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College of Pharmacy

1963-1965



The principles and processes of pharmacy include the preparations of pharmaceuticals.

Bulletin

of the UNIVERSITY of MINNESOTA

UNIVERSITY OF MINNESOTA

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College of Pharmacy

GENERAL INFORMATION

The art and science of pharmacy deals with the preparation, compounding, and dispensing of medicinal agents and the study of their chemistry, pharmacological properties, and therapeutic applications.

Beginning in 1892, the University of Minnesota awarded the Ph.G. 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) greater emphasis on cultural courses which "broaden" the student's knowledge and enhance the prestige of the profession; (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 Prepharmacy 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, general economics, and accounting which are equivalent to those listed in the pharmacy curriculum.

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.

The college also offers an optional combined course in pharmacy and business administration. Evidence of above-average academic ability is required for admission to this course.

Graduate study with major work in pharmaceutical chemistry, pharmaceutical technology, 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 course 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 pharmaceutical chemistry, pharmaceutical technology, pharmacology, and pharmacognosy is contained in the *Bulletin of the Graduate School*.

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 *Bulletin of General Information*.

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 236-238 credit hours of work in professional, scientific, and pharmacy administrative courses (most of it required) of which approximately 50 per cent is laboratory instruction. This must be preceded by the required credits of the prepharmacy year.

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 or 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 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 the approval of the dean.

Examinations and Standings

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

Fees and Expenses

For a detailed statement of fees and expenses, see *Bulletin of General Information*. For course fees, see *Class Schedule* issued at registration.

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 *Bulletin of General Information*.

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 *Bulletin of General Information*.

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

Students who plan to complete course deficiencies during a Summer Session should proceed as indicated above, being sure to supply information on (a) deficient subjects to be removed; (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 of the first year 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.

Graduation Requirements

An over-all 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, all candidates for the degree of bachelor of science in pharmacy are required to pass a comprehensive examination covering the 4 years of professional work as set forth in the curriculum. The comprehensive examination will be given during the spring quarter final examination period.

A student who has met all other requirements for graduation but has failed in the comprehensive examination is eligible for re-examination during the week immediately preceding any subsequent commencement. Application for re-examination

must be made at the college office not less than 15 days prior to the particular examination he wishes to take. A fee of \$5 is charged for each re-examination.

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.

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

In January, 1940, the Minnesota State Board of Pharmacy issued a regulation to the effect 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.

In order that practical experience obtained as an apprentice during summer vacations may be credited toward the year of practical experience required by law, a student must file three statements with the Board of Pharmacy: (a) within 5 days a notice of employment form showing the date apprenticeship began; (b) within 30 days after termination of apprenticeship, an affidavit by his pharmacist preceptor showing the date on which apprenticeship began and ended, this regardless of the length of time employed; and (c) a progress report covering period of apprenticeship as certified to in the affidavit. These forms may be obtained from the secretary of the Minnesota State Board of Pharmacy.

Any student wishing to obtain employment as an apprentice 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 16.

Medicinal Plant Laboratory and Garden

The facilities of the medicinal plant garden, plant laboratory, and greenhouses afford opportunity for instruction in methods of cultivating, collecting, preparing, drying, and milling many official and nonofficial drugs. Many species of plants of medicinal and economic importance grown in the garden and greenhouses provide ample and varied material for study of the gross anatomical, histological, and chemical characteristics of these plants, for the preparation of herbarium specimens, for research in medicinal plant cultivation, plant physiology, etc.

Military Science

(Elective Course)

The student entering ROTC will not specialize in any one military field but instead will pursue the general military science course. The aim of this course is to produce officers qualified for any branch of the service.

For detailed information on ROTC programs, see *Bulletin of the Army-Navy-Air Force ROTC*.

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.

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.

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

All of the facilities of the University are open to students of this college. Therefore, students having the necessary prerequisites may elect subjects in other colleges of the University, if such election does not interfere with the required work in the College of Pharmacy. Subjects elected must be approved by the Committee on Student Scholastic Standing.

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 fol-

lowing descriptions. The faculty of the College of Pharmacy will award scholarships only to students who apply unless otherwise specified. No student will be awarded more than one scholarship. The scholarships are awarded on the bases of scholastic achievement, financial need, vocational intention, and other criteria. Additional information and application forms may be obtained from the dean of the College of Pharmacy. For information about all-University scholarships, refer to the section on Financial Aids in the *Bulletin of General Information*.

Two **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 **Bertha D. McWilliams Memorial Scholarship** (\$100) is awarded annually to a student in the College of Pharmacy, with preference to a woman student.

Two **C. Earl Dougherty Memorial Scholarships** (\$250), sponsored by the Mando Photo Company, are awarded annually to students 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 **Dolores and Lawrence M. B. Atkinson Scholarship** (\$300) is awarded annually to a student in the prepharmacy year at the University of Minnesota, with preference to graduates of Bloomington High School.

One **Doris and Ted Maier Scholarship** (\$300) is awarded annually to a student in the prepharmacy year or the first 2 professional years of the pharmacy curriculum, with preference to residents of Winona or vicinity.

One **Gray's Drug Stores Pharmacy Scholarship** (\$250) is awarded annually to a student in the prepharmacy year or the first 2 professional years of the pharmacy curriculum, with preference to male students who have demonstrated interest in the practice of retail pharmacy.

One **McKesson and Robbins (Minneapolis and St. Paul Divisions) 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 or more **Minnesota Rexall Pharmacists Scholarships** (\$300) are awarded annually to students in the College of Pharmacy or to students enrolled at the University of Minnesota for prepharmacy training, with preference to students preparing for a career in retail pharmacy.

One **Minnesota State Pharmaceutical Association Senior Scholarship** (\$300 and a key) is awarded annually to the junior student who achieved the highest scholastic average for the first 8 quarters of professional study. No application is necessary.

Two or more **Minnesota State Pharmaceutical Association Scholarships** (\$225) 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.

Two **Nelson-Forchay Pharmacy Intern Scholarships** (\$300) are awarded annually to students in the College of Pharmacy who have been nominated by pharmacists in the Twin Cities area who have been serving as preceptors in the nominees' apprenticeship training.

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.

Twelve **Samuel W. Melendy Memorial Scholarships** (\$225) are awarded annually to students in the College of Pharmacy. Not more than 4 scholarships are awarded to students in any 1 of the 4 professional years.

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.

One or more **Twin City Wholesale Drug Company Scholarships** (\$250) are awarded annually to students enrolled for the prepharmacy year at the University of Minnesota.

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 Pepsodent Presidential Scholarships, the Walgreen Pharmacy Scholarships, etc.

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

American Foundation for Pharmaceutical Education Fellowships

Rowell Laboratories Incorporated Fellowship (PhmC)

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 5, D.C.

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.

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 \$425 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.

Lehn and Fink Gold Medal—Lehn and Fink Products Corporation, of New York City, awards annually a gold medal to that student in the College of Pharmacy who graduates with the degree B.S. in Pharm. and who has earned the highest general average rating during the 4 years of professional study.

Merck Award—Merck and Company, Inc., manufacturing chemists of Rahway, New Jersey, offers annually the Merck Award to 2 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*.

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*.

Wulling Club Key—The Wulling Club of the College of Pharmacy awards annually an appropriate gold key to that student in the College of Pharmacy who graduates with the degree B.S. in Pharm. and who has earned the second highest general average during the 4 years of professional study.

Communications

Correspondence relating to registration or advanced standing should be addressed to the Office of Admissions and Records, University of Minnesota, Minneapolis 14. 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 14.

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 co-operation 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 curriculums 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, PhmT 1A, 1B, 1C, 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 combined program in pharmacy and business administration 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.

Biol 1-2—General Biology (or equivalent work in zoology and botany)
Phys 1-2-3—Introduction to Physical Science
Phys 1A-2A-3A—Introduction to Physical Science Laboratory

OrCh 61-62—Elementary Organic Chemistry
Econ 1-2—Principles of Economics
Acct 24-25—Principles of Accounting
Electives—not less than 6 credits

PREPHARMACY YEAR

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

(Credits shown in parentheses)

GeCh 4-5—General Principles of Chemistry (5, 5)
GeCh 6—Principles of Solution Chemistry (4)
Math 10—College Algebra, Analytic Geometry (5)
Math T—Trigonometry (3)

Comm 1-2-3—Communication** (4, 4, 4)
PhmT 1A, 1B, 1C—Orientation (1, 1, 1)
Electives (6-8)

Total Prepharmacy Year (13-16f, 15w, 12-14s = 43-45)

FIRST YEAR

Biol 1-2—General Biology (5, 5)
Phys 1-2-3—Introduction to Physical Science (3, 3, 3)
Phys 1A-2A-3A—Introduction to Physical Science Laboratory (1, 1, 1)
OrCh 61-62—Elementary Organic Chemistry (4, 4)

PhmT 3—Pharmaceutical Calculations (3)
PhmT 54—Fundamental Principles and Processes (5)
PhmT 70—First Aid (2)
Electives (9)

Total First Pharmacy Year (15f, 16w, 18s = 49)

** If these courses are not available, consult the dean's office for permissible substitutes.

SECOND YEAR

MicB 53—General Microbiology (5)	Phcg 1-2-3—Introductory Pharmacognosy (3, 3, 3)
OrCh 63—Elementary Organic Chemistry (3)	Electives (3)
Econ 1-2—Principles of Economics (3, 3)	
Acct 24-25—Principles of Accounting (3, 3)	
PhmC 1-2—Inorganic Pharmaceutical Products (4, 4)	Total Second Pharmacy Year (16f, 18w, 16s = 50)
PhmC 54-55—Quantitative Pharmaceutical Chemistry (5, 5)	

THIRD YEAR

PubH 50—Personal and Community Health (3)	Phcl 55-56-57—Pharmacology of Official Medicinal Agents (3, 3, 3)
Phsl 60—Human Physiology (6)	Electives (6)
PhmT 55-56—Pharmaceutical Preparations (4, 4)	
PhmC 53—Pharmaceutical Biochemistry (5)	Total Third Pharmacy Year (16f, 16w, 14s = 46)
PhmC 161-162-163—Organic Medicinal Agents (3, 3, 3)	

FOURTH YEAR

PubH 75—Introduction to Environmental Sanitation (3)	Phcl 101-102—General Pharmacology (2, 5)
Mktg 107A—Retail Management for Pharmacy Students (3)	Phcl 106—Toxicology (2)
PhmT 58-59-60—Prescription Compounding (5, 5, 5)	Specialization courses (3, 3, 3)
PhmT 64—Pharmaceutical Jurisprudence (3)	Total Fourth Pharmacy Year (16f, 16w, 16s = 48)
PhmT 71—Pharmaceutical Specialties (3)	Grand Total Including Prepharmacy Year = 236-238
Phcg 160—Recent Advances in Pharmacognosy (3)	

Specialization Courses—Each student is required to enroll for 9 quarter credits of specialization courses. Any combination is acceptable. The eight combinations which follow are suggested to permit a student to specialize in a particular phase of pharmacy.

Pharmaceutical Chemistry (with a view to graduate work)

1. PhmC 164-165-166 (9 cr)
2. PCh 101, 102, 103 (12 cr)

Pharmacy (retail, hospital, manufacturing)

3. PhmT 68-69 (6 cr) and 165 or 168 (3 cr)
4. PhmT 165, 166-167 (9 cr)

Biology (with a view to graduate work, retail and manufacturing pharmacy)

5. PhmT 72 (3 cr); Phcl 162 (3 cr); and Phcg 164 (3 cr)
6. Phcg 162-163, 164 (9 cr)
7. Phcl 109 (3 cr), 162 (3 cr); and ITM 90
8. Phcg 165-166 (5 cr); and PubH (cr ar)

Students who have demonstrated a high degree of predetermination with respect to work following graduation may petition the Committee on Student Scholastic Standing to substitute equivalent credits in subjects that they believe will be more helpful in their life's work than the "specialization courses" listed above.

Optional Combined Course in Pharmacy and Business Administration

The College of Pharmacy and the School of Business Administration offer an optional combined course in pharmacy and business administration leading to the degrees of bachelor of science in pharmacy and bachelor of science in business

This optional course is open only to those students who register in the College of Pharmacy and who can present evidence of better-than-average ability. Requirements for these degrees are (a) completion of all courses listed in the pharmacy curriculum; and (b) completion of the following courses in the School of Business Administration:

(Credits shown in parentheses)

Econ 1-2—Principles of Economics (6)	QA 51—Business Statistics (3)
BLaw 28—Business Law (3)	BFin 56—Corporation Finance (3)
Acct 24-25-26—Principles of Accounting (9)	Mktg 107C—Retail Management II (3)
QA 5—Elements of Statistics (3 or 4)	Mktg 187—Price Policy (3)
Mktg 57—Principles of Marketing (3)	Mktg 97—Market Analysis and Research I (3)
Prod 50—Production Management (3)	Econ 65—Intermediate Economic Analysis: The Firm (3)
Jour 18—Principles of Advertising (3)	Econ 66—Intermediate Economic Analysis: Income and Employment (3)
Mktg 107A—Retail Management for Pharmacy Students (3)	Econ 67—Money and Banking (3)
Ins 53—Risk Management and Insurance (3)	Econ 68—Elements of Public Finance (3)
Acct 55C—Managerial Costs (3)	
IR 52—Systems of Industrial Relations: Labor Marketing (3)	Total Business Administration Courses—(69-70)

If the professional and business administration courses are taken concurrently, it is estimated that between 6 and 7 academic years will be necessary to meet the requirements for both of these degrees. There is the possibility that by taking business administration courses during the terms of the Summer Session the time necessary to meet the requirements for these degrees could be reduced to the minimum (6 years).

DESCRIPTION OF COURSES

Courses Offered in the College of Pharmacy

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 ‡.

All students are required to purchase \$5 Pharmacy Deposit Cards from the bursar. Breakage and supplies will be deducted from these cards.

PHARMACEUTICAL TECHNOLOGY (PhmT)

Professor

Charles V. Netz, Ph.D., *head*
Willard J. Hadley, Ph.D.

Associate Professor

Robert H. Miller, Ph.D.
Edward G. Rippie, Ph.D.

Assistant Professor

Hugh F. Kabat, Ph.D.

Lecturer

Richard H. Bachelder, LL.B.

Chief Pharmacist, University Hospitals

Marie L. Perreault, B.S.

Student Pharmacist Supervisor

Ruth Livingston, B.S.
James L. Olsen, B.S.
Paul W. Romig, B.S.

- 1A. **Orientation: History.** Development of pharmacy including historical transitions in the healing arts and sciences. (1 cr; 1 lect hr per wk)
- 1B. **Orientation: Laws and Organizations.** Minnesota pharmacy laws and state board regulations; local and national professional associations. (1 cr; 1 lect hr per wk)
- 1C. **Orientation: Training and Opportunities.** Career opportunities in the profession and the industry and preparation for them. (1 cr; 1 lect hr per wk)
3. **Pharmaceutical Calculations.** Mathematical procedures in pharmaceutical practice. (3 cr; 3 lect hrs per wk)
54. **Fundamental Principles and Processes.** Physicochemical aspects of pharmaceutical technology. (5 cr; prereq Phys 2, PhmT 3, OrCh 62; 3 lect and 6 lab hrs per wk)
- 55-56. **Pharmaceutical Preparations.** Official and nonofficial dosage forms and preparations. (4 cr per qtr; prereq jr, 54; 2 lect and 6 lab hrs per wk)
- 58-59-60. **Prescription Compounding.** (5 cr per qtr; prereq sr, 56, PhmC 55, PhmC 163, Phcl 57; 3 lect and 6 lab hrs per wk [w, s], 4 lect and 6 lab hrs per wk [f])
64. **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; prereq sr; 3 lect hrs per wk)
- 68-69. **Introduction to Hospital Pharmacy.** (Specialization course) Training for hospital pharmacy: stock control, records, manufacture of pharmaceutical preparations, prescriptions, and parenteral solutions. (3 cr per qtr; prereq sr, 56, PhmC 163; 1 lect hr and 6 lab hrs per wk)
70. **First Aid.** First aid procedures including those in the American Red Cross course. (2 cr; prereq fr; 3 lect hrs per wk)
71. **Pharmaceutical Specialties.** New medicinal preparations, sickroom supplies. Lectures by representatives of pharmaceutical manufacturers. (3 cr; prereq sr, PhmC 163; 3 lect hrs per wk)

- 72. Veterinary Products.** (Specialization course) Chemical, pharmaceutical, and pharmacological study of agents and preparations used in the prevention and treatment of disease in domestic animals and poultry. (3 cr; prereq sr; 3 lect hrs per wk)
- 165. Cosmetics and Dermatological Preparations.** (Specialization course) Pharmaceutical aspects of cosmetics and dermatological preparations. (3 cr; prereq 56; 2 lect and 3 lab hrs per wk)
- 166-167. Pharmaceutical Manufacturing.** (Specialization course) Problems in the production of pharmaceutical preparations on a pilot plant scale. Formula development and product stabilization. (3 cr per qtr; regis limited; prereq sr, 56; 1 lect and 6 lab hrs per wk)
- 168. Preparation of Parenteral Products.** (Specialization course) Principles and procedures involved in manufacture of parenteral products. (3 cr; prereq sr, 56, MicB 53, or #; 2 lect and 3 lab hrs per wk)
- 173. Special Problems in Pharmaceutical Technology.** Problems in the formulation, production, and evaluation of pharmaceutical products. (Cr ar; prereq jr or sr and #)

PHARMACEUTICAL CHEMISTRY (PhmC)

Professor

Ole Gisvold, Ph.D., *head*
 Frank E. DiCangi, Ph.D.
 George P. Hager, Ph.D.
 Taito O. Soine, Ph.D.

Assistant Professor

Philip S. Portoghesse, Ph.D.

Student Pharmacist Supervisor

Lyle Becker, B.S.

- 1-2. Inorganic Pharmaceutical Products.** Histories, sources, commercial manufacture, laboratory preparation, properties, and medicinal uses of inorganic chemicals. (4 cr per qtr; prereq soph, GeCh 6 or equiv; 2 lect and 6 lab hrs per wk)
- 53. Pharmaceutical Biochemistry.** Selected topics in biochemistry required as a basis for the understanding of the pharmacodynamic action and therapeutic use of medicinal agents. Particular emphasis is given to the modification of organic substances by a biological system. (5 cr; prereq jr, OrCh 62; 3 lect, 1 rec, and 6 lab hrs per wk)
- 54-55. Quantitative Pharmaceutical Chemistry.** Principles, procedures of gravimetric and volumetric methods of analyses of inorganic and organic pharmaceutical products. (5 cr per qtr; prereq soph, GeCh 6, OrCh 62; 3 lect and 6 lab hrs per wk)
- 161-162-163. 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 per qtr; prereq jr, OrCh 62; 3 lect hrs per wk)
- 164-165-166. Special Analytical Methods.** (Specialization course) The Food, Drug, and Cosmetic Act, and official analytical methods of the U.S.P., N.F., and the A.O.A.C. Analyses of some drugs and foods with emphasis on instrumental methods. (3 cr per qtr; prereq sr, 55, OrCh 63; 1 lect and 6 lab hrs per wk)
- 173. Special Problems in Pharmaceutical Chemistry.** Elementary investigation of the analysis, synthesis, and phytochemistry of medicinal agents. (Cr ar; prereq 3rd- or 4th-year pharmacy student and #)

PHARMACOGNOSY (Phcg)

Associate Professor

Herbert Jonas, Ph.D., *head*

Assistant Professor

Lee C. Schramm, Ph.D.

Gardeners

Harvey H. Harrington
 Onie J. Benson

1. **Introductory Pharmacognosy.** Characteristics of crude drugs, cultivation, preparation, identification, analysis. (3 cr; prereq soph, Biol 2, OrCh 62; 2 lect, 1 conf, and 3 lab hrs per wk)
2. **Introductory Pharmacognosy.** Physiology and breeding of medicinal plants. Extraction and identification of natural drug constituents. (3 cr; prereq soph, 1; 2 lect, 1 conf, and 3 lab hrs per wk)
3. **Introductory Pharmacognosy.** Biologicals, enzymes, allergens, antibiotics. Fundamentals of fermentation processes and applications to pharmacy. (3 cr; prereq soph, 2, MicB 53; 2 lect, 1 conf, and 3 lab hrs per wk)
160. **Recent Advances in Pharmacognosy.** Crude drug production, biosynthesis, enzymes, biological and fermentation products, insecticides, fungicides, and herbicides. (3 cr; prereq 3 or #; 3 lect hrs per wk)
162. **Intermediate Pharmacognosy.** (Specialization course) Biochemistry and physiology of drug-producing organisms. Chemical and physical methods for production and analysis of their medicinal constituents. (3 cr; prereq sr, 3, and #; 2 lect and 3 lab hrs per wk)
163. **Intermediate Pharmacognosy.** (Specialization course) Microscopic and microchemical methods in the study of drug-producing organisms and their constituents. (3 cr; prereq sr, 3, and #; 1 lect and 6 lab hrs per wk)
164. **Intermediate Pharmacognosy.** (Specialization course) Insecticides, fungicides, and plant growth regulators involved in the cultivation and preservation of medicinal plants and their products. (3 cr; prereq sr, Phcl 56, and #; 2 lect and 3 lab hrs per wk)
165. **Basic Application of Radionuclides.** (Specialization course) Properties and utilization of radioactive substances of importance in biology, pharmacy, public health, and civil defense. (3 cr; prereq jr, MicB 53, and #; 3 lect hrs per wk)
166. **Basic Laboratory Course in Radionuclide Techniques.** (Specialization course) Demonstration and participation experiments in fundamental isotope techniques and applications. (2 cr; prereq 165, ¶165, or #; 6 lab hrs per wk)
167. **Advanced Course in Radionuclides.** (Specialization course) Advanced lecture course expanding on 165. (3 cr; prereq 165 or #; 3 lect hrs per wk)
168. **Advanced Laboratory Course in Radionuclide Techniques.** (Specialization course) (2 cr; prereq 167, ¶167, or #; 6 lab hrs per wk)
173. **Special Problems in Pharmacognosy.** Problems dealing with the botany, biochemistry, and physiology of medicinal plants and microorganisms and their products. Radioisotope applications. (Cr ar; prereq #)

PHARMACOLOGY (Phcl)

Professor

Wallace F. White, Ph.D.

- 55-56-57. **Pharmacology of Official Medicinal Agents.** Introductory course with emphasis upon topics of particular importance to the dispensing pharmacist. (3 cr per qtr; prereq jr or #; 3 lect hrs per wk)
109. **Pharmacological Problems.** (Cr ar; prereq #)
162. **Biological Assay of Drugs.** (Specialization course) Quantitative pharmacological procedures with an introduction to biostatistics. (3 cr; prereq sr, grad, or #; 1 lect and 6 lab hrs per wk)

Required Courses Offered by Other Departments

PREPHARMACY YEAR

(Credits shown in parentheses)

GeCh 4-5—General Principles of Chemistry (10)	Math T—Trigonometry (3)
GeCh 6—Principles of Solution Chemistry (4)	Comm 1-2-3—Communication (12)
Math 10—College Algebra, Analytic Geometry (5)	Electives (6-8)

PROFESSIONAL YEARS

MicB 53—General Microbiology (5)	Phcl 106—Toxicology (2)
Biol 1-2—General Biology (10)	Phys 1-2-3—Introduction to Physical Science (9)
OrCh 61-62-63—Elementary Organic Chemistry (11)	Phys 1A-2A-3A—Introduction to Physical Science Laboratory (3)
Econ 1-2—Principles of Economics (6)	Phsl 60—Human Physiology (6)
Acct 24-25—Principles of Accounting (6)	PubH 50—Personal and Community Health (3)
Mktg 107A—Retail Management (3)	PubH 75—Environmental Sanitation (3)
Phcl 101-102—General Pharmacology (7)	

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Graduate Programs in

Medicine, Dentistry, Pharmacy

1963-1965



*“ . . . dedicated to the
advancement of learning
and the search for
truth . . . ”*

Bulletin

of the UNIVERSITY of MINNESOTA

How to Use This Bulletin

The section on "Requirements for Advanced Degrees in Medicine" in this bulletin is your official source of information about the policies of the Graduate School and about procedures in earning graduate degrees in the medical fields. Do not fail to read it.

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.

Symbols and Explanations

A course sequence separated by hyphens (121f-122w-123s) must be taken *in the order listed* unless it is specifically stated that a student may enter any quarter. When course numbers are separated by commas (121f, 122w, 123s) the student may enter any quarter. Suffixed letters separated by commas (121f,w,s,su) indicate the repetition of the course in corresponding quarters.

When no departmental abbreviation precedes the number of a course listed as a prerequisite, this 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.

The following symbols are used throughout the course descriptions and will not carry any page footnotes:

° Graduate students may prepare Plan B papers.

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

‡ A sequence course followed by a double dagger may be taken out of sequence.

§ No credit is given if credit has been received for equivalent course listed after section mark.

¶ Means "concurrent registration in" (i.e., course must be taken simultaneously).

A sharp sign means "consent of instructor."

△ A triangle means "consent of department or school offering course."

x After a course number indicates course is offered more than 1 quarter.

f,w,s,su. These letters following a course number indicate fall, winter, spring, or summer quarter.

Courses numbered between 100 and 199 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.

Students should consult the *Class Schedule* each quarter for the hour and place of a given course.

Generally, the work is described in two separate groups—that given at the Medical School, and that given at the Mayo Foundation. The prefix M is added to courses offered at the Mayo Foundation.

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Graduate Programs in Medicine, Dentistry, and 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. The Graduate School is not concerned with the short-term review or refresher courses which are made available to practitioners through the Center for Continuation Study and the Department of Continuation Medical Education of the Medical School. The Graduate School program is concerned with systematic studies in medicine and its allied fields as subjects of scientific inquiry and therefore offers to prospective clinicians opportunities to prepare themselves for study in their fields primarily as scientific disciplines rather than primarily as practical professional specialties. It also offers facilities for study in all of the sciences fundamental to clinical fields, both to students majoring in those fundamental sciences and to students majoring in applied and clinical fields.

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.

Although the Graduate School was not formally organized until 1905, graduate work in medical fields was being done and the first Ph.D. in a medical field was awarded in 1898. As a result of the concern of President George E. Vincent of the University, Dean Guy Stanton Ford of the Graduate School, and Drs. Will and Charles Mayo of the Mayo Clinic that the best possible program of medical graduate work be developed in the state of Minnesota, it was proposed that some type of affiliation be arranged between the facilities at Rochester and graduate medical education at the University. To enable this program to be realized, the Mayo Foundation for Medical Education and Research was organized as an independent entity but one closely related to the Mayo Clinic, and on May 6, 1915, the Board of Regents of the University voted to extend graduate work in the medical fields to include the work at the Mayo Foundation. Members of the Mayo Foundation hold academic rank in the University of Minnesota and are also appointed to the Graduate School faculty. Currently approximately 600 students are registered annually in the Graduate School for advanced study of medicine at Rochester.

Laboratory Equipment—Laboratory equipment for graduate work in medicine is located in the several buildings on the campuses at Minneapolis and St. Paul and at Rochester.

In Rochester, laboratory facilities for research are available at St. Marys Hospital, Methodist Hospitals, the Medical Sciences Building, and the Mayo Clinic buildings.

Clinical 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, and the University Health Service.

Minneapolis General Hospital, Veterans Hospital in Minneapolis, Ancker 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, are also available for graduate work.

In Rochester, Curie, St. Marys, and Methodist Worrall 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 the Mayo Foundation in 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 of the Mayo Foundation at Rochester occupies floors 11, 12, part of 14, 16, and 17 (tower floors) in the Mayo Clinic—Plummer Building. The collection 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.

Required Quality of Study—The student's work is graded quarterly by his immediate chief. Work which receives a grade below B is not acceptable for graduate credit in the major field, nor if below C, in the minor. Students with unsatisfactory records will not be permitted to continue.

Admission—All graduate students are admitted by the dean of the Graduate 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 degree of doctor of medicine 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) 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, others 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.

Note to Foreign Physicians—The foreign physician should check with the Immigration and Naturalization Service for current regulations as to permissible length of stay in the United States for individuals with exchange visitor's visas before planning his program of study.

Registration and Number of Students—All students entering upon graduate work in medicine will register with the dean of the Graduate School. Fellows who begin their residence in Rochester may fulfill the preliminary requirements by registering there with the director of the Mayo Foundation. The number of graduate students registered for work is determined by the clinical opportunities and laboratory facilities available.

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 sessions. Registration for thesis only is permissible for students working on dissertations and not registered for any courses.

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. All persons appointed under trainee programs shall be registered full time during the tenure of their appointments.

3. Postdoctoral research fellows supported by agencies other than the Regents of the University 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 1. A person already holding the Ph.D. degree or its equivalent may be recommended for appointment as honorary fellow.

4. Persons on research fellowships, established investigatorships, or special research investigatorships who have fully completed their graduate training may be appointed to academic staff positions with or without salary supplementation, providing it is demonstrated that they will actually be performing important teaching and research functions.

Tuition—Students enrolled for graduate work in clinical medicine, dentistry, and pharmacy pay tuition and fees as required for these respective colleges. Students enrolled for graduate work in the fundamental laboratory branches of medicine pay fees at the Graduate School rate. 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 *Bulletin of General Information*. For Summer Session fees, see the *Bulletin of the Summer Session*.

Fellowships and Assistantships—Medical fellowships and assistantships offer stipends ranging up to \$3,600 per year and higher in special cases. Holders of assistantships must be enrolled in or approved for admission to the Graduate School. After the opening of the academic year the holder must be registered in the Graduate School during each quarter that he holds an appointment. For students holding assistantships during summer terms registration is not obligatory. *Medical fellows must be registered for each quarter and summer term while holding their appointments.*

Fellowships are available in the following clinical departments of the Medical School: anesthesiology, internal medicine, dermatology, psychiatry, neurology, obstetrics, ophthalmology, otolaryngology, pediatrics, physical medicine, radiology, surgery, neurosurgery, orthopedic surgery, proctology, and urologic surgery. In addition, there are several clinical fellowships at Minneapolis General Hospital and at Ancker

Hospital (St. Paul). At the Minneapolis General Hospital fellowships are offered in medicine, ophthalmology and otolaryngology, pediatrics, surgery, pathology, urology, radiology, obstetrics and gynecology, psychiatry, neurology, and dermatology. At Ancker Hospital they include medicine, ophthalmology and otolaryngology, radiology, pediatrics, dermatology, pathology, and surgery. Medical fellows are required to devote their entire time to graduate work, including a small amount of teaching.

The University graduate training program in the clinical specialties of medicine includes residencies at the Minneapolis Veterans Hospital in medicine, dermatology, ophthalmology, otolaryngology, pathology, general surgery, urologic surgery, neurosurgery, orthopedic surgery, anesthesiology, neurology, psychiatry, and radiology.

Teaching assistantships have been established in the preclinical departments of the Medical School in anatomy (including embryology and histology), biochemistry, microbiology, pharmacology, physiology, physiological hygiene, and public health. There are 6 fellowships in pathology which carry a stipend comparable to those for fellowships in the clinical departments. They require a small amount of teaching, the remainder of the time being devoted to graduate work leading to advanced degrees.

Funds are also available from United States Public Health Service training grants in many departments of the Medical School. Information concerning these may be obtained from department heads.

On the Minneapolis Campus a number of teaching assistantships and fellowships with stipend are also available to qualified students in dentistry and pharmaceutical chemistry, pharmaceutical technology, and pharmacognosy.

The Mayo Foundation carries the following laboratory science and clinical fellowships-residencies: 15 in anesthesiology, 2 in biochemistry, 15 in dermatology and syphilology, 180 in internal medicine, 27 in neurologic surgery, 28 in neurology and psychiatry, 2 in nutrition, 15 in obstetrics and gynecology, 19 in ophthalmology, 44 in orthopedic surgery, 6 in otolaryngology and rhinology, 2 in parasitology, 20 in pathology, 18 in pediatrics, 9 in physical medicine and rehabilitation, 3 in physiology, 10 in plastic surgery, 6 in proctology, 24 in radiology, 80 in surgery, 15 in urology, and 12 in dentistry. The fellowships carry stipends of \$2,400 first year, \$2,800 second year, \$3,200 third year, and \$4,200 fourth year with a two-week vacation during first and second years, and 3-week vacation during the third and each succeeding year.

Nominations for fellowships at the Mayo Foundation are made throughout the year but primarily in the fall. Each applicant is notified of his nomination immediately after it is made, and his acceptance or rejection thereof is requested.

In the Medical School, appointments are made as vacancies occur.

Applicants for fellowships are expected to read and speak English fluently and to pass a physical examination including X ray of chest after nomination and before being finally accepted.

All appointments are made for 1 year and are renewable annually for a total period of 3 years or longer upon the basis of satisfactory progress in the work pursued. Requests for application blanks for fellowships and assistantships should be addressed to the department concerned (for clinical fields) or (for basic sciences) to the Dean of the Graduate School, University of Minnesota, Minneapolis 14. For fellowships at the Mayo Foundation requests should be sent to the Director of the Mayo Foundation, Rochester, Minnesota.

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 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 the Director of the Mayo Foundation, Rochester, Minnesota.

Fellows who have satisfactorily completed 3 years of residence at the Mayo Foundation may be awarded first assistantships in the Mayo Clinic at increased stipend.

Several of the departments in the Medical School and in related fields (anatomy, biochemistry, microbiology, pathology, pharmacology, physiology, public health, and biostatistics) have other paid assistantships which may furnish means of self-support while the holder is pursuing graduate work. For further information, address the Dean of Medical Sciences, University of Minnesota, Minneapolis 14.

REQUIREMENTS FOR ADVANCED DEGREES IN MEDICINE

Academic Rank and Candidacy for a 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.

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

Master's Degree

Residence—Upon entrance to the Graduate School, the student, with the approval of the dean, will select his adviser in the field of his major work. With the approval of his adviser and the dean, he will outline a study program for the year and if possible for the period of 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 (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. The requirement can be satisfied either by passing the proficiency examination or by presenting to the appropriate language department certification of 15 credit hours with grade of A or 20 credit hours with grade of B, assuming: (1) that the course work was completed at the University of Minnesota; (2) that the course work was completed no longer than 5 years from the time the student applies for language certification; and (3) that any language department at Minnesota has the right to specify minimal course requirements in excess of those mentioned above. For further information, consult the Graduate School office and the major department. Blanks for making application for the language examination may be obtained in the Graduate School office.

The candidate shall present to the office of the dean of the Graduate School a certificate of proficiency in the designated language before he may be admitted to the written or oral examinations required for this degree. The certificate must be signed by a representative of the appropriate foreign language department.

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

Language examinations occur on the second Thursday of each quarter. A repetition of the language examination because of failure is considered a special examination for which a fee of \$5 is charged.

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

not later than opening of the quarter preceding the final quarter or final summer term, the student who expects to obtain a Master's degree shall present (for Plan A) his program and his thesis plan or (for Plan B) his program for his adviser's recommendation and transmission to the appropriate group committee. 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.

Transfer of Major Field—Admission to the Graduate School involves a specified major field. Any subsequent proposal for a change in major necessitates a formal request to the Graduate School.

Transfer of Major Fields at the Mayo Foundation—A fellow appointed in a given major field is expected to remain in that field for 1 year. Exceptions to the policy may be made when they are deemed desirable by the sections concerned and the Mayo Foundation administration.

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.

Mayo Foundation 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 the 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. 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.

No material which has been published prior to its approval 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 therefore obtain approval through the Graduate School office.

The Master's thesis must be typewritten in quadruplicate, 2 copies on 20-pound linen stock of 75 per cent rag content, the others on 13-pound bond paper. Samples of the paper required should be examined in the dean's office. 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. A copy of the thesis, certified by the adviser as complete, must be registered in the dean's office at least 8 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 will include 2 representatives of the major field and 1 representative of the minor field. *Unanimous approval by the thesis committee is necessary for the acceptance of the thesis*, and a record of this approval 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 deposit with the Office of Admissions and Records, at least 5 weeks before the commencement in which he wishes to take his degree, the sum of \$5 for binding 2 copies of the thesis, which will be cataloged and deposited in the University Library.

Examinations—In addition to the usual course examinations in all subjects where such are given, the candidate for the Master's degree must pass final written and oral examinations.

The final *written examination* will be held prior to the oral examination. It will cover the major field and may include any work fundamental thereto. The final written examination will be arranged by the adviser as chairman of the thesis committee, the questions to be prepared with the co-operation of the faculty of the major department. 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.

The final *oral examination* is held when all other requirements for the degree have been met, including the final written examination and the acceptance of the thesis. The final oral examination for the M.S. degree in medicine will in general include questions from both major and minor fields. If a written qualifying examination covering the minor field has been taken successfully, the final oral examination need not include questions on the minor field. The oral examination shall not exceed 2 hours. 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.

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 should 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 before the commencement in which he expects to take the degree.*

Reports—Special blanks are provided for signed reports concerning the thesis and the final written and oral examinations.

Attendance at Commencement—Unless especially excused 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

Requirement	Under the Direction of	Date
Initial registration	Adviser and dean of the Graduate School or director of Mayo Foundation	On entrance
Candidacy: with approval of program (Plans A and B) and thesis plan (Plan A)....	Adviser, 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
Language requirement (completion)	Adviser and language department	Before end of second year for majors in clinical fields
Licensure (Mayo Foundation only)	State Board	6 months after beginning graduate work
Registering of thesis	Graduate School office	Consult Graduate School office for date
Approval of thesis	Thesis committee	Before admission to final oral examination
Final written examination in major	Major adviser and committee	} Consult Graduate School office for date
Final oral examination on all work	Committee	
Filing of thesis	Graduate School office	
Graduation fee and fee for binding thesis	Office of Admissions and Records	Not later than 5 weeks before commencement in which student takes his degree

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.

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.

Transfer of Major Field—Admission to the Graduate School involves a specified major field. Any subsequent proposal for a change in major necessitates a formal request to the Graduate School.

Transfer of Major Fields at the Mayo Foundation—A fellow appointed in a given major field is expected to remain in that field for 1 year. Exceptions to the policy may be made when they are deemed desirable by the sections concerned and the Mayo Foundation administration.

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 for the degree. *At least one-sixth* of the work offered for the degree in a clinical subject should consist of graduate courses in those fundamental laboratory branches which will serve as a basis for the proposed clinical specialization. This fundamental work should be concentrated in the first part of the course so far as possible. The preliminary oral examination will include the minor field.

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

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

Program of Study

Upon entrance to the Graduate School, the student shall select and be accepted by an adviser from the graduate faculty. During the early phase of the graduate program, the chief concern should be completion of required courses. Attention should also be given to meeting requirements pertaining to the foreign language, collateral field, and research technique (see discussion under Language Requirement).

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 language declaration form and doctoral program blank.

Language Declaration Form—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 on the reverse side of the form the course work he has completed or proposes to complete to satisfy the requirement and will justify its appropriateness.

Doctoral Program Blank—On the doctoral program blank the student will submit a complete statement of all work to be offered for the degree:

1. A list of all courses already completed in the major and minor.
2. A list of proposed additional course work in the major and minor.
3. Courses offered as a collateral field or special research technique when either is being proposed.
4. A detailed list of graduate courses taken elsewhere if the candidate wishes to present such work toward the Ph.D. degree from the University of Minnesota. For the student who transfers work from other graduate schools, 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 graduate work the student lists on his program, whether taken here or elsewhere, must accompany the program.

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. (or fall quarter, 1962, for students who have been admitted to candidacy prior to fall quarter, 1962) 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 oral preliminary examination.

2. Register continuously and pay fees (see *Bulletin of the Graduate School*) during the academic year (fall, winter, spring) from the date of the preliminary oral until the Ph.D. is awarded. (Candidates who hold appointments as medical fellows consult Graduate School for special rule applying to them.) Failure to register continuously will automatically terminate candidacy for the doctorate. To reinstate candidacy, the student may be required to retake 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.)

Registration by Mail—The student who has been admitted to candidacy for the Ph.D. degree (for definition of candidacy see above) and is not registering for course work may register by mail. Registration forms for this purpose will be mailed to the candidate prior to the opening of each academic quarter. He must return his registration form and check or money order for the appropriate amount to the Office of Admissions and Records, 105 Morrill Hall, University of Minnesota, Minneapolis 14.

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 plan for his doctoral dissertation. The thesis title form is obtained in the Graduate School office. When it is filed it will be accompanied by a statement, some 250 words in length, describing the research to be undertaken and the methods to be employed in carrying it out.

Language Requirements

The following regulations are effective for all Ph.D. candidates. In general, reading knowledge of two 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. The reading knowledge of one foreign language is always required. The requirement can be satisfied either by passing the proficiency examination or by presenting to the appropriate language department certification of 15 credit hours with grade of A or 20 credit hours with grade of B, assuming: (a) that the course work was completed at the University of Minnesota; (b) that the course work was completed no longer than 5 years prior to the time the student applies for language certification; and (c) that any language department at Minnesota has the right to specify minimal course requirements in excess of those mentioned above.

1. The Ph.D. candidate shall submit the language declaration form no later than the time he submits his doctoral program.

2. The foreign language and the special research technique requirements (as defined in 10 and 11) must be completed before the student is admitted to the preliminary examinations for the Ph.D., and the work to be presented in meeting the research technique requirement shall be entered on the student's program. The special research technique requirements may be met by special proficiency examinations where such examinations are feasible and practical.

3. Repetition of any foreign language examination taken under regulation 2 above is considered a special examination for which a fee of \$5 is charged.

4. Where a collateral field of knowledge (as defined in 12) 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 examinations where feasible and practical.

5. In meeting either the foreign language requirements or the requirements of a special research technique, credits earned or proficiency demonstrated in other approved institutions are transferable to the Minnesota record if these have been completed within a 3-year period immediately prior to entering this Graduate School. To meet the requirements of a collateral field of knowledge, credits earned in other approved institutions are transferable to the Minnesota record in accordance with existing regulations governing credits offered for the Ph.D. from other institutions.

6. Course credits presented to fulfill requirements of a special research technique or a collateral field of knowledge shall be recorded on the student's permanent grade record and must represent a quality of work no lower than C. Any group committee may require a standard of performance higher than this minimum standard 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 collateral field or as a research technique.

7. 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.

8. In no case may the special research technique subject or 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. The special research technique subject should represent the acquisition of any special skill that will effectively contribute to the research proficiency of the candidate. 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.

9. The burden of proof of the significance or relevance of the collateral field or research technique proposed 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.

10. The foreign language or languages selected for fulfilling this requirement should be relevant to the field of scholarly work of the candidate. The burden of proof of the relevance of the languages proposed rests upon the candidate and his major adviser. In no case may English be submitted as a foreign language.

11. A special research technique is defined as not less than 9 credits in approved Upper Division or graduate courses, completed with a grade not lower than C.

12. 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 transferred from the Extension Division, provided that the courses are taught by approved members of the graduate faculty.

Transfer of Language Certification—See *Bulletin of the Graduate School*.

Examinations and Thesis

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 re-examination 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 1 of 3 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 5-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 6 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 7 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 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 re-examination or prior to the reporting of satisfactory performance, and when such re-examination 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 re-examination shall be held until at least 1 full academic quarter has passed. Preliminary examinations must be scheduled in the Graduate School office 2 weeks in advance.

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 week in ad-*

vance in the office of the Graduate School by the prospective candidate or his adviser.

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 literature 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. Candidates contemplating publication of any material that they expect to present for a thesis should therefore obtain such approval through the Graduate School office.

The thesis must be typewritten in quadruplicate to facilitate reading by the thesis committee. A copy must be registered in the dean's office and 4 copies distributed to the thesis committee at least 2 weeks before the final oral examination. (Students should consult the Graduate School office for dates when their theses must be registered.) Multilith, multigraph, and ozalid methods of reproduction are permitted. Unanimous approval of the thesis by the committee is necessary, and the chairman of the committee will report the results of the review of the thesis to the Graduate School office on the appropriate form, available in that office.

When he submits to the Graduate School office his *thesis report form, final oral examination report, and two bound copies of the thesis*, the candidate will sign in triplicate a *Memorandum of Agreement* with University Microfilms, Ann Arbor, Michigan, under which the ribbon copy of the thesis will be microfilmed before being permanently filed in the University of Minnesota Library. He will then pay his microfilm fee of \$25. If he wishes his thesis to be copyrighted he will pay an additional \$5 plus 1¼ cents per page for 2 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 the bound copies of his thesis an abstract of 600 words or less, approved 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.

Publication of Theses—Publication by microfilm does not preclude publication by other methods later, and it is hoped that attempts at publication in the regular way will not be relaxed.

Final Oral Examination—After preliminary written and oral examinations, after acceptance of the thesis, and after successful completion of final written examinations, when required, the final oral examination shall be given. This examination shall be conducted by a committee consisting of the adviser, the 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 Graduate Group Committee in Medical Sciences. This examination (not to exceed 3 hours) covers the thesis and the field of the candidate's special study and may include the collateral field when that option is taken.

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.

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 should arrange such dates with the Graduate School office. If the student's name is to be included in the commencement program, however, *all the*

requirements for his degree must be completed at least 5 weeks before the commencement in which he expects to take the degree.

Reports—Special blanks 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 of 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.

Attendance at Commencement—Unless excused by the dean of the Graduate School, all candidates are required to be present at commencement when the degrees are conferred.

Summary of Requirements for the Doctor's Degree

Requirements	Under the Direction of	Date
Selection of major	Adviser and dean of the Graduate School	
Selection of minor	Adviser, minor faculty, Medical Graduate Committee, and dean of Graduate School	After first year or at least 5 months before preliminary oral examination
Doctoral program and language plan	Course instructors	} Before admission to preliminary examination
Completion of minor	Adviser and language departments	
Language certification	Graduate faculties of the major and minor fields	Prior to preliminary oral examination
Written examinations	Committee	At least 1 academic quarter before degree is to be conferred
Preliminary examination, oral	Adviser, Medical Graduate Committee, and dean of Graduate School	After doctoral program is submitted and at least 5 months before final oral examination
Thesis plan	Graduate School office	Consult Graduate School office for date
Registering of completed thesis	Thesis committee	Before admission to final oral examination
Approval of thesis	Committee. Date of examination fixed by Graduate School	Consult Graduate School office for date
Final oral examination	Graduate School office	} Not later than 5 weeks before commencement in which student takes his degree
Two bound copies, abstract of thesis, and payment of \$25 for micro-filming of thesis	Graduate School office	
Office of Scientific Personnel Survey Form	Graduate School office	
Release card	Office of Admissions and Records	
Graduation fee		

VETERANS' INFORMATION

Veterans who plan to use training benefits for work in graduate medicine should arrange an appointment with the counselor at 102 Morrill Hall.

FIELDS OF INSTRUCTION

See page 2 for explanations of course listings and for the List of Symbols used in connection with course requirements.

For Graduate Training in the Basic Medical Sciences and Clinical Specialities

It is deemed desirable that the graduate student in medicine be given the greatest possible freedom of choice in his plan of study. Rarely, if ever, have any two graduate students in medical fields in the University of Minnesota selected exactly the same type of work throughout their periods of residence.

Graduate degrees may be earned in the following major fields:

<i>Master's Degree</i>	<i>Ph.D. Degree</i>
Anatomy (including hematology, histology, and embryology) Anesthesiology Biostatistics Dermatology Medical Technology Medicine, Internal Microbiology Neurology Neurosurgery Obstetrics and Gynecology Ophthalmology Orthopedic Surgery Otolaryngology (including otology, rhinology, and laryngology) Pathology Pediatrics Pharmaceutical Chemistry Pharmaceutical Technology Pharmacognosy Pharmacology Physical Medicine and Rehabilitation Physiological Chemistry (Biochemistry) Physiological Hygiene Physiology Plastic Surgery Proctology (Colon and Rectal Surgery) Psychiatric Nursing Psychiatry Public Health Radiology Surgery Urology	Anatomy (including hematology, histology, and embryology) Biostatistics Dermatology Environmental Health Epidemiology Medicine, Internal Microbiology Neurology Neurosurgery Obstetrics and Gynecology Orthopedic Surgery Otolaryngology (including otology, rhinology, and laryngology) Pathology Pediatrics Pharmaceutical Chemistry Pharmaceutical Technology Pharmacognosy Pharmacology Physical Medicine and Rehabilitation Physiological Chemistry (Biochemistry) Physiological Hygiene Physiology Psychiatry Radiology Surgery Urology

ANATOMY

OFFERED AT THE MEDICAL SCHOOL

Professor

Arnold Lazarow, M.D., Ph.D.
 J. Francis Hartmann, Ph.D.
 Charles F. Morgan, Ph.D.
 R. Dorothy Sundberg, Ph.D., M.D.
 Lemen J. Wells, Ph.D.

Associate Professor

Anna-Mary Carpenter, Ph.D., M.D.
 William J. L. Felts, Ph.D.

Assistant Professor

Carl B. Heggstad, M.D., Ph.D.
 Morris Smithberg, Ph.D.

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

Major and Minor, for the Ph.D.—Each major in anatomy must have had or must take the basic courses in anatomy—embryology, gross anatomy, histology, and human neuroanatomy. For majors in anatomy (hematology), 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 100-101, 103, 104, 107, and 111).

Language Requirement—For the Master's degree, reading knowledge of one foreign language. For the Ph.D. degree, either (a) 2 foreign languages (preferred) or (b) 1 foreign language and the option of a collateral field of knowledge.

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. (15 cr for both qtrs; prereq #; enrollment limited) Hartmann, Lazarow, Morgan, Smithberg, Wells
- 103f-104s.† **Human Histology.** Microscopic structure, cytochemical and functional aspects of cells, tissues, and organs. (7 cr for both qtrs; prereq #; enrollment limited) Lazarow, Carpenter, Heggstad
- 105f. **Microscopic Anatomy.** Minute structure of the tissues and organs of the body including the nervous system, emphasis on teeth and digestive tract. (8 cr; prereq 102)
- 107w. **Human Embryology.** Development of the human body. (4 cr; prereq #; enrollment limited) Wells, Heggstad
- 108w. **Gross Anatomy for Dental Students.** Lectures and dissection of extremities and abdomen and pelvis. (6 cr; prereq #; enrollment limited) Felts and staff
- 109s. **Gross Human Anatomy for Dental Students.** Lectures and dissection of thorax and head and neck. (6 cr; prereq #; enrollment limited) Felts and staff
- 111s. **Human Neuroanatomy.** Structure of the nervous system including the organs of special sense. (5 cr; prereq 104 or Zool 150, #; enrollment limited) Hartmann
131. **Biological Electron Microscopy.** (Cr and hrs ar; prereq #) Hartmann
132. **Experimental Study of the Fetus.** (Cr and hrs ar; prereq #) Wells
- 140f. **Skeletal Tissue Biology.** Gross and microscopical anatomy of the skeletal tissues, their origin and development. Student presentation of literature in their particular areas of interest. (2 cr; prereq #) Felts
149. **Experimental Neuroanatomy.** Morphology of the central nervous system as determined by experimental methods. (Cr and hrs ar; prereq #)
- 153, 154, 155, 156.† **Advanced Anatomy.** Cytochemistry, embryology, gross anatomy, hematology, histology, or neurology or experimental morphology. (Cr and hrs ar; prereq #) Staff
160. **Introduction to Histological and Morphologic-Histochemical Techniques.** Fixation, embedding, and staining of cytological components and enzymes. (2 cr; prereq 104, #) Carpenter
161. **Experimental Cytochemistry.** (Cr and hrs ar; prereq 104, MdBc 101, #) Lazarow
- 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 54 or #) Sundberg
- 167s. **Seminar in Hematology.** (1 cr; prereq 166) Sundberg
180. **Endocrinology of the Reproductive Tract.** Relationship of endocrines to reproduction studied by use of the experimental techniques of physiology, cytochemistry, and radioautography. (Cr and hrs ar; prereq 103, 104, MdBc 100-101, #) Morgan
- 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 #) Carpenter, Felts, Hartmann, Lazarow, Morgan, Sundberg, Wells
- 205, 206, 207. **Anatomy Seminar.** 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 THE MAYO FOUNDATION**

Professor

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

In co-operation with other departments at the Mayo Foundation, there is opportunity for study and research leading to a minor in anatomy.

- M 251f,s. Anatomy for General Surgeons.** Fundamental anatomical facts and relations, especially of the neck and trunk, are reviewed, and details of special surgical interest, not generally acquired in undergraduate anatomy, are studied in lectures, discussions, and by dissection. Hollinshead
- M 252s. 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, is supplemented by lectures and discussions. Hollinshead
- M 253f. Anatomy of the Orbit.** Lectures and laboratory work in the detailed anatomy of the orbit and optic pathways. Hollinshead
- M 254f. Neuroanatomy.** Review of fundamental structures and connections of the central and peripheral nervous systems. Hollinshead
- M 255s. Orthopedic Anatomy.** Lectures and laboratory work on the limbs and back. Hollinshead

ANESTHESIOLOGY

OFFERED AT THE MEDICAL SCHOOL

Professor

Frederick H. Van Bergen, M.D., M.S., *head*
Joseph J. Buckley, M.D., M.S.

Assistant Professor

Earl A. Schultz, M.D., M.S.
John R. Gordon, M.D., M.S.

Associate Professor

James H. Matthews, M.D., M.S.

Instructor

Charles E. Galway, M.D., M.S.
Hugh D. Westgate, M.D., M.S.

Graduate work in anesthesiology in the Medical School offers superior training to a number of fellows with opportunity for large clinical experience and investigative work in all types of general and regional anesthesia.

In addition, work in co-operation 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. General Anesthesia.** Instruction and experience in general anesthesia. (12 cr per qtr)
- 266f,w,s,su. Regional Anesthesia.** Observation, instruction, and administration of all types of local, regional, and spinal anesthesia. (4 cr per qtr)
- 267f,w,s,su. 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. Seminar in 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. 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:

MdBe 100-101. Biochemistry

MdBe 153. Problems in Biochemistry

** Enrollment in these courses is limited.

- MdBc 200. Seminar: Biochemistry
 Med 202. Diseases of the Cardiovascular Apparatus
 Phcl 109. Pharmacological Problems
 Phcl 203. Research in Pharmacology
 PubH 110. Biostatistics I
 PubH 111f, 121w. Biostatistics Laboratory I, II
 PubH 120. Biostatistics II

OFFERED AT THE MAYO FOUNDATION

Professor

Albert Faulconer, M.D., M.S., *head*

Associate Professor

Thomas H. Seldon, M.D., C.M., M.S.

Assistant Professor

Richard A. Theye, M.D.

Instructor

Brian Dawson, M.B.
 Robert A. Devloo, M.D.
 Robert R. Jones, M.D.
 John T. Martin, M.D.
 Emerson A. Moffitt, M.D.
 John A. Paulson, M.D., M.S.
 Howard R. Terry, Jr., M.D.

Graduate training in anesthesiology at the Mayo Foundation combines opportunity for an advanced degree with realistic training in anesthesiology. The majority of fellows in anesthesiology who seek a degree 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 are 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. 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. 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. Anesthesiology as Applied to All Types of Oral Surgery.** Faulconer and staff
- M 254f,w,s,su. Neurosurgical Anesthesia.** Twelve months' observation and training in this field with graded responsibility increasing. Several months devoted to lectures, demonstrations, and clinical work in related fields: neuroanatomy, neuropathology, neurophysiology, electroencephalography, and electromyography. (Prereq 2 yrs general and special anesthesia)
- M 255f,w,s,su. 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)

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

OFFERED AT THE MEDICAL SCHOOL

Professor

Wallace D. Armstrong, M.D., Ph.D.
 Cyrus P. Barnum, Jr., Ph.D.
 Ellis S. Benson, M.D.
 Ivan Frantz, M.D.
 Ralph T. Holman, Ph.D.

Associate Professor

Charles W. Carr, Ph.D.
 William O. Caster, Ph.D.
 Helmut R. Gutmann, Ph.D.

Leon Singer, Ph.D.
 Frank Ungar, Ph.D.
 Donald B. Wetlaufer, Ph.D.
 Leslie Zieve, M.D., Ph.D.

Assistant Professor

Ernest D. Gray, Ph.D.
 James F. Koerner, Ph.D.
 John F. Van Pilsun, Ph.D.
 Richard W. Von Korff, Ph.D.

Prerequisites—For a doctoral major in physiological chemistry courses in analytical, organic, and physical chemistry comparable to those of a baccalaureate chemistry major are expected. The minimum requirements for candidates for the Ph.D. degree with a major in physiological chemistry are AnCh 101-102 or equivalent; OrCh 61-64 or equivalent; PCh 101-103 or in exceptional cases PCh 107-108. Candidates for the Master's degree with a major in physiological chemistry or those seeking a Ph.D. with a minor in 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) 2 foreign languages or (b) 1 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 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 program of graduate study: MdBc 100-101, 5 of the 7 biochemistry courses numbered 206, 207, 208, 211, 214, 215, or 217 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 100-101 or its equivalent has been taken 5 years or more prior to the time the candidate is to appear for the preliminary oral examination, this course must be retaken.

100f,su-101w,su. Biochemistry. (7 cr per qtr; prereq physics, physical and organic chemistry) Armstrong, Barnum, Carr, Ungar, Van Pilsun

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 101) Armstrong, Barnum, Carr, Singer, Von Korff, Ungar, Wetlaufer

200f,w,s,su. Seminar: Biochemistry. (1 cr) Armstrong, Barnum, Benson, Carr, Caster, Frantz, Singer, Von Korff, Ungar, Wetlaufer

205f,w,s,su. Research in Biochemistry. (Cr and hrs ar) Armstrong, Barnum, Frantz, Carr, Singer, Von Korff, Wetlaufer

206f. Advanced Endocrinology and Steroid Chemistry. (3 cr; minimum of 8 students; prereq 101; offered 1963-64 and alt yrs) Ungar

207f. Radiotracers and Mineral Metabolism. (3 cr; minimum of 8 students; prereq 101; offered 1964-65 and alt yrs) Armstrong, Singer

208s. Advanced Laboratory Technique. (3 cr; limited to 10 students; prereq 101 and ‡; offered 1963-64 and alt yrs) Staff

- 211s. **Nucleic Acid and Protein Metabolism.** (3 cr; minimum of 8 students; prereq 101; offered 1964-65 and alt yrs) Barnum
- 213f,w,s. **Clinical Biochemistry.** (Cr and hrs ar)
- 214s. **Kinetics and Mechanism of Enzymic Reactions.** (3 cr, §PCh 214; minimum of 8 students; prereq PCh 103 and §; offered 1964-65 and alt yrs) Lumry
- 215w. **Topics in Lipide Metabolism.** (3 cr; minimum of 8 students; prereq 101 or §; offered 1963-64 and alt yrs) Frantz
- 217s. **Physical Chemistry of Proteins.** (3 cr, §PCh 215; minimum of 8 students; prereq PCh 103 and §; offered 1963-64 and alt yrs) Lumry
- 236f,w,s. **Radioisotope Seminar.** (1 cr, §Rad 236) Loken, Armstrong, and staff

OFFERED AT THE MAYO FOUNDATION

Professor

Harold L. Mason, Ph.D., *head*
Eunice V. Flock, Ph.D.
Charles A. Owen, Jr., M.D., Ph.D.

Associate Professor

Gerhard A. Fleisher, Ph.D.
Vernon R. Mattox, Ph.D.

Assistant Professor

Warren F. McGuckin, M.S., Ph.D.

Instructor

James D. Jones, M.S., Ph.D.
John W. Rosevear, M.D., 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. Biochemistry. Research work in problems related to metabolism, chemistry of the blood, steroid hormones, enzymes, proteins, and lipides; training in the use of methods of organic and inorganic analysis. Mason, Flock, Owen, Fleisher, McGuckin, Rosevear, Jones

Biophysics—Electronic Computers. (See Department of Biophysics)

Nutrition. (See Division of Nutrition)

Students majoring in physiological chemistry (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 physiological chemistry for a minor in physiological chemistry.

BIOPHYSICS

OFFERED AT THE MINNEAPOLIS CAMPUS

Committee:

Professor

Rufus W. Lumry, Ph.D., *chairman*
Robert M. Benolken, Ph.D.
Kenneth N. Ogle, Ph.D.
A. Glenn Richards, Ph.D.
Otto H. Schmitt, Ph.D.
Carlo A. Terzuolo, M.D.

Associate Professor

Eugene Ackerman, Ph.D.

Assistant Professor

Robert M. Benolken, Ph.D.
Merle K. Loken, Ph.D., M.D.
Alan L. Orvis, Ph.D.

Staff:

Professor

Kenneth N. Ogle, Ph.D.
Otto H. Schmitt, Ph.D.
Marvin M. D. Williams, Ph.D.

Additional staff for course work in biophysics is drawn from the Departments of Botany and Zoology, from the School of Physics, the School of Chemistry, the Medical School, and from the Mayo Clinic.

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, reading knowledge of one foreign language (Russian or German is recommended). For the Ph.D. degree, reading knowledge of 2 foreign languages, 1 of which should be Russian or German. In special cases where another language is needed for development of the thesis it may be substituted by petition.

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 a core of biophysics 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 in Biophysics and General Physiology. (Cr ar) Staff

Zool 153. Molecular Biology. (3 cr; offered 1963-64 and alt yrs) Benolken

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; schedule ar) 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. Radiobiology Seminar. 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. Radioisotope Seminar. (1 cr; prereq #) Loken

296°-297°-298.° Seminar in Biophysics. (Cr ar) Schmitt, Benolken

OFFERED AT THE MAYO FOUNDATION

Professor

Kenneth N. Ogle, Ph.D., *head*
Marvin M. D. Williams, Ph.D.

Assistant Professor

Alan L. Orvis, Ph.D.

Associate Professor

Eugene Ackerman, Ph.D.

Advanced work in biophysics at the Mayo Foundation may include studies in bioelectric phenomena, shortwave diathermy, energy exchanges between the body and its environment, hemodynamics, mass spectrometry, microangiography, microscopy, osmotic pressure, ultrasound, etc. Investigations involving the use of X ray and radioisotopes are carried on both independently and in co-operation with other departments, especially the sections of radiology, the latter including some routine work. Facilities are available also for research in general biophysics, especially in molecular biology, and for studies of the acclimatization to simulated altitude, as

well as to heat and cold. Excellent facilities are available for graduate study and research in optics and visual physiology, both basic and as allied to ophthalmology. A series of seminars and lectures is presented from time to time in optics with emphasis on ophthalmic optics and physiological optics. Fellows in ophthalmology may present this work for their minor study toward a Master's degree. There has been close association in the research program for the fellows in the Section of Physical Medicine and Rehabilitation, and it has been customary to give, on occasion, a number of lectures on physics as applied to physical medicine and rehabilitation. A series of lectures is given each year on various phases of radiological physics, radioisotopes, and reviews of the major areas of biophysics. Students in biophysics would also be encouraged to attend courses in biochemistry in the Section of Biochemistry and seminars in physiology in the Section of Physiology. The Section of Biophysics also co-operates with the Sections of Physiology and of Biochemistry in providing courses dealing with electronic computers, their technology, and their use in biology, medical research, and medical practice.

Prerequisites—A limited number of qualified fellows majoring in biophysics may undertake research projects that will be the basis for the doctoral thesis. In general, the Master's degree or its equivalent is a prerequisite for admission to these advanced research courses.

Facilities for experimental work are available to fellows majoring in the various fields of medicine.

M 251f,w,s,su. Special Research in Biophysics. Williams, Ogle, Orvis, Ackerman

M 252f,w,s,su. Physiologic Optics. Ogle.

M 253f,w,s. Radiology and Radiological Physics. Williams, Orvis

M 254f,w,s,su. Electronic Computers. Ackerman, Bickford, Rosevear

BIostatistics

OFFERED AT THE SCHOOL OF PUBLIC HEALTH

Professor

Jacob E. Bearman, Ph.D.
Joseph Berkson, M.D., D.Sc.
Richard B. McHugh, Ph.D.
I. Richard Savage, Ph.D.

Associate Professor

Byron W. Brown, Jr., Ph.D.

Assistant Professor

Robert P. Gage, M.S.
Marion W. Thornton, Ph.D.

Instructor

Franklin W. Briese, M.S.
Ruth Loewenson, M.S.

Prerequisites—For major work, completion of the premedical curriculum. Acceptable alternatives include the equivalent of an undergraduate major in 1 of the following 2 categories:

1. The biological and/or behavioral sciences
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, none. For the Ph.D. degree, either (a) 2 foreign languages or (b) 1 foreign language and the option of a special research technique or a collateral field of knowledge.

Master's Degree—Offered under both Plan A and Plan B. [See the *Bulletin of the School of Public Health* for the master of public health degree.]

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

For students minoring in biostatistics the sequence PubH 110-111, 120-121, 130-131, or equivalent, is required. The remainder of the program should be planned with the minor adviser before any other courses in the minor are taken.

- PubH 108. Introduction to Biostatistics and Statistical Decision.** Variation, frequency distribution; probability; significance tests; estimation; trends. Statistical approach to rational administrative decision making. Lectures and laboratory exercises. (2 cr) Bearman, Weckwerth
- PubH 110. Biostatistics I.** Role of statistics in research; estimation; sampling distribution; tests of significance; power; regression; correlation; other measures of association; standard distributions including normal, t , χ^2 , F , binomial, Poisson; special distributions arising from non-parametric procedures. (3 cr; prereq ¶111, Math 10 or §) Bearman, Brown
- PubH 111f, 121w. Biostatistics Laboratory I, II.** Presentation of data; descriptive statistics; coding and short-cut computational procedures; use of desk calculators; practical application of principles and methods covered in 110 and 120. (2 cr per qtr; prereq ¶110 for 111, ¶120 for 121) Briese, Loewenson
- PubH 120. Biostatistics II.** Continuation of 110. (3 cr; prereq 110 with grade not lower than C, ¶121) Brown, Bearman
- PubH 124. Medical Statistics II.** Selected statistical techniques in continuation of Course 90, including analysis of data resulting from follow-up studies. (2 cr; prereq 90 or §; offered when demand warrants) Staff
- PubH 130s.* Biostatistics III.** Principles and methods of analysis of components of variance and effects in surveys and experiments; 1-way, 2-way, and higher nested, crossed, or mixed classifications; simple and multiple analysis of covariance. (3 cr; prereq 120 with grade not lower than C, ¶131) Bearman, Brown
- PubH 131s. Biostatistics Laboratory III.** Practical exercises associated with 130. (2 cr; prereq ¶130) Briese, Loewenson
- PubH 140f. Vital Statistics I.** Official sources; population changes; rates; trends; significant differences. (3 cr) Bearman, Thornton
- PubH 150.* Vital Statistics II.** Life table techniques and follow-up studies; survivorship curves; problem of bias and selection connected with retrospective studies. (3 cr; prereq §) Staff
- PubH 180. Introduction to Biostatistics.** Variation; frequency distribution; probability; estimation; significance tests; binomial, normal, Poisson distributions; serial dilutions; most probable number. (6 cr; prereq environmental health students only, others §) Staff
- PubH 200x.* Research.** Opportunities are offered by the School of Public Health and by various co-operating organizations for qualified students to pursue research work. (Cr ar) Graduate staff
- PubH 201x.* Topics in Biometry.** Studies in special topics for advanced students. (Cr ar; prereq 120, 130 and §) Bearman and staff
- PubH 203f°-205w°-207s.* 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 experiments; simple random, stratified, multistage, and multiphase sampling design. (3 cr per qtr; prereq 130 or §) McHugh
- PubH 204f°-206w°-208s.* 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 ¶203-205-207) McHugh
- PubH 211x.* Seminar in Biometry.** (Cr ar) Graduate staff
- PubH 216f°-218w.* Biomedical Measurement Problems, Assays.** Qualitative and quantitative response surface assays, density determination by plate counts and serial dilution, source and magnitude of variation associated with advanced measurement techniques. (3 cr per qtr; prereq 120 or §) Brown
- PubH 217f°-219w.* Theory of Biomedical Measurement Problems, Assays.** (2 cr per qtr; prereq ¶216-218 and §) Brown
- PubH 250f°-251w°-252s.* Foundations of Biometry.** Measurement models, theories of probability, logic of induction, alternative theories of inference. (2 cr per qtr; prereq 208, 219 or §) Staff

OFFERED AT THE MAYO FOUNDATION

Professor

Joseph Berkson, M.A., M.D., D.Sc., head

Assistant Professor

Robert P. Gage, M.S.

Graduate work in biometry and medical studies at the Mayo Foundation is offered in the Division of Biometry and Medical Statistics at the Mayo Clinic. This may include studies in clinical as well as laboratory fields.

M 251f,w,s,su. **Research Problems in Biometry.** Berkson, Gage

DENTISTRY

OFFERED AT THE SCHOOL OF DENTISTRY

Professor

William H. Crawford, D.D.S., *dean*
 Mellor R. Holland, D.D.S., M.S.D., *assistant dean*
 Wallace D. Armstrong, Ph.D., M.D.
 Henry B. Clark, Jr., M.D., D.D.S.
 Robert J. Gorlin, D.D.S., M.S.
 Ambert B. Hall, D.D.S.
 Norman O. Holte, D.D.S., M.S.D.
 James R. Jensen, D.D.S., M.S.
 Andrew T. Morstad, D.D.S., M.S.
 Leon Singer, Ph.D.
 Harold C. Wittich, D.D.S.
 Douglas H. Yock, D.D.S., M.S.

Clinical Professor

Erwin M. Schaffer, D.D.S., M.S.D.
 Sherwood R. Steadman, D.D.S., M.S.

Assistant Professor

Dwight L. Anderson, M.S., Ph.D.
 Robert J. Isaacson, D.D.S., Ph.D.

Clinical Assistant Professor

Charles D. Simpson, D.D.S., M.S.

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, microbiology, biochemistry, pathology, 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 suitable 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.

Master of Science Degree—Offered only under Plan A.

Oral Medicine

230f,w,s,su. **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)

231f,w,s,su. **Advanced Clinical Oral Diagnosis.** Practical work in the clinic taking and recording case histories, making oral examinations, and setting up a detailed treatment plan. (Cr and hrs ar)

232f,w,s,su. **Research Problems in Oral Medicine.** (Cr and hrs ar)

- 261f,w,s,su. Advanced Dental Roentgenology.** Systematic consideration of basic factors governing X-radiation, emphasizing recent advances in biophysics with special reference to technique and material used. Demonstration and practice. (Cr and hrs ar) Petersen

Oral Pathology

- 260f. Oral Pathology and Histology.** Lectures and laboratory on histology of teeth and related oral tissues, including embryologic considerations. Special pathology of the oral region 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
- 262f,w,s,su. Research in Oral Pathology.** (Cr and hrs ar) Gorlin
- 263f,w,s. Dental Research Seminar.** (1 cr) Gorlin
- 264f,w,s. Clinical Oral Pathology Conference.** (1 cr) Clark, Gorlin
- 266s. 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; offered 1964-65 and alt yrs) Gorlin

Oral Surgery

- 250f,w,s,su. Advanced Oral Surgery.** Includes assigned clinics in University Hospitals such as Tumor, Plastic, and Hospital Dental Clinic in addition to regular periods in the Dental School. (Cr and hrs ar) Clark and staff
- 251f,w,s,su. Oral Surgery Seminar.** (1 cr) Clark
- 252f,w,s,su. Research in Oral Surgery.** (Cr and hrs ar) Clark and staff
- 253f,w,s,su. Problems in Oral Surgery.** (Cr and hrs ar) Clark and staff

Orthodontics

- 200f,w,s,su. Advanced Orthodontic Techniques.** (Cr and hrs ar) Steadman, Simpson
- 201f,w,s,su. Treatment Procedures in Orthodontics.** (Cr and hrs ar) Steadman, Simpson
- 202f,w,s,su. Case Analysis.** (Cr and hrs ar) Steadman, Simpson
- 203f,w,s,su. Treatment Planning.** (Cr and hrs ar) Steadman, Simpson
- 204f,w,s,su. Advanced Clinical Orthodontics.** (Cr and hrs ar) Steadman, Simpson
- 205f,w,s,su. Osteology and Myology of the Head.** (Cr and hrs ar) Steadman
- 206f,w,s,su. Growth of the Head.** (Cr and hrs ar) Steadman and staff
- 207f,w,s,su. Comparative Odontology.** (Cr and hrs ar) Steadman
- 208f,w,s,su. Seminar in Orthodontics.** (Cr and hrs ar) Steadman and staff
- 209f,w,s,su. Problems and Research in Orthodontics.** (Cr and hrs ar) Steadman
- 210. Principles of Orthodontic Retention.** (1 cr) Steadman, Simpson
- 211. Advanced Clinical Orthodontic Retention.** (2 cr) Steadman, Simpson, staff
- 212. Principles of Orthodontic Prognosis.** (1 cr) Steadman, Simpson
- 213. Advanced Clinical Orthodontic Prognosis.** (1 cr) Steadman, Simpson, staff
- 214. Advanced Orthodontic Seminar.** (1 cr) Steadman

Periodontics

- 280f,w,s,su. 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) Schaffer and staff
- 281f,w,s,su. Advanced Periodontics Lectures.** Consideration of tissues involved in periodontal disease. Etiology and treatment of periodontal disease. (3 cr) Schaffer and staff

- 282f,w,s,su. **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) Schaffer and staff
- 283f,w,s,su. **Seminar: Periodontics.** Etiology of periodontal disease, histopathology of periodontal symptoms, treatment of periodontal disease, research in periodontics. (1 cr) Schaffer and staff
- 284f,w,s,su. **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) Schaffer and staff
- 285w,su. **Histochemistry of the Normal and Pathologic Periodontium.** (2 cr) Staff
- 286s. **Bacteriology of Periodontal Diseases.** (1 cr) Staff

Restorative Dentistry

- 220f,w,s,su. **Advanced Dental Anatomy.** Under supervision, student assists in teaching and participates in activities of the Division of Dental Anatomy. He also is assigned special problems. (Cr and hrs ar) Hall
- 240f,w,s,su. **Advanced Technical Restorative Dentistry.** Teaching experience is integrated with technical solution of problems involving application of the theories of indeterminate stresses to more complex problems of tooth morphology. (Cr and hrs ar) Jensen, Wittich, Yock
- 243f,w,s,su. **Advanced Clinical Restorative Dentistry.** Detailed application of clinical techniques provides comprehensive training in restorative dentistry through studies on clinical material, collateral reading, and conferences. Research methods and evaluation of data emphasized. (Cr and hrs ar) Jensen, Wittich, Yock
- 247f,w,s,su. **Research Problems in Restorative Dentistry.** Arranged with individual students upon application after a critical review of current and historical literature pertaining to the problem. (Cr and hrs ar) Crawford, Jensen, Wittich, Yock

OFFERED AT THE MAYO FOUNDATION

Assistant Professor

Joseph A. Gibilisco, D.D.S., M.S., *head*

Associate Professor

Stanley A. Lovstedt, D.D.S., M.S.

Assistant Professor

Robert J. Gores, D.D.S., M.S.

Instructor

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

The Mayo Foundation offers fellowships in oral surgery to a limited number of graduates of approved dental schools who have bachelor of science degrees or the equivalent. An internship, while not required, is desirable.

The Foundation program is approved by the Council on Dental Education of the American Dental Association and provides the training required for certification by the American Board of Oral Surgery. One fellow is appointed each quarter, about a year in advance, and the residency requirement is 3 years. Services include oral roentgenology, oral diagnosis, oral surgery, surgical pathology, anatomy of the head and neck, anesthesiology, and hospital medical residency. Fellows, under staff supervision, care for the oral surgical patients in the Rochester State Hospital. Fellows may take work also in some of the divisions of physiology.

Orthodontic and prosthodontic services provide regular care for patients including those with jaw fractures and congenital or acquired oral defects. A service in periodontics completes the clinical practice.

For graduate students in the field of oral surgery, the surgical service at the Mayo Clinic is supplemented by a period of training at the Rochester State Hospital, Methodist Worrall Hospital, and St. Marys Hospital. Through special arrangements, each fellow may spend a quarter in oral surgery in residency at Detroit Receiving Hospital, Detroit, Michigan.

Seminars and conferences are held regularly, and in addition, fellows attend seminars relating to their quarterly assignments.

Master's Degree—Completion of the requirements leads to the degree of M.S. in dentistry, with minors available in the allied laboratory sciences of anatomy, pathology, and physiology.

M 251f,w,s,su. Dental Roentgenology. Staff

M 252f,w,s,su. Oral Diagnosis. Staff

M 253f,w,s,su. Oral Surgery. Staff

M 254f,w,su. Oral Pathology. Staff

Anat M 252s. Anatomy of the Head and Neck. (See Department of Anatomy)

Anes M 253f,w,s,su. Anesthesiology. (See Department of Anesthesiology)

Path M 255f,w,s,su. Surgical and Fresh Tissue Pathology. (See Department of Pathology)

Pl Surg M 253f,w,s,su. Plastic Surgery. (See Department of Plastic Surgery)

ENVIRONMENTAL HEALTH

Work leading to the Ph.D. degree with a major in environmental health is offered in the School of Public Health. For a list of faculty and course work, see section on Public Health in this bulletin.

EPIDEMIOLOGY

Work leading to the Ph.D. degree with a major in epidemiology is offered in the School of Public Health. For a list of faculty and course work see section on Public Health in this bulletin.

HOSPITAL ADMINISTRATION

OFFERED ON THE MINNEAPOLIS CAMPUS

Professor

James A. Hamilton, M.C.S.

James W. Stephan, M.B.S.

Associate Professor

E. Gartly Jaco, Ph.D.

The American hospital has become an important focal point of health care. It is part of a complex of institutions and ideas—medical, religious, charitable, and civic. Full understanding of this complex requires intensive and broad education.

Prerequisites—The professional degree master of hospital administration (administered by the School of Public Health) or its equivalent will serve as a first step in acquiring the Ph.D.

Ph.D. Degree—The Ph.D. program in hospital administration is interdepartmental and is designed to produce scholars, teachers, and researchers who possess thorough knowledge not only of the problems of the hospital but also of the hospital's role within the wider community. Work toward the Ph.D. will be done under a dual advisership. The second adviser shall be in one of the relevant departments such as anthropology, business administration, economics, political science, psychology, or sociology. Use of a double major rather than a major and minor is permitted for students who choose this alternative. Programs will be submitted to the Social Science Graduate Group Committee.

For a more complete statement concerning requirements, fellowships, and recommended courses of study, see the special bulletin published by the Program in Hospital Administration at the School of Public Health.

Thesis—The dissertation shall deal with a significant problem concerning health care services as they relate to the role and function of the hospital.

Language Requirement—Reading knowledge of one foreign language and a collateral field of knowledge.

- PubH 261f-262w-263s. Alternative Patterns for Meeting Health Care Needs.** Future role of hospitals in light of patient needs and community services. (3 cr per qtr; prereq #)
- PubH 264f. Seminar: Medical Care Patterns Abroad.** Readings, discussion, guest lectures on relations between health services and other social institutions. (3 cr; prereq #)
- PubH 265w. Seminar: Research Studies on Health Services.** Appraisal of design, instruments, field work procedures, and findings of existing studies. (3 cr; prereq #)
- PubH 266w.s. Hospital Administration Topics.** Independent study under tutorial guidance on selected problems, current issues. (Cr ar; prereq #)

LABORATORY MEDICINE

OFFERED AT THE MEDICAL SCHOOL

Professor

Gerald T. Evans, M.D.C.M., Ph.D., *director*
 Ellis S. Benson, M.D.
 R. Dorothy Sundberg, M.D., Ph.D.

Associate Professor

Robert A. Bridges, M.D.
 Ruth F. Hovde, M.S.
 Paul H. Lober, M.D.
 Newell R. Ziegler, M.D., Ph.D.

Assistant Professor

Esther F. Freier, M.S.
 Lorraine M. Gonyea, M.S.
 Patricia M. Hanauer, M.S.
 Verna L. Rausch, M.S.
 Joseph W. St. Geme, M.D.

Instructor

Grace Mary Ederer, M.P.H.
 Douglas A. Nelson, M.D.
 Edmond Y. Yunis, M.D.

The clinical laboratories (blood bank, chemistry and metabolism, electrocardiography, hematology, microbiology, morphologic pathology, parasitology) are administratively integrated, but each unit is under the professional charge of a specially assigned member of the appropriate fundamental department. Credits obtained in this field may be used in the above listed areas at the discretion of the adviser.

Besides gaining experience with the principal techniques and their interpretation, fellows are assigned special problems and reading courses. Recourse to the fundamental sciences and to current literature in investigative medicine is stressed.

There is no graduate major in this area. Students will do their major work in anatomy (hematology), microbiology, physiological chemistry, or pathology, and their minor work in 2 of the remaining 3 fields.

One-year renewable fellowships are open to suitably prepared persons wishing to spend their time principally on laboratory medicine and clinical laboratory research.

- 180f. Problems in Fluid and Electrolyte Metabolism A.** (Cr ar; offered 1963-64 and alt yrs) Evans and staff
- 181w. Problems in Fluid and Electrolyte Metabolism B.** (Cr ar; prereq 180; offered 1963-64 and alt yrs) Evans and staff
- 183f. Topics in Immunology.** (Cr ar; offered 1964-65 and alt yrs) Evans, Bridges, Ziegler
- 184. Problems in Laboratory Medicine.** (Cr ar) Evans and staff
- 185s. Topics in Hematology.** (Cr ar; prereq Anat 166; offered 1963-64 and alt yrs) Evans, Sundberg, Nelson
- 235f,w,s,su. Advanced Clinical Laboratory Medicine.** General rotation as above described. (Cr ar; prereq Anat 166) Evans and staff
- 236f,w,s,su. Research on Clinical Laboratory Problems.** (Cr ar) Evans and staff

MEDICAL TECHNOLOGY

For description of work leading to the Master's degree in medical technology, see the *Bulletin of the Graduate School*.

MEDICINE*(Including Divisions of Internal Medicine and Dermatology)*

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.

Internal Medicine**OFFERED AT THE MEDICAL SCHOOL****Professor**

Cecil J. Watson, M.D., Ph.D., *head*
 Ivan D. Frantz, M.D.
 Paul S. Hagen, M.D.
 Wendell H. Hall, M.D., Ph.D.
 Frederick W. Hoffbauer, M.D., M.S.
 Robert B. Howard, M.D., Ph.D.
 Samuel Schwartz, M.D.
 Wesley W. Spink, M.D.
 Leslie Zieve, M.D., Ph.D.

Murray J. Murray, M.D.
 Alvin L. Schultz, M.D., M.S.
 Louis Tobian, Jr., M.D.
 C. Paul Winchell, M.D.
 Horace H. Zinneman, M.D.

Clinical Associate Professor

Reuben Berman, M. D.
 Howard L. Horns, M.D.
 Arthur C. Kerkhof, M.D., Ph.D.

Clinical Professor

Thomas Lowry, M.D.
 Ragnvald S. Ylvisaker, M.D.

Assistant Professor

Carl S. Alexander, M.D., Ph.D.
 Naip Tuna, M.D., Ph.D.
 Yang Wang, M.D.

Associate Professor

J. B. Carey, Jr., M.D., Ph.D.
 Frederick C. Goetz, M.D.
 Byrl J. Kennedy, M.D., M.Sc.
 Frank M. MacDonald, M.D.

Clinical Assistant Professor

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

A wide range of clinical material for graduate work in internal medicine is available in the wards and outpatient departments of University of Minnesota Hospitals, Minneapolis General Hospital, Ancker Hospital in St. Paul, and Veterans Hospital in Minneapolis. 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 science 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 Requirement—For the Ph.D. degree, either (a) 2 foreign languages or (b) 1 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.

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. **Clinical Medicine.** General diagnosis and methods of investigation; recording of clinical data. Emphasis on methods of treatment. (Cr ar) Watson and staff
- 202f,w,s,su. **Diseases of the Cardiovascular Apparatus.** (Cr ar) Frantz, Tobian, Winchell, Wang, and staff
- 203f,w,s,su. **Research in Medicine.** Study of a clinical or fundamental problem related to internal medicine. (Cr ar) Watson, Spink, Frantz, Hoffbauer, Hall, and staff
- 205f,w,s,su. **Diseases of the Chest.** Opportunities to study problems relating to tuberculosis from both the clinical and laboratory standpoint. (Cr ar) Hall and staff
- 206f,w,s,su. **Clinical Conference.** Presentation of problem cases from the Medical Service. Discussion of diagnosis and treatment and consideration of pertinent literature. (1 cr) Watson and staff
- 207f,w,s,su. **Clinical Pathological Conference.** Presentation of clinical features, necropsy findings, and discussion. Medical and surgical cases. (1 cr) Dawson, Watson, and staff
- 208f,w,s,su. **Clinical Radiological Conference.** Presentation and discussion of X-ray films from the Medical Service, with clinical correlation. (1 cr) Peterson, Watson, and staff
- 210f,w,s,su. **Infectious Disease Seminar.** (1 cr) Spink, Hall, and staff
- 211f,w,s,su. **Electrocardiographic Conference.** (1 cr) Tuna
- 212w,s. **Pigment Metabolism.** (1 cr) Schwartz, Watson, and staff
- 213w,s. **Psychosomatic Medicine Seminar.** (1 cr) Magraw
- 214f,w,s,su. **Cardiovascular Seminar.** Weekly conference on clinical cardiovascular problems, held jointly by Departments of Medicine, Surgery, and Radiology. (1 cr) Wang and staff

OFFERED AT THE MAYO FOUNDATION

Professor

Nelson W. Barker, M.D., M.S.
 Howard B. Burchell, M.D., Ph.D.
 Hugh R. Butt, M.D., M.S.
 W. H. Dearing, M.D., M.A., Ph.D.
 F. Raymond Keating, M.D., M.S.
 Walter F. Kvale, M.D., M.S.
 Carl G. Morlock, 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.
 Edward H. Rynearson, M.D., M.S.
 Herbert W. Schmidt, M.D., M.S.
 Charles H. Slocumb, M.D., M.S.
 Randall G. Sprague, M.D., Ph.D.
 J. Minott Stickney, M.D., M.S. (Clinical)
 Charles H. Watkins, M.D., Ph.D.
 Eric E. Wollaeger, M.D., M.S.

James C. Cain, M.D., M.S.
 D. C. Campbell, M.D., M.S. (Clinical)
 David T. Carr, M.D., M.S.
 H. M. Carryer, M.D., Ph.D. (Clinical)
 Guy W. Daugherty, M.D., M.S. (Clinical)
 Earl E. Gambill, M.D., M.S.
 Joseph E. Geraci, M.D., M.S.
 Albert B. Hagedorn, M.D., M.S.
 Malcolm M. Hargraves, M.D.
 Corrin H. Hodgson, M.D., M.S.
 Giles A. Koelsche, M.D., Ph.D. (Clinical)
 William M. McConahey, M.D., M.S.
 R. Drew Miller, M.D., M.S.
 Donald R. Nichols, M.D., M.S.
 Robert L. Parker, M.D., M.S.
 Robert M. Salassa, M.D., M.S.
 William G. Sauer, M.D., M.S.
 Richard M. Shick, M.D., M.S.
 Lucian A. Smith, M.D., M.S.
 Jan H. Tillisch, M.D., M.S.
 L. O. Underdahl, M.D., M.S. (Clinical)
 L. Emmerson Ward, M.D. M.S.

Associate Professor

Edwin D. Bayrd, M.D., M.S.
 John M. Berkman, M.D., M.S.

Assistant Professor

Howard A. Andersen, M.D., M.S.
 Milton W. Anderson, M.D., M.S.
 Lloyd G. Bartholomew, M.D., M.S.
 Kenneth G. Berge, M.D., M.S.
 Charles M. Blackburn, M.D., M.S.
 Robert O. Brandenburg, M.D., M.S.
 James C. Broadbent, M.D., M.S.
 John A. Callahan, M.D., M.S.
 Earl T. Carter, M.D., Ph.D.
 Norman A. Christensen, M.D., M.S.
 Daniel C. Connolly, M.D., Ph.D.
 Talbert Cooper, M.D., M.S.
 William T. Foulk, M.D., M.S.
 C. F. Gastineau, M.D., Ph.D.
 John B. Gross, M.D., M.S.
 David G. Hanlon, M.D., M.S.
 Lowell L. Henderson, M.D., M.S.
 Llewelyn P. Howell, M.D., M.S.
 Kenneth A. Huizenga, M.D., M.S.
 John L. Juergens, M.D., M.S.
 William J. Martin, M.D., M.S.
 Thomas W. Parkin, M.D., M.S.
 G. A. Peters, M.D., M.A., M.S.
 Raymond V. Randall, M.D., M.S.
 R. A. Rovelstad, M.D., Ph.D.
 Donald A. Scholz, M.D., M.S.
 Harold H. Scudamore, M.D., Ph.D.
 Ralph E. Smith, M.D.
 J. A. Spittell, Jr., M.D., M.S.
 Maurice H. Stauffer, M.D., M.S.
 Charles F. Stroebel, M.D., M.S.
 W. H. J. Summerskill, M.D., M.A.
 William E. Wellman, M.D., M.S.

Instructor

E. J. W. Bowie, B.M., B.Ch., M.S.
 G. Roy Diessner, M.D., M.S.
 Matthew B. Divertie, M.D., M.S.

F. Edmund Donoghue, M.D., M.S.
 Bruce E. Douglass, M.D., M.S.
 John F. Fairbairn II, M.D.
 Robert S. Fontana, M.D., M.S.
 Paul A. Green, M.D., M.S.
 Norbert O. Hanson, M.D.
 Cynthia S. Hardison, M.D., M.S.
 Norman G. G. Hepper, M.D., M.S.
 John A. Higgins, M.D., M.S.
 Richard W. Hill, M.D., M.S.
 David L. Hoffman, M.D.
 Harry N. Hoffman II, M.D., M.S.
 James C. Hunt, M.D., M.S.
 Horace K. Ivy, M.D., M.S.
 Joseph M. Kiely, M.D., M.S.
 Robert A. Kyle, M.D., M.S.
 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.
 Charles G. Moertel, M.D., M.S.
 George D. Molnar, M.D., Ph.D.
 Philip J. Osmundson, M.D., M.S.
 Jaime Paris, M.D., M.S.
 Don C. Furnell, M.D., M.S.
 Donald E. Ralston, M.D., M.S.
 R. J. Reitemeier, M.D., M.S.
 B. Lawrence Riggs, Jr., M.D., M.S.
 James V. Ross, Jr., M.D., M.S.
 Alexander Schirger, M.D., M.S.
 Sheldon G. Sheps, M.D.
 Donald A. Sones, M.D., M.S.
 Ralph E. Spiekerman, M.D., M.S.
 Harry A. Swedlund, M.D., M.S.
 Deloran L. Thurber, M.D., M.S.
 Louis D. Vaughn, M.D., M.S.
 Richard E. Weeks, M.D., M.S.
 J. W. Worthington, Jr., 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 21 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 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 the special field of interest including allergy, infectious diseases, rheumatology, cardiovascular and renal diseases, diseases of the chest, metabolic diseases, endocrinology, hematology, and 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. Fellows are assigned quarterly to most of the subspecialty services in the latter part of the 3-year fellowship. This allows for intensive study in a specialty each quarter. Care of patients is a co-operative responsibility of fellows under faculty supervision.

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 greatest learning media. Seminars may be small when a patient forms the center for discussion or larger when disease entities, disease mechanisms, or laboratory techniques provide the theme for dissertation. Knowledge of appropriate current medical literature augments the learning value of these seminars, be they large or small, in the hospital, clinic, or laboratories.

Full-time assignments for at least 6 or 9 months in one of the basic sciences 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 but enriches the graduate study in internal medicine for any talented physician. It is at this time that all or most of the original work is done, forming the basis for the graduate thesis.

Fellows showing academic promise are urged to avail themselves of these research opportunities to add depth to their broad exposure to abundant clinical problems. Those fellows also showing special clinical promise are offered the first assistantships near or at the end of the 3-year period of study.

Language Requirement—For the Ph.D. degree, either (a) 2 foreign languages or (b) 1 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. **General Medical and Surgical Diagnosis.** Research. Seminar. Staff

M 252f,w,s,su. **Medical Hospital Residence.** Research. Seminar. Staff

M 253f,w,s,su. **Medical Diagnosis and Hospital Service.** Staff

Psych M 256f,w,s,su. **Clinical Psychiatry.** Diagnostic and hospital services. Staff

Neur M 257f. **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 Department of Microbiology)

Fellows majoring in internal medicine may also take work in biophysics, dermatology, pediatrics, and physical medicine and rehabilitation. For details, see these departments.

Dermatology

OFFERED AT THE MEDICAL SCHOOL

Professor

Francis W. Lynch, M.D., M.S., *director*

Clinical Professor

Carl W. Laymon, M.D., Ph.D.

Clinical Associate Professor

Robert W. Goltz, M.D.
John G. Rukavina, M.A., M.D.

Clinical Assistant Professor

Isadore Fisher, M.D., M.S.

Master's and Doctor's Degrees—Instruction in dermatology and syphilology leading to the M.S. or Ph.D. degree is offered at University Hospitals, Minneapolis General Hospital, Veterans Hospital in Minneapolis, and Ancker Hospital in St. Paul, combined with attendance at the clinics at the four hospitals. A limited number of graduate students are appointed as residents in dermatology, rotating in these hospitals. The student devotes full time and may not carry on outside practice. All graduate students majoring in dermatology and syphilology are required to carry on independent research under the direction of Dr. Lynch and the head of the 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 physiological chemistry 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) 2 foreign languages or (b) 1 foreign language and the option of a collateral field of knowledge.

225f,w,s,su. Clinical Dermatology. Wards and outpatient departments of University Hospitals, Veterans Hospital, Minneapolis General Hospital, and Ancker Hospital. (Cr ar) Lynch and staff

226f,w,s,su. Dermatology. Conference twice weekly on diagnosis and treatment of skin conditions. Minneapolis General Hospital. (Cr ar) Laymon and staff

227f,w,s,su. Histopathology of the Skin. (Cr ar) Lynch, Goltz, and staff

228f,w,s,su. Research in Dermatology. (Cr ar) Lynch, Goltz, Rukavina, and staff

229f,w,s. Experimental Methods in Dermatology. (Cr ar) Goltz and staff

230f,w,s. Functional Biology of the Skin. (Cr ar) Rukavina and staff

OFFERED AT THE MAYO FOUNDATION

Professor

Robert R. Kierland, M.D., M.S., *head*
Louis A. Brunsting, M.D., M.S.

Associate Professor

Richard K. Winkelmann, M.D., Ph.D.

Assistant Professor

Harold O. Perry, M.D., M.S.

The Department of Dermatology of the Mayo Foundation 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 1,500 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.

Language Requirement—For the Ph.D. degree, either (a) 2 foreign languages or (b) 1 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. Histopathology of the Skin. Laboratory and lectures. Winkelmann

M 252f,w,s,su. Diagnosis with Special Reference to Dermatology and Syphilology. Daily seminar. Clinical conference. Brunsting, Kierland, Perry, Winkelmann

M 253f,w,s,su. Hospital Residence. Care of hospitalized patients. Seminar. Brunsting, Kierland, Perry, Winkelmann

Fellows 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.

MICROBIOLOGY

OFFERED AT THE MEDICAL SCHOOL

Professor

John Spizizen, Ph.D., *head*
Robert A. Good, M.D.
James J. Jezeski, Ph.D.
Joseph C. Olson, Ph.D.
Dennis W. Watson, Ph.D.

Associate Professor

S. Gaylen Bradley, Ph.D.
K. Gerhard Brand, M.D.
Martin Dworkin, Ph.D.
Leroy C. McLaren, Ph.D.
Louis H. Muschel, Ph.D.
Edwin L. Schmidt, Ph.D.

Assistant Professor

Dwight L. Anderson, Ph.D.
 Robert W. Bernlohr, Ph.D.
 Brooks D. Church, Ph.D.
 Ronald W. Hinz, Ph.D.
 Palmer Rogers, Ph.D.

Joseph W. St. Geme, Jr., M.D.

Joseph V. Scaletti, Ph.D.
 John E. Verna, Ph.D.

Lecturer

Wendell H. Hall, M.D., Ph.D.

Language Requirement—For the Master's degree, one foreign language. For the Ph.D. degree, either (a) 2 foreign languages or (b) 1 foreign language and the option of a collateral field of knowledge.

Master's Degree—Offered under Plan A.

Doctor's Degree—Work toward the Ph.D. degree is offered.

- 100s.** 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 infections to other focal and general infections. (6 cr) Anderson
- 102s.** 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 med students; prereq 116) Brand
- 103s. Soil Microbiology.** Methods for enumeration and study of microflora and microfauna. Biochemical activities of soil population. (4 cr; prereq 53, 8 cr in organic chemistry and #) Schmidt
- 105f-106w.** Principles of Infectious Disease.** 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) McLaren and staff
- 110w. 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 #; offered 1964-65 and alt yrs) Bradley
- 111s. Advanced Laboratory.** Techniques employed in study of fundamental techniques in microbiology. Laboratory exercises illustrate isolation, cultivation, and identification of microorganisms. (3 cr; prereq 53 or #) Church
- 112w. General Mycology.** Physiology; genetics; development; ecology; evolution; taxonomy; economic importance of the yeasts, molds, actinomycetes, and other fungi. (3 cr; prereq 53 or #; offered 1963-64 and alt yrs) Bradley
- 116w. 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. (4 cr; prereq 53) Watson
- 121f. Physiology of Bacteria.** Chemical and physical structure; staining; growth; influence of environment on growth; nutrition; enzymes; metabolism. (3 cr; required of all microbiology majors; prereq 53, 8 cr in organic chemistry or biochemistry) Rogers
- 122s. Physiology of Bacteria Laboratory.** Techniques employed in study of bacterial physiology and metabolism. (3 cr; required of all grad students in microbiology, open to others by consent; prereq 121) Rogers, Bernlohr
- 124f. Principles of Virology and Animal Cell Culture.** Lectures on biology of animal cell cultures; nature of viruses and rickettsia; etiology, epidemiology, and laboratory diagnosis of viral and rickettsial infections. (3 cr; prereq 102 or 105 and 116) Verna
- 152f,w,s. Special Problems.** (Cr ar; prereq #)
- 153f,w,s. General Microbiology.** Lectures, demonstrations, and laboratory exercises in morphology, physiology, taxonomy, and ecology of bacteria. Practical application of these fundamental

** Microscope required. Students may obtain use of microscope by purchasing \$3 microscope cards from the bursar.

- principles in other phases of science and industry. (3 cr; prereq 10 cr in chemistry, 4 cr in biological sciences, §) Schmidt
- 201f,w,s. **Research in Microbiology.** Graduate students with the requisite preliminary training may elect research, either as majors or minors. (Cr and hrs ar) Staff
- 202f,w,s. **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, §) McLaren, St. Geme
- 203f,w,s. **Seminar.** (1 cr) Brand
- 206s.** **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 1964-65 and alt yrs) McLaren, Verna
207. **Advanced Medical Microbiology.** (2 cr; prereq §) Brand
- 223s. **Bacterial Metabolism.** Advanced treatment of metabolism: enzymes; biological energy; fermentation; respiration; nitrogen metabolism. (3 cr; required of all grad students in microbiology, open to others by consent; prereq 122 or equiv, introductory biochemistry) Bernlohr

OFFERED AT THE MAYO FOUNDATION

Professor

Lyle A. Weed, M.D., Ph.D., *head*
Alfred G. Karlson, D.V.M., M.S., Ph.D.

Assistant Professor

Ernest C. Herrmann, Ph.D.
Harold Markowitz, Ph.D., M.D.
Gerald M. Needham, Ph.D.
John A. Ulrich, Ph.D.

Prerequisites—Opportunities are offered for advanced work in microbiology (bacteriology, mycology, virology, immunology) in connection with routine clinical examinations and special research. These may be in conjunction with minor programs offered to fellows in the Mayo Foundation who are majoring in clinical fields or may be taken separately.

- M 251f,w,s,su. **Diagnostic Microbiology.** Experience in a diagnostic laboratory including special procedures and research. Weed, Needham, Ulrich, Karlson, Markowitz, Herrmann
- M 252f,w,s,su. **Experimental Microbiology.** Graduate research in any of the various phases of microbiology (immunology, virology, mycology, bacteriology, and parasitology). Weed, Needham, Ulrich, Karlson, Markowitz, Herrmann, Thompson
- M 253f,w,s,su. **Lectures in Microbiology.** Medical bacteriology, mycology, parasitology, virology, and immunology. Weed, Needham, Ulrich, Karlson, Markowitz, Herrmann, Thompson, Stilwell

NUTRITION

OFFERED AT THE MAYO FOUNDATION AND BY THE SCHOOL OF HOME ECONOMICS

Professor

Charles F. Code, M.D., Ph.D., *head*
Randall G. Sprague, M.D., Ph.D.

The fellowship program offers experience in clinical dietetics and an introduction to the principles and procedures required for research in problems of metabolism and nutrition as well as experience in carrying out a modest research problem in one of these areas. The fellowship may lead to an M.S. degree through integration with a graduate degree program in home economics (nutrition) in the Graduate School of the University of Minnesota, of which the Mayo Foundation is a part.

The fellowship appointment is customarily made for 1 year. The program of the fellow has considerable flexibility although it is usually arranged to provide experience in clinical dietetics, in research studies with patients having metabolic diseases, and in a problem of research in basic nutrition.

** Microscope required. Students may obtain use of microscope by purchasing \$3 microscope cards from the bursar.

Generally 3 months of the fellowship are devoted to clinical dietetics during which the fellow makes daily hospital rounds with the medical staff, attends the associated seminars and conferences, and is responsible for the dietary care of the patients on the medical service assigned. This period of work is done under the supervision of the Department of Dietetics, St. Marys Hospital.

The nutrition fellow spends 3 months in the Metabolism Unit (Nutrition Laboratory). There instruction is given in the general organization of the Unit and in the procedures employed in conducting research of a metabolic or nutritional nature. The fellow learns the dietary principles and techniques involved in the planning and executing of balance studies and other types of metabolic and nutrition research, and is further afforded the experience and responsibility of planning such studies with direction as to selection, storage, and preparation of food. Work in the Metabolism Unit is conducted under the supervision of the Departments of Medicine and Physiology of the Mayo Clinic and Mayo Foundation.

During the next 6 months of the fellowship, the fellow is encouraged to carry out an individual research project, which may be concerned with a problem in human or animal nutrition or in physiologic or biochemical nutritional problems, dependent on the particular interest of the fellow. This research project may be offered as a thesis problem in partial fulfillment for the M.S. degree in home economics (nutrition).

Following the year's fellowship program at the Mayo Foundation, most of the nutrition fellows take course work, usually in the School of Home Economics, on the St. Paul Campus of the University of Minnesota. They usually carry a minor in some related field such as education, biochemistry, physiology, or economics. When the above plan is followed, a period of 1½ to 2 years is generally needed to complete a Master's program.

Appointments carry a stipend of \$250 per month.

Prerequisites—A B.S. degree and a completed dietetic internship approved by the American Dietetic Association.

M 251f,w,s,su. Nutrition. Code, Sprague

M HE 272f,w,s,su. Human Metabolic Studies in Health and Disease. Experience in a metabolic research unit; conferences and group discussion. (4 cr; prereq HE 173 or equiv, #; offered at Mayo Foundation, Rochester) Code

M HE 273f,w,s,su. Advanced Diet Therapy. Lectures, conferences, and experience in the dietary care of patients. (4 cr; prereq HE 173 or equiv, #; offered at St. Marys Hospital, Rochester) Victor

OBSTETRICS AND GYNECOLOGY

OFFERED AT THE MEDICAL SCHOOL

Professor

John L. McKelvey, M.D.C.M., *head*

Clinical Assistant Professor

Leonard A. Lang, M.D.
Mancel T. Mitchell, M.D.

Associate Professor

Konald A. Prem, M.D.

Language Requirement—For the Ph.D. degree, either (a) 2 foreign languages or (b) 1 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.

201f-202w-203s-204su. Advanced Obstetrics and Gynecology, I. Includes service in the University Hospitals or Minneapolis 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) McKelvey and staff

- 205f-206w-207s-208su. Advanced Obstetrics and Gynecology, II.** Similar to 201-204, 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) McKelvey and staff
- 209f-210w-211s-212su. Advanced Obstetrics and Gynecology, III.** Similar to 201-204 and 205-208, but more advanced. (Cr ar; required of 3rd-yr fellows) McKelvey and staff
- 213f-214w-215s. 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) McKelvey and staff
- 216f-217w-218s-219su. 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 yr; elective for 2nd-yr fellows or other properly qualified grad students) McKelvey and staff
- 221f-222w-223s-224su. 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) McKelvey and staff

OFFERED AT THE MAYO FOUNDATION

Associate Professor

Robert B. Wilson, M.D., M.S., *head*

Professor

Arthur B. Hunt, M.D., M.S.

Associate Professor

Joseph H. Pratt, M.D., M.S.

Assistant Professor

Edward A. Banner, M.D., M.S.

David G. Decker, M.D., M.S.

Richard E. Symmonds, M.D., M.S.

John S. Welch, M.D., M.S.

Instructor

Leonard 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.

M. Elizabeth Mussey, M.D., M.S.

Reginald A. Smith, 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 surgical sections concerned with gynecologic conditions. Seminars and conferences are held regularly.

Through special arrangements each fellow is assigned for a period of 6 months to the Cook County Hospital in Chicago, Illinois, where he receives more special training in obstetrics.

Language Requirement—For the Ph.D. degree, either (a) 2 foreign languages or (b) 1 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. Diagnosis, principally in relation to obstetrics and gynecologic conditions. Research. Seminar. Wilson, Hunt, Faber, Mussey, Banner, Decker, Johnson, Smith, Aaro

M 252f,w,s,su. Clinical Obstetrics and Gynecology. Diagnosis and treatment with special study of selected obstetric and gynecologic cases. Residence. Seminar. Wilson, Hunt, Faber, Mussey, Banner, Decker, Johnson, Smith, Aaro, Kempers

M 253f,w,s,su. Operative Surgery. Pratt, Welch, Symmonds

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

OFFERED AT THE MEDICAL SCHOOL

Professor

John E. Harris, Ph.D., M.D., *head*

Clinical Professor

Walter H. Fink, M.D.

Clinical Associate Professor

Walter L. Hoffman, M.D., M.S.

John P. Wendland, M.D., M.S.

Clinical Assistant Professor

Edward P. Burch, M.D.
Llewellyn E. Christensen, M.D.
Richard C. Horns, M.D., M.S.
Bourne Jerome, M.D.
Bruce L. Kantar, M.D., M.S.
Robert H. Monahan, M.D.
Karl E. Sandt, M.D.
George T. Tani, M.D., M.S.

Assistant Professor

William L. Fowles, Ph.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, Minneapolis General Hospital, Ancker Hospital in St. Paul, and the Veterans Hospital in Minneapolis provides an excellent core for clinical training and insures adequate surgical experience for each individual fellow. The department's laboratory facilities and its staff are available to all for research in basic or clinical studies of the specialty. Regardless of 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, physiological chemistry, 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, physiological chemistry, pharmacology, etc., as they apply to the practice of ophthalmology. The remainder of the courses (with the exception of Opth 204 and 215) are presented once during the 3-year program.

- 200f,w,s,su. **Clinical Ophthalmology.** (6 cr per qtr) Harris and staff
 201f,w,s,su. **Practical Ocular Surgery.** (3 cr per qtr) Harris and staff
 202f,w,s. **Ocular Pathology Conference.** (1 cr per qtr) Monahan and staff
 203f,w,s,su. **Basic and Applied Ophthalmology.** (2 cr per qtr) Harris and staff
 204. **Seminar in Ophthalmology.** (Cr ar) Harris and staff
 205f,w,s. **Neuro-ophthalmology.** (1 cr per qtr) Wendland, Baker, and staff
 206f. **Refraction.** (1 cr) Tani
 207w,s. **Ocular Muscles.** (1 cr per qtr) Fink, Horns, and staff
 208f,w. **Didactic Ocular Surgery.** (1 cr per qtr) Burch and staff
 209f,w. **Pathology of the Eye.** (1 cr per qtr) Monahan and staff

- 210s. Radiology of the Eye, Orbit, and Head. (1 cr) Peterson
 211s,f. External Diseases. (1 cr per qtr) Wendland and staff
 212f,w,s. Medical Ophthalmology. (1 cr per qtr) Kantor and staff
 213w,s. Physiologic Optics. (1 cr per qtr) Jerome
 214. Ophthalmology Laboratory. (9 cr) Harris and staff
 215. Research in Ophthalmology. (Cr ar) Harris and staff

OFFERED AT THE MAYO FOUNDATION

Associate Professor

John W. Henderson, M.D., M.S., *head*

Professor

C. Wilbur Rucker, M.D., M.S.

Associate Professor

Hugo L. Bair, M.D.

Robert W. Hollenhorst, M.D., M.S.

Assistant Professor

Thomas P. Kearns, M.D., M.S.

Theodore G. Martens, M.D., M.S.

Instructor

John A. Dyer, M.D., M.S.

Thomas J. Kirby, Jr., M.D., M.S.

Fellows 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 are available in the departments concerned.

Language Requirement—For the Ph.D. degree, either (a) 2 foreign languages or (b) 1 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. 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. Martens, Dyer

M 252f,w,s,su. Clinical Ophthalmology. Diagnosis and treatment of diseases of the eye and its adnexa. Bair, Henderson, Kirby

M 253f,w,s,su. Medical and Neurologic Ophthalmology. Ophthalmology and ophthalmoscopy as they pertain to the fields of internal medicine and neurology. Rucker, Hollenhorst, Kearns

M 254f,w,s,su. Ophthalmic Surgery. A 6-months' hospital service. Bair, Henderson, Hollenhorst, Martens, Kirby, Dyer

Anatomy of the Orbit. (See Department of Anatomy)

Pathology of the Eye. (See Department of Pathology)

Optics, Physical and Physiologic. (See Department of Biophysics)

OTOLARYNGOLOGY

OFFERED AT THE MEDICAL SCHOOL

Professor

Lawrence R. Boies, M.A., M.D., *head*

Frank M. Lassman, Ph.D.

Associate Professor

W. Dixon Ward, Ph.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) 2 foreign languages or (b) 1 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.

- 230f,w,s. **Clinical Otolology.** (3 cr per qtr) Staff
 231. **Clinical Rhinology and Laryngology.** (3 cr) Staff
 232f,w,s. **Surgery of the Ear, Nose, and Throat.** (3 cr per qtr) Staff
 233. **Operative Surgery of the Temporal Bone.** (2 cr) Staff
 234. **Operative Surgery of the Nose and Throat.** (2 cr) Staff
 235. **Roentgenology of the Head.** (½ cr) Staff
 236. **Functional Ear Tests.** (1 cr) Staff
 237. **Endoscopy. Lectures and demonstrations.** (2 cr) Staff
 238. **Pathology of the Ear, Nose, and Throat.** (1 cr) Staff
 239. **Neurologic Lesions in the Field of Otolaryngology.** (½ cr) Staff
 240. **Physiotherapy and Surgery of the Malignant Diseases of the Ear, Nose, and Throat.** (2 cr) Staff
 241. **Seminar on Current Literature.** (1 cr) Staff
 242. **Applied Physiology in Otolaryngology.** (½ cr)
 243. **Applied Pharmacology in Otolaryngology.** (½ cr)
 244. **Speech Pathology.** (½ cr) Lassman
 245. **Allergy.** (1 cr) Staff
 246. **Practical Audiology.** (1 cr) Lassman
 247. **Reconstructive Nasal Surgery.** (1 cr) Staff
 248. **Research.** (Cr ar) Boies

Otolaryngology and Rhinology

OFFERED AT THE MAYO FOUNDATION

Professor

Kinsey M. Simonton, M.D., M.S., *head*
 Henry L. Williams, M.D., M.S.

Instructor

John C. Lillie, M.D., M.S.
 James B. McBean, M.D.

Associate Professor

Olav E. Hallberg, M.D., M.S. (Clinical)
 Henry A. Brown, M.D., M.S.
 LeRoy D. Hedgecock, Ph.D.
 Clifford F. Lake, M.D., M.S.

The fellowship in otolaryngology and rhinology at the Mayo Foundation 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. Plastic, reconstructive, and tumor operations of the head and neck are done by the surgeons during affiliation with the Section on Plastic Surgery. Training in peroral endoscopy, including diagnosis of diseases of the chest, is given in affiliation with the Section on 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 co-operation 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 3-year program is available for candidates who have 1 year of experience in an approved surgical residency program. Candidates are encouraged to take their year in general surgery at the Mayo Foundation, where the general surgery experience is directed to those areas most related to the practice of otolaryngology.

Language Requirement—For the Ph.D. degree, either (a) 2 foreign languages or (b) 1 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. 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. Williams, Simonton, Hallberg, Brown, Lake, McBean

M 252f,w,s,su. Preoperative and Postoperative Care of Patients. Treatment of complications. Williams, Simonton, Hallberg, Brown, Lake, McBean

M 253f,w,s,su. Operative Otolaryngology and Rhinology. Hospital residence, second assistantship in operating service. Cadaver surgery, microsurgery of the ear on fresh anatomic material. Williams, Simonton, Hallberg, Brown, Lake, McBean

M 254f,w,s,su. Operative Otolaryngology and Rhinology. First assistantship in operative service. Williams, Simonton, Hallberg, Brown, Lake, McBean

M 255f,w,s,su. 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

Plastic Surgery. (See Department of Plastic Surgery)

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

OFFERED AT THE MEDICAL SCHOOL

Professor

James R. Dawson, Jr., M.D., *head*
A. B. Baker, M.D., Ph.D.
Ellis S. Benson, M.D.
Jesse E. Edwards, M.D.
Robert Hebbel, M.D., Ph.D.

Assistant Professor

John I. Coe, M.D.

Clinical Instructor

Frederick A. Fox, M.D.

Associate Professor

Paul H. Lober, M.D., Ph.D.
Nathaniel A. Lufkin, M.D.
Lee W. Wattenberg, 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) 2 foreign languages or (b) 1 foreign language and the option of a collateral field of knowledge.

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. **Pathology.** General pathology. (8 cr; prereq completion of 1st yr in Med School or equiv) Dawson, Hebbel, and staff
102. **Pathology.** Special pathology. (8 cr; prereq 101) Dawson, Hebbel, and staff
- 104x. **Autopsies.** (Cr ar; prereq 102) Dawson, Hebbel
105. **Diseases of the Kidney.** (3 cr; prereq 102) Hebbel
106. **Diseases of the Heart.** (1 cr; prereq 102) Staff
- 110x. **Seminar in Pathology.** (1 cr per qtr; prereq 102) Dawson
- 111x. **Conference on Autopsies.** (1 cr per qtr; prereq 102) Dawson
112. **Diagnosis of Tumors.** (Cr ar; prereq 102) Hebbel
- 113x. **Surgical Pathology.** (Cr ar; prereq 102) Hebbel
114. **Diseases of the Liver.** (1 cr; prereq 102) Staff
115. **Advanced Neuropathology.** (Cr ar, §NPsy 150, §210; hrs ar) Baker
116. **Problems in Neuropathology.** (Cr ar, §NPsy 143; prereq 102; hrs ar) Baker
117. **Neuropathology.** (Cr ar, §NPsy 143; hrs ar) Baker
118. **Intracranial Neoplasms.** (2 cr, §NPsy 211) Baker
119. **Survey of Neuropathology.** Examination of specimens from current autopsies. (Cr ar, §NPsy 151 and §212; hrs ar)
120. **Diseases of the Lungs.** (1 cr; prereq 102) Dawson
121. **Diseases of the Alimentary Tract.** (1 cr; prereq 102) Hebbel
122. **Basic Science of Cancer.** (4 cr; prereq MdBe 100 or equiv) Wattenberg
- 140f,w,s. **Seminar in Experimental Pathology.** (Formerly CBio 140) (1 cr) Hallberg
- 141f,w,s. **Problems in Experimental Pathology.** (Formerly CBio 141) (Cr and hrs ar) Staff
- 150x. **Problems in Pathology.** (Cr and hrs ar; prereq 102, Δ) Staff
- 201x. **Research.** (Cr and hrs ar; grad students with necessary preliminary training may elect research, either as majors or minors in pathology)
- 207f,w,s. **Research in Experimental Pathology.** (Formerly CBio 207) (Cr and hrs ar) Staff

OFFERED AT THE MAYO FOUNDATION

Professor

Archie H. Baggenstoss, M.D., M.S., *head*,
Anatomic Pathology
 Malcolm B. Dockerty, M.D., C.M., M.S., *head*,
Surgical Pathology
 David C. Dahlin, M.D., M.S.
 Alfred G. Karlson, D.V.M., M.S., Ph.D.
 Lewis B. Woolner, M.D., M.S.

Associate Professor

George P. Sayre, M.D., M.S.

Assistant Professor

Robert C. Bahn, M.D., Ph.D.
 Edith M. Parkhill, M.D., M.S.
 Edward H. Soule, M.D.

Instructor

Arnold L. Brown, Jr., M.D.
 Edgar C. Harrison, Jr., M.D., M.S.
 Jack L. Titus, M.D., Ph.D.

Opportunities for advanced work in anatomic pathology are offered in two different sections of the Mayo Foundation as follows:

1. Experimental and Anatomic Pathology—Within this section active research programs utilizing the techniques of histochemistry, electron microscopy, tissue culture, and tissue transplantation are under way, in addition to the performance of necropsies. Post-mortem examinations are made in sufficient numbers to permit approximately 12 fellows being assigned to the section.

The service permits the laying of a thorough foundation in general principles of pathologic anatomy. Each fellow serves as junior assistant 3 months and senior assistant 3 months, during which time he takes part in the routine of post-mortem examinations and studies the microscopic sections of these post-mortems and engages in weekly conferences and seminars concerned with general and special subjects in pathologic anatomy. Each fellow is expected to work on a problem and to present his findings to the group. Microscopic and gross demonstrations are held at frequent intervals, and the work throughout is carefully supervised. Collateral reading and study are encouraged, and there is ample opportunity for thesis studies or special lines of research. First assistants are provided with an additional 6 months' service with increased responsibilities and opportunities for more extensive investigation. Available for study is a large collection of operative and post-mortem specimens, both gross and microscopic, cross-indexed as to organ and disease. In addition there are over 45,000 photomicrographs and photographs of gross specimens illustrating various phases of pathologic anatomy.

2. Surgical Pathology—The laboratories of surgical pathology receive immediately all tissues removed at operation. 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) also are 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 254f,w,s,su. Necropsy Service.** Junior assistant 3 months; senior assistant 3 months; demonstrations in clinico-pathologic conferences; microscopic examination of fixed tissues removed at necropsy. Microbiology and necropsy material. Research problems. Weekly seminars. Baggenstoss, Sayre, Bahn, Brown, Shorter, Titus
- M 255f,w,s,su. Surgical and Fresh Tissue Pathology.** Diagnosis of surgical specimens (gross and microscopic) with immediate correlation with all clinical data. Experience in examination of cellular content of body secretions, including cervical smears. Research problems. Daily demonstrations and discussions. Dockerty, Parkhill, Dahlin, Woolner, Soule, Harrison
- M 256f,w,s,su. Research Work on Selected Problems in Experimental Pathology.** Owen, Hallenback, Bahn, Titus
- M 257f,w,s,su. Research Work on Selected Problems in Comparative Pathology.** Karlson
- M 258f,w,s,su. Cytology of Body Secretions.** Dahlin, Woolner
- M 259f,w,s,su. Pathology of the Eye.** Open to ophthalmology majors who have adequate preparation in general pathology. Parkhill

- M 260f,w,s,su. Neuropathology.** Open to majors in neurology and psychiatry or neurologic surgery who have adequate preparation in general pathology. Sayre
- M 261f,w,s,su. Electron Microscopy.** Brown

Clinical Pathology

Professor

Charles A. Owen, Jr., M.D., Ph.D., *head*

Associate Professor

Frank T. Maher, M.D., M.S., Ph.D.
Don R. Mathieson, M.D., M.S.

Assistant Professor

Gertrude L. Pease, M.D., M.S.
John H. Thompson, Jr., Ph.D.

Instructor

Welby N. Tauxe, M.D., M.S.

A 2-year program in clinical pathology is offered as part of a 4-year program in pathology leading to eligibility for examination and certification by the American Board of Pathology and Clinical Pathology. This program consists of lectures, demonstrations, and actual performance of tests in the laboratories of microbiology, chemistry, parasitology, blood coagulation, blood grouping, urinalyses, gastric analyses, radioactive isotopes, and hematology where over 1.5 million tests are performed yearly.

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 investigative work in any of the laboratories.

- M 251Af,w,s,su. Diagnostic Microbiology.** Experience in a diagnostic laboratory; special procedures and research. Weed, Needham, Ulrich, Karlson, Markowitz, Herrmann
- M 251Bf,w,s,su. Biochemistry.** Research work in problems related to metabolism and the chemistry of the blood; training in use of methods of organic and inorganic analysis. Owen, Mason, Flock, Fleisher, Mattox, McGuckin, Rosevear, Jones
- M 251Cf,w,s,su. Clinical Pathology.**
Serology. Mathieson, Stillwell
Blood Banking. Mathieson, Stillwell
Analyses of Gastric Contents, Urine, and Cerebrospinal Fluid. Mathieson
Tests for Liver, Pancreas, Adrenal and Renal Function. Maher, Stilwell
Radioactive Isotope Diagnostic Tests. Tauxe
Problems in Blood Coagulation. Owen, Thompson
- M 252f,w,s,su. Parasitology.** Routine clinical and special research in parasitology, examination of stools, study of internal parasites. Thompson
- M 253f,w,s,su. Hematology.** Blood smears, bone marrow examination, L.E. clot test, as well as common hematologic technique. Pease

PEDIATRICS

OFFERED AT THE MEDICAL SCHOOL

Professor

John A. Anderson, M.D., Ph.D., *head*
Robert A. Good, M.D., Ph.D.
Reynold A. Jensen, M.D.
Robert A. Ulstrom, M.D.
William Krivit, M.D., Ph.D.
Lewis W. Wannamaker, M.D.

Clinical Associate Professor

Paul F. Dwan, M.D.
Robert L. Wilder, M.D.

Assistant Professor

Richard B. Raile, M.D.
Robert L. Vernier, M.D.

Clinical Professor

Hyman S. Lippman, M.D., Ph.D.
Albert V. Stoesser, M.D., Ph.D.

Clinical Assistant Professor

Edward N. Nelson, M.D.
W. Ray Shannon, M.D.

Associate Professor

Paul Adams, M.D.
Ray C. Anderson, M.D., Ph.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. Two 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 Minneapolis General Hospital, the Ancker Hospital of St. Paul, the Northwestern Hospital of Minneapolis and the Variety Club Heart Hospital. Extensive clinical experience in premature and newborn care, communicable and infectious diseases, heart disease, allergy, pathology, neurology, child psychiatry, and endocrinology and metabolism is provided.

Prerequisites—General understanding of bacteriology, immunology, pathology, physiology, and biochemistry and reading knowledge of certain foreign languages are essential.

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) 2 foreign languages or (b) 1 foreign language and the option of a collateral field of knowledge.

Master's Degree—Offered only under Plan A.

Doctor's Degree—Courses leading to the Ph.D. may be arranged with members of the graduate faculty.

200f,w,s,su. Graduate Seminar in Pediatrics. (1½ cr) J A Anderson and staff

202f,w,s,su. Pediatric Clinics. (Cr and hrs ar; prereq #) J A Anderson and staff

204f,w,s,su. Residency in Pediatrics. Two- to 4-month rotations on the inpatient, outpatient, and special pediatric services of the University Hospitals, Minneapolis General Hospital, Northwestern Hospital, and Ancker Hospital. (Cr and hrs ar; prereq #) Pediatric staff

206f,w,s,su. 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 1 or more of the following special fields: Allergy, neurology, cardiology, pathol-

ogy, endocrinology and metabolism, hematology. 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 #) Pediatric staff

208f,w,s,su. Pediatric Research. (Cr ar; prereq #) J A Anderson, Good, Ulstrom, Adams, R C Anderson, Raile, Wannamaker, Vernier, Krivit

OFFERED AT THE MAYO FOUNDATION

Professor

James W. DuShane, M.D., *head*
Haddow M. Keith, M.D.
George B. Logan, M.D., M.S.

Associate Professor

Stephen D. Mills, M.D., M.S. (Clinical)

Assistant Professor

Edmund C. Burke, M.D., M.S.
Lloyd E. Harris, M.D.
Alvin B. Hayles, M.D., M.S.
Patrick A. Ongley, M.D.
Gunnar B. Stickler, M.D., Ph.D.
William H. Weidman, M.D., M.S.

Instructor

E. Omer Burgert, Jr., M.D., M.S.

The Section of Pediatrics of the Mayo Clinic and Mayo Foundation 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. Out-patient 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, and child psychiatry is available to qualified individuals for one or more additional years. Opportunity for participation in laboratory programs in pathology, hematology, chemistry, and physiology leading to the M.S. degree is offered in the third year for those desiring to pursue such research opportunities. In addition, selected individuals may fulfill the requirements for the Ph.D. degree.

Fellows participate in seminars and conferences covering growth and development, fluid balance and renal function, metabolism, hematology, cardiology, allergy, roentgenology, neurology, and case presentations of ambulatory and hospitalized patients.

Language Requirement—For the Ph.D. degree, either (a) 2 foreign languages or (b) 1 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. Diagnosis of Medical and Surgical Diseases of Infants and Children. Seminar. Staff

M 252f,w,s,su. Hospital Residence. Diagnosis and care of sick infants and children. Staff

M 253f,w,s,su. Child Health. Diagnosis and care of sick infants and children of the community under direction of consultants.

M 254f,w,s,su. Care of Newborn and Well Infants. St. Marys Hospital newborn nursery and Mayo well-baby clinic.

M 255f,w,s,su. Care of Well Infants and Children and Health Supervision of Preschool and School-Age Children. City Hall and county well-baby and well-child clinics and schools of city and county.

M 256f,w,s,su. Pediatric Cardiology. Staff

M 257f,w,s,su. Pediatric Allergy. Staff

M 258f,w,s,su. Pediatric Hematology.

Child Psychiatry. (See Department of Psychiatry and Neurology)

Pediatric Neurology. Staff

Research in Pathology, Biochemistry, or Physiology. (See these departments)

PHARMACEUTICAL CHEMISTRY

OFFERED AT THE COLLEGE OF PHARMACY

Professor

Ole Gisvold, Ph.D., *head*

Frank E. DiGangi, Ph.D.

George P. Hager, Ph.D.

Taito O. Soine, Ph.D.

Assistant Professor

Philip S. Portoghese, Ph.D.

Pharmaceutical chemistry involves the applications of the principles and processes of the various areas of chemical science to inorganic and organic medicinal agents. The synthesis of compounds in accordance with molecular structure-biological activity concepts or as congeners of medicinal agents that are often of natural origin constitute the medicinal chemistry phase of pharmaceutical chemistry, which is also 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 pharmaceutical 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 pharmaceutical chemistry.

Language Requirement—For the Master's degree, one foreign language. For the Ph.D. degree, either (a) 2 foreign languages or (b) 1 foreign language 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 pharmaceutical 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 per qtr; prereq OrCh 62) Gisvold and staff

164-165-166. Special Analytical Methods. Food, Drug, and Cosmetic Act and many of the official analytical methods of the U.S.P., N.F., and A.O.A.C. Analytical procedures involving instrumental methods. (3 cr per qtr; prereq 55, OrCh 63) Portoghese and staff

173. Special Problems in Pharmaceutical Chemistry. Elementary investigation of the analysis, synthesis, and phytochemistry of medicinal agents. (Cr ar; prereq #) Staff

201-202-203.* Pharmaceutical Chemistry Seminar. (1 cr per qtr; required of majors in pharmaceutical chemistry) Staff

205-206-207.* Advanced Medicinal Chemistry. Natural and synthetic sources of medicinal agents. Theoretical bases of biological responses to applied agents. Correlation of molecular structure with biological activity. (3-5 cr per qtr; prereq 163 and OrCh 63 or #; offered 1963-64 and alt yrs) Staff

208.* Carbohydrates and Glycosides. Origin, isolation, characterization, and chemistry. (3-5 cr; prereq OrCh 63 or #; offered 1964-65 and alt yrs) Gisvold

- 209.° **Alkaloids.** Isolation, purification, and characterization. (3-5 cr; prereq OrCh 63 or #; offered 1964-65 and alt yrs) Soine
- 211.° **Terpenes, Carotinoids, Tannins, and Anthocyanins.** Discussion of their chemistry; experimental investigation of methods of isolation and characterization. (3-5 cr; prereq OrCh 63 or #; offered 1964-65 and alt yrs) DiGangi
- 212.° **Fats, Waxes, Steroids, and Related Compounds.** Origin, isolation, characterization, and chemistry. (3-5 cr; prereq OrCh 63 or #; offered 1964-65 and alt yrs) Gisvold
- 213x. **Pharmaceutical Chemistry Laboratory Techniques.** (Cr ar; prereq OrCh 63 or #) Portoghese
- 214x. **Research in Pharmaceutical Chemistry.** Study and experimental investigation of topics in the area of natural products and synthetic organic medicinal agents. (Cr ar; prereq OrCh 63 or #) Staff

PHARMACEUTICAL TECHNOLOGY

OFFERED AT THE COLLEGE OF PHARMACY

Professor

Charles V. Netz, Ph.D., *head*
Willard J. Hadley, Ph.D.

Assistant Professor

Hugh F. Kabat, Ph.D.

Associate Professor

Robert H. Miller, Ph.D.
Edward G. Rippie, Ph.D.

Graduate work leading to the M.S. or Ph.D. degree in pharmaceutical technology is offered to students who wish to prepare for careers as teachers in colleges of pharmacy, hospital pharmacists, or pharmaceutical scientists in areas often designated as "new product development," "manufacturing pharmacy," "operative pharmacy," "pharmacy," etc.

Prerequisites—A degree from an accredited 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 pharmaceutical technology.

Minor—The choice of minor fields of study may vary considerably depending on the research and interests of the student, e.g., mathematics including statistics; engineering (industrial, chemical, electrical); economics and business administration; chemistry (physical, organic, analytical, pharmaceutical); pharmacology and other biological sciences. The selection of courses will be made after consultation with the student's adviser. All candidates for the Ph.D. degree must complete PCh 103 and Math 106.

Language Requirement—For the Master's degree, one foreign language. For the Ph.D. degree, either (a) 2 foreign languages or (b) with consent of adviser 1 foreign language 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—Work toward the Ph.D. degree is offered.

- 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 PhmC 163, PhmT 56 or #) Miller
168. **Preparation of Parenteral Products.** Principles and procedures involved in manufacture of parenteral products. (3 cr; prereq #) Kabat
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 69 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.** A survey of established pharmacy services in hospitals. (1 cr; prereq 171 and #) Kabat
- 173.° **Special Problems in Pharmaceutical Technology.** Problems in formulation, production, and evaluation of pharmaceutical products. (Cr ar; prereq #) Staff
- 201x.° **Pharmaceutical Technology Seminar.** (1 cr; required of majors in pharmaceutical technology) Staff
- 202-203-204.° **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 PhmC 165, PCh 103, or #; offered when demand warrants) Rippe
- 213x.° **Research Problems.** Experimental investigation of problems in pharmaceutical technology. (Cr ar; prereq PhmC 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 PhmC 163 or #; offered when demand warrants) Miller
- 221.° **Homogeneous Systems in Pharmacy.** Application of physicochemical principles and processes to preparation, standardization, and therapeutic application of homogeneous dosage forms. (3-5 cr; prereq PhmC 163, PCh 103 or #; offered when demand warrants) Hadley
- 222.° **Heterogeneous Systems in Pharmacy.** Application of physicochemical principles and processes to preparation, standardization, and therapeutic application of heterogeneous dosage forms. (3-5 cr; prereq 221; offered when demand warrants) Hadley

PHARMACOGNOSY

OFFERED AT THE COLLEGE OF PHARMACY

Associate Professor

Herbert Jonas, Ph.D., *head*

Assistant Professor

Lee C. Schramm, Ph.D.

Prerequisites—A degree from an accredited college of pharmacy and an exceptional scholastic record. Consideration will also be given to applicants who are graduates of institutions other than colleges of pharmacy provided their undergraduate courses satisfy the prerequisites for the graduate courses in pharmacognosy.

Language Requirement—For the Master's degree, one foreign language. For the Ph.D. degree, (a) 2 foreign languages, 1 of which must be German, or (b) with consent of adviser, 1 foreign language 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—Work toward the Ph.D. degree is offered.

160. **Recent Advances in Pharmacognosy.** Crude drug production, biogenesis, enzymes, biological and fermentation products, insecticides, fungicides, and herbicides. (3 cr; prereq 3 or #) Staff
162. **Intermediate Pharmacognosy.** Biochemistry and physiology of drug-producing organisms. Chemical and physical methods for production and analysis of their medicinal constituents. (3 cr; prereq 3 and #) Staff
163. **Intermediate Pharmacognosy.** Microscopic and microchemical methods in the study of drug-producing organisms and their constituents. (3 cr; prereq 3 and #) Staff
164. **Intermediate Pharmacognosy.** Insecticides, fungicides, and plant growth regulators involved in the cultivation and preservation of medicinal plants and their products. (3 cr; prereq 3, Phcl 56, and #) Staff

165. **Basic Application of Radionuclides.** Properties and utilization of radioactive substances of importance in biology, pharmacy, public health, and civil defense. (3 cr; prereq MicB 53 and #) Jonas and staff
166. **Basic Laboratory Course in Radionuclide Techniques.** Demonstration and participation experiments in fundamental isotope techniques and applications. (2 cr; prereq 165 or #165) Jonas and staff
167. **Advanced Course in Radionuclides.** An advanced lecture course. (3 cr; prereq 165 or #) Jonas and staff
168. **Advanced Laboratory Course in Radionuclide Techniques.** (2 cr; prereq 167 or #) Jonas and staff
173. **Special Problems in Pharmacognosy.** Problems dealing with the botany, biochemistry, and physiology of medicinal plants and microorganisms and their products. Problems of radio-isotope applications. (Cr ar; prereq #) Staff
- 201-202-203.* **Advanced Pharmacognosy.** Advanced studies in pharmacognosy of living organisms producing medicinally important substances. (3-5 cr per qtr; prereq 162 or 163, and #) Staff
- 204x. **Research in Pharmacognosy.** (Cr ar; prereq #) Staff

PHARMACOLOGY

OFFERED AT THE MEDICAL SCHOOL

Professor

Frederick E. Shideman, M.D., Ph.D., *head*
 Raymond N. Bieter, M.D., Ph.D.
 Gilbert J. Mannering, Ph.D.
 Wallace F. White, Ph.D.
 Harold N. G. Wright, Ph.D.

Associate Professor

Frank T. Maher, M.D., Ph.D.
 Jack W. Miller, Ph.D.

Assistant Professor

Elizabeth M. Cranston, 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 co-operative research with the clinical departments of the Medical School.

Graduate training in the field of pharmacology usually is 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 (103w and 104s). These include courses in physiology and biochemistry. Additional requirements are Phcl 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—Ordinarily German, French, Italian, or Spanish. For the Master's degree, one foreign language. For the Ph.D. degree, either (a) 2 foreign languages or (b) 1 foreign language and a collateral field of knowledge.

Master's Degree—Offered only under Plan A.

Doctor's Degree—Work toward the Ph.D. degree is offered.

- 101f. **General Pharmacology.** Lectures on action and fate of drugs. Limited to students of dentistry and pharmacy. (2 cr) Cranston, Wright, Miller, White

- 102w. **General Pharmacology.** Lectures and laboratory exercises. (5 cr; prereq 101) Cranston, Wright, Miller, White
- 103w. **General Pharmacology.** Lectures on action and fate of drugs. (3 cr; prereq Phsl 106, 107, or equiv and MdBc 100, 101, or equiv) Shideman, Miller, Wright, Mannering, Cranston
- 104s. **General Pharmacology.** Lectures and laboratory exercises. (7 cr; prereq 103) Shideman, Miller, Wright, Mannering, Cranston
- 106s. **Toxicology.** Lectures on chemistry, action, fate, and detection of toxic substances. (2 cr; prereq 101 and 102 or 103 and 104 or §104) Wright and Mannering
- 109x. **Pharmacological Problems.** (Cr and hrs ar; prereq §) Shideman, Mannering, Wright, Miller, or Cranston
- 162x. **Biological Assay of Drugs.** (3 cr; prereq 101 or §) White
- 203x. **Research in Pharmacology.** (Cr and hrs ar; prereq 103 and 104 or §) Shideman, Mannering, Miller, Wright, Cranston, or White
- 204x. **Seminar: Selected Topics in Pharmacology.** (1 cr; prereq 101 and 102 or 103 and 104 or §) Miller
- 205x. **Seminar: Survey of Current Pharmacologic Literature.** (1 cr; prereq 101 and 102 or 103 and 104 or §) Mannering, Cranston

OFFERED AT THE MAYO FOUNDATION

Associate Professor

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

All opportunities for advanced work in pharmacology and therapeutics offered at the Mayo Foundation are in connection with the Departments of Clinical Pathology, Medicine, Pediatrics, and Surgery. For details, see announcements of these departments.

PHYSICAL MEDICINE AND REHABILITATION

OFFERED AT THE MEDICAL SCHOOL

Professor

Frederic J. Kottke, M.D., Ph.D., *head*
William G. Kubicek, Ph.D.

Clinical Professor

Miland E. Knapp, M.D., M.S.

Associate Professor

Glenn Gullickson, Jr., M.D., Ph.D.

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 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 Minneapolis General Hospital, Minneapolis Veterans Hospital, and the Kenny 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.

Qualified physical therapists with a Bachelor's degree may be accepted for study for the degree of master of science in physical medicine and rehabilitation.

Language Requirement—For the Ph.D. degree, either (a) 2 foreign languages or (b) 1 foreign language and the option of a collateral field of knowledge.

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.

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. **Physical Therapy Clinic.** Participation in practical application of physical therapy to patient. (Cr and hrs ar) Kottke

161s. **Clinical Medicine in Rehabilitation.** (5 cr) Kottke

200f,w,s,su. **Physical Medicine Service.** Service at University Hospitals, Minneapolis General Hospital, and other affiliated hospitals. (Cr and hrs ar) Kottke, Gullickson

204f,w,s,su. **Peripheral Vascular Disease Clinic.** (Cr and hrs ar; for physicians) Gullickson

205f,w,s,su. **Readings in Physical Medicine and Rehabilitation.** (1 cr per qtr) Kottke

206f,w,s. **Conference on Physical Medicine and Rehabilitation.** Topics vary from quarter to quarter. Prepared papers required. (1 cr per qtr) Graduate staff

210f,w,s,su. **Research in Physical Medicine.** (Cr and hrs ar) Kottke, Kubicek, Gullickson

211f,w, or s. **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, or s. **Electromyography.** Clinical and laboratory training in use and interpretation of electromyograph. (Cr ar; prereq #) Kottke, Kubicek

213f,w,s. **Laboratory Procedures in Physical Medicine and Rehabilitation.** (1 cr per qtr; prereq #) Kubicek

220f,w,s. **Seminar in Physical Medicine.** (Cr and hrs ar) Kubicek

OFFERED AT THE MAYO FOUNDATION

Professor

Earl C. Elkins, M.D., *head*

Associate Professor

Gordon M. Martin, M.D., M.S.

Assistant Professor

Donald J. Erickson, M.D., M.S.
G. Keith Stillwell, M.D., Ph.D.

Instructor

Karl J. Olsen, M.D.

The 3-year fellowship program in physical medicine and rehabilitation consists, in the major field, of 21 to 24 months of supervised clinical practice in the hospital and outpatient departments of physical medicine and rehabilitation, 1 to 2 quarters on 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 anatomy, biophysics, or physiology. The program is approved by the Council on Medical Education and Hospitals.

In clinical practice the fellow 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 fellow can follow the various steps involved in the overall rehabilitation program of many seriously handicapped patients. He will learn

to co-ordinate and utilize the services of other medical specialists and auxiliary personnel, including speech pathologists, physical and occupational therapists, social service personnel, psychologists, and vocational counselors.

Conferences, seminars, and informal discussions of unusual clinical problems make it possible for the fellow 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) 2 foreign languages or (b) 1 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. Physical Medicine and Rehabilitation. Staff

M 252f,w,s,su. 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 THE MEDICAL SCHOOL

Professor

Ancel Keys, Ph.D., *head*
Joseph T. Anderson, Ph.D.
Francisco Grande, M.D.
Ernst Simonson, M.D.
Henry L. Taylor, Ph.D.

Minor—It is suggested that students who major in physiological hygiene present a minor in one of the following fields: epidemiology, physiological chemistry, 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, 2 foreign languages.

Master's Degree—Offered only under Plan A.

Doctor's Degree—Members of the physiological hygiene staff who are appointed to the graduate faculty in physiology or physiological chemistry may advise students majoring in physiology or physiological chemistry. 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. Science of Human Nutrition. Surveys, nutritional status, malnutrition. (3 cr; prereq #; offered when demand warrants) Anderson, Grande

PubH 192. Physiology of Exercise. Muscular efficiency, training, deconditioning, effects of exercise on physiological systems. (Cr ar; prereq Phsl 106, 107 or equiv, and #; offered when demand warrants) Simonson, Taylor

PubH 195. Public Health Aspects of Cardiovascular Disease. (3 cr; prereq #) Keys, Grande, and staff

PubH 202x. Seminar in Physiological Hygiene. Nutrition, tests and measurements of human physical fitness, gerontology, adaptation in health and disease, circulatory dynamics, and related topics. (1 cr)

PubH 220x. Readings in Problems of Physiological Hygiene. (Cr ar; prereq #)

PubH 290x. Research in Physiological Hygiene and Related Areas. (Cr ar)

PHYSIOLOGY

OFFERED IN THE MEDICAL SCHOOL

Professor

Maurice B. Visscher, M.D., Ph.D., *head*
 Francisco Grande, M.D.
 Eugene D. Grim, Ph.D.
 Franz Halberg, M.D.
 John A. Johnson, Ph.D.
 Ancel Keys, Ph.D.
 Joseph T. King, M.D., Ph.D.
 William G. Kubicek, Ph.D.
 Nathan Lifson, M.D., Ph.D.
 Victor Lorber, M.D., Ph.D.
 Carlos Martinez, M.D., Ph.D.
 Ernst Simonson, M.D.
 Henry L. Taylor, Ph.D.
 Carlo A. Terzuolo, M.D.

Associate Professor

Marvin B. Bacaner, M.D.
 H. Mead Cavert, M.D., Ph.D.
 Charles Edwards, Ph.D.
 Rodney B. Harvey, M.D., Ph.D.

Assistant Professor

Irwin J. Fox, M.D.
 Jui S. Lee, Ph.D.
 Laurence O. Pilgeram, Ph.D.

Prerequisites—For a major or minor in physiology, acceptable courses in general zoology or anatomy, general chemistry, organic chemistry, and college physics. Physical chemistry is desirable.

Minor—Students majoring in clinical subjects who desire a minor in physiology must have had the courses in these branches usually required of medical students.

Language Requirement—For the Master's degree, German, French, Russian, or Spanish. For the Ph.D. degree, either (a) 2 foreign languages or (b) 1 foreign language and the option of a collateral field of knowledge.

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.

- 100. General Physiology.** For high school teachers in biological sciences and for those who wish an introduction to modern physiological science. (4 cr; prereq college algebra, 1 yr chemistry, college physics)
- 106-107.† Human Physiology.** (7 cr for 106, 8 cr for 107; prereq organic chemistry, zoology, and neuroanatomy; students may register for lect without lab) Visscher and staff
- 112x. Hemodynamic Measurements.** Demonstrations and student participation in the setting up, calibration, and use of modern tools for measurements of blood pressure, blood flow, cardiac output, circulation time, oxygen saturation of blood, blood volume, and vasomotor control of vascular beds. For students specially interested in cardiovascular problems. (3 cr; limited to 10 students; prereq #)
- 113x. 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) Visscher and staff
- 202.* Readings in Physiology.** Topics selected for each student, written reviews prepared and discussed. (Cr and hrs ar) Visscher and staff
- 203.* Research in Physiology.** (Cr and hrs ar) Visscher and staff
- 210x. Selected Topics in Permeability.** Advanced seminar. (Cr and hrs ar; prereq 107 or equiv, #) Lifson, Johnson, Grim
- 211x. 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, Lorber
- 212x. Selected Topics in Respiration.** Advanced seminar. (Cr and hrs ar; prereq 107 or equiv, #)
- 215. Selected Topics in Intermediary Metabolism.** (Cr and hrs ar; prereq 107 or equiv, #) Pilgeram
- 216. Selected Topics in Neurophysiology.** Advanced seminar. (Cr and hrs ar; prereq 106-107 or equiv, #) Terzuolo, Edwards
- 227. Methods in Physiology.** (Cr and hrs ar; prereq 107 or equiv, #) Staff

- 230s. **Topics in General Physiology.** Relatively systematic coverage of biological transport processes; kidney and G.I. tract. (3 cr; prereq 107 within past 8 years) Grim, Johnson, Lifson
- 231f. **Topics in General Physiology.** Continuation of 230. (2 cr) Grim, Johnson, Lifson
- 232w. **Immunological Basis of Tissue Transplantation and Related Phenomena.** (2 cr; prereq 107 within past 8 yrs) Martinez
- 233s. **Biophysics of Circulation.** (3 cr; prereq 107 within past 8 yrs) Fox
- 234f. **Respiration, Acid-Base Chemistry, and Electrolyte Metabolism.** (3 cr; prereq 107 within past 8 yrs)
- 235w. **Bioenergetics of Cardiac Contraction.** (3 cr; prereq 107 within past 8 yrs) Cavert, Lorber
- 236s. **Renal Hemodynamics.** (Cr ar; prereq 107 within past 8 yrs) Harvey
- 237f. **Biophysical Aspects of Nerve Function.** (3 cr; prereq 107 within past 8 yrs) Edwards, Terzuolo
- 238w. **Neural and Humoral Control of Circulation.** (3 cr; prereq 107 within past 8 yrs) Grande

OFFERED AT THE MAYO FOUNDATION

Professor

Charles F. Code, M.D., Ph.D., *head*
 Alexander Albert, M.D., Ph.D.
 Reginald G. Bickford, M.B., Ch.B.
 Ward S. Fowler, M.D.
 George A. Hallenbeck, M.D., Ph.D.
 Victor Johnson, M.D., Ph.D.
 Edward H. Lambert, M.D., Ph.D.
 John T. Shepherd, M.D., D.Sc.
 Khalil G. Wakim, M.D., Ph.D.
 Earl H. Wood, M.D., M.S., Ph.D.

Associate Professor

Albert Faulconer, Jr., M.D., M.S.
 H. Frederic Helmholz, Jr., M.D.
 Harold J. C. Swan, M.B., Ph.D.

Assistant Professor

David E. Donald, D.V.M., Ph.D.

Instructor

Donald W. Klass, M.D.

Much of the graduate work in physiology at the Mayo Foundation 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 are offered in the department for those wishing to major in physiology. For those using physiology in partial fulfillment of the major or minor fields for an advanced degree, the following regular sessions are held: (a) *Review Discussions in Physiology* (1 hour a week for 3 quarters). Discussions on basic knowledge and recent advances in physiology are led by members of the department with fellows participating. (b) *Demonstrations in Physiology* (2 to 3 hours once a week during 3 quarters). Demonstrations of classical physiological experiments are conducted by the staff. (c) *Conferences on Problems in Physiology* (1 hour a week for 3 quarters). Graduate students and staff members present problems of research. (d) *Seminars in Clinical Physiology* (1 hour a week for 3 quarters). Graduate students present selected topics. (e) Weekly seminars on special topics and in the various subdivisions of physiology are held during the year by the staff for fellows and co-workers active in these areas. Examples are neurophysiology and muscle myography, pulmonary physiology, the cardiovascular system, endocrinology, and gastroenterology (G.I. Physiology). (f) Regular weekly seminars are also held in the department in special areas of physiology to aid fellows in their training in these subdivisions: (1) cardiovascular, (2) respiratory, (3) neurophysiology-cerebral function, (4) neurophysiology-neuromuscular physiology, (5) gastroenterologic and others.

M 251f,w,s,su. **Research Work on Selected Problems in Physiology.** Staff

M 258f,w,s,su. **Basic Neurologic Sciences.** Staff (See Departments of Neurology, Psychiatry, and Neurosurgery)

Biophysics—Electronic Computers. (See Department of Biophysics)

PSYCHIATRIC NURSING

OFFERED AT THE SCHOOL OF NURSING

Professor

Edna L. Fritz, M.A.

Instructor

Joann R. Rusch, M.S.

Associate Professor

M. Isabel Harris, M.Ed., Ph.D.
Garland K. Lewis, M.N.

The program in psychiatric nursing leads to a master of science degree. In addition to the field of concentration in psychiatric nursing, knowledge of several related fields will be required to accomplish the purpose and objectives of the program. A minimum of 18 credits in at least 2 fields with not less than 6 credits in each is required. Appropriate related fields include anthropology, child development, history and philosophy of education, and sociology.

Prerequisites—Completion of a baccalaureate degree which has included undergraduate preparation in psychiatric and public health nursing in an accredited nursing program.

Language Requirement—None.

Master's Degree—Offered under Plan B only.

Nurs 181Aw, Bs. Research in Nursing. Exploration of needs for research and discussion of possible ways in which selected research efforts might be undertaken. Development of a study design. (4 cr; prereq PubH 108 or #) Harris

Nurs 190f. Foundations of Nursing. Investigation of the role of nursing in promotion of health and care of the ill or helpless. (3 cr) Harris

Nurs 191f. Seminar: Foundations of Psychiatric Nursing. Changing role of the psychiatric nurse in society. Current trends related to education and functions of psychiatric nurses. Historical development of personality theories and influence of relative research and social organizational patterns affecting present-day psychiatric care and treatment. (3 cr; prereq 190 or ¶190) Lewis, Rusch

Nurs 192Aw. Psychiatric Nursing Seminar and Field Practice with 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) Lewis, Rusch

Nurs 192Bs. Psychiatric Nursing Seminar and Field Practice with Groups. Group relationships. Experience working with groups, looking at individual's role within the group; identification of behaviors and therapeutic functioning within the group setting. These processes examined via work or recreational activities. (5 cr; prereq 192A or #) Lewis, Rusch

Nurs 192Csu. Psychiatric Nursing Seminar and Field Practice in the Community. Community mental health problems, community resources and psychiatric nurse's role in the community. Collaborative study with public health nursing. (3 cr; prereq 192B or #) Murphy

Nurs 193w. Seminar: 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) Medical staff

Nurs 195f. Problems in Nursing. Individual study of a problem in the field of nursing. (1-9 cr; prereq regis in grad program and Δ) Lewis, Rusch

PSYCHIATRY AND NEUROLOGY

OFFERED AT THE MEDICAL SCHOOL

Professor

Donald W. Hastings, M.D., *head*
Abe B. Baker, M.D., Ph.D., *director*
of Neurology
Starke R. Hathaway, Ph.D., *director of*
*Clinical Psychology*Reynold A. Jensen, M.D., *director of*
Child Psychiatry
Richard W. Anderson, M.D.
Maynard M. Cohen, M.D., Ph.D.
Royal C. Gray, M.D., Ph.D.

Robert G. Hincley, M.D.
Paul E. Meehl, Ph.D.
Burtrum C. Schiele, M.D.
William Schofield, Ph.D.
Werner Simon, M.D.

Clinical Professor

S. Allan Challman, M.D.
Hyman S. Lippman, M.D., Ph.D.
Harold H. Noran, M.D., Ph.D.

Associate Professor

William Fleesson, M.D.
Ian W. D. Gregory, M.D., M.A.
Gordon Heistad, Ph.D.
John Logothetis, M.D., Ph.D.
David T. Lykken, Ph.D.

Anthony J. Resch, M.D.
Hildred Schuell, Ph.D.
Fernando Torres, M.D.

Clinical Associate Professor

Clifford O. Erickson, M.D.
Gove Hambidge, M.D.
Frank Kiesler, M.D.

Assistant Professor

Michael E. Blaw, M.D.
Erland R. Nelson, M.D.

Clinical Assistant Professor

Fred Gross, M.S.W.
Virgil R. Zarling, M.D.

Master's and Doctor's Degrees—Excellent facilities are available for M.A. (Plan A) and Ph.D. degrees in psychiatry and neurology. The minor may be elected in anatomy, pathology, physiology, or other laboratory fields. Fellows in psychiatry are advised to satisfy the minor requirements 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 of training for the American Board of Psychiatry and Neurology. The fellow in psychiatry spends 3 months of the 3 years in neurology. Opportunities for personal psychotherapy are available.

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. In neurology, the Master's degree can be earned in 3 years but usually requires an additional year.

Psychiatry, Clinical Psychology, and Child Psychiatry

Language Requirement—For the Ph.D. degree, either (a) 2 foreign languages or (b) 1 foreign language and the option of a collateral field of knowledge.

201f-w-s. **Clinical Seminar for Psychologists.** (1 cr; prereq #) Schofield, Koutsky

202f-w-s-su. **Case Conference.** (1 cr; prereq #) Staff

203f-w-s-su. **Psychometric Clerkship.** (Cr ar; prereq #)

204f-w-s. **Intermediate Seminar.** (1 cr; prereq #) Hathaway

205f-w-s. **Advanced Seminar.** (1 cr; prereq #) Hathaway

251f-w-s-su. **Clinical Inpatient Psychiatry.** (Cr ar; prereq MD) Staff

252f-w-s-su. **Clinical Outpatient Psychiatry.** (Cr ar; prereq MD) Staff

253f-w-s-su. **Clinical Child Psychiatry.** (Cr ar; prereq MD) Staff

254f-w-s-su. **Advanced Clinical Inpatient Psychiatry.** (Cr ar; prereq MD and 251, 252, 253 or equiv) Staff

255f-w-s-su. **Advanced Clinical Outpatient Psychiatry.** (Cr ar; prereq MD and 251, 252, 253 or equiv) Staff

256f-w-s-su. **Advanced Clinical Child Psychiatry.** (Cr ar; prereq MD and 251, 252, 253 or equiv) Staff

257f-w-s-su. **Special Assignments in Psychiatry.** (1 cr; prereq MD and 251, 252, 253 or equiv) Staff

258f-w-s-su. **Research in Psychiatry.** (Cr ar; prereq MD or #) Staff

260su. **Orientation to Clinical Psychiatry.** (1 cr; prereq MD or #) Staff

262f-w-s. **Techniques of Clinical Observation and Evaluation.** (1 cr; prereq MD or #)

264su. **Descriptive Psychopathology.** (1 cr; prereq MD or #) Schiele

265su-f. **Personality Development and Psychodynamics.** (1 cr; prereq MD or #) Anderson

- 266w,s. *Therapeutic Dynamics in Hospital Psychiatry*. (1 cr; prereq MD or #) Koutsky
- 269f,w,s. *Introduction to Psychotherapy*. (Same as Psy 271, 272, 273) (3 cr; prereq MD or #) Meehl and others
- 271f-w-s. *Basic Readings from Psychoanalysis I*. (1 cr; prereq MD or #) Hambidge
- 272f-w-s. *Reconstructive Psychotherapy*. (1 cr; prereq MD or #)
- 273w-s. *Survey of Psychosomatic Medicine*. (1 cr; prereq MD or #) Magraw
- 274f. *Introduction to Group Therapy*. (1 cr; prereq MD or #) Guzie
- 275w-s. *Introduction to Collaborative Therapy*. (1 cr; prereq MD or #) Gross, Hambidge
- 276f. *Current Research in Psychiatry*. (1 cr; prereq MD or #)
- 277f. *Psychophysiology for Psychiatrists*. (1 cr; prereq MD or #) Heistad
- 278f. *The Family and Community*. (1 cr; prereq MD or #) Gross
- 279w-s. *Development of Psychiatric Thought*. (1 cr; prereq MD or #)
- 281f,w,s. *Readings in Psychoanalysis II*. (1 cr; prereq MD or #) Hambidge
- 283f,w,s. *Special Topics Seminar*. (1 cr; prereq MD or #) Schiele
- 284x. *Basic Readings in Child Psychiatry*. (1 cr) Jensen and others
- 285x. *Current Literature Seminar in Child Psychiatry*. (1 cr) Jensen and others
- 286x. *Diagnostic and Therapeutic Methods in Child Psychiatry*. (1 cr) Jensen and others
- 290w,s. *Survey of Psychiatry for Neurology Residents*. (1 cr; offered 1965 and every 3rd yr)
- 291f-w-s-su. *Seminar in Current Literature*. (1 cr; prereq MD or #) Simon
- 292f,w,s,su. *Special Supervision in Psychotherapy*. (1 cr; prereq MD or #)
- 293f-w-s-su. *Problems in Teaching Psychiatry*. (Cr ar; prereq MD or #)
- 294f,w,s. *Seminar in Advanced Critical Examination of Systems and Theories*. (1 cr; prereq MD or #) Hathaway
- 295f. *Introduction to Group Therapy*. (1 cr; prereq MD or #)

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, and Minneapolis General Hospital.

The fellow is given a clinical assignment in the inpatient and the outpatient services of University Hospitals, Veterans Hospital, or Minneapolis General Hospital and is responsible to his service chief for the clinical study and therapy of his patients. He makes daily informal rounds with his 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.

Neurology

Language Requirement—For the Ph.D. degree reading knowledge of two foreign languages is required.

- 208f-w-s-su. *Clinical Neurology*. (Cr and hrs ar) Baker and staff
- 209f-w-s-su. *Research in Neurology*. (Cr and hrs ar) Baker and staff
- 210f-w. *Advanced Neuropathology*. (2 cr, §150 and Path 115; offered 1964-65 and alt yrs) Nelson
- 212f-w-s-su. *Survey of Neuropathology*. (1 cr, §151 and Path 119) Nelson
- 213x. *Neuropharmacology*. (1 cr per qtr) Bieter and staff
214. *Child Neurology*. (1 cr) Staff
- 215w. *Neurological Complications of Internal Disease*. (1 cr) Staff
- 216s. *Clinical Neurochemistry*. (1 cr) Cohen
217. *Neuroembryology*. (1 cr) Staff

- 218f. *Neurological Language Disorders*. (1 cr) Schuell
- 219x. *Instrumentation in the Basic and Neurological Sciences*. (1 cr; prereq #) Baker and staff
- 220f-w-s-su. *Advanced Clinical Neurology*. Selected readings and comprehensive review of specialized subjects in the neurological field. (1 cr) Baker and staff
- 221w,s. *Neurochemistry*. (2 cr) Cohen
- 222s. *Seizure Mechanisms*. (1 cr) Staff
- 223w. *Brain Tumors*. (1 cr) Staff
- 224s. *Infectious Diseases of the Nervous System*. (1 cr) Baker
225. *Neuro-ophthalmology*. Lectures on the field of ophthalmology as related to neurology. (2 cr; offered 1963-64 and alt yrs) Baker, Harris
- 225f-w-s-su. *Neurological-Neurosurgical Conference*. Review of X rays, case histories, and neuropathological material on neurological and neurosurgical cases. (1 cr, §Surg 318, Rad 163) Peterson, Baker
- 227w-s. *Neurological Development*. (1 cr) Staff
- 228f-w-s-su. *Research in Neuropathology*. (Cr and hrs ar) Baker and staff
- 230f. *Electroencephalography*. (1 cr) Torres
- 231f-w-s. *Applied Electroencephalography and Myography*. Practical experience in reading and interpretation of electroencephalographical tracings. (1 cr) Torres
- 232f-w-s. *Applied Neuroroentgenology*. Experience in the actual reading of neuroroentgenological films. (1 cr) Peterson
- 233f-w-s. *Applied Neuropathology*. (1 cr) Staff
- 238f-w-s. *Neurological Clinical Pathological Conference*. (1 cr per qtr) Baker and staff
- 239s. *Neuroanatomy*. (1 cr) Baker and staff
- 240f-w-s. *Neuropathology Conference*. (1 cr per qtr) Staff
- 241f-w. *Neuroradiology*. (1 cr per qtr, §Rad 163; offered 1964-65 and alt yrs) Peterson
- 247f-w-s. *Neurological Speech Disorders*. (1 cr) Schuell
- 248f-w. *Applied Neurophysiology*. (2 cr per qtr; offered 1963-64 and alt yrs) Staff
- 249f. *Survey of Neurology for Psychiatry Residents*. (2 cr; prereq #) Baker and staff

OFFERED AT THE MAYO FOUNDATION

Psychiatry

Professor

Howard P. Rome, M.D., *head*
David A. Boyd, Jr., M.D., M.S.

Assistant Professor

John S. Pearson, Ph.D. (*Clinical Psychology*)
Wendell M. Swenson, Ph.D. (*Clinical Psychology*)

Instructor

Maurice J. Barry, Jr., M.D., M.S.
Thomas L. Brannick, M.D., M.S.
Edward M. Litin, M.D.
Maurice J. Martin, M.D., M.S.
Richard M. Steinhilber, 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 departments 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.

Ample facilities for basic behavioral and clinical research are available. The facilities of the Mayo Clinic and its affiliated hospitals are supplemented by those of the Rochester State Hospital, local nursery schools, and the Rochester Counseling Clinic.

Language Requirement—For the Ph.D. degree either (a) 2 foreign languages or (b) 1 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. **Diagnosis in Psychiatry.** Research. Seminar. Staff

M 253f,w,s,su. **Hospital Residence in Psychiatry.** Staff

M 254f,w,s,su. **Special Psychiatry at the Rochester State Hospital.** Residence. Boyd, Rome

M 255f,w,s,su. **Child Psychiatry.**

M 256. **Clinical Psychiatry.** Staff

M 258f,w,s,su. **Basic Neurologic Sciences.** Staff

Neurology

Professor

Kendall B. Corbin, M.D.
Clark H. Millikan, M.D.

Associate Professor

Joe R. Brown, M.D., M.S.
Donald W. Mulder, M.D., M.S.
Robert E. Yoss, M.D., M.S., Ph.D.

Assistant Professor

Norman P. Goldstein, M.D., M.S.
E. Douglas Rooke, M.D., C.M., M.S.
Joseph G. Rushton, M.D., M.S.
Robert G. Siekert, M.D., M.S.
Jack P. Whisnant, M.D., M.S.

Instructor

James A. Bastron, M.D., M.S.
Donald D. Layton, Jr., M.D.
Juergen E. Thomas, M.D., M.S.
Arthur G. Waltz, M.D.

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 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. **Diagnosis in Neurology.** Research. Seminar. Staff

M 252f,w,s,su. **Hospital Residence in Neurology.** Staff

M 257. Clinical Neurology. Staff

M 258f,w,s,su. Basic Neurologic Sciences. Staff

M 259f,w,s,su. Neurologic Diseases of Infants and Children. Staff

Neuroanatomy. (See Department of Anatomy)

Neuropathology. (See Department of Pathology)

Neurophysiology. (See Department of Physiology)

Neuro-ophthalmology. (See Department of Ophthalmology)

PUBLIC HEALTH

OFFERED AT THE SCHOOL OF PUBLIC HEALTH

Professor

Gaylord W. Anderson, M.D., Dr.P.H., *head*
 Richard G. Bond, M.S., M.P.H.
 Donald W. Cowan, M.D., M.S.
 Ruth E. Grout, M.P.H., Ph.D.
 James A. Hamilton, M.A., M.C.S.
 Marion I. Murphy, M.P.H., Ph.D.
 Theodore A. Olson, M.A., Ph.D.
 Leonard M. Schuman, M.S., M.D.
 James W. Stephan, M.B.S.
 Stewart C. Thomson, M.D., M.P.H.

Associate Professor

John O. Buxell, M.S., M.P.H.
 Harry Foreman, M.D., Ph.D.
 Kathryn M. Fritz, M.S.

E. Cartly Jaco, Ph.D.

George S. Michaelsen, M.S.

Harold J. Paulus, M.S., Ph.D.

Ruth von Bergen, M.P.H.

Assistant Professor

Eleanor M. Anderson, M.P.H.

Clare L. Blanchard, M.P.H.

George E. Williams, M.D.

Lecturer

Henry Bauer, Ph.D.

Leslie W. Foker, M.D., M.P.H.

William A. Jordan, D.D.S., 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 2 foreign languages or of 1 foreign language and option of a special research technique or a collateral field of knowledge.

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.

Doctor's Degree—Work leading to the Ph.D. degree is offered for a major in environmental health, epidemiology, or hospital administration. 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. 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. Students will be admitted to the doctoral program in hospital administration only if they have had prior formal training and experience in hospital administration. For further information on this program, see the index reference to a special description of work in hospital administration.

[Inquiries concerning other work in public health, including courses of study leading to the degrees of master of public health and master of hospital administration, should be addressed to the Director of the School of Public Health, 1325 Mayo Memorial Building, University of Minnesota, Minneapolis 14.]

- 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, 3A or 50 and a course in bacteriology) Anderson, Thomson, Schuman
- 100B,C. Elements of Public Health II and III.** Group work on selected public health problems. (1 cr per qtr; prereq 100A or §) Staff
- 102.^o Environmental Sanitation.** Methods for promoting man's health and comfort by controlling environment. (3 cr; prereq 100A or ¶100A and §) Bond, Olson
- 102A. Environmental Sanitation.** General principles of urban and rural sanitation; problems encountered by official health agencies. (2 cr; prereq 100A or ¶100A and §) Bond, others
- 103. Public Health Bacteriology.** Bacteriologic and serologic diagnosis, public health laboratory administration and methods. (Cr ar; prereq MicB 102, 116, §) Bauer
- 104.^o Epidemiology I.** Basic epidemiologic principles applicable to infectious and noninfectious disease; host-agent-environment complex; factors underlying spread of infectious disease; laboratory applications of statistical and epidemiologic methods. (3 cr; prereq 100A, 140 or 110-111) Schuman
- 105.^o Epidemiology II.** Extension of epidemiologic principles to detailed study of selected diseases. (3 cr; prereq 104) Schuman
- 106.^o Public Health Administration.** Structure, basic functions, and activities of public health agencies. (3 cr; prereq 100A) Anderson, Hamilton
- 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)
- 107A. Maternal and Child Health Program.** Community programs for major maternal and child health problems. (1 cr, §107; prereq 106 or §)
- 108. Introduction to Biostatistics and Statistical Decision.** Variation, frequency distribution; probability; significance tests; estimation; trends. Statistical approach to rational administrative decision making. Lectures and laboratory. (2 cr) Bearman
- 109.^o Institutional Sanitation.** Sanitation practices in hospitals and other institutions. (3 cr; prereq hospital administrators or § and 100A) Bond, others
- 110. Biostatistics I.** Role of statistics in research; estimation; sampling distribution; tests of significance; power; regression; correlation; other measures of association; standard distributions including normal, t , χ^2 , F , binomial, Poisson; special distributions arising from nonparametric procedures. (3 cr; prereq ¶111, Math 10 or §) Brown, Bearman
- 111. Biostatistics Laboratory I.** Presentation of data; descriptive statistics; coding and short-cut computational procedures; use of desk calculators; practical application of principles and methods covered in 110. (2 cr; prereq ¶110) Briese, Loewenson
- 112.^o Public Health Engineering—Plan Examinations.** 112A: Water supplies. 112B: Waste disposal systems. 112C: Swimming pools and plumbing. (1 cr per qtr, §114; prereq engineering degree and 102, and §) Bond
- 113.^o Public Health Engineering—Field Investigations.** 113A: Water supplies. 113B: Waste disposal. 113C: Swimming pools and plumbing. (2 cr per qtr, §114; prereq engineering degree and § and 102) Bond
- 114. Environmental Sanitation Programs.** Public health supervision of activities in urban and rural sanitation. (3 cr, §112, §113, or §116; prereq §) Bond
- 115.^o Food Sanitation.** A review of current literature on sanitary problems in production, processing, and distribution of milk, meat, shellfish, and other foods; methods of public health supervision. (3 cr; prereq 100A and §) Olson
- 116.^o Public Health Engineering Administration.** Administrative organization of environmental sanitation activities. (2 cr, §114; prereq §) Bond
- 117-118-119.^o Sanitary Biology.** Plant and animal forms important in environmental sanitation, with special reference to disease vectors. (3 cr per qtr; prereq 100A or ¶100A or §) Olson
- 122s. Public Health Administration Problems.** Budgeting, program planning, and appraisal of public health procedures. (3 cr; prereq 106) Anderson
- 123.^o Topics in Public Health.** Selected readings and problems. (Cr ar; prereq §) Staff
- 125. Public Health Education.** Planning educational aspects of community health programs; group procedures; public relations; selection, development, and use of mass media. (2 cr; prereq §) Grout

- 125A. **Public Health Education.** Purposes; scope; methods and materials; planning, with special emphasis on hospitals. (1 cr; prereq hospital administrators or §) Grout
127. **Occupational Health: Nursing Aspects.** Organization and administration of nursing service in industrial health programs. (1 cr)
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 §) Fritz, Williams
135. **Conservation of Hearing.** Detection, prevention, and amelioration of hearing impairments. (1 cr; prereq §) Boies and staff
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
139. **Advanced Field Practice in Public Health Nursing—Block Placement.** Opportunity for concentration on public health nursing field practice under supervision of co-ordinator of mental health program. (Cr ar; prereq §) von Bergen
- 140.* **Vital Statistics I.** Official sources; population changes; rates; trends; significant differences. (3 cr) Bearman
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 §)
- 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. **The Hospital and the Community.** Functions and classifications of hospitals; organization and relation to health care and to public health agencies. (1 cr; prereq §) Stephan, Hamilton
- 154.* **Radiological Health I.** Orientation in radiation effects and study and control of radiation hazards in laboratories, hospitals, and industrial plants. (Cr ar; prereq §) Foreman
- 155.* **Introduction to Air Pollution Problems.** (3 cr; prereq §) Paulus
- 156.* **Air Pollution Surveys.** Public health engineering phases of air pollution surveys. (2 cr; prereq 155 and §) Paulus
159. **Chemical Laboratory Safety.** Principles of accident and fire prevention in chemical laboratories. (1 cr; prereq §) Scheffler
160. **Principles of Administration in Hospitals.** Lectures, seminars, and field trips in hospital administrative principles; top management and board of trustees, personnel policy formation, human relations. (6 cr) Hamilton, Stephan
161. **History and Development of Hospitals.** Functions; ownership and control; promoting and building new hospitals; integrated service; national associations and foundations. (3 cr) Hamilton, Stephan
- 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) Stephan, Hamilton
164. **Principles of Organization and Management of Hospitals.** Personnel department; legal liability; fiscal management, hospital insurance, research in administration. (6 cr; prereq 162, 163) Stephan, Hamilton, Bieter
166. **Hospital Clerkship.** Assignment to local hospital for survey or solution of special problem. (5 cr) Stephan
167. **Management Problems in Hospital Administration.** Assignment and solution of specific managerial problems. (6 cr; prereq 162, 163, ¶164) Hamilton
168. **Orientation to Medical Sciences.** Medical terminology, applied anatomy and physiology. (3 cr; prereq §) Thomson
169. **Administrative Residency.** Field work of 1 calendar year's duration in approved hospital; weighted rotation through departments, solution of special problems and preparation of an acceptable formal report. (Cr ar) Hamilton, Stephan
170. **Seminar: 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 §) Murphy, K Fritz

- 170A. **Public Health Nursing.** Scope; relationship to other aspects of public health. (1 cr, §170; prereq #) Murphy, K Fritz
- 171^o-172.^o **Studies in Public Health Nursing.** Application of scientific method to selected topics; preparation of a study. (3 cr per qtr; prereq public health nurses only) Murphy
173. **Advanced Field Practice in Public Health Nursing; Functional Area.** Opportunity for field placement in suitable functional area including administration, supervision, consultation, or teaching under guidance of faculty. (Cr ar; prereq public health nurses only, 174, 177 or #) Murphy, K Fritz, von Bergen
- 174A-B. **Seminar in Administration, Supervision, and Consultation.** Analysis of selected aspects of administrative, supervisory, and consultant process in public health nursing situations. (2 cr per qtr; prereq public health nurse, 171, 175 or #) Murphy
- 175-176-177. **Advanