert Edward Summers, Dean of Admissions and Records

GRADUATE PROGRAMS IN MEDICINE, DENTISTRY, AND PHARMACY

Administration

Bryce Crawford, Jr., Ph.D., Dean of the Graduate School
Francis M. Boddy, Ph.D., Associate Dean of the Graduate School
Warren E. Ibele, Ph.D., Associate Dean of the Graduate School
Robert B. Howard, M.D., Ph.D., Dean of the College of Medical Sciences
Charles F. Code, M.D., Ph.D., Director for Medical Education and Research, Mayo Foundation
Raymond D. Pruitt, M.D., M.S., Director of the Mayo Graduate School of Medicine
Erwin M. Schaffer, D.D.S., M.S.D., Dean of the School of Dentistry
Lawrence C. Weaver, Ph.D., Dean of the College of Pharmacy

Committee on Graduate Medical Education

Bryce Crawford, Jr., Ph.D., *chairman*
Robert B. Howard, M.D., Ph.D.
Ellis Benson, M.D., Medical School
Eugene Grim, Ph.D., Medical School
Robert J. Isaacson, D.D.S., Ph.D., School of Dentistry
Joseph Lerner, M.D., Ph.D., Medical School
Erwin M. Schaffer, D.D.S., M.S.D., School of Dentistry
Alvin L. Schultz, M.D., M.S., Medical School
Robert A. Ulstrom, M.D., Medical School
Dennis Watson, M.D., Ph.D., Medical School
Ward S. Fowler, M.D., Mayo Graduate School of Medicine
P. J. Kelly, M.D., M.S., Mayo Graduate School of Medicine
R. Drew Miller, M.D., M.S., Mayo Graduate School of Medicine
Gerald M. Needham, Ph.D., Mayo Graduate School of Medicine
Raymond D. Pruitt, M.D., M.S., Mayo Graduate School of Medicine
John S. Welch, M.D., M.S., Mayo Graduate School of Medicine

GRADUATE PROGRAMS IN Medicine, Dentistry, Pharmacy

GENERAL INFORMATION

Purpose — Opportunities for graduate study in the medical and allied 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, or pharmacy.

In clinical branches the degree of master of science primarily indicates scientific proficiency. To be recommended for this degree the candidate must have given evidence that he is competent to begin practice of a clinical specialty in a scientific manner, i.e., he must have acquired clinical competence in the selected field and have made a contribution to knowledge related to or basic to his 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 in addition have substantially advanced medical science through original investigation.

Equipment — 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, 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, St. Marys and Methodist Hospitals and the Rochester State Hospital are available. All patients are examined clinically in the Mayo Clinic buildings.

Fellows or other graduate students in medicine may divide their time, part of their work being taken at Rochester and part at the Medical School in Minneapolis.

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 collection of the Mayo Graduate School of Medicine at Rochester consists of over 100,000 bound volumes, and the library receives some 2,000 medical journals. There are a general reading room, reading tables in the stacks, and special rooms for study. Current issues and complete files of the most important medical periodicals are available in both Minneapolis and Rochester.

Fellowships and Assistantships — Graduate fellowships and assistantships are offered in all departments of the Medical School, School of Dentistry, and the College of Pharmacy, 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.

Note — To be eligible to hold an appointment, a student must have been admitted to the Graduate School and be registered in the Graduate School each quarter that he holds the appointment during the academic year.

A Note to Wives — There are many campus employment opportunities open to wives of graduate students. Applicants should communicate *at once* with the Department of Civil Service Personnel, 4 Morrill Hall, University of Minnesota, Minneapolis, Minnesota 55455.

Grading System — In courses *open to graduates only*, the student may receive a grade of S — “satisfactory.” This indicates the instructor’s approval of the quality of the student’s work on the graduate level. It signifies a letter grade of B at least. Grades A, B, C, D, or F may be received for these courses. In courses open to both graduates and undergraduates, the A-F system is used. A student registering in the Graduate School may *not* elect to use the P-N grading system. A grade point average of at least 2.80 must be maintained over all courses included in the approved degree program and may also apply to all graduate courses taken by the student even if they are not a part of his approved program; a higher level of performance may be required in certain fields.

Course instructors may at their discretion place a time limit for removal of incomplete grades. In general, it is recommended that grades of incomplete be removed within 1 calendar year.

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 course department is required before submission of the petition.

Quarterly Progress Report — As an aid to the student, the adviser, and the department, the Graduate School issues a Quarterly Progress Report which indicates progress made toward degree attainment. Included on the report are grades received, grade point average, program courses completed, examining committees, and degree requirements yet to be completed.

Tuition — All fellows, scholars, medical fellow specialists, and members of the teaching staff enrolled in the Graduate School pay fees at the resident rate.

For specific information concerning fees and expenses during the academic year, consult the current *General Information Bulletin*.

ADMISSION

All graduate students are admitted on recommendation of the graduate faculty in the proposed major field and approval of the dean of the Graduate

General Information

School. Entrance upon 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 character and 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 (d) 1 year's experience as an intern in an approved hospital or as an assistant in a laboratory of an acceptable medical school. In the fundamental sciences (anatomy, biochemistry, biophysics, microbiology, pathology, pharmacology, and physiology) as well as some special programs (i.e., pharmacognosy, pharmaceuticals, nutrition, etc.) properly prepared students may be admitted without (c) and (d) as candidates for the Master's degree (M.A. or M.S.) or the Doctor's degree (Ph.D.).

In the selection of graduate medical students and of fellows for medical graduate work, preference will be given, other things being equal, to candidates who have more extensive training in the fundamental medical sciences (anatomy, pathology, physiology, etc.) through which they approach the specialty they wish to take as a major subject.

Credentials Examination Fee — A credentials examination fee of \$10 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 the General Extension Division 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.

Application Procedure — At least 1 month prior to the proposed first registration an applicant must submit the application for admission form (G.S. 52) together with one official copy of a transcript from each college or university attended (including premedical) and one for any work taken at the University of Minnesota. A transcript from each institution is required regardless as to whether the work taken was subsequently transferred to the record of another college or university. To be regarded as official the transcripts must bear either the original signature of the registrar and/or the impression seal of the institution. The applicant is responsible for requesting all transcripts, including those from the University of Minnesota.

Notes to Foreign Physicians —

A. The foreign physician planning to undertake graduate study at the University of Minnesota should check with the Immigration and Naturalization Service regarding current regulations as to permissible length of stay in the United States for individuals with educational objectives such as his. This is an important aspect of planning the program of study.

B. 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.

C. Test of English as a Foreign Language (TOEFL) — This test is required of all foreign applicants whose native language is not English. 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 we have evidence of satisfactory performance on the test.

D. 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 marks 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 on the credentials themselves, a separate official statement from the university is required giving this information. If an applicant is not sure of what documents are required in his case, early inquiry is recommended.

E. Our experience has shown that quite often during the program of study a student has need of a complete set of official credentials covering his previous college and university training. We urge applicants preparing applications for admission to request two sets of official credentials — one to be submitted for permanent filing in the Graduate School of the University of Minnesota and the other for his personal use.

REGISTRATION

All students entering upon graduate work in medicine will register with the dean of the Graduate School.

Students who have received notification of admission to the Graduate School may obtain directions for registration either in their departments or at the Graduate School, 316 Johnston Hall, when they arrive at the University.

Registration in the Graduate School includes making out a schedule for the next quarter, which must be approved by a departmental adviser and the Graduate School. A physical examination is required of all students entering the Graduate School prior to their first registration. Forms upon which the physician will report the results of the student's examination will accompany the letter of acceptance, or will be available in the Graduate School.

Students shall be registered in the Graduate School for the entire period they are receiving formal or clinical instruction. This registration shall include fall, winter, spring, and summer terms. Registration for *thesis only* is permissible for students working on dissertations and not registered for any courses.

General Information

Registration Requirements

1. All teaching and research assistants, medical fellows, and medical fellow specialists shall be registered for full loads in the Graduate School for the full period of residence requirements of the master of science degree (3 calendar years of 4 quarters each for the M.S. with field named and 3 quarters for the degree without designation). All such persons 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 this should be addressed to: Director of the Mayo Graduate School of Medicine, Rochester, Minnesota 55901.

3. All persons appointed under trainee programs shall be registered 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 shall be either (a) registered in the Graduate School or (b) 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.

Registration by Mail (Ph.D. Candidates) — The student who has been admitted to candidacy for the Ph.D. (for definition of candidacy see page 14) and is not registered for course work may register by mail. He must return his registration form and check or money order in the appropriate amount to the Office of Admissions and Records, Morrill Hall, University of Minnesota, Minneapolis, Minnesota 55455. Registration forms for this purpose will be mailed to the candidate prior to the opening of each academic quarter.

Back Registration and Cancellation of Courses — Graduate students must complete registration, including addition and cancellation of courses, each quarter by the last day of class and before examinations begin.

REQUIREMENTS FOR ADVANCED DEGREES IN MEDICINE

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.

Academic Rank and Candidacy for Graduate Degree

A member of the staff of instruction above the rank of instructor or research fellow is not permitted to take a graduate degree at this University. He may register for graduate work, however, and credit thus obtained may be presented elsewhere.

Foreign Language Proficiency

In order to satisfy the foreign language requirements, a student must obtain a language certification card from the Graduate School Office, 316 Johnston Hall, *no matter how he establishes proficiency*. For information regarding the language requirements, examinations, and level of proficiency, the student should consult the Graduate School.

A student may establish foreign language proficiency in one of the following ways:

1. Completing as a graduate student at the University of Minnesota 3 quarters of language with no grade lower than C, or an intensive course approved by the dean of the Graduate School.

2. Successful completion of the examination at the end of a course established in the General Extension Division (German, French, Spanish, Italian, Portuguese, and Russian) to aid students in meeting the language requirement. (*Note* — As these courses are not taken for credit, it is *not* necessary to register under joint registration.)

3. Successful completion of the examination at the end of a course (French, German, and Spanish) offered through the Independent Study Department. (*Note* — Courses taken in the General Extension Division or in the Department of Independent Study *for credit* may not be used in lieu of the proficiency examination.)

4. Presenting evidence of completion (within 5 years preceding certification) of 2 years of a language at the college level with a C average or 1 year of a language at the college level with an average of B or better and a grade no lower than B in the final quarter or semester. Courses may have been taken at the University of Minnesota or at another accredited college or university. One year is the equivalent of 12 quarter credits or 8 semester credits. Two years is the equivalent of 24 quarter credits or 16 semester credits.

The Graduate School permits transfer of language certification from any institution in the United States whose credits are regularly accepted by the Graduate School, and whose language tests are administered by procedures approved by the Graduate School at Minnesota. The GSFLT is acceptable. Language certification will not be accepted from institutions where the examinations are administered by the student's major department. Certification of language proficiency demonstrated more than 5 years before a student enrolls at the University of Minnesota will not be acceptable.

Where certification at another institution is not possible, and where it would work a hardship on the student to come to Minneapolis for an examina-

General Information

tion, the language departments will send written examinations to be taken wherever the candidate may be, provided proper arrangements for proctoring can be made. This provision cannot apply when a candidate is to be examined in depth in one language, because of the requirement of demonstrable conversational ability as well as superior reading proficiency.

5. Passing a language proficiency examination administered by a foreign language department. The level of the examination is such that a student who has completed 1 year of college foreign language with emphasis on reading, and who has shown higher-than-average proficiency (approximately a B record) would be considered adequately prepared. The student should consult with the language department regarding the time and place such examinations are given.

A repetition of the language examination is considered a special examination for which a fee of \$5 is charged.

6. Graduate School Foreign Language Test of the E.T.S. Some language departments may elect to administer a standardized foreign language test developed by the Educational Testing Service. For information about which departments use the GSFLT, the student will wish to inquire in the Graduate School office, 316 Johnston Hall. A fee is charged the student *each* time he registers for the GSFLT.

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 for the thesis. Departmental statements in this bulletin announce policies as to use of the Plan A and Plan B. At the time of matriculation, the student will indicate his intention to be a candidate for the Master's degree and choose the plan he proposes to follow. With the approval of his adviser and the dean, he will outline a study program for the period of residence.

Residence — For the Master's degree (M.S.) in *clinical subjects*, 2 or 3 years are required. For the *Master's degree with field named in clinical fields* (e.g., M.S. in pathology or radiology), 3 calendar years are required. This implies proficiency in the special field. For the ordinary Master's degree *without special designation* the length of residence in clinical fields may be reduced to 2 years. For the Master's degree in the basic sciences a minimum of 1 year (3 quarters) is required.

Language Requirements — For the Master's degree in the *basic sciences*, a reading knowledge of one foreign language is required. See page 7 and consult the language requirement for the major department.

For the Master's degree in the *clinical branches*, the language certificate is optional.

Admission to Candidacy — *For the Master's degree in the basic sciences:* After completing 9 to 15 graduate credits, at least 3 of which must be in the major, and no later than opening of the quarter preceding the final quarter, the student who expects to obtain a Master's degree shall present (for Plan A) his program and his thesis title, or (for Plan B) his program for his adviser's

signature. He shall then submit his signed program to the Graduate School for group committee action. Blanks for this purpose are provided by the Graduate School. A transcript of all graduate work the student has taken must accompany the program. Approval by the graduate group committee and the Graduate School indicates the student's admission to candidacy for the degree.

For the Master's degree in the clinical branches: Students are encouraged to submit their programs and thesis plans before the end of the second year of registration.

Major — 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.

Minor — With the approval of his adviser and the dean of the Graduate School, each student upon entrance selects a minor, which must be logically related to his major subject. For *majors in clinical branches*, unless variations are permitted by special petition, the minor shall be a fundamental laboratory 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.

Thesis — Each candidate for a Master's degree must submit a thesis except in certain fields where Plan B (without thesis) may be authorized with the approval of the major adviser and the Medical Graduate Group Committee. Plan B is not employed in the clinical medical fields. The thesis shall present evidence of ability and accomplishment in the planning and prosecution of scientific research by the candidate. In any of the several fields of medicine the Master's thesis should demonstrate significant accomplishment on the part of the candidate in applying the scientific method. It is especially to be noted that in the clinical fields the tabulation of data confirming earlier established observations is not acceptable. Statistical studies of clinical material may, however, be appropriate if through such studies new discoveries are made. The distinction between the Master's and the Doctoral dissertation shall be in the importance and extent of the studies in question. Both shall represent contributions to knowledge made by the candidate. In the medical fields the candidate shall, except in unusual cases where the problem would not permit, himself make the majority of the original observations upon which the thesis is based.

The subject of the thesis must be approved by the adviser and by the Medical Graduate Group Committee. The topic should be within the field of the major, or within the minor field but related to the major. The thesis must be written in acceptable English. It must give evidence of independent investigation and thought by the candidate in perceiving the problems and in making satisfactory progress toward their solution. Familiarity with the bibliography of the special field and correct citation of authorities are expected.

General Information

No material which has been published prior to its certification by the thesis committee may be used to meet the thesis requirement. Candidates contemplating publication of any material that they expect to present for a thesis should obtain approval through the Graduate School office.

The Master's thesis must be typewritten in quadruplicate, two copies on 16-pound or 20-pound linen stock of 75 percent rag content, the others on 13-pound bond paper. The original and first copy must contain all illustrative material. Ample margins should be left for binding purposes. The body of the thesis should be double spaced, but footnotes may be single spaced. Multilith, multigraph, and xerox methods of reproduction may be accepted, provided that 16- and 20-pound bond paper is used. A copy of the thesis, certified by the adviser as complete, must be registered in the dean's office at least 9 weeks before graduation. (Students should consult the Graduate School office for dates when their theses must be registered.)

The thesis will be examined by a committee of not less than three appointed by the dean of the Graduate School on recommendation of the Medical Graduate Group Committee. The examining committee normally will include two representatives of the major field and one representative of the minor field. The committee must be unanimous in certifying that the thesis is ready for defense, and a record of this action must be filed in the Graduate School office on the appropriate form before the candidate may be admitted to the final written and oral examinations. The Graduate School in any case should be informed, on the appropriate blank, of the action of the thesis committee.

If the thesis is accepted, the candidate must file with the Office of Admissions and Records, *at least 5 weeks before the commencement in which he wishes to take his degree*, an Application for Degree form and pay graduation fees, including a \$5 binding fee for two copies of the thesis, which will be cataloged and deposited in the University Library.

Examinations — In addition to the usual course examinations, the candidate for the Master's degree Plan A must pass a final written examination, a final oral examination, or both, at the discretion of his examining committee, which must meet collectively and determine the appropriate course of procedure.

If only a final written examination is specified, it must be held not later than *5 weeks* before the end of the quarter in which the student takes his degree. It will cover the major and minor fields and may include any work fundamental thereto. The final written examination will be arranged by the chairman of the thesis committee, the questions to be prepared with the cooperation of the graduate faculty of the major and minor departments. The chairman will report the results of the examination to the Graduate School office on the appropriate form. A majority vote of the committee is required for approval of the written examination.

If only a final oral examination is specified, it also must be held not later than *5 weeks* before the end of the quarter in which the student takes his degree. This examination, normally 1 hour and not more than 2 hours in length, will be conducted by the committee appointed to examine the thesis, with the adviser serving as chairman, and may cover both the major and minor fields, including any work fundamental thereto.

At the close of the examination, the committee will vote upon the candidate's performance, and a majority vote is required for approval. The chairman of the committee will then report the result of the vote to the Graduate School office on the appropriate form. The final oral examination must be scheduled *at least 30 days in advance* in the office of the Graduate School, and cannot be scheduled until 30 days after the completed thesis is registered in the Graduate School office.

If both a written and an oral examination are specified, the written examination must precede the oral examination, and the time of completion of the oral examination indicated above must be met. Committee certification of the thesis must precede the final oral examination.

Students eligible for the "preliminary examination" for the Doctor's degree may substitute this examination for the final oral examination for the Master's degree, if all other requirements for the preliminary examination have been met and if there is no conflict in majors and minors.

Date for Completion of Requirements for Degrees — Because flexibility is necessary in scheduling final oral examinations in the medical fields, it is not feasible to publish definite times when these are held and when other requirements must be met. Each student must arrange such dates with the Graduate School office. If the student's name is to be included in the commencement program, *all the requirements for his degree must be completed at least 5 weeks prior to the commencement in which he expects to take the degree.*

Reports — Forms are provided for signed reports concerning the thesis and the final written or oral examinations. All reports must be filed in the office of the dean of the Graduate School *at least 5 weeks before the end of the quarter in which the student expects to receive his degree.*

Attendance at Commencement — Unless especially excused (by means of an absentia petition) by the dean of the Graduate School, candidates upon whom degrees are to be conferred are required to be present at commencement.

SUMMARY OF REQUIREMENTS FOR THE MASTER'S DEGREE

<i>Requirements</i>	<i>Under the Direction of</i>	<i>Date</i>
Initial registration	Adviser and dean of the Graduate School or director of Mayo Graduate School..	On entrance
Approval of degree program, language choice, thesis subject, and candidacy	Adviser, committee (normally from the major department, division, or college) group committee, and dean	After completion of 9 to 15 credits for basic science majors or no later than opening of quarter preceding final quarter Before end of second year for majors in clinical fields
Language requirement (completion)	Adviser, group committee, and language department..	Before admission to written and oral examinations
Licensure (Mayo Graduate School only)	State Board	6 months after beginning graduate work
Registering of thesis	Graduate School office	At least 30 days before scheduling of final oral examination

General Information

Certification of thesis	Thesis committee	Before admission to final oral examination
Final examinations, written or oral or both	Major adviser and committee } Graduate School office } Office of Admissions and Records }	Not later than 5 weeks before commencement in which student takes his degree
Filing of thesis		
Graduate fee and fee for binding thesis		

Doctor of Philosophy Degree

Residence — For the Doctor's degree (Ph.D.) at least 3 full years of successful graduate study are required, including certain special requirements noted in the following pages. 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.

Major — 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.

Minor — The minor must be logically related to the major subject, and must be completed by the end of the second year. The minor is preferably a laboratory subject in some other field, and should amount to not less than one-sixth of the total work, which must be completed before admission to the preliminary examination.

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.

Supporting Program of Study — With the approval of his major adviser and the appropriate group committee, a student may include, in place of the minor, a *supporting program* of study in his overall doctoral program. The traditional minor will continue to be available at the option either of the student or of his adviser.

This supporting program, like the minor, must include not less than one-sixth of the total work in the doctoral program in courses numbered 100 and above and must be completed before admission to the preliminary examinations. It must be a coherent pattern of studies, possibly embracing several disciplines, but clearly forming a purposeful part of the doctoral program with the same type of supporting relation to the major field as the traditional minor. The student's major will, of course, be the core that holds the entire program together.

A student electing to use the supporting program option may be expected to take written preliminary examinations in the fields included in his supporting program, but will not be expected to have competency in each of the fields in his supporting program comparable to that of a person with a traditional minor in the field concerned.

This type of individually tailored program will necessitate careful planning by the student in cooperating with faculty advisers. It is therefore essential that the Ph.D. program be submitted to the Graduate School office as soon as

Doctor of Philosophy Degree

possible after completion of 1 academic year of course work to facilitate group committee action and approval before a student commits himself to work on a supporting program.

A student who wishes to use the supporting program should consult with his major adviser and at least one other full member of the graduate faculty concerning the coherency of his doctoral program. A student's completed Ph.D. program must have the approval of the major adviser and, with regard to the supporting program, the approval of one other full member of the graduate faculty.

Program of Study

Upon entrance to the Graduate School, the student shall select and be accepted by an adviser from the graduate faculty. The first year is devoted primarily to completion of courses in his program. Attention should also be given to meeting requirements to the foreign language (see page 7), collateral field, and research technique.

After successful completion of the equivalent of a full academic year of course work, but at least 5 calendar months before the preliminary oral examination is to be scheduled, the student shall submit to the Graduate School office a doctoral program and language declaration.

Ph.D. Program and Language Declaration — On this form the student will indicate and justify the appropriateness of the foreign languages to be presented in fulfillment of the requirements for the Ph.D. When a collateral field of knowledge or a research technique is offered as a substitute for one of the foreign languages, he will indicate the course work he has completed or proposes to complete to satisfy the requirement.

The student will also submit a complete statement of all work to be offered for the degree:

1. A list of all graduate courses completed and proposed in the major.
2. A list of all graduate courses completed and proposed in the minor.
3. Courses offered as a collateral field or special research technique when either is being proposed.
4. For the student who transfers work from other graduate schools to his doctoral program at Minnesota, the first 2 years or the last year must be spent in residence at the University of Minnesota. Whatever the amount of transferred credit, he must pay tuition fees appropriate to his residence or staff status for at least 3 quarters of graduate study in residence at the University of Minnesota. Transfer of credit from other institutions will be considered when the doctoral program is approved, and no petition for transfer of credits or residence is necessary.

A transcript of all completed graduate work the student lists on his program, whether taken here or elsewhere, must accompany the program.

Programs should be submitted to the Graduate School office early in any quarter to insure action within the quarter by the Group Committee.

General Information

Candidacy — Admission to candidacy for the Ph.D. degree will be determined by the dean of the Graduate School upon recommendation of the group committee and can be defined as that point where the student has passed the preliminary oral examination.

Time Limit for Earning the Ph.D. Degree — Effective with the quarter immediately following admission to candidacy for the Ph.D. the student must:

1. Complete all requirements and receive the Ph.D. degree within 5 calendar years (in some areas an earlier deadline is established). Petitions for extension of this time limit must be submitted before expiration of the 5-year time limit. Violation of this time limit through failure to obtain Graduate School approval of extension may necessitate retaking the preliminary oral examination.
2. Register continuously and pay fees during the academic year (fall, winter, spring) until the Ph.D. is awarded. (These tuition payments stop with the quarter in which requirements are completed provided that the degree is conferred at the close of the following quarter.) Failure to register continuously will automatically terminate candidacy for the doctorate. To reinstate candidacy, the student may be required to re-take the preliminary oral examination and to pay fees past due. Course registration for the first or second summer term (or both) may be made in lieu of the respective fall or winter quarters (or both) immediately following and will fulfill the continuous registration requirement. However, students who hold University appointments which require registration in the Graduate School in the academic year must be registered in the Graduate School during the period of appointment.

Note — The student must have completed the preliminary examination prior to the opening of a quarter in which he becomes eligible for the \$20 fee.

Registration by Mail — See page 6.

Thesis Title Form — At the time of submission of the doctoral program, or not less than 5 months before the scheduling of the final oral examination, the student shall file with his adviser's approval the title of his doctoral dissertation. The thesis title form is obtained in the Graduate School office. The following group committees and their component major fields require that the thesis title form 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: Agriculture, Biological Sciences; Education; Genetics; Language, Literature, and Art; and Physical Sciences. In addition, Agriculture, Biological Sciences, and Language, Literature and Art require the adviser's signature on the outline as well.

Language Requirement — In general, reading knowledge of two foreign languages is required. Where it is so stipulated, however, the requirement may be met with reading knowledge of one foreign language and the option of a collateral field of knowledge or a research technique. Consult the state-

ment of the major department in this bulletin for option and specific languages which are acceptable.

In no case may English be submitted as a foreign language. The foreign language requirement must be completed before the student is admitted to the preliminary examinations for the Ph.D. (See also page —).

Research Technique Option — A special research technique is defined as not less than 9 credits in courses numbered 100 or above, completed with a grade not lower than C. The burden of proof of the significance or relevance of the proposed research technique rests upon the candidate and his major adviser. The group committee under whose jurisdiction the major field falls shall review the recommendations of the major adviser and in turn recommend action to the dean of the Graduate School. In no case may the special research technique subject be one that has regularly or traditionally been included in the major or minor fields of study of similar candidates in the past. The special research technique subject should represent the acquisition of any special skill that will effectively contribute to the research proficiency of the candidate.

Course credits presented to fulfill the requirements of a special research technique shall be recorded on the student's permanent grade record. Any group committee may require a standard of performance higher than the minimum standard of C after appropriate consultation with the departments within its area. Course credits which are used as part of the major or minor may not be reused as a research technique. The special research technique requirements may be met by special proficiency examinations as feasible and practical. This requirement must be met before admission to the preliminary examination.

To meet the requirements of a special research technique, credit earned or proficiency demonstrated in other approved institutions may be transferred to the University of Minnesota record if these have been completed within a 3-year period immediately prior to entering this Graduate School.

Collateral Field Option — A collateral field of knowledge is defined as not less than 15 credits of work in courses numbered 100 or above, completed with a grade not lower than C. For this purpose a maximum of 6 of the 15 credits may be earned through the joint registration program within the Extension Division, provided that they do not exceed the limit imposed for such work in a graduate program.

The collateral field of knowledge is expected to broaden the candidate's scholarly and scientific background by permitting exploration of knowledge in a field related to the major and minor. The collateral field of knowledge may include in this sense any work now available or to be developed in the preparation for college teaching, including supervised instruction at the college level.

The burden of proof of the significance or relevance of the collateral field rests upon the candidate and his major adviser. The group committee under whose jurisdiction the major field falls shall review the recommendations of the major adviser and in turn recommend action to the dean of the Graduate School. In no case may the collateral field of knowledge be one that has regularly or traditionally been included in the major or minor fields of study of similar candidates in the past.

General Information

Where a collateral field of knowledge is offered in place of one foreign language, this collateral field must be completed before the student is admitted to the final oral examination for the Ph.D., and the work to be presented in meeting this requirement shall be entered on the student's doctoral program. Completion may be in terms of earned course credits, or of validated transfer of credits from another institution, or of special proficiency examination where feasible and practical.

The group committee may include the collateral field of knowledge in the final oral examination of the candidate by the appointment of a representative of this field to the oral examination committee.

Written Examinations — The major department shall give a written qualifying examination prior to the oral preliminary examination for the Ph.D. degree. This examination shall cover all the work done in the major, and *may include any work fundamental thereto*. The passing or failing of this written examination shall be reported by the major adviser to the Graduate School office on a form which the student will obtain in that office. In case of failure, the candidate will normally be allowed only one opportunity to retake the failed examination; this reexamination will be permitted not earlier than the following academic quarter. The department may also give a written examination prior to the final oral examination.

A written qualifying examination in the minor field shall be required prior to the oral preliminary examination for the Ph.D. degree, and the results shall be reported to the dean of the Graduate School. This requirement may be waived in a specific case by the graduate faculty in the minor field, which shall notify the dean of such a waiver.

Preliminary Oral Examination — At least 1 full academic quarter before the Doctor's degree is conferred, an oral preliminary examination (not to exceed 3 hours) is given by a committee appointed by the dean of the Graduate School. Language certificates and completion of special technique requirements, completion of the minor work, and the recommendation of the major department are required before admission to this examination, which is in addition to the usual course examinations. It shall cover the graduate work previously taken by the student and *may include any work fundamental thereto* except the thesis subject and the thesis.

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

In the case of an examination reported as passed with reservations, these reservations may involve: additional preparation and study followed by re-examination; the preparation of a special paper or written examination in a

Doctor of Philosophy Degree

stated field; or other special conditions deemed appropriate by the examining committee.

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 passing with reservations, what additional requirements must be met by the candidate prior to reexamination or prior to the reporting of satisfactory performance, and when such reexamination shall take place.

Students failing the preliminary oral examination may, upon recommendation of the examining committee, be excluded from further candidacy for the degree, and in any case no reexamination shall be held until at least 1 full academic quarter has passed.

Preliminary oral examinations will not be scheduled during the period of final oral examinations for the June commencement—normally from about April 8 to May 6—or from the beginning of the second term of Summer Session to the opening of the fall quarter. Preliminary oral examinations must be scheduled *1 month in advance* in the office of the Graduate School by the prospective candidate or his adviser.

Final Oral Examination—After preliminary written and oral examinations, after final written examinations, when required, and after certification that the thesis is ready for defense, and *not less than 5 weeks* before graduation, the final oral examination shall be given. Ordinarily this examination shall be conducted by a committee consisting of the adviser, the two other members of the thesis review committee, and at least two additional members of the graduate faculty, appointed by the dean upon recommendation of the appropriate group committee.

This examination covers the thesis and the field of the candidate's special study and shall not exceed 3 hours. The final oral examination must be scheduled *at least 1 month in advance* of the proposed date in the office of the Graduate School, and cannot be scheduled until 30 days after the thesis is registered in the Graduate School office. The committee for the final examination and the Graduate School office must be given the finished thesis to read *at least 1 month* before the examination is scheduled. One copy of the thesis should be delivered to the Graduate School office for each Rochester member of the examining committee.

The date of the final oral examination shall be publicly announced, and any member of the graduate faculty may attend. Upon completion of the examination, a formal vote of the committee shall be taken. To be recommended for the award of the doctoral degree, the candidate must receive either a unanimous vote or a vote showing not more than one dissenting member of the total final examining committee. The chairman of the examining committee will then report the result of the vote to the Graduate School office on the appropriate form.

The final oral examination may not be scheduled during the quarter in which the preliminary oral examination was passed.

Thesis—The thesis shall present an original contribution to knowledge in the field of major specialization. The thesis must give evidence of originality and power of independent investigation and must exhibit mastery of the lit-

General Information

erature of the subject and familiarity with the sources. The matter must be presented with a fair degree of literary skill.

No material that has been published prior to its approval by the thesis committee may be used to meet the thesis requirement. A candidate contemplating publication of any material that he expects to present for a thesis should therefore obtain such approval through the Graduate School office.

The thesis** must be typewritten in quadruplicate (in some departments five copies are required) to facilitate reading by the thesis committee. Multi-graphs, multilith, and xerox methods of reproduction may be accepted, provided that 16- or 20-pound rag content bond is used. The thesis 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 the candidate expects to receive the degree. Following the registration of the thesis (a clean and complete draft) a 30-day period must elapse before the final oral examination may be scheduled.

The thesis must be read by a committee of not less than three members, appointed by the dean of the Graduate School upon recommendation of the appropriate group committee. As a rule, the student's major adviser will be chairman of this committee, and the field of the minor or the supporting program of study will be represented by at least one committee member. This committee must be unanimous in certifying that the thesis is ready for defense before the final oral examination can be held. The results of the review of the thesis shall be reported to the Graduate School office on an appropriate form available in that office.

When he submits his *final oral examination report*, the candidate will sign in duplicate a *Memorandum of Agreement* with University Microfilms, Ann Arbor, Michigan, under which the ribbon copy of the thesis will be micro-filmed before being permanently filed in the University of Minnesota Library. He will then pay his microfilm fee of \$25. If he wishes his thesis to be copyrighted he will pay an additional \$7 plus the cost of two positive microfilm copies of his thesis which will be deposited in the Library of Congress.

Each candidate for the Doctor's degree shall submit with his final oral examination report two copies of an abstract of 600 words or less, approved and signed by his adviser, embodying the principal findings of the research. Such abstracts will be published in *Dissertation Abstracts*, which announces the availability of the thesis for distribution.

Two copies of the thesis on 16- or 20-pound bond paper are to be bound and deposited in the Graduate School office.

Release Card — When he deposits the bound copies of his thesis at the Graduate School office, the student will sign a release card permitting immediate circulation of his thesis. For valid reasons and with his adviser's endorsement he may request, on the same forms, that his thesis be withheld from circulation for 6 months or at most 1 year.

** Instructions for typing and registration of the thesis may be obtained in the Graduate School office. Before having his thesis typed, the student should also read the Memorandum of University Microfilms concerning errors commonly found in theses submitted for microfilming. This may be obtained from the Graduate School office.

Doctor of Philosophy Degree

Reports — Special forms are provided for signed reports on the written examination in the major, the preliminary oral examination, the review of the thesis, and the final oral examination. *All these must be filed with the Graduate School office:* the report on the written examination in the major before the preliminary oral examination can be scheduled, the thesis review report at the time the final oral examination is scheduled, and the final oral report form at least 5 weeks before graduation.

Office of Scientific Personnel Survey Form — Before the student's name can be included on the degree list, he is required to fill out a survey form for the Office of Scientific Personnel of the National Research Council. The completed form is submitted to the Graduate School office.

SUMMARY OF REQUIREMENTS FOR THE DOCTOR'S DEGREE

<i>Requirements</i>	<i>Under the Direction of</i>	<i>Date</i>
Initial registration	Adviser and Graduate School	On entrance
Doctoral program	Adviser, minor faculty or supporting program faculty, appropriate graduate group committee, and dean of Graduate School	After first year or at least 5 months before preliminary oral examination
Completion of minor or supporting program	Course instructors	} Before admission to preliminary examination
Language certification or research technique	Adviser, language departments	
Written examinations	Graduate faculty of major and minor or supporting program fields	
Oral preliminary examination	Examining committee	Before preliminary oral or before final oral examination or both
Completion of collateral field	Course instructors	At least 1 academic quarter before degree is to be conferred
Thesis title and statement of research design, if required	Adviser, group committee, and dean of Graduate School	Before admission to final oral examination
Registering of completed draft of thesis	Graduate School office	When doctoral program is submitted or at least 5 months before final oral examination
Certification of thesis	Thesis committee	9 weeks before graduation, and at least 30 days before the final examination
Final oral examination	Committee	Before admission to final oral examination
2 bound copies and 2 abstracts of thesis, micro-filming agreement form and fee	Graduate School	} Not later than 5 weeks before commencement in which student takes his degree
Release card	Graduate School	
Office of Scientific Personnel Survey Form	Graduate School	
Graduation fee	Office of Admissions and Records	

FIELDS OF INSTRUCTION

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

Master's Degree

Anatomy (including hematology, histology, and embryology)
Anesthesiology
Biochemistry
Biometry
Biophysics
Dentistry
Dermatology
Environmental Health
Epidemiology

Hospital Pharmacy
Laboratory Medicine
Medical-Surgical Nursing
Medical Technology
Medicinal Chemistry
Medicine, Internal
Microbiology
Neurology
Neurosurgery
Nutrition
Obstetrics and Gynecology
Ophthalmology
Orthopedic Surgery

Otolaryngology (including otology, rhinology, and laryngology)
Pathology
Pediatrics
Pharmaceutics
Pharmacognosy
Pharmacology
Physical Medicine and Rehabilitation
Physical Therapy
Physiological Chemistry
Physiological Hygiene
Physiology
Plastic Surgery
Proctology (colon and rectal surgery)
Psychiatry
Public Health
Radiology
Surgery
Urology

Ph.D. Degree

Anatomy (including hematology, histology, and embryology)

Biochemistry
Biometry
Biophysics
Dermatology
Environmental Health
Epidemiology
History of Medicine
Hospital Administration

Medicinal Chemistry
Medicine, Internal
Microbiology
Neurology
Neurosurgery
Nutrition
Obstetrics and Gynecology
Orthopedic Surgery

Otolaryngology (including otology, rhinology, and laryngology)
Pathology
Pediatrics
Pharmaceutics
Pharmacognosy
Pharmacology
Physical Medicine and Rehabilitation
Physiological Chemistry
Physiological Hygiene
Physiology

Psychiatry
Radiology
Surgery
Urology

ANATOMY (Anat)

OFFERED AT MINNEAPOLIS

Professor

Arnold Lazarow, M.D., Ph.D., *head*
Anna-Mary Carpenter, Ph.D., M.D.
Carl B. Heggstad, M.D., Ph.D.

Morris Smithberg, Ph.D., *coordinator of graduate study*
R. Dorothy Sundberg, Ph.D., M.D.
Lemen J. Wells, Ph.D.

Associate Professor

G. Eric Bauer, Ph.D.
Padmakar K. Dixit, Ph.D.
Richard L. Wood, Ph.D.

Assistant Professor

Dean E. Abrahamson, Ph.D., M.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 in anatomy — embryology, gross anatomy, histology, and human neuroanatomy. For majors in anatomy (hematology), Anat 165 and 166 are 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 100-101, 103-104, 107, and 111).

Language Requirement — For the Master's degree, reading knowledge of one foreign language — French, German, Italian, Spanish, or Russian. For the Ph.D. degree, either (a) two foreign languages (preferred) or (b) one foreign language and the option of a collateral field of knowledge. When two languages are offered, any combination of the languages listed above may be approved.

Master's Degree — Offered only under Plan A. (Consult department head.)

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

- 100f-101w.† **Gross Human Anatomy.** Dissection of the human body. (14 cr for both qtrs; enrollment limited; prereq #) Heggstad, Lazarow, Smithberg
- 103f-104s.† **Human Histology.** Microscopic structure, cytochemical and functional aspects of cells, tissues, and organs. (8 cr for both qtrs; enrollment limited; prereq #) Carpenter, Lazarow, Wood
- 105f. **Microscopic Anatomy.** Minute structure of the tissues and organs of the body including the nervous system, emphasis on teeth and digestive tract. (6 cr; prereq 108 and 109) Bauer, Dixit
- 107f,w. **Human Embryology.** Development of the human body. (4 cr for both qtrs; enrollment limited; prereq #) Heggstad
- 108w. **Gross Anatomy for Dental Students.** Lectures and dissection: extremities, abdomen, and pelvis. (6 cr; enrollment limited; prereq #) Sorenson
- 110f. **Dental Neuroanatomy.** Gross and microscopic structure of the central nervous system; emphasis on structure related to function. Laboratory demonstrations include gross anatomy of the brain stem. (3 cr; prereq 105 or #) Abrahamson
- 111s. **Human Neuroanatomy.** Structure of the nervous system including the organs of special sense. (5 cr; enrollment limited; prereq 104 or Zool 150, #) Abrahamson, Coulter, Smithberg
- 135f. **Biological Electron Microscopy: Technics.** (Cr and hrs ar; prereq #; offered 1969-70 and alt yrs) Wood
- 137s. **Biological Electron Microscopy: Interpretation.** (Cr and hrs ar; enrollment limited; prereq 104 or 105 or equiv, #) Wood
- 153, 154, 155, 156. **Advanced Anatomy.** Cytochemistry, embryology, gross anatomy, hematology, histology, or neurology or experimental morphology. (Cr and hrs ar; prereq #) Staff
- 160s. **Introduction to Histological and Morphologic-Histochemical Technics.** Fixation, embedding, and staining of cytological components and enzymes. (2 cr; prereq 104, #; offered 1970-71 and alt yrs) Carpenter

Fields of Instruction

- 161f, 162w, 163s. **Methods in Anatomical Research.** Introduction to instrumentation, techniques, and experimental approaches in the fields of endocrine physiology, microchemistry, electron microscopy, radioautography, quantitative histochemistry, tissue culture, etc. (2 cr per qtr; primarily for 1st-yr grad students; prereq 100 or ‡; offered 1970-71 and alt yrs) Bauer and staff
- 165f-166w. **Hematology.** Blood and blood-forming organs; blood and bone marrow from the standpoint of diagnosis and prognosis. (4 cr per qtr; prereq 103 or ‡; Zool 65 or ‡) Sundberg
- 167s. **Seminar: Hematology.** (1 cr; prereq 166) Sundberg
- 168w. **Protein Biosynthesis.** Seminar on protein synthesis in mammalian tissues. Discussion of morphologic sites; the synthesis of specific proteins, especially by endocrine organs; chemical mechanisms; regulation, and the role of inhibitors. (3 cr; prereq 101 or ‡) Bauer
- 201, 202, 203, 204. **Research in Anatomy.** Cytochemistry, embryology, gross anatomy, histology, hematology, or neurology. Special facilities offered to graduate students in clinical departments for work upon problems in applied anatomy. (Cr and hrs ar; prereq ‡) Bauer, Carpenter, Dixit, Felts, Heggstad, Lazarow, Smithberg, Sundberg, Wells, Wood
- 205, 206, 207. **Seminar: Anatomy.** Reviews of current literature and discussion of research work being carried on in the department. (1 cr per qtr; prereq ‡) Lazarow and staff

OFFERED AT ROCHESTER**

Professor

W. Henry Hollinshead, Ph.D., *head*

Associate Professor

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

In cooperation with other departments at the Mayo Graduate School of Medicine, there is opportunity for study and research leading to a minor in anatomy.

- M 251f,s (8-851). **Anatomy for General Surgeons.** Fundamental anatomical facts and relations, especially of the neck and trunk, are reviewed; details of special surgical interest, not generally acquired in undergraduate anatomy, are studied in lectures, discussions, and by dissection. Hollinshead
- M 252s (8-852). **Anatomy of the Head and Neck.** Detailed laboratory study of the gross anatomy of the head and neck, designed especially for fellows majoring in otolaryngology, supplemented by lectures and discussion. Hollinshead
- M 253f (8-853). **Anatomy and Neuroanatomy of the Orbit.** Lectures and laboratory work in detailed anatomy of the orbit and optic pathways. Hollinshead
- M 254f (8-854). **Neuroanatomy.** Review of fundamental structures and connections of the central and peripheral nervous systems. Hollinshead
- M 255s (8-855). **Orthopedic Anatomy.** Lectures and laboratory work on the limbs and back. Hollinshead

ANESTHESIOLOGY (Anes)

OFFERED AT MINNEAPOLIS

Professor

Frederick H. Van Bergen, M.D., M.S.,
head

Joseph J. Buckley, M.D., M.S.
James H. Matthews, M.D., M.S.

** Enrollment in these courses is limited.

Associate Professor

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

Clinical Associate Professor

Russell W. Bagley, M.D.
J. Albert Jackson, M.D.

Assistant Professor

James F. Cumming, M.D., Ph.D.
John S Rydberg, M.D., M.S.
Earl A. Schultz, M.D., M.S.

Clinical Assistant Professor

Robert C. Knutson, M.D., M.S.

Instructor

Jurgen J. Moller, M.D.
Boris E. Synchych, M.D.
Mien Fa Tchou, M.D.
George T. Wier, M.D.

Clinical Instructor

Egon Marte, M.D.

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.

265f,w,s,su (8-265). General Anesthesia. Instruction and experience in general anesthesia. (12 cr per qtr)

266f,w,s,su (8-266). Regional Anesthesia. Observation, instruction, and administration of all types of local, regional, and spinal anesthesia. (4 cr per qtr)

267f,w,s,su (8-267). Pre- and Postanesthetic Evaluation. Selection of proper anesthetic agent and technique, premedication, and observation of recovery from anesthesia. (2 cr per qtr)

268f,w,s,su (8-268). Seminar: Anesthesiology. Review of literature, report of case problems, and discussion of research work in progress within the department. (2 cr per qtr)

269f,w,s,su (8-269). Research in Anesthesia. Anesthesia problems in experimental laboratory or in hospital. (Cr and hrs ar)

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

MdBc 100-101. Biochemistry

MdBc 153. Problems in Biochemistry

MdBc 200. Seminar: Biochemistry

Med 202. Diseases of the Cardiovascular Apparatus

Phcl 109. Pharmacological Problems

Phcl 203. Research in Pharmacology

PubH 110A. Biometry I

PubH 111A. Biometry Laboratory I

OFFERED AT ROCHESTER

Professor

Albert Faulconer, M.D., M.S., *head*
Thomas H. Seldon, M.D., C.M., M.S.
(Clinical)
Richard A. Theye, M.D.

Assistant Professor

Brian Dawson, M.B.
Edward P. Didier, M.D.
Robert R. Jones, M.D.
John T. Martin, M.D.

Fields of Instruction

John D. Michenfelder, M.D.
Emerson A. Moffitt, M.D.
Kai Rehder, M.D.

Instructor

Francoise M. T. Carney, M.B.B.
Robert A. Devloo, M.D.
Allan B. Gould, Jr., M.D., M.S.

Gerald A. Gronert, M.D.
Virginia B. Hartridge, M.D.
Paul F. Leonard, M.D.
Richard O. Lundborg, M.D.
John A. Paulson, M.D., M.S.
Charles J. Restall, M.D.
Norbert Schnelle, M.D., M.S.
Alan D. Sessler, M.D.

Graduate training in anesthesiology at the Mayo Graduate School of Medicine combines opportunity for an advanced degree with realistic training in anesthesiology. Fellows in anesthesiology may work toward an M.S. degree with a minor in physiology. The usual 3-year program fulfills requirements for the American Board of Anesthesiology.

A fellow who is particularly interested in study in certain branches of anesthesiology may arrange to stress those phases. A limited number of opportunities is available to anesthesiologists who are board qualified for subspecialty training in cardiovascular anesthesiology and neuroanesthesiology.

Seminars, conferences, and informal discussions make it possible for the fellow to obtain theoretical as well as wide clinical training in all aspects of anesthesiology.

Master's Degree — Offered only under Plan A.

- M 251f,w,s,su (8-851). General Anesthesia.** Observation and instruction in all types of clinical general anesthesia followed by administration under supervision, and finally by responsible administration. Faulconer and staff
- M 252f,w,s,su (8-852). Special Anesthesia.** Intravenous anesthesia including intravenous sedation and pre- and postoperative medication and care; intravenous infusions and transfusion of blood and blood substitutes; oxygen resuscitation and other gas therapy; intravenous technique and venipuncture; diagnostic and therapeutic nerve block; inhalation and endotracheal methods and rectal anesthesia; spinal and continuous spinal anesthesia; caudal and continuous caudal anesthesia; lumbar epidural anesthesia; bronchoscopic aspiration; regional anesthesia; extracorporeal circulation. Faulconer and staff
- M 253f,w,s,su (8-853). Anesthesiology as Applied to All Types of Oral Surgery.** Faulconer and staff
- M 254f,w,s,su (8-854). Neurosurgical Anesthesia.** Twelve months' observation and training in this field with graded responsibility increasing. In addition to intensive clinical experience, several months are devoted to lectures, demonstrations, and clinical work in related fields: neuroanatomy, neuropathology, neurophysiology, electroencephalography, and electromyography. (Prereq 2 yrs general and special anesthesia) Michenfelder and staff
- M 255f,w,s,su (8-855). Cardiovascular Anesthesia.** Twelve months devoted to anesthesia for patients undergoing surgery for cardiovascular disease. Increasing responsibility for patient care as experience increases. 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. (Prereq 2 yrs general and special anesthesia training) Moffitt and staff
- M 256f,w,s,su (8-856). Respiratory Therapy.** Twelve months' observation, training, and research in all phases of management of patients with respiratory problems, including chronic therapy, mechanical ventilation, respiratory physiology, and general intensive care. Experience in the function of hospital respiratory therapy service as well as participation in directing a respiratory intensive care unit. (Prereq 2 yrs approved residency in allied clinical field) Didier, Sessler

Anatomy for General Surgeons. (See Department of Anatomy)

Physics in Relation to Anesthesiology. (See Department of Biophysics)

Research Work on Selected Problems in Physiology. (See Department of Physiology)

General Medical and Surgical Diagnosis. (See Department of Medicine)

BIOCHEMISTRY (MdBc)

OFFERED AT MINNEAPOLIS

Professor

Wallace D. Armstrong, M.D., Ph.D.,
head, director of graduate study
Joseph T. Anderson, Ph.D.
Ellis S. Benson, M.D.
Robert W. Bernlohr, Ph.D.
Charles W. Carr, Ph.D.
Ivan D. Frantz, M.D.
Helmut R. Gutmann, M.D.
Ralph T. Holman, Ph.D.
Joseph Larner, M.D., Ph.D.
Leon Singer, Ph.D.
Frank Ungar, Ph.D.
David B. Wetlaufer, Ph.D.
Finn Wold, Ph.D.
Leslie Zieve, M.D., Ph.D.

Associate Professor

Mary E. Dempsey, Ph.D.
Ernest D. Gray, Ph.D.
James F. Koerner, Ph.D.
Andreas Rosenberg, D.Sc., Ph.D.
John F. Van Pilsun, Ph.D.

Assistant Professor

James W. Bodley, Ph.D.
Ronald D. Edstrom, Ph.D.
Quenton T. Smith, Ph.D.

Graduate training leading to the M.S. and Ph.D. degrees is offered jointly with the Biochemistry Department in the College of Biological Sciences by a cooperative effort maintained through an interdepartmental committee.

Prerequisites — For a doctoral major in biochemistry (or physiological chemistry) courses in analytical, organic, and physical chemistry comparable to those of a baccalaureate chemistry major are expected. These minimum requirements for admission should include mathematics through calculus, 1 year of college physics, courses in inorganic and analytical chemistry, and 1 year of organic and physical chemistry. Candidates for the Master's degree with a major in biochemistry (or physiological chemistry) or those seeking a Ph.D., with a minor in biochemistry (or physiological chemistry) may be admitted with less rigorous courses in these fields of chemistry. Some admission deficiencies may be discharged in courses taken concurrently with graduate studies. One year's work in a biological science is desirable.

Language Requirement — Ordinarily German, French, or Russian. For the Master's degree, one foreign language. For the Ph.D. degree, either (a) two foreign languages or (b) one foreign language and a collateral field of knowledge.

Master's Degree — Offered only under Plan A.

Doctor's Degree — Candidates for the Doctor's degree with a major in biochemistry (or physiological chemistry) will be required to present or to develop satisfactory competence in organic, analytical, and physical chemistry and in the biological sciences. The following courses are usually included in the

Fields of Instruction

program of graduate study: MdBc 141, 142, 143 and 147 (or by permission MdBc 100-101), AnCh 211-212 and four courses numbered 206, 211, 215, 217, or 219 and other courses in biochemistry or logically related fields. These are not intended to be interpreted as minimum requirements, however, and each graduate student is expected to work out his full program in consultation with an adviser, with the understanding that needs may differ in individual cases. The department will supply full information on admission and graduate study requirements on request.

If MdBc 141, 142, 143, 147, 100-101 or their equivalents have been taken 5 years or more prior to the time the candidate is to appear for the preliminary oral examination, these courses must be retaken.

- 100f,su-101w,su. Biochemistry.** (8 cr per qtr; prereq physics, physical and organic chemistry) Armstrong, Carr, Koerner, Ungar, Van Pilsun, Wetlaufer, Wold
- 141f. The Chemistry of Carbohydrates, Lipids, Proteins, and Nucleic Acids.** (Same as BioC 141) (3 cr; prereq 1 yr organic chemistry, 2 qtrs physical chemistry [or concurrent registration], §145 or Δ) Wetlaufer
- 142w. Cellular and Intermediary Metabolism.** (Same as BioC 142) (3 cr; prereq 141) Wold
- 143s. Cellular and Intermediary Metabolism.** (Same as BioC 143) Continuation of MdBc 142. (3 cr; prereq 142) Gander
- 147s. General Biochemistry Laboratory.** (4 cr; biochemistry majors given priority; prereq 142 and AnCh 212) Staff
- 153f,w,s,su. Problems in Biochemistry.** Special work arranged with qualified students. (Cr and hrs ar; may be taken 1 or more qtrs; prereq 143 or 101) Staff
- 200f,w,s,su. Seminar: Biochemistry.** (1 cr) Staff
- 205f,w,s,su. Research in Biochemistry.** (Cr and hrs ar) Staff
- 206f. Advanced Endocrinology and Steroid Chemistry.** (3 cr; minimum of 8 students; prereq 143 or 101; offered 1969-70 and alt yrs) Ungar
- 211s. Nucleic Acid Structure and Function.** (3 cr; prereq 143 or 101; offered 1969-70 and alt yrs) Bodley, Koerner
- 215su. Topics in Lipid Metabolism.** (3 cr; minimum of 8 students; prereq 143 or 101 or §; offered 1969 and alt yrs) Frantz
- 217w. Protein Chemistry.** (3 cr; minimum of 8 students; prereq 143 or 101 or § and PCh 103 or §; offered 1970-71 and alt yrs) Wetlaufer
- 219f. Biochemistry of Specialized Tissues.** (3 cr; minimum of 8 students; prereq 143 or 101; offered 1970-71 and alt yrs) Armstrong, Van Pilsun
- 236f,w,s. Radioisotope Seminar.** (1 cr, §Rad 236) Loken, Armstrong, and staff

BIOCHEMISTRY (BioC)

OFFERED AT ST. PAUL

Professor

LaVell M. Henderson, Ph.D., *head, director of graduate study*
David R. Briggs, Ph.D., *emeritus*

Stanley Dagley, D.Sc.
John E. Gander, Ph.D.
Robert Jenness, Ph.D.
Samuel Kirkwood, Ph.D.

Irvin E. Liener, Ph.D.
Walter O. Lundberg, Ph.D.**
Helmut K. Mangold, Ph.D.**
Hermann Schlenk, Ph.D.**
Max O. Schultz, Ph.D.

Associate Professor

Victor A. Bloomfield
Robert L. Glass, Ph.D.

Rex E. Lovrien, Ph.D.
Ulysses S. Seal, Ph.D.
Huber R. Warner, Ph.D.

Assistant Professor

John S. Anderson, Ph.D.
Peter J. Chapman, Ph.D.
Dolph Klein, Ph.D.

Graduate training leading to the M.S. and Ph.D. degrees is offered jointly with the Biochemistry Department in the College of Medical Sciences, by cooperative effort maintained through an interdepartmental committee.

Prerequisites — For major work, candidates must offer the equivalent of courses in analytical, organic, and physical chemistry as contained in an American Chemical Society approved curriculum. In addition the student is required to have at least 1 year of college physics, mathematics through integral calculus, and 1 year of biology (general, botany, zoology, or microbiology).

Students will be permitted to make up deficiencies in these requirements in the course of completing their graduate program.

Proficiency Examination — 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.

Major — Candidates for the Ph.D. degree must have credit in appropriate biochemistry courses as well as four graduate courses in organic and physical chemistry. Two graduate courses in biology are also required. Thesis research may be undertaken in areas acceptable to the adviser.

Minor — Suitable courses to meet the requirements for the biochemistry minor will be selected in consultation with the department head.

M.S. Degree — Work for the Master's degree is offered only under Plan A.

Language Requirement — The foreign language requirement may be satisfied by one of the three following options: (1) demonstrate a high level of proficiency in German, (2) demonstrate a reading knowledge of German and one other foreign language, normally either French or Russian, or (3) demonstrate a reading knowledge of German and competence in computer science.

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

101. Basic Biochemistry. Offered to enable students to make up certain deficiencies in background course work. (1-3 cr; prereq Δ) Staff

119. Physical Biochemistry. Hydrodynamic, optical, and thermodynamic methods for study of macromolecular structure in solution, particularly proteins. Quantitative aspects of conformation changes. Lectures and assigned reading. (3 cr; prereq PCh 101 or equiv, #) Lovrien

** Members of the Hormel Institute Staff.

Fields of Instruction

- 141-142-143. General Biochemistry.** (Same as MdBc 141-142-143) Course offered jointly by Department of Biochemistry (Biological Sciences) and Department of Biochemistry (Medical Sciences). Integrated series of lectures on chemical nature, properties, biochemical reactions, and intermediary metabolism of components of biological systems. (3 cr per qtr; prereq ¶145-146 except with Δ , 1 yr organic chemistry and cr in physical chemistry or ¶PCh 101, 107, and $\#$) Gander, Kirkwood, Wetlaufer, Wold
- 145-146. General Biochemistry Laboratory.** Laboratory work paralleling and required of all who are registered in BioC 141-142 or MdBc 141-142 except with permission of department heads. (3 cr per qtr; prereq ¶141-142, 4 cr in analytical chemistry and $\#$) Chapman, Gander, Lovrien
- 147. Advanced Biochemical Techniques.** Laboratory in modern methods for study of enzymatic and metabolic reactions. (3 cr; prereq 146 or MdBc 146, ¶143 and $\#$) Warner
- 148. General Biochemistry Laboratory.** For students in chemistry and chemical engineering. (2 cr; prereq 142, 4 cr in analytical chemistry and $\#$) Chapman
- 151-152. Introduction to Biochemistry.** Fundamentals of composition, chemical properties, reactions and interactions of biological materials; these are illustrated in part through laboratory exercises performed by the student. Term paper required. (4 cr per qtr; prereq OrCh 62 and $\#$) Anderson, Schultze
- 153. Dairy Biochemistry.** Problems in biosynthesis and physical and chemical properties of constituents of milk. Term paper on special topic required. (3 cr; prereq ¶163 except with $\#$, 152) Jenness
- 163. Dairy Biochemistry Laboratory.** Laboratory work paralleling and required of all who register in 153 except with permission. (2 cr; prereq ¶153, 152) Jenness
- 204. Tracer Techniques.** Laboratory work on application of radioisotopes to study of metabolic processes. (3 cr; prereq $\#$ and 143 or MdBc 144, 146 or MdBc 146...MeAg 127 advised) Kirkwood
- 220. Advanced Protein Chemistry.** Lectures and assigned reading on composition, structure, chemical and physical properties, and biochemical functions of proteins and amino acids. (2 cr; prereq 143 or MdBc 144; offered 1969-70 and alt yrs)
- 221. Advanced Carbohydrate Chemistry.** Lectures and assigned reading on composition, structure, chemical and physical properties, and biochemical functions of carbohydrates. (2 cr; prereq 143 or MdBc 144; offered 1969-70 and alt yrs)
- 222. Advanced Lipid Chemistry.** Lectures and assigned reading on composition, structure, chemical and physical properties, and biochemical functions of fats and fat-like compounds. (2 cr; prereq 143 or MdBc 144; offered 1969-70 and alt yrs)
- 223. Advanced Enzyme Chemistry.** Lectures and assigned reading on nature and function of enzymes. (2 cr; prereq 143 or MdBc 144; offered 1970-71 and alt yrs) Kirkwood, Liener
- 224. Vitamins.** Lectures and assigned reading on biochemistry of vitamins and their physiological action. (3 cr; prereq 143 or $\#$) Schultze
- 225s. Metabolism of Nucleic Acids.** Lectures on the synthesis and metabolism of nucleotides and nucleic acids, and their role in protein synthesis and cellular metabolism. (3 cr, $\$$ MdBc 211; prereq ¶143; offered 1970-71 and alt yrs) Warner
- 295. Graduate Student Orientation.** Designed for first-year graduate students to acquaint them with current areas of research. (1 cr)
- 296. Research and Literature Reports.** Consideration of current developments in biochemistry. (1 cr)
- 297. Special Topics in Biochemistry.** Lectures and discussions varying from quarter to quarter according to staff availability and needs of the department. (1-3 cr; prereq 143) Staff
- 298. Graduate Seminar.** Reports on recent developments in biochemistry and on research projects in the department. (1 cr; prereq Δ) Staff
- 299. Graduate Research.** Research problems in various fields in biochemistry represented by staff interest. (2-5 cr; prereq $\#$) Staff

OFFERED AT ROCHESTER

Professor

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

Bernard K. Forscher, Ph.D.
 Nai-Siang Jiang, Ph.D.
 James D. Jones, Ph.D.
 John T. McCall, Ph.D.
 John W. Rosevear, M.D., Ph.D.

Assistant Professor

Carl Bernofsky, Ph.D.
 Ralph D. Ellefson, Ph.D.

Students pursuing graduate work in a clinical field may select biochemistry as the minor subject and prepare a laboratory thesis in the Department of Biochemistry or they may select physiology as the minor subject and prepare a thesis in the Department of Biochemistry.

M 251f,w,s,su (8-851). Biochemistry. Research work in problems related to metabolism, chemistry of the blood, steroid hormones, enzymes, proteins, lipids, and minerals; training in use of methods of organic and inorganic analysis. Mattox, Flock, Fleisher, Rosevear, Jones, Ellefson, McCall, Bernofsky

M 252f (8-852). Biochemistry Lecture. Major constituents of cells; enzymes; biological oxidations; metabolism of carbohydrates and amino acids. (3 cr) Staff

M 253w (8-853). Biochemistry Lecture. Metabolism of lipids and nucleic acids; biosynthesis of proteins; biochemistry of blood and specialized tissues; endocrinology; nutrition. (3 cr) Staff

M 254 (8-854). Biochemistry Seminar. (1 cr) Staff

M 255w (8-855). Endocrinology and Metabolism. (3 cr) Staff

Biophysics — Electronic Computers. (See Department of Biophysics)

Nutrition. (See Division of Nutrition)

Students majoring in biochemistry may also carry on research work in physiology. For details, see that department.

Students majoring in medicine may combine course work in physiology and biochemistry for a minor in biochemistry.

BIOMETRY

OFFERED AT MINNEAPOLIS

Professor

Richard B. McHugh, Ph.D., *head, director of graduate study*
 Eugene Ackerman, Ph.D.
 Jacob E. Bearman, Ph.D.
 Eugene A. Johnson, Ph.D.

Robert L. Evans, Ph.D.
 Marcus O. Kjelsberg, Ph.D.
 Marion W. Thornton, Ph.D.

Assistant Professor

Kathleen M. Keenan, Ph.D.
 Ruth B. Loewenson, Ph.D.
 Frank B. Martin, Ph.D.

Associate Professor

Glenn E. Bartsch, Ph.D.
 James R. Boen, Ph.D.

Prerequisites — For major work, completion of the premedical curriculum. Acceptable alternatives include the equivalent of an undergraduate major in one of the following two categories:

1. The biological and/or behavioral sciences,

Fields of Instruction

2. The physical sciences and/or mathematics,

and the equivalent of a minor in the other category. If the major is in category 2, the candidate should be interested in application in category 1.

Language Requirement — For the M.S. degree Plan A, one foreign language. For the Ph.D. degree, either (a) two foreign languages or (b) one foreign language and the option of a special research technique or a collateral field of knowledge. Acceptable languages are Chinese, French, German, Italian, Japanese, Russian, Scandinavian languages, and Spanish.

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

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

Programs for the M.S. or Ph.D. degree with a major in biometry will include courses in the application of statistics, mathematics, and computer science to the biological, medical, and public health fields. These courses will be chosen from those listed below, supplemented with appropriate courses in statistical theory, mathematics, computer science, and biology.

For students minoring in biometry the sequences PubH 110A, B, C and PubH 111A, B, C, or equivalent are required. The remainder of the program should be planned with the minor adviser before any other courses in the minor are taken.

PubH 110A.* Biometry I. Basic concepts in probability; binomial, Poisson, and normal probability models; testing hypotheses and estimation of parameters of probability models. (3 cr; prereq Math 10 or § and ¶(PubH 111A) Bartsch

PubH 111A. Biometry Laboratory I. Application of concepts of probability to the development of probability models for random phenomena in the biological and medical sciences. (2 cr; prereq ¶(110A) Bartsch

PubH 110B.* Biometry II. Further consideration of testing statistical hypotheses and interval estimation; regression analysis; correlation; use of ratios; analysis of variance; contrasts and multiple comparison techniques. (3 cr; prereq 110A and ¶(111B) Bartsch

PubH 111B. Biometry Laboratory II. Application of concepts of testing and estimation concerning the parameters of the basic probability models; application of regression to bioassay; examples of the use and misuse of ratios; application of analysis of variance to bioassay. (2 cr; prereq ¶(110B) Bartsch

PubH 110C.* Biometry III. Analysis of randomized block, factorial and split plot designs; χ^2 applied to frequency data. (3 cr; prereq 110B and ¶(111C) Bartsch

PubH 111C. Biometry Laboratory III. Basic designs will be illustrated with numerous examples from the biological sciences; application of χ^2 to goodness of fit and heterogeneity tests. (2 cr; prereq ¶(110C) Bartsch

PubH 120A-B-C. Biomedical Computing. 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. (3 cr per qtr; prereq Math 10) Johnson

PubH 120D-E.*† Biomedical Computing. Introduction to digital computer and FORTRAN programming with applications in biology and medicine. (2 cr per qtr, §120A; prereq Math 10) Johnson

PubH 121A-B-C.* Quantitative Mammalian Biology. A: Diffusion, surface tension, and mechanics of respiration, circulation, digestion, and locomotion. B: Chemical aspects of blood, respiration, renal function, nutrition, and metabolism. C: Endocrine, sensory,

- neuromuscular, and central neural functioning. (3 cr per qtr; prereq 1-yr sequences in mathematics, physics, chemistry, and biology or #) Evans
- PubH 124. Medical Statistics II.** Survey of biostatistics for dentists and physicians; elementary statistical methods and their application with emphasis on dental and medical research and appreciation of research literature; examples taken from recent dental and medical journals. (3 cr; prereq D.D.S. or M.D. or #) Bearman
- PubH 124A. Research Methods in Clinical Studies.** Design, conduct, and analysis of clinical studies; prophylactic trials; 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. (3 cr; prereq 124 or equiv or #) Bearman
- PubH 140. Vital Statistics I.** Official sources; population changes; rates; trends; significant differences. (3 cr) Bearman, Thornton
- PubH 140A. Vital Statistics II.** Demographic techniques and statistical inference for public health majors. (3 cr; prereq 140 with grade of B) Thornton
- PubH 144. History of Biometry.** Development of probability theory and systems for collection of vital statistics; early application to life tables, medical, and biological problems; biographies of men important in development. (2 cr; prereq 3 cr in statistics) Thornton
- PubH 150A. Health Statistics I.** Statistics for health planning and administration. Sources of data on health. Summarization procedures used in vital statistics. Methods of data collection. Morbidity surveys. (3 cr, §140A; prereq biometry major, others #) Kjelsberg
- PubH 150B. Health Statistics II.** Statistical topics in epidemiology, relative risk; misclassification; matched pair designs; incidence as a function of several variables; selection; familial aggregation. (3 cr; prereq 150A, biometry major, others #) Kjelsberg
- PubH 150C. Health Statistics III.** Statistics on survivorship. Mathematical development of life table techniques and their application to follow-up studies in medicine and public health. (3 cr; prereq 150B, biometry major, others #) Kjelsberg
- PubH 180. Introduction to Biometry.** Variation; frequency distribution; probability; estimation; significance tests; binomial, normal, Poisson distributions; serial dilutions, most probable number. (6 cr; prereq environmental health students only, others #) Kjelsberg
- PubH 197A-B-C.* Elements of Mathematical Biology.** Physico-, chemico-, and mathematical biology; statics and dynamics of tissues and fluids; biological reaction and compartment analysis, ion diffusions, and colloids; analog and digital computer uses in biomedicine. (3 cr per qtr; prereq mathematics through differential equations and 1-yr sequences in physics, chemistry, and a basic biological science, with lab work in one or more, or #) Ackerman, Evans
- PubH 200.* Research.** Opportunities are offered by the School of Public Health and by various cooperating organizations for qualified students to pursue research work. (Cr ar) Graduate staff
- PubH 201.* Topics in Biometry.** Studies in special topics for advanced students. (Cr ar; prereq 110A and #) Staff
- PubH 203A-B-C.* Research Design in Biometry.** Methodology of design of experiments and sample surveys in behavioral and biological sciences; randomized blocks, Latin-squares, factorials, incomplete blocks, long-term experiments and analysis of groups of experimental simple random, stratified, multistage, and multiphase sampling designs. (3 cr per qtr; prereq 110C or #) McHugh
- PubH 204A-B-C.* Theory of Research Design in Biometry.** Theory of linear estimation and general linear hypothesis; analysis of multiple classifications; components of variance; randomization theory of designs. (2 cr per qtr; prereq calculus and †203A-B-C) McHugh
- PubH 211.* Seminar: Biometry.** (Cr ar) Staff
- PubH 216A-B.* Biomedical Measurement Problems.** Statistical aspects of biological assays and counting techniques, calibration problems, quality control procedures. (3 cr per qtr; prereq 110C) Staff

Fields of Instruction

PubH 217A-B.° Theory for Biomedical Measurement Problems. (2 cr per qtr; prereq Stat 123 or Stat 133 or #, and ¶PubH 216A-B) Staff

PubH 250A-B-C.° Foundations of Biometry. Measurement models, theories of probability, logic of induction, alternative theories of inference. (2 cr per qtr; prereq 204C, 217B or #) Staff

OFFERED AT ROCHESTER

Professor

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

Graduate work in medical statistics at the Mayo Graduate School of Medicine is offered in the Section of Medical Statistics, Epidemiology, and Population Genetics at the Mayo Clinic.

M 123 (8-823). Introductory Statistics I. The role of statistics in the evaluation of evidence. Estimation and comparisons in clinical and experimental research. Basic considerations in experimental design: populations and samples. Statistical methodology: binomial, normal, and skewed distributions, t , χ^2 , and introduction to correlation and regression in the two-variable case.

M 124 (8-824). Introductory Statistics II. Further considerations of experimental design. Additional applications of χ^2 . Analysis of variance. Multivariate regression. Survivorship in chronic disease.

M 125 (8-825). Introductory Statistics III. The Poisson distribution, normal values in clinical medicine, nonparametric methods, clinical trials, introduction to sequential methods, bioassay, and analysis of covariance.

BIOPHYSICS (BPhy)

OFFERED AT MINNEAPOLIS

Committee

Professor

Rufus W. Lumry, Ph.D., *chairman*
A. Glenn Richards, Ph.D.
Otto H. Schmitt, Ph.D.
Carlo A. Terzuolo, M.D.

Staff

Professor

Eugene Ackerman, Ph.D.
Merle K. Loken, M.D., Ph.D.
Rufus W. Lumry, Ph.D.
Murray D. Rosenberg, M.D., Ph.D.
Otto H. Schmitt, Ph.D.
Carlo A. Terzuolo, M.D.

Associate Professor

Alan L. Orvis, Ph.D.

Additional staff for course work in biophysics is drawn from the Departments of Zoology, Physics, Chemistry, Genetics, Physiology, Chemical Engineering, and the Mayo Graduate School of Medicine. At present there are opportunities for thesis research in a limited number of areas including bioelectronics, metabolite and energy dynamics, neural and sensory physiology, radiology, membrane structure and function, certain aspects of computer research, and physical chemistry of proteins. There are opportunities for additional types of thesis research at the Mayo Graduate School of Medicine in Rochester, Minnesota. Ph.D. students doing thesis work at the Mayo Graduate School of Medicine customarily take the major part of their course work in

Minneapolis. In addition there is a Master's program in biophysics at the Mayo Graduate School of Medicine which includes only courses given in Rochester.

Prerequisites — Basic preparation in biological and physical sciences and mathematics, with an undergraduate major in one of these areas, is required.

Language Requirement — For the Master's degree, either reading knowledge of one language (Russian or German recommended) or substitution of approved course work, choice of approved course work or language to be made by the student's adviser. For the Ph.D. degree, either Russian or German and an additional language chosen from Russian, German, or French. A collateral field may be substituted for the second language.

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

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

Biophysics is a broad field including diverse biological and physical disciplines. Accordingly credit in biophysics is regularly granted for courses drawn from various 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 his adviser the student should plan a program tailored to his individual needs. Because biophysics is highly interdisciplinary a minor field is not identified as such on the student's program.

105. **Review of Elementary Physics.** For medical students by arrangement with instructor. (1 cr) Loken

138x. **Seminar: Biophysics and General Physiology.** (Cr ar) Staff

155,* 156,* 157.* **Biophysics.** Theoretical and experimental aspects of biology that can be studied by quantitative physical means. 155: Tissue ultrastructure (biostatics) as revealed by hypermicroscopy, birefringence, X-ray, electron and radioactive means, and by colloidal and micellar phenomena. 156: Dynamics of biophysical systems: excitatory state, contraction, secretion, synthesis. 157: Integrative biophysical systems; stability of systems, transmission of information, sensory mechanism. (3 cr per qtr; prereq 28 cr distributed between physics and biology, #...physical chemistry and physiology recommended) Schmitt

170, 171, 172. **Radiation Biophysics.** Theoretical and experimental aspects of radiological physics, medical physics, and radiobiology. Consideration of physical properties of various ionizing radiations, interaction of ionizing radiations with biological systems, and the use of radioactive isotopes as tracer elements. (3 cr per qtr; prereq #) Loken

204x.* **Research in Biophysics and Radiation Biology.** (Cr ar) Loken

218x. **Seminar: Radiobiology.** Discussion of research problems and current literature on the biological effects of ionizing radiations. (1 cr; prereq #)

221x* - 222x* - 223x.* **Research in Biophysics.** (Cr ar) Staff

Rad 236 (0-220). **Seminar: Radioisotope.** Loken

296* - 297* - 298.* **Seminar: Biophysics.** (Cr ar) Schmitt

OFFERED AT ROCHESTER

(See Department of Physiology and Biophysics)

DENTISTRY

OFFERED AT MINNEAPOLIS

Professor

Erwin M. Schaffer, D.D.S., M.S.D., *dean*
Mellor R. Holland, D.D.S., M.S.D., *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, M.S.D., Ph.D.
James R. Jensen, D.D.S., M.S.
Andrew T. Morstad, D.D.S., M.S.
Edmund S. Olsen, D.D.S., M.S.D.
Leon Singer, Ph.D.
Carl J. Witkop, D.D.S., M.S.
George M. Yamane, D.D.S., Ph.D.
Douglas H. Yock, D.D.S., M.S.

Clinical Professor

Arthur H. Bulbulian, D.D.S.
Sherwood R. Steadman, D.D.S., M.S.

Associate Professor

Dwight L. Anderson, Ph.D.
Lawrence Meskin, D.D.S., Ph.D.
Burton L. Shapiro, D.D.S., Ph.D.
Robert A. Vickers, D.D.S., M.S.D.

Clinical Associate Professor

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

Assistant Professor

James H. Butler, D.D.S., M.S.
Richard J. Goodkind, D.M.D., M.S.
Freeman N. Rosenblum, D.D.S., M.S.D.

Clinical Assistant Professor

Ralph B. Kersten, D.D.S.
Norman A. Korn, D.D.S., M.S.D.
Ronald E. LaBelle, D.D.S., M.S.D.
Richard C. Paulson, D.D.S., M.S.D.
Frank W. Worms, D.D.S., M.S.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 M.S. 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, 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)

- 295 (8-295). **Hospital Protocol.** Instruction in the 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. (Cr and hrs ar; prereq #) Olsen and staff
- 301 (8-400). **Occlusion.** (1 cr) Butler
- 301 (8-401). **Occlusion.** (1 cr) Butler

Endodontics (Endo)

- 270f,w,s,su (0-300, 0-301, 0-302, 0-303). **Advanced Clinical Endodontics.** Diagnosis and treatment of clinical cases. Students will be assigned complex cases, and explore new and unique techniques. Jensen and staff
- 271f,w,s,su (8-001). **Research in Endodontics.** Organized literature review in area of specific interest of student, selection of thesis project, and completion of research and thesis. (Cr ar) Jensen and staff
- 272f,w,s,su (8-310, 8-311, 8-312, 8-313). **Seminar: Endodontics.** Review current literature, research, and clinical cases. Sessions assigned to student. (2 cr) Jensen and staff
- 273f,w,s,su (8-320, 8-321, 8-322, 8-323). **Advanced Endodontic Lectures.** Pulpal and periapical pathology, diagnosis, and treatment planning in endodontics. (1 cr per qtr) Jensen and staff
- 330 (8-330). **Endodontic Diagnosis and Treatment Planning.** Etiology treatment, and prognosis of clinical endodontic patients. (Cr ar) Jensen and staff
- 331 (8-331). **Topics in Endodontics.** Studies in special topics for advanced students. (Cr ar) Jensen and staff

Oral Medicine (OMed)

- 232 (8-001). **Research Problems in Oral Medicine.** (Cr and hrs ar) Yamane and staff
- 236 (8-002). **Research in Oral Roentgenology.** (Cr and hrs ar) Yamane and staff
- 233 (8-003). **Topics in Oral Medicine and Oral Roentgenology.** Special topics in medicine and/or roentgenology as related to dentistry will be assigned. (Cr and hrs ar) Yamane and staff
- 230 (8-100). **Advanced Oral Diagnosis.** Basic principles of oral examinations, differential clinical diagnostic techniques, and treatment planning. Topics dealing with oral manifestations of systemic disease and systemic manifestations of oral disease assigned for collateral reading. (Cr and hrs ar) Yamane
- 231 (8-101). **Advanced Clinical Oral Diagnosis.** Application of the basic principles of oral diagnosis; recording of clinical data and organizing and implementing a detailed treatment plan. (Cr and hrs ar) Yamane
- 234 (8-200). **Advanced Oral Roentgenology.** Consideration of basic factors governing X-radiation, emphasizing recent advances in biophysics with special reference to technique and materials used. Topics in radiobiology will be assigned. Demonstration and practice. (Cr and hrs ar) Yamane and staff
- 235 (8-201). **Advanced Clinical Roentgenology.** Student assists in teaching and participates in activities of oral roentgenology clinic. Opportunity for thorough study of intra-oral and extra-oral roentgenology and associated problems and techniques. (1-3 cr) Yamane and staff
- 237 (8-300). **Advanced Treatment Planning Seminar.** Treatment and prognosis of advanced clinical cases discussed. (Cr and hrs ar)

Fields of Instruction

Oral Pathology (OPat)

- 222A (8-300). Human Development Genetics I.** Genetic and genetic-environmental interactions in the 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, will be emphasized. (2 cr; prereq GCB 66, BioC 101, Path 101 or #) Umana, Witkop
- 222B (8-301). Human Development Genetics II.** Continuation of OPat 222A. (2 cr; prereq 222A) Umana, Witkop
- 223 (8-009). Embryology of the Head and Neck.** Primitive germ layers, ectodermal placodes, sternodaeum. Oral cavity, Rathke's pouch, hypophysis, nose, jaws, chondrocranium, tongue, thyroid, pharyngeal arches and pouches, parathyroid, thymus will be discussed. (1 cr)
- 260-261 (8-002/8-003). Oral Pathology.** Lectures and laboratory on histology of teeth and related oral tissues, including embryologic considerations. Special pathology of the oral regions as well as relation of local pathologic findings to systemic conditions and to general pathology. Graduate students participate as laboratory assistants and meet some further requirements. (4 cr) Gorlin, Vickers
- 262 (8-001). Research in Oral Pathology.** (Cr and hrs ar) Gorlin, Vickers, Shapiro
- 264 (8-008). Clinical Oral Pathology Conference.** (1 cr) Gorlin
- 265 (8-004). Histopathology.** (1 cr) Vickers
- 266 (8-005). Advanced Oral Pathology.** Salivary gland development and pathology; dental organ pathology; bone physiology and pathology; radiation pathology; dermatology; lymph node and/or reticuloendothelial pathology; soft tissue pathology pertaining to the head and neck. (1-3 cr; limited to 8 students) Gorlin, Shapiro, Vickers
- 268 (8-006). Current Literature Review.** (1 cr) Gorlin, Vickers
- 269 (8-007). Special Oral Pathology.** Designed to acquaint potential clinical specialists in dentistry with oral diseases and oral manifestations of systemic disease. (2 cr) Gorlin, Vickers, Witkop
- 302 (8-302). Seminar: Human Developmental Genetics.** (Cr ar)

Oral Surgery (OSur)

- 250 (8-250). Advanced Oral Surgery.** Includes assigned clinics in University, Veterans Administration, and Hennepin County General Hospitals, such as tumor, plastic, and hospital dental clinics, in addition to regular periods in the Dental School. (Cr and hrs ar) Waite and staff
- 251 (8-251). Oral Surgery Seminar.** (1 cr) Shearer and staff
- 252 (8-252). Research in Oral Surgery.** (Cr and hrs ar) Wilkes and staff
- 253 (8-253). Problems in Oral Surgery.** (Cr and hrs ar) Waite and staff

Orthodontics (Otho)

- 200, 201, 202, 203 (8-200, 8-201, 8-202, 8-203). Growth and Development.** Head growth, development, osteology and myology. Includes both normal and abnormal morphology and function with emphasis on cephalometric methods. (Cr and hrs ar)
- 204, 205, 206, 207 (8-204, 8-205, 8-206, 8-207). Orthodontic Diagnosis and Treatment Planning.** Etiology, treatment, and prognosis of clinical orthodontic patients. (Cr and hrs ar)
- 208, 209, 210, 211 (8-208, 8-209, 8-210, 8-211). Orthodontic Seminar.** Review of current literature and discussion of current research and its implication to orthodontics. (Cr and hrs ar)
- 212, 213, 214, 215 (8-001). Research in Orthodontics.** (Cr and hrs ar)

- 216, 217, 218, 219 (8-216). **Topics in Orthodontics.** Studies in special topics for advanced students. (Cr and hrs ar)

Pediatric Dentistry (Pedo)

- 291 (0-291). **Clinical Pediatric Dentistry.** Designed to acquaint the student with 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. (Prereq #) Rosenblum and staff
- 290 (8-290). **Pediatric Dentistry.** Designed to familiarize the graduate student with problems in etiology, diagnosis, and treatment planning procedures in pediatric dentistry. Unusual cases are analyzed. (Cr and hrs ar; prereq #) Rosenblum and staff
- 292 (8-292). **Pediatric Dentistry Seminar.** Review of current literature and discussion of current research and its implication to pediatric dentistry. (Cr and hrs ar; prereq #) Rosenblum and staff
- 293 (8-293). **Research in Pediatric Dentistry.** (Cr and hrs ar; prereq #)
- 294 (8-294). **Dental Pediatrics.** Oral health problems of the physically and mentally handicapped child. Normal and abnormal growth of the child. (Cr and hrs ar; prereq #) Rosenblum and staff

Periodontology (Pero)

- 280 (8-000). **Advanced Periodontics Clinic.** Practical work in the 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. (Cr and hrs ar)
- 281 (8-200). **Advanced Periodontics Lectures.** Consideration of tissues involved in periodontal disease. Etiology and treatment of periodontal disease. (3 cr)
- 282 (8-100). **Research in Periodontics.** Opportunity to take part in the many phases of periodontal research under way in the laboratory for periodontal research. (Cr and hrs ar)
- 283 (8-300). **Seminar: Periodontics.** Etiology of periodontal disease, histopathology of periodontal symptoms, treatment of periodontal disease, research in periodontics. (2 cr)
- 284 (8-250). **Supporting Structures of the Teeth.** Histology, pathology, and physiology of the gingival tissues, the cementum, the periodontal membrane, and the alveolar bone discussed in lectures. Associated problems studied on a set of microscopic slides. (3 cr)
- 285 (8-400). **Histochemistry of the Normal and Pathologic Periodontium.** (2 cr)
- 286 (8-450). **Bacteriology of Periodontal Diseases.** (1 cr) Korn and staff

Prosthodontics (Pros)

- 240 (8-003). **Advanced Technical Restorative Dentistry.** Clinical and technological theories and practices are interrelated in an effort to solve the more complex problems in restorative therapy. (Cr and hrs ar [may be repeated for cr]) Goodkind, Jensen, Morstad, Olsen, and Yock
- 241 (8-010). **Seminar: Advanced Restorative Dentistry.** Review of current and selected historical literature with discussion of current research and its implication on restorative dental therapy. (Cr and hrs ar [may be repeated for cr]) Goodkind, Jensen, Morstad, Olsen, and Yock
- 241 (8-012). **Topics in Prosthodontics.** Studies in special topics for advanced students. (Cr and hrs ar [may be repeated for cr]; prereq #) Goodkind, Morstad, Olsen, and Yock
- 241 (8-020). **Applied Gnathology.** Seminar and clinical experience involving concepts and philosophies of jaw function. Emphasis is directed toward application of kinematics in

Fields of Instruction

- the development of a dental occlusion. (Cr and hrs ar [may be repeated for cr]; prereq §) Branstad, Butler, Goodkind, Olsen, and staff
- 243 (8-005). **Advanced Clinical Prosthodontics I.** Practical clinical experience in examination, diagnosis, treatment planning, and in the various phases of treatment of patients with restorative dental problems. New and/or unfamiliar concepts and techniques are stressed. (Cr and hrs ar [may be repeated for cr]) Goodkind, Morstad, Olsen, Yock, and staff
- 243 (8-006). **Advanced Clinical Prosthodontics II.** Experience in the prosthodontic treatment of patients having systemic complications. Patient therapy coordinated in a hospital environment as well as in the graduate clinic of the dental school. (Cr and hrs ar [may be repeated for cr]; prereq §) Goodkind, Morstad, Olsen, Yock, and staff
- 245 (8-015). **Seminar: Prosthodontics I.** Current concepts and practices related to treatment of the partially edentulous patient by means of fixed and removable partial prosthetic restorations. Based upon the application of related sciences with emphasis on prevention. (Cr and hrs ar [may be repeated for cr]; prereq §) Goodkind, Morstad, Olsen, Yock, and staff
- 246 (8-016). **Seminar: Prosthodontics II.** Consideration of the tissues involved and treatment of the completely edentulous patient. (Cr and hrs ar [may be repeated for cr]; prereq §) Goodkind, Morstad, Olsen, and staff
- 247 (8-001). **Research in Prosthodontics.** Arranged with individual students upon application after a critical review of current and historical literature pertaining to the problem. (Cr and hrs ar [may be repeated for cr]) Olsen and staff
- 248 (8-017). **Seminar: Advanced Prosthodontics.** Treatment planning for the partially edentulous patient. (Cr and hrs ar [may be repeated for cr]; prereq §) Goodkind, Morstad, Olsen, and staff
- 249 (8-018). **Seminar: Advanced Prosthodontics.** Treatment planning for the completely edentulous patient. (Cr and hrs ar [may be repeated for cr]; prereq §) Goodkind, Morstad, Olsen, and staff
- 290 (8-030). **Introduction to Comprehensive Maxillofacial Care.** Milestones in the development of maxillofacial prosthetics, and interdisciplinary relationships in treatment of the maxillofacial patient. (Cr and hrs ar; prereq §) Kersten, Bulbulian, Olsen, and staff
- 291 (8-032). **Principles of Maxillofacial Care.** Treatment biomechanics and technical procedures associated with the fabrication, fitting, and servicing of various types of oral and facial restorations. (Cr and hrs ar [may be repeated for cr]; prereq §) Bulbulian, Olsen, Warpeha, and staff
- 292 (8-034). **Advanced Clinical Maxillofacial Prosthetics.** Factors involved in diagnosis and organization of a treatment plan for the maxillofacial patient, and practical experience in associated clinical and laboratory procedures. (Cr and hrs ar [may be repeated for cr]; prereq 290, 291, §) Bulbulian, Olsen, Warpeha, and staff
- 296 (8-025). **Seminar: Applied Biomaterials I.** Consideration of principles which govern the manipulation of materials used in restorative dental practice. Physical properties and dimensional changes are stressed. (Cr and hrs ar; prereq §) Goodkind, Olsen, Petersen, Yock, and staff

OFFERED AT ROCHESTER

Associate Professor

Joseph A. Giblisco, D.D.S., M.S.D., head
Stanley A. Lovstedt, D.D.S., M.S.

Assistant Professor

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

Instructor

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.

The Section of Dentistry is composed of five closely integrated dental disciplines: oral diagnosis, oral surgery, orthodontics, prosthodontics, and periodon-

tics. The close association of all other medical sections with the graduate dental training programs provides a unique opportunity for advanced education. The degree, master of science in dentistry, is available to all qualified residents in oral surgery, orthodontics, periodontics, and prosthodontics, and will be at the direction of the Mayo Graduate School of Medicine and the staff of the Section of Dentistry. A minimum of 3 calendar years is required in each program. 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, clinico-pathologic 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 the requirements for American Board Certification.

Oral Surgery (OrSu)

Resident appointments in oral surgery are made quarterly and 6 months in advance. Facilities are available to accept four 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, otorhinolaryngology, 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 in 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 of all patients.

Training in anesthesiology is under the supervision of the Section of Anesthesiology. During the period of 6 months' 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 the preanesthetic and postanesthetic drugs and also in the management of pain.

M 250 (8-850). Oral Surgery. Includes first assistant on all oral surgery problems, in oral surgery Outpatient Clinic and hospitals. (Cr ar; 3 qtrs)

M 251 (8-851). Dental Roentgenology. Includes X-ray diagnosis and techniques. (Cr ar; 1 qtr)

M 252 (8-852). Oral Diagnosis. Clinical diagnosis relating to dental and oral surgery problems. (Cr ar; 1 qtr)

M 253 (8-853). Seminar: Current Literature. Weekly literature review from current journals relating to oral surgery. (1 cr)

M 254 (8-854). Seminar: Oral Surgery. Weekly review of case histories, academic presentation, discussion of oral surgery subjects, and related areas. (1 cr)

Fields of Instruction

- M 256 (8-856). Advanced Oral Surgery.** Includes assignment to Detroit General Hospital and Rochester State Hospital. (Cr ar; 2 qtrs)
- M 257 (8-857). Research on Selected Problems.** (Cr ar) Gibilisco and staff
- M 258 (8-858). Seminar: Dentistry.** Relationship to other disciplines of dentistry and medicine. (1 cr)
- M 259 (8-859). Principles of Oral Surgery.** Lecture presentation of the principles involved in basic oral surgery. (1 cr; 1 qtr)
- M 273 (8-873). Oral Pathology.** Special pathology of the oral region; histopathology of oral lesions. (Cr ar; 1 hr biweekly) Dahlin, Dockerty
- Anat M 252 (Anat 8-852). Anatomy of the Head and Neck.** (See Department of Anatomy) (Cr ar) Hollinshead
- Anes M 253 (Anes 8-853). Anesthesiology.** (See Department of Anesthesiology) Faulconer and staff
- Otol M 251 (Otol 8-851). Clinical Otolaryngology and Rhinology.** (See Department of Otolaryngology and Rhinology)
- Med M 253 (Med 8-853). Medical Diagnosis in Hospital Service.** (See Department of Medicine)
- Nutr M 290 (Nutr 8-890). Current Concepts in Applied Nutrition.** (2 cr) Nelson
- Path M 267 (Path 8-867). General Pathology — Surgical Pathology.** (See Department of Pathology) (Cr ar) Dockerty and staff
- Biom M 123 (Biom 8-823). Introductory Statistics I.** (See Department of Biometry) (3 cr) Kurland and staff

Orthodontics (Otho)

The fellowship program in orthodontics is 3 years. One or two appointments per year are made to qualified graduates of approved dental schools.

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. A 2-quarter, off-campus assignment at the Minneapolis Campus is utilized to provide human histology, human embryology, biostatistics, genetics, and available orthodontic seminars and lectures.

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 the Rochester State Hospitals.

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

- M 200 (8-800). Advanced Orthodontic Techniques.** Initial technical procedures in preparation for clinical patient care. Technical procedures on the typodont, model preparation, photography, metallurgy, and cephalometrics. (Cr ar) Sather
- M 202 (8-802). Orthodontic Case Analysis.** The first phase of case analysis involves complete review of previously treated cases. The second phase is application of basic analytic principles to clinical patients. (Cr ar) Sather
- M 203 (8-803). Orthodontic Treatment Planning.** Mechanical principles coordinated with case analyses to provide the treatment plan. Force analysis and biomechanics of tooth movement. (Cr ar) Sather
- M 204 (8-804). Clinical Orthodontics.** Individual treatment care and clinical observation. Treatment care coordinated with other services in selected instances in the hospital. (Cr ar) Sather

- M 205 (8-805). Advanced Clinical Orthodontics.** Final treatment care of individual patients. (Cr ar) Sather
- M 206 (8-806). Orthodontic Seminar: Technique.** Seminar on technical orthodontic procedures. (Cr ar) Sather
- M 207 (8-807). Orthodontic Seminar: Literature Review.** Selected review of classical orthodontic literature as well as current literature review. (Cr ar) Sather
- M 208 (8-808). Orthodontic Seminar: Case Presentation.** Cases with complete records are reviewed and new patient treatment plans are discussed. (Cr ar)
- M 209 (8-809). Oral Rehabilitation Clinic.** Case presentation, illustration, diagnostic and treatment procedures that encompass the various dental specialties. (Cr ar) Lund, Sather
- M 251 (8-851). Dental Roentgenology.** Includes X-ray diagnosis and techniques. (Cr ar; 1 qtr) Gibilisco, Lovestedt, Tolman
- M 252 (8-852). Oral Diagnosis.** A clinical course in diagnosis related to dental problems. (Cr ar) Gibilisco, Lovestedt, Tolman
- M 255 (8-855). Dental Specialties.** Rotation through the adjunctive services of various dental specialties (oral surgery, periodontics, and prosthodontics). (Cr ar)
- M 257 (8-857). Research in Selected Problems.** Arrangements for research in selected areas related to minor. (Cr ar) Gibilisco and staff
- M 258 (8-858). Seminar: Dentistry.** Relationship to other disciplines of dentistry and medicine. (1 cr)
- M 261 (8-861). Speech Pathology.** (Cr ar) Darley, Aronson, and staff
- M 273 (8-873). Oral Pathology.** Special pathology of the oral region; histopathology of oral lesions. (Cr ar) Dahlin, Dockerty, Reeve
- Anat M 252 (Anat 8-852). Anatomy of the Head and Neck.** (See Department of Anatomy) Hollinshead

Prosthodontics (Pros)

Fellowship appointments to qualified graduates of approved dental schools are made once a year, beginning in the summer quarter. Services include clinical and laboratory prosthodontics, maxillofacial prosthetics, oral diagnosis and roentgenographic interpretation, surgical pathology, anatomy and physiology, speech pathology, hospital procedure and clinical practice, and related dental specialties. Under staff supervision, fellows care for patients at Methodist, St. Marys, and Rochester State Hospitals. 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, and, in addition, fellows attend seminars relating to their quarterly assignments.

- M 240 (8-840). Clinical Prosthodontics: Complete Dentures.** Orientation and introduction to the clinical and laboratory phases of prosthodontics in the medical center with emphasis on principles, concepts, and practices related to complete denture prostheses. (2 qtrs) Laney, Gonzalez
- M 241 (8-841). Prosthodontic Seminar.** Literature review and discussion of past and current concepts and practices of complete denture prosthesis. (3 qtrs) Laney, Gonzalez
- M 242 (8-842). Clinical Prosthodontics: Partial Dentures.** Orientation and introduction to the clinical and laboratory phases of prosthodontics in the medical center with emphasis on principles, concepts, and practices related to removable and fixed partial denture prostheses. (1 qtr) Laney, Gonzalez
- M 243 (8-843). Prosthodontic Seminar.** Literature review and discussion of past and current concepts and practices of partial denture prosthesis. (2 qtrs) Laney, Gonzalez

Fields of Instruction

- 243 (8-005). **Advanced Clinical Restorative Dentistry.** (Cr and hrs ar; offered on Minneapolis Campus) Morstad, Yock, and staff
- M 244 (8-844). **Maxillofacial Prosthetics (Intra-Oral) — Advanced Prosthodontics.** Clinical and laboratory procedures involved in the management of patients with acquired, congenital, and developmental intra-oral defects. (3 qtrs) Laney, Gonzalez
- M 245 (8-845). **Seminar: Maxillofacial Prosthetics (Extra-Oral) — Advanced Prosthodontics.** Lectures and discussion related to the clinical and laboratory procedures involved in the fabrication of extra-oral prostheses. (1 qtr) Gonzalez
- M 246 (8-846). **Maxillofacial Prosthetics (Extra-Oral) — Advanced Prosthodontics.** Clinical and laboratory procedures involved in the management of patients with acquired and congenital head and neck defects. (2 qtrs) Gonzalez
- M 247 (8-847). **Seminar: Maxillofacial Prosthetics (Intra-Oral) — Advanced Prosthodontics.** Literature review and discussion of past and present concepts and practices related to maxillofacial prosthetics. (2 qtrs) Laney, Gonzalez
- M 251 (8-851). **Dental Roentgenology.** X-ray diagnosis and technique. (Cr ar) Gibilisco, Lovstedt, Tolman
- M 252 (8-852). **Oral Diagnosis.** Clinical diagnosis related to dental problems. (Cr ar) Gibilisco, Lovstedt, Tolman
- M 255 (8-855). **Dental Specialties.** Rotation through the adjunctive services of various dental specialties (oral surgery, periodontics, and orthodontics). (Cr ar)
- M 257 (8-857). **Research in Selected Problems.** (Cr ar) Gibilisco and staff
- M 258 (8-858). **Seminar: Dentistry.** Relationship to other disciplines of dentistry and medicine. (1 cr)
- M 261 (8-861). **Speech Pathology.** (Cr ar) Darley, Aronson
- M 273 (8-873). **Oral Pathology.** Special pathology of the oral region, histopathology of oral lesions. (Cr ar; 1 hr biweekly) Dahlin, Dockerty, Reeve
- Anat M 252a (Anat 8-852). **Anatomy of Head and Neck.** (See Department of Anatomy) (Cr ar) Hollinshead
- Biom M 123 (Biom 8-823). **Introductory Statistics I.** (See Department of Biometry) (3 cr) Kurland and staff
- Nutr M 290 (Nutr 8-890). **Current Concepts in Applied Nutrition.** (2 cr) Nelson
- Path M 267 (Path 8-867). **General Pathology — Surgical Pathology.** (See Department of Pathology) (Cr ar) Dockerty and staff
- PlSu M 253 (PlSu 8-853). **Plastic Surgery.** (See Department of Surgery) (Cr ar) Simons and staff
- Rad M 253 (Rad 8-853). **Therapeutic Radiology.** (See Department of Radiology) (Cr ar) Childs and staff

Periodontics (Pero)

The Mayo Graduate School of Medicine fellowship 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 non-clinical fields, *viz.*, pathology, anatomy, histology, and microbiology. One quarter is spent at the Minneapolis Campus for additional clinical and didactic training.

- M 251 (8-851). **Dental Roentgenology.** X-ray diagnosis and technique. (Cr ar) Gibilisco, Lovstedt, Tolman

- M 252 (8-852). Oral Diagnosis.** Clinical diagnosis related to dental problems, (Cr ar) Giblisco, Lovestedt, Tolman
- M 255 (8-855). Dental Specialties.** Rotation through the adjunctive services of various dental specialties (oral surgery, orthodontics, prosthodontics). (Cr ar)
- M 257 (8-857). Research on Selected Problems.** (Cr ar) Giblisco and staff
- M 258 (8-858). Seminar: Dentistry.** Relationship to other disciplines of dentistry and medicine. (1 cr)
- M 273 (8-873). Oral Pathology.** Special pathology of the oral region; histopathology of oral lesions. (Cr ar) Dahlin, Dockerty, Reeve
- M 280 (8-880). Clinical Periodontics.** Etiology, diagnosis, and treatment of periodontal disease. (Cr ar) Reeve
- M 281 (8-881). Advanced Clinical Periodontics.** Case presentation and treatment of difficult periodontal problems. (Cr ar) Reeve
- M 283 (8-883). Periodontic Seminar.** Literature review and discussion. (1 cr) Reeve
- M 284 (8-884). Pathology of Periodontal Disease.** Histopathology of periodontal disease. The oral mucous membrane as well as the calcified tissues are studied. (Cr ar) Reeve
- Anat M 252 (Anat 8-852). Anatomy of the Head and Neck.** (See Department of Anatomy) (Cr ar) Hollinshead
- Biom 123 (Biom 8-823). Introductory Statistics I.** (See Department of Biometry) (3 cr) Kurland and staff
- Derm M 251 (Derm 8-851). Diagnosis with Special Reference to Dermatology.** (See Department of Dermatology) (Cr ar) Kierland and staff
- MicB 251 (MicB 8-851). Diagnostic Microbiology.** (See Department of Microbiology) (Cr ar) Weed and staff
- Med M 253 (Med 8-853). Medical Diagnosis and Hospital Service.** (Cr ar)
- Nutr 290 (Nutr 8-890). Current Concepts in Applied Nutrition.** (2 cr) Nelson
- Path M 267 (Path 8-867). General Pathology — Surgical Pathology.** (See Department of Pathology) (Cr ar) Dockerty and staff

DERMATOLOGY (Derm)

OFFERED AT MINNEAPOLIS

Professor

Francis W. Lynch, M.D., M.S., *director*

Clinical Professor

Carl W. Laymon, M.D., Ph.D.

Associate Professor

Ramon M. Fusaro, M.D., Ph.D.
Alvin S. Zelikson, M.D.

Clinical Associate Professor

Isidore Fisher, M.D., M.S.
Milton Orkin, M.D.
John G. Rukavina, M.D.

Clinical Assistant Professor

Willard C. Peterson, 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 is appointed as residents in dermatology, rotating in these hospitals. The student devotes full time and may not carry on outside practice. All graduate students majoring in dermatology and working toward an advanced degree are required to carry on

Fields of Instruction

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.

225f,w,s,su (8-225). Clinical Dermatology. Wards and outpatient departments of University Hospitals, Veterans Hospital, Hennepin County General Hospital, and St. Paul-Ramsey Hospital. (Cr ar) Lynch, Laymon, Fusaro, Fisher, and staff

226f,w,s,su (8-226). Clinical Seminar: Dermatology. Conference twice weekly on diagnosis and treatment of skin conditions. (Cr ar) Lynch and staff

227f,w,s,su (8-227). Histology of the Skin. Includes histopathology, histochemistry, and fluorescence microscopy. (Cr ar) Orkin and staff

228f,w,s,su (8-228). Research in Dermatology. (Cr ar) Zelickson and staff

229f,w,s,su (8-229). Electron Microscopy in Dermatology. (Cr ar) Zelickson and staff

230f,w,s (8-230). Functional Biology of the Skin. (Cr ar) Fusaro, Rukavina, and staff

OFFERED AT ROCHESTER

Professor

Robert R. Kierland, M.D., M.S., *head*
Richard K. Winkelmann, M.D., Ph.D.

Assistant Professor

W. Mitchell Sams, Jr., M.D.

Associate Professor

Sigfrid A. Muller, M.D., M.S.
Harold O. Perry, M.D., M.S.

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 months' 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 in this department.

M 251f,w,s,su (8-841). **Diagnosis with Special Reference to Dermatology and Syphilology.** Daily seminar. Clinical conference. Kierland, Perry, Winkelmann, Muller, Sams

M 252f,w,s,su (8-842). **Hospital Residence.** Care of hospitalized patients. Seminar. Kierland, Perry, Winkelmann, Muller, Sams

Basic Dermatologic Science

OFFERED AT ROCHESTER

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

M 251 (8-851). **Microscopic Anatomy and Histochemistry of the Skin.** Lecture and seminar. (1 cr) Winkelmann, Sams

M 252 (8-852). **Histochemistry.** Principles and practice. (2 cr) Winkelmann, Muller, Sams

M 253f,w,s (8-853). **Experimental Anatomy and Physiology of the Skin.** (1 cr) Winkelmann, Sams

M 254f,w,s,su (8-854). **Experimental Anatomy and Physiology of the Skin.** (3 cr) Staff

M 255f,w,s,su (8-855). **Experimental Pathologic Anatomy of the Skin.** (1 cr) Winkelmann, Perry, Muller, Sams

M 256f,w,s,su (8-856). **Experimental and Pathologic Anatomy of the Skin.** (14 cr) Winkelmann, Perry, Muller, Sams

M 257 (8-857). **Special Topics in Experimental and Anatomic Pathology.** (2 cr) Winkelmann, Perry, Muller, Sams

M 258f,w (8-858). **Cytology.** (1 cr) Winkelmann

M 259f,w,s,su (8-859). **Surface Microscopy of the Skin.** (1 cr) Staff

M 260su,f (8-860). **Gross and Clinical Anatomy of the Skin.** (1 cr) Winkelmann, Perry, Muller

M 261w,s (8-861). **Investigative Dermatology.** (1 cr) Staff

M 262f,w,s,su (8-862). **Research in Experimental Anatomy.** (Full time) Staff

M 263 (8-863). **Investigations in Clinical Physiology and Biochemistry.** (1 qtr) Winkelmann and staff

M 264 (8-864). **Biochemical Problems of the Skin.** Decker and biochemistry staff

M 265 (8-865). **Microbiology.** Weed, Ulrich, and microbiology staff

ENVIRONMENTAL HEALTH

OFFERED AT MINNEAPOLIS

Professor

Richard G. Bond, M.S., M.P.H., *director of program*

George S. Michaelsen, M.S.

Theodore A. Olson, Ph.D.

Harold J. Paulus, Ph.D.

Irving Pflug, Ph.D.

Conrad P. Straub, Ph.D., *director of graduate study*

Fields of Instruction

Associate Professor

Donald E. Barber, M.P.H., Ph.D.
Harry Foreman, M.D., Ph.D.
Velvl W. Greene, Ph.D.

Assistant Professor

Orlando R. Ruschmeyer, Ph.D.
Gustave Scheffler, B.S.C.E.
Rexford Singer, B.S.C.E., M.S.
Lee D. Stauffer, M.P.H.

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 one foreign language and option of a special research technique or a collateral field of knowledge. Acceptable languages are Finnish, French, German, Japanese, Norwegian, Russian, Spanish, or Swedish.

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 100A, B, and C 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 100A, B, and C, PubH 104, and either PubH 106 or PubH 116.

Doctor's Degree — Applicants for the degree in environmental health will present a Bachelor's degree in a physical or biological science or some field of engineering and will minor in a fundamental discipline appropriate to their previous training.

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

- 102.* **Environmental Health.** (3 cr; prereq §) Bond
- 109.* **Institutional Environmental Health.** (3 cr; prereq hospital administration students or § and 100A) Bond
- 112.* **Environmental Aspects of Water Systems.** (3 cr; prereq 102, §) Bond, Straub, Singer
- 113.* **Environmental Aspects of Liquid Waste Systems.** (3 cr; prereq 102, §) Bond, Straub
- 115.* **Food Sanitation.** (3 cr; prereq 100A and §) Olson
- 115A. **Institutional Food Protection Programs.** (2 cr; prereq §) Bond, Jopke
- 116.* **Administration of Environmental Health Programs.** (3 cr, §114; prereq §) Bond
- 117A,B,C.* **Environmental Biology.** (3 cr per qtr; prereq §) Olson, Ruschmeyer
- 118. **Environmental Microbiology.** (3 cr; prereq 100A, 102, MicB 53 or §) Greene
- 123.* **Topics in Public Health.** (Cr ar; prereq §) Staff
- 138. **Hospital Engineering Problems.** (Cr ar; prereq §) Staff and visiting lecturers
- 143. **Measurement and Application of Ionizing Radiation.** (Same as Phcg 169) (3 cr lect and lab, 2 cr lect only; prereq §) Barber, Jonas
- 145. **Low Level Radioactivity and Radiation Measurements.** (3 cr; prereq §) Barber
- 147.* **Environmental Radioactivity.** (3 cr; prereq §) Barber, Straub
- 148. **Seminar: Health Physics.** Review and discussion of current health physics problems. (1 cr; prereq §) Barber
- 149. **Public Health Aspects of Housing and the Residential Environment.** (3 cr; prereq §) Bond
- 151. **Health Aspects of Air Control in Hospitals.** (2 cr; prereq §) Michaelsen

- 152.° Industrial Hygiene Engineering. (3 cr; prereq #) Michaelsen
153. Principles and Methods of Accident Prevention. (Cr ar; prereq #) Michaelsen, Scheffler
154. Special Studies in Accident Prevention. (Cr ar; prereq #) Michaelsen, Scheffler
155.° Introduction to the Air Pollution Problem. (3 cr; prereq #) Paulus
156.° Air Pollution Controls and Surveys. (3 cr; prereq 155 and #) Paulus
157. Radiation Protection Criteria for Hospitals. (2 cr; prereq #) Barber, Wollan
158. Hospital Safety. (3 cr; prereq #) Michaelsen, Scheffler
159. Chemical Laboratory Safety. (1 cr; prereq #) Scheffler
185. Air Analysis. (3 cr; prereq 152 or 155, #) Paulus
186. Problems of Air Pollution Control. (Cr ar; prereq 155, #) Paulus
200. Research. (Cr ar) Staff
210. Seminar: Public Health (Cr ar)
212.° Seminar: Environmental Health. (Cr ar; prereq #) Olson
230. Observations of Selected Public Health Practices. (Cr ar; prereq #) Bond, Stauffer
231.° Groundwater Development. (Cr ar; prereq grad engineer and #) Bond, Singer, staff and visiting lecturers
232.° Field Work in Groundwater Development. (Cr ar; prereq grad engineer, 231) Bond, Singer, staff and visiting lecturers
233. Water Quality Investigation and Research Techniques. (6 cr; prereq #) Olson, Odlaug, Ruschmeyer
234. Water Quality Research. (6 cr; prereq #) Olson, Odlaug, Ruschmeyer
238.° Radiation Dosimetry. (3 cr; prereq MeAg 127, Phys 110, PubH 147 or #) Barber
238A. Radiation Dosimetry Laboratory. (1 cr; prereq ¶238) Barber

EPIDEMIOLOGY

OFFERED AT MINNEAPOLIS

Professor

Leonard M. Schuman, M.D., M.S.,
chairman
Gaylord W. Anderson, M.D., Dr.P.H.
R. K. Anderson, D.V.M., M.P.H.

Assistant Professor

Stanley L. Diesch, D.V.M., M.P.H.

Lecturer

Henry Bauer, Ph.D.

Associate Professor

Lawrence H. Meskin, D.D.S., M.S.D.,
M.P.H., 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 — 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 lan-

Fields of Instruction

guage and option of a special research technique or a collateral field of knowledge. Acceptable languages are: Danish, French, German, Japanese, Norwegian, Russian, Spanish, or Swedish.

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 100A, B, and C, and 20 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 100A, B, and C.

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 section on Public Health in this bulletin.

- 100A. Elements of Public Health I. (3 cr; prereq 3, or 50 and a course in microbiology) G Anderson, Thomson, Schuman
- 100B. Elements of Public Health II. (2 cr; prereq 100A) Staff
- 100C. Elements of Public Health III. (1 cr; prereq 100B) Staff
- 103. Public Health Bacteriology. (Cr ar; prereq MicB 102, MicB 116, #) Bauer
- 104.* Epidemiology I. (3 cr; prereq 100A and 140 or 110A and 111A) Schuman
- 105.* Epidemiology II. (3 cr; prereq 104) Schuman
- 110A-B-C. Biometry I, II, III. (3 cr per qtr; prereq Math 10 or # and ¶111A-B-C) Bartsch
- 111A-B-C. Biometry Laboratory I, II, III. (2 cr per qtr; prereq ¶110A-B-C) Bartsch
- 123.* Topics in Public Health. (Cr ar; prereq #) Staff
- 129. Epidemiologic Survey Methods. (3 cr; prereq 104 and 140 or equiv and #) Schuman
- 134. Human Genetics and Public Health. (3 cr) Schacht
- 140. Vital Statistics I. (3 cr) Bearman, Thornton
- 182. Philosophy and Concepts of Preventive Dentistry. (3 cr; prereq #) Meskin
- 188. Comparative Medicine and Public Health. (2 cr; prereq 100A and #) Diesch
- 191.* Science of Human Nutrition. (3 cr; prereq #) J Anderson, Keys
- 195. Public Health Aspects of Cardiovascular Disease. (3 cr; prereq #) Grande, Keys, and staff
- 199A. Fundamentals of Biostatistics. Rates, probability methods, statistical inference, sampling distributions. (3 cr) Bearman, White
- 199B. Fundamentals of Epidemiology. Basic epidemiologic concepts and methods of investigation of diseases. (3 cr) Terris, Winkelstein, Henderson, Ibrahim, Syme
- 199C. Epidemiology of Cancer. Epidemiologic aspects of selected types of cancer with emphasis on approaches to study. (3 cr; prereq basic epidemiology and biostatistics, 199F or ¶199F) Schuman, Lilienfeld
- 199D. Epidemiology of Cardiovascular Diseases. Epidemiologic aspects of various types of cardiovascular disease with emphasis on multivariate setting of etiologies. (3 cr; prereq basic epidemiology and biostatistics, 199F or ¶199F) Peacock, Kuller

- 199E. **Topics in Infectious Disease Epidemiology.** Factors involved in epidemic occurrence, clinical response to infection, impact on man of zoonoses, immunologic responses, vaccine evaluation. (3 cr; prereq basic epidemiology and biostatistics) Grayston, Alexander, Fox
- 199F. **Selected Statistical Topics in Epidemiology.** Rate adjustment, relative risk, measures of association, matched pair analyses, force of mortality, and estimation of survivorship. (3 cr; prereq basic epidemiology and biostatistics) Kjelsberg
- 199G. **Genetics and Epidemiology.** Genetic methods of evaluating families and topics in population genetics. (3 cr; prereq basic epidemiology and biostatistics) Murphy
- 199H. **Health Survey Methods.** Practical aspects of survey design, execution, analysis, and interpretation. (2 cr; prereq basic epidemiology and biostatistics)
- 199I. **Population Dynamics.** Historical and current levels and changes in rates of population growth, mortality, natality, migration. (2 cr; prereq basic epidemiology and biostatistics)
- 199J. **Epidemiology of Mental Disorders.** Application of epidemiologic concepts and methods to psychiatric problems. Specific mental disorders are discussed. (2 cr; prereq basic epidemiology and biostatistics) Lapouse
- 199K. **Epidemiology of Neurologic Diseases.** 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. (2 cr; prereq basic epidemiology and biostatistics) Poskanzer
200. **Research.** (Cr ar)
213. **Seminar: Epidemiology.** (Cr ar; prereq #) Schuman
- 241.^o **Epidemiology of Noncommunicable Diseases.** (3 cr; prereq 104) Schuman

OFFERED AT ROCHESTER

Professor

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

Graduate work in epidemiology in the Mayo Graduate School of Medicine is offered in the Section of Medical Statistics, Epidemiology, and Population Genetics at the Mayo Clinic. Investigations of an epidemiologic and genetic nature and particularly population studies in chronic diseases are offered in conjunction with staff of clinical and laboratory sections of the Mayo Clinic.

M 201 (8-801). Epidemiology Seminar. Presentation, analysis, and discussion of proposed investigative work, research developments and results by members of the section and guest lecturers. Research methods and statistical evaluation of data are emphasized.

M 202 (8-802). Epidemiology Journal Club. Students and faculty report on articles from current journals in epidemiology, genetics, and statistics. Emphasis on methodologic papers. Both infectious and chronic disease subjects are covered. Presentation and group discussions.

M 251f,w,s (8-851). (See research problems in epidemiology)

HISTORY OF MEDICINE (HMed)

OFFERED AT MINNEAPOLIS

Professor

Leonard C. Wilson, Ph.D.

Assistant Professor

Gunter Risse

Fields of Instruction

The program in the history of medicine is designed to allow students to proceed to the Ph.D. degree with specialization either in the history of medicine or the history of the biological sciences. The doctorate in these areas will prepare the student 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 already 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 Requirement — 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.

5-400f, 5-401w, 5-402s. History of Medicine. (3 cr per qtr)

5-410f, 5-411w, 5-412s. Seminar: The Emergence of Modern Medicine 1750-1900. (3 cr per qtr)

8-220f, 8-221w, 8-222s. History of the Biological Sciences. (3 cr per qtr; not offered 1969-70)

8-230f, 8-231w, 8-232s. Readings: History of Science. (3 cr per qtr)

HOSPITAL AND HEALTH CARE ADMINISTRATION**

Professor

Bright M. Dornblaser, M.H.A., *director*
James W. Stephan, M.B.A.

Associate Professor

Theodor J. Litman, Ph.D.
Vernon E. Weckwerth, Ph.D.

Assistant Professor

Jerome T. Bieter, M.H.A.
Janet G. Brodahl, M.H.A.
Archibald D. Kincaid, B.A.
John M. Phin, M.D., M.H.A.
John Sweetland, Jr., M.H.A.

** Inquiries concerning courses of study leading to the degree of master of hospital administration should be addressed to: Program in Hospital Administration, School of Public Health, Box 97, 1260 Mayo Memorial Building, University of Minnesota, Minneapolis, Minnesota 55455, while inquiries concerning doctoral studies should be sent to the same address, "Attention: Doctoral Program."

Prerequisites — Applicants are expected to have demonstrated both marked academic ability as well as potential for independent study and research in the course of their previous academic training. While attainment of a Master's degree in either hospital or health care administration is normally considered to be the first step in the acquisition of the doctoral degree, students with advanced degrees in such allied fields as business administration, industrial relations, medical sociology, public administration, comprehensive planning, public health, medical care, nursing, or medicine are encouraged to seek enrollment as well. Applicants lacking the basic public health courses will be required to complete such courses concurrently with their doctoral program. Graduate work satisfactorily completed prior to admission may be applied for credit where appropriate and in accordance with the regulations of the Graduate School. An acceptable score on the Miller Analogies Test, graduate level, is required for admission.

Language Requirement — A reading knowledge of one foreign language plus a special research technique or a collateral field of knowledge.

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

Doctor's Degree — The curriculum emphasizes breadth of learning in contrast to technical skills. While the academic program normally takes 3 years to complete, this may take somewhat longer depending upon the individual and the kind of program he wishes to pursue. Each student's course of study will be developed with the guidance of his adviser, so as to build upon the individual's own background and interests. Candidates will be expected to demonstrate proficiency in three 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

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 his adviser, the student may elect to meet this requirement through one of the following options:

1. One-sixth of his 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 100 or higher, which may be used to satisfy the collateral field requirement (see below).

Fields of Instruction

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.

- PubH 108. Introduction to Biostatistics and Statistical Decision.** Variation, frequency distribution; probability; significance tests; estimation; trends; data handling; simple operations, research applications. Statistical approach to rational administrative decision making. Lectures and laboratory exercises. (3 cr; prereq #) Weckwerth
- PubH 141. Social and Economic Aspects of Medical Care.** Social and economic forces affecting administration and financing of medical care; sickness insurance, group hospitalization; concern of government in provision of medical care. (3 cr; prereq #) Litman and staff
- Soc 152. Sociology of Medicine and Medical Institutions.** Social factors associated with incidence of physical and mental illness and its treatment. Social organization of medical institutions. Public needs and medical services. Sociology of aging, and social problems of the aged. (3 cr; prereq Soc 1 or #) Litman
- PubH 160. Principles of Administration in Hospitals.** Lectures, seminars, and field trips in hospital administrative principles; top management and board of trustees, policy formation, human relations. (6 cr) Dornblaser, Stephan, Sweetland
- PubH 161. History and Development of Hospitals.** Functions; ownership and control; promoting and building new hospitals; integrated service; national associations and foundations. (3 cr; prereq #) Dornblaser, Phin, Stephan
- PubH 162-163. Principles of Organization and Management of Hospitals.** Departmental structures and functions; organizational principles and practice. (3 cr for 162, 6 cr for 163; prereq #) Brodahl, Dornblaser
- PubH 164A. Principles of Organization and Management of Hospitals.** Personnel department; legal liability; fiscal management, hospital insurance. (4 cr; prereq 163) Bieter, Stephan
- PubH 164B. Research Methodology in Hospital Administration.** Research design; research in administration. (2 cr; prereq 108, 164A) Litman, Weckwerth
- PubH 167. Management Problems in Hospital Administration.** Assignment and solution of specific managerial problems. (6 cr; prereq 163, ¶164) Dornblaser, Phin, Sweetland
- PubH 200. Research.** Field work and research practicum in health care administration. Independent and team research under supervision on selected research topics and problems in the field of health care. (6 cr; prereq #) Litman, Weckwerth, and staff
- PubH 261-262. Alternative Patterns for Meeting Health Care Needs.** Future role of hospitals and related health services in light of patient needs and community services. (3 cr per qtr; prereq #) Litman
- PubH 263. Advanced Statistical Methods in Health Care Research.** Survey and analysis of the application of nonparametric statistics to health care research. (3 cr; prereq 110 or #) Weckwerth
- PubH 264. Seminar: Comparative Health Care Systems.** Reading and discussion on relations between health care services and other social institutions in different societies. (3 cr; prereq #) Litman
- PubH 265. Seminar: Research Studies on Health Services.** Appraisal of design, instruments, field work procedures, and findings of contemporary studies. (3 cr; prereq #) Litman, Weckwerth
- PubH 266. Hospital Administration Topics.** Independent study under tutorial guidance on selected problems, current issues. (Cr ar; prereq #) Dornblaser, Stephan, Weckwerth
- PubH 267. Health and Human Behavior.** Social ecology of health; social and personal components of illness; health and the community; social and cultural aspects of health care services. (3 cr; prereq #) Litman

PubH 269. **Political Aspects of Health Services.** Analysis of interrelationships between government, politics, and health services; the political-social bases of health legislation and community decision making in provision and modification of health services. (3 cr; prereq #; offered winter 1970-71 and alt yrs) Litman

PubH 273. **Contemporary Problems of Hospital and Related Health Services.** Current concepts, problems, principles, and future developments in hospital and related health services. (Cr ar; prereq #) Stephan, Weckwerth

PubH 274. **Readings in Theory and Principles of Hospital Administration.** (Cr ar; prereq #) Stephan

HOSPITAL PHARMACY

OFFERED AT MINNEAPOLIS

See *Pharmaceutics*, page 91

LABORATORY MEDICINE (LMed)

OFFERED AT MINNEAPOLIS

Professor

Eugene Ackerman, Ph.D.
Ellis S. Benson, M.D., *director*
Richard Doe, M.D.
Esther F. Freier, M.S.
R. Dorothy Sundberg, Ph.D., M.D.
Edmond Y. Yunis, M.D.
Jorge J. Yunis, M.D.

Associate Professor

Robert A. Bridges, M.D.
Richard Brunning, M.D.
Mary E. Dempsey, Ph.D.
Richard Moore, Ph.D.
Paul Quie, M.D.
Andreas Rosenberg, Ph.D.
Lorraine G. Stewart, M.S.

Assistant Professor

Miguel Azar, M.D., Ph.D.
Philip Blume, M.D.
C. Mary Bradley, M.D.
David M. Brown, M.D.
John R. Edson, M.D.
Henry Gewurz, M.D.
John Haland, Ph.D.
Ben Hallaway, M.S.
John Matsen, M.D.
Herbert F. Polesky, M.D.
Nancy Staley, M.D.
Patrick C. J. Ward, M.D.
Walid Yasmineh, Ph.D.

Graduate work in the Department of Laboratory Medicine offers opportunities to qualified physicians to prepare themselves for careers of teaching and research in clinical pathology.

The program requires a minimum of 3 years and provides experience in laboratory techniques and basic and applied research in five major areas: (1) clinical chemistry, including radioisotopes; (2) hematology, including general and morphologic hematology and blood coagulation; (3) immunology, including clinical immunology, immunohematology, and blood transfusion; (4) microbiology, including diagnostic bacteriology, mycology, and parasitology; and (5) medical genetics, including cytogenetics and biochemical genetics. Original investigative work in one major area is essential.

Master's Degree — Offered under Plan A.

100 (5-100). **Basic Electronics of Laboratory Instruments.** (2 cr; prereq #) Rosenberg

Fields of Instruction

- 150 (5-150). **Introduction to Clinical Chemistry.** Introduction to the fundamental principles and techniques in clinical chemistry. (4 cr; prereq #) Freier and staff
- 160 (5-160). **Human Cytogenetics.** Selected aspects of chromosome structure and function and genetic and clinical problems associated with study of human chromosomes. (2 cr; prereq #; offered 1970-71 and alt yrs) J Yunis
- 161 (5-161). **Human Cytogenetics Laboratory.** Techniques for study of human chromosomes: cell culture, autoradiography, and chromosome isolation techniques. (2 cr; prereq #; offered 1970-71 and alt yrs) J Yunis and staff
- 162 (5-162). **Human Biochemical Genetics.** Selected topics on molecular and genetic basis of human genetic traits. (2 cr; prereq #; offered 1969-70 and alt yrs) J Yunis
- 163 (5-163). **Human Biochemical Genetics Laboratory.** Biochemical techniques used in study of human genetic traits. (2 cr; prereq #; offered 1969-70 and alt yrs) J Yunis and staff
- 165, 166 (5-765, 5-766). **Hematology.** Blood and blood forming organs; blood and bone marrow from the standpoint of diagnosis and prognosis. (4 cr per qtr, §Anat 165, §Anat 166; prereq #) Sundberg and staff
- 167 (5-767). **Seminar: Hematology.** (1 cr, §Anat 167; prereq 166) Sundberg
- 172 (5-172). **Human Genetic Traits Including Blood Groups and Serum Protein Polymorphism.** (3 cr, §Anth 172; prereq #) Polesky
- 173, 174 (5-173, 5-174). **Analytical Techniques in Laboratory Medicine.** (2 cr per qtr; prereq #) Freier, Rosenberg, Blume
- 175, 176 (5-175, 5-176). **Interpretation of Laboratory Data: Normal Values, Accuracy, and Precision.** Clinical value. (1 cr per qtr; prereq #) Polesky and staff
- 177 (5-177). **Clinical Chemistry.** Modern clinical chemistry techniques with emphasis on instrumental methods. (6 cr; prereq #) Freier and staff
- 182 (5-261). **Topics in Hematology.** (Cr ar; prereq 166) Brunning, Stewart, Sundberg
- 183 (5-262). **Topics in Immunology.** (Cr ar; prereq 172) Bridges, E Yunis
- 185 (5-263). **Seminar: Clinical Chemistry.** (1 cr per qtr; prereq #) Benson
- 190 (5-264). **Research Seminar.** (1 cr; prereq #) Benson, J Yunis
- 191 (5-265). **Departmental Seminar.** (1 cr per qtr; prereq #) Benson, J Yunis
- 193 (5-266). **Immunology Seminar.** (1 cr per qtr; prereq #) Bridges, E Yunis
- 235 (8-235). **Advanced Clinical Laboratory Medicine.** Residence rotation. (Cr ar) Benson and staff
- 236 (8-236). **Research on Clinical Laboratory Problems.** (Cr ar) Benson and staff
- 251 (8-251). **Research in Human Genetics.** Laboratory problems in basic and clinical cytogenetics or biochemical genetics. (Cr ar) J Yunis

MEDICAL-SURGICAL NURSING

OFFERED AT MINNEAPOLIS

See Nursing, page 70

MEDICAL TECHNOLOGY (MedT)

OFFERED AT MINNEAPOLIS

Professor

Ellis S. Benson, M.D., *head*
Ruth F. Hovde, M.S., *director, director*
of graduate study
Esther F. Freier, M.S.
R. Dorothy Sundberg, M.D., Ph.D.
Edmond Y. Yunis, M.D.

Associate Professor

Robert A. Bridges, M.D.
Grace M. Ederer, M.S.
Paul H. Lober, M.D.
Verna L. Rausch, M.S.
Andreas Rosenberg, Ph.D.

Lorraine G. Stewart, M.S.
Paul E. Strandjord, M.D.
Jorge J. Yunis, M.D.

Assistant Professor

Donna Blazevic, M.P.H.
Patricia M. Bordewich, M.S.
Gloria M. Bradley, M.D.
Richard D. Brunning, M.D.
Mary E. Dempsey, Ph.D.
Ben Hallaway, M.S.
Barbara Merritt, M.S.
Herbert F. Polesky, M.D.
Walid Yasmineh, Ph.D.

Graduate work in the field of medical technology is available for the qualified candidate who wishes to prepare himself for a career of teaching and investigation in the area of clinical laboratory. Regardless of ultimate aim, each student spends a period of time in the clinical laboratories to familiarize himself with the aspects of methodology, teaching, and research. Each student is required to carry out a problem of independent research in one of the subareas of this field under the direction of his major adviser.

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: anatomy (hematology or cytology), biochemistry, physiology, microbiology, public health, zoology, or pathology.

Language Requirement — Reading knowledge of either French or German. In special cases another language may be substituted by petition.

Master's Degree — Offered under Plan A; in special cases Plan B may be followed by petition to the graduate faculty.

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.

100w (5-100). Basic Electronics of Laboratory Instruments. A review of basic laws of electrical circuits; detection instruments, power sources, amplifiers, and recorders. (2 cr; prereq regis Med or Δ) Rosenberg

105 (5-105). Introduction to Biologic Electron Microscopy. Electron optics, preparative technique for electron microscopy, recording and interpretation of micrographs. (2 cr)

Fields of Instruction

- 106 (5-106). **Basic Techniques for Electron Microscopy.** Demonstration and experience in preparing biological material for electron microscopy including microscope maintenance and operation. (2 cr)
- 110, 111* (5-110, 5-111). **Advanced Clinical Laboratory Techniques.** Assignment on individual basis for observation, study, and practice in special problems; techniques and methodology in units of clinical laboratories (microbiology, chemistry, hematology, histology, or immunology). (5 cr per qtr) Staff
- 120x (5-120). **Seminar: Medical Technology.** Review and discussion of current literature; presentation and discussion of research being carried on in the department. (1 cr) Rausch
- 130, 131* (5-130, 5-131). **Elements of Administration in Medical Technology.** Organization and role of the laboratory service in hospitals; job analysis and classification; personnel assignments and evaluation; plant, supplies, and equipment. 130: Lectures. 131: Assignment of specific problems in management. (2 cr per qtr) Ederer
- 140, 141* (5-140, 5-141). **Educational Administration in Medical Technology.** Development, organization, and administration of educational programs in medical technology. 140: Lectures. 141: Clinical practice in technique; analysis and construction of courses of study. (3 cr per qtr) Hovde, Rausch
- 145 (5-145). **Development of Medical Technology.** Current problems. (3 cr) Hovde
- 150x (5-155). **Selected Topics in Microbiology.** Advanced seminar; topics assigned for conferences and reading. (Cr ar; may be taken 1 or more qtrs) Blazevic, Ederer, E Yunis
- 151x (5-156). **Selected Topics in Chemistry.** Advanced seminar; topics assigned for conferences and reading. (Cr ar; may be taken 1 or more qtrs) Evans, Benson, Freier
- 152x (5-157). **Selected Topics in Hematology.** Advanced Seminar; topics assigned for conferences and reading. (Cr ar; may be taken 1 or more qtrs) Stewart, Sundberg
- 153x (5-158). **Selected Topics in Immunology.** Advanced seminar; topics assigned for conferences and reading. (Cr ar; may be taken 1 or more qtrs) E Yunis
- 154 (5-154). **Selected Topics in Advanced Techniques and Theory of Electron Microscopy.** Discussion of new techniques and theory of electron microscopy. (Cr ar)
- 173, 174 (5-173, 5-174). **Analytical Techniques in Laboratory Medicine.** (2 cr per qtr) Benson, Rosenberg
- 175-176 (5-175/5-176). **Interpretation of Laboratory Data.** Normal values, accuracy, precision. (1 cr per qtr) Benson and staff
- 185, 186, 187 (5-193). **Seminar: Clinical Chemistry.** (1 cr per qtr) Benson and staff

MEDICINAL CHEMISTRY (MedC)

OFFERED AT MINNEAPOLIS

Professor

Taito O. Soine, Ph.D., *acting head, director of graduate study*
Frank E. Di Gangi, Ph.D.
Ole Gisvold, Ph.D.
Philip S. Portoghese, Ph.D.

Associate Professor

Herbert T. Nagasawa, Ph.D.

Assistant Professor

Robert Vince, Ph.D.

Instructor

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 of this or 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 graduate work successfully with a major in medicinal chemistry.

Language Requirement — For the Master's degree, one foreign language (German would be routinely acceptable). For the Ph.D. degree, either (a) two foreign languages (German and French would be routinely acceptable) or (b) one foreign language (German only) and the option of a collateral field of knowledge.

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.

- 161-162-163. Organic Medicinal Agents.** Sources, production, properties, reactions, structure-activity relationships, and uses of natural and synthetic organic compounds — both simple organic compounds (hydrocarbons, alcohols, amines, etc.) and vitamins, hormones, alkaloids, organometallics, etc. (3 cr for 161, 4 cr each for 162, 163; prereq OrCh 62) Soine and staff
- 165 (5-494). Instrumentation in Medicinal Chemistry.** Modern approaches to drug analysis. (3 cr; prereq OrCh 63 or #)
- 167 (5-496). Modern Concepts in Medicinal Chemistry.** 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. (3 cr; prereq 165)
- 173 (5-499). Special Problems in Medicinal Chemistry.** Analysis, synthesis, and phytochemistry of medicinal agents. (Cr ar; prereq #)
- 201-202-203* (8-100). Seminar: Medicinal and Natural Product Chemistry.** (1 cr per qtr; may be taken 1 or more qtrs; required of all majors in medicinal chemistry)
- 204 (8-200). Selected Topics.** (3 cr on completion of 3 qtrs)
- 205f (8-300). Advanced Medicinal Chemistry.** General principles of drug design and molecular bases of biological responses to applied agents. (3 cr; prereq 163, OrCh 63 or #; offered 1969-70 and alt yrs) Portoghese
- 206w (8-400). Advanced Medicinal Chemistry.** Correlations of molecular structure and biological activity with principal reference to the autonomic nervous system. (3 cr; prereq 205 or #; offered 1969-70 and alt yrs) Soine
- 207s (8-500). Advanced Medicinal Chemistry.** Modern methods in the design and evaluation of chemotherapeutic agents including enzyme inhibitors and metabolic blockers. (3 cr; prereq 206; offered 1969-70 and alt yrs) Vince
- 208* (8-600). Carbohydrates and Glycosides.** Origin, isolation, characterization, and chemistry. (3-5 cr; prereq OrCh 63 or #; offered 1970-71 and alt yrs) Gisvold
- 212 (8-700). Fats, Waxes, Steroids, and Related Compounds.** Origin, isolation, characterization, and chemistry. (3-5 cr; prereq OrCh 63 or #; offered when demand warrants) Gisvold

Fields of Instruction

- 213x (8-800). Medicinal Chemistry Laboratory Techniques. (Cr ar; prereq OrCh 63 or #)
214x (8-900). Research in Medicinal Chemistry. Study and experimental investigation of topics in the area of natural products and synthetic organic medicinal agents. (Cr ar; prereq OrCh 63 or #)

MEDICINE (Med)

OFFERED AT MINNEAPOLIS

Professor

Richard V. Ebert, M.D., head
Howard Burchell, M.D., Ph.D.
J. B. Carey, Jr., M.D., Ph.D.
Richard P. Doe, M.D.
John W. Frost, M.D.
Ivan D. Frantz, Jr., M.D.
Frederick C. Goetz, M.D.
Wendell H. Hall, M.D., Ph.D.
Robert B. Howard, M.D., Ph.D.
Byrl J. Kennedy, M.D., M.S.C.
Alvin L. Schultz, M.D., M.S.
Samuel Schwartz, M.D.
Wesley W. Spink, M.D., D.Sc.
Louis Tobian, Jr., M.D.
Cecil J. Watson, M.D., Ph.D., Emeritus
Leslie Zieve, M.D., Ph.D.
Horace H. Zinneman, M.D.

Clinical Professor

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

Associate Professor

Carl S. Alexander, M.D., Ph.D.
Harry S. Jacob, M.D.
F. Bruce Lewis, M.D.
Frank M. MacDonald, M.D.
Robert J. McCollister, M.D.
M. John Murray, M.D.
Naip Tuna, M.D., Ph.D.
Yang Wang, M.D.
C. Paul Winchell, M.D.

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 and research in, or the practice of, internal medicine or any of its subdivisions as a specialty. Primarily it guides its fellows in research in these fields and gives them a start in university teaching. Prospective fellows who have had no special orientation beyond that of the ordinary undergraduate courses will profit greatly from some special work. While any of the preclinical subjects might be of value, anatomy, biochemistry, microbiology, pathology, pharmacology, and physiology are of the greatest importance. Work in any of these subjects may be continued further during the major studies in medicine to meet the requirements for a minor subject.

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 Hospital, and Veterans Administration Hospital. There are opportunities for research in the laboratories 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 more definitely clinical studies. The large autopsy material of the Department of Pathology provides experience in this field as well as control of clinical diagnosis.

The more intensive clinical studies of the graduate student in medicine are carried on in one or more of the hospitals mentioned, and the outpatient

departments are used as necessary for training the fellow for later practice.

In general, fellowships are planned for 4-year periods, of which from 1 to 1½ years are devoted to basic sciences and research and 2½ to 3 years to clinical medicine and research. During the greater part of the latter period the individual will act as assistant resident physician or as resident physician in one of the hospitals. In this position he assumes greater responsibility for patients than during the internship. The fellow in medicine must devote some time to teaching.

Besides clinical work, a fellowship also includes research toward preparation of an acceptable thesis. This work may be purely clinical for the M.S. degree, but a combined clinical and laboratory study is preferable and is essential for a Ph.D. thesis.

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. Routinely acceptable languages are German, French, Italian, Russian, and Spanish.

Master's Degree — Offered only under Plan A.

Doctor's Degree — Work leading to the Ph.D. degree is offered in this department.

The courses listed below are described in the broadest outline to convey the character of the work. No hard and fast program is contemplated, the individual capabilities and purposes of the fellow being given particular attention.

- 201f,w,s,su (8-201). **Clinical Medicine.** General diagnosis and methods of investigation; recording of clinical data. Emphasis on methods of treatment. (Cr ar) Ebert, Frost, Hall, Schultz, Watson, Lewis, and staff
- 202f,w,s,su (8-202). **Diseases of the Cardiovascular System.** (Cr ar) Frantz, Tobian, Winchell, Wang, and staff
- 203f,w,s,su (8-203). **Research in Medicine.** Study of a clinical or fundamental problem related to internal medicine. (Cr ar) Ebert, Frost, Hall, Schultz, Watson, Lewis, and staff
- 205f,w,s,su (8-205). **Diseases of the Chest.** Opportunities to study problems relating to the chest from both the clinical and laboratory standpoints. (Cr ar) Ebert and staff
- 206f,w,s,su (8-206). **Clinical Conference.** Presentation of problem cases from the Medical Service. Discussion of diagnosis and treatment and consideration of pertinent literature. (1 cr) Ebert and staff
- 207f,w,s,su (8-207). **Pathological Conference.** Presentation of clinical features, necropsy findings, and discussion. Medical and surgical cases. (1 cr) Dawson, Ebert, and staff
- 208f,w,s,su (8-208). **Clinical Radiological Conference.** Presentation and discussion of X-ray films from the Medical Service, with clinical correlation. (1 cr) Peterson, Ebert, and staff
- 210f,w,s,su (8-210). **Infectious Disease Seminar.** (1 cr) Hall, Spink, and staff
- 211f,w,s,su (8-211). **Electrocardiographic Conference.** (1 cr) Tuna
- 212w,s (8-212). **Pigment Metabolism.** (1 cr) Schwartz, Watson
- 214f,w,s,su (8-214). **Cardiovascular Seminar.** Weekly conference on clinical cardiovascular problems, held jointly by Departments of Medicine, Surgery, and Radiology. (1 cr) Wang and staff

Fields of Instruction

OFFERED AT ROCHESTER

Professor

Lloyd G. Bartholomew, M.D., M.S.
Edwin D. Bayrd, M.D., M.S.
Hugh R. Butt, M.D., M.S.
James C. Cain, M.D., M.S. (clinical)
David T. Carr, M.D., M.S. (clinical)
William H. Dearing, M.D., Ph.D.
Earl E. Gambill, M.D., M.S.
Albert B. Hagedorn, M.D., M.S. (clinical)
Malcolm M. Hargraves, M.D.
F. Raymond Keating, Jr., M.D., M.S.
Walter F. Kvale, M.D., M.S.
James W. Linman, M.D.
William M. McConahey, M.D., M.S.
R. Drew Miller, M.D., M.S.
Carl G. Morlock, M.D., M.S. (clinical)
Donald R. Nichols, M.D., M.S. (clinical)
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.
Robert M. Salassa, M.D., M.S.
William G. Sauer, M.D., M.S. (clinical)
Charles H. Slocumb, M.D., M.S.
Randall G. Sprague, M.D., Ph.D.
J. Minott Stickney, M.D., M.S. (clinical)
William H. J. Summerskill, M.D., M.A.
L. Emmerson Ward, M.D., M.S. (clinical)
Eric E. Wollaeger, M.D., M.S.

Associate Professor

Howard A. Andersen, M.D., M.S. (clinical)
Milton W. Anderson, M.D., M.S. (clinical)
Robert O. Brandenburg, M.D., M.S.
Donald C. Campbell, M.D., M.S. (clinical)
Haddon M. Carryer, M.D., Ph.D. (clinical)
Earl T. Carter, M.D., Ph.D. (clinical)
Norman A. Christensen, M.D., M.S. (clinical)
Talbert Cooper, M.D., M.S. (clinical)
Guy W. Daugherty, M.D., M.S. (clinical)
John F. Fairbairn II, M.D. (clinical)
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.
Lowell L. Henderson, M.D., M.S. (clinical)
Alan F. Hofman, M.D.
Kenneth A. Huizenga, M.D., M.S. (clinical)
James C. Hunt, M.D., M.S. (clinical)
John L. Juergens, M.D., M.S. (clinical)
Giles A. Koelsche, M.D., Ph.D. (clinical)
William J. Martin, M.D., M.S.
Frederic C. McDuffie, M.D.
Charles G. Moetzel, M.D., M.S.
George D. Molnar, M.D., Ph.D.
Robert L. Parker, M.D., M.S.

Thomas W. Parkin, M.D., M.S. (clinical)
Gustavus A. Peters, M.D., M.A., M.S. (clinical)
Raymond V. Randall, M.D., M.S.
Richard J. Reitemeier, M.D., M.S.
Robert J. Ryan, M.D.
Alexander Schirger, M.D. (clinical)
Donald A. Scholz, M.D., M.S. (clinical)
Harold H. Scudamore, M.D., Ph.D.
Richard M. Shick, M.D., M.S.
Lucian A. Smith, M.D., M.S.
John A. Spittell, Jr., M.D., M.S.
Charles F. Stroebel, M.D., M.S. (clinical)
L. O. Underdahl, M.D., M.S. (clinical)
William E. Wellman, M.D., M.S. (clinical)

Assistant Professor

Claude D. Arnaud, M.D.
William P. Baldus, M.D., M.S.
Kenneth G. Berge, M.D., M.S.
Harry F. Bisel, M.D.
E. J. Walter Bowie, M.B., B.Ch., M.S.
James C. Broadbent, M.D., M.S.
John A. Callahan, M.D., M.S.
Daniel C. Connolly, M.D., Ph.D.
C. Roy Diessner, M.D., M.S.
David E. Dines, M.D., M.S.
Matthew B. Divertie, M.D., M.S.
F. Edmund Donoghue, M.D., M.S.
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.
Paul A. Green, M.D., M.S.
David G. Hanlon, M.D., M.S.
Carlos E. Harrison, Jr., M.D., M.S.
Norman G. G. Hepper, M.D., M.S.
Paul E. Hermans, M.S.
John A. Higgins, M.D., M.S.
Richard W. Hill, M.D., M.S.
Harry N. Hoffman II, M.D., M.S.
Llewelyn P. Howell, M.D., M.S.
Gene G. Hunder, M.D., M.S.
Horace K. Ivy, M.D., M.S.
William J. Johnson, M.D.
Joseph M. Kiely, M.D., M.S.
Bruce A. Kottke, M.D., Ph.D.
Robert A. Kyle, M.D., M.S.
Jorge E. Maldonado, M.D., Ph.D.
Harold T. Mankin, M.D., M.S.
William E. Mayberry, M.D., M.S.
John G. Mayne, M.D., M.S.
Douglass B. McGill, M.D., M.S.
James R. McPherson, M.D., M.S.
Wallace A. Merritt, M.D., M.S.
George W. Morrow, Jr., M.D., M.S.
Philip J. Osmundson, M.D., M.S.
Jaime Paris, M.D., M.S.

Robert V. Pierre, M.D.
 Donald E. Ralston, M.D., M.S.
 B. Lawrence Riggs, M.D., M.S.
 Randolph A. Rovelstad, M.D., Ph.D.
 Leslie J. Schoenfeld, M.D., Ph.D.
 Sheldon G. Sheps, M.D.
 Murray N. Silverstein, M.D.
 Ralph E. Smith, M.D.
 Ralph E. Spiekerman, M.D., M.S.
 J. W. Worthington, Jr., M.D., M.S.
 Ralph S. Zitnik, M.D.

Instructor

David L. Ahmann, M.D., M.S.
 Carl F. Anderson, M.D.
 Leo F. Black, M.D., M.S.
 Philip W. Brown, Jr., Ph.D.
 Mahlon K. Burbank, M.D., M.S.
 Henry N. Coleman, III, M.D.
 Joseph J. Combs, M.D.
 Edgar R. Dickson, M.D., M.S.
 James V. Donadio, Jr., M.D.
 Bruce E. Douglass, M.D., M.S.
 Allen A. Frethem, M.D., M.S.
 Stafford W. Gedge, M.D.
 Colum A. Gorman, M.B., Ch.B.
 Richard G. Hahn, M.D.

Jack W. Hall, M.D.
 Norbert O. Hanson, M.D.
 David L. Hoffman, M.D.
 John W. Joyce, M.D.
 Gerald J. Kavanaugh, M.D., M.S.
 Francis J. Kazmier, M.D., M.S.
 Benjamin D. McCallister, M.D.
 Albert D. Newcomer, M.D.
 Stuart L. Nunn, M.D., M.S.
 Pasquale J. Palumbo, M.D., M.S.
 Sidney F. Phillips, M.B.B.S.
 Don C. Purnell, M.D., M.S.
 James V. Ross, Jr., M.D., M.S.
 David R. Sanderson, M.D.
 Thomas T. Schattenberg, M.D., M.S.
 Richard E. Sedlack, M.D., M.S.
 Lynwood H. Smith, M.D.
 Donald A. Sones, M.D., M.S.
 Cameron G. Strong, M.D., M.S.
 Harry A. Swedlund, M.D., M.S.
 Deloran L. Thurber, M.D., M.S.
 Ross M. Tucker, M.D.
 Louis D. Vaughn, M.D., M.S.
 Carlo M. Veneziale, M.D., M.S.
 Richard D. Wagoner, M.D.
 Richard E. Weeks, M.D., M.S.

A major responsibility of the field of internal medicine lies in 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 he plans for special diagnostic procedures in consultation with a member of the faculty. Clinical work in the first year in the clinic and hospitals 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 through 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

Fields of Instruction

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 is required 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 — This department offers work leading to the Ph.D. degree.

- M 251f,w,s,su (8-851). General Medical and Surgical Diagnosis. Research. Seminar. Staff
- M 252f,w,s,su (8-852). Medical Hospital Residence. Research. Seminar. Staff
- M 253f,w,s,su (8-853). Medical Diagnosis and Hospital Service. Staff
- M 254f,w,s,su (8-854). Advanced Medical Diagnosis and Management. Staff
- M 255f,w,s,su (8-855). Allergy (Special Clinical and Laboratory Techniques). Staff
- M 256f,w,s,su (8-856). Clinical Hematology (Special Clinical and Laboratory Techniques). Staff
- M 257f,w,s,su (8-857). Gastroenterology (Special Clinical and Laboratory Techniques). Staff
- M 258f,w,s,su (8-858). Cardiovascular Diseases (Special Clinical and Laboratory Techniques). Staff
- M 259f,w,s,su (8-259). Peripheral Vascular Diseases (Special Clinical and Laboratory Techniques). Staff
- M 260f,w,s,su (8-860). Nephrology (Special Clinical and Laboratory Techniques). Staff
- M 261f,w,s,su (8-861). Rheumatology (Special Clinical and Laboratory Techniques). Staff
- M 262f,w,s,su (8-862). Thoracic Diseases (Special Clinical and Laboratory Techniques). Staff
- M 263f,w,s,su (8-863). Infectious Diseases (Special Clinical and Laboratory Techniques). Staff
- M 264f,w,s,su (8-864). Endocrinology and Metabolism (Special Clinical and Laboratory Techniques). Staff
- M Psy 256f,w,s,su (Psy 8-856). Clinical Psychiatry. Diagnostic and hospital services. Staff
- M Neur 257f,w,s,su (Neur 8-857). Clinical Neurology. Diagnostic and hospital services. Staff

Hospital Residence in Neurology. (See section on Neurology)

Hospital Residence in Psychiatry. (See section on Psychiatry)

Necropsy Service. (See Department of Pathology)

Hematology. (See Department of Pathology)

Research Work on Selected Problems in Physiology. (See Department of Physiology)

Biochemistry. (See Department of Biochemistry)

Microbiology

(See following section)

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.
Martin Dworkin, Ph.D.
Robert A. Good, M.D., Ph.D.
Wendell H. Hall, M.D., Ph.D.
James J. Jezeski, Ph.D.
Robert K. Lindorfer, Ph.D.
Charles F. McKhann, M.D.
Louis H. Muschel, Ph.D.
Palmer Rogers, Ph.D.
Edwin L. Schmidt, Ph.D.
Henry M. Tsuchiya, Ph.D.
Lewis W. Wannamaker, M.D.

Associate Professor

Dwight L. Anderson, Ph.D.
Stephen S. Chapman, Ph.D.
V. William Greene, Ph.D.
Russell C. Johnson, Ph.D.
James T. Prince, M.S.
Palmer Rogers, Ph.D.

Assistant Professor

Alan B. Hooper, Ph.D.
Yoon Berm Kim, M.D., Ph.D.
Dolph Klein, Ph.D.
Peter G. W. Plagemann, Ph.D.
Richard Simmons, M.D.

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. Acceptable languages are French, German, and Russian.

Master's Degree — Offered under Plan A.

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

100s (5-201). Microbiology for Dental Students.** Morphology; methods of staining; culture media; methods of identification; principles of sterilization and disinfection; antibiotics; bacteria and disease; fundamentals of immunology; oral flora; bacteriology of oral infections, dental caries, alveolar abscess, and periodontal infection; relationship of oral infection to other focal and general infections. (6 cr) Anderson

102s (5-232). Medical Microbiology.** Pathogenic bacteria, fungi, and viruses, especially in their relationship to disease; principles of infection, pathogenesis, and immunity; microbiological techniques for laboratory diagnosis and antibiotic determinations. (4 cr; for other than medical students; prereq 116) Chapman

** Microscope required. Students may obtain use of microscope by purchasing \$3 microscope cards from the bursar.

Fields of Instruction

- 102As (5-233). Medical Microbiology.** Additional lecture and laboratory instruction on current diagnostic microbiological techniques. (2 cr; prereq ¶102, med tech students, # for others) Chapman
- 103s (5-612). Ecology of Soil Microorganisms.** (Same as Soil 127 and Ecol 138) Soil as a microhabitat; the nature of the microbial population of soil; interactions among microorganisms in the soil ecosystem; and significant activities of soil microorganism. Lectures and laboratory. (4 cr; prereq 53 or 153, or Biol 52 and #; offered 1970-71 and alt yrs) Schmidt
- 105f,s** (5-205). Microbiology for Medical Students.** Medical bacteriology, immunology, mycology, and virology inclusive of factors that produce an infectious process. Principles and techniques that make possible diagnosis, treatment, and prevention of specific infectious disease. (6 cr per qtr; prereq Anat 103, MdBc 100 or 101, or BioC 120) Brand, Watson, and staff
- 110s (5-311). Microbial Genetics.** Genetic mechanisms in the bacteria, bacteriophages, fungi, protozoa, and algae. Mutagenesis; selection; adaptation; cytoplasmic inheritance; patterns of genic recombination; fine structure of genetic material. (3 cr; prereq 53 or 153 or #; offered 1970-71 and alt yrs) Staff
- 111f** (5-611). Advanced Microbiology.** Advanced laboratory in comparative morphology, taxonomy, and physiology of bacteria. For microbiology majors and others interested in biological and chemical aspects of microbes. Stresses enrichment, isolation, identification, cultivation, structure, and function of microorganisms. (4 cr; prereq 53 or 153 and 121 or #; offered 1969-70 and alt yrs) Dworkin
- 112s (5-512). General Mycology.** Physiology; genetics; development; ecology; evolution; taxonomy; economic importance of yeasts, molds, actinomycetes, and other fungi. (3 cr; prereq 53 or 153 or #; offered when feasible) Staff
- 116w (5-216). Immunology.** Host-parasite interactions; 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; homotransplantation and tumor immunity; mechanisms of natural and acquired immunity. (3 cr; prereq 53 or 153) Muschel
- 116Aw (5-217). Immunology Laboratory.** (2 cr; prereq ¶116)
- 121w (5-321). Physiology of Bacteria.** Chemical and physical organization of bacteria as related to function; growth; energy metabolism including oxidations and fermentations; nutritional requirements; antimicrobial agents; autotrophic mechanisms; and microbial differentiation. (3 cr; required of all microbiology majors; prereq 53 or 153, 8 cr in organic chemistry or biochemistry) Rogers
- 124s (5-424). Biology of Viruses.** Structure, composition, and properties of bacterial and mammalian viruses; their interaction with cells and effect on host cell metabolism; biochemistry of viral replication; techniques used in study and diagnosis of viral infections; viral tumorigenesis. (3 cr; prereq 53 or 153, and 121) Plagemann
- 152f,w,s (5-970). Special Problems.** (Cr ar; prereq #)
- 153f** (5-153). Biology of Microorganisms.** Lectures, demonstrations, and laboratory exercises in taxonomy, anatomy, physiology, biochemistry, and ecology of microbes. Fundamental properties of bacteria. (4 cr, §53; prereq 5 cr in biological sciences, OrCh 61, 62 or #) Dworkin, Klein
- 201f,w,s (8-990). Research in Microbiology.** Graduate students with the requisite preliminary training may elect research, either as majors or minors. (Cr and hrs ar)
- 202f,w,s (8-242). Diagnostic Microbiology.** Laboratory procedures for isolation and identification of microorganisms from patients. Work is carried out in the diagnostic microbiology laboratories of the hospital. (Cr ar; prereq grad student in microbiology, #) Watson

** Microscope required. Students may obtain use of microscope by purchasing \$3 microscope cards from the bursar.

- 203f,w,s (8-910). Seminar. (1 cr) Johnson
- 205f,w,s (8-920). **Advances in Immunology.** Research reports: evolution and mechanisms of immune response, cellular and humoral aspects of hypersensitivity, immunological tolerance, autoimmunity and its relation to disease, and other topics. (1 cr per qtr) Good, Muschel, Watson, and staff
- 206^o (8-425). **Laboratory Methods, Applied Animal Cell Culture and Virology.** Laboratory exercises on preparation of animal cell cultures; study and laboratory diagnosis of viral and rickettsial infections. (3 cr; prereq 124 or ¶124, ‡; offered when feasible)
- 207 (8-234). **Advanced Medical Microbiology.** (2 cr; prereq ‡; offered when feasible) Brand
- 222 (8-322). **Physiology of Bacterial Laboratory.** Techniques employed in study of bacterial physiology and metabolism. (3 cr; prereq 121, grad in microbiology, others by ‡; offered 1st term SS only) Rogers
- 223f (8-332). **Bacterial Metabolism.** Advanced treatment of metabolism: enzymes; biological energy; fermentation; respiration; nitrogen metabolism. (3 cr; required of all Ph.D. candidates in microbiology, open to others by permission; prereq 121 or equiv, introductory biochemistry) Bernlohr
- 224f (8-218). **Immunochemistry and Immunobiology.** Lectures, assigned reading, and discussion on the immunochemistry and synthesis of immunoglobulins; antibody synthesis *in vitro*; regulation of the immune response and cellular differentiation of immunocompetent systems. Demonstrations of advanced immunochemical and immunobiological techniques. (3 cr; required of all Ph.D. candidates in microbiology as alternative to MicB 223, open to others by consent; prereq 116 or equiv) Kim

OFFERED AT ROCHESTER

Professor

R. E. Ritts, Jr., M.D., *head*
Alfred G. Karlson, D.V.M., Ph.D.

Gerald M. Needham, Ph.D.
John A. Ulrich, Ph.D.

Assistant Professor

Gerald J. Gleich, M.D.

Associate Professor

Ernest C. Herrmann, Ph.D.
Harold Markowitz, Ph.D., M.D.
Frederic C. McDuffie, M.D.

Instructor

John A. Washington, II, M.D.

Opportunities are offered for advanced work in microbiology (bacteriology, mycology, virology, immunology, parasitology). These may be in conjunction with minor programs offered to fellows in the Mayo Graduate School of Medicine who are majoring in clinical fields or may be taken separately.

- M 251f,w,s,su (8-851). **Clinical Microbiology and Immunology.** Experience is offered in routine and special diagnostic laboratories of bacteriology, mycology, virology, and immunology. Staff
- M 252f,w,s,su (8-852). **Experimental Microbiology and Immunology.** Graduate thesis research under supervision of staff. (Cr and hrs ar)
- M 253f,w,s,su (8-853). **Lectures in Microbiology.** Didactic presentation of selected topics in bacteriology, mycology, and virology. Weekly. Herrmann, Ulrich, Washington, Karlson
- M 254, 255 (8-854, 8-855). **Immunology.** 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,

^o Microscope required. Students may obtain use of microscope by purchasing \$3 microscope cards from the bursar.

Fields of Instruction

theories of antibody production, transplantation and tolerance, autoimmunity. (2 cr per qtr) Gleich, Markowitz, McDuffie, Ritts

M 256 (8-856). Seminar: Immunology. Current research in immunology and immunochemistry. Staff

M 257 (8-857). Molecular Basis of Immunology. Seminar on the biochemical and genetic parameters of immunochemistry based on texts by Kabat, Watson. Staff

NEUROLOGY (Neur)

OFFERED AT MINNEAPOLIS

Professor

Abe B. Baker, M.D., Ph.D., *head*
James F. Berry, Ph.D.
John A. Logothetis, M.D., Ph.D.
Harold H. Noran, M.D.
Joseph A. Resch, M.D.
Hildred Schuell, Ph.D.
Sidney K. Shapiro, M.D.
Joo Ho Sung, M.D.
Kenneth F. Swaiman, M.D.
Fernando Torres, M.D.
David D. Webster, M.D.

Associate Professor

Milton Alter, M.D.
William E. Bradley, M.D.
Harold P. Cohen, Ph.D.
Milton G. Ettinger, M.D.
George C. Flora, M.D.
Robert J. Gumnit, M.D.
William R. Kennedy, M.D., M.S.
Sping Lin, Ph.D.
Francis S. Wright, M.D.

Assistant Professor

Giovanni F. Ayala, M.D.
William Riley, M.D., Ph.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., fulfills 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.

208f,w,s,su (8-200). **Clinical Neurology.** (Cr and hrs ar) Baker and staff

211f,w,s,su (8-201). **Clinical Pediatric Neurology.** (Cr and hrs ar) Swaiman and staff

209f,w,s,su (8-202). **Research in Neurology.** (Cr and hrs ar) Baker and staff

231Af,w,s,su (8-203). **Applied Electroencephalography.** (Cr and hrs ar) Torres

231Bf,w,s,su (8-204). **Applied Electromyography.** (Cr and hrs ar) Kennedy

233f,w,s,su (8-205). **Applied Neuropathology.** (Cr and hrs ar) Sung

213 (8-220). **Neuropharmacology.** (1 cr; offered every 3rd yr) Staff

221w,s (8-221). **Neurochemistry.** (2 cr; offered every 3rd yr) Berry

248f,w (8-222). **Applied Neurophysiology.** (2 cr; offered every 3rd yr) Bradley

215w,s (8-223). **Neurological Complications of Internal Disease.** (1 cr; offered every 3rd yr) Logothetis

- 219s (8-224). Instrumentation in the Basic and Neurological Sciences. (1 cr; prereq #) Webster and staff
- 229f (8-225). Neuropsychology. (1 cr; offered every 3rd yr) Meier
- 236s (8-226). Neuromuscular Diseases. (1 cr; offered every 3rd yr) Kennedy
- 247s (8-227). Neurological Speech Disorders. (1 cr; offered every 3rd yr) Schuell
- 246 (8-228). Neurogenetics. (1 cr; offered every 3rd yr) Alter
- 245su (8-229). Clinical Correlative Neuroanatomy. (1 cr) Riley
- 224s (8-230). Infectious Diseases of the Nervous System. (1 cr) Baker
- 220f,w,s (8-231). Advanced Clinical Neurology. (1 cr) Baker and staff
- 238f,w,s (8-233). Neurological Clinical Pathological Conference. (1 cr) Baker and staff
- 217f,w,s,su (8-234). Neuropsychology Conference. (1 cr) Meier
- 218 (8-235). Advanced Neuropsychology. (2 cr; 1 qtr per yr) Meier
- 228f,w,s,su (8-236). Research in Neuropathology. (Cr and hrs ar) Sung
- 225 (8-701). Neuroophthalmology. (2 cr; offered every 3rd yr) Baker, Harris
- 241 (8-702). Neuroradiology. (1 cr, §Rad 163; offered alt yrs) Peterson
- 210f,w (8-703). Advanced Neuropathology. (2 cr, §Path 115; offered alt yrs) Sung
- 212f,w,s,su (8-704). Survey of Neuropathology. (1 cr, §Path 119) Sung and staff
- 226f,w,s,su (8-705). Neurological-Neurosurgical Conference. (1 cr, §Surg 318, §Rad 163) Peterson, Baker

OFFERED AT ROCHESTER

Professor

Donald W. Mulder, M.D., M.S., *chairman*
 Joe R. Brown, M.D., M.S.
 Kendall B. Corbin, M.D.
 Frederic L. Darley, Ph.D.
 Norman P. Goldstein, M.D., M.S.
 Clark H. Millikan, M.D.

Peter J. Dyck, M.D.
 Andrew G. Engel, M.D.
 Manuel 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.
 Arthur G. Waltz, M.D.

Associate Professor

Joseph G. Rushton, M.D., M.S. (clinical)
 Robert G. Stiekert, M.D., M.S.
 Juergen E. Thomas, M.D., M.S. (clinical)
 Jack P. Whisnant, M.D., M.S.
 Robert E. Yoss, M.D., M.S., Ph.D.

Instructor

Allen J. D. Dale, M.D., M.S.
 Robert P. Dinapoli, M.D.
 Raul E. Espinosa, M.D.
 Robert V. Groover, M.D.
 William E. Karnes, M.D.
 Donald D. Layton, Jr., M.D.
 Manfred D. Muentner, M.D.
 Sean Reiher, M.D.

Assistant Professor

Arnold E. Aronson, Ph.D.
 James A. Bastron, M.D., M.S.

The fellowship in neurology is normally for a period of 3 years, which is divided into approximately 1 year of outpatient assignments, 1 year of hospital experience, and 1 year in the laboratory sciences and other fields related to neurology. Selected individuals may extend their fellowships to a fourth or fifth year. In both the outpatient department and the hospitals, fellows work in close collaboration with the faculty, who are available for consultation and guidance at all times. In the laboratory sciences and related fields fellows obtain experience in neuropathology, neuroanatomy, electroencephalography, electromyography, funduscopy, and physical medicine and rehabilitation. Experience in psychiatry may also be provided in the fellowship in

Fields of Instruction

neurology. In addition to the practical work, there is an organized series of lectures, conferences, and seminars on clinical material, the neurologic literature, and selected topics in neurology. The sections on neurology are closely associated with the other medical and surgical sections of the Mayo Clinic as well as with the 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 — This department offers work leading to the Ph.D. degree.

M 250f,w,s,su (8-850). Diagnosis in Neurology. Research. Seminar. Staff

M 252f,w,s,su (8-852). Hospital Residence in Neurology. Staff

M 257 (8-857). Clinical Neurology. Staff

M 258f,w,s,su (8-858). Basic Neurologic Sciences. Staff

M 259f,w,s,su (8-859). Neurological Diseases of Infants and Children. Staff

Neuroanatomy. (See Department of Anatomy)

Neuropathology. (See Department of Pathology)

Neurophysiology. (See Department of Physiology)

Neuroophthalmology. (See Department of Ophthalmology)

NEUROSURGERY (NSur)

OFFERED AT MINNEAPOLIS

Professor

Lyle A. French, M.D., Ph.D., *chairman*
Shelley N. Chou, M.D., Ph.D.

Clinical Assistant Professor

Paul S. Blake, M.D.
Robert L. Merrick, M.D., Ph.D.

Clinical Associate Professor

Harold I. Buchstein, M.D., M.S.
Leonard A. Titrud, M.D., Ph.D.

Clinical Instructor

Erich Wisiol, M.D.
Max Zarling, M.D.

Assistant Professor

Donlin M. Long, M.D., Ph.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, 6 months on clinical medical neurology and neuropathology; 12 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.

305f,w,s,su (8-305). Neurosurgical Diagnosis. The neurosurgical fellow assists in instruction of clinical clerks and interns, and studies problems in diagnosis in the Outpatient Department and in University Hospitals. (3 cr) Chou, French

308f,w,s,su (8-308). Neurosurgical Problems and Management. The neurosurgical fellow acts as house surgeon at University Hospitals. (4 cr) Chou, French

311f,w,s,su (8-311). Operative Neurosurgery. The neurosurgical fellow acts as first assistant at operations in University Hospitals, and later may be permitted to operate. (4 cr) Chou, French

316f,w,s,su (8-316). Neurosurgical Research. Problems in experimental or clinical surgery. (3 cr) Chou, French

318f,w,s,su (8-318). Neurosurgical Conference. A review of X-rays and case histories on neurosurgical service. (1 cr) Chou, French

OFFERED AT ROCHESTER

Professor

Collin S. MacCarty, M.D., M.S., *head*
George S. Baker, M.D., M.S. (clinical)
Hendrik J. Svien, M.D., M.S. (clinical)

Associate Professor

Frederick W. L. Kerr, M.D., M.S.

Assistant Professor

Ross H. Miller, M.D., M.S.

Instructor

Burton M. Onofrio, M.D.
Albert L. Rhoton, 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 by the care 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, neuro-

Fields of Instruction

ophthalmology, electroencephalography, and electromyography. Competence in neuroradiology is developed by performance and interpretation of a large number of contrast studies. Virtually all neuroradiologic contrast studies done at the Mayo Clinic are performed by the neurosurgical fellows aided by a member of the neuroradiologic staff.

During the period in which the trainees are assigned to the Department of Basic Neurological Sciences they see pathology specimens obtained at necropsy and at surgery. They 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 fellows who wish to carry out research problems in this phase.

Master's Degree — Offered only under Plan A.

Doctor's Degree — This department offers work leading to the Ph.D. degree.

M 251f,w,s,su (8-851). Surgery of the Nervous System. Operative technique and study of special problems involved. Seminar. Residence. Love, Baker, MacCarty, Svien, Miller, Uihlein, Kerr

M 258f,w,s,su (8-858). Basic Neurologic Sciences. Staff

Neuroanatomy. (See Department of Anatomy)

Neuropathology. (See Department of Pathology)

Neurophysiology, Electroencephalography. (See Department of Physiology)

Diagnosis in Neurology and Psychiatry. (See Section on Psychiatry and Neurology)

Hospital Residence in Neurology. (See Section on Psychiatry and Neurology)

Necropsy Service. (See Department of Pathology)

Neuroophthalmology. (See Department of Ophthalmology)

Fellows in neurosurgery may also take work in general pathology, physiology, and general surgery. For details, see these departments.

NURSING (Nurs)

OFFERED AT MINNEAPOLIS IN THE SCHOOL OF NURSING

Professor

Edna L. Fritz, Ed.D.

Associate Professor

Isabel Harris, Ph.D., *acting dean*
Barbara K. Redman, Ph.D.

Assistant Professor

Marilyne R. Backlund, M.S.
Benita P. Cowlishaw, M.N.
Frances E. Dunning, M.Ed.
Mary L. Freeberg, M.N.A.
Barbara Hibyan, M.S.
Joann R. Hubbard, M.S.
Joan M. Tuberty, M.S.N.

The graduate program in nursing extends over 2 academic years and provides the option of a field of concentration in either medical-surgical nursing or psychiatric nursing. During the second year, students may elect preparation in clinical supervision, teaching, or may continue study in the clinical nursing area. Seminars, independent study, and observation and practice in a variety

of laboratory settings are utilized to realize the objectives of the program. Graduates of the program will possess knowledge and skills which will enable them to influence and upgrade the health care of patients in a variety of settings.

Prerequisites — Completion of a baccalaureate degree in a nursing program accredited by the National League for Nursing. Applicants not meeting this requirement may be considered for admission.

Language Requirement — None.

Master's Degree — Offered under Plan B only.

- 181. Research in Nursing.** Exploration of needs for research and discussion of possible ways in which selected research efforts might be undertaken. (3 cr)
- 185A. Medical-Surgical Nursing.** General concepts of man, the life process, health, and nursing. (4 cr; prereq advanced physiology and mental health courses)
- 185B. Medical-Surgical Nursing.** Acute health problems; effects on man's states of health and nursing intervention. (6 cr; prereq 185A)
- 185C. Medical-Surgical Nursing.** Chronic health problems; effects on man's states of health and nursing intervention; includes the out-patient clinic and the community as the clinical laboratory. (8 cr; prereq 185B)
- 186A-B.* Problems in Physiology.** Individual study of a problem in physiology relevant to nursing. (1-3 cr per qtr; prereq Δ)
- 190. Foundations of Nursing.** Investigation of the role of nursing in promotion of health. (3 cr)
- 191. Foundations of Psychiatric Nursing.** Changing role of the psychiatric nurse in society. Current trends related to education and functions of psychiatric nursing. Historical development of personality theories and influence of related research and social organizational patterns affecting present-day psychiatric care and treatment. (3 cr; prereq 190 or ¶190)
- 192A. Psychiatric Nursing — Individual Patients.** Nurse-patient relationships; examination of effective and ineffective interpersonal relationships. Intensive, individually supervised clinical experience working with individual patients, planning dynamic nursing care, and participation on the interdisciplinary team. (8 cr; prereq 191)
- 192B. Psychiatric Nursing — Groups of Patients.** Group relationships. Experience working with groups, the individual's role within the group; identification of behaviors and therapeutic functioning within the group setting. These processes examined through work or recreational activities. (5 cr; prereq 192A)
- 192C. Psychiatric Nursing — Community.** Community mental health problems, community resources, and psychiatric nurse's role in the community. (4 cr; prereq 192B)
- 193. Psychopathology.** Eclectic approach to psychopathology as related to observed patient behavior in clinical setting. Student presentation and discussion of psychopathology of specific patients. (3 cr; prereq ¶192A)
- 195.* Problems in Nursing.** Individual study of a problem in the field of nursing. (1-9 cr; prereq regis in grad program and Δ)
- 196A-B. Advanced Clinical Nursing.** Hypothesis generation and testing in general nursing for the purpose of developing creative and critical approaches to nursing. (6 cr)
- 197. Seminar: Interdisciplinary Health.** Exploration of the relationship of health care to the goal of health. (3 cr)
- 198. Nursing Consultation.** Study and practice in consultation in nursing care. (3 cr)
- 199. Special Topics in Nursing.** (Cr ar)
- NuEd 190. Nursing Education in the United States.** Study of educational programs in nursing within higher educational institutions. Examination of the relationship be-

Fields of Instruction

- tween professional and liberal education. (3 cr; prereq grad and ¶EPsy 193 or ¶EPsy 293)
- NuEd 191. Instruction in Nursing.** Identification of the role of the teacher in a clinical setting; use of resources of the clinical area; selected experiences in a school of nursing. (6 cr; prereq NuEd 190)
- NuEd 192. Evaluation in Nursing Education.** Determination and evaluation of educational outcomes in terms of the goals of programs in nursing and the institutions in which these programs are located. (3 cr; prereq NuEd 191)
- NuEd 195.* Problems in Nursing Education.** Individual study of a problem in the field of nursing. (1-9 cr; prereq regis in grad program and Δ)
- NCL 190. Health Care Institutions and Nursing Leadership.** Investigation of some aspects inherent in American society (alienation, productivity, roles, youth emphasis) and their demonstration in health care institutions for the purpose of deepening the nurse's understanding of her effects upon individuals involved in these institutions. (3 cr; prereq grad regis)
- NCL 191. Clinical Nursing Leadership I.** Clinical practice involving extension of patient assessment in various health care institutions; emphasis is given individual employee assessment and working with and through others to achieve patient care goals. Examination of consultation and evaluation processes, individual counseling, and group dynamics, for the purpose of creating more positive approaches to the care of individuals. (6 cr; prereq NCL 190)
- NCL 192. Clinical Nursing Leadership II.** Clinical practice involving extension of patient assessment in various health care institutions; working with and through others to achieve patient care goals. (3 cr; prereq NCL 191)
- NCL 199. Special Topics in Nursing Supervision.** (Cr ar)

NUTRITION (Nutr)

OFFERED AT MINNEAPOLIS AND ST. PAUL

Professor

- Paul E. Waibel, *chairman* (Animal Science)
- Robert J. Meade, *vice chairman* (Animal Science)
- Joseph T. Anderson (Physiological Hygiene)
- Charles F. Code (Mayo Foundation, Rochester)
- John D. Donker (Animal Science)
- Francisco Grande (Physiological Hygiene)
- Lester E. Hanson (Animal Science)
- Lavell M. Henderson (Biochemistry, Biological Sciences)
- Ancel Keys (Physiological Hygiene)
- Irvin E. Liener (Biochemistry, Biological Sciences)
- Lura M. Morse (Nutrition, Home Economics)
- Max O. Schultze (Biochemistry, Biological Sciences)
- Robert J. Sirny (Nutrition, Home Economics)
- Jesse B. Williams (Animal Science)

Associate Professor

- Margaret D. Doyle (Nutrition, Home Economics)
- Clifford F. Gastineau (Mayo Foundation, Rochester)
- Robert L. Glass (Biochemistry, Biological Sciences)
- Richard D. Goodrich (Animal Science)
- Jay C. Meiske (Animal Science)
- Donald E. Otterby (Animal Science)
- Patricia B. Swan (Nutrition, Home Economics)
- John F. Van Pilsum (Biochemistry, Medical Sciences)

Assistant Professor

- Kathleen H. Harris (Nutrition, Home Economics)
- James D. Jones (Mayo Foundation, Rochester)
- Ralph A. Nelson (Mayo Foundation, Rochester)
- James W. Nordstrom (Animal Science)
- John D. Smith (Animal Science)
- George M. Speers (Animal Science)
- Ruth E. Stief (Nutrition, Public Health)

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. Deficiencies must be removed before the student can become a candidate for a degree. For minor work, the student must satisfy the nutrition graduate faculty that he has an adequate background. Most students preparing for graduate study in nutrition will find it advantageous to become proficient in at least one foreign language prior to entrance into the Graduate School.

Language Requirements — For the M.S. degree, none. For the Ph.D. degree, (a) two foreign languages or (b) one foreign language plus a special research technique or collateral field. Acceptable languages are French, German, Russian, and Spanish. In special cases, some other language may be substituted by petition.

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

Doctor's Degree — For a major study, the student will be required to develop and demonstrate a general competence in nutrition, including a comprehensive knowledge of basic biochemistry and statistics. In addition, the student 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 the student with a nutrition minor.

The following is a listing 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 listings under the indicated departments.

AnSc 212x.* **Research in Animal Nutrition.** (Cr ar; prereq #) Staff

AnSc 222.* **Energy in Animal Nutrition.** (3 cr; prereq BioC 52 [152] or equiv or #...BioC 143 recommended; offered 1970-71 and alt yrs)

AnSc 223.* **Protein and Amino Acid Nutrition.** (3 cr; prereq BioC 152 or equiv or #...BioC 143 recommended; offered 1970-71 and alt yrs)

AnSc 224.* **Vitamin Nutrition.** (3 cr; prereq BioC 142 or #; offered 1969-70 and alt yrs)

AnSc 225.* **Mineral Nutrition.** (3 cr; prereq BioC 52 [152] or #...BioC 142 recommended; offered 1969-70 and alt yrs)

AnSc 226.* **Ruminant Nutrition.** (3 cr; prereq BioC 52 [152] or #...MicB 121, 223 recommended; offered 1970-71 and alt yrs)

AnSc 227f. **Concepts and Developments in Avian Nutrition.** (2 cr; prereq #; offered 1970-71 and alt yrs)

AnSc 228w. **Concepts and Developments in Ruminant Nutrition.** (2 cr; prereq #)

AnSc 229s. **Concepts and Developments in Swine Nutrition.** (2 cr; prereq #; offered 1970-71 and alt yrs)

BioC 141-142-143. **General Biochemistry.** Same as MdBc 141-142-143. (3 cr per qtr; prereq ¶145-146 except with Δ, 1 yr organic chemistry and cr in physical chemistry or ¶PCh 101, 107 or 90 and #) Gander, Kirkwood, Wetlaufer, Wold

BioC 145-146. **General Biochemistry Laboratory.** (3 cr per qtr; prereq ¶141-142, 4 cr analytical chemistry and #) Chapman, Gander, Lovrien

Fields of Instruction

- BioC 147. **Advanced Biochemical Techniques.** (3 cr; prereq 146 or MdBc 146, ¶BioC 143 and #) Warner
- BioC 204. **Tracer Techniques.** (3 cr; prereq # and 143 or MdBc 144, or MdBc 146...MeAg 127 advised) Kirkwood
- BioC 224. **Vitamins.** (3 cr; prereq 143 or #) Schultze
- HE 170-171. **Human Nutrition.** (3 cr per qtr; prereq BioC 1, Phsl 51 or #) Morse
- HE 173. **Clinical Nutrition.** (3 cr; prereq 171, BioC 52 or ¶BioC 52, or #) Verstraete
- HE 174. **Nutrition Topics.** (1 cr; prereq 170) Doyle, Morse, Swan
- HE 176. **Human Nutrition Research Methods.** (3 cr; prereq 171, BioC 52 or ¶BioC 52) Swan
- HE 178x. **Clinical Problems in Nutrition.** (2-4 cr [2 cr at StP and/or 2 cr at Rochester]; prereq 170, BioC 52 or ¶BioC 52) Rey, Verstraete
- HE 179. **Readings in Nutrition.** (2 cr; prereq 170) Nutrition Division staff
- HE 270-271. **Principles of Human Nutrition.** (3 cr per qtr; prereq 170, #) Nutrition Division staff
- HE 279x. **Seminar: Nutrition.** (1 cr; prereq #) Nutrition Division staff
- HE 295-296x.* **Home Economics Problems.** Problems in nutrition area. (1-5 cr per qtr; prereq #) Nutrition Division staff
- MdBc 101. **Biochemistry.** (8 cr; prereq physics, physical and organic chemistry) Armstrong, Carr, Larner, Ungar, Wetlaufer, Van Pilsum, Koerner
- Nutr 298. **Seminar.** (1 cr [may be repeated for cr]; prereq #) Staff
- PubH 191.* **Applied Human Nutrition.** (3 cr; prereq #) J Anderson, Stief

OFFERED AT ROCHESTER AND AT ST. PAUL

Professor

Charles F. Code, M.D., Ph.D.

Associate Professor

Clifford F. Gastineau, M.D., Ph.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.

- M HE 174. Nutrition Topics.** (1 cr; prereq 170) Jones, Victor
- M HE 177. Metabolic Basis for Therapeutic Nutrition.** The physiological and biochemical basis for dietary treatment, and exploration of dietary principles as related to adequate nutrition. Dietary case presentation. (4 cr; prereq ¶178 or §) M Jones
- M HE 178. Clinical Problems in Nutrition.** Lectures in diseases with emphasis on nutrition problems. (2 cr; prereq HE 170 or equiv; offered at St Marys Hospital in Rochester) Victor
- M HE 272. Human Metabolic Studies in Health and Disease.** 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. (4 cr; prereq HE 173 or equiv; offered at Rochester) Goldsmith, Nelson
- M HE 273. Advanced Diet Therapy with Clinical Experience.** 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. (4 cr; prereq HE 173 or equiv, §; offered at St. Marys Hospital in Rochester) Victor
- M 251f,w,s,su (8-851). Research in Basic Nutrition or Metabolism.** Research project concerned with a problem in human or animal nutrition or with physiologic or biochemical nutritional problems. Berge, Code, Gastineau, Feldt, Goldsmith, Jones, Nelson
- M 264f,w,s,su (8-864). Endocrinology and Metabolism.** Obesity clinic, seminar, and bi-weekly discussions of endocrine problems (along with medical fellows). Gastineau, Nelson
- M 290f. Current Concepts in Applied Nutrition.** (2 cr) Nelson

OBSTETRICS AND GYNECOLOGY (Obst)

OFFERED AT MINNEAPOLIS

Professor

John J. Sciarra, M.D., Ph.D., *head*

Associate Professor

Konald A. Prem, M.D.

Clinical Associate Professor

Leonard A. Lang, M.D.
Mancel T. Mitchell, M.D.

Fields of Instruction

Clinical Assistant Professor

Erick Y. Hakanson, M.S.

Clinical Instructor

John S. Gillam, 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 in this department.

- 201f-202w-203s-204su (8-201/8-202/8-203/8-204). Advanced Obstetrics and Gynecology I.** Includes service in the University Hospitals or Hennepin County General Hospital with ample experience in diagnosis, care, and treatment (operative and nonoperative) of patients. Facilities for study of problems and cases of unusual interest. (Cr ar; required of 1st-yr fellows)
- 205f-206w-207s-208su (8-205/8-206/8-207/8-208). Advanced Obstetrics and Gynecology II.** Similar to Obst 201-202-203-204, but more advanced, both in clinical and research aspects of the subjects adapted to the increased training and experience. (Cr ar; required of 2nd-yr fellows)
- 209f-210w-211s-212su (8-209/8-210/8-211/8-212). Advanced Obstetrics and Gynecology III.** Similar to Obst 205-206-207-208, but more advanced. (Cr ar; required of 3rd-yr fellows)
- 213f-214w-215s (8-213/8-214/8-215). Staff Conference Seminar.** Presentation and discussion of original work and reports upon current literature in obstetrics and gynecology. (Cr ar; for fellows and grad students)
- 216f-217w-218s-219su (8-216/8-217/8-218/8-219). Research.** Clinical and laboratory research upon problems in obstetrics and gynecology. (Cr ar; required of 3rd-yr fellows, who must complete a satisfactory thesis during the yr; elective for 2nd-yr fellows or other properly qualified grad students)
- 221f-222w-223s-224su (8-221/8-222/8-223/8-224). Clinical Obstetrics and Gynecology.** Diagnosis and treatment, with special study of selected cases. Clinic in the Outpatient Department of University Hospitals. (Cr ar; required of teaching fellows)

OFFERED AT ROCHESTER

Professor

Joseph H. Pratt, M.D., M.S. (clinical)
Robert B. Wilson, M.D., M.S. (clinical)

Associate Professor

Edward A. Banner, M.D., M.S. (clinical)
David G. Decker, M.D., M.S. (clinical),
head
M. Elizabeth Mussey, M.D., M.S. (clinical)
Richard E. Symmonds, M.D., M.S. (clinical)
John S. Welch, M.D., M.S. (clinical)

Assistant Professor

Leonard A. Aaro, M.D., M.S.
John E. Faber, M.D., M.S.
Carl E. Johnson, M.D., M.S.
Roger D. Kempers, M.D., M.S.
Raymond A. Lee, M.D., M.S.
George D. Malkasian, M.D.
Reginald A. Smith, M.D.
Tiffany J. Williams, M.D.

Instructor

Richard S. Sheldon, M.D., M.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, where he receives 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 in this department.

M 251f,w,s,su (8-851). Diagnosis. Principally in relation to obstetrics and gynecologic conditions. Research. Seminar. Wilson, Faber, Mussey, Banner, Decker, Johnson, Smith, Aaro, Kempers, Malkasian

M 252f,w,s,su (8-852). Clinical Obstetrics and Gynecology. Diagnosis and treatment with special study of selected obstetric and gynecologic cases. Residence. Seminar. Wilson, Faber, Mussey, Banner, Decker, Johnson, Smith, Aaro, Kempers, Malkasian

M 253f,w,s,su (8-853). Operative Surgery. Pratt, Welch, Symmonds, Williams, Lee

Anatomy for General Surgeons. (See Department of Anatomy)

Surgical and Fresh Tissue Pathology. (See Department of Pathology)

Students majoring in obstetrics and gynecology may also take work in physiology, radium therapy, urology, and anesthesiology. For details, see these departments.

OPHTHALMOLOGY (Oph)

OFFERED AT MINNEAPOLIS

Professor

John E. Harris, M.D., Ph.D., *head*

Clinical Professor

John P. Wendland, M.D., M.S.

Associate Professor

William L. Fowlks, Ph.D.

William Knobloch, M.D.

Clinical Associate Professor

Llewellyn E. Christensen, M.D.

Walter L. Hoffman, M.D., M.S.

Richard C. Horns, M.D., M.S.

Bourne Jerome, M.D.

Robert H. Monahan, M.D.

George Tani, M.D., M.S.

Assistant Professor

Robert D. Letson, M.D.

William B. Rathbun, Ph.D.

Clinical Assistant Professor

Robert R. Cooper, M.D.

Douglas L. Johnson, M.D., M.S.

Sidney Nerenberg, M.D.

Graduate work in the field of ophthalmology is available 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

Fields of Instruction

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 his ultimate aim, each fellow spends a period of time in the laboratory familiarizing himself 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. Particular 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 *not* offered in ophthalmology. Rather, the individual desiring the Ph.D. is encouraged to take this in one of the basic sciences, doing his research on some ophthalmologic problem appropriate to his major subject.

The listed course work is required of all graduate students whether they are working toward a degree or not. Opth 200, 201, 202, and 203 are offered on a continuing basis throughout the 3-year program. Opth 203 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 204, 215, and 216) are presented once during the 3-year program.

- 200f,w,s,su (8-101). Clinical Ophthalmology. (6 cr per qtr) Harris and staff
- 201f,w,s,su (8-131). Practical Ocular Surgery. (3 cr per qtr) Harris and staff
- 202f,w,s (8-141). Ocular Pathology Conference. (1 cr per qtr) Monahan and staff
- 203f,w,s,su (8-151). Basic and Applied Ophthalmology. (2 cr per qtr) Harris and staff
- 204 (8-154). Seminar: Ophthalmology. (Cr ar) Harris and staff
- 205f,w,s (8-701). Neuroophthalmology. (1 cr per qtr) Wendland, Baker, and staff
- 206f (8-121). Refraction. (1 cr) Tani
- 207w,s (8-105). Ocular Motility. (1 cr per qtr) Letson
- 208f,w (8-132). Didactic Ocular Surgery. (1 cr per qtr) Staff
- 209f,w (8-143). Pathology of the Eye. (1 cr per qtr) Monahan and staff
- 210s (8-104). Radiology of the Eye, Orbit, and Head. (1 cr) Peterson
- 211s,f (8-102). External Diseases. (1 cr per qtr) Wendland and staff
- 212f,w,s (8-103). Medical Ophthalmology. (1 cr per qtr) Nerenberg
- 213w,s (8-122). Physiologic Optics. (1 cr per qtr) Ellingson, Jerome
- 214 (8-152). Ophthalmology Laboratory. (9 cr) Harris and staff
- 215 (8-153). Research in Ophthalmology. (Cr ar) Harris and staff
- 216 (8-142). Ophthalmic Pathology Laboratory. (2 cr) Monahan and staff
- 217 (8-106). Strabismus Management. (Cr ar) Letson

OFFERED AT ROCHESTER

Professor

John W. Henderson, M.D., M.S., *head*
Robert W. Hollenhorst, M.D., M.S.

Associate Professor

Hugo L. Bair, M.D.
Thomas P. Kearns, M.D., M.S.

Assistant Professor

John A. Dyer, M.D., M.S.
Thomas J. Kirby, Jr., M.D., M.S.
Theodore G. Martens, M.D., M.S.

Instructor

Paul G. Belau, M.D., M.S.
Roger W. Neault, M.D., M.S.
Dennis M. Robertson, M.D., M.S.

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 in this department.

M 251f,w,s,su (8-851). Refraction and Ophthalmic Myology. Theory of refraction, retinoscopy, diagnosis of refraction errors of the eye, prescribing of lenses, disturbances of motility of the eyes, orthoptics and strabismus surgery. Prescribing and fitting contact lenses. Martens, Dyer, Belau

M 252f,w,s,su (8-852). Clinical Ophthalmology. Diagnosis and treatment of diseases of the eye and its adnexa. Bair, Henderson, Kirby, Neault, Robertson

M 253f,w,s,su (8-853). Medical and Neurologic Ophthalmology. Ophthalmology and ophthalmoscopy as they pertain to the fields of internal medicine and neurology. Hollenhorst, Kearns

M 254f,w,s,su (8-854). Ophthalmic Surgery. A 9-months' hospital service. Bair, Henderson, Kirby, Neault, Robertson

Anatomy of the Orbit. (See Department of Anatomy)

Pathology of the Eye. (See Department of Pathology)

ORTHOPEDIC SURGERY (OrSu)

OFFERED AT MINNEAPOLIS

Professor

John H. Moe, M.D., *director*

Clinical Professor

Harry B. Hall, M.D.
Malvin J. Nydahl, M.D., M.S.

Associate Professor

William J. Kane, M.D., Ph.D.

Clinical Associate Professor

Walter Indeck, M.D.
Edward H. O'Phelan, M.D., M.S.

Instructor

James H. House, M.D.

Fields of Instruction

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 — The department offers work leading to the Ph.D. degree.

- 401 (8-401). **Orthopedic Conference.** Review of X-rays and case histories of patients on the orthopedic inpatient or outpatient service. (3 cr) House, Kane, Moe, and staff
- 403 (8-403). **Fractures.** The orthopedic fellow acts as house surgeon on the fracture service at Hennepin County General Hospital. (5 cr) Nydahl and staff
- 405 (8-405). **Orthopedic Diagnosis.** The orthopedic fellow assists in instruction of clinical clerks and interns and studies problems in diagnosis in the Outpatient Department and in the University Hospitals. (3 cr) Moe, Kane, House, and staff
- 407 (8-407). **Pediatric Orthopedics.** The orthopedic fellow acts as house surgeon at Gillette State Hospital for Crippled Children. (5 cr) Moe and staff
- 408 (8-408). **Orthopedic Problems and Management.** The orthopedic fellow acts as house surgeon at the University Hospitals. (5 cr) Moe, Kane, House, and staff
- 410 (8-410). **Orthopedic Pathology.** Seminar for systematic review of pathology of ossified tissues and soft tissues of the extremities. (2 cr) Moe, Kane, House, and staff
- 411 (8-411). **Orthopedic Operative Surgery.** The orthopedic fellow acts as first assistant at operations at the University Hospitals and later may be permitted to operate. (5 cr) Moe, Kane, House, and staff
- 412 (8-412). **Orthopedic Anatomy.** The orthopedic fellow dissects upper and lower extremities and aids in instruction of medical students in anatomy of the extremities. (2 cr) Moe, Kane, House, and staff
- 416 (8-416). **Orthopedic Research.** Problems in experimental or clinical surgery. University Hospitals. (5 cr) Moe, Kane, and staff

OFFERED AT ROCHESTER

Professor

Mark B. Coventry, M.D., M.S., *head*
William H. Bickel, M.D., M.S.
John C. Ivins, M.D., M.S. (clinical)
Joseph M. Janes, M.D., M.S.
Patrick J. Kelly, M.D., M.S.
Paul R. Lipscomb, M.D., M.S.
H. Herman Young, M.D., M.S. (clinical)

Einar W. Johnson, Jr., M.D., M.S. (clinical)

Assistant Professor

Anthony J. Bianco, Jr., M.D., M.S.
Richard S. Bryan, M.D.
Ronald L. Lindscheid, M.D., M.S.
Lowell F. A. Peterson, M.D.

Associate Professor

Edward D. Henderson, M.D., M.S. (clinical)

Instructor

Hamlet A. Peterson, M.D.

Orthopedic surgery at the Mayo Graduate School of Medicine embraces not only the congenital deformities of childhood, such as clubfeet, dislocated hips, torticollis, etc., but also practically all the acquired deformities of the extremities and spines of children and adults. All fractures, recent and old; bone and joint infections, acute or chronic; bone and soft tissue tumors of the extremities and spine are cared for on this service. In addition, members of this department are in charge of hand surgery, performing tendon grafts, capsulotomies, tenotomies, and the allied procedures that are necessary for the

rehabilitation of the crippled hand whether it be from a congenital deformity or acquired through trauma, arthritis, or other disease process. An active emergency service at the St. Marys and Methodist Hospitals handles emergency cases in close cooperation with the Departments of General Surgery, Neurosurgery, Plastic Surgery, etc. All orthopedic inpatients are cared for in the St. Marys and Methodist Hospitals.

To cope successfully with such a broad field the surgeon must have a sound general surgery training. The Mayo Graduate School of Medicine is prepared to give the full 4 years of training in orthopedic surgery that are required for certification by the American Board of Orthopedic Surgery, including general surgery requirements.

At the present time 16 four-year residencies are available annually for those showing a special interest and aptitude for orthopedic surgery. The surgery includes orthopedic diagnosis, operative and nonoperative orthopedics, service in specialties closely allied to orthopedic surgery, and a minor in orthopedic basic sciences. Gross specimens and microscopic slides of all orthopedic conditions are readily available for study while regularly scheduled lectures cover the field of surgical pathology, anatomy, orthopedic research, and muscle physiology. Three seminars in orthopedic surgery are held weekly during the academic year and there is a weekly fracture conference during which all emergency cases are reviewed in detail. Basic science seminars are held on a regularly scheduled program.

Residents majoring in orthopedic surgery are given ample opportunity to serve as senior residents in the operating room and outpatient clinic. Senior residents, under staff supervision, likewise care for the orthopedic patients in the Rochester State Hospital.

Through special arrangements, each resident majoring in orthopedic surgery at the Mayo Graduate School of Medicine spends either 6 months at an off-campus children's hospital, where intensive experience in the care of orthopedic conditions in children may be secured, or in a similar assignment at the Mayo Clinic.

Residents majoring in the field of orthopedic surgery may also take work in physiology, neurology, anatomy, physical medicine, or experimental surgery.

The present permanent staff is composed of 15 full-time consultants.

Master's Degree — Offered only under Plan A.

Doctor's Degree — This department offers work leading to the Ph.D. degree.

M 251f,w,s,su (8-851). Orthopedic Diagnosis. History taking and physical examination of orthopedic cases. Braces, material and construction, measurements and fitting; application and use of plaster of paris; interpretation of radiograms of orthopedic cases; care of nonsurgical and postoperative cases. Seminar. Coventry and staff

M 252f,w,s,su (8-852). Orthopedic Surgery. One year in service is offered to fellows majoring in orthopedic surgery. Seminar. Coventry and staff

Orthopedic Anatomy. (See Department of Anatomy)

Surgical and Fresh Tissue Pathology. (See Department of Pathology)

Students majoring in orthopedic surgery may also take work in necropsy service, physiology, neurology, and physical medicine. For details, see these departments.

Fields of Instruction

OTOLARYNGOLOGY (Otol)

OFFERED AT MINNEAPOLIS

Professor

Michael M. Paparella, M.D., *head*
Frank M. Lassman, Ph.D.
W. Dixon Ward, Ph.D.
Henry L. Williams, Jr., M.D., M.S.

Associate Professor

Arndt J. Duvall, III, M.D.
Clinical Associate Professor
Conrad J. Holmberg, M.D.

Clinical Professor

Jerome A. Hilger, M.D., M.S.
Robert E. Priest, M.D., M.S.

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 are German and Spanish.

Master's Degree — Offered only under Plan A.

Doctor's Degree — This department offers work leading to the Ph.D. degree.

- 230f,s (8-230). Clinical Otology. (3 cr per qtr)
- 231 (8-231). Clinical Rhinology and Laryngology. (3 cr)
- 232f,w,s (8-232). Surgery of the Ear, Nose, and Throat. (3 cr per qtr)
- 233 (8-233). Operative Surgery of the Temporal Bone. (2 cr)
- 234 (8-234). Operative Surgery of the Nose and Throat. (2 cr)
- 235 (8-235). Roentgenology of the Head. ($\frac{1}{2}$ cr)
- 236 (8-236). Functional Ear Tests. (1 cr)
- 237 (8-237). Endoscopy. Lectures and demonstrations. (2 cr)
- 238 (8-238). Pathology of the Ear, Nose, and Throat. (1 cr)
- 239 (8-239). Neurological Lesions in the Field of Otolaryngology. ($\frac{1}{2}$ cr)
- 240 (8-240). Physiotherapy and Surgery of the Malignant Diseases of the Ear, Nose, and Throat. (2 cr)
- 241 (8-241). Seminar: Current Literature. (1 cr)
- 242 (8-242). Applied Physiology in Otolaryngology. ($\frac{1}{2}$ cr)
- 243 (8-243). Applied Pharmacology in Otolaryngology. ($\frac{1}{2}$ cr)
- 244 (8-244). Speech Pathology. ($\frac{1}{2}$ cr) Lassman
- 245 (8-245). Allergy. (1 cr)
- 246 (8-246). Practical Audiology. (1 cr) Lassman
- 247 (8-247). Reconstructive Nasal Surgery. (1 cr)
- 248 (8-248). Research. (Cr ar)

OTOLARYNGOLOGY AND RHINOLOGY

OFFERED AT ROCHESTER

Professor

Kinsey M. Simonton, M.D., M.S.
Kenneth D. Devine, M.D. (clinical)

Associate Professor

Henry A. Brown, M.D., M.S. (clinical)
Olav E. Hallberg, M.D., M.S. (clinical)
Clifford F. Lake, M.D., M.S. (clinical)

Assistant Professor

Douglas T. R. Cody, M.D.C.M., Ph.D.,
head
John C. Lillie, M.D., M.S.
James B. McBean, M.D.
Jack L. Pulec, M.D., M.S.

The residency in otolaryngology and rhinology at the Mayo Graduate School of Medicine offers practical experience in diagnosis and treatment of diseases comprising the broad field of ear, nose, and throat.

Diagnostic experience includes medical and surgical diagnosis, otoneurologic diagnosis, and audiologic practice and its application to otologic and neurologic diagnosis. The relationship of diseases of the ear, nose, and throat to the field of general medicine is demonstrated by consultation on patients undergoing general medical examination. Therapeutic experience includes care of patients in office, home, and hospital, giving a well-rounded preparation for practice of the specialty. Surgery of the ear, including operations for restoration of function, surgery of the paranasal sinuses, reconstructive surgery of the nasal septum and pyramid, and surgery of the pharynx and larynx, is offered. Training in peroral endoscopy is given in affiliation with the Section of Diseases of the Chest, Department of Internal Medicine.

Courses in surgical pathology and anatomy are offered in the Departments of Pathology and Anatomy. Microsurgical procedures of the ear, using fresh tissue specimens, and surgical procedures of the ear, nose and throat, using cadavers, are performed under direction of the staff. Opportunity is available for original research in cooperation with the department dealing with the basic sciences.

The full 4-year program, including 1 year of general surgery as required for certification by the American Board of Otolaryngology, is offered. A 5-year program with a minimum of a year spent in a basic research is available. Candidates must take their year in general surgery at the Mayo Graduate School of Medicine, where the general surgery experience is directed to those areas most related to the practice of otolaryngology.

During the final year, 6-9 months are spent as a chief resident associate.

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 in this department.

M 251f,w,s,su (8-851). Clinical Otolaryngology and Rhinology. Theory and practice with differential diagnosis and treatment of diseases of the ear, nose, paranasal sinuses, pharynx, and larynx, and their relation to general diagnosis. Simonton, Hallberg, Brown, Lake, McBean, Cody, Pulec, Devine, Lillie

Fields of Instruction

M 252f,w,s,su (8-852). Preoperative and Postoperative Care of Patients. Treatment of complications. Simonton, Hallberg, Brown, Lake, McBean, Cody, Pulec, Devine, Lillie

M 253f,w,s,su (8-853). Operative Otolaryngology and Rhinology. Hospital residence, resident in operating service. Cadaver surgery, microsurgery of the ear on fresh anatomic material. Simonton, Hallberg, Brown, Lake, McBean, Cody, Pulec

M 254f,w,s,su (8-854). Operative Otolaryngology and Rhinology. Senior resident service. Simonton, Hallberg, Brown, Lake, McBean, Cody, Pulec, Devine, Lillie

M 255f,w,s,su (8-855). Advanced Audiology. Tests of hearing; evaluation of speech disorders for purposes of diagnosis and as a basis for advising use of hearing aids; educational therapy. Hedgecock

Surgical and Fresh Tissue Pathology. (See Department of Pathology)

Anatomy of the Head and Neck. (See Department of Anatomy)

Fellows majoring in otolaryngology and rhinology may also take work in microbiology or biophysics. For details, see these departments.

PATHOLOGY (Path)

OFFERED AT MINNEAPOLIS

Professor

James R. Dawson, Jr., M.D., *head, director of graduate study*
A. B. Baker, M.D., Ph.D.
Ellis S. Benson, M.D.
Jesse E. Edwards, M.D.
Franz Halberg, M.D.
Robert Hebbel, M.D., Ph.D.
Paul H. Lober, M.D., Ph.D.
Lee W. Wattenberg, M.D.

Associate Professor

John I. Coe, M.D.
Donald F. Gleason, M.D., Ph.D.
Kenneth Osterberg, M.D.

Assistant Professor

Robert E. T. Rydell, M.D.

Instructor

John R. Dych, 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.

101 (5-101). Pathology. General pathology. (8 cr; prereq completion of 1st yr in Med School or equiv) Dawson, Hebbel, and staff

102 (5-102). Pathology. Special pathology. (8 cr; prereq 101) Dawson, Hebbel, and staff

- 104x (5-104). Autopsies. (Cr ar; prereq 102) Dawson, Hebbel
 105 (5-105). Diseases of the Kidney. (3 cr; prereq 102) Hebbel
 106 (5-106). Diseases of the Heart. (1 cr; prereq 102) Edwards
 110x (5-110). Seminar: Pathology. (1 cr per qtr; prereq 102) Dawson
 111x (5-111). Conference on Autopsies. (1 cr per qtr; prereq 102) Dawson
 112 (5-112). Diagnosis of Tumors. (Cr ar; prereq 102) Hebbel
 113x (5-113). Surgical Pathology. (Cr ar; prereq 102) Hebbel
 114 (5-160). Diseases of the Liver. (1 cr; prereq 102)
 115 (8-701). Advanced Neuropathology. (Cr ar, §Neur 210) Baker
 119 (8-702). Survey of Neuropathology. Examination of specimens from current autopsies. (Cr ar, §Neur 212)
 120 (5-120). Diseases of the Lungs. (1 cr; prereq 102) Dawson
 121 (5-121). Diseases of the Alimentary Tract. (1 cr; prereq 102) Hebbel
 122 (5-122). Basic Science of Cancer. (3 cr; prereq MdBc 100 or equiv) Wattenberg
 140 (5-140). Seminar: Experimental Pathology. (Formerly CBio 140) (1 cr) Halberg
 141 (5-141). Problems in Experimental Pathology. (Formerly CBio 141) (Cr and hrs ar) Halberg
 161 (5-161). Forensic Pathology. (2 cr; prereq 104 or equiv or Δ) Coe
 201x (8-201). Research. (Cr and hrs ar; grad students with necessary preliminary training may elect research, either as majors or minors in pathology)
 207 (8-207). Research in Experimental Pathology. (Formerly CBio 207) (Cr and hrs ar) Halberg

OFFERED AT ROCHESTER

Professor

Malcolm B. Dockerty, M.D., C.M., M.S.,
chairman, Surgical Pathology
 Archie H. Baggenstoss, M.D., M.S.
 Robert C. Bahn, M.D., Ph.D.
 David C. Dahlin, M.D., M.S.
 Alfred G. Karlson, D.V.M., M.S., Ph.D.
 Lewis B. Woolner, M.D., M.S.

George P. Sayre, M.D., M.S.
 Roy C. Shorter, M.D.
 Edward H. Soule, M.D.
 Jack L. Titus, M.D., Ph.D.

Assistant Professor

Haruo Okazaki, M.D.

Instructor

John A. Carney, M.B.B.Ch.
 George M. Farrow, M.D.
 Keith E. Holley, M.D.
 Jurgen Ludwig, M.D.

Associate Professor

Arnold L. Brown, Jr., M.D., *head, Anatomic Pathology*
 Edgar C. Harrison, Jr., M.D., M.S.

Experimental and Anatomic Pathology—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 are individualized according to the primary specialty of the resident. Residents in pathology serve as junior residents for 1 to 3 months during which they participate in postmortem examinations. The period of junior residency is followed by a period of approximately 6 months as a first assistant with the opportunity for major responsibility in service activities and a period of 3 months in neuropathology also as a first assistant. Opportunities for study and investigation are provided. Further experiences in any aspect of anatomic pathology (including neuro-

Fields of Instruction

pathology) or in research activities are made 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: daily 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, twice-weekly brain-cutting seminars, weekly neuropathology conferences, weekly slide review conferences, weekly resident's conference 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 the fellows and discussed at daily conferences that correlate clinical symptoms and results of laboratory tests with pathologic findings. All gross specimens 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 fellow has an opportunity to study approximately 7,000 surgical specimens over a 6-month period. First assistants are provided with an additional 6 months' training with increased responsibilities. Material from some 50,000 cytologic smears (annually) are also available for study.

In addition to participation in formal seminars and conferences conducted by the staff, each fellow is assigned a subject each quarter for investigation and presentation. Current thesis work is often discussed at these meetings, and outstanding presentations are typed and multigraphed for future reference.

M 251f,w,s,su (8-851). General Pathology. Autopsy service. (8 cr per qtr) Baggenstoss, Bahn, Brown, Holley, Ludwig, Okazaki, Sayre, Titus

M 252f,w,s,su (8-852). Seminar: Pathology. (1 cr per qtr) Baggenstoss, Bahn, Brown, Holley, Ludwig, Okazaki, Sayre, Titus

M 253f,w,s,su (8-853). Conference on Autopsies. (1 cr per qtr) Baggenstoss, Bahn, Brown, Holley, Ludwig, Okazaki, Sayre, Titus

M 254f,w,s,su (8-854). Diseases of the Liver. (2 cr per qtr) Baggenstoss

- M 255f,w,s,su (8-855). **Diseases of the Heart.** (1 cr per qtr) Titus
- M 256f,w,s,su (8-856). **Diseases of the Kidney.** (1 cr per qtr) Holley
- M 257f,w,s,su (8-857). **Problems in Experimental Pathology.** Baggenstoss, Bahn, Brown, Holley, Ludwig, Okazaki, Sayre, Titus
- M 258f,w,s,su (8-858). **Neuropathology.** (8 cr per qtr) Okazaki, Sayre
- M 259f,w,s,su (8-859). **Problems in Neuropathology.** Okazaki, Sayre
- M 260f,w,s,su (8-860). **Computer Applications to Pathology.** Bahn
- M 261f,w,s,su (8-861). **Electron Microscopy.** Baggenstoss, Brown, Holley, Titus
- M 262f,w,s,su (8-862). **Histochemistry.** Bahn, Holley
- M 263f,w,s,su (8-863). **Tissue Culture.** Titus
- M 264f,w,s,su (8-864). **Chromosomal Studies.** Titus
- M 265f,w,s,su (8-865). **Autoradiography.** Brown, Titus
- M 266f,w,s,su (8-866). **Problems in Comparative Pathology.** Karlson and staff
- M 267f,w,s,su (8-867). **General Pathology — Surgical Pathology.** (8 cr per qtr) Carney Dahlin, Dockerty, Farrow, Harrison, Soule, Woolner
- M 268f,w,s,su (8-868). **Lectures: Surgical Pathology.** (2 cr per qtr) Carney, Dahlin, Dockerty, Farrow, Harrison, Soule, Woolner
- M 269f,w,s,su (8-869). **Demonstration Conferences on Surgical Pathology.** (4 cr per qtr) Carney, Dahlin, Dockerty, Farrow, Harrison, Soule, Woolner
- M 270f,w,s,su (8-870). **Cytology.** (3 cr per qtr) Dahlin, Harrison, Soule, Woolner
- M 271f,w,s,su (8-871). **Obstetric and Gynecologic Pathology.** (1 cr per qtr) Dockerty
- M 272f,w,s,su (8-872). **Bone Pathology.** (1 cr per qtr) Dahlin
- M 273f,w,s,su (8-873). **Oral Pathology.** (1 cr per qtr) Dahlin
- M 274f,w,s,su (8-874). **Problems in Surgical Pathology.** Carney, Dahlin, Dockerty, Farrow, Harrison, Soule, Woolner

Clinical Pathology

Professor

Charles A. Owen, M.D., Ph.D., *head*
Frank T. Maher, M.D., Ph.D.

Associate Professor

Don R. Mathieson, M.D., M.S.
John H. Thompson, Jr., Ph.D.
Welby N. Tauxe, M.D., M.S.
James W. Linman, M.D.

Assistant Professor

George G. Stilwell, M.D.
Virgil F. Fairbanks, M.D.
Paul Didisheim, M.D.
Robert V. Pierre, M.D.
Howard F. Taswell, M.D., M.S.

Instructor

Donald A. Wolochow, M.D.

Three programs in clinical pathology are offered: (1) 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; (2) a 3-year program in clinical pathology alone leading to eligibility for examination and certification by the American Board of Pathology in the field of clinical pathology; and (3) courses in specific fields of clinical pathology available to residents in any specialty of medicine. In each program, the requirements for an advanced degree may be fulfilled in part.

These programs consist of lectures, demonstrations, and actual performance of tests in the laboratories of microbiology, chemistry, parasitology, blood co-

Fields of Instruction

agulation, blood banking, renal tests, gastrointestinal tests, diagnostic uses of radioisotopes, hematology, and serology.

Graduate students may be assigned to one or all of these laboratories to learn the methods used as aids in clinical diagnoses. They may, also, conduct original research in any of the laboratories.

- M 275f,w,s,su (8-875). Parasitology.** (4 cr per qtr) Thompson
- M 276f,w,s,su (8-876). Hematology.** (8 cr per qtr) Linman, Pierre
- M 277f,w,s,su (8-877). Hematologic Enzymology and Genetics.** (2 cr per qtr) Fairbanks
- M 278f,w,s,su (8-878). Immunohematology and Blood Banking.** (8 cr per qtr) Mathieson, Taswell
- M 279f,w,s,su (8-879). Radioisotopes.** (8 cr per qtr) Fairbanks, Novak, Owen, Tauxe, Wahner
- M 280f,w,s,su (8-880). Coagulation.** (3 cr per qtr) Didisheim, Owen, Thompson
- M 281f,w,s,su (8-881). Serology.** (2 cr per qtr) Mathieson, Stilwell
- M 282f,w,s,su (8-882). Analysis of Gastric Contents, Urine, and Cerebrospinal Fluid.** (2 cr per qtr) Stilwell, Wolochow
- M 283f,w,s,su (8-883). Studies of Renal, Pancreatic, Liver, and Adrenal Function.** (3 cr per qtr) Maher, Stilwell, Wolochow
- M 284f,w,s,su (8-884). Research Problems in M 275 through M 283.** Owen and staff
- Biochemistry.** (See Department of Biochemistry)
- Diagnostic Microbiology.** (See Department of Microbiology)

PEDIATRICS (Ped)

OFFERED AT MINNEAPOLIS

Professor

John A. Anderson, M.D., Ph.D., *head*
Elia M. Ayoub, M.D.
Robert A. Good, M.D., Ph.D.
Richard Hong, M.D.
Reynold A. Jensen, M.D.
William Krivit, M.D., Ph.D.
Alfred F. Michael, M.D.
Paul G. Quie, M.D.
Richard B. Raile, M.D.
Robert A. Ulstrom, M.D.
Robert L. Vernier, M.D.
Lewis W. Wannamaker, M.D.

Clinical Professor

Paul F. Dwan, M.D.

Associate Professor

Ray C. Anderson, M.D., Ph.D.
Edward C. DeFoe, M.D.
Russell J. Lucas, Jr., M.D.
Bernard L. Mirkin, M.D., Ph.D.
Arthur R. Page, M.D.
John W. Reynolds, M.D.
Kenneth F. Swaiman, M.D.

Homer D. Venters, M.D.
Warren J. Warwick, M.D.
James G. White, M.D.
Francis S. Wright, M.D.

Clinical Associate Professor

Paul M. Ellwood, M.D.
Robert L. Wilder, M.D., *emeritus*

Assistant Professor

David M. Brown, M.D.
Barbara A. Burke, M.D.
Carlyle C. Clawson, M.D.
Adnan C. Dajani, M.D., M.S.
Robert Otto Fisch, M.D.
John M. Matsen, M.D.
James H. Moller, M.D.
Mark E. Nesbit, M.D.
Henry S. Sauls, M.D.
Krishna M. Saxena, M.D., D.C.H.
Harvey L. Sharp, M.D.
Robert W. ten Bensel, 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 the subspecialties related to the field of pediatrics. The graduate training 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 of the 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, the Children's Hospital of St. Paul, and the Variety Club Heart Hospital. 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.

Fields of Instruction

Doctor's Degree — Courses leading to the Ph.D. may be arranged with members of the graduate faculty.

- 200f,w,s,su (8-200). **Graduate Seminar: Pediatrics.** (1½ cr) J Anderson and staff
- 202f,w,s,su (8-202). **Pediatric Clinics.** (Cr and hrs ar; prereq #) J Anderson and staff
- 204f,w,s,su (8-204). **Residency in Pediatrics.** Two- to four-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. (Cr and hrs ar; prereq #) Staff
- 206f,w,s,su (8-206). **Pediatric Special Interest.** Pediatric graduate students who have completed at least 1½ years of their general graduate pediatric training may obtain 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 in these areas is obtained in the inpatient and outpatient services of the University Hospitals and the affiliated hospitals. Training in the basic sciences related to these fields of special interest may be obtained in the preclinical divisions of the Medical School. (Cr and hrs ar; prereq #) Staff
- 208f,w,s,su (8-208). **Pediatric Research.** (Cr ar; prereq #) J Anderson, R Anderson, Good, Krivit, Michael, Raile, Wannamaker

OFFERED AT ROCHESTER

Professor

James W. DuShane, M.D., head
Alvin B. Hayles, M.D., M.S.
George B. Logan, M.D., M.S.
Patrick A. Ongley, M.D.
William E. Segar, M.D.

Gunnar B. Stickler, M.D., Ph.D.
William H. Weidman, M.D., M.S.

Assistant Professor

E. Omer Burgert, Jr., M.D., M.S.
Manuel R. Gomez, M.D., M.S.

Associate Professor

Edmund C. Burke, M.D., M.S. (clinical)
Lloyd E. Harris, M.D.
Stephen D. Mills, M.D., M.S. (clinical)

Instructor

Robert H. Feldt, M.D., M.S.
Edward J. O'Connell, M.D.
Donald G. Ritter, M.D., M.S.

The Section of Pediatrics of the Mayo Clinic and the Mayo Graduate School of Medicine provides opportunities for graduate training in all aspects of pediatrics. Clinical fellowships are offered for 2 years of training 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 all aspects of preventive pediatrics is afforded through the Well Child Clinics. Three months are devoted to child psychiatry under the direction of the faculty in child psychiatry where experience is gained in evaluating children with emotional and psychosomatic disorders and application of the various techniques of psychotherapy.

Advanced training in clinical subspecialties such as pediatric allergy, pediatric cardiology, pediatric endocrinology and metabolism, pediatric neurology, pediatric nephrology, pediatric hematology, and child psychiatry is available to qualified individuals for 1 or more additional years. Opportunity for par-

ticipation 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—This department offers work leading to the Ph.D. degree.

M 251f,w,s,su (8-851). Diagnosis of Medical and Surgical Diseases of Infants and Children. Seminar. Staff

M 252f,w,s,su (8-852). Hospital Residence. Diagnosis and care of sick infants and children. Staff

M 253f,w,s,su (8-853). Child Health. Diagnosis and care of sick infants and children of the community under direction of consultants.

M 254f,w,s,su (8-854). Care of Newborn and Well Infants. St. Marys Hospital newborn nursery and Mayo well-baby clinic.

M 255f,w,s,su (8-855). 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 256f,w,s,su (8-856). Pediatric Cardiology. Staff

M 257f,w,s,su (8-857). Pediatric Allergy. Staff

M 258f,w,s,su (8-858). Pediatric Hematology

M 259f,w,s,su (8-859). Pediatric Endocrinology

M 260f,w,s,su (8-860). Pediatric Nephrology

Child Psychiatry. (See Department of Psychiatry and Neurology)

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

Philip A. Harris, Ph.D.
Kenneth G. Nelson, Ph.D.

Fields of Instruction

Pharmaceutics offers a selection of courses in physical pharmacy and hospital pharmacy. The pharmaceutics program with emphasis in physical pharmacy is designed for the student who desires to prepare himself for a career in education, industry, or research. The hospital pharmacy program, leading to a master of science degree in hospital pharmacy, is designed for the student who desires a responsible supervisory and managerial position in the hospital pharmacy.

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 — Knowledge of a foreign language may be waived upon petition to the Graduate School.

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 scholarship 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 record must show completion of mathematics courses through differential equations and statistics. These courses can be completed after admission to the Graduate School. In addition, 1 year of physical chemistry is prerequisite to a number of required courses in the department.

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

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 — Graduate work toward the Ph.D. degree is offered.

123.* **Veterinary Science.** (Same as VPP 123) Specialization course. Professional interrelationships between pharmacists and veterinarians, disease problems of domestic animals, and animal pharmacology. (3 cr; prereq Phsl 70, Phcl 102 or equiv; 3 lect hrs per wk)

150. **Clinical Pharmacy.** Supervised study of patient drug therapy and related factors at the University and affiliated hospitals. (Cr ar)

160. **Biopharmaceutics.** Drug absorption, distribution, metabolism, and excretion in the human. (3 cr; prereq 56; 3 lect hrs per wk) Harris
161. **Drug Information Evaluation.** Critical evaluation of data on drug effectiveness. (3 cr; prereq 59, 160; 3 lect hrs per wk) Harris
- 165.° **Cosmetics and Dermatological Preparations.** Pharmaceutical aspects of cosmetics and dermatological preparations. (3 cr; prereq 56) Miller
- 166-167.° **Pharmaceutical Manufacturing.** Production and control of pharmaceutical preparations on a pilot plant scale. Formula development and product stabilization. (3-5 cr per qtr; prereq 56, MedC 163, or #) Miller
- 168.° **Preparation of Parenteral Products.** Principles and procedures involved in manufacture of parenteral products. (3 cr; prereq #) Nelson
170. **Hospital Pharmacy Administration I.** The history, classification, organization, and functions of the departments in a hospital in relation to the pharmacy service. (2 cr; prereq 67 or #) Kabat
171. **Hospital Pharmacy Administration II.** The development, organization, responsibility, and administration of pharmacy services in a hospital. (3 cr; prereq 170 and #) Kabat
172. **Hospital Pharmacy Survey.** (1 cr; prereq 171 and #) Kabat
- 173.° **Special Problems in Pharmaceutics.** Problems in formulation, production, and evaluation of pharmaceutical products. (Cr ar; prereq #) Staff
- 201x.° **Seminar: Pharmaceutics.** (1 cr; required of majors in pharmaceutics) Staff
- 203-204.° **Advanced Analytical Methods.** 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. (3-5 cr per qtr; prereq MedC 165, PCh 104 or #; offered when demand warrants) Rippie
206. **Stabilization of Pharmaceutics.** Application of physicochemical principles (e.g., chemical kinetics) to elucidate and minimize stability problems in pharmaceutical systems. (3 cr; prereq PCh 104) McRae
- 213x.° **Research Problems.** Experimental investigation of problems in pharmaceutics. (Cr ar; prereq MedC 163 or #) Staff
- 215-216. **Pharmaceutical Development.** 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. (5 cr per qtr; prereq 167 or #; offered when demand warrants) Miller
- 218-219. **Extraction, Distribution, and Partition Systems.** Theory and practice of extraction of liquids and solids, countercurrent distribution, solvent and solute effects and chromatography. (3-5 cr per qtr; prereq MedC 163 or #; offered when demand warrants) Miller

PHARMACOGNOSY (Phcg)

OFFERED AT MINNEAPOLIS

Professor

E. John Staba, Ph.D., *chairman*

Assistant Professor

Yusuf Abul-Hajj, 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 Requirements — For the Master's degree, one foreign language is advised but not required. For the Ph.D., the requirement may be met either by (a) two foreign languages, (b) a higher order of proficiency in one foreign

Fields of Instruction

language, or (c) one foreign language in French, German, Japanese, or Russian plus a collateral field of study or a special research technique.

- 111 (5-830). **Introductory Pharmacognosy.** Study of natural drug products. Consideration of the production, constituents, metabolism, and uses of drugs containing enzymes, carbohydrates, antibiotics, and biologicals. (5 cr; prereq Biol 2, MedC 53, MicB 53 or #) Staba
- 121 (5-840). **Introductory Pharmacognosy.** Continuation of the study of natural products. Consideration of the production, constituents, metabolism, and uses of drugs containing vitamins, hormones, terpenes, lipids, phenylpropides, and alkaloids. (5 cr; prereq 111 or #) Abul-Hajj
- 204x (8-900). **Research in Pharmacognosy.** (Cr ar; prereq #) Staff
- 205, 206, 207, 341 (8-500). **Pharmacognosy Seminar.** (1 cr per qtr) Staff
- 221 (5-860). **Antibiotics.** Natural antibiotic substances. Methods of production, biosynthesis, extraction, and assay, together with chemical, pharmaceutical, and chemotherapeutic properties. (2 cr; prereq 111 or #) Staba
- 231 (5-870). **Vitamins and Hormones.** These substances will be discussed with regard to biosynthesis, chemistry, biochemical functions, mechanisms of actions, production, and uses. (2 cr; prereq 121 or #) Abul-Hajj
- 232 (5-875). **Antibiotics, Vitamins, and Hormones Laboratory.** An introduction to the techniques used to produce, isolate, and observe the biological effects of these substances. (1 cr; prereq 111 and 121 or #) Staff
- 241 (5-899). **Special Problems in Pharmacognosy.** Problems dealing with the microbiology, chemistry, or biology of medicinal natural products from plants, animals, insects, etc. (Cr ar; prereq #) Staff
- 311 (8-100). **Medicinal Product Isolation and Identification.** The isolation and identification of a glycoside, pigment (flavonoid, tetracycline, etc.), and a heterocyclic compound (alkaloid, etc.) from either plants or animals. (4 cr; prereq #; offered when feasible) Staff
- 321 (8-200). **Medicinal Product Isolation and Identification.** The isolation and identification of a triterpene or steroid, terpene (citral, geraniol, etc.), and a phenylpropide (coumarin, chlorogenic acid, etc.) from either plants or animals. (4 cr; prereq #; offered when feasible) Staff
- 321 (8-300). **Pharmaceutical Fermentation Techniques.** A study of the physical and nutritional factors involved in the production and biotransformation of antibiotics, steroids, alkaloids, growth regulators, and other useful compounds by microorganisms, tissue cultures, and extracellular enzyme preparations. (4 cr; prereq #)
- (8-400). **Selected Topics.** (3 cr on completion of 3 qtrs) Staff

PHARMACOLOGY (Phcl)

OFFERED AT MINNEAPOLIS

Professor

Frederick E. Shideman, M.D., Ph.D.,
head
Norman O. Holte, D.D.S.
Frank T. Maher, M.D., Ph.D.
Gilbert J. Mannering, Ph.D.
Jack W. Miller, Ph.D.
Akira E. Takemori, Ph.D.
Travis I. Thompson, Ph.D.
Lawrence C. Weaver, Ph.D.
Wallace F. White, Ph.D.

Associate Professor

Nelson D. Goldberg, Ph.D.
Bernard L. Mirkin, M.D., Ph.D.
Ben G. Zimmerman, Ph.D.

Assistant Professor

Faruk S. Abuzzahab, M.D., Ph.D.
James F. Cumming, M.D., Ph.D.
Donald B. Hunninghake, M.D.
Harvey J. Kupferberg, Ph.D.
Roy W. Pickens, Ph.D.
Norman E. Sladek, Ph.D.
Sheldon B. Sparber, Ph.D.

Pharmacology is a broad science which considers the interactions between chemical substances or drugs 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 research with the clinical departments of the Medical School.

Graduate training in the field of pharmacology is usually oriented toward the Ph.D. degree, either as a major or a minor subject. The M.S. degree is offered only under special circumstances. A number of 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 each of the medical courses prerequisite to, and including, the major courses in general pharmacology (Phcl 103 and 104). These include courses in physiology and biochemistry. Additional requirements are Phcl 106, 201, 202, 203, 204, and 205 and such other courses 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 103, 104, 204, and 205.

Language Requirement — For the Master's degree, one foreign language — French or German. For the Ph.D. degree, either (a) two foreign languages or (b) one foreign language and a collateral field of knowledge. Routinely acceptable languages for the Ph.D. are French, German, Italian, Russian, and Spanish.

Master's Degree — Offered only under Plan A.

Doctor's Degree — Work toward the Ph.D. degree is offered.

- 101-102 (5-101/5-102). **General Pharmacology.** Lectures and laboratory exercises on the action and fate of drugs. Limited to students of dentistry and pharmacy. (7 cr) Holte, Kupferberg, Mannering, Miller, Shideman, Takemori, Zimmerman
- 103-104† (5-103/5-104). **General Pharmacology.** Lectures and laboratory exercises on the action and fate of drugs. (10 cr; prereq Phsl 106, 107 or equiv and MdBc 100, 101 or equiv) Shideman, Holte, Kupferberg, Mannering, Miller, Sladek, Takemori, Zimmerman
- 105 (5-105). **Forensic Medicine and Medical Jurisprudence.** Lectures on legal aspects of medicine and on laws governing practice of medicine. (1 cr; prereq regis med or #) Mannering, McCoid
- 106 (5-106). **Toxicology.** Lectures on the chemistry, mechanisms, action, and physiological disposition of substances toxic to man and animals. (2 cr; prereq #) Mannering, Hammond
- 107 (5-107). **Pharmacometrics.** Lectures and laboratory exercises on the principles and their application in the evaluation of drug activity. (3 cr; prereq 102 or 104 or #; offered 1969-70 and alt yrs) Kupferberg, Weaver, White
- 108 (5-108). **Dental Therapeutics.** (1 cr; prereq 102) Holte and staff

Fields of Instruction

- 109x (5-109). **Problems in Pharmacology.** (Cr and hrs ar; prereq #) Shideman and staff
- 162x (5-162). **Biological Assay of Drugs.** (3 cr; prereq 102 or #) White
- 201 (8-201). **Advanced Pharmacology: Physiological Disposition of Drugs.** Principles underlying absorption, distribution, metabolism, and excretion of drugs. (3 cr; prereq 102 or 104 or #; offered 1969-70 and alt yrs) Miller, Mannering, and staff
- 202 (8-202). **Advanced Pharmacology: Pharmacodynamics.** Lectures and laboratory exercises on physiological, biochemical, and behavioral effects of drugs utilizing modern techniques. (3 cr; prereq 102 or 104 or #; offered 1970-71 and alt yrs) Takemori, Zimmerman, and staff
- 203x (8-203). **Research in Pharmacology.** (Cr and hrs ar; prereq 104 or #) Shideman and staff
- 204x (8-204). **Seminar: Selected Topics in Pharmacology.** (3 cr on completion of 3 qtrs; prereq 102 or 104 or #) Mirkin and staff
- 205x (8-205). **Seminar: Survey of Current Pharmacological Literature.** (3 cr on completion of 3 qtrs; prereq 102 or 104 or #) Goldberg and staff
- 206x (8-206). **Seminar: Psychopharmacology.** Selected topics on behavioral aspects of drug action. (3 cr on completion of 3 qtrs; prereq #) Pickens, Sparber, and staff
- 207 (5-501). **Clinical Pharmacology.** Lectures on general principles of clinical pharmacology with special emphasis on therapeutic problems associated with recent advances in therapeutics, and methods of evaluating human reactivity to drugs. (1 cr) Hunninghake, Mirkin

OFFERED AT ROCHESTER

Professor

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

Associate Professor

John R. Blinks, M.D., head

Opportunities for graduate training in pharmacological research are available at the Mayo Graduate School of Medicine. For details consult Dr. Blinks.

Other opportunities for advanced work in pharmacology and therapeutics exist in the Sections of Clinical Pathology, Endocrine Research, and many of the clinical specialties. For details see announcements of these departments.

PHYSICAL MEDICINE AND REHABILITATION (PMed)

OFFERED AT MINNEAPOLIS

Professor

Frederic J. Kottke, M.D., Ph.D., head
Peter F. Briggs, Ph.D.
Glenn Gullickson, Jr., M.D., Ph.D.
William G. Kubicek, Ph.D.

Clinical Professor

Thomas Anderson, M.D., M.S.
Paul Ellwood, M.D.
Miland E. Knapp, M.D., M.S.

Associate Professor

Essam A. Awad, M.D., Ph.D.
Daniel Halpern, M.D.

Assistant Professor

John D. Allison, M.S.
Theodore Cole, M.D.
Martin O. Mundale, M.S.
James F. Pohilla, M.S.
Helen V. Skowlund, M.S.

Clinical Assistant Professor

Ruby G. Overmann, M.S.

The field of physical medicine and rehabilitation, which includes physical therapy, occupational therapy, vocational counseling, guidance, and training

Physical Medicine and Rehabilitation

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, Minneapolis Veterans Hospital, and the Kenny Rehabilitation Institute. The student devotes full time to his 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, each graduate student is required to carry out a problem of independent research under the direction of his 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.

103f,w,s,su (8-103). Physical Therapy Clinic. Clinical physical therapy in adult and pediatric rehabilitation. (Cr and hrs ar; prereq physical therapist) Kottke, Halpern, Gullickson, Cole, Awad

130x (8-130). Current Literature Seminar in Physical Therapy. Presentation and discussion of current literature in physical therapy and related medical fields. (1 cr per qtr) Staff

161 (8-161, 8-162). Clinical Medicine in Rehabilitation. (3 cr per qtr) Kottke

170 (8-170). Special Topics in Physical Therapy. Advanced seminar. Topics vary from quarter to quarter. Prepared papers required. (1 cr per qtr; prereq #) Graduate faculty

171 (8-171). Special Topics in Administration of Physical Therapy Services. Individual study of selected problems in administration of physical therapy in hospitals, clinics, and community agencies. (Cr ar; prereq #) Moen

181, 182 (8-180, 8-181). Physiological Bases for Therapeutic Exercise. Lectures on therapeutic exercise plus assigned projects. (3 cr per qtr) Kottke

185f,w,s,su (8-185). Problems in Physical Therapy. (Cr ar; prereq physical therapist) Allison, Mundale, Pohtilla, Skowlund

Fields of Instruction

- 197 (8-192). **Introduction to Scientific Literature and Research in Physical Therapy.** Critical appraisal of current medical literature; use of source material; fundamentals of research design and techniques of medical writing. (2 cr; prereq #) Skowlund
- 198 (8-193). **Research Problems in Physical Therapy.** Methods of research appropriate to physical therapy. Experimental research study. (Cr ar; prereq 192 or #) Allison, Mundale, Pohilla, Skowlund
- 199 (8-195). **Research in Physical Therapy.** (Cr ar; prereq #) Kottke, Skowlund, and staff
- 200f,w,s,su (8-200). **Physiatry Service.** Service at University Hospitals, Hennepin County General Hospital, Kenny Rehabilitation Institute, Veterans Administration Hospital, and other affiliated hospitals. (Cr and hrs ar) Staff
- 204f,w,s,su (8-204). **Peripheral Vascular Disease Clinic.** (Cr and hrs ar; for physicians) Gullickson
- 205f,w,s,su (8-205). **Readings in Physical Medicine and Rehabilitation.** (1 cr per qtr) Kottke
- 206f,w,s (8-206). **Conference on Physical Medicine and Rehabilitation.** Topics vary from quarter to quarter. Prepared papers required. (1 cr per qtr) Staff
- 210f,w,s,su (8-210). **Research in Physical Medicine.** (Cr and hrs ar) Kottke, Kubicek, Gullickson, Awad, and staff
- 211f,w,s,su (8-211). **Electronics in Physical Medicine.** Review of principles of electronic circuits, vacuum tubes, power supplies, and their application in physical medicine. (2 cr) Kubicek
- 212f,w,s (8-212). **Electromyography.** Clinical and laboratory training in use and interpretation of electromyograph. (Cr ar; prereq #) Awad and staff
- 220f,w,s (8-220). **Seminar: Physical Medicine and Rehabilitation.** (Cr and hrs ar) Kottke

OFFERED AT ROCHESTER

Associate Professor

Gordon M. Martin, M.D., M.S., *head*
G. Keith Stillwell, M.D., Ph.D.

Instructor

Joachim L. Opitz, M.D., M.S.

Assistant Professor

Donald J. Erickson, M.D., M.S.

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 months of electromyography, 1 to 2 quarters of related clinical services (which may include such fields as rheumatology, orthopedics, general medicine, neurology) and, as a minor, 6 to 9 months in a basic science, such as physiology, anatomy or biophysics. The program is approved by the Council on Medical Education of the American Medical Association.

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 the hospital services. He has experience in the evaluation and care of patients having physical disabilities such as may be seen in all phases of medical practice. On the service at St. Marys Hospital the resident will learn to prescribe and will follow the various steps involved in the overall rehabilitation program of many seriously handicapped patients. He will learn to coordinate and utilize the services of other medical specialists and auxiliary personnel, in-

cluding speech pathologists, physical and occupational therapists, social service personnel, psychologists, and vocational counselors.

Conferences, seminars, lectures, and informal discussions of clinical problems make it possible for the resident to obtain wide clinical as well as theoretical experience in all aspects of physical medicine and rehabilitation.

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 — This department offers work leading to the Ph.D. degree.

M 251f,w,s,su (8-851). Physical Medicine and Rehabilitation. Staff

M 252f,w,s,su (8-852). Special Service. Special service in physical medicine and rehabilitation as related to rheumatology, orthopedic surgery, neurology, and various other medical and surgical specialties. Staff

Research Work on Selected Problems in Physiology. (See Department of Physiology)

PHYSIOLOGICAL HYGIENE

OFFERED AT MINNEAPOLIS

Professor

Ancel Keys, Ph.D., *director*

Minor — It is suggested that students who major in physiological hygiene present a minor in one of the following fields: epidemiology, medical biochemistry, psychology, or internal medicine.

Language Requirement — For the Master's degree, French or German. In exceptional cases Spanish or Russian may be substituted by petition. For the Ph.D. degree, two foreign languages (French and German).

Master's Degree — Offered only under Plan A.

Attention of the student is also directed to the field of nutrition.

Doctor's Degree — Members of the physiological hygiene staff who are appointed to the graduate faculty in physiology or biochemistry (medical) or nutrition may advise students majoring in those fields. In addition, in exceptional cases, physiological hygiene may be employed as the major field. The programs of students in this field will not include physiology as a minor field and will incorporate an interdisciplinary group of subjects within the major. Plans of study of these students should be drawn up early in their course of study and be submitted to the dean of the Graduate School.

PubH 191. Applied Human Nutrition. Food compositions and standards of nutrient requirements. Methods in dietary and nutritional status surveys. Applications of nutrition to public health programs related to specific diseases and population groups. (3 cr; prereq #) J Anderson, Grande, Steif

Fields of Instruction

- PubH 192. Physiology of Exercise.** Muscular efficiency, training, deconditioning, effects of exercise on metabolism and physiological systems. (Cr ar; prereq Phsl 106, 107 or equiv, and #; offered when demand warrants) Taylor
- PubH 195. Public Health Aspects of Cardiovascular Disease.** (3 cr; prereq #) Keys, Grande, and staff
- PubH 202. Seminar: Physiological Hygiene.** Nutrition, tests and measurements of human physical fitness, gerontology, adaptation in health and disease, body composition, circulatory dynamics, and related topics. (1 cr)
- PubH 220. Readings in Problems of Physiological Hygiene.** (Cr ar; prereq #)
- PubH 290. Research in Physiological Hygiene and Related Areas.** (Cr ar)

PHYSIOLOGY (Phsl)

OFFERED AT MINNEAPOLIS

Professor

Eugene D. Grim, Ph.D., *head*
H. Mead Cavert, M.D., Ph.D.
Francisco Grande, M.D.
Franz Halberg, M.D.
John A. Johnson, M.D., Ph.D.
Ancel Keys, Ph.D.
William G. Kubicek, Ph.D.
Nathan Lifson, M.D., Ph.D.
Victor Lorber, M.D., Ph.D.
Aldo Rescigno
Ernst Simonson, M.D.
Henry L. Taylor, Ph.D.
Carlo A. Terzuolo, M.D.
Maurice B. Visscher, M.D., Ph.D.

Associate Professor

Marvin B. Bacaner, M.D.
Irwin J. Fox, M.D., Ph.D.
Rodney B. Harvey, M.D., Ph.D.
Jui S. Lee, Ph.D.

Assistant Professor

James S. Beck, M.D., Ph.D.
Robert L. Evans, Ph.D.
Eric Hahn, Ph.D.
David G. Levitt, M.D., Ph.D.
Richard E. Poppele, Ph.D.
Richard L. Purple, Ph.D.
David E. Schafer, 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, 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. Acceptable languages are French, German, and Russian.

Master's Degree — Offered under both Plan A and Plan B, the latter by petition.

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, the use of a supporting program.

(8-111). **Human Physiology for Medical-Surgical Nursing.**

106-107† (8-116/8-117). **Human Physiology.** (7 cr for 106, 8 cr for 107; prereq organic chemistry, zoology, and neuroanatomy; students may register for lect without lab)

112w (8-236). **Hemodynamic Measurements.** Lectures, experiments, and problems dealing with pulsatile blood flows. (3 cr; prereq 107 within past 8 yrs) Evans

Physiology and Biophysics

- 113 (8-113). **Problems in Physiology.** Arranged with qualified students. Topics assigned for laboratory study, conferences, and reading. (Cr ar; may be taken 1 or more qtrs; prereq 107)
- 201f,w,s (8-201). **Literature Seminar.** (1 or 2 cr by ar; prereq 107 or equiv)
- 202° (8-202). **Readings in Physiology.** Topics selected for each student, written reviews prepared and discussed. (Cr and hrs ar)
- 203° (8-203). **Research in Physiology.** (Cr and hrs ar)
- 204 (8-204). **History of Physiology.** (Cr and hrs ar) Visscher, Wilson
- 210 (8-210). **Selected Topics in Permeability.** Advanced seminar. (Cr and hrs ar; prereq 107 or equiv, §) Grim, Lifson, Johnson
- 211 (8-211). **Selected Topics in Heart and Circulation.** One or more seminars in the advanced physiology of heart and circulation. (Cr and hrs ar; prereq 107 or equiv, §) Visscher, Bacaner, Fox
- 212 (8-212). **Selected Topics in Respiration.** Advanced seminar. (Cr and hrs ar; prereq 107 or equiv, §)
- (8-213). **Selected Topics in Alimentary Physiology**
- 216 (8-216). **Selected Topics in Neurophysiology.** Advanced seminar. (Cr and hrs ar; prereq 107 or equiv, §) Terzuolo, Poppele, Purple
- 219 (8-239). **Topics in Microcirculation and Lymphatics.** (Cr and hrs ar; prereq 107 or equiv) Lee, Meyer
- 220 (8-220). **Methods of Analysis.** Topics selected from: control theory, compartment analysis, tracer analysis, thermodynamics of irreversible processes, construction and use of models. Applications in physiology. (3 cr; prereq calculus through introduction to differential equations, physical chemistry, or §) Beck
- 227 (8-227). **Methods in Physiology.** (3 cr; prereq 107 or equiv, §) Stish
- 230 and 231 (8-230 and 8-231). **Transport Process in Biology.** Relatively systematic coverage of biological transport processes. (3 cr per qtr; prereq 107 within past 8 yrs) Grim, Johnson, Lifson
- 234 (8-234). **Respiration, Acid-Base Chemistry, and Electrolyte Metabolism.** (3 cr; prereq 107 within past 8 yrs)
- 235 (8-235). **Bioenergetics of Cardiac Contraction.** (3 cr; prereq 107 within past 8 yrs) Cavert, Lorber
- 236 (8-214). **Selected Topics in Nephrology.** Advanced seminar. (3 cr; prereq 107 or equiv) Harvey
- 238 (8-238). **Neural and Humoral Control of Circulation.** (3 cr; prereq 107 within past 8 yrs) Grande

PHYSIOLOGY AND BIOPHYSICS

OFFERED AT ROCHESTER

Professor

John T. Shepherd, M.D., D.Sc., *head*
Alexander Albert, M.D., Ph.D.
Charles F. Code, M.D., Ph.D.
Ward S. Fowler, M.D.
Edward H. Lambert, M.D., Ph.D.
Frank T. Maher, Ph.D., M.S.
Charles A. Owen, Jr., M.D., Ph.D.
William H. J. Summerskill, M.D.
Khalil G. Wakim, M.D., Ph.D.
Earl H. Wood, M.D., M.S., Ph.D.

Associate Professor

David E. Donald, D.V.M., Ph.D.
Albert Faulconer, Jr., M.D., M.S.
H. Frederic Helmholz, Jr., M.D.
Robert E. Hyatt, M.D.
Jenifer Jowsey, Ph.D.
Welby N. Tauxe, M.D., M.S.

Assistant Professor

James B. Bassingthwaight, M.D., Ph.D.
William P. Baldus, M.D., M.S.

Fields of Instruction

Ralph A. Nelson, M.D., Ph.D.
Leslie J. Schoenfeld, M.D., Ph.D.
Ralph E. Sturm

Instructor

Henry N. Coleman, III, M.D.
Donald W. Klass, M.D.
Sidney F. Phillips, M.B.B.S.
Jerry F. Schlegel, B.S.

Much of the graduate work in physiology or biophysics at the Mayo Graduate School of Medicine is carried out in conjunction with other departments, particularly medicine, surgery, and anesthesiology. In addition to these collaborative undertakings, opportunities for advanced work in physiology or biophysics are offered in the department for those wishing to major in physiology or biophysics and for those using either in partial fulfillment of the major or minor fields for an advanced degree.

Research programs for the M.S. or Ph.D. degrees are developed with members of the faculty in the department and on the Minneapolis Campus.

- M 251f,w,s (8-851). Physiology Seminars.** Weekly seminars participated in by the whole department in which research papers are presented by students, staff, or invited lecturers.
- M 252f,w,s (8-852). Lectures in Mammalian Physiology.** An in-depth review of human and mammalian physiology directed toward those who have already had an introductory course. (3 cr per qtr) Staff
- M 253f,w,s,su (8-853). Research in Physiology.** (Cr and hrs ar) Staff
- M 254f,w,s,su (8-854). Readings in Physiology.** (Cr and hrs ar) Staff
- M 255, 256 (8-855, 8-856). Optics and Visual Physiology.** Optics as applied to ophthalmology; basic principles of visual physiology. (2 cr per qtr; prereq #) Staff
- M 257, 258, 259 (8-857, 8-858, 8-859). Radiology and Radiologic Physics.** Physical basis of radiology, radiologic equipment, dosimetry, radiation safety. Required for fellows in radiology. (3 cr per qtr [1st qtr not available for biophysics cr]; prereq #) Orvis and staff
- M 260f,w,s,su. Basic Neurologic Sciences.** Neurology, Psychiatry, and Neurosurgery staffs
- M 261, 262, 263 (8-861, 8-862, 8-863). Mathematics for Biology and Medicine.** Applications of advanced calculus, differential equations, and partial differential equations to biophysics, physiology, and biochemistry. FORTRAN programming. (3 cr per qtr; prereq calculus and 28 cr distributed between biology, physics, and physical chemistry) Staff
- M 264, 265 (8-864, 8-865). Mathematical Basis of Tracer Methodology.** Principles of tracer method, compartmental systems, stochastic processes, circulatory studies, fitting models to data. (3 cr per qtr; prereq M 251, M 252, M 253 or #) Orvis
- M 266f,s. Basic Principles of Electricity and Electronics.** Lectures on basic principles in electricity, electronic components, and circuits afford understanding of research and diagnostic uses of electrical apparatus. (1 cr per qtr) Staff
- M 267Af,w,s,su. Neurology Conference on Electroencephalography I.** Introduction to principles of techniques and interpretation of EEG. (11 cr per qtr) Klass
- M 267B. Neurology Conference in Electroencephalography II.** Intermediate EEG; individual responsibility toward interpretation and use of special techniques. (11 cr per qtr) Klass
- M 267C. Neurology Conference on Electroencephalography III.** Advanced EEG with higher levels of individual responsibility for diagnostic interpretations. Research procedures. Klass
- M 267D. Neurology Diagnostic Electroencephalography.** Continuation of 267C.
- M 268f,w,s,su. Neurophysiology.** Seminars in physiology of central nervous systems; electrophysiology and quantitation of neurophysiologic data. (2 cr per qtr) Klass

Physiology and Biophysics

- M 269 (8-869). Biomedical Applications of Mathematical Transforms.** Fourier series, Fourier transforms, and LaPlace transforms applied to problems in biology; computer techniques for handling these problems. (3 cr per qtr; prereq M 261, M 262, M 263 or equiv) Staff
- M 270 (8-870). Digital Computer Analysis of Physiological Data.** Data acquisition systems, concepts of noise, sampled data representation, aliasing, filtering, computer control of experimental data acquisition. (3 cr) Wood, Sturm, and staff
- M 271 (8-871). Mathematical Modeling of Biological Systems.** Review of ordinary differential equations; time domain system impulse responses; operator notation; filter theory; analog and digital simulation; introduction to numerical analysis and integration methods; fitting of experimental data with mathematical models. (3 cr) Sturm, Bassingthwaighte, and staff
- M 272 (8-872). Biological Systems Analysis I.** Network analysis introduction to the mathematical methods used to describe systems and signals, including Fourier, LaPlace and differential equation techniques. (3 cr) Bassingthwaighte, Sturm, and staff
- M 273 (8-873). Biological Systems Analysis II.** Techniques for mathematical description of biological systems and analysis of biological control systems. (3 cr; prereq M 272 or #) Bassingthwaighte, Sturm, and staff
- M 274f,w,s,su. Neuromuscular Physiology.** Lectures, discussions, demonstrations in physiology of peripheral nerves and muscle; basic aspects and mechanisms of neuromuscular diseases. (1 cr per qtr) Lambert
- M 275 (8-875). Analog Computer Analysis of Physiological Problems.** Analog computer theory, description of function of components, ordinary differential equations, compartmental analysis, nonlinear components, function generation, closed loop systems. (3 cr) Sturm, Bassingthwaighte, and staff
- M 276 (8-876). Physics for Biologists.** Introductory theory of relativity, atomic structure, quantum mechanics, statistical mechanics, nuclear disintegration, and elementary particles. (3 cr) Sturm, Orvis, and staff
- M 280 (8-880). Contraction of Striated Muscle.** Mechanisms and theories of contraction, force-velocity relationships, and muscle energetics. (1½ cr) Coleman, Wood, and staff
- M 281 (8-881). Hemodynamics and Rheology.** A 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. (3 cr; prereq M 252, calculus) Bassingthwaighte, Sturm, and staff
- M 282 (8-882). Cardiovascular Regulation.** Neural control; cardiac work; effects of exercise; press-volume curves; peripheral vessel responses to autonomic stimuli; abnormal states (hypertension, shock). (3 cr) Donald, Shepherd, Wood
- M 290 (8-890). Advanced Respiratory Physiology.** Gas exchange and transport; neural and chemical control; anoxia; acclimatization; surface tension; regional ventilation and perfusion. (3 cr) Fowler, Hyatt, Helmholtz
- M 300 (8-891). Gastrointestinal Secretion.** Comprehensive description of gastric pancreatic and intestinal secretory processes of water, electrolyte, and large molecular substances. (3 cr) Code, Nelson
- M 301 (8-892). Gastrointestinal Transport.** Mechanisms of transport of sugars, amino acids, and fats in the stomach, small and large intestine. (3 cr) Nelson, Code, and staff
- M 302 (8-893). Gastrointestinal Motility.** Electrical activity of smooth muscle in gut and relation to mechanical events: inhibition and stimulation. (3 cr) Code, Kelly, Nelson
- M 310 (8-894). Advanced Renal Physiology.** Correlation of structure and function; autoregulation; tubular transport mechanisms; countercurrent mechanisms for ions and urea and role in forming concentrated urine. (3 cr) Wakim, Strong
- Biochem M 255w. Endocrinology and Metabolism.** (3 cr) Staff

PLASTIC SURGERY

OFFERED AT ROCHESTER

Professor

Kenneth D. Devine, M.D. (clinical)
John B. Erich, M.D.

Assistant Professor

Thaddeus J. Litzow, M.D.
James K. Masson, M.D.
John N. Simons, M.D., *head*

Residencies in plastic surgery at the Mayo Graduate School of Medicine include training in all aspects of this surgical specialty. 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. Three months of rotation during the first year is with Dr. William Frackelton and associates in Milwaukee for exposure to surgery of the hand. The last year of training is divided into 4-month periods at St. Marys Hospital, Rochester Methodist Hospital, and the 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.

M 252f,w,s,su. Diagnostic and Clinical Plastic Surgery. Theory and practice of plastic surgery. Diagnosis of diseases and defects requiring plastic repair. Pre- and postoperative care of patients. Staff

M 253f,w,s,su. Operative Plastic Surgery. Hospital residence. Junior residence in operative service. Staff

M 254f,w,s,su. Operative Plastic Surgery. 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. Staff

Surgical and Fresh Tissue Pathology. (See Department of Pathology)

Anatomy. (See Department of Anatomy)

PSYCHIATRIC NURSING

OFFERED AT MINNEAPOLIS

See Nursing, page 70

PSYCHIATRY

OFFERED AT MINNEAPOLIS

Professor

William Hausman, M.D., *head*
 Starke R. Hathaway, Ph.D., *director of*
clinical psychology
 Richard W. Anderson, M.D.
 Peter F. Briggs, Ph.D.
 A. Jack Hafner, Ph.D.
 Donald W. Hastings, M.D.
 Gordon Heistad, Ph.D.
 Reynold A. Jensen, M.D.
 David T. Lykken, Ph.D.
 Richard M. Magraw, M.D.
 Manfred J. Meier, Ph.D.
 Wentworth Quast, Ph.D.
 Burtrum Schiele, M.D.
 William Schofield, Ph.D.
 Werner Simon, M.D.

Clinical Professor

S. Alan Challman, M.D.
 Gove Hambidge, M.D.

Hyman S. Lippman, M.D.
 Otto N. Raths, M.D.

Associate Professor

John P. Brantner, Ph.D.
 Floyd K. Garetz, M.D., M.S.
 William W. Jepson, M.D.
 Alan H. Roberts, Ph.D.
 Lloyd K. Sines, Ph.D.
 Travis I. Thompson, Ph.D.

Assistant Professor

David W. Cline, M.D.
 James J. Lawton, Jr., M.D.
 Richard Teeter, M.D.

Clinical Assistant Professor

William T. Luckey

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 giving 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. Opportunities for personal psychotherapy are available. A 4-year program offering advanced degrees in child psychiatry is also available.

Psychiatry (AdPy)

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, Russian, and Spanish.

- 251 (8-201). **Clinical Inpatient Psychiatry.** (Cr ar; prereq MD)
 252 (8-202). **Clinical Outpatient Psychiatry.** (Cr ar; prereq MD)
 254 (8-203). **Advanced Clinical Inpatient Psychiatry.** (Cr ar; prereq MD and 251, 252, 253 or equiv)
 255 (8-204). **Advanced Clinical Outpatient Psychiatry.** (Cr ar; prereq MD and 251, 252, 253 or equiv)
 257 (8-205). **Special Assignments in Psychiatry.** (1 cr; prereq MD and 251, 252, 253 or equiv)
 258 (8-206). **Research in Psychiatry.** (Cr ar; prereq MD or #)
 260 (8-207). **Orientation to Clinical Psychiatry.** (1 cr; prereq MD or #)
 263 (8-208). **A Survey of Physiologic Treatments in Psychiatry.** (1 cr) Schiele
 265 (8-209). **Personality Development and Psychodynamics.** (1 cr; prereq MD or #) Anderson

Fields of Instruction

- 267 (8-210). **Social Psychiatry.** (1 cr) Malmquist
269 (8-211). **Introduction to Psychotherapy.** (Same as Psy 271, 272, 273) (3 cr; prereq MD or §) Raiths
270 (8-212). **Review of Current Literature.** (2 cr) Hastings
271 (8-213). **Basic Readings from Psychoanalysis I.** (1 cr; prereq MD or §) Hambidge
273 (8-214). **Survey of Psychosomatic Medicine.** (1 cr; prereq MD or §)
276 (8-215). **Current Research in Psychiatry.** (1 cr; prereq MD or §)
278 (8-216). **Introduction to Family Therapy.** (1 cr; prereq MD or §)
279 (8-217). **Development of Psychiatric Thought.** (1 cr; prereq MD or §)
281 (8-218). **Readings in Psychoanalysis II.** (1 cr; prereq MD or §) Hambidge
283 (8-219). **Seminar: Special Topics.** (1 cr; prereq MD or §) Schiele
290 (8-220). **Survey of Psychiatry for Neurology Residents.** (1 cr; offered 1971-72 and every 3rd yr)
291 (8-221). **Seminar: Current Literature.** (1 cr; prereq MD or §) Simon
292 (8-222). **Special Supervision in Psychotherapy.** (1 cr; prereq MD or §)
293 (8-223). **Problems in Teaching Psychiatry.** (Cr ar; prereq MD or §)
295 (8-224). **Introduction to Group Therapy.** (1 cr)

Child Psychiatry (ChPy)

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, Russian, and Spanish.

- 253 (8-201). **Clinical Child Psychiatry.** (Cr ar; prereq MD)
256 (8-202). **Advanced Clinical Child Psychiatry.** (Cr ar; prereq MD and 251, 252, 253 or equiv)
284 (8-203). **Basic Readings in Child Psychiatry.** (1 cr)
285 (8-204). **Current Literature Seminar: Child Psychiatry.** (1 cr)
286 (8-205). **Diagnostic and Therapeutic Methods in Child Psychiatry.** (1 cr)
287 (8-206). **Research in Child Psychiatry.** (Cr ar)

In addition to work in the University Hospitals psychopathic unit, on the neurologic service, the child psychiatry service, and the outpatient service, the student has access to Veterans Administration Hospital, Veterans Administration Mental Hygiene Clinic, Hennepin County General Hospital, and St. Paul-Ramsey Hospital.

The fellow is given a clinical assignment in the inpatient and the outpatient services of University or affiliated hospitals, and is responsible to his service chief for the clinical study and therapy of his patients. He makes daily informal rounds with this superior staff, has weekly clinical conferences with the director of the department, and prepares cases for presentation at formal weekly staff conferences and at the clinic given to undergraduate medical students. He reports on the literature or on his special studies in staff conferences from time to time.

Clinical Psychology (ClPy)

The following courses may be used as part of a major or minor in psychiatry and neurology for the M.S. or Ph.D. degree, or for the M.A. or Ph.D. degree in psychology.

- 200 (8-200). **Descriptive Psychopathology.** (3 cr; prereq #) Roberts
- 201 (8-201). **Readings in the History of Psychiatry.** (1 cr per qtr; prereq #) Schofield
- 202 (8-202). **Special Research Topics.** (Cr ar; prereq #)
- 203 (8-203). **Psychometric Clerkship.** (Cr ar; prereq #)
- 204 (8-204). **Internship in Clinical Psychology.** (2 or 4 cr; prereq 400 hrs clerkship exper and PhD candidate in psychology)
- 205 (8-205). **Advanced Seminar.** (1 cr; prereq #) Hathaway
- 206A (8-206). **Medical Psychology A.** (2 cr; prereq Psy 292A, B, C, D)
- 206B (8-207). **Medical Psychology B.** (2 cr; prereq Psy 292A, B, C, D)
- 206C (8-208). **Medical Psychology C.** (2 cr; prereq Psy 292A, B, C, D)
- 206D, 206su (8-209). **Medical Psychology D.** (2 cr; prereq Psy 292A, B, C, D)
- 264 (8-210). **Introduction to Clinical Psychology.** (1 cr; prereq resident in psychiatry or #)
- 274 (8-211). **Seminar: Basic Principles of Clinical Psychology.** (2 cr; prereq resident in psychiatry or #) Hathaway
- 277 (8-212). **Psychophysiology for Psychiatrists.** (1 cr; prereq MD or #) Heistad
- 297 (8-213). **Organic Therapies in Psychiatry.** (1 cr per qtr; prereq #) Sines
- 298 (8-214). **Organic Syndromes in Psychiatry.** (1 cr per qtr; prereq #) Sines
- 299 (8-215). **Professional Problems in Clinical Psychology.** (1 cr; prereq #) Sines

OFFERED AT ROCHESTER

Professor

David A. Boyd, Jr., M.D., M.S., *chairman*
Howard P. Rome, M.D.

Maurice J. Martin, M.D., M.S.
Richard M. Steinhilber, M.D.
Francis A. Tyce, M.B., M.S.

Associate Professor

Wendell M. Swenson, Ph.D. (Clinical Psychology)

Instructor

Leo J. Davis, Jr., Ph.D. (Clinical Psychology)
Glen Duncan, B.M.B.Ch.
Myron P. Wilson, M.D.

Assistant Professor

Maurice J. Barry, Jr., M.D., M.S.
James G. Delano, M.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 and nonpsychotic 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 depart-

Fields of Instruction

ments there is the opportunity to study a wide variety of psychosomatic problems. As an integral part of the fellowship 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. This 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, and Shattuck School, Faribault, 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.

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 — This department offers work leading to the Ph.D. degree.

M 251f,w,s,su (8-851). **Diagnosis in Psychiatry.** Research. Seminar. Staff

M 253f,w,s,su (8-853). **Hospital Residence in Psychiatry.** Staff

M 254f,w,s,su (8-854). **Special Psychiatry at the Comprehensive Mental Health Center, Rochester State Hospital.** Staff

M 255f,w,s,su (8-855). **Child Psychiatry**

M 256f,w,s,su (8-856). **Clinical Psychiatry.** Staff

M 258f,w,s,su (8-858). **Basic Neurologic Sciences.** Staff

PUBLIC HEALTH** (PubH)

OFFERED AT MINNEAPOLIS

Professor

Gaylord W. Anderson, M.D., Dr.P.H.,

dean

Richard G. Bond, M.S., M.P.H.

Donald W. Cowan, M.D., M.S.

George S. Michaelsen, M.S.

Theodore A. Olson, Ph.D.

Harold J. Paulus, Ph.D.

Leonard M. Schuman, M.D., M.S.

James W. Stephan, M.B.S.

Stewart C. Thomson, M.D., M.S., M.P.H.

Associate Professor

Eleanor M. Anderson, M.P.H.

Allyn G. Bridge, M.D., M.P.H.

Norman A. Craig, M.P.H.

** 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.

Alma G. Sparrow, M.S., M.P.H.
George E. Williams, M.D.

Lee D. Stauffer, M.P.H.
Ruth Edna Stief, M.P.H.

Assistant Professor

Edward V. Ellis, M.P.H., Ph.D.
Delphie J. Fredlund, M.P.H.
Rita A. Kroska, M.S., M.P.H., Ph.D.
Gustave L. Scheffler, B.S.C.E.
Rexford D. Singer, B.S.C.E., M.S.

Lecturer

Henry Bauer, Ph.D.
Leslie W. Foker, M.D.
William A. Jordan, D.D.S., M.P.H.
Lee E. Schacht, Ph.D.

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 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 100A, B, and C and courses in statistics and either epidemiology or public health administration.

For the Ph.D. degree, PubH 100A, B, and C 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 100A, B, and C.

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, teaching, or advanced practice. Emphasis in mental health, long-term patient care and rehabilitation, or school nursing is available.

Doctor's Degree — Work leading to the Ph.D. degree is offered for majors in biometry, environmental health, epidemiology, hospital administration, and physiological hygiene. For further information on these programs, see the index reference.

100A. Elements of Public Health I. Occurrence and prevention of communicable, degenerative, and industrial diseases; protection of food, water, and milk; maternal and child health. (3 cr; prereq 3, or 50 and a course in microbiology) G Anderson, Schuman, Thomson

100B, C. Elements of Public Health II and III. Group work in evaluation and solution of representative community health problems. (2 cr for B, 1 cr for C; prereq 100A) Staff

102.* Environmental Health. Methods for promoting man's health and comfort by controlling environment. (3 cr; prereq #) Bond

102A. Environmental Health. General principles of urban and rural sanitation; problems encountered by official health agencies. (2 cr; prereq 100A or #) Bond, Stauffer

103. Public Health Bacteriology. Bacteriologic and serologic diagnosis, public health laboratory administration and methods. (Cr ar; prereq MicB 102, 116, #) Bauer

104.* Epidemiology I. Basic epidemiologic principles applicable to infectious and non-infectious disease; host-agent-environment complex; factors underlying spread of infectious disease; laboratory applications of statistical and epidemiologic methods. (3 cr; prereq 100A, 140, 180 or 110A-111A) Schuman

105.* Epidemiology II. Extension of epidemiologic principles to detailed study of selected infectious diseases. (3 cr; prereq 104) Schuman

Fields of Instruction

- 106.* **Public Health Administration.** Structure, basic functions, and activities of public health agencies. (3 cr; prereq 100A) G Anderson
107. **Maternal and Child Health.** Health needs and services for mothers and children in public health programs. (3 cr, §107A; prereq MD, DDS, nurses, or §, ¶100A) Bridge
- 107A. **Maternal and Child Health Programs.** Community programs for major maternal and child health problems. (1 cr, §107; prereq hospital administration students and §) Bridge
108. **Introduction to Biostatistics and Statistical Decision.** Variation, frequency distribution; probability; significance tests; estimation; trends; data handling; simple operations research applications. Statistical approach to rational administrative decision making. Lectures and laboratory exercises. (3 cr; prereq §) Weckwerth
- 109.* **Institutional Environmental Health.** Sanitation and safety practices in hospitals and other institutions. (3 cr; prereq hospital administration students or §, 100A) Michaelson
- 110A. **Biometry I.** Basic concepts in probability; binomial, Poisson and normal probability models; testing statistical hypotheses and estimation of parameters of probability models. (3 cr; prereq ¶111A, Math 10 or §) Bartsch
- 111A. **Biometry Laboratory I.** Application of concepts of probability to the development of probability models for random phenomena in the biological and medical sciences. (2 cr; prereq ¶110A) Bartsch
- 112.* **Environmental Aspects of Water Systems.** Sanitary aspects of design and operation of water treatment and distribution systems; examination of plans and field investigations. (3 cr; prereq 102, §) Bond and staff
- 113.* **Environmental Aspects of Liquid Waste Systems.** Sanitary aspects of design and operation of liquid waste treatment and collection systems; examination of plans and field investigations. (3 cr; prereq 102, §) Bond and staff
114. **Environmental Health Programs.** Public health supervision of activities in urban and rural sanitation. (3 cr; prereq 110A and §) Bond and staff
- 115.* **Food Sanitation.** Review of current literature on sanitary problems in production, processing, and distribution of milk, meat, shellfish, and other foods; methods of supervision. (3 cr; prereq 100A and §) Olson
- 115A. **Institutional Food Protection Programs.** Public health implications in food preparation and service; regulatory controls by official public health agencies. (2 cr; prereq §) Bond, Jopke
- 116.* **Administration of Environmental Health Programs.** Administrative organization of environmental health activities. (3 cr; prereq §) Bond
- 117A-B-C.* **Environmental Biology.** Plant and animal forms in environmental health with special reference to disease vectors, eutrophication, and water supply problems. (3 cr per qtr; prereq 100A or ¶100A, §) Olson
- 118.* **Environmental Microbiology.** Survival, dissemination, transportation, and significance of microorganisms in the environment; application of principles to environmental health problems. (3 cr; prereq 100A, 102, MicB 53 or §) Greene
- 120D-E.*† **Biomedical Computing.** Introduction to digital computer and FORTRAN programming with applications in biology and medicine. (2 cr per qtr, §120A; prereq Math 10) Johnson and staff
122. **Public Health Administration Problems.** Budgeting, program planning, and appraisal of public health procedures. (3 cr; prereq 106) G Anderson
- 123.* **Topics in Public Health.** Selected readings and problems. (Cr ar; prereq §) Staff
125. **Introduction to Public Health Education.** Planning educational components of community health programs; group procedures; community organization; methods and materials. (2 cr; prereq §) Craig, Ellis
- 125A. **Health Education in Hospitals.** Guiding principles; purposes and scope; methods and materials; health education planning, with special emphasis on hospitals. (1 cr; prereq hospital administration students) Craig, Ellis

127. **Advanced Studies in Health Education.** Case studies; planning and educational processes as applied within specific public health disciplines. (3 cr; prereq 125, 125A, or #) Craig
128. **Comparative Community Health Education, Urban and Rural.** 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. (3 cr; prereq #) Craig
129. **Epidemiologic Survey Methods.** Practical aspects of survey design, execution, analysis, and interpretation. (3 cr; prereq 104, 140 or equiv and #) Schuman
132. **Mental Health Program.** Community program for promotion of mental health and care of mentally ill persons. (1 cr; prereq 106 or #) Williams
133. **Mental Health.** Emotional factors underlying wholesome family relations or interfering with successful adjustment in family and community. (3 cr; prereq #) Williams
134. **Human Genetics and Public Health.** Evaluation of current studies in human genetics and applications to community health. (3 cr) Schacht
136. **Handicapped Children.** Prevention and rehabilitation of handicapping conditions affecting children. Community activities related to emotional, physical, and intellectual handicaps. (Cr ar; prereq 107 and #) Bridge
137. **Dental Health.** Conditions resulting in tooth decay and loss; preventive and corrective measures; mouth hygiene; community programs for dental health. (1 cr; prereq #) Jordan
138. **Hospital Engineering Problems.** Application of environmental engineering, sanitation, and maintenance principles to planning, administration, and operation of hospitals. (Cr ar; prereq #) Michaelsen and visiting lecturers
- 140.* **Vital Statistics I.** Official sources; population changes; rates; trends; significant differences. (3 cr) Bearman
- 140A. **Vital Statistics II.** Demographic techniques and statistical inference. (3 cr; for public health majors; prereq 140 with grade of B) Thornton
141. **Social and Economic Aspects of Medical Care.** Social and economic forces affecting administration and financing of medical care; sickness insurance, group hospitalization; concern of government in provision of medical care. (Cr ar; prereq #) Litman
143. **Measurement and Application of Ionizing Radiation.** (Same as Phcg 169) Introduction to principles of measurement and use of radiative sources. (3 cr lect and lab, 2 cr lect only; prereq #) Barber, Jonas
145. **Low Level Radioactivity and Radiation Measurements.** Advanced isotope techniques designed for assay of low levels of radioactivity in environmental samples. (3 cr; prereq #) Barber
- 147.* **Environmental Radioactivity.** Measurement, evaluation, and control of environmental radioactivity hazards to general population. (3 cr; prereq #) Barber, Straub
148. **Seminar: Health Physics.** Review and discussion of current health physics problems. (1 cr; prereq #) Barber
149. **Public Health Aspects of Housing and the Residential Environment.** Principles of healthful housing; application in community planning and development. (3 cr; prereq #) Bond
151. **Health Aspects of Air Control in Hospitals.** 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. (2 cr; prereq #) Michaelsen
- 152.* **Industrial Hygiene Engineering.** Field and laboratory methods used by industrial hygiene engineers in study and control of occupational health hazards. (3 cr; prereq #) Michaelsen
153. **Principles and Methods of Accident Prevention.** Accidents as a community public health problem; current concepts of etiology and methodology of control. (Cr ar; prereq #) Michaelsen, Scheffler

Fields of Instruction

154. **Special Studies in Accident Prevention.** Directed readings and reports on selected problem areas in accident prevention and injury control. (Cr ar; prereq #) Michael-
sen, Scheffler
- 155.° **Introduction to the Air Pollution Problem.** History, sources, controls, effects, sur-
veys, legal aspects, and administration of air pollution problems. (3 cr; prereq #)
Paulus
- 156.° **Air Pollution Controls and Surveys.** Public health engineering approach to air pol-
lution controls and surveys. (3 cr; prereq 155, #) Paulus
157. **Radiation Protection Criteria for Hospitals.** Methods of design, shielding, equipping,
and operation of radioisotope laboratories, X-ray, and other ionizing radiation facili-
ties. (2 cr; prereq #) Michaelsen, Wollan
158. **Hospital Safety.** Theories and practices in accident and fire prevention and control
for hospitals and other medical care facilities. (3 cr; prereq #) Michaelsen, Scheffler
159. **Chemical Laboratory Safety.** Principles of accident and fire prevention in chemical
laboratories. (1 cr; prereq #) Scheffler
168. **Orientation to Medical Sciences.** Medical terminology, applied anatomy and physi-
ology. (3 cr; prereq #) Thomson
170. **Administration of Public Health Nursing.** Interpretation of background and trends
in public health nursing; analysis of staff and supervisory practice. (2 cr, §170A;
prereq health officers, others #) Sparrow, Sime
- 170A. **Administration of Public Health Nursing.** Scope; relationship to other aspects of
public health. (1 cr, §170; prereq #) Sparrow, Fredlund
- 171.° **Research Methodology in Nursing.** Orientation to research; design. (3 cr; prereq
140) Kroska, Sparrow
- 172A-B. **Directed Research.** Guided study in research design and completion of a project.
(3 cr per qtr; prereq 171) Kroska and associates
173. **Culture and Public Health I.** Intensive introduction to characteristics of culture and
their implications for the health worker; adaptations to public health nursing. (3
cr; prereq #) Kroska
- 175A. **Foundations of Public Health Nursing I.** Physical, psychosocial growth and devel-
opment of early childhood; application of theory and knowledge in nursery school
experience and nursing seminar. (4 cr; prereq #) E Anderson and associates
- 175B. **Foundations of Public Health Nursing II.** (Continuation of PubH 175A) Focus on
school-age child through adolescence; experience in social settings, neighborhood
centers. (4 cr; prereq 175A) E Anderson and associates
176. **Clinical Seminar: Public Health — Mental Health Nursing.** Focus on family devel-
opment and analysis of behavior and interactions; opportunity for increased compe-
tence through experience with families in a community agency. (4 cr; prereq 175A,
175B) E Anderson and associates
177. **Group Dynamics.** Practical application of social psychological concepts to analysis
of group behavior. (2 cr) Rosenberg
- 179A. **Long-Term Patient Care and Rehabilitation.** Problems associated with rehabilitation;
selected experiences correlated with seminars. (Cr ar; prereq #) E Anderson and as-
sociates
- 179B. **Long-Term Patient Care and Rehabilitation.** Independent study. Exploration of a
comprehensive multidiscipline approach in the continuity of care for long-term pa-
tients. (Cr ar; prereq 179A) E Anderson
- 179C. **Field Work: Physical Therapy in Community Agencies.** Supervised experience in
local public health agencies. Includes advisory service and planning in-service pro-
grams for nursing staff; selected experiences in county and state health departments.
(Cr ar; prereq 179B) E Anderson
180. **Introduction to Biometry.** Variation; frequency distribution; probability; estimation;
significance tests; binomial, normal, Poisson distributions; serial dilutions, most
probable number. (6 cr; prereq environmental health students only, others #) Kjelsberg

- 181A. Foundations in Public Health Education Practice.** Role and function of health education specialist; relationship to other public health disciplines; overview of public health and related fields; introduction to health education principles and methods. (3 cr; prereq #) Craig
- 181B. Principles and Methods of Health Education Planning.** Nature and role of the planning process in health education; elements of comprehensive educational planning. (3 cr; prereq 181A) Craig
- 181C. Communication Process in Health Education.** Communication theory and process; application of communication models in planned community health education efforts; case studies in communication. (3 cr; prereq 181A, 181B) Craig
- 181D. Principles and Methods in Public Health Education — Practicum in Program Evaluation.** Determining, selecting, and applying criteria for evaluating health education methods; measurement of progress; evaluation of public health programs. (3 cr; prereq 181C) Craig
- 181E. Principles and Methods in Public Health Education — Organization and Administration in Health Education.** Methods and procedures in organizing and administering health education programs and services; consultation process in health education. (3 cr; prereq 181D) Craig
- 182. Philosophy and Concepts of Preventive Dentistry.** 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. (3 cr; prereq #) Meskin
- 183. Seminar: Dental Health Literature.** Current review of literature pertinent to dental public health, critical examination for design, content, and validity of conclusions. (Cr ar; prereq #) Meskin and staff
- 184. Dental Health Programs.** 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. (Cr ar; prereq #) Meskin
- 185. Air Analysis.** Laboratory and field exercises including air flow measurement, calibration of instruments, analysis of gases, stack sampling, dust counting and sizing, and industrial plant visits. (3 cr; prereq 152 or 155, #) Paulus
- 186. Problems of Air Pollution Control.** Special supervised studies involving laboratory and field investigation procedures; pertinent literature review. (Cr ar; prereq 155, #) Paulus
- 187A, B, C, D, E. Community Health Education Laboratory.** Practical experience in community agencies and organizations; background studies in specific neighborhood areas; supervised health education practice; action planning for health education. (Cr ar; prereq ¶181A, B, C, D, or E) Craig
- 188. Comparative Medicine and Public Health.** Survey of 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. (2 cr; prereq 100A and #) Diesch
- 189. Field Work in Public Health Nutrition.** Placement in an approved agency with opportunity for experience in nutritional aspects of public health programs. (Cr ar; prereq #) Stief and associates
- 190. Community Health Education Practice.** Approximately 10 weeks of supervised community health education experience. I and II summer terms only. (5 cr each term; prereq 181, 187 sequences and #) Craig
- 191.* Applied Human Nutrition.** Food composition and standards of nutrient requirements. Methods in dietary and nutritional status surveys; application of nutrition to public health programs related to specific diseases and population groups. (3 cr; prereq #) J Anderson, Grande, Stief
- 193. Group Process in Community Health Education.** Group methodology in problem solving; principles, concepts, and process of group dynamics as a method to community health education. (2 cr; prereq 181A or 125 and #) Craig

Fields of Instruction

194. **Health Education Preparation of Health and Allied Personnel.** 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. (2 cr; prereq ¶181D and §) Craig
195. **Public Health Aspects of Cardiovascular Disease.** Etiology, incidence, problems of control, and relationship to mode of life. (3 cr; prereq §) Keys, Grande, and staff
- 196.* **Seminar: Public Health Nutrition.** (Cr ar; prereq §) Stief
198. **Health Education and Contemporary Health Care Systems.** 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, injury control. (2 cr; prereq ¶181D and §) Craig
200. **Research.** Opportunities will be offered by the School of Public Health and by various cooperating organizations for qualified students to pursue research work. (Cr ar)
210. **Seminar: Public Health.** (Cr ar)
- 212.* **Seminar: Environmental Health.** (Cr ar; prereq §) Olson
213. **Seminar: Epidemiology.** (Cr ar; prereq §) Schuman
214. **Health of School Age Child.** Review of major health problems among children of school age; methods of providing and evaluating school health services. (2 cr; prereq 107 or §) Bridge
215. **Maternal and Child Health Problems.** Problems in administration of health programs for infants, preschool and school age children, handicapped children, and women of childbearing age. (3 cr; prereq 107 and §) Bridge
221. **Seminar: Long-Term Patient Care and Rehabilitation.** Development of and exploration of project relative to multidisciplinary action affecting patient care; review of current research findings. (Cr ar; prereq 179 or §) E Anderson and associates
222. **Seminar: School Nursing and Related Field Practice.** Exploration of nursing in the school setting; role relationships; review of current research. (Cr ar; prereq §) Fredlund
224. **Seminar: Public Health Nursing Within the Curriculum.** Course objectives; organization; opportunity to explore problems in development of plans for teaching public health nursing. (Cr ar; prereq §) Kroska
225. **Practicum in Teaching Public Health Nursing.** Planning for and evaluation of instructions; selected field experiences and seminars. (Cr ar; prereq §)
- 226A. **Clinical Seminar: Public Health Nursing—Mental Health.** Opportunity for increasing competence in use of behavioral and mental health concepts and use of nurse-patient relationship. Seminar analysis concurrent with public health nursing experience. (Cr ar; prereq 175, 176) Sparrow
- 226B-C. **Clinical Seminar: Concepts of Behavior in Illness.** Etiology of physical and mental illness, and current treatment. Opportunity for experience with patients in hospital and community agencies. (Cr ar; prereq 226A, §) Sparrow and associates
230. **Field Observations of Selected Public Health Practices.** (Cr ar; prereq §) Bond, Stauffer
- 231.* **Ground Water Development.** Ground water exploration through well design and construction. Special reference to public health problems. (Cr ar; prereq grad engr and §) Bond, Singer, staff, visiting lecturers
232. **Field Work in Ground Water Development.** Construction of wells, field tests, and public health problems. (Cr ar; prereq grad engr, 231) Bond, Singer, staff, visiting lecturers

233. **Water Quality Investigation and Research Techniques.** Field techniques and special research methods for establishing base lines; recognition and appraisal of advancing eutrophication. (6 cr; prereq §) Olson, Odlaug
234. **Water Quality Research.** Design and implementation of independent, short-term research activity. Literature review, statistical design and data processing. (6 cr; prereq §) Olson, Odlaug
- 238.° **Radiation Dosimetry.** Radiant energy absorption in liquids, gases, and solids; absorption in biological systems. (3 cr; prereq MeAg 127, Phys 110, PubH 147 or §) Barber
- 238A. **Radiation Dosimetry Laboratory.** Laboratory exercises involving principles discussed in PubH 238. (1 cr; prereq ¶238) Barber
- 241.° **Epidemiology of Noncommunicable Diseases.** Application of basic epidemiological principles to noncommunicable diseases and to trauma; selected disease examples. (3 cr; prereq 104) Schuman
- 261-262. **Alternative Patterns for Meeting Health Care Needs.** Future role of hospitals and related health services in light of patient needs and community services. (3 cr per qtr; prereq §) Litman, Stephan, and staff
263. **Advanced Statistical Methods in Health Care Research.** Survey and analysis of the application of nonparametric statistics to health care research. (3 cr; prereq 110 or §) Weckwerth
264. **Seminar: Comparative Health Care Systems.** Reading, discussion, guest lecturers on relations between health services and other social institutions in different societies. (3 cr; prereq §) Litman
265. **Seminar: Research Studies on Health Services.** Appraisal of design, instruments, field work procedures, and findings of contemporary studies. (3 cr; prereq §) Litman, Weckwerth, and staff
266. **Hospital Administration Topics.** Independent study under tutorial guidance on selected problems, current issues. (Cr ar; prereq §) Stephan, Weckwerth
267. **Health and Human Behavior.** Social ecology of health; social and personal components of illness; health and the community; social and cultural aspects of health care services. (3 cr; prereq §; not offered 1970-71)
269. **Political Aspects of Health Services.** Analysis of interrelationships between government, politics, and health services; political and social bases of health legislation and community decision making in provision and modification of health services. (3 cr; prereq §; offered winter 1970-71 and alt yrs) Litman
273. **Contemporary Problems of Hospital and Related Health Services.** Current concepts, problems, principles, and future developments in hospital and related health services. (Cr ar; prereq §) Dornblaser, Stephan, Weckwerth
280. **Orientation to Supervision and Administration in Public Health Nursing.** Application of principles; relationship of structure and philosophy of agency to supervisory role. (3 cr; prereq §) E Anderson
281. **Problems in Supervision and Administration in Public Health Nursing.** Analysis of selected aspects of administrative and supervisory process. (3 cr; prereq 280) E Anderson
282. **Practicum in Supervision or Administration in Public Health Nursing.** Experience in selected aspects of supervision or administration in local agencies under faculty guidance. (Cr ar; prereq 281) E Anderson
283. **Seminar: Consultation.** Opportunity for selected public health students to deepen understanding of the process involved in consultation. (2 cr; prereq §)
285. **Culture and Public Health II.** Culture patterns and culture change. The dynamics of change and their implications for the health worker in developing and advanced societies. (3 cr; prereq §) Kroska

RADIOLOGY (Rad)

OFFERED AT MINNEAPOLIS

Harold O. Peterson, M.D., *Professor and Head*

DIVISION OF ROENTGEN DIAGNOSIS

Associate Professor

Eugene Gedgudas, M.D., *director*
Kurt Amplatz, M.D.
Stephen A. Kieffer, M.D.

Assistant Professor

Gail Wilhelm Haut, M.D.
J. Paul Leonard, M.D.
Paul Neiberger, M.D.
Mario Pliego, M.D.
Shih Hao Tsai, M.D.
Justin J. Wolfson, M.D.

Instructor

Lawrence Harvey A. Gold, M.D.

DIVISION OF NUCLEAR MEDICINE

Professor

Merle K. Loken, M.D., Ph.D., *director*

Assistant Professor

Norbert S. Domek, Ph.D.

DIVISION OF RADIATION THERAPY

Associate Professor

Komanduri K. N. Charyulu, M.D.,
codirector
Yosh Maruyama, M.D., *codirector*

Assistant Professor

Hans Kuisk, M.D.
Vaughn C. Moore, Ph.D.

Instructor

Virgil T. Fallon, M.D.
Faiz M. Khan, Ph.D.
Anam Sudarsanam, M.D.

Graduates of class A schools who have completed at least 1 year of satisfactory internship in a recognized hospital are eligible for appointment as medical fellow specialists with stipend in radiology. 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. Sufficient time is spent on application of roentgen rays, radium, cobalt 60 teletherapy, beta rays, and radioisotopes to give a thorough working knowledge in this field. Appropriate periods of time are devoted to the various divisions of roentgen diagnosis, including special procedures.

Medical fellows may assist in the teaching of undergraduate students and may teach independently in elective courses. A certain amount of investigation and research should be carried out during the course of the program.

The following institutions are used for practical training in the field of radiology 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 together offer an unusual clinical material.

There is, in addition, Variety Club Heart Hospital, which is connected directly with University Hospitals and 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 study of all types of tumors both from the diagnostic and therapeutic standpoints. It is fully equipped with roentgen therapy machines, two cobalt 60 teletherapy units, 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 therapy 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 there is 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, and Spanish.

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 meet qualifications for the Ph.D. degree. In the latter case a minimum period of 4 years 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.

Fields of Instruction

Diagnostic Roentgenology

- 102f,w,s (0-120). X-Ray Conference. 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. Staff
- 111f,w,s,su (0-121). Medical Roentgenologic Conference. Staff
- 124f,w,s,su (0-122). Pediatric Roentgenologic Conference. Staff
- 135f,w,s,su (0-123). Surgical Roentgenologic Conference. Staff
- 163f,w,s,su (0-124). Neurosurgical-Roentgenologic Conference. Staff
- 200f,w,s,su (8-150). Research in Roentgenology. Problems in roentgen diagnosis. (Cr and hrs ar) Staff
- 201f,w,s (8-110). Neuroradiology. Roentgen diagnostic procedures and roentgen findings in study of the head, including diseases of the skull, orbits, intracranial conditions, and in study of the spine and spinal canal. (2 cr per qtr; offered alt yrs) Staff
- 202f,w,s,su (0-125). Cardiovascular Roentgenologic Conference. Staff
- 209f,w,s,su (8-100). Gastrointestinal Roentgenology. In-service training on roentgenological evaluation of the gastrointestinal system. (Cr and hrs ar) Staff
- 209f,w,s,su (8-101). Urologic Roentgenology. In-service training on roentgenological evaluation of the genitourinary system. (Cr and hrs ar) Staff
- 209f,w,s,su (8-102). Neurological Roentgenology. In-service training on roentgenological evaluation of the central nervous system. (Cr and hrs ar) Staff
- 209f,w,s,su (8-103). Cardiovascular Roentgenology. In-service training on roentgenological evaluation of the cardiovascular system. (Cr and hrs ar) Staff
- 209f,w,s,su (8-104). Pediatric Roentgenology. In-service training on roentgenological evaluation of infants and children. (Cr and hrs ar) Staff
- 209f,w,s,su (8-105). Pulmonary Roentgenology. In-service training on roentgenological evaluation of the pulmonary system. (Cr and hrs ar) Staff
- 217f,w,s (0-126). Roentgenologic Conference on Chest Diseases. Staff
- 238f,w,s,su (0-127). Roentgen-Surgical Pathology Conference. Staff
- (5-140)f,w,s,su. Special Problems in Roentgenology. (Cr ar) Staff

Nuclear Medicine

- 104f,w,s (8-210). Fundamentals of Nuclear Medicine. Lectures and demonstrations on nuclear instrumentation and applications of radioisotopes in medicine. (1 cr per qtr; prereq 1st yr residents) Staff
- 212f,w,s,su (8-250). Research in Nuclear Medicine. (Cr ar) Staff
- 236f,w,s,su (0-220). Nuclear Medicine Conference. Weekly presentations of informative nuclear medicine cases seen in University and affiliated hospitals.
- (5-240)f,w,s,su. Special Problems in Nuclear Medicine. (Cr ar) Staff
- (8-200)f,w,s,su. Nuclear Medicine. In-service training in the uses of radioisotopes in the diagnosis and treatment of disease. (Cr ar) Staff

Radiation Therapy

- 103f,w,s (8-310). Fundamentals of Radiation Therapy. Lectures on physical and clinical aspects of radiation therapy. Techniques of radiation therapy including radium and other isotopic implants will be discussed. (1 cr per qtr) Staff

- 204f,w,s (0-321). Tumor Clinic Conference. Staff
- 205f,w,s,su (8-350). Research in Radiation Therapy. (Cr ar) Staff
- 240f,w,s (0-320). Radiation Therapy Conference. Weekly presentations of informative cases treated in radiation therapy at the University and affiliated hospitals. Staff
- (5-340)f,w,s. Special Problems in Radiation Therapy. (Cr ar) Staff
- (8-300)f,w,s,su. Radiation Therapy. In-service training in the treatment and management of patients with malignant disease. (Cr ar) Staff

Radiation Biology

- 205f,w,s,su (5-450). Research in Radiation Biology. (Cr ar)
- 212f,w,s,su (8-410). Seminar: Radiation Biology. Approaches to problems in radiation biophysics. Recent advances reviewed. (1 cr per qtr; prereq 2) Staff
- (5-440)f,w,s,su. Special Problems in Radiation Biology. (Cr ar)

Radiological Physics

- 103f,w,s (5-510). Basic Principles of Radiological Physics. Lectures and demonstrations of basic principles in radiology. (1 cr per qtr; offered alt yrs) Staff
- 170f (5-770). Radiological Physics. Production and properties of ionizing radiations and their interactions with matter. Principles of radiation dosimetry. (3 cr) Staff
- 171w (5-771). Medical Nuclear Physics. Consideration of natural and induced radioactivity. Nuclear instrumentation and uses of radioactive materials as tracer elements. (3 cr per qtr) Staff
- 172s (5-772). Radiation Biology. Consideration of basic interactions of ionizing radiations with biological systems. (3 cr per qtr) Staff
- 205f,w,s,su (8-550). Research in Radiological Physics. (Cr ar) Staff
- 210f,w,s (5-511). Roentgen Technique. Theory and practical application of principles of roentgen technique including the study of X-ray machines and X-ray tubes, exposure, technique, and darkroom work. (1 cr per qtr; offered alt yrs) Staff
- 211f,w,s,su (5-512). Dosimetry of Internal and External Radiation Emitters. Basic principles of radiation dosimetry discussed in detail; clinical applications considered. (1 cr per qtr) Staff
- (5-540)f,w,s,su. Special Problems in Radiological Physics. (Cr ar) Staff

OFFERED AT ROCHESTER

Professor

John R. Hodgson, M.D., *head, Diagnostic Roentgenology*
C. Allen Good, M.D., M.S.
David G. Pugh, M.D.

Malcolm Y. Colby, Jr., M.D., M.S.
George D. Davis, M.D., M.S.
Paul W. Scanlon, M.D., M.S.
Martin Van Herik, M.D., M.S.
David M. Witten, M.D., M.S.

Associate Professor

Donald S. Childs, Jr., M.D., M.S., *head, Therapeutic Radiology*
Colin B. Holman, M.D., M.S.
Owings W. Kincaid, M.D., M.S.

Instructor

Franz J. Hallermann, M.D., Ph.D.
Margaret A. Holbrook, M.D.
Robert E. Lee, M.D., M.S.
Walter E. Miller, M.D., M.S.
David F. Reese, M.D., M.S.
James R. Stewart, M.D., M.S.

Assistant Professor

Hillier L. Baker, Jr., M.D., M.S.
Harley C. Carlson, M.D., Ph.D.

Fields of Instruction

The sections of diagnostic and therapeutic radiology at the Mayo Clinic are well arranged and equipped for examination and treatment of large numbers of clinic and hospital patients. Approximately 330,000 diagnostic examinations and 30,000 X-ray, radium, and isotope treatments are carried out from year to year in the clinic and its affiliated hospitals. In addition to these clinical facilities, adequate space has been set aside in the Radiology Department for conference, library, and study facilities. The Mayo Clinic library and the research facilities of the pathology, physiology, and biophysics laboratories are readily available to graduate students working in the field of radiology.

Approximately 36 fellowships in radiology are offered in the Mayo Graduate School of Medicine, 12 appointments being made each year. Training may begin in July or October and, under 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, X-ray therapy, radium therapy, the diagnostic and therapeutic applications of isotopes, radiobiology, and in the basic field of pathology. Numerous departmental and interdepartmental conferences and seminars are held each week. In addition to the 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 on completion of 3¼ years' training become candidates for the degree of M.S. or Ph.D. in radiology. During the final year, fellows are eligible for appointments as chief resident associates in either diagnostic or therapeutic radiology with increased responsibilities in film interpretation and treatment of patients. Additional training and experience beyond the required 3 years may be available in some instances.

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 — This department offers work leading to the Ph.D. degree.

M 251f,w (8-851). Radiologic Physics. An extensive series of lectures and demonstrations on radiologic physics and its applications in diagnostic and therapeutic radiology. Orvis

M 252f,w,s,su (8-852). Diagnostic Radiology. At least 21 months are spent in diagnostic radiology. Additional time may be arranged. For 3 months, each afternoon is devoted to study of diagnostic X-ray equipment and to practical experience in roentgenologic technique. Through observation, precept, and progressive participation in film interpretation and fluoroscopy, the student becomes thoroughly familiar with the entire field of radiologic diagnosis. He observes a wide variety of special techniques in neuroradiology, cardiovascular radiology, pulmonary diseases, gastrointestinal radiology, pediatric radiology, urologic radiology, gynecologic radiology, etc. Baker, Carlson, Davis, Good, Hallerman, Hodgson, Holman, Kincaid, Pugh, Reese, Stewart, Witten

M 253f,w,s,su (8-853). Therapeutic Radiology. At least 1 year is spent in therapeutic radiology, observing and participating in treatment of a wide variety of benign and

malignant diseases which are amenable to treatment by X rays, radium, or radioactive isotopes. The student also becomes familiar with various diagnostic techniques employing radioactive isotopes. Childs, Colby, Lee, Scanlon, Van Herik

Pathology. (See Department of Pathology) Assignment to pathology for 3 months is mandatory. 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.
Richard C. Lillehei, M.D., Ph.D.
Charles F. McKhann, M.D.
John F. Perry, M.D., Ph.D.
Yoshio Sako, M.D., Ph.D.
Richard L. Varco, M.D., Ph.D.

Clinical Professor

William C. Bernstein, M.D.
Lyle J. Hay, M.D., Ph.D.
William D. Kelly, M.D., Ph.D.
Arnold J. Kremen, M.D., Ph.D.
N. Logan Leven, M.D., Ph.D.
Charles E. Rea, M.D., Ph.D.

Associate Professor

Eugene F. Bernstein, M.D., Ph.D.
Aldo R. Castaneda, M.D., Ph.D.
John P. Delaney, M.D., Ph.D.
Theodor B. Grage, M.D., Ph.D.
John J. Haglin, M.D., Ph.D.
Arnold S. Leonard, M.D., Ph.D.

Donald G. McQuarrie, 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.
Davitt A. Felder, M.D., Ph.D.
Howard Frykman, M.D., M.S.
N. Kenneth Jensen, M.D.
Bernard G. Lannin, M.D., Ph.D.
Earl G. Yonehiro, M.D., Ph.D.

Assistant Professor

Henry Buchwald, M.D., Ph.D.
Victor Gilbertsen, M.D., M.S.
Robert L. Goodale, M.D., Ph.D.
Gary W. Lyons, M.D., Ph.D.
Albert Mowlem, M.D., Ph.D.
Demetre M. Nicoloff, M.D., Ph.D.
Richard L. Simmons, M.D.
Henry Sosin, M.D., Ph.D.

Clinical Assistant Professor

Stanley M. Goldberg, M.D.
Samuel W. Hunter, M.D., M.S.

It is the intention of the Residency Program in General Surgery at the University of Minnesota to provide excellent training both on the clinical wards and in the laboratory with the ultimate aim of training men both for the practice of surgery and for positions in the academic surgical world. Toward this goal, a merger of the residency training programs of the University of Minnesota Hospitals and the Minneapolis Veterans Administration Hospital was effected on July 1, 1968. In addition, the program offers rotations at the Hennepin County General Hospital in Minneapolis, the St. Paul-Ramsey County Hospital in St. Paul, the Mount Sinai Hospital in Minneapolis, the Methodist Hospital in Minneapolis, the Anoka State Hospital, and the Stillwater Prison Hospital. Each appointment is for a year, and reappointment is contingent upon superior performance.

Fields of Instruction

All residents in general surgery begin their training with 2 years of junior assistant residency on the clinical services. In the second year, the resident rotates on several of the specialty services, including vascular surgery, plastic and head and neck surgery, cardiothoracic surgery, proctology, and other surgical specialty rotations. In general, the resident is able to select the specialty rotations he desires from this group, and approximately three of the four second-year rotations are specialty services. The remaining second-year time is on the general surgical services.

In the third year all residents enter the experimental laboratory. Trainees interested in clinical practice spend this year in an experimental surgical laboratory. They then proceed to the associate resident level. The associate has at least 6 months of intensive surgical operative experience under supervision. The remainder of the associate resident year consists of clinical rotations on such services as cancer chemotherapy, medical-surgical gastroenterology, and pathology. In the fifth and final year of the clinical practice program, the resident is a senior surgical resident for 12 months on the General Surgical Services of the University and Veterans Administration Hospitals.

In the academic training program, the third year is also in the laboratory. However, the academic trainee spends approximately 3 years in the laboratory, and begins his laboratory experience in the basic science of his choice, where he may pursue a graduate degree. He then proceeds to an experimental surgical laboratory in the area of his choice. Following completion of his laboratory experience, the academic trainee then progresses through the associate residency and senior residency years in the same pattern as the clinical practice trainee. The complete academic training program takes approximately 7 years.

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.) Opportunity for special investigative and research work may be found in these departments. The proximity of the medical buildings and arrangements of courses afford opportunity for 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 operative surgery, and similar opportunities are available in some of the surgical specialties, such as proctology, neurosurgery, orthopedics, urology, and thoracic and cardiovascular surgery.

First-year fellows are chosen yearly, largely from our own surgical intern group. The fellow aids the surgical staff in diagnosis and in the preoperative and postoperative care of patients. He helps to direct and supervise the work of the interns, and after his first year assists in the bedside teaching of the surgical clerks. He acts as first assistant in operations performed by the gen-

eral surgical staff. As soon as he proves himself capable, the more simple major operations are delegated to him to perform, with a staff surgeon acting as first assistant. Later he is permitted to operate under the supervision of the surgeon, and finally, when he has demonstrated his ability, he operates independently. Increasingly difficult cases are assigned as his ability warrants. Supervision is always given until the staff surgeon is satisfied concerning the fellow's ability to operate independently.

Medical School surgical fellowships are offered also at Hennepin County General Hospital (10), and St. Paul-Ramsey Hospital (12). The respective surgical staffs of the affiliated hospitals supervise the training of their surgical fellows. Arrangements can be made for rotation between the surgical services of the various affiliated hospitals and the service at the University of Minnesota Hospitals.

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, Japanese, Russian, Scandinavian.

Master's Degree — Offered only under Plan A.

Doctor's Degree — Work leading to the Ph.D. degree is offered in this department.

The following courses are all given at all of the participating hospitals unless otherwise indicated. Registrants taking fellowships at Hennepin County General Hospital or St. Paul-Ramsey Hospital should indicate which of these sections they are in by adding after the course number either the notation "Section C" for Hennepin County General Hospital, or "Section A" for St. Paul-Ramsey Hospital.

- 200 (8-200). Outpatient Clinic in Surgery.** Student is required to assist in the outpatient surgical clinic, and in this connection studies the diagnosis and treatment of selected cases. (1 cr per qtr) Staff
- 203 (8-203). Proctoscopy and Sigmoidoscopy (Hospital).** Treatment and diagnosis of pathological conditions found in the lower bowel, including minor surgical operations. (1 cr per qtr) Bernstein and staff
- 204 (8-204). Tumor Clinic.** Combined clinical and pathological consideration of tumors. Insofar as available material permits, a systematic presentation of manifestations and effects of malignant tumors which come in the province of general surgery and its divisions will be made. (1 cr per qtr) Staff
- 205 (8-205). Surgical Diagnosis.** The graduate student assists in the practical instruction of the clinical clerks and interns and makes a special study of problems in surgical diagnosis on patients in the Outpatient Department as well as in the wards. (1 cr per qtr) Staff
- 208 (8-208). Surgical Problems and Management.** The graduate student acts as house surgeon and in connection with the service is required to study the patients, preparing them for clinics and observing them after operations. (1 cr per qtr) Staff
- 211 (8-211). Operative Surgery.** The surgical fellow acts as first assistant at all operations by the teaching surgical staff. When properly qualified, the fellow is permitted to operate, beginning with simpler surgical procedures. (1 cr per qtr) Staff
- 214 (8-214). Surgical Ward Conference.** A weekly exercise in which cases offering interesting problems are presented by the student. (1 cr per qtr) Staff

Fields of Instruction

- 215 (8-215). Surgical-Roentgenological Conference.** A weekly exercise in which films of all surgical patients presenting interesting roentgen findings are reviewed. Staffs of the Departments of Radiology and Surgery. (1 cr per qtr) Delaney
- 216 (8-216). Surgical Research.** Properly qualified students may undertake original investigation of problems in either experimental or clinical surgery. (Cr ar; may be taken 1 or more qtrs) Staff
- 221 (8-221). Surgery Research Seminar.** Current research problems are presented for interdepartmental discussion and evaluation. (1 cr per qtr) Sosin
- 222 (8-222). Surgery Complications Conference.** Report of surgical procedures performed including postoperative course. (1 cr per qtr) Grage
- 285-286-287 (8-785/8-786/8-787). Biomedical-Engineering Seminar.** 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. (Cr ar [1-3 per qtr]) E Bernstein, Blackshear
- 290 (8-290). Transplantation and Bone Marrow Conference.** Current clinical and research problems are presented for interdepartmental discussion and evaluation. (1 cr per qtr) Pediatric and Surgery staffs

OFFERED AT ROCHESTER

Professor

Oliver H. Beahrs, M.D., M.S.
B. Marden Black, M.D., M.S.
O. Theron Clagett, M.D., M.S.
F. Henry Ellis, Jr., M.D., Ph.D.
Deward O. Ferris, M.D., C.M., M.S.
(clinical)
Edward S. Judd, M.D., M.S.
Joseph H. Pratt, M.D., M.S. (clinical)

Associate Professor

Philip E. Bernatz, M.D., M.S. (clinical)
Hugh B. Lynn, M.D. (clinical)
Dwight C. McGoan, M.D.
William H. ReMine, M.D., M.S.

Richard E. Symmonds, M.D., M.S.
Robert B. Wallace, M.D., *chairman*
John S. Welch, M.D., M.S. (clinical)

Assistant Professor

Martin A. Adson, M.D., M.S.
Gordon K. Danielson, M.D.
Keith A. Kelly, M.D., M.S.
Karl A. Lofgren, M.D., M.S.
Donald C. McIlrath, M.D., M.S.
Thomas T. Myers, M.D.
W. Spencer Payne, M.D., M.S.

Instructor

Eric P. Lofgren, 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 fellowships 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, 2 quarters of surgical pathology, and 11 or 12 quarters of general surgery at junior and senior levels of responsibility.

There is opportunity for alternate or additional assignments to include surgical research, physiology, or experimental pathology. Special fellowship appointments of 1 or 2 years are made in certain cases for advanced study of cardiopulmonary or gastrointestinal disease. A limited number of 1- to 3-year appointments is available to provide basic surgical experiences prior to surgical specialty training.

Senior fellows in operative surgery who are best qualified 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 the Rochester Methodist Hospital and St. Marys Hospital with a total of 600 surgical beds. These patients, together with the outpatient 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 in this department.

M 251f,w,s,su (8-851). Peripheral Vein Surgery. Treatment of complications, surgical and medical, and varicose veins. Staff

M 252f,w,s,su (8-852). Surgical Problems and Management (Junior Residents). Graduate students act as house surgeons. Required to study patients, prepare them for conferences, operative surgery, and participate in postoperative care. Formal conferences, seminars, and informal study in special areas of surgery. Staff

M 253f,w,s,su (8-853). Operative Surgery (Senior Residents). 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. Staff

M 254f,w,s,su (8-854). Operative Surgery. 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. Staff

Operative Surgery in Surgical Specialties. (See specific departments)

Surgical and Fresh Tissue Pathology. (See Department of Pathology)

Pathologic Anatomy. (See Department of Pathology)

Research on Problems in Physiology. (See Department of Physiology)

Research on Problems in Pathologic Anatomy. (See Department of Pathology)

Anatomy for General Surgeons. (See Department of Anatomy)

General Medical and Surgical Diagnosis. (See Department of Medicine)

Diagnosis in Relation to Obstetrics and Gynecology. (See Department of Obstetrics and Gynecology)

Medical Hospital Residence. (See Department of Medicine)

Special Anesthesia. (See Department of Anesthesiology)

Colon and Rectal Surgery/Proctology

OFFERED AT ROCHESTER

Professor

Raymond J. Jackman, M.D., M.S.

Associate Professor

John R. Hill, M.D., M.S. (clinical), *head*

Assistant Professor

Markham J. Anderson, Jr., M.D., M.S.
Robert J. Spencer, M.D.

Instructor

Clyde E. Culp, M.D.

Fields of Instruction

Graduate training in colon and rectal surgery/proctology is carried out in conjunction with the Department of Surgery. The fellowship permits the candidate to complete the requirements for the specialties of surgery and colon and rectal surgery established by the specialty boards.

The graduate program requires a minimum of 5 years following internship. 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. It includes at least 6 months in a minor field. Four quarters of the 5-year period are in the field of anorectal surgery and diagnostic proctoscopy.

Master's Degree — Offered only under Plan A.

M 251f,w,s,su (8-851). Colon and Rectal Surgery. Hill, McIlrath, and staff

M 252f,w,s,su (8-852). Surgical Problems and Management (Junior Residents). Graduate students act as house surgeons. Required to study patients, prepare them for conferences, operative surgery, and participate in postoperative care. Formal conferences, seminars, and informal study in special areas of general surgery. Judd, Black, Behrs, ReMine, Adson, McIlrath, Kelly

M 253f,w,s,su (8-853). Operative Surgery (Senior Residents). 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. Judd, Black, Behrs, ReMine, Adson, McIlrath, Kelly

General Surgical Diagnosis. (See Department of Surgery)

Medical Hospital Residence. (See Department of Medicine)

Surgical and Fresh Tissue Pathology. (See Department of 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., *chairman*

Clinical Professor

Baxter A. Smith, Jr., M.D., M.S.

Associate Professor

Colin Markland, M.B., Ch.B.

Assistant Professor

Clyde E. Blackard, M.D.
Alexander S. Cass, M.D.

Clinical Assistant Professor

Milton P. Reiser, M.D., M.S.

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 — This department offers work leading to the Ph.D. degree.

- 250 (8-250). Urological Surgery. (4 cr per qtr)
251 (8-251). Cystoscopy and Urological Diagnosis. (4 cr per qtr)
252 (8-252). Urological Conference. (4 cr per qtr)
253 (8-253). Research in Urology. (4 cr per qtr)
254 (8-254). Urological Seminar. (3 cr per qtr)
255 (8-255). Urological-Radiological Conference. (3 cr per qtr)
256 (8-256). Urological-Pathological Conference. (3 cr per qtr)

OFFERED AT ROCHESTER

Professor

Ormond S. Culp, M.D., *head*
Edward N. Cook, M.D., M.S.
James H. DeWeerd, M.D., M.S.
Laurence F. Greene, M.D., Ph.D.

Associate Professor

Thomas L. Pool, M.D., M.S.
David C. Utz, M.D., M.S.

Assistant Professor

Panayotis P. Kelalis, M.D., M.S.

Instructor

Frank J. Leary

The Department of Urology at the Mayo Graduate School of Medicine seeks to provide excellent training for residents in all phases of clinical and experimental urology. The curriculum permits certification by the American Board of Urology, and trainees who have completed 1 year in basic sciences or clinical studies basic to urology or 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; those who wish to receive their basic training in the Mayo Graduate School of Medicine may do so, thus extending the period of training to 4 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 and progresses to first assistant and in some instances to chief resident associate. In the latter capacities, he 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.

Teaching is provided in the clinic, at the bedside, and during ward walks. Conferences concerning interpretation of urologic roentgenograms are conducted twice daily, and urologic conferences are held daily. During the fall, winter, and spring quarters weekly seminars are presented both by the resident staff and by urologic consultants. 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 his training period, 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.

Fields of Instruction

Doctor's Degree — This department offers work leading to the Ph.D. degree.

M 251f,w,s,su (8-851). Urologic Diagnosis and Special Urologic Treatment. Cytoscopic 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. Staff

M 252f,w,s,su (8-852). Genitourinary Surgery Including Endoscopic and Open Procedures.

M 253f,w,s,su (8-853). General Surgery, Gynecological Surgery. (See these departments)
Staff

Necropsy Service. (See Department of Pathology)

Surgical and Fresh Tissue Pathology. (See Department of Pathology)

Fellows majoring in urology may also, if they wish, take work in anatomy, biochemistry, clinical pathology, physiology, and dermatology. For details, see these departments.

INDEX

	Page		Page
Academic Rank	7	Laboratory Equipment	2
Admission	3	Laboratory Medicine	53
Foreign Physicians	4	Language Requirement (<i>see</i> Foreign Language Proficiency)	7, 14
Anatomy	20	Libraries	2
Anesthesiology	22	Licensure	6
Application Procedures	4		
Foreign Physicians	4	Major Fields, Master's and Ph.D.	
Assistantships	3	Degrees	20
		Master's Degree	8
Biochemistry	25	Examinations	10
Biometry	29	Major	9
Biophysics	32, 101	Minor	9
		Residence	8
Cancellation of Courses	6	Summary of Requirements	11
Candidacy for Graduate Degree	7	Thesis	9
Child Psychiatry	106	(<i>see also</i> departmental requirements)	
Clinical Pathology	87	Mayo Graduate School of Medicine	
Clinical Psychology	107	(<i>see</i> departmental listings)	
Collateral Field Option (Ph.D.)	15	Medical-Surgical Nursing	
Colon and Rectal Surgery		(<i>see</i> Nursing)	70
(<i>see</i> Proctology)	125	Medical Technology	55
Commencement, Attendance at	11	Medicinal Chemistry	56
Continuous Registration (Ph.D. candidates)	14	Medicine, Internal	58
		Microbiology	63
Dentistry	34	Minor	9, 12
Dermatology	43		
		Neurology	66
Embryology (<i>see</i> Anatomy)	20	Neurosurgery	68
Environmental Health	45	Nursing	70
Epidemiology	47	Nutrition	72
Examinations	10, 16		
Language	7	Obstetrics and Gynecology	75
Master's Degree	10	Office of Scientific Personnel	
Ph.D. Degree	16	Survey Form	19
Physical	5	Ophthalmology	77
Report Forms	11, 19	Orthopedic Surgery	79
		Otolaryngology	82
Fees			
Credentials Examination	4	Pathology	84
Fellowships and Assistantships	3	Pediatrics	88
Fields of Instruction	20	Pharmaceutics	91
Final Oral Examination		Pharmacognosy	93
Master's Degree	10	Pharmacology	94
Ph.D. Degree	17	Ph.D. Degree	12
Foreign Language Proficiency	7, 14	Candidacy	14
(<i>see also</i> departmental requirements)		Final Oral Examination	17
Foreign Physicians, Special Notes	4	Major	12
		Minor	12
General Information	2	Preliminary Oral Examination	16
Grading System	3	Program of Study	13
		Registration by Mail	
History of Medicine	49	(Continuous Registration)	6, 14
Hospital and Health Care		Research Technique Option	15
Administration	50	Summary of Requirements	19
Hospital Pharmacy	53	Supporting Program of Study	12
		Thesis	17
Internal Medicine	58		

	Page		Page
Thesis Title	14	Residence	
Time Limit	14	Master's Degree	8
Written Examination	16	Ph.D. Degree	12
Physical Medicine and Rehabilitation ..	96	Rhinology	83
Physiological Chemistry		Summary of Requirements	
(see Biochemistry)	25	Master's Degree	11
Physiological Hygiene	99	Ph.D. Degree	19
Physiology	100, 101	Supporting Program of Study	12
Plastic Surgery	104	Surgery	121
Preliminary Oral Examination		Symbols and	
Master's Degree	10	Explanations	inside back cover
Ph.D. Degree	16	Thesis	
Proctology	125	Master's Degree	9
Psychiatry	105	Ph.D. Degree	17
Public Health	108	Time Limit (Ph.D. Degree)	14
Quarterly Progress Report	3	Tuition	3
Radiology	116	Urology	126
Registration	5	Written Examinations	
Back Registration	6	Master's Degree	10
By Mail (Ph.D. Candidates)	6	Ph.D. Degree	16
Requirements	6		
Research Technique Option (Ph.D.) ..	15		

SYMBOLS AND EXPLANATIONS

A course sequence separated by hyphens (121-122-123) must be taken *in the order listed* unless it is specifically stated that a student may enter any quarter.

When no departmental prefix precedes the number of a course listed as a prerequisite, that prerequisite course is in the same department as the course being described.

A prerequisite reading "5 cr" means 5 credits earned in courses offered by the same department as that offering the course being described.

Symbols — The following symbols are used throughout this bulletin and will carry no page footnotes:

° Courses through which it is possible for graduate students to prepare Plan B papers.

† To receive credit, all courses listed before dagger must be completed.

§ No credit is given if credit has been received for equivalent course listed after section mark.

¶ Means "concurrent registration in."

A sharp sign means "consent of instructor."

△ A triangle means "consent of the division, department, or school offering course."

x After a course number, means "course is offered more than 1 quarter."

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

Courses numbered from 100 to 199, which are taught by members of the graduate faculty, are open to both graduate and undergraduate students except in the School of Dentistry and a few departments of the Medical School. Those numbered 200 or above are for graduate students only.

Courses prefixed by the letter M indicate courses offered at the Mayo Graduate School of Medicine in Rochester.

New Course Numbering System — The University will change to a new numbering system in the fall of 1970. In this bulletin, the *present* system is used, with the new course numbers listed in parentheses in the course description section.



UNIVERSITY OF MINNESOTA

Board of Regents

The Honorable Lester A. Malkerson, Minneapolis, Chairman; The Honorable Marjorie J. Howard (Mrs. C. Edward), Excelsior, Vice Chairman; The Honorable Elmer L. Andersen, St. Paul; The Honorable Lyman A. Brink, Hallock; The Honorable Fred A. Cina, Aurora; The Honorable Daniel C. Gainey, Owatonna; The Honorable Albert V. Hartl, Fergus Falls; The Honorable Herb L. Huffington, M.D., Waterville; The Honorable Fred J. Hughes, St. Cloud; The Honorable George W. Rauenhorst, Olivia; The Honorable Neil C. Sherburne, Lakeland Township; The Honorable John A. Yngve, Plymouth.

Administrative Officers

Malcolm Moos, President
Donald K. Smith, Vice President, Administration
William G. Shepherd, Vice President, Academic Administration
Laurence R. Lunden, Vice President, Business Administration
Stanley J. Wenberg, Vice President for Educational Relationships and Development
Paul H. Cashman, Vice President for Student Affairs
Robert Edward Summers, Dean of Admissions and Records

Medical School Officers

Robert B. Howard, M.D., Ph.D., Dean, College of Medical Sciences
Robert A. Ulstrom, M.D., Associate Dean, College of Medical Sciences
Robert O. Mulhausen, M.D., Assistant Dean, College of Medical Sciences
Reynold A. Jensen, M.D., Director, Division of Special Educational Services
H. Mead Cavert, M.D., Ph.D., Associate Dean and Executive Officer, Medical School
Robert J. McCollister, M.D., Assistant Dean, Medical School
W. A. Sullivan, Jr., M.D., Assistant Dean, Medical School
John H. Westerman, M.H.A., Director, University Hospitals

Minnesota Medical Foundation

Eivind O. Hoff, Executive Director

Volume LXXII

Number 22

September 30, 1969

UNIVERSITY OF MINNESOTA BULLETIN

Published by the University of Minnesota, Office of Admissions and Records, 105 Morrill Hall, Minneapolis, Minnesota 55455, January through September inclusive. One issue in January, one issue in February, two issues in March, four issues in April, four issues in May, three issues in June, four issues in July, two issues in August, and one issue in September. Second class postage paid at Minneapolis, Minnesota. Send change of address notices and other communications to Office of Admissions and Records, Minneapolis, Minnesota 55455.

The contents of this bulletin and of other University bulletins, publications, or announcements are subject to change without notice.

Medical School

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 Medical School; since then there have been no other schools of medicine in Minnesota.

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, and the Children's Rehabilitation Center—called collectively 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 strengths 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 College of Medical Sciences is a major academic unit of the University of Minnesota and has administrative responsibility for the Medical School, the School of Nursing, the School of Public Health, and University Hospitals. The principal administrative officer of the college is the dean who is assisted in his duties related to the college and the Medical School by associate and assistant deans. The Schools of Nursing and of Public Health and the University Hospitals are administered by their respective directors and deans. The administrative center for the Medical School and for Medical Student Affairs is located

Medical School

in 1305 Mayo Memorial Building in the Health Sciences Center on the Minneapolis Campus, telephone 373-8091.

The Faculty of the School

The full-time faculty of the Medical School numbers approximately 500, of which approximately 180 are members of the Executive Faculty. 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 through 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 has as its function 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 University Hospitals and the associated Mayo Memorial Building. The other medical center units, each close to and connected with the complex, include 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.

Library facilities and services of the Bio-Medical Library are spaciouly housed on three floors of Diehl Hall 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 1,900 periodicals. There are in excess of 185,000 volumes in the library, almost all of which are shelved on open stacks. Photoduplication services 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 new 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 a comfortably appointed spacious new History of Medicine Library just above the main Bio-Medical Library area.

ADMISSION

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.

The physician has an increasing responsibility to understand and deal with the social, cultural, and psychological forces in the environment which may adversely affect his patients. Scientific background and training alone are not sufficient to meet this need and, therefore, studies in humanities and social and behavioral science 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 minimums in his 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. are encouraged to pursue their studies at advanced levels in preparation for entering Medical School. The following table lists *minimum* course requirements and credits.

MINIMUM REQUIREMENTS

	Approximate Semester Hours	Approximate Quarter Hours
General Biology or Zoology	7	10
Chemistry	15	22
General or inorganic, quantitative, and organic required		
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 (see below)

Medical School

The student is expected to add to the required credit hours indicated in various ways, depending on his own special interests, the requirements of his college, and the counsel of his college adviser. Students applying for a combined medical-graduate degree program or considering a career in academic medicine should proceed beyond the required preparatory courses in the sciences.

Medical School representatives in the Medical School office, 1305 Mayo Memorial Building are prepared to discuss premedical 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 from the Association of American Medical Colleges, 2530 Ridge Avenue, Evanston, Illinois 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 without 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

Application forms with detailed instructions for completing the forms may be obtained from the Office of Admissions and Records, University of Minnesota, Minneapolis, Minnesota 55455. These forms should be completed during the *year before* the student plans to enter the Medical School; they must be forwarded to the University after May 15, but before November 1. 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 the student will not have completed his undergraduate studies at the time of application. Two official copies of all college transcripts are required as part of the application. Additional official records of completed courses are to be forwarded as soon as the student's grades are available. Provisional acceptance may be granted depending on satisfactory completion of required courses or other college work in process at the time of 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 letters. Personal acquaintances, 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. The Medical School will independently request letters of reference directly from the high school and pre-medical advisory committee or major premedical faculty adviser of the applicant's primary college.

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 may be necessary. With 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—Premedical 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 October of each year. Those students planning to enter Medical School in September 1970 should plan to take the MCAT in May or October of 1969. 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, Psychological Corporation, 304 East 45th Street, New York, New York 10017.

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 December of the year before matriculation. Accepted candidates will be notified in writing in February of the year they plan to enter the first-year class and candidates have a period of 2 weeks in which to indicate their intention to matriculate. A deposit of \$25, which is applied on tuition fees, is required within 2 weeks of notification to hold the student's place in his class.

Foreign Students

While there is no firm rule against the admission of students trained 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 two 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.

Medical School

The Medical College Admission Test is required and 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 examinations.

Transfers

Medical students wishing to transfer to the University of Minnesota from other medical schools may be accepted only from medical schools in the United States and Canada and only after completion of the first 2 years of their medical education. Students must be in good standing and have the approval of the dean of the medical school which they are attending before transfer will be considered. Transfers from foreign medical schools will not be accepted. (See section on Foreign Students.) If a student has completed the first and second years of medical school in the United States, is in good standing, and has the consent of his dean, he should arrange for discussion of the transfer in the Medical School office. The student will be asked to make formal application including transcripts of premedical credits.

Special arrangements are in effect with the 2-year medical schools in North and South Dakota which offer training in preclinical or basic science subjects. Students of these schools should consult their dean and the University of Minnesota Medical School office for additional information.

Baccalaureate Degree Requirement

The Medical School and the University require all students to 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 to their own students after satisfactory completion of the first year of medical school and 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. 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 College of Medical Sciences.

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 College of Medical Sciences must meet these University requirements regardless of their

college or courses of undergraduate, premedical study. In general, completion of the courses and credits stated (see page 3) as minimum requirements for admission to the University of Minnesota Medical School will also meet the University-wide distribution requirement 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 this requirement. Additional and specific and detailed information is available in the Medical School office or in the *College of Liberal Arts Bulletin*.

FINANCIAL CONSIDERATIONS

Tuition and Fees

Medical School enrollment at the University of Minnesota Medical School is for 13 academic quarters and tuition is paid quarterly at the rate of \$228 per quarter for residents of Minnesota for the academic year 1969-70. Non-resident tuition is \$516 per quarter. An additional incidental fee of \$37 per quarter is required of both residents and nonresidents. Students do not pay tuition during the free quarters.

Books and supplies including a microscope and other necessary equipment are to be provided by the student.

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.

Student research fellowships are awarded for vacation or free time work within the Medical School. These fellowships enable a student to supplement 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. Part-time employment may be necessary for some students, though the student should be aware that his studies are a full-time obligation. Limited part-time work is available in some departmental research laboratories.

The Minnesota Medical Foundation

The Minnesota Medical Foundation is a nonprofit philanthropic arm of the Medical School, providing specialized services and supplementary financial support to the institution. It is located in 5416 Powell Hall and is under the supervision of Eivind O. Hoff, Jr., executive director. It has assets exceeding \$4,000,000.

The Minnesota Medical Foundation offers cash scholarships to approximately 65 medical students each year in competition based on scholastic achievement and financial need. Application periods are announced regularly. Scholarships of \$500 per year and larger are offered.

The Medical Foundation administers the *Herman M. Johnson Memorial Emergency Loan Fund*, offering interest-free loans of up to \$200 for 90-day periods to needy students. Some long-term interest-free loans are also available annually, in addition to financial counseling for students. Summer fellowships

Financial Considerations

are offered to students interested in medical research, with stipends usually set at \$1,200.

The Medical Foundation is also publisher of the *University of Minnesota Medical Bulletin*, monthly journal of the medical institutions. The foundation receives and distributes gifts and grants for various purposes at the Medical School, and is supported itself by such gifts from its 3,000 members. The foundation publishes *Handbook of Financial Aids for Medical Students at the University of Minnesota*, a valuable information resource which is useful to prospective applicants and medical students.

THE COURSE OF STUDY

The Medical School aims to provide the facilities and faculty for instruction of students in the course of medicine. The primary goal of undergraduate medical education is to produce good physicians. The characteristic of a good physician is the possession of sound training in quantitative biology as it applies to man which will serve as the basis for continuing professional and scholarly growth. Much depends on individual student learning rather than teaching so that a climate of independence, responsibility, and individual initiative is encouraged.

In common with essentially all American medical schools, the University of Minnesota offers a comprehensive course of study in basic medical sciences during the first and second years of the curriculum. In the first year the student has an opportunity to study, in depth, the structure and function of the human organism by way of gross and microscopic anatomy, physiology, and physiological chemistry. Special courses acquaint the student with the structure and function of the central nervous system and with embryological development. The laboratory method of instruction is emphasized. Also, the first-year students begin their studies of the emotional, social, and psychological development of the individual.

During the second year, medical students encounter the changes which occur in the body as a result of disease processes. In microbiology and pharmacology the student is introduced to the study of chemical and biological changes which alter or modify physiological and anatomical functions. The concept of therapeutic alterations in the body is introduced into the student's knowledge and thought about disease states. Instruction in psychological adaptation continues through the second year along with study in the broad fields of public health and preventive medicine with the result that the student enlarges his knowledge of man as a social being.

Instruction in the techniques of physical and laboratory diagnosis begins in the second year of the medical student's career with examination of patients and discussion of selected clinical problems in medicine at the University Hospitals or at one of the affiliated hospitals. The emphasis is on the pathophysiology of disease, on the production of significant symptoms and signs, and on the detection of biochemical alterations by clinical laboratory methods.

Throughout these first 2 years the emphasis is on broad and detailed understanding of the human being as a biological individual. Regardless of the student's ultimate choice of a general or specialized medical career, sound and thorough knowledge of the basic medical sciences is required. The University of Minnesota endeavors to provide such a background for all medical students so that, regardless of choice from the extraordinarily wide fields open to him, the graduate physician will have an adequate background in the fundamentals of medical science.

During the succeeding 2 years the focus of the student's program shifts from the laboratory to the patient. Bedside instruction on hospital wards and in the clinics enlarges the student's experience and knowledge of the problems of the sick. He learns how to recognize and treat illness and learns about the many ways to help patients seeking relief from symptoms of disease and dis-

The Course of Study

comfort. Certain regular lecture-demonstrations are available to the student but the chief learning experience comes from study of patients assigned. Scheduled time is arranged to facilitate the individual instruction which is a necessary part of this kind of learning experience.

The examinations given to the various classes in Medical School are administered by the various departments and follow no set schedule. There is the usual midquarter and end-of-quarter concentration of tests. 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 S (satisfactory) or I (incomplete) and appear as such on the official University transcript with a notation as to overall yearly class ranking according to third of the class. Information as to relative performance in specific courses may be obtained from one of the deans in the Medical School office after completion of a quarter or at the end of the academic year. The student may be dismissed from Medical School work if in the opinion of the Faculty Committee on Student Scholastic Standing he has not performed academically at a satisfactory overall level or if there are other factors which, in the opinion of the committee, would be sufficiently unfavorable to permit an individual to be granted the M.D. degree.

In June, immediately following completion of the second academic year of the Medical School curriculum, the third-year student enters clinical studies on the hospital wards. Students may be assigned to the University Hospitals or to any of the major affiliated hospitals such as St. Paul-Ramsey, Hennepin County General, or Veterans. On these assignments the student participates in the diagnosis and treatment of patients as a member of the clinical team engaged in the treatment of patients.

The student is assigned to internal medicine during 1 quarter, to surgery in another quarter. During one 6-month period the student rotates through a sequence which includes pediatrics, obstetrics and gynecology, and psychiatry and neurology. Approximately 8 weeks are spent on each of these three services.

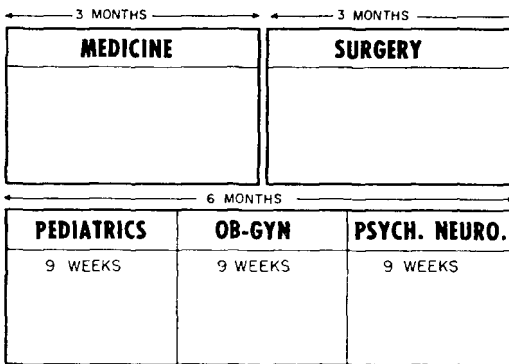


Diagram of the Junior Clerkship Year in one of several possible variations

Medical School

Didactic or lecture room instruction for entire classes has been reduced to 4 or 5 lecture hours each week in the junior year. Most of the lectures are given in a single afternoon, so as to interfere as little as possible with the clerkship responsibilities.

LECTURE SCHEDULE FOR JUNIORS

	Summer	Fall	Winter	Spring
Wednesday 1:15-4 p.m.	Neurology 101	Surgery and Surgical Specialties 122, 127, 173	Ophthalmology 100, Dermatology 123 on alternate weeks	Medicine 104, Pediatrics 120 on alternate weeks

During the junior and senior Medical School years, the student has 1 free quarter which can be taken during any 3-month period but not during the pediatrics, obstetrics-gynecology, psychiatry-neurology 6-month block. Students are encouraged to take this free quarter during the senior year in Medical School, at a time when they can make the most of medical educational opportunities in local hospitals or in medical centers elsewhere in the United States or in foreign countries.

The fourth-year or senior medical student begins to plan for his final year during winter and spring of the junior year. If he has arranged to take his free quarter during the fourth year, he must plan for 3 quarters of academic work, selecting, with the help of his senior-year adviser, from among the many elective offerings. Students are asked to indicate a general area of interest for future professional work from five possible "tracks" or pathways: family practice, medical, surgical, psychiatry, basic medical scientist. An adviser who is capable of assisting him in planning along this career pathway is selected by the student and this adviser is consulted on all senior-year plans. The 3-quarter or 36-week senior year program is completely arranged by the student and his adviser.

If academic work in other colleges within the University or at other medical centers will be of potential benefit to help the student toward his future goals, such work can be arranged. There are no required lectures during the senior year. Each student is required to take the Part II examination of the National Board of Medical Examiners during April prior to June graduation.

A Proposed New Curriculum

During 1967-68, the Educational Policy Committee of the Medical School developed a plan for substantial revision of the course of study leading to the M.D. degree. In December 1968, the Executive Faculty approved the new plan. This curriculum will be inaugurated beginning with the fall 1969 entering class.

Under the new plan, the course of study for the M.D. degree will consist 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 3 quarters will be termed Phase A and will include course work in basic medical sciences, behavioral science, and introductory experiences with patients. The remaining 5 academic quarters of the core program, termed Phase B, will consist of integrated interdepartmental presentations along organ, system, and topical lines. In the track portion of the curriculum, some students may 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 additional quarters with no restrictions as to type of internship.

Phase A will be taught in 3 academic quarters beginning in the fall. The major thrust of the Phase A curriculum is a presentation of a core of material in five basic medical sciences: anatomy, biochemistry, physiology, microbiology, and general pathology. In addition, there is a course titled "Behavioral Science." A major block of time, $\frac{1}{2}$ day weekly, has been earmarked for presentation of a challenging new program titled "Introduction to the Patient." This program is intended to involve the student physician in his own synthesis and correlation of basic sciences with clinical applications and in direct, personal confrontation with human illness and patient care.

In Phase B, there will be an emphasis on correlated, integrated interdepartmental teaching, designed to emphasize fundamental principles and to avoid unplanned repetition. There will be extensive faculty involvement with undergraduate teaching. Medical students will benefit from provision of large amounts of unscheduled time, through which they can order their own activities in a setting which maximizes the opportunities for independence and maturity in the learning process. By providing elective opportunities early in Phase B and in the entire Phase D segment, the student will be encouraged to become the prime mover in his own medical education.

Phase B is planned for 5 academic quarters beginning in the summer. The Phase B curriculum will consist of a core of material related to 16 organs, systems, or topics which will be presented by interdepartmental sections with emphasis on pathophysiology and general and basic concepts. The organ system topics will be presented in the following order with overlap in timing between many of the topics: basic pharmacology, cardiovascular, blood, respiratory, renal, man in his community, endocrine, reproduction, gut, ear-nose-throat and speech, skin, eye, neurological sciences, trauma, bone, and connective tissue. The other two topics, "Student as Physician" and "Behavior of Man" are planned to extend over 5 and 2 quarters, respectively.

An example of how 1 week in Phase B might be organized is shown in the chart on next page.

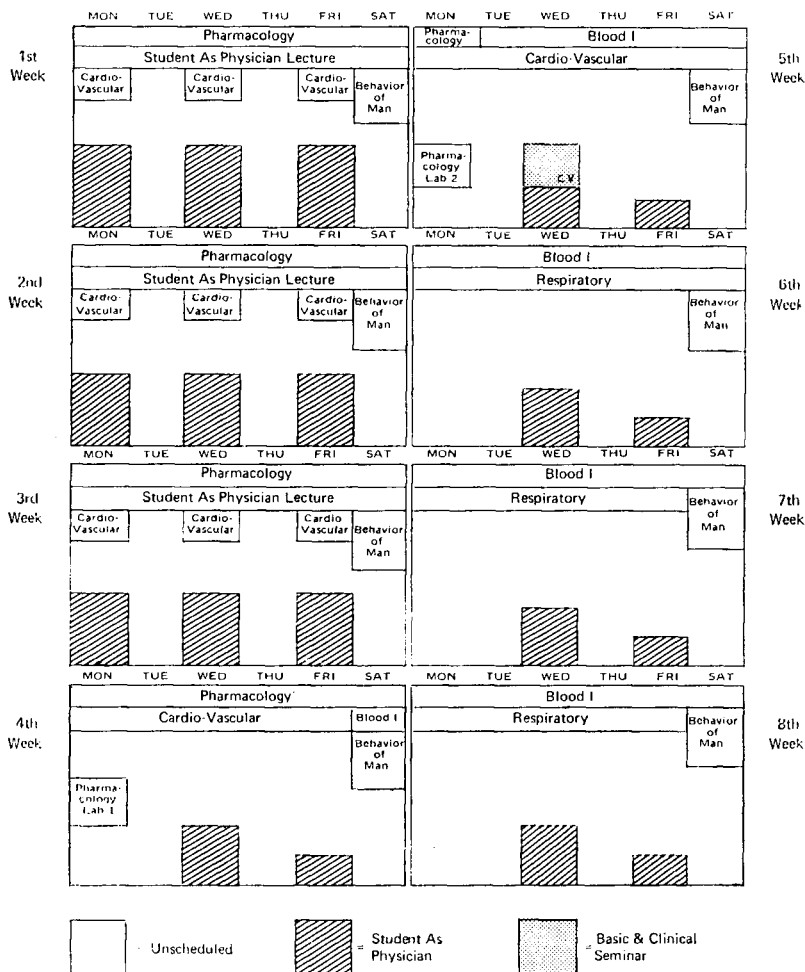
Phase C, composed of core clerkships, was included in the original plan. Ultimately, the clinical teaching and experience which were to be the essence of the core clerkships were woven into the "Student as Physician" portion of Phase B.

In Phase D, the student, with the help of his adviser, will embark on an elective program of study in one general career pathway. Examples of several possible tracks or pathways are as follows:

1. Medicine, Pediatrics, and Medical Specialties
2. Surgery and Surgical Specialties, including Obstetrics and Gynecology

Medical School

PHASE B (Sophomore Year) TYPICAL 8-WEEK CLASS SCHEDULE Showing Scheduled Periods and Unscheduled Periods



Phase B chart

3. Psychiatry and Behavioral Sciences
4. Neurological Sciences
5. Family Medicine, Family Practice, and Community Health
6. Medical Science

None of the pathways will contain mandatory requirements but each student will be urged to include at least 12 credits of basic science subjects in his program. The opportunity to return to the study of one or more basic science subjects in depth after some experience in clinical medicine is one of the attractive features of Phase D. Each pathway will be under the supervision of a review committee made up of the faculty involved in the pathway, and will include at least one member of a basic science faculty in each committee. The committees, which will also have representation from the student body and from the junior faculty, will be appointed by the Educational Policy Committee and will have the responsibility of reviewing and approving each student's program. A thesis on a research subject or defense of some proposition in the area of specialty will be a part of the requirement for completion of Phase D for each student. The length of Phase D will vary depending upon whether the student is on a 3-year or a 4-year plan. In the 3-year plan, it will be 3 academic quarters. Five quarters of Phase D will be included in the 4-year program.

Students who elect or are chosen to complete Medical School on the 3-year plan will be required to serve their internship year at a major affiliated teaching hospital. There will be no restrictions on the type of internship for those students on the 4-year program.

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 construction 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 discussion group meets with a visiting medical educator in the Adytum.

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 Student Housing Bureau. The cost is approximately \$300 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, chiefly upperclassmen.

Students may eat in the University Hospitals cafeteria, in facilities in University residence halls, the Student Union, fraternity houses, or may purchase meals 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 a separate ward of the University Hospitals. Each student receives health service coverage as part of the incidental 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

Medical students are urged not to engage extensively in work outside 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. The Medical School days are crowded with the business of learning as much of medicine as possible in 13 academic quarters. 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 the men and one sorority for the 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

Medical School

by the membership on the basis of research interest and achievement. The group meets monthly at one of several faculty members' homes for discussions of medical and other topics of current interest. The Cyrus P. Barnum, Jr. Society is an organization of students working toward the combined M.D.-Ph.D. degree which 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 through the Student Council sponsors certain schoolwide functions. 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, and for medical students to conduct research work in either clinical or basic science departments. 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.

The combined M.D.-Ph.D. program is especially planned for academically superior medical students with interests in graduate study in a fundamental medical science, leading to a graduate degree (M.S. or Ph.D.) and the M.D. degree. The combined program allows distribution of the student's time between a graduate degree program and the standard medical curriculum, thus extending the period for completion of both doctoral degrees over 6 or more years. The program emphasizes flexibility and adaptability to each student's individual requirements and research interests. Financial support is available to a number of qualified students who have been accepted by the faculties for the combined program. Stipends for the combined program begin at a level of \$2,400 plus dependency allowances and Graduate School tuition. Students are accepted for stipend support under the M.D.-Ph.D. program usually after completion of the first year of the standard Medical School curriculum and on the basis of the quality of the work done during the first year. Application is made through the Medical School office to the Combined Medical-Graduate Program Committee during the winter or spring quarter of the first year. These students must be eligible 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. Research fellowships, teaching assistantships, or scholarships through United States Public Health Service training grants or other grants are available to academically qualified students in all of 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.

Numerous 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 the Medical School and individual departments through federal agencies and voluntary health foundations. Research fellowships may be held during the full summer vacation following the freshman medical year or during the free quarter of the junior-senior biennium. Fellowships are announced in March from the Medical School office

Medical School

and applications are received during April in the offices of participating departments. These research fellowships are usually granted at \$300 per month for a 3-month (or 1-quarter) period.

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 in 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 Postgraduate Educational Activities organizes and presents 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 recent medical advances to the registrants in these courses.

Through cooperation with the Regional Medical Program and Medical School faculty, efforts are being made to utilize the newer communications media to extend the consultation services and information sources of the Health Sciences Center to the community hospitals in the state.

DESCRIPTION OF COURSES

Symbols and Explanations

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

- † To receive credit, all courses listed before the single dagger must be completed.
- ‡ Students may enter sequence course in any quarter which precedes the double dagger.
- § No credit is granted if credit was received for equivalent course listed after section mark.
- ¶ Concurrent registration is allowed with the course listed after paragraph mark.
- ‡ Consent of instructor is required.
- △ Consent of department or school offering course is required.

Anatomy (Anat)

Arnold Lazarow, Professor and Head

The courses in the department provide an opportunity for examining the structure of the human body. In gross anatomy, three-dimensional architecture and relationships to other organs are studied by dissection. In microscopic anatomy, the organization of cells, tissues, and organs is assessed from stained sections using light microscopy and electron micrographs. For each system, in embryology, the normal development and anomalies are presented using preserved specimens and models. Special emphasis is given to neurocytology and neurochemistry in neuroanatomy. 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. More depth in any of the subjects can be obtained through advanced course work on elective time.

Professor

Anna-Mary Carpenter, Ph.D., M.D.
Arnold Lazarow, M.D., Ph.D.
R. Dorothy Sundberg, M.D., Ph.D.
Lemen J. Wells, Ph.D.

Associate Professor

Padmakar K. Dixit, Ph.D.
Carl B. Heggestad, M.D., Ph.D.
Morris Smithberg, Ph.D.
Richard L. Wood, Ph.D.

Assistant Professor

Dean E. Abrahamson, M.D., Ph.D.
G. Eric Bauer, Ph.D.
David Kvistberg, Ph.D.
Arnold W. Lindall, M.D., Ph.D.
Leonard R. Murrell, Ph.D.
Joseph Rigatus, Ph.D.
Donald Robertson, Ph.D.

REQUIRED COURSES

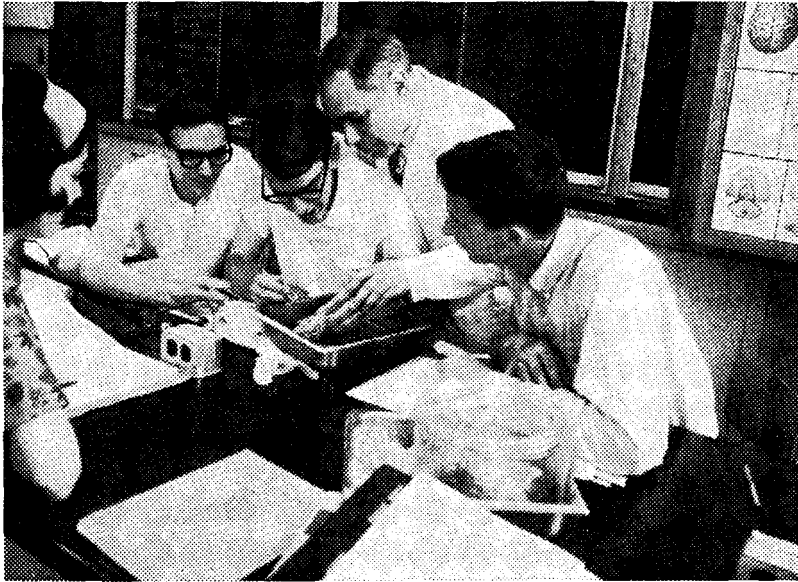
- 100f-101w† (5-100/5-101).** **Gross Human Anatomy.** Dissection, including osteology. (6 cr for 100, 8 cr for 101; prereq regis med fr or grad with # for 100, 100 for 101)
- 103f-104s† (5-103/5-104).** **Human Histology.** The microscopic structure, and the cytochemical and functional aspects of cells, tissues, and organs. (7 cr for both qtrs; prereq regis med fr or grad with # for 103, 103 for 104)
- 107w (5-107).** **Human Embryology.** Development of the human body. (4 cr; prereq regis med fr or grad with #)
- 111s (5-111).** **Neuroanatomy.** Structure and function of the nervous system including the organs of special senses. (5 cr; prereq regis med fr and 103, or grad with # and 104, or Zool 150 with #)

ELECTIVE COURSES

- 109 (5-190).** **Advanced Anatomy.** Instruction in teaching methods or supervision of student's original research or combination of both. (Cr ar; prereq regis med and 104)

ADVANCED CREDIT COURSES

- 131f (5-131).** **Biological Electron Microscopy.** Cr ar; prereq #; offered 1969-70 and alt yrs)



Dr. Lazarow instructs in Neuroanatomy.

- 132 (5-132). **Experimental Study of the Fetus.** (Cr ar; prereq #)
- 153, 154, 155, 156 (5-153, 5-154, 5-155, 5-156). **Advanced Anatomy.** Gross anatomy, histology, embryology, cytochemistry, hematology, neuroanatomy, or experimental morphology. (Cr ar; prereq #)
- 160 (5-160). **Introduction to Histological and Morphologic-Histochemical Techniques.** Fixation, embedding, and staining of cytological components and enzymes. (2 cr; prereq 103-104, #)
- 161-162-163-164 (5-161/5-162/5-163/5-164). **Methods in Anatomical Research.** (2 cr; prereq 100 or #)
- 165-166 (5-765/5-766). **Hematology.** Blood and blood-forming organs; emphasis on blood and bone marrow from the standpoint of diagnosis and prognosis. (4 cr per qtr; limited to 90 students; prereq 103, or Zool 54 or # for 165...165, # for 166)
- 167 (5-767). **Seminar: Hematology.** Discussion of literature and research. (1 cr; prereq 166)
- 201, 202, 203, 204 (8-201, 8-202, 8-203, 8-204). **Research in Anatomy**
- 205, 206, 207 (8-205, 8-206, 8-207). **Seminar: Anatomy**

Anesthesiology (Anes)

Frederick H. Van Bergen, Professor and Head

Professor

Joseph J. Buckley, M.D., M.S.
James H. Matthews, M.D., M.S.
Frederick H. Van Bergen, M.D., M.S.

Associate Professor

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

Clinical Associate Professor

Russell Bagley, M.D.
Irving Greenfield, M.D.
J. Albert Jackson, M.D.

Assistant Professor

James F. Cumming, M.D., Ph.D.
William Kneller, M.D.

Van S. Lawrence, M.D.
John S. Rydberg, M.D., M.S.
Earl A. Schultz, M.D., M.S.

Clinical Assistant Professor

Norman P. Johnson, M.D.
Robert C. Knutson, M.D., M.S.

Instructor

Otto K. Bosch, M.D.
Egon Marte, M.D.
Nyel Moss, M.D.
G. Thomas Wier, M.D.
Wen Y. Yue, M.D.

Clinical Instructor

Boris E. Symchych, M.D.

ELECTIVE COURSES

- 169 (5-169). **Research.** (Cr ar; prereq regis med)
181 (5-181). **Externship in Anesthesiology.** (Cr ar; prereq regis med)
182 (5-182). **Externship in Anesthesiology and Respiratory Problems.** (Cr ar; prereq regis med)

ADVANCED CREDIT COURSES

- 265 (8-265). **General Anesthesia**
266 (8-266). **Regional Anesthesia**
267 (8-267). **Pre- and Postanesthetic Evaluation**
268 (8-268). **Seminar: Anesthesiology**
269 (8-269). **Research in Anesthesia**

Biochemistry (MdBc)

Wallace D. Armstrong, Professor and Head

Biochemistry occupies a central position in all medical science and in clinical medicine. The required course first deals with general biochemistry and treats 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 the metabolic reactions. Biochemical abnormalities in disease are employed to fortify the understanding of the normal processes and to indicate the application of biochemical principles to future studies of disease processes.

The lectures furnish comprehensive surveys of some of the main topics but these require supplementation by reading or by advanced courses for exploration in depth. The laboratory work is used to examine some of the ways by which biochemical knowledge is obtained.

Professor

Wallace D. Armstrong, M.D., Ph.D.
Ellis S. Benson, M.D.
Charles W. Carr, Ph.D.
Ivan D. Frantz, Jr., M.D., Ph.D.
Helmut R. Gutmann, Ph.D.
Ralph T. Holman, Ph.D.
Leon Singer, Ph.D.
Frank Ungar, Ph.D.
Donald B. Wetlaufer, Ph.D.
Finn Wold, Ph.D.

Andreas Rosenberg, D.Sc., Ph.D.
John F. Van Pilsun, Ph.D.

Assistant Professor

James W. Bodley, Ph.D.
Mary E. Dempsey, Ph.D.
Ronald D. Edstrom, Ph.D.
Albert D. Notation, Ph.D.
Venkateswarlu Pothapragada, Ph.D.
Everett C. Short, Jr., D.V.M.
Quenton T. Smith, Ph.D.
Carlos Villar-Palasi, Ph.D.

Associate Professor

Robert W. Bernlohr, Ph.D.
Ernest D. Gray, Ph.D.
James F. Koerner, Ph.D.

Lecturer

Ulysses S. Seal, Ph.D.
C. Roberto Umana, Ph.D.

REQUIRED COURSES

100f (5-100). **Biochemistry.** (8 cr; prereq regis med fr, physics, and organic chemistry)

101w (5-101). **Biochemistry.** (8 cr; prereq regis med fr, 100)

ELECTIVE COURSES

153 (5-053). **Problems in Biochemistry.** (Cr ar; may be taken 1 or more qtrs; prereq 101)

ADVANCED CREDIT COURSES

200 (8-150). **Seminar: Biochemistry**

205 (8-300). **Research in Biochemistry**

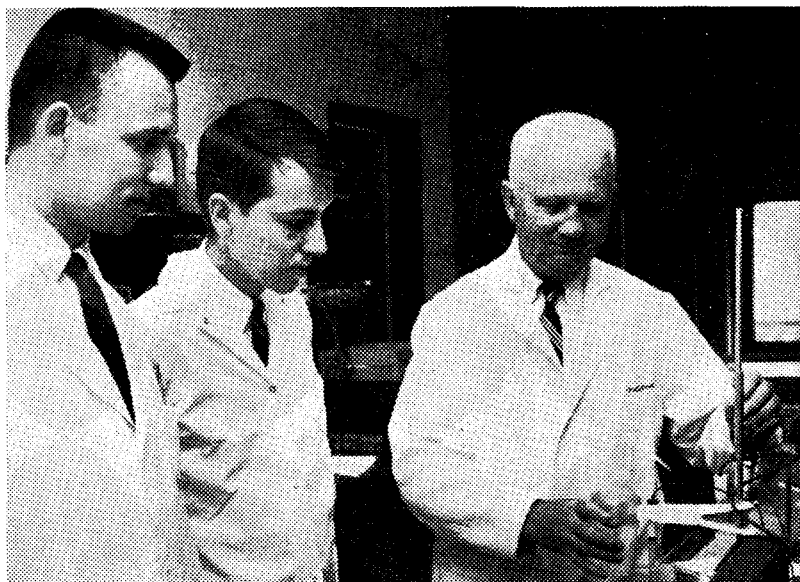
206 (8-206). **Advanced Endocrinology and Steroid Chemistry**

210 (8-210). **Metabolic Enzymology**

211 (8-211). **Nucleic Acid and Protein Metabolism**

Medical School

- 215 (8-215). Topics in Lipid Metabolism
- 217 (8-217). Protein Chemistry
- 219 (8-219). Biochemistry of Specialized Tissues
- 236 (8-136). Seminar: Radioactive Isotopes



Dr. Armstrong and students in the Biochemistry Laboratory.

Dermatology (Derm)

Francis W. Lynch, Professor and Head

A series of lectures in the third year and scheduled clinical conferences and case presentations during the Clerkship in Internal Medicine present essential knowledge of the structure and function of the skin and the nature of its more common diseases. The elective program in the clinics of the major hospitals offers the student an opportunity to acquire diagnostic skill 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.

Professor

Francis W. Lynch, M.D., M.S.

Clinical Professor

Carl W. Laymon, M.D., Ph.D.

Associate Professor

Ramon M. Fusaro, M.D., Ph.D.
A. S. Zelickson, M.D.

Clinical Associate Professor

Isadore Fisher, M.D., M.S.
Milton Orkin, M.D.
Harold G. Ravits, M.D.
John G. Rukavina, M.D.
A. S. Zelickson, M.D.

Research Associate

Quenton T. Smith, Ph.D.

Clinical Assistant Professor

Frederic T. Becker, M.D.
Elmer M. Hill, M.D.
Manuel O. Jaffe, M.D.
Thomas J. Kalb, M.D.
Irvine Karon, M.D.
Harry I. Katz, M.D.
Sheldon L. Mandel, M.D.
Kenneth P. Manick, M.D.
Willard C. Peterson, Jr., M.D.
Elmer M. Rusten, M.D.

Clinical Instructor

David W. Anderson, M.D.
Charles J. Balogh, M.D.
Bruce J. Bart, M.D., M.S.
Samuel F. Bean, M.D.
Elmer T. Ceder, M.D.
Peter J. Lynch, M.D.
Orville E. Ockuly, M.D., M.S.
Nadine G. Smith, M.D.
C. Gordon Vaughn, M.D.

REQUIRED COURSES

123 (5-123). **Dermatology and Syphilology.** Clinical lectures on common skin diseases and syphilis; diagnoses and treatment. (2 cr; prereq 101)

ELECTIVE COURSES

182 (5-182). **Externship in Dermatology.** (Cr ar; prereq regis med)

183 (5-183). **Problems in Dermatology.** (Cr ar; prereq regis med)

ADVANCED CREDIT COURSES

225 (8-225). **Clinical Dermatology**

226 (8-226). **Clinical Seminar: Dermatology**

227 (8-227). **Histology of the Skin**

228 (8-228). **Research: Dermatology and Syphilology**

229 (8-229). **Electron Microscopy in Dermatology**

230 (8-230). **Functional Biology of the Skin**

Family Practice and Community Health (FPCH)

Benjamin F. Fuller, Professor and Head

This department's responsibility is to introduce the student to the fundamentals of patient care in the context of the family and the community. The existence of multiple environmental variables which affect the patient's functional capacity, both in health and disease, will be stressed. Health maintenance, both through early recognition of change from the norm and through anticipation of such change by recognition of environmental problems, as well as the natural history of disease will be emphasized.

The importance of continuity of care in effecting optimal therapeutic results will be demonstrated.

The student will have the opportunity to participate with the staff in delivery of care to a defined population of patients which will be selected as representative of a cross section of society. This patient population will receive ongoing care from the staff of the department.

Affiliated community hospitals and practicing physicians' offices will provide added experience for the student.

Professor

Benjamin F. Fuller, M.D.

John E. Verby, M.D.

Vernon E. Weckwerth, Ph.D.

Associate Professor

Edward C. DeFoe, M.D.

John B. O'Leary, M.D.

Research Fellow

Gary R. Peterson, M.A.

ELECTIVE COURSES

100 (5-500). Externship. Care of families (both ambulatory care and hospital care) at a progressing level of responsibility. Offered at University Hospitals, affiliated clinics and hospitals, and private physicians' offices.

101 (5-501). Problems in Patient Care. (Cr ar)

102 (5-502). Problems in Community Health. (Cr ar)

ADVANCED CREDIT COURSES

201 (8-201). Family Medicine Conference

202 (8-202). Conference on Human Behavior

203 (8-203). Research in Family Medicine and Community Health

History of Medicine (HMed)

Leonard G. Wilson, M.Sc., Ph.D., Professor and Director

ELECTIVE COURSES

- 400f (5-400). History of Medicine.** Two lectures and a 1-hour seminar each week. (3 cr per qtr)
- 401w (5-401). History of Medicine.** Two lectures and a 1-hour seminar each week. (3 cr per qtr)
- 402s (5-402). History of Medicine.** Two lectures and a 1-hour seminar each week. (3 cr per qtr)
- 410f (5-410). Seminar: The Emergence of Modern Medicine 1750-1900.** (3 cr per qtr)
- 411w (5-411). Seminar: The Emergence of Modern Medicine 1750-1900.** (3 cr per qtr)
- 412s (5-412). Seminar: The Emergence of Modern Medicine 1750-1900.** (3 cr per qtr)

ADVANCED CREDIT COURSES

- 220f (8-220). History of the Biological Sciences**
- 221w (8-221). History of the Biological Sciences**
- 222s (8-222). History of the Biological Sciences**

Medical School

Laboratory Medicine** (LMed)

Ellis S. Benson, Professor and Head

Professor

Ellis S. Benson, M.D.
Esther F. Freier, M.S.
R. Dorothy Sundberg, Ph.D., M.D.
Edmond Y. Yunis, M.D.

John Matsen, M.D.
Herbert F. Polesky, M.D.
Robert E. Rydell, M.D.
Nancy Staley, M.D.
Patrick C. J. Ward, M.D.

Associate Professor

Robert A. Bridges, M.D.
Donald F. Gleason, M.D.
Paul Quie, M.D.
Andreas Rosenberg, Ph.D.
Lorraine G. Stewart, M.S.
Jorge J. Yunis, M.D.

Clinical Assistant Professor

Leonard Crowley, M.D.
Paul Finley, M.D.
John Raich, M.D.
Edward Segal, M.D.
Martin Segal, M.D.

Clinical Associate Professor

Paul Alexander, M.D.

Instructor

Calvin Bandt, M.D.
Michael Burke, M.D.
Charles Horwitz, M.D.
J. Jeffrey McCullough, M.D.
Wayne Schrader, M.D.
Robert Strom, M.D.

Assistant Professor

Miguel Azar, Ph.D., M.D.
Philip Blume, M.D.
G. Mary Bradley, M.D.
David M. Brown, M.D.
Richard Brunning, M.D.
Mary E. Dempsey, Ph.D.
John R. Edson, M.D.
Henry Gewurz, M.D.
Ben Hallaway, M.S.

Clinical Instructor

Aina Galejis, M.D.
Seymour Handler, M.D.
Norman Horns, M.D.
Thomas Swallen, M.D.

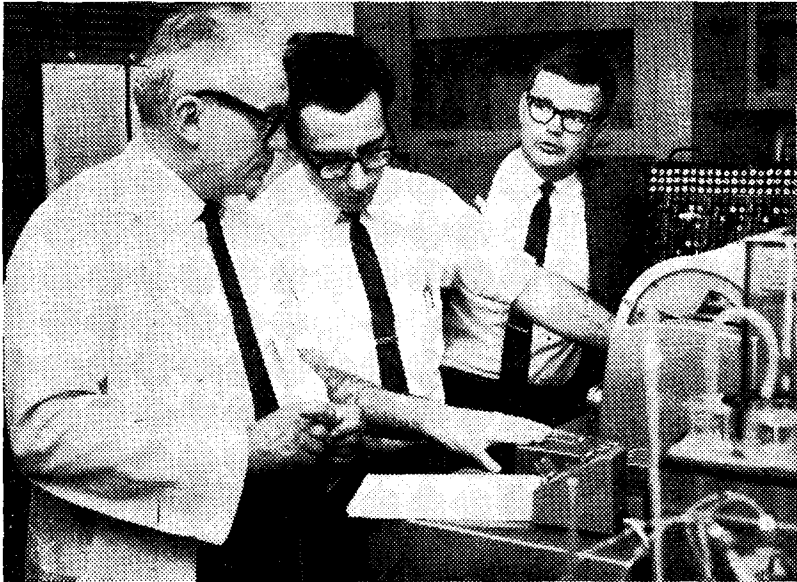
Graduate work in the Department of Laboratory Medicine offers opportunities to qualified physicians to prepare themselves for careers of teaching and research in clinical pathology.

The program requires a minimum of 3 years and provides experience in laboratory techniques and basic and applied research in five major areas: (1) clinical chemistry, including radioisotopes; (2) hematology, including general and morphologic hematology and blood coagulation; (3) immunology, including clinical immunology, immunochemistry, and blood transfusion; (4) microbiology, including diagnostic bacteriology, mycology, and parasitology; and (5) medical genetics, including cytogenetics and biochemical genetics. Original investigative work in one major area is essential. A Master's degree is offered.

ELECTIVE COURSES

- 100s (5-100).** Basic Electronics of Laboratory Instruments. (2 cr; prereq #) Rosenberg
- 101w (5-101).** Methods of Laboratory Examination for Diagnostic Purposes. (3 cr per qtr; prereq MdBc 101, Path 101) Benson, Bradley, and staff
- 102s (5-102).** Methods of Laboratory Examination for Diagnostic Purposes. (3 cr per qtr; prereq MdBc 101, Path 101) Benson, Bradley, and staff

*Offered at Minneapolis.



Dr. Benson outlines plans for another experiment.

- 150s (5-150). Introduction to Clinical Chemistry.** Introduction to the fundamental principles and techniques in clinical chemistry. (4 cr; prereq #) Freier and staff
- 160s (5-160). Human Cytogenetics.** Selected aspects of chromosome structure and function and genetic and clinical problems associated with study of human chromosomes. (2 cr; prereq #; offered 1970-72 and alt yrs) J Yunis
- 161s (5-161). Human Cytogenetics Laboratory.** Techniques for study of human chromosomes: cell culture, autoradiography, and chromosome isolation techniques. (2 cr; prereq #; offered 1970-71 and alt yrs) J Yunis and staff
- 162s (5-162). Human Biochemical Genetics.** Selected topics on molecular and genetic basis of human genetic traits. (2 cr; prereq #; offered 1969-71 and alt years) J Yunis
- 163s (5-163). Human Biochemical Genetics Laboratory.** Biochemical techniques used in study of human genetic traits. (2 cr; prereq #; offered 1969-70 and alt yrs) J Yunis and staff
- 165f (5-765). Hematology.** Blood and blood forming organs; blood and bone marrow from the standpoint of diagnosis and prognosis. (4 cr per qtr, §Anat 165f, §Anat 166w; prereq #) Sundberg and staff
- 166w (5-766). Hematology.** Blood and blood forming organs; blood and bone marrow from the standpoint of diagnosis and prognosis. (4 cr per qtr, §Anat 165f, §Anat 166w; prereq #) Sundberg and staff

Medical School

- 167s (5-767). Seminar: Hematology. (1 cr, §Anat 167s; prereq 166) Sundberg
- 172f (5-172). Human Genetic Traits Including Blood Groups and Serum Protein Polymorphism. (3 cr, §Anth 172; prereq #) Polesky
- 173f (5-173). Analytical Techniques in Laboratory Medicine. (2 cr per qtr; prereq #; offered 1969-70 and alt yrs) Freier, Rosenberg, Strandjord
- 174w (5-174). Analytical Techniques in Laboratory Medicine. (2 cr per qtr; prereq #; offered 1969-70 and alt yrs) Freier, Rosenberg, Strandjord
- 175f (5-175). Interpretation of Laboratory Data: Normal Values, Accuracy, and Precision. Clinical value. (1 cr per qtr; prereq #; offered 1970-71 and alt yrs) Polesky and staff
- 176w (5-176). Interpretation of Laboratory Data: Normal Values, Accuracy, and Precision. Clinical value. (1 cr per qtr; prereq #; offered 1970-71 and alt yrs) Polesky and staff
- 177w,s (5-177). Clinical Chemistry. Modern clinical chemistry techniques with emphasis on instrumental methods. (6 cr; prereq #) Freier and staff
- 181f,w,s,su (5-181). Laboratory and Clinical Hematology. (Cr ar; prereq #) Sundberg
- 181f,w,s,su (5-182). Medical Genetics. (Cr ar; prereq #) J Yunis
- 181f,w,s,su (5-183). Clinical and Laboratory Immunology. (Cr ar; prereq #) E Yunis
- 181f,w,s,su (5-184). Immunohematology in Blood Banking. (Cr ar; prereq #) E Yunis
- 182f,w,s,su (5-261). Topics in Hematology. (Cr ar; prereq 166) Brunning, Stewart, Sundberg
- 183f,w,s,su (5-262). Topics in Immunology. (Cr ar; prereq 172) Bridges, E Yunis
- 185f,w,s (5-263). Seminar: Clinical Chemistry. (1 cr per qtr; prereq #) Benson, Strandjord
- 190f (5-264). Research Seminar. (1 cr; prereq #) Benson, J Yunis
- 191f,w,s (5-265). Departmental Seminar. (1 cr per qtr; prereq #) Benson, J Yunis
- 193f,w,s (5-266). Seminar: Immunology. (1 cr per qtr; prereq #) Bridges, E Yunis

ADVANCED CREDIT COURSES

- 235f,w,s,su (8-235). Advanced Clinical Laboratory Medicine
- 236f,w,s,su (8-236). Research on Clinical Laboratory Problems
- 251f,w,s,su (8-251). Research in Human Genetics

Medicine (Med)

Richard V. Ebert, Professor and Head

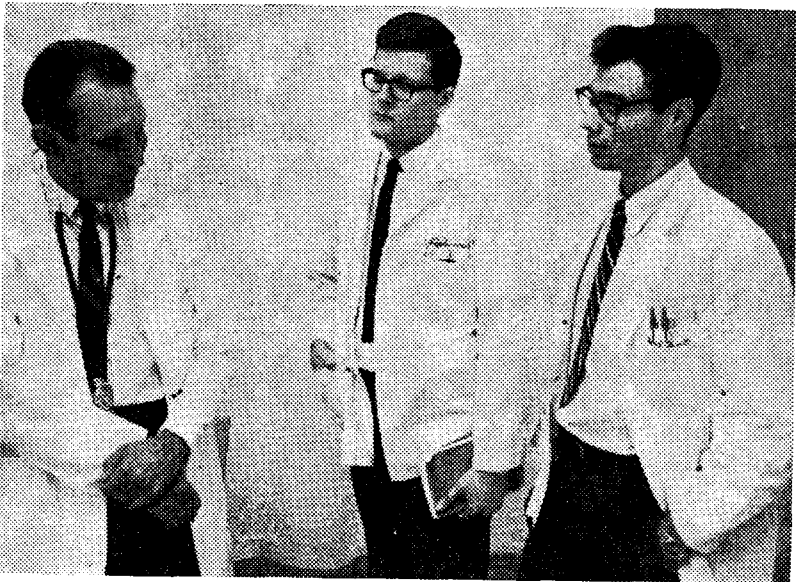
The Department of Medicine has two goals in teaching. The first is to instruct the student in certain general skills such as history taking and physical examination which are necessary in the care of patients. Working in small groups with a tutor, the student integrates the information obtained from the patient including his assessment of the social background and emotional reaction to illness with the laboratory and x-ray data in an attempt to design a plan of therapy.

The second goal is to acquaint the student with the body of knowledge represented by the subspecialties of medicine including dermatology. This is accomplished by study of patients with disease, supplemented by reading and lectures.

Professor

Howard B. Burchell, M.D., Ph.D.
James B. Carey, Jr., M.D., Ph.D.
Richard V. Ebert, M.D.
Ivan D. Frantz, Jr., M.D.
John W. Frost, M.D.
Frederick C. Goetz, M.D.

Wendell H. Hall, M.D., Ph.D.
Robert B. Howard, M.D., Ph.D.
B. J. Kennedy, M.D., M.S.
Alvin L. Schultz, M.D.
Samuel Schwartz, M.D., Ph.D.
Wesley W. Spink, M.D., D.Sc.
Louis Tobian, Jr., M.D.



Dr. Ebert quizzes junior medical students on ward rounds.

Medical School

Cecil J. Watson, M.D., Ph.D.
Leslie Zieve, M.D., M.A.
Horace H. Zinneman, M.D.

Clinical Professor

Reuben Berman, M.D., M.S.
John F. Briggs, M.D.
Robert A. Green, M.D.
Howard L. Horns, M.D.
John W. LaBree, M.D.
A. Boyd Thomes, M.D.

Associate Professor

Carl S. Alexander, M.D.
Jonathan Bishop, M.D.
Richard P. Doe, M.D., Ph.D.
Harry S. Jacob, M.D.
Richard J. Johnson, M.D.
Manuel E. Kaplan, M.D.
F. Bruce Lewis, M.D.
Frank M. MacDonald, M.D.
M. John Murray, M.D.
Naip Tuna, M.D., Ph.D.
Yang Wang, M.D.
C. Paul Winchell, M.D.

Clinical Associate Professor

Donald S. Amatuzio, M.D.
Karl W. Anderson, M.D., M.S.
Rolf L. Andreassen, M.D.
Paul J. Bilka, M.D.
Robert D. Blomberg, M.D.
Donald G. Bohn, M.D.
Sumner S. Cohen, M.D.
David M. Craig, M.D.
James C. Dahl, M.D.
William R. Fifer, M.D.
Richard J. Frey, M.D.
Delmar R. Gillespie, M.D.
Albert J. Greenberg, M.D.
Mark C. L. Hanson, M.D.
William H. Hollinshead, M.D.
Milton M. Hurwitz, M.D., M.S.
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.
Paul T. Lowry, M.D.
James C. Mankey, M.D.
Frank Martin, M.D.
Burtis J. Mears, M.D.
Harold E. Miller, M.D.
J. C. Miller, M.D.
James G. Myhre, M.D.
Oscar L. N. Nelson, M.D.
William E. Petersen, M.D.
Herbert F. R. Plass, M.D., M.S.
Dean K. Rizer, M.D.
George C. Roth, M.D.
Joseph M. Ryan, M.D.
Raymond W. Scallen, M.D.

L. Raymond Scherer, M.D.
Philip H. Soucheray, M.D.
Francis B. Tiffany, M.D.
Richard B. Tregilgas, M.D.
Lowell W. Weber, M.D.
Asher A. White, M.D.

Assistant Professor

Arnold Adicoff, M.D.
William D. Blackwood, M.D.
David C. Brown, M.D.
Alfred Doscherholmen, M.D.
Charles W. Drage, M.D.
Jean R. Eckerly, M.D.
Abraham Falk, M.D.
Ignacio E. Fortuny, M.D.
Vincent L. Fromke, M.D.
Fredarick L. Gobel, M.D.
Jerry G. Greene, M.D.
Daniel H. Gregory, M.D.
Robert P. Gruninger, M.D.
Donald B. Hunninghake, M.D.
Maynard E. Jacobson, M.D.
John W. Jenne, M.D., Ph.D.
Carl-Magnus Kjellstrand, M.D.
Robert T. Kunau, Jr., M.D.
Gerald B. Lee, M.D.
John I. Levitt, M.D., M.S.
Michael D. Levitt, M.D., M.S.
James R. McArthur, M.D.
Robert J. McCollister, M.D.
Robert O. Mulhausen, M.D.
Thomas F. Mulrooney, M.D.
A. MacDonnell Richards, M.D.
Harold G. Richman, M.D.
Frederick L. Shapiro, M.D.
William R. Swaim, M.D.
Luigi Taddeini, M.D.
Athanasios Theologides, M.D.
Jack A. Vennes, M.D.
I. Dodd Wilson, M.D.
Edward T. Wong, M.D.

Clinical Assistant Professor

Alfred F. Anderegg, M.D.
Graham Beaumont, M.D.
David A. Berman, M.D.
Henry B. Blumberg, M.D.
Paul F. Bowlin, M.D.
John G. Bradley, M.D.
Rene Braun, M.D.
John H. Brown, M.D.
Thaddeus Chao, M.D.
Malcolm D. Clark, M.D.
Ephraim B. Cohen, M.D.
Robert E. Doan, M.D.
Donn R. Driver, M.D.
Hugh A. Edmondson, M.D.
Edmund Eichhorn, M.D.
John G. Fee, M.D.
John N. Ferguson, M.D.
A. S. Gilbertsen, M.D.

Description of Courses

Wilbert J. Henke, M.D.
Earl Hill, M.D.
Wayne L. Hoeseth, M.D.
Kjeld O. Husebye, M.D.
Martin E. Jansen, M.D.
James N. Karnegis, M.D.
Everett H. Karon, M.D.
Walter F. Larrabee, Jr., M.D.
George X. Levitt, M.D.
Robert E. Lindell, M.D.
Charles M. E. Lindemann, M.D.
Russell C. Lindgren, M.D.
Jeanette K. Lowry, M.D.
Charles N. McCloud, Jr., M.D.
James L. McKenna, M.D.
Dwight L. Martin, M.D.
Robert A. Maslansky, M.D.
William F. Mazzitello, M.D.
Harold D. Miller, M.D.
Franklin C. Norman, M.D.
William Nuessle, M.D.
William O'Brien, M.D.
Valentine O'Malley, M.D.
Richard A. Pfohl, M.D.
Frank S. Preston, Jr., M.D.
David A. Randall, M.D.
Thomas M. Recht, M.D.
Paul D. Redleaf, M.D.
Fred A. Rice, M.D.
Rudolph J. Ripple, M.D.
Alan P. Rusterholz, M.D.
Andrew W. Shea, M.D.
Donald B. Swenson, M.D.
Frank A. Ubel, Jr., M.D.
Donald G. Vellek, M.D.
Harold M. Wexler, M.D.
Richard C. Woelner, M.D.
A. Cabot Wohlrabe, M.D.
Donald W. Woodley, M.D.

Instructor

Erskine M. Caperton, Jr., M.D.
Stuart T. Chen, M.D.
Curtis E. Davis, M.D.
Arthur H. L. From, M.D.
Joyce L. Funke, M.D.
Charles R. Jorgensen, M.D.
Mohammed Y. Khan, M.D.
George E. Kitzmiller, M.D.
Goran Kronvall, M.D.
Herbert Lauritzen, M.D.
Byron C. McGregor, M.D.
Leonard I. Mastbaum, M.D.
John N. Mork, M.D.
Frank Q. Nuttall, M.D.
Russell Payson, M.D.
Claus A. Pierach, M.D.
Rex B. Shafer, M.D., M.S.
Stephen E. Silvis, M.D.
Henry T. Smith, M.D.
Wayne H. Thalhuber, M.D.
Harold E. Windschitl, M.D.

Clinical Instructor

Sigrid A. Bachmann, M.D.
Jerome J. Ballantine, M.D.
Alphonso A. Belsito, M.D.
Henry S. Bloch, M.D.
Malcolm N. Blumenthal, M.D.
Robert B. Breitenbucher, M.D.
John M. Burns, M.D.
John B. Cardle, M.D.
Henry W. Cohen, M.D.
James S. Cole, M.D.
Robert S. Colton, M.D.
Wilfred A. Corson, M.D.
Patrick J. Daly, M.D.
Donald E. Derauf, M.D.
Jerome W. Dougan, M.D.
David K. Drill, M.D.
Donald A. Duncan, M.D.
Ronald W. Ellis, M.D.
Rodney W. England, M.D.
David L. Fingerman, M.D.
William D. Flory, M.D.
Stanley A. Fruchtman, M.D.
Muharrem Gokcen, M.D., Ph.D.
David Gold, M.D.
Benjie L. Goldfarb, M.D.
William L. Hedrick, M.D.
A. Sherman Hill, Jr., M.D.
Edward A. Johnson, M.D.
Harold B. Kaiser, M.D.
Arnold P. Kaplan, M.D.
Harold A. Kaplan, M.D.
Markle Karlen, M.D.
Joseph R. Kelly, M.D.
Douglas L. Kjellsen, M.D.
Charles P. Kolars, M.D.
Jerrold V. Larson, M.D.
Elliot M. Latts, M.D.
John W. Lawrow, M.D.
Irving J. Lerner, M.D.
Arthur T. Lindeland, M.D.
Michael Lobell, M.D.
Francis N. Lohrenz, M.D.
Aaron L. Mark, M.D.
John E. Middlebrook, M.D.
Winston R. Miller, M.D.
Gerald T. Mullin, Jr., M.D.
William D. Nessett, M.D.
S. Scott Nicholas, M.D.
Bruce C. Nydahl, M.D.
Robert E. Olson, M.D.
Earl T. Opstad, M.D.
William J. Paule, M.D.
William D. Remole, M.D.
James F. Reynolds, M.D.
Eugene Rinkey, M.D.
George L. River, M.D.
Kusum Saxena, M.D.
Leonard D. Schloff, M.D.
William F. Schoenwetter, M.D.
Robert J. Schultz, M.D.
Marvin Segal, M.D.
Maurice L. Straus, M.D.

Medical School

Richard W. Swenson, Jr., M.D.
Nejat Turkbash, M.D.
Frederick Walker, Jr., M.D.
John G. Walsh, M.D.
F. Douglas Whiting, M.D.

Conrad J. Wilkowske, M.D.
Soloman J. Zak, M.D.

Lecturer
Henry W. Blackburn, Jr., M.D.

REQUIRED COURSES

- 101w,s (5-101). Physical Diagnosis.** Examination of the normal body; physical diagnosis in disease. Students assigned to cases. (2 cr per qtr; prereq regis med soph, Anat 101, Phsl 107)
- 104 (5-104). Introduction to Internal Medicine.** Lectures and clinics in the field of internal medicine. (2 cr; prereq 101, LMed 102)
- 112 (5-112). Clerkship in Internal Medicine.** Supervised study of care of hospitalized patients on an inpatient service. Offered at University and affiliated hospitals with rotation through special services including cardiac, gastrointestinal, chest, metabolic, diabetic, arthritis, and peripheral vascular disease. (16 cr; prereq regis med)

ELECTIVE COURSES

Externship

Care of medical patients on an inpatient service at an advanced level of responsibility.

- 180 (5-501). Externship (Oncology), University Hospitals.** (18 cr per qtr) Kennedy
- 180 (5-502). Externship, Veterans Administration Hospital.** (18 cr per qtr) Brown
- 180 (5-503). Externship, St. Paul-Ramsey Hospital.** (18 cr per qtr) Frost
- 180 (5-504). Externship, Northwestern Hospital.** (18 cr per qtr) Watson
- 180 (5-505). Externship, Mt. Sinai Hospital.** (18 cr per qtr) Lewis

Research in Medicine

Research opportunities in the following areas are available at University Hospitals:

- 181 (5-511). Research in Gastroenterology.** (Cr ar) Carey
- 181 (5-512). Research in Hematology.** (18 cr per qtr) Jacob, McArthur

Special Clinical Problems

Opportunities for study in the following areas of clinical interest are available at University and affiliated hospitals:

University Hospitals

- 184 (5-521). Problems in Clinical Medicine.** (1 cr per qtr) Murray
- 184 (5-522). Gastroenterology.** (18 cr per qtr) Carey

Description of Courses

- 184 (5-523). **Metabolism and Clinical Pharmacology.** (18 cr per qtr) Goetz, Hunninghake
- 184 (5-524). **Immunology, Allergy, and Infectious Diseases.** (18 cr per qtr) Spink
- 184 (5-525). **Cardiovascular Disease.** (18 cr per qtr) Winchell
- 184 (5-526). **Electrocardiography.** (4½ cr per 3 wks) Tuna
- 184 (5-527). **Renology.** (18 cr per qtr) Levitt, Tobian, Kjellstrand
- 184 (5-528). **Hematology.** (18 cr per qtr) Jacob, McArthur
- 184 (5-529). **Hematology. Condensed course.** (4½ cr per 3 wks) Jacob, McArthur
- 184 (5-530). **Seminar: Oncology.** (1 cr per qtr) Fortuny

St. Paul-Ramsey Hospital

- 184 (5-541). **Trends, Methodology, and Techniques in the Delivery of Medical Service.** (1 cr per qtr) Frost, Greene
- 184 (5-542). **Hematology.** (18 cr per qtr) Taddeini
- 184 (5-543). **Cardiology.** (18 cr per qtr) Lee
- 184 (5-544). **Pulmonary.** (18 cr per qtr) Greene

Veterans Administration Hospital

- 184 (5-551). **Cardiology (EKG).** (18 cr per qtr) Alexander and staff
- 184 (5-552). **Hematology.** (18 cr per qtr) Swaim and staff
- 184 (5-553). **Pulmonary.** (18 cr per qtr) MacDonald and staff
- 184 (5-554). **Fluid, Electrolyte, and Acid-Base Metabolism at Veterans Administration Hospital.** (18 cr per qtr) Mulhausen and staff
- 184 (5-555). **Electrocardiography.** (18 cr per qtr) Alexander and staff

Hennepin County General Hospital

- 184 (5-561). **Cardiology.** (18 cr per qtr) Richards
- 184 (5-562). **Renology.** (18 cr per qtr) Shapiro, Smith
- 184 (5-563). **Pulmonary.** (18 cr per qtr) Mulrooney

Ambulatory Care

Courses in ambulatory care encompass student contact with patients in general medical outpatient clinics and emergency rooms.

- 184 (5-571). **Medical Emergency Room, St. Paul-Ramsey Hospital.** (18 cr per qtr) Frost
- 184 (5-572). **Ambulatory Medicine, St. Paul-Ramsey Hospital.** (18 cr per qtr) Frost
- 184 (5-573). **Medical Outpatient Clinics, Hennepin County General Hospital.** (18 cr per qtr) Schultz

Medical School

ADVANCED CREDIT COURSES

- 201 (8-201). Clinical Medicine
- 202 (8-202). Diseases of the Cardiovascular Apparatus
- 203 (8-203). Research in Medicine
- 205 (8-205). Diseases of the Chest
- 206 (8-206). Clinical Conference
- 207 (8-207). Clinical Pathological Conference
- 208 (8-208). Clinical Radiological Conference
- 210 (8-210). Seminar: Infectious Disease
- 211 (8-211). Electrocardiographic Conference
- 212 (8-212). Pigment Metabolism
- 213 (8-213). Psychosomatic Medicine
- 214 (8-214). Seminar: Cardiovascular

Microbiology (MicB)

Dennis W. Watson, Professor and Head

Microbiology for sophomore medical students at Minnesota educates the future practicing physician in the principles and techniques which will help him to understand host-parasite relationships and pathogenesis in 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, experts in each area review current research and basic principles in medical bacteriology, immunology, mycology, and virology. Through intensive 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.

Professor

K. Gerhard Brand, M.D.
Robert A. Good, M.D., Ph.D.
Wendell H. Hall, M.D., Ph.D.
James J. Jezeski, Ph.D.
Robert K. Lindorfer, Ph.D.
Charles F. McKham, M.D.
Louis H. Muschel, Ph.D.
Edwin L. Schmidt, Ph.D.
Henry M. Tsuchiya, Ph.D.
Lewis W. Wannamaker, M.D.
Dennis W. Watson, Ph.D.
Yoon B. Kim, M.D., Ph.D.
Dolph Klein, Ph.D.
Peter G. Plagemann, Ph.D.

Associate Professor

Dwight L. Anderson, Ph.D.
Robert W. Bernlohr, Ph.D.
S. Stephen Chapman, Ph.D.
V. W. Greene, Ph.D.
Martin Dworkin, Ph.D.
Howard Jenkin, Ph.D.
Gerald Needham, Ph.D.
James T. Prince, M.S.
Palmer Rogers, Ph.D.
John A. Ulrich, Ph.D.

Assistant Professor

Alan B. Hooper, Ph.D.
Russell C. Johnson, Ph.D.

Instructor

David E. Peterson, B.A.

REQUIRED COURSES

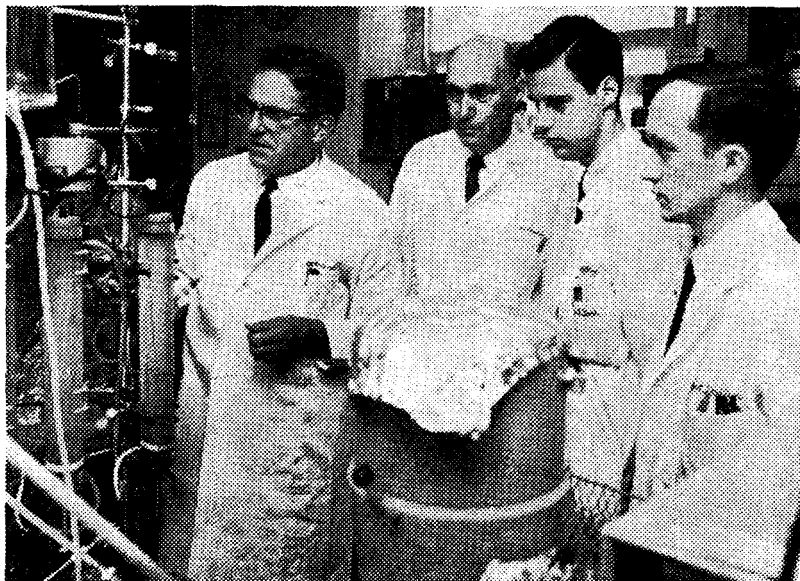
105f-106w (5-105/5-106). **Microbiology for Medical Students.** Medical bacteriology, immunology, mycology, and virology; the infectious process. Principles and techniques enabling diagnosis, treatment, and prevention of infectious disease. (12 cr; prereq regis med soph or grad, Anat 103, MdBc 100 or 101 or BioC 120 for 105...105 for 106) Brand and staff

ELECTIVE COURSES

152f,w,s (5-152). **Special Problems in Microbiology.** Research opportunities at graduate level for medical students with interest in microbiology. (Cr ar)

ADVANCED CREDIT COURSES

110s (5-110). **Microbial Genetics.** Genetic mechanisms in the bacteria, bacteriophages, fungi, protozoa, and algae. Mutagenesis; selection; adaptation; cyto-



Dr. Watson and an interested group in the Microbiology Laboratory.

plasmic inheritance; patterns of genic recombination; fine structure of genetic material. (3 cr; prereq 53 or 153, or #; offered 1970-71 and alt yrs) Staff

111f (5-111). Advanced Microbiology. Advanced laboratory in comparative morphology, taxonomy, and physiology of bacteria; biological and chemical aspects of microbes; enrichment, isolation, identification, cultivation, structure, and function of microorganisms. (4 cr; prereq 53 or 153 and 121 or #; offered 1969-70 and alt yrs) Dworkin

112 (5-112). General Mycology. Physiology; genetics; development; ecology; evolution; taxonomy; economic importance of the yeasts, molds, actinomycetes, and other fungi. (3 cr; prereq 53 or 153 or #; offered when feasible) Staff

116w (5-116). Immunology. Host-parasite interactions; 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; homotransplantation and tumor immunity; mechanisms of natural and acquired immunity. (3 cr; prereq 53 or 153) Muschel

116Aw (5-117). Immunology Laboratory. (2 cr; prereq ¶116) Muschel

121w (5-121). Physiology of Bacteria. Chemical and physical structure; staining; growth; influence of environment on growth; nutrition; enzymes; metabolism. (3 cr; prereq 53 or 153, 8 cr organic chemistry or biochemistry) Rogers

Description of Courses

- 124f (5-124). Biology of Viruses.** Structure, composition, and properties of bacterial and mammalian viruses; their interaction with cells and effect on host-cell metabolism; biochemistry of viral replication; techniques used in study and diagnosis of viral infections; viral tumorigenesis. (3 cr; prereq 53 or 153, and 121) Plagemann
- 153f,s (5-153). Biology of Microorganisms.** Lectures, demonstrations, and laboratory exercises in taxonomy, anatomy, physiology, biochemistry, and ecology of microbes; emphasis on fundamental properties of bacteria. (4 cr; prereq 5 cr biological sciences, OrCh 61, 62 or #) Dworkin, Klein
- 201f,w,s (8-201). Research in Microbiology**
- 202f,w,s (8-202). Diagnostic Microbiology**
- 203f,w,s (8-203). Seminar**
- 205f,w,s (8-205). Advances in Immunology**
- 206 (8-206). Laboratory Methods in Virology**
- 207 (8-207). Advanced Medical Microbiology**
- 222 (8-222). Physiology of Bacteria Laboratory**
- 223f (8-223). Bacterial Metabolism**

Neurology (Neur)

A. B. Baker, Professor and Head

The Department of Neurology provides undergraduate medical education in clinical neurology as well as interfacing with other departments to present an interdisciplinary approach to the neurosciences. This is achieved in the first and second years by the provision of clinical correlation, case conferences and by the teaching of the technique of the neurological examination through lectures and demonstrations. In the third year a series of 1-hour weekly lectures provides a didactic approach to clinical neurology. To the foregoing is added a neurological clerkship which provides supervised clinical experience. Elective and free time programs are available in the fourth year for students with a special interest in neurology.

Professor

A. B. Baker, M.D., Ph.D.
James Berry, Ph.D.
John A. Logothetis, M.D., Ph.D.
Manfred J. Meier, Ph.D.
Joseph A. Resch, M.D.
Hildred Schuell, Ph.D.
Fernando Torres, M.D.

Clinical Professor

Robert L. Meller, M.D., M.S.
Zondal Miller, M.D.
Harold H. Noran, M.D., Ph.D.
Sidney Shapiro, M.D.

Associate Professor

Milton Alter, M.D.
William Bradley, M.D.
Harold Cohen, Ph.D.
Milton Ettinger, M.D.
George Flora, M.D.
Robert Gumnit, M.D.
William R. Kennedy, M.D.
Joo Ho Sung, M.D.
Kenneth Swaiman, M.D.
David Webster, M.D.
Francis S. Wright, M.D.

Clinical Associate Professor

Harold Berris, M.D.
William Chalgren, M.D.
Paul Elwood, M.D.

Assistant Professor

Giovanni-Francesco Ayala, M.D.
Terrance Capistrant, M.D.

Donald D. Castle, M.D.
Anna Ellington, M.D.
Robert Goldberg, M.D.
Arthur Klassen, M.D.
Sping Lin, Ph.D.
Ruth Loewenson, Ph.D.
James Moriarty, M.D.
Glen Sawyer, M.D.
Emanuel Stadlan, M.D.
Gerald Timm, Ph.D.

Clinical Assistant Professor

E. M. Hammes, Jr., M.D.
Andrew Leembuis, M.D.
Robert Stoltz, M.D.
V. Richard Zarling, M.D.

Instructor

Myoung C. Lee, M.D.
William E. Martin, M.D.
Robert Soll, M.D.
Jack Utting, Ph.D.
Costante Vasconetto, M.D.
Gilbert Westreich, M.D.

Clinical Instructor

James Allen, M.D.
Cecil Baker, M.D.
Thomas H. Davis, M.D.
Lawrence Farber, M.D.
Richard F. Galbraith, M.D.
Hsien-Hwa Hsieh, M.D.
Maland Hurr, M.D.
John M. McKelvey, M.D.
Lawrence Schut, M.D.
Paul M. Silverstein, M.D.

REQUIRED COURSES

- 101 (5-101). **Clinical Neurology.** Systematic clinics, demonstrations, and lectures. (4 cr; prereq regis med or grad clinical psychology)
- 103 (5-103). **Clinical Clerkship in Neurology.** (6 cr; prereq regis med)

Description of Courses

ELECTIVE COURSES

- 181 (5-510). Externship in Clinical Practice—University Hospitals. (Cr and hrs ar; prereq regis med) Baker
- 181 (5-511). Externship in Clinical Practice—St. Paul-Ramsey Hospital. (Cr and hrs ar; prereq regis med) Gummit, Goldberg
- 181 (5-512). Externship in Clinical Practice—Hennepin County General Hospital. (Cr and hrs ar; prereq regis med) Ettinger, Riley
- 181 (5-513). Externship in Clinical Practice—Veterans Administration Hospital. (Cr and hrs ar; prereq regis med) Alter, Sawyer, Webster
- 182 (5-120). Selected Problems in Neurology. (Cr and hrs ar; prereq regis med) Staff
- 221 (5-540). Neurochemistry. (Cr and hrs ar; prereq regis med) Berry, Cohen, Lin
- 221A (5-541). Neurochemistry—Pediatric Neurology. (Cr and hrs ar; prereq regis med) Swaiman
- 230 (5-544). Clinical Electroencephalography. (Cr and hrs ar; prereq regis med) Torres, Ellington
- 231B (5-545). Electromyography. (Cr and hrs ar; prereq regis med) Kennedy
- 233 (5-550). Neuropathology. (Cr and hrs ar; prereq regis med) Sung
- 248 (5-555). Clinical Neurophysiology—St. Paul-Ramsey Hospital. (Cr and hrs ar; prereq regis med) Sung
- 260 (5-560). Genetics—Veterans Administration Hospital. (Cr and hrs ar; prereq regis med) Alter

ADVANCED CREDIT COURSES

- 171B (5-171). Descriptive Neurology. (Cr ar; prereq regis occup ther)
- 201 (8-201). Clinical Pediatric Neurology
- 208 (8-200). Clinical Neurology
- 209 (8-202). Research in Neurology
- 210 (8-703). Advanced Neuropathology
- 212 (8-704). Survey of Neuropathology
- 213 (8-220). Neuropharmacology
- 215 (8-223). Neurological Complications of Internal Disease
- 219 (8-224). Instrumentation in the Basic and Neurological Sciences
- 220 (8-231). Advanced Clinical Neurology
- 221 (8-221). Neurochemistry
- 224 (8-230). Infectious Disease of the Nervous System
- 225 (8-701). Neuro-ophthalmology
- 226 (8-705). Neurological-Neurosurgical Conference
- 228 (8-236). Research in Neuropathology
- 229 (8-225). Neuropsychology
- 231 (8-203). Applied Electroencephalography

Medical School

- 231 (8-204). Applied Electromyography
- 233 (8-205). Applied Neuropathology
- 234 (8-234). Neuropsychology Conference
- 235 (8-235). Advanced Neuropsychology
- 236 (8-226). Neuromuscular Disease
- 238 (8-233). Neurological Clinical Pathological Conference
- 241 (8-702). Neuroradiology
- 245 (8-229). Clinical Correlative Neuroanatomy
- 246 (8-228). Neurogenetics
- 247 (8-227). Neurological Speech Disorders
- 248 (8-222). Applied Neurophysiology

Neurosurgery (NSur)

Lyle A. French, Professor and Chairman

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 the problems with special emphasis on the broad scope of methodology used in diagnosis. Experience in methods of treatment is obtained by 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 can, in certain instances, be oriented for the individual specifically interested in neurological sciences.

Professor

Lyle A. French, M.D., Ph.D.
S. N. Chou, M.D., Ph.D.

Clinical Associate Professor

Harold F. Buchstein, M.D., M.S.
Leonard A. Titrud, M.D., Ph.D.

Assistant Professor

Donlin Long, M.D., Ph.D.
James Bloedel, M.D., Ph.D.

Clinical Assistant Professor

Paul S. Blake, M.D.
Robert L. Merrick, M.D., Ph.D.
Michael P. Sperl, M.D., M.S.

Instructor

Edward L. Seljeskog, M.D.

Clinical Instructor

Erich S. Wisiol, M.D.
Max Zarling, M.D.

REQUIRED COURSES

127 (5-127). **Clinical Lectures in Neurosurgery.** (1 cr per yr; prereq regis med)

ELECTIVE COURSES

188 (5-500). **Neurosurgery Externship, University Hospitals.** (Cr ar; prereq regis med)

189 (5-510). **Neurosurgery Externship, Veterans Administration Hospital.** (Cr ar; prereq regis med)

189 (5-511). **Neurosurgery Externship, Hennepin County General Hospital.** (Cr ar; prereq regis med)

190 (5-520). **Neurosurgery Investigation.** (Cr ar; prereq regis med)

ADVANCED CREDIT COURSES

300 (8-300). **Outpatient Clinic in Neurosurgery**

305 (8-305). **Neurosurgical Diagnosis**

308 (8-308). **Neurosurgical Service**

311 (8-311). **Operative Neurosurgical Surgery**

316 (8-316). **Neurosurgical Research**

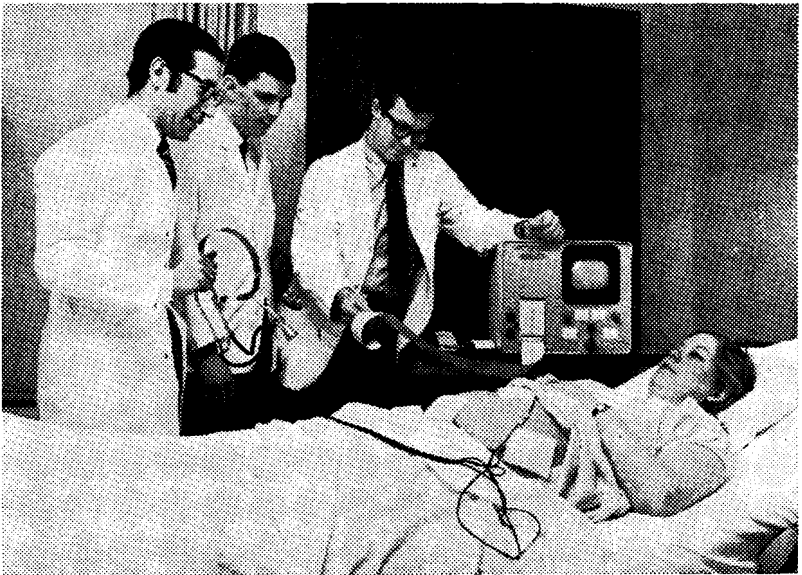
318 (8-318). **Neurosurgical Conference**

Obstetrics and Gynecology (Obst)

John J. Sciarra, Professor and Head

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.



Dr. Sciarra reviewing fetal heart recording with medical students.

Description of Courses

Professor

Erlio Gurpide, M.D.
John J. Sciarra, M.D., Ph.D.

Clinical Professor

Irving C. Bernstein, M.D.

Assistant Professor

Donald W. Freeman, M.D.
Erick Y. Hakanson, M.D., M.S.
Konald A. Prem, M.D.

Clinical Associate Professor

Alex Barno, M.D.
John S. Gillam, M.D.
Mancel T. Mitchell, M.D.
Rodney F. Sturley, M.D.

Associate Professor

Leon L. Adcock, M.D.
Richard P. Bendel, M.D.

Clinical Assistant Professor

Melvin P. Baken, Jr., M.D., D.D.S.
Maxwell M. Barr, M.D.
James R. Bergquist, M.D.
Robert A. Diamond, M.D.
John A. Haugen, M.D.
George W. Janda, M.D.
Leonard A. Lang, M.D.
Henry C. Meeker, M.D.
Gunnard Nelson, M.D.
Jay R. Olsen, M.D.

David I. Seibel, M.D.
Clark A. Shattuck, M.D.
William B. Stromme, M.D.
Robert N. Wagner, M.D.

Clinical Instructor

Milton Abramson, M.D., Ph.D.
John M. Brown, M.D.
Ray F. Cochrane, M.D.
Joseph Goldsmith, M.D.
Albert F. Hayes, M.D.
Robert D. Hilgers, M.D.
Eugene M. Kasper, M.D., Ph.D.
David C. Lees, M.D.
Howard M. Levine, M.D.
Edward C. Maeder, Sr., M.D., Ph.D.
Joseph S. Massee, M.D.
Charles J. McCarthy, M.D.
Fred E. Mecklenburg, M.D.
Nicholas M. Mensheha, M.D.
Edward H. Neira, M.D.
Bruce J. O'Brien, M.D.
Oliver H. Peterson, M.D.
Mitchell Pincus, M.D., M.S.
Owen F. Robbins, M.D.
Melvin B. Sinykin, M.D.
Gaius J. Slosser, M.D.
William A. Treat, M.D.
Dirk J. A. Van Oppen, M.D.
John W. Warren, M.D.

Clinical Assistant

Paul N. Larson, M.D.

REQUIRED COURSES

- 120 (5-120). Lectures in Obstetrics and Gynecology.** The physiology of pregnancy, labor, and the puerperium. The diagnosis and therapy of the common diseases of the female reproductive system. (4 cr; prereq regis med jr)
- 124w (5-124). Introduction to Obstetrics and Gynecology.** A series of lectures to acquaint the student with the problems of the specialty of obstetrics and gynecology and to provide an introduction to clinical obstetrics. (1 cr; prereq regis med soph)
- 135 (5-135). Clinical Clerkship in Obstetrics and Gynecology.** Supervised study of hospitalized and clinic patients at University Hospitals and selected affiliated community hospitals. (12 cr; prereq regis med)

ELECTIVE COURSES

- 184 (5-500). Externship in Obstetrics.** (Cr ar; prereq regis med)
- 184 (5-505). Externship in Gynecology.** (Cr ar; prereq regis med)
- 184 (5-510). Externship in Obstetrics and Gynecology.** (Cr ar; prereq regis med)
- 184 (5-515). Obstetrics and Gynecology Externship in Clinical Practice.** (Cr ar; prereq regis med)
- 190 (5-520). Problems in Obstetrics and Gynecology.** (Cr ar; prereq regis med)

Medical School

190 (5-540). Psychiatric Aspects of Obstetrics and Gynecology. (Cr ar; prereq regis med)

ADVANCED CREDIT COURSES

- 201 (8-201). Advanced Obstetrics and Gynecology, Part I
- 205 (8-205). Advanced Obstetrics and Gynecology, Part II
- 209 (8-209). Advanced Obstetrics and Gynecology, Part III
- 213 (8-213). Advanced Seminar
- 216 (8-230). Research in Reproduction
- 221 (8-221). Clinical Obstetrics and Gynecology
- 222 (8-222). Gynecological Oncology
- 223 (8-223). Gynecological Endocrinology

Ophthalmology (Ophth)

John E. Harris, Professor and Head

Professor

John E. Harris, Ph.D., M.D.

Clinical Professor

John P. Wendland, M.D., M.S.

Associate Professor

William L. Fowls, Ph.D.

Clinical Associate Professor

Llewellyn Christensen, M.D.

Robert J. Fink, M.D.

Walter Hoffman, M.D., M.S.

Richard C. Horns, M.D.

Bourne Jerome, M.D.

Malcolm McCannel, M.D.

Robert H. Monahan, M.D.

Howard Shaw, M.D.

George T. Tani, M.D.

Assistant Professor

William H. Knobloch, M.D.

Robert Letson, M.D.

William Rathbun, Ph.D.

Clinical Assistant Professor

Frank Adair, M.D.

Robert Cooper, M.D.

Richard Ellingson, M.D.

Harry S. Friedman, M.D.

Joseph L. Garten, M.D.

Charlotte W. Hill, M.D.

Douglas L. Johnson, M.D.

Ernest Larson, M.D.

Richard O. Leavenworth, Jr., M.D.

Vernon L. Lindberg, M.D.

Winston Lindberg, M.D.

John A. McNeill, M.D.

Lydia Neibergs, M.D.

Sidney Nerenberg, M.D.

Thomas O'Kane, M.D.

Harry L. Plotke, M.D.

Robert E. Rocknem, M.D.

Thomas K. Rucker, M.D.

Irving Shapiro, M.D.

Leander T. Simons, M.D.

Donald Sterner, M.D.

Richard Student, M.D.

Frederic F. Wippermann, M.D.

Robert Wohlrabe, M.D.

Clinical Instructor

Christopher Brown, M.D.

James P. Brown, M.D.

Martin G. Bruhl, M.D.

William B. Clark, M.D.

Donald Herrick, M.D.

Leslie Jacobson, M.D.

Yale Kanter, M.D.

Clyde Kitchen, M.D.

Murray Lufkin, M.D.

Charles S. Ostrov, M.D.

Rene Pelletier, M.D.

John E. Riley, M.D.

Charles Roach, M.D.

Byron Teska, M.D.

James Thompson, M.D.

Frederick C. Wuest, M.D.

REQUIRED COURSES

100 (5-100). Ophthalmology. Lectures and demonstrations. (2 cr; prereq regis med)

ELECTIVE COURSES

180 (5-180). Externship in Ophthalmology. (Cr ar; prereq regis med)

190 (5-190). Ophthalmology Research Problems. (Cr ar; prereq regis med)

ADVANCED CREDIT COURSES

200 (8-200). Clinical Ophthalmology

201 (8-201). Practical Ocular Surgery

202 (8-202). Ocular Pathology Conference

203 (8-203). Basic and Applied Ophthalmology

204 (8-204). Seminar: Ophthalmology

Medical School

- 205 (8-205). Neuro-ophthalmology
- 206 (8-206). Refraction
- 207 (8-207). Ocular Motility
- 208 (8-208). Didactic Ocular Surgery
- 209 (8-209). Pathology of the Eye
- 210 (8-210). Radiology of the Eye, Orbit, and Head
- 211 (8-211). External Diseases
- 212 (8-212). Medical Ophthalmology
- 213 (8-213). Physiologic Optics
- 214 (8-214). Ophthalmology Laboratory
- 215 (8-215). Research in Ophthalmology
- 216 (8-216). Seminar: Pathology

Orthopedic Surgery (OrSu)

John H. Moe, Professor and Head

The major goals of the orthopedic surgery courses available to the medical student are to provide him with a foundation for performing a basic neuromusculo-skeletal examination of the patient, to correlate the clinical expressions of disease with the student's basic science knowledge, and to acquaint the student with those patient situations which require immediate appraisal and resolution. In a number of clinical electives the student also has the option to participate 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.

Professor

John H. Moe, M.D.

Wayne Thompson, M.D.

Robert B. Winter, M.D.

Clinical Professor

Harry B. Hall, M.D.

Malvin J. Nydahl, M.D.

Instructor

Thomas Comfort, M.D.

Wilton H. Bunch, M.D., Ph.D.

James H. House, M.D.

Paul G. Patterson, M.D.

Associate Professor

William J. Kane, M.D., Ph.D.

Clinical Instructor

Vincent E. Eilers, M.D.

Robert M. Barnett, M.D.

John J. Beer, M.D.

Michael Davis, M.D.

David Florence, M.D.

Paul H. Gislason, M.D.

Richard D. Granquist, M.D.

Arnold Hamel, M.D.

John A. Hartwig, M.D.

Richard J. Johnson, M.D.

Lowell H. Kleven, M.D.

William R. Leslie, M.D.

Donald Madsen, M.D.

Donald C. Meredith, M.D.

David J. Nelson, M.D.

Roland F. Neuman, M.D.

Edward L. Salovich, M.D.

Elmer R. Salovich, M.D.

Irwin F. Schaffhausen, M.D.

Ivan Schloff, M.D.

Joseph M. Tambornino, M.D.

Francis J. Trost, M.D.

Clinical Associate Professor

Walter Indeck, M.D.

Richard H. Jones, M.D.

Harvey O'Phelan, M.D.

Assistant Professor

Robert F. Premer, M.D.

Clinical Assistant Professor

Paul M. Arnesen, M.D.

Frank S. Babb, M.D., M.S.

Lester W. Carlander, M.D.

Frederick E. Drill, M.D.

Paul O. Gustafson, M.D.

Ramon B. Gustilo, M.D.

Edward H. Kelly, M.D.

Sheldon M. Lagaard, M.D.

Donald R. Lannin, M.D., M.S.

D. Keith Millett, M.D.

George E. Nelson, Jr., M.D., M.S.

Richard E. Reiley, M.D.

Frederick G. Rosendahl, M.D.

REQUIRED COURSES

122 (5-122). Principles of Diagnosis, Treatment, Prognosis of Fractures, Dislocations. (1 cr; prereq regis med jrj)

140 (5-140). Clinical Lectures in Orthopedic Surgery. (1 cr; prereq regis med sr)

Medical School

ELECTIVE COURSES

- 185 (5-185). Externship in Orthopedic Surgery and Fractures. (Cr ar; prereq regis med)
- 185 (5-187). Externship in Orthopedic Surgery and Fractures. At St. Paul-Ramsey Hospital. (Cr ar; prereq regis med)
- 185 (5-188). Externship in Orthopedic Surgery and Fractures. At Gillette State Hospital for Crippled Children, St. Paul. (Cr ar; prereq regis med)
- 185 (5-189). Externship in Orthopedic Surgery and Fractures. At Fairview-St. Mary's Hospital. (Cr ar; prereq regis med)
- 186 (5-186). Research Problems. (Cr ar; prereq regis med)

ADVANCED CREDIT COURSES

- 401 (8-401). Orthopedic Conference
- 403 (8-403). Fractures
- 405 (8-405). Orthopedic Diagnosis
- 407 (8-407). Pediatric Orthopedics
- 408 (8-408). Orthopedic Service
- 410 (8-410). Orthopedic Pathology
- 411 (8-411). Orthopedic Operative Surgery
- 412 (8-412). Orthopedic Anatomy
- 416 (8-416). Orthopedic Research

Otolaryngology (Otol)

Michael M. Paparella, Professor and Head

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 familiarization with the content of the specialty. The essence of teaching in the Department of Otolaryngology consists of active student participation in the clinical examination of patients with otolaryngological disorders. This is supplemented by discussions and seminars with the faculty. During this time the student develops skills in the examination (especially indirect laryngoscopy) and interpretation of findings. Students are also encouraged to spend additional elective time in clinical, surgical, and research services in the department.

Professor

Michael M. Paparella, M.D.
Frank M. Lassman, Ph.D.
(Audiology and Speech)
W. Dixon Ward, Ph.D.
(Hearing Research)
Henry L. Williams, M.D.

Clinical Professor

Jerome A. Hilger, M.D., M.S.
Robert E. Priest, M.D., M.S.

Associate Professor

Arndt J. Duvall, M.D., M.S.

Clinical Associate Professor

Albert Hohmann, D.D.S., M.D.
Conrad Holmberg, M.D.
Kurt Pollak, M.D.

Assistant Professor

Lawrence R. Boies, Jr., M.D.
Mary Jayne Capps, Ph.D.
Cedric Quick, M.D.

Clinical Assistant Professor

John Glaeser, M.D.
John S. Huff, M.D.
Bradley Kusske, M.D.
Douglas Kusske, M.D.
Hyman Paisner, M.D.
Robert Richardson, M.D.
Graham C. Smith, M.D., M.S.
George V. Tangen, M.D., M.S.

Instructor

Carol J. Becklund, M.A.
Helen L. Gladwin, M.A.
Raymond A. Stassen, M.A.

Clinical Instructor

John Banovetz, M.D.
David Buran, M.D.
Barclay Cram, M.D.
John R. Hilger, M.D.
Morton Kane, M.D.
Robert Koller, M.D.
Severin Koop, M.D.
Melvin Sigel, M.D.

REQUIRED COURSES

101 (5-101). Otolaryngology. Lectures and demonstrations. (2 cr; prereq regis med)

ELECTIVE COURSES

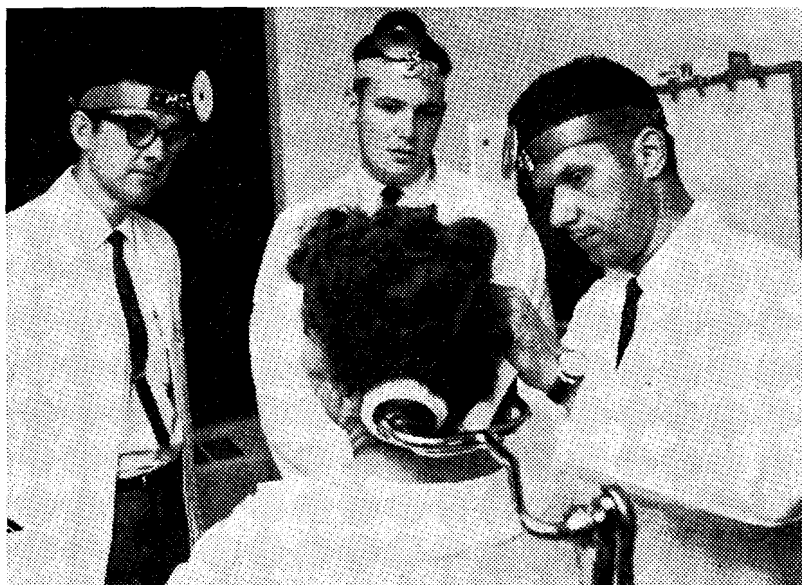
191 (5-191). Otolaryngology Externship. (Cr ar; prereq regis med)

194 (5-194). Research in Otolaryngology

ADVANCED CREDIT COURSES

230 (8-230). Clinical Otology

231 (8-231). Clinical Rhinology, Laryngology



Dr. Paparella demonstrates the otoscopic examination to senior students.

- 232 (8-232). **Surgery of Ear, Nose, and Throat**
- 233 (8-233). **Operative Surgery of the Temporal Bone**
- 234 (8-234). **Operative Surgery of the Nose and Throat**
- 235 (8-235). **Roentgenology of the Head**
- 236 (8-236). **Functional Ear Tests**
- 237 (8-237). **Endoscopy**
- 238 (8-238). **Pathology of the Ear, Nose, and Throat**
- 239 (8-239). **Neurologic Lesions in the Field of Otolaryngology**
- 240 (8-240). **Physiotherapy and Surgery of Malignant Diseases of the Ear, Nose, and Throat**
- 241 (8-241). **Seminar: Current Literature**
- 242 (8-242). **Applied Physiology in Otolaryngology**
- 243 (8-243). **Applied Pharmacology**
- 244 (8-244). **Speech Pathology**
- 245 (8-245). **Allergy**
- 246 (8-246). **Practical Audiology**
- 247 (8-247). **Reconstructive Nasal Surgery**

Pathology (Path)

James R. Dawson, Jr., Professor and Head

Pathology is the study of disease, especially the morphologic changes in organs and tissues which occur in disease. It is the first course in the medical curriculum which is devoted to the study of disease. In lectures, demonstrations, and laboratory study the student is presented the basic reactions of the body to various kinds of injury and also the special types of reactions of various organs and organ systems to specific types of injurious agents. Opportunities are offered to those students who wish to continue their study of pathology beyond the regular courses either by taking elective courses or by engaging in research projects.

Professor

James R. Dawson, Jr., M.D.
Franz Halberg, M.D.
Robert Hebbel, M.D., Ph.D.
Paul H. Lober, M.D., Ph.D.
Lee W. Wattenberg, M.D.

Clinical Professor

Jesse E. Edwards, M.D.

Associate Professor

John I. Coe, M.D.
Donald F. Gleason, M.D., Ph.D.
Kenneth A. Osterberg, M.D.

Assistant Professor

David R. Duffell, M.D.
Walter J. Runge, M.D.
Robert E. Rydell, M.D.

Instructor

William R. Anderson, M.D.
John R. Dyck, M.D.
Erhard Haus, M.D.
David J. Lakatua, M.D.
Wayne H. Schrader, M.D.
Verne A. Schulberg, M.D.

Robert L. Strom, M.D.
Charles E. Weigent, M.D.
Bertram F. Woolfrey, M.D.

Clinical Instructor

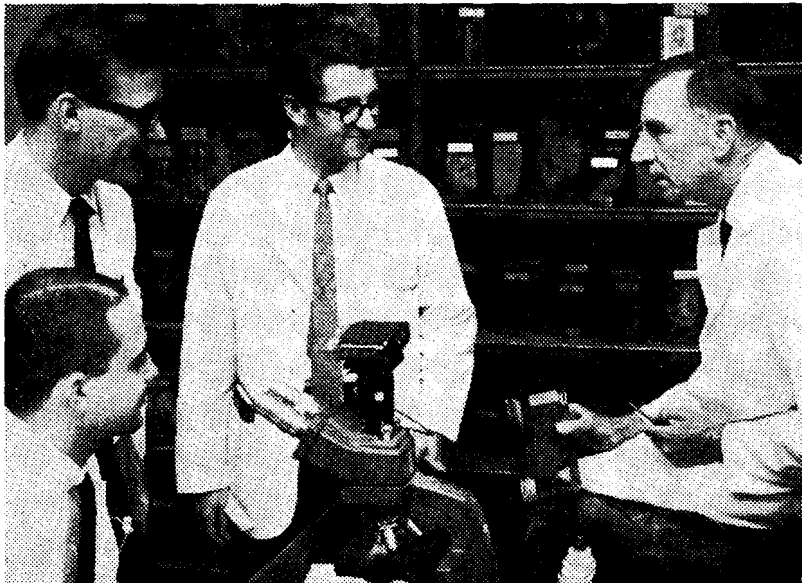
Thomas A. Arlander, M.D.
Charles H. Chedister, M.D.
William Foley, M.D.
Craig Freeman, M.D.
J. Roald Fuglestad, M.D.
Seymour Handler, M.D.
Ellery James, M.D., M.S.
Allen Judd, M.D.
Nicola D. Kostich, M.D.
John E. Kylo, M.D.
Stanley Lofsness, M.D.
Frederick Lott, M.D.
Richard P. Lynch, M.D.
Elias N. Manoles, M.D.
Robert J. McClellan, M.D.
Ronald C. Munkittrick, M.D.
John G. Popowich, M.D.
Thomas Semba, M.D.
Marshall H. Short, M.D.
Clarence M. Strand, M.D.
Walter Subby, M.D.
John O. Swanson, M.D.
Thomas O. Swallen, M.D.

REQUIRED COURSES

- 101f (5-101). **General Pathology.** (8 cr; prereq regis med soph or grad)
102w (5-102). **Special Pathology.** (8 cr; prereq 101 and regis med soph)

ELECTIVE COURSES

- 113 (5-113). **Surgical Pathology.** (Cr ar; prereq 102)
113 (5-114). **Surgical Pathology.** Hennepin County General Hospital. (Cr ar; prereq 102)
113 (5-115). **Surgical Pathology.** Veterans Hospital. (Cr ar; prereq 102)



Dr. Dawson discusses gross pathology with medical students.

- 150 (5-150). **Problems in Pathology.** (Cr ar; prereq regis med)
150 (5-151). **Problems in Pathology.** Hennepin County General Hospital. (Cr ar; prereq regis med)
150 (5-152). **Problems in Pathology.** Veterans Hospital. (Cr ar; prereq regis med)

ADVANCED CREDIT COURSES

- 104 (5-104). **Autopsies.** (Cr ar; prereq 102)
105 (5-105). **Diseases of the Kidney.** (3 cr; prereq 102)
106 (5-106). **Diseases of the Heart.** (1 cr; prereq 102)
110 (5-110). **Seminar: Pathology.** (1 cr per qtr; prereq 102)
111 (5-111). **Conference on Autopsies.** (1 cr per qtr; prereq 102)
112 (5-112). **Diagnosis of Tumors.** (Cr ar; prereq 102)
115 (8-701). **Advanced Neuropathology.** (Cr ar, §Neur 8-703)
119 (8-702). **Survey of Neuropathology.** Examination of specimens from current autopsies. (Cr ar, §Neur 8-704)
122 (5-122). **Basic Science of Cancer.** (3 cr)

Description of Courses

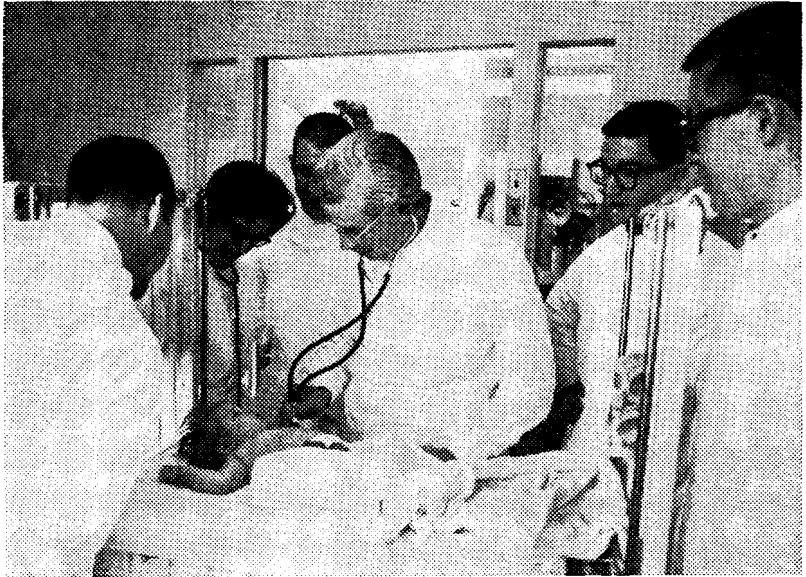
- 140 (5-140). Seminar: Experimental Pathology. (1 cr)
- 141 (5-141). Problems in Experimental Pathology. (Cr ar)
- 151 (5-161). Forensic Pathology. (2 cr; prereq 104 or equiv or Δ)
- 201 (8-201). Research
- 207 (8-207). Research in Experimental Pathology

Pediatrics (Ped)

John A. Anderson, Professor and Head

The field of pediatrics is concerned with the basic aspects of human developmental biology during prenatal and postnatal life extending through the entire period of growth and development to maturity. Students obtain experience during the last 2 years of medicine by participating in the patient-care programs for children in the outpatient and inpatient services of the University Hospitals and in affiliated community hospitals. Working experience in all aspects of diseases as they occur in children is provided. Students have the opportunity to observe and participate in diagnostic and care programs concerned with the premature and the newborn, growth and developmental processes, endocrinology, allergy, cardiology, psychiatry, communicable diseases, and in problems of a nutritional or metabolic nature. There is considerable emphasis on preventive as well as therapeutic medicine. The program provides a broad spectrum of experience concerning all of the medical, psychologic, and social problems that may affect children.

To help the student reinforce fundamental concepts, the program maintains strong emphasis on the application of basic knowledge in the prevention, diagnosis, and management of diseases in infants and children. Opportunities for a special interest in selected areas of pediatrics are provided to interested students.



Dr. Anderson makes rounds on a pediatric ward.

Description of Courses

Professor

John A. Anderson, M.D., Ph.D.
Robert A. Good, M.D., Ph.D.
William Krivit, M.D., Ph.D.
Alfred F. Michael, M.D.
Paul G. Quie, M.D.
Richard B. Raile, M.D.
Robert A. Ulstrom, M.D.
Robert L. Vernier, M.D.
Lewis W. Wannamaker, M.D.

Clinical Professor

Paul F. Swan, M.D.
Albert V. Stoesser, M.D., Ph.D.

Associate Professor

Ray C. Anderson, M.D., Ph.D.
Robert A. Bridges, M.D.
Stephen S. Chapman, Ph.D.
Edward C. Defoe, M.D.
Ernest D. Gray, Ph.D.
Russell V. Lucas, M.D.
Bernard L. Mirkin, M.D., Ph.D.
Arthur R. Page, M.D.
John W. Reynolds, M.D.
Kenneth F. Swaiman, M.D.
Homer D. Venters, M.D.
Warren J. Warwick, M.D.
James G. White, M.D.
Francis S. Wright, M.D.

Clinical Associate Professor

Arnold S. Anderson, M.D.
Stuart L. Arey, M.D.
Paul M. Ellwood, M.D.
Harold B. Hanson, M.D.
Stanley A. Leonard, M.D.
Elizabeth Lowry, M.D.

Assistant Professor

Bascom F. Anthony, M.D.
Charles A. Branthaver, M.D.
David M. Brown, M.D.
Barbara A. Burke, M.D.
Richard A. Chilgren, M.D.
C. Carlyle Clawson, M.D.
Adnan S. Dajani, M.D.
Rolf R. Engel, M.D.
Robert O. Fisch, M.D.
Alfred Fish, M.D.
Lloyd A. Fish, M.D.
Gary Gathman, M.D.
Henry Gewurz, M.D.
Margaret J. Horrobin, M.D.
James J. Lawton, M.D.
John Matsen, M.D.
Hilaire Meuwissen, M.D.
James H. Moller, M.D.
Harriet J. Morgart, M.Ed.
Mark E. Nesbit, M.D.
George R. Noren, M.D.
Henry S. Sauls, M.D.

Krishna M. Saxena, M.D.
Harvey L. Sharp, M.D.
Henry P. Staub, M.D.
Martha B. Strickland, M.D.
Robert W. ten Benschel, M.D.

Clinical Assistant Professor

Don P. Amren, M.D.
Northrup Beach, M.D.
Eldon B. Berglund, M.D.
William D. Bevis, M.D.
Heinz H. Bruhl, M.D.
Donnell D. Eitzwiler, M.D.
John J. Galligan, M.D.
Evelyn E. Hartman, M.D.
William Heilig, M.D.
George W. Lund, M.D.
Jack M. Markovitz, M.D.
Edward N. Nelson, M.D.
Theodore C. Papermaster, M.D.
Sidney S. Scherling, M.D.
Albert Schroeder, M.D.
Theodore Smith, M.D.
Edward K. Strem, M.D.
John D. Tobin, M.D.

Research Associate

Harold R. Ireton, Ph.D.

Lecturer

Allyn G. Bridge, M.D.
A. Jack Hafner, Ph.D.
Elliott B. Karpeles, D.D.S.
Lawrence H. Meskin, D.D.S., M.S.D.,
Ph.D.
Wentworth Quast, Ph.D.

Instructor

Gregory A. Culley, M.D.
Eunice A. Davis, M.D.
Roswith I. Lade, M.D.

Clinical Instructor

Sol Austrian, M.D.
Alice Brill, M.D.
James G. Cardle, M.D.
Richard C. Cohan, M.D.
Richard T. Cushing, M.D.
Robert T. Dooley, M.D.
Sergio Franco-Vasquez, M.D.
Clayton R. Green, M.D.
Harold Katkov, M.D.
George Kimmel, M.D.
Wallace Lueck, M.D.
William Mulholland, M.D.
Lloyd Nelson, M.D.
Everett C. Perlman, M.D.
Richard E. Sand, M.D.
Sylvester Sanfilippo, M.D.
Francis E. Schaar, M.D.
Lewis Sher, M.D.
Lawrence J. Sholler, M.D.

Medical School

Charles L. Steinberg, M.D.
Ellsworth Stenswick, M.D.
Norman Sterrie, M.D.

Jack L. Strobel, M.D.
Richard Tudor, M.D.
Walter Wilder, M.D.

REQUIRED COURSES

- 120 (5-120). **Clinical Lectures in Pediatrics.** Physical growth and development. Psychological development. Physiology and metabolism. (2 cr; prereq regis med)
- 135 (5-135). **Clinical Clerkship in Pediatrics.** Patients on wards assigned to individual students for examination, treatment, and follow-up observation under supervision including demonstration clinics on contagious and noncontagious diseases. (12 cr; prereq regis med)

ELECTIVE COURSES

Inpatient Clinical Externship

- 181 (5-501). **Inpatient Externship at Hennepin County General Hospital.** (Cr ar)
- 181 (5-502). **Inpatient and Outpatient Externship at Children's Hospital.** (Cr ar)
- 181 (5-503). **Inpatient Externship at St. Paul-Ramsey Hospital.** (Cr ar)

Outpatient Clinical Externship

- 181 (5-511). **Outpatient Externship at University Hospitals.** (Cr ar)
- 181 (5-512). **Outpatient Externship at Hennepin County General Hospital.** (Cr ar)
- 181 (5-513). **Clinical Experience at Community-University Health Care Center.** (Cr ar)
- 181 (5-515). **Outpatient Health Care at St. Paul-Ramsey Hospital.** (Cr ar)
- 181 (5-516). **Clinical Pediatrics at the Mayo Clinic.** (Cr ar)

Subspecialty Externship

- 182 (5-531). **Neo-Infant Program.** (Cr ar)
- 182 (5-532). **Clinical Immunology at University Hospitals.** (Cr ar)
- 182 (5-533). **Pediatric Cardiology at the Mayo Clinic.** (Cr ar)
- 182 (5-534). **Pediatric Cardiology at the University Hospitals.** (Cr ar)
- 182 (5-535). **Infectious Disease.** (Cr ar)
- 182 (5-536). **Pediatric Hematology-Oncology at University Hospitals.** (Cr ar)
- 182 (5-537). **Pediatric Endocrinology and Metabolism at University Hospitals.** (Cr ar)
- 182 (5-538). **Endocrinology and Metabolism.** (Cr ar)
- 182 (5-539). **Introduction to Neonatology.** (Cr ar)
- 182 (5-540). **Pediatric Neurology at University Hospitals.** (Cr ar)
- 182 (5-541). **Pediatric Neurology at the Mayo Clinic.** (Cr ar)
- 182 (5-542). **Clinical Pharmacology.** (Cr ar)

Description of Courses

- 182 (5-543). Nephrology at the University Hospitals. (Cr ar)
- 182 (5-544). Pediatric Pulmonary Disease. (Cr ar)
- 182 (5-545). Child Psychiatry at the Mayo Clinic. (Cr ar)

Research

- 183 (5-571). Research at Community-University Health Care Center. (Cr ar)
- 183 (5-572). The Prenatal Interview as a Predictor of Health Risk Areas for a Child. (Cr ar)
- 183 (5-573). Research in Immunocytology. (Cr ar)

ADVANCED CREDIT COURSES

- 200 (8-200). Graduate Seminar: Pediatrics
- 202 (8-202). Pediatric Clinic
- 204 (8-204). Residency in Pediatrics
- 206 (8-206). Pediatric Special Interest
- 208 (8-208). Pediatric Research

Pharmacology (Phcl)

Frederick E. Shideman, Professor and Head

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 during the sophomore year is placed on mechanism 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. Emphasis during the third and fourth years of medicine shifts to clinical use of drugs. At this point clinical pharmacologists attempt to show by means of ward rounds and clinical conferences how principles of pharmacology are applied for treatment of disease in patients.

Professor

Norman O. Holte, D.D.S.
Frank T. Maher, M.D., Ph.D.
Gilbert J. Mannering, Ph.D.
Jack W. Miller, Ph.D.
Frederick E. Shideman, M.D., Ph.D.

Associate Professor

Nelson Goldberg, Ph.D.
Bernard L. Mirkin, M.D., Ph.D.
Akira E. Takemori, Ph.D.
Travis I. Thompson, Ph.D.
Ben G. Zimmerman, Ph.D.

Assistant Professor

Faruk S. Abuzzahab, M.D., Ph.D.
James F. Cumming, M.D., Ph.D.
Donald B. Hunninghake, M.D.
Harvey J. Kupferberg, Ph.D.
Roy W. Pickens, Ph.D.
Aloysius J. Quebbemann, Ph.D.
Norman E. Sladek, Ph.D.
Sheldon B. Sparber, Ph.D.

Instructor

Patrick E. Hanna, Ph.D.

REQUIRED COURSES

- 103-104† (5-103/5-104). **General Pharmacology.** Lectures and laboratory exercises on the action and fate of drugs. (10 cr; prereq regis med soph, Phsl 106, 107 or equiv and MdBc 100, 101 or equiv)
- 105 (5-105). **Forensic Medicine and Medical Jurisprudence.** Lectures on the legal aspects of medicine and on laws governing the practice of medicine. (1 cr; prereq regis med sr or #)

ELECTIVE COURSES

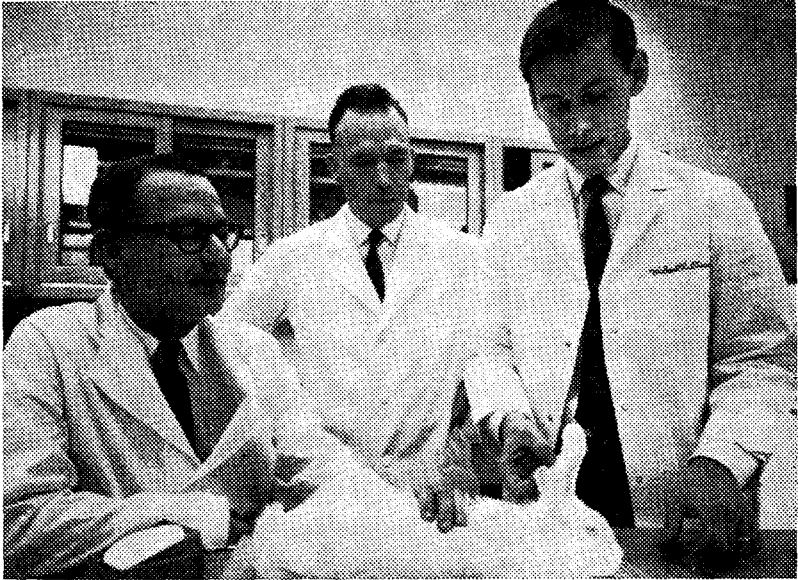
- 106 (5-106). **Toxicology.** Lectures on the chemistry, action, fate, and detection of toxic substances. (2 cr; prereq 103 and 104 or ¶104)
- 107 (5-107). **Pharmacometrics.** Lectures and laboratory exercises on the principles and applications used in the evaluation of drug activity. (3 cr; prereq 102 or 103, 104 or #)
- 109 (5-109). **Problems in Pharmacology.** (Cr and hrs ar; prereq #)

ADVANCED CREDIT COURSES

- 201 (8-201). **Advanced Pharmacology: Physiological Disposition of Drugs**
- 202 (8-202). **Advanced Pharmacology: Pharmacodynamics**
- 203 (8-203). **Research in Pharmacology**

Description of Courses

- 204 (8-204). Seminar: Selected Topics in Pharmacology
- 204 (5-501). Clinical Pharmacology
- 204 (5-502). Clinical Pharmacology
- 205 (8-205). Seminar: Survey of Current Pharmacological Literature
- 206 (8-206). Seminar: Psychopharmacology



Dr. Shideman and associates about to begin an experiment.

Physical Medicine and Rehabilitation (PMed)

Frederic J. Kottke, Professor and Head

The care of patients with chronic diseases will occupy an increasing proportion of the time of the physician in the future. The comprehensive medical management of a patient with chronic disease or disability requires that the physician be skilled in the evaluation of the patient's remaining abilities which may be utilized to rehabilitate him to his optimal level of function. Rehabilitation requires the use of multiple types of therapy and participation by multiple members of the allied health professions in a coordinated program. The Department of Physical Medicine and Rehabilitation utilizes the Rehabilitation Center to provide, within a single area of the University Hospitals, the setting in which this multi-disciplinary approach can be taught. The student learns the concept and application of comprehensive care of the patient by example, precept, and participation in the program of patient care. Methods of coordination, communication, leadership, and administration are learned by participation in the practice of physical medicine and of patient management. By active involvement, the student may become prepared for similar activities in his own professional practice. In this rehabilitation program the student also has the opportunity to participate in research related to neuromuscular and circulatory function, techniques of therapy, programs for better management of patients, and methods of education in the health professions.

Professor

Frederic J. Kottke, M.D., Ph.D.
Peter F. Briggs, Ph.D.
Glenn Gullickson, M.D., Ph.D.
William G. Kubicek, Ph.D.
Frank M. Lassman, Ph.D.

Milton Malof, Ph.D.
Romine E. Matthews, Ph.D.
Wilbur L. Moen, B.S., B.A.
Mostafa Mosharafa, Ph.D.
Martin O. Mundale, M.S.
James F. Pohilla, M.S.
Helen Skowlund, M.S.

Clinical Professor

Thomas P. Anderson, M.D., Ph.D.
Paul M. Ellwood, M.D.
Miland E. Knapp, M.D.

Clinical Assistant Professor

W. John Dawson, M.D.
Loren Leslie, M.D.
Frank Meelhuysen, M.D.
Ruby G. Overmann, M.D.
Richard R. Owen, M.D.
John E. Quast, M.D.
Herbert A. Schoening, M.D.
Richard M. Steidl, M.D.

Associate Professor

Essam A. Awad, M.D.
Theodore M. Cole, M.D.
Daniel Halpern, M.D.
Alan Roberts, Ph.D.
Bror S. Troedsson, M.D.
F. George Zaki, Ph.D.

Clinical Associate Professor

Pearl Rosenberg, Ph.D.

Assistant Professor

John D. Allison, M.S.
Wesley D. Anderson, D.V.M.
Alan Bensman, M.D.
Helen Dahlstrom, B.A.
Marian L. Eliason, B.S.
Dortha L. Esch, B.S.
Marvin G. Lepley, B.S.

Instructor

Robert Bollinger, B.S.
Shelby Clayson, M.S.
Mary Kay Cowan, B.S.
Arthur From, M.D.
Vivian Hannan, B.S.
Garland K. Meadows, M.Ed.
Jane Olson, M.A.
Donna K. Pauley, B.S.
Mary Price, M.D.
Glenn Scudder, B.S.
Clarence A. Sicard, B.S.
Lorraine Wolff, M.A.

Description of Courses

Clinical Instructor

Joseph P. Engel, M.D.
Roger F. Hallin, M.D.

Rollin J. Houle, M.D.
Michael Kosiak, M.D.
Arthur B. Quiggle, M.D.

ELECTIVE COURSES

- 181 (5-410). **Adult Rehabilitation Medicine.** (Cr ar; prereq regis med)
- 181 (5-411). **Pediatric Rehabilitation Medicine.** (Cr ar; prereq regis med)
- 181 (5-412). **Arthritis Rehabilitation.** (Cr ar; prereq regis med)
- 181 (5-413). **Amputation Rehabilitation.** (Cr ar; prereq regis med)
- 181 (5-414). **Physical Medicine and Rehabilitation for the Family Physician.** (Cr ar; prereq regis med)
- 181 (5-415). **Psychological Aspects of Chronic Disease.** (Cr ar; prereq regis med)
- 181 (5-420). **Histopathology, Electrodiagnosis, and Kinesiology.** (Cr ar; prereq regis med)
- 190 (5-430). **Research in Physical Medicine and Rehabilitation.** (Cr ar; prereq regis med)

ADVANCED CREDIT COURSES

- 200 (8-200). **Physical Medicine and Rehabilitation Service**
- 204 (8-204). **Peripheral Vascular Disease Clinic**
- 205 (8-205). **Physical Medicine and Rehabilitation Literature**
- 206 (8-206). **Physical Medicine and Rehabilitation Conference**
- 210 (8-210). **Research in Physical Medicine and Rehabilitation**
- 211 (8-211). **Electronics in Physical Medicine and Rehabilitation**
- 212 (8-212). **Electrodiagnosis and Electromyography**
- 220 (8-220). **Seminar: Physical Medicine and Rehabilitation**

Physiology (Phsl)

Eugene Grim, Professor and Head

Professor

H. Mead Cavert, M.D., Ph.D.
Eugene Grim, Ph.D.
John A. Johnson, M.D., Ph.D.
Nathan Lifson, M.D., Ph.D.
Victor Lorber, M.D., Ph.D.
Carlo Terzuolo, M.D.
Maurice B. Visscher, M.D., Ph.D.

Associate Professor

Marvin Bacaner, M.D.
Irwin J. Fox, M.D., Ph.D.
Rodney B. Harvey, M.D., Ph.D.

Jui S. Lee, Ph.D.
Aldo Rescigno, M.D.

Assistant Professor

Eric Hahn, M.S., Ph.D.
David Levitt, M.D., Ph.D.
Richard E. Poppele, Ph.D.
Richard L. Purple, Ph.D.
David E. Schafer, Ph.D.
Richard Stish, B.E.E.

Lecturer

Maurice W. Meyer, D.D.S.

REQUIRED COURSES

106s-107f (5-106/5-107). **Human Physiology.** (7 cr for 106, 8 cr for 107; prereq regis med fr or grad for 106...regis med soph or grad, neuroanatomy, organic chemistry, zoology for 107)

ELECTIVE COURSES

113 (5-113). **Problems in Physiology.** Topics assigned for laboratory study, conferences, and reading. (Cr ar; prereq 107)

ADVANCED CREDIT COURSES

- 112w (8-236). **Hemodynamic Measurements**
201f,w,s (8-201). **Seminar: Literature**
202 (8-202). **Readings in Physiology**
203 (8-203). **Research in Physiology**
204 (8-204). **History of Physiology**
210 (8-210). **Selected Topics in Permeability**
211f (8-211). **Selected Topics in Heart and Circulation**
212 (8-212). **Selected Topics in Respiration**
213 (8-213). **Selected Topics in Alimentary Physiology**
216 (8-216). **Selected Topics in Neurophysiology**
219w (8-239). **Topics in Microcirculation and Lymphatics**
220s (8-220). **Methods of Analysis**
227f (8-227). **Methods in Physiology**
230f-231w (8-230/8-231). **Transport Processes in Biology**
234 (8-234). **Respiration, Acid-Base Chemistry, and Electrolyte Metabolism**
235 (8-235). **Bioenergetics of Cardiac Contraction**
236 (8-214). **Selected Topics in Nephrology**
238 (8-238). **Neural and Humoral Control of Circulation**

Psychiatry

William Hausman, Professor and Head

The teaching program in psychiatry is designed to help the student understand the emotional aspects of patients' illnesses and to demonstrate the various treatment methods of helping patients with problems of this nature. The psychiatry program is designed to help the student understand and label the varieties of human behavior as they relate to patients showing emotional distress and to his role as a helping person. In the first year, determinants of behavior are studied. In the second year, the course deals with descriptive and developmental psychopathology, psychological testing, and problems of the doctor-patient relationship. This is reemphasized in the third year along with supervised clinical experience wherein the student learns to relate to emotionally disturbed people.

Elective and free-time programs offer possibilities which are designed to meet the interest of the student.

Adult Psychiatry (AdPy)

William Hausman, Professor and Director

Professor

Richard W. Anderson, M.D.
Donald W. Hastings, M.D.
William Hausman, M.D.
Robert Hinkley, M.D.
Burtrum C. Schiele, M.D.
Werner Simon, M.D.

Clinical Professor

Irving C. Bernstein, M.D.
S. Alan Challman, M.D.
Philip Feinberg, M.D.
Gove Hambidge, Jr., M.D.
Otto N. Raths, Jr., M.D.
Clarence J. Rowe, M.D.
Marvin Sukov, M.D.
David J. Vail, M.D.

Associate Professor

Titus P. Bellville, M.D.
Floyd Garetz, M.D.
William W. Jepson, M.D.

Clinical Associate Professor

Robert Bush, M.D.
Leslie Caplan, M.D.
Donald Daggett, M.D.
Clifford O. Erickson, M.D.
Walter Gardner, M.D.
Charles Haberle, M.D.
Frank Kiesler, M.D.
Joyce S. Lewis, Jr., M.D.
J. Benjamin Lund, M.D.

Donald Mayberg, M.D.
John Regan, M.D.

Assistant Professor

Faruk Abuzzahab, M.D.
A. Margaret Bailey, M.D.
Edward Bardon, M.D.
Cherry Cedarleaf, M.D.
David W. Cline, M.D.
Charles E. Dean, M.D.
John Docherty, M.D.
Thomas Dredge, Sr., M.D.
Daniel Ferguson, M.D.
Joseph Gendron, M.D.
Stephen M. Greenwald, M.D.
Richard O. Heilman, M.D.
G. Wendell Hopkins, M.D.
Orville H. Johnson, M.D.
Myron Messenheimer, M.D.
Sonja D. Monson, M.D.
Anthony J. Pollock, M.D.
Edward W. Posey, M.D.
Richard R. Teeter, M.D.

Clinical Assistant Professor

Burton Abramson, M.D.
Jerome Bach, M.D.
Robert Clark, M.D.
George Dorsey, M.D.
Louis Flynn, M.D.
James Garvey, M.D.
Leonard Goldman, M.D.
John Haas, M.D.
Glenn Lewis, M.D.

Medical School

William T. Luckey, M.D.
John Mulvahill, M.D.
Ilgvars Nagobads, M.D.
Martin Orbuch, M.D.
Henry J. Osekowsky, M.D.
Jennings Peteler, M.D.
Loren Pilling, M.D.
James Swenson, M.D.
Frederic Wilson, M.D.
Ronald Young, M.D.

Instructor

Arie W. Dieperink, M.D.
Harold J. Lawn, M.D.
Charles McCafferty, M.D.
Mary Pennington, M.D.

Clinical Instructor

David Auran, M.D.
Ronald N. Berry, M.D.
Thomas P. Burton, M.D.
Robert Fischer, M.D.
William Goodchild, M.D.
Malka Goodman, M.D.
Bruce Hiller, M.D.
Murray S. Locke, M.D.
Richard G. Lunzer, M.D.
Timothy Magee, M.D.
John C. Whitacre, M.D.

Lecturer

George Williams, M.D.

REQUIRED COURSES

- 103 (5-103). Clinical Clerkship in Psychiatry. (6 cr; prereq regis med)
120s (5-101). Basic Behavioral Science. (3 cr; prereq regis med fr)
121s (5-102). Behavior Pathology and Psychiatric Methods. (4 cr; prereq regis med soph)

ELECTIVE COURSES

- 106 (5-106). Externship in Clinical Psychiatry. (Cr ar; prereq regis med sr)
191 (5-500). Externship in Adult Psychiatry at Hennepin County General Hospital. (Cr ar; prereq regis med)
191 (5-501). Externship in Adult Psychiatry at St. Paul-Ramsey Hospital. (Cr ar; prereq regis med)
191 (5-502). Externship in Adult Psychiatry at Veterans Administration Hospital. (Cr ar; prereq regis med)
191 (5-503). Externship in Adult Psychiatry at Fairview and St. Mary's Hospitals. (Cr ar; prereq regis med)
193 (5-510). Clinical Problems in Psychiatry. (Cr ar; prereq regis med)

ADVANCED CREDIT COURSES

- 145 (5-120). Readings in Psychiatry. (Cr ar)
171A (5-121). Descriptive Psychiatry. (Cr ar)
251 (8-201). Clinical Inpatient Psychiatry
252 (8-202). Clinical Outpatient Psychiatry
254 (8-203). Advanced Clinical Inpatient Psychiatry
255 (8-204). Advanced Clinical Outpatient Psychiatry
257 (8-205). Special Assignments
258 (8-206). Research
260 (8-207). Orientation to Clinical Psychiatry
263 (8-208). Survey of Physiologic Treatments in Psychiatry
264 (8-209). Introduction to Clinical Psychology

Description of Courses

- 265 (8-210). **Personality Development and Psychodynamics**
- 267 (8-211). **Social Psychiatry**
- 269 (8-212). **Introduction to Psychotherapy**
- 270 (8-213). **Review of Current Literature**
- 271 (8-214). **Basic Readings in Psychoanalysis I**
- 273 (8-215). **Survey of Psychosomatic Medicine**
- 276 (8-216). **Current Research in Psychiatry**
- 278 (8-217). **Introduction to Family Therapy Techniques**
- 279 (8-218). **Development of Psychiatric Thought**
- 281 (8-219). **Readings in Psychoanalysis II**
- 283 (8-220). **Seminar: Special Topics**
- 290 (8-221). **Survey of Psychiatry for Neurology Residents**
- 291 (8-222). **Seminar: Current Literature**
- 292 (8-223). **Special Supervision in Psychotherapy**
- 293 (8-224). **Problems in Teaching Psychiatry**
- 295 (8-225). **Introduction to Group Therapy**

Child Psychiatry (ChPy)

John C. Duffy, Assistant Professor and Acting Director

Professor

A. Jack Hafner, Ph.D.
Reynold A. Jensen, M.D.
Wentworth Quast, Ph.D.

James Lawton, Jr., M.D.
Lawrence C. Mayerle, M.D.

Clinical Assistant Professor

Dorothy Bernstein, M.D.
Paul Bransford, M.D.
Leo Hanvik, Ph.D.
Ronald Kyllonen, M.D.

Assistant Professor

George J. Barry, M.D.
John C. Duffy, M.D.
Michael F. Koch, M.D.

ELECTIVE COURSES

- 192 (5-500). **Externship in Child Psychiatry.** (Cr ar; prereq regis med)
- 193 (5-520). **Problems in Basic and Clinical Child Psychiatry.** (Cr ar; prereq regis med)

ADVANCED CREDIT COURSES

- 253 (8-201). **Clinical Child Psychiatry**
- 256 (8-202). **Advanced Clinical Child Psychiatry**
- 284 (8-203). **Readings in Child Psychiatry**
- 285 (8-204). **Seminar: Current Literature in Child Psychiatry**
- 286 (8-205). **Diagnostic and Therapeutic Methods in Child Psychiatry**
- 287 (8-206). **Research in Child Psychiatry**

Medical School

Clinical Psychology (CIPy)

Starke R. Hathaway, Professor and Director

Professor

Peter F. Briggs, Ph.D.
Norman Garmezy, Ph.D.
Irving I. Gottesman, Ph.D.
A. Jack Hafner, Ph.D.
Starke R. Hathaway, Ph.D.
Gordon T. Heistad, Ph.D.
David T. Lykken, Ph.D.
Paul E. Meehl, Ph.D.
Manfred J. Meier, Ph.D.
Wentworth Quast, Ph.D.
William Schofield, Ph.D.
Robert D. Wirt, Ph.D.

Associate Professor

John P. Brantner, Ph.D.
James Butcher, Ph.D.
Harold Gilberstadt, Ph.D.
Thomas Kiresuk, Ph.D.
Alan H. Roberts, Ph.D.
Lloyd K. Sines, Ph.D.
Travis I. Thompson, Ph.D.
Daniel N. Wiener, Ph.D.

Assistant Professor

Edward M. Eells, Ph.D.
Seymour Gross, Ph.D.
Margalith Holzinger, Ph.D.

Harold Ireton, Ph.D.
Milton Malof, Ph.D.
Romine Matthews, Ph.D.
Mary Lou Maxwell, Ph.D.
Charles Moan, Ph.D.
William Myers, Ph.D.
Phyllis C. Reynolds, Ph.D.
George W. Shardlow, Ph.D.
John G. Sineps, Ph.D.
Zigfrids Stelmachers, Ph.D.
Donald R. Steiper, Ph.D.
Edward J. Thwing, Ph.D.

Clinical Assistant Professor

Patricia E. Good, Ph.D.
Richard Friberg, Ph.D.
Leo Hanvik, Ph.D.
Gayle K. Lumry, Ph.D.
Sherman Nelson, Ph.D.
Murray K. Reed, Ph.D.
Jon Weinberg, Ph.D.

Instructor

Marlin Wiener, Ph.D.

Clinical Instructor

Willard Kehrberg, Ph.D.

ADVANCED CREDIT COURSES

- 172 (5-101). Human Behavior in New and Stressful Situations
- 200 (8-200). Descriptive Psychopathology
- 201 (8-201). Readings in the History of Psychiatry
- 202 (8-202). Special Research Topics
- 203 (8-203). Psychometric Clerkship
- 204 (8-204). Internship in Clinical Psychology
- 205 (8-205). Advanced Seminar
- 206A (8-206). Medical Psychology A
- 206B (8-207). Medical Psychology B
- 206C (8-208). Medical Psychology C
- 206D (8-209). Medical Psychology D
- 229 (8-210). Behavior Assessment of the Neurological Patient
- 274 (8-211). Seminar: Basic Principles of Clinical Psychology

Description of Courses

- 277 (8-212). **Psychophysiology for Psychiatrists**
- 292 (8-213). **Special Supervision in Psychotherapy**
- 294 (8-214). **Advanced Seminar: Neuropsychology**
- 297 (8-215). **Organic Therapies in Psychiatry**
- 298 (8-216). **Organic Syndromes in Psychiatry**
- 299 (8-217). **Professional Problems in Clinical Psychology**

Medical School

Public Health (PubH)

Gaylord W. Anderson, 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

Gaylord W. Anderson, M.D., Dr.P.H.
Joseph T. Anderson, Ph.D.
Jacob E. Bearman, Ph.D.
Richard G. Bond, M.S., M.P.H.
Allyn G. Bridge, M.D., M.P.H.
Francisco Grande, M.D.
Ansel Keys, Ph.D.
Richard B. McHugh, Ph.D.
George S. Michaelsen, M.D.
Harold J. Paulus, Ph.D.
Leonard M. Schuman, M.D., M.S.
Henry L. Taylor, Ph.D.
Stewart C. Thomson, M.D., M.P.H.

Associate Professor

Donald E. Barber, M.P.H., Ph.D.
Marion W. Thornton, Ph.D.

Assistant Professor

John M. Phin, M.D., M.H.A.
Gustave L. Scheffer, B.S.C.E.
Ralph O. Wollan, M.P.H.

Lecturer

Lloyd F. Detwiller, M.H.A.

REQUIRED COURSES

- 90s **Medical Statistics I.** Frequency proportions and probability; rates, measured variables; chance variation and judgment of significance; association. (3 cr; prereq regis med soph)
- 100s. **Elements of Preventive Medicine and Public Health.** Occurrence and prevention of communicable, degenerative, and industrial diseases; protection of food, water, and milk; maternal and child health. (6 cr; prereq regis med soph)

ELECTIVE COURSES

104. **Epidemiology I.** (Cr ar; prereq regis med)
105. **Epidemiology II.** (3 cr; prereq 104)
106. **Public Health Administration.** (Cr ar; prereq regis med)
107. **Maternal and Child Health.** (Cr ar; prereq regis med)
- 120A. **Biomedical Computing.** (Cr ar; prereq regis med)
123. **Topics in Public Health.** (Cr ar; prereq regis med)
124. **Medical Statistics II.** (Cr ar; prereq regis med)
129. **Epidemiologic Survey Methods.** (3 cr; prereq 104, 140 or equiv, #)
134. **Human Genetics and Public Health.** (3 cr; prereq 100A and #)
136. **Handicapped Children.** (Cr ar; prereq regis med)
- 142s. **Medical Economics.** Economic problems of medical and hospital care for community; programs for medical care and health and hospital insurance. (2 cr)
143. **Measurement and Application of Ionizing Radiation.** (Cr ar; prereq regis med)
151. **Health Aspects of Air Control in Hospitals.** (2 cr; prereq #)
153. **Principles and Methods of Accident Prevention.** (Cr ar; prereq #)

Description of Courses

- 155. **Introduction to Air Pollution Problems.** (Cr ar; prereq regis med)
- 157. **Radiation Protection Criteria for Hospitals.** (2 cr; prereq #)
- 158. **Hospital Safety.** (3 cr; prereq #)
- 188. **Comparative Medicine and Public Health.** (2 cr; prereq 100A and #)
- 191. **Science of Human Nutrition.** (Cr ar; prereq regis med)
- 195. **Public Health Aspects of Cardiovascular Disease.** (Cr ar; prereq regis med)

ADVANCED CREDIT COURSES

- 200. **Research**
- 214. **Health of the School Age Child**
- 238. **Radiation Dosimetry**
- 238A. **Radiation Dosimetry Laboratory**
- 241. **Epidemiology of Noncommunicable Diseases**

Radiology (Rad)

Eugene Gedgaudas, Professor and Head

DIVISION OF ROENTGEN DIAGNOSIS

Eugene Gedgaudas, Professor and Director

Professor

Eugene Gedgaudas, M.D.
Harold O. Peterson, M.D.

Clinical Professor

Samuel B. Feinberg, M.D.
Oscar Lipschultz, M.D.

Associate Professor

Kurt Amplatz, M.D.
Stephen A. Kieffer, M.D.

Clinical Associate Professor

Lewis S. Carey, M.D.
Daniel L. Fink, M.D.
Sewell Gordon, M.D.
Leonard O. Langer, M.D.
Donald H. Peterson, M.D.

Assistant Professor

Harold A. Baltaxe, M.D.
Glen G. Cramer, M.D.
Gail Wilhelm Haut, M.D.
J. Paul Leonard, M.D.
Donald Gene Marsh, M.D.
Paul Neiberger, M.D.
Mario Pliego, M.D.
Shih Hao Tsai, M.D.
Justin Jacob Wolfson, M.D.

Clinical Assistant Professor

Eugene E. Ahern, M.D.
Heino Alari, M.D.
O. J. Baggenstoss, M.D.
Chauncey N. Borman, M.D.
Stanford H. Calin, M.D.
John B. Coleman, M.D.
Glen G. Cramer, M.D.
Donald E. Dietrich, M.D.
Charles W. Frye, M.D.
Milton R. Gilchrist, M.D.

Marvin E. Goldberg, M.D.
Gerald A. Gretsck, M.D.
Barnard Hall, M.D.
Cyrus O. Hansen, M.D.
Donald C. Hauser, M.D.
Harlan Hawkinson, M.D.
Carroll N. Hess, M.D.
Robert E. Kasper, M.D.
Thomas B. Merner, M.D.
Harry W. Mixer, M.D.
David L. Moody, M.D.
John A. Tobin, M.D.
Hugh J. Williams, M.D.

Instructor

Eugene Francis Binet, M.D.
Augustin (Gustav) Formanek, M.D.
Lawrence Harvey A. Gold, M.D.
Walter Conrad Hildebrandt, M.D.
Philippe R. L'Heureux, M.D.
Murray James Mylrea, M.D.
James Yuzo Nakamura, M.D.
Charles C. Nicolette, M.D.
Walter B. Prentice, M.D.
John Maney Wolff, M.D.

Clinical Instructor

Manouchehr Azad, M.D.
Herman H. Eelkema, M.D.
Robert T. Foley, M.D.
Jule J. Hopperstad, M.D.
Richard S. Johnson, M.D.
Thomas Errol Johnson, M.D.
Warren L. Kump, M.D.
Andrew R. Lillie, M.D.
John B. Marta, M.D.
Paul C. Olfelt, M.D.
Arnold O. Rholl, M.D.
Norman F. Stone, M.D.
Richard C. Tucker, M.D.
Stanley Von Drashek, M.D.
William A. Wilcox, M.D.

DIVISION OF NUCLEAR MEDICINE

Merle K. Loken, Ph.D., M.D., Professor and Director

Clinical Professor

Elmer Paulson, M.D.

Assistant Professor

Norbert S. Domek, Ph.D.

Instructor

Martin T. J. Hilger, M.S.

Description of Courses

DIVISION OF RADIATION THERAPY

Komanduri K. N. Charyulu, M.D., Associate Professor and Co-Director
Yosh Maruyama, M.D., Associate Professor and Co-Director

Clinical Professor

Donn G. Mosser, M.D., M.S.

Clinical Associate Professor

John P. Medelman, M.D.

Assistant Professor

Hans Kuisk, M.D.

Eric Walter Hahn, Ph.D.

Vaughn C. Moore, Ph.D.

Clinical Assistant Professor

Solveig M. Bergh, M.D.

Arnolds Veinbergs, M.D.

Instructor

Virgil Thomas Fallon, M.D.

Faiz M. Khan, Ph.D.

Anam Sudarsanam, M.D.

Clinical Instructor

John A. Matthews, M.D.

REQUIRED COURSES

107w (5-107). Biophysics. (1 cr; prereq regis med fr)

ELECTIVE COURSES

181 (5-510). Externship in Diagnostic Radiology. (Cr ar; prereq regis med)

182 (5-505). Externship in Radiation Therapy. (Cr ar; prereq regis med)

183 (5-530). Problems in Radiation Biology and Radioactive Isotope Methods.
(Cr ar; prereq regis med)

184 (5-184). Problems in Diagnostic Radiology. (Cr ar; prereq regis med)

ADVANCED CREDIT COURSES

102 (5-102). X-ray Conference. (1 cr; prereq #)

103 (5-103). Fundamentals of Radiation Physics, Radiology. (1 cr)

104 (5-104). Fundamentals of Nuclear Medicine. (1 cr)

111 (5-111). Medical Roentgenologic Conference. (1 cr)

124 (5-124). Pediatric Roentgenologic Conference. (1 cr)

135 (5-135). Surgical Roentgenologic Conference. (1 cr)

163 (5-163). Neurosurgical Roentgenologic Conference. (1 cr)

170, 171, 172 (5-170, 5-171, 5-172). Radiation Physics. (3 cr; prereq #)

200 (8-200). Research: Roentgenology

201 (8-702). Neuroradiology

202 (8-202). Cardiovascular Roentgenologic Conference

203 (8-203). Growth Development

204 (8-204). Tumor Clinic Conference

205 (8-205). Research: Radiation Therapy, Nuclear Medicine, Radiobiology

207 (8-207). Clinical Nuclear Medicine

208 (8-208). Seminar: Radiology Pathology

Medical School

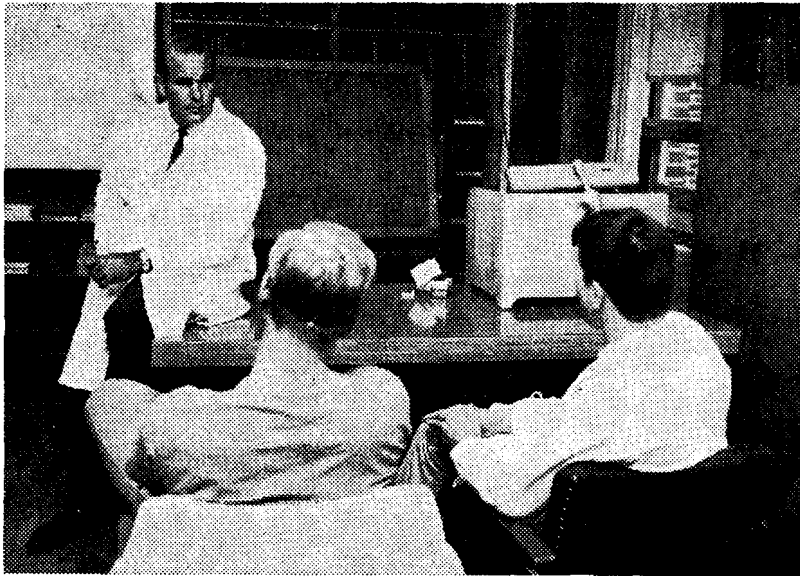
- 209 (8-209). Diagnostic Radiology
- 211 (8-211). Dosimetry of Internal, External Radiation Emitters
- 212 (8-212). Seminar: Radiation Biophysics
- 217 (8-217). Roentgenologic Conference on Chest Diseases
- 220 (8-220). Urologic Roentgenologic Conference
- 236 (8-236). Seminar: Radioisotope
- 238 (8-238). Roentgen-Surgical Pathology Conference
- 240 (8-240). Seminar: Radiation Therapy

Surgery (Surg)

John S. Najarian, Professor and Head

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 general surgery and the surgical subspecialties. The students are given an exposure to basic pathophysiology and a study of 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 clerkship at the University Hospitals and at affiliated hospitals. In addition to the in-patient surgical clerkship, small group seminar sessions with individual members of the full-time staff are offered each afternoon to provide close contact between the students and staff to review 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 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.



Dr. Najarian conducts a seminar for students on the surgery clerkship.

Medical School

General Surgery

Professor

Claude R. Hitchcock, M.D., Ph.D.
Edward W. Humphrey, M.D., Ph.D.
Richard C. Lillehei, M.D., Ph.D.
Charles F. McKhann, M.D.
John S. Najarian, M.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.
Lyle J. Hay, M.D., Ph.D.
Conrad I. Karleen, M.D., D.D.S.
William D. Kelly, M.D., Ph.D.
Arnold J. Kremen, M.D., Ph.D.
N. Logan Leven, M.D., Ph.D.
Charles E. Rea, M.D., Ph.D.

Associate Professor

Aldo Castaneda, M.D., Ph.D.
John J. Haglin, M.D., Ph.D.
Arnold S. Leonard, M.D., Ph.D.
Donald G. McQuarrie, 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., Ph.D.
Davitt A. Felder, M.D., Ph.D.
David Gavisier, M.D., M.S.
Earl C. Henrikson, M.D., M.S.
N. Kenneth Jensen, M.D.
Frank Edward Johnson, M.D.
Bernard G. Lannin, M.D., Ph.D.
Donald C. MacKinnon, M.D.
Maynard C. Nelson, M.D., M.S.
Frederick M. Owens, Jr., M.D.
Frank Quattlebaum, M.D., M.S.
Jacob H. Strickler, M.D., M.S.
Robert William Utendorfer, M.D., M.S.
Earl G. Yonehhiro, M.D., Ph.D.

Assistant Professor

Henry Buchwald, M.D., Ph.D.
John Delaney, M.D., Ph.D.
Victor A. Gilbertsen, M.D., M.S.
Robert Goodale, M.D., Ph.D.
Theodor B. Grage, M.D., Ph.D.
John Lunseth, M.D., Ph.D.
Albert Mowlem, M.D., Ph.D.
Demetre Nicoloff, M.D., Ph.D.
Richard L. Simmons, M.D.
Henry Sosin, M.D., Ph.D.

Clinical Assistant Professor

Samuel G. Balkin, M.D., D.D.S.
Coleman J. Connolly, M.D.
John A. Culligan, M.D.

Edward C. Emerson, M.D.
Harrison Farley, M.D.
Joseph J. Garamella, M.D., Ph.D.
Bernard Goott, M.D., Ph.D.
Jerome T. Grismer, M.D.
William F. Hartfiel, M.D.
Laurence D. Hilger, M.D.
Samuel Hunter, M.D., M.S.
Thomas L. Huseby, M.D.
James LaFave, M.D.
John H. Linner, M.D.
Stanley R. Maxeiner, M.D., M.S.
Daniel J. Moos, M.D.
Nathan C. Plimpton, M.D., M.S.
Walter R. Schmidt, M.D.
William R. Scott, M.D., M.S.
Abbott Skinner, M.D., M.S.
Vernon D. Smith, M.D.
Bernard J. Spencer, M.D.
Lyle A. Tongen, M.D., M.S.

Instructor

Robert C. Anderson, M.D., Ph.D.
James E. DeMeules, M.D.
Robert B. Gilsdorf, M.D.
Gary Lyons, M.D., Ph.D.
John C. Parrott, M.D.
Wallace P. Ritchie, M.D.

Clinical Instructor

John F. Alden, M.D., M.S.
Frank J. Ankner, M.D.
Robert C. Benjamin, M.D.
Manuel R. Binder, M.D.
Norman B. Bloom, M.D.
Donald A. Bolt, M.D.
John B. Brainard, M.D., M.S.
Merrill D. Chesler, M.D.
Charles T. Eginton, M.D., M.S.
Robert S. Flom, M.D.
Leroy J. Fox, M.D.
Donald W. Hannon, M.D.
David F. Hickok, M.D.
Carter W. Howell, M.D.
Joseph Kiser, M.D.
Clarence V. Kusz, M.D.
Donald L. Lamb, M.D.
Lawrence M. Larson, M.D., Ph.D.
Richard Larson, M.D.
Louis C. Lick, M.D., M.S.
Michael F. Lynch, M.D.
Walter L. Lynn, M.D.
Felix A. McParland, M.D.
Berton D. Mitchell, M.D.
Aaron A. Papermaster, D.D.S.
Theodore A. Peterson, M.D.
John H. Rosenow, M.D.
Horace G. Scott, M.D., M.S.
Joseph L. Sprafka, M.D.

Description of Courses

John Stafne, M.D.
William E. Stephens, M.D.
Neil M. Trotman, M.D.
John F. Waldron, M.D.
Richard J. Webber, M.D.

George Werner, M.D.
Carrell E. Westover, M.D.

Research Associate
Nabuko S. Mizuno, M.D.

REQUIRED COURSES

- 121s (5-121). **Principles of Surgery.** "The Origins of Contemporary Surgical Thought." Antiseptics, asepsis, homeostasis, inflammation, process of repair of tissues. (3 cr; prereq regis med soph)
- 129w (5-129). **Clinical Lectures in General Surgery.** (1 cr per yr; prereq regis med)
- 135 (5-135). **Clinical Clerkship.** (16 cr; prereq regis med)

ELECTIVE COURSES

- 181 (5-501). **Externship in Surgery at University Hospitals—Cardiovascular and Thoracic Problems.** (Cr ar; prereq regis med)
- 182 (5-520). **Experimental Surgery.** (Cr ar; prereq regis med)
- 190 (5-500). **Externship in Surgery at University Hospitals—Transplantation and General Surgery.** (Cr ar; prereq regis med)
- 191 (5-502). **Externship in Surgery at University Hospitals.** (Cr ar; prereq regis med)
- 192 (5-503). **Externship in Surgery at University Hospitals—Pediatric Surgery.** (Cr ar; prereq regis med)
- 193 (5-504). **Externship in Surgery at University Hospitals—General Surgical Problems.** Includes some thoracic and cardiovascular cases. (Cr ar; prereq regis med)
- 194 (5-510). **Externship in Surgery at Veterans Administration Hospital.** (Cr ar; prereq regis med)
- 195 (5-511). **Externship in Surgery at St. Paul-Ramsey Hospital.** (Cr ar; prereq regis med)
- 196 (5-512). **Externship in Surgery at Hennepin County General Hospital.** (Cr ar; prereq regis med)
- 197 (5-513). **Externship in Surgery at Mt. Sinai Hospital.** (Cr ar; prereq regis med)

ADVANCED CREDIT COURSES

- 200 (8-200). **Outpatient Clinic in Surgery**
- 203 (8-203). **Proctoscopy and Sigmoidoscopy**
- 204 (8-204). **Tumor Clinic**
- 205 (8-205). **Surgical Diagnosis**
- 208 (8-208). **Surgical Service**
- 211 (8-211). **Operative Surgery**
- 215 (8-715). **Roentgenological-Surgical Conference**
- 216 (8-216). **Surgical Research**

Medical School

- 221 (8-221). Surgery Research Conference
222 (8-222). Surgery Complications Conference
285 (8-785, 8-786, 8-787). Biomedical-Engineering Seminar
290 (8-290). Transplantation and Bone Marrow Conference

Urology (Urol)

Elwin E. Fraley, Professor and Head

Professor

Elwin E. Fraley, M.D.

Clinical Professor

Baxter A. Smith, M.D., M.S.

Associate Professor

Colin Markland, M.D.

George T. Mellinger, M.D. (VA Hospital)

Clinical Associate Professor

Samuel S. Beirstein, M.D.

Milton P. Reiser, M.D., M.S.

Richard S. Rodgers, M.D.

Assistant Professor

Clyde Blackard, M.D. (VA Hospital)

Alexander S. Cass, M.D. (St. Paul-Ran Hospital)

Clinical Assistant Professor

David M. Anderson, M.D.

Robert W. Geist, M.D.

Bruce E. Linderholm, M.D.

Paul R. Hartig, M.D.

Gerald W. Koos, M.D.

Hugo E. Miller, M.D., M.S.

William E. Price, M.D.

Edward J. Richardson, M.D.

Edgar A. Webb, M.D.

Instructor

Gerald W. Ireland, 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.

Gordon W. Strom, M.D.

Theodore H. Sweetser, Jr., M.D.

Shin Tanaka, M.D.

Joseph E. Twidwell, M.D.

REQUIRED COURSES

- 173 (5-173). Urology Lecture. (1 cr; prereq regis med)

ELECTIVE COURSES

- 180 (5-180). Externship in Urology. (Cr ar; prereq regis med)

ADVANCED CREDIT COURSES

- 250 (8-250). Urological Surgery
251 (8-251). Cystoscopy and Urology Diagnosis
252 (8-252). Urological Conference
253 (8-253). Research: Urology
254 (8-254). Urological Seminar
255 (8-255). Urological-Radiological Conference
256 (8-256). Urological-Pathological Conference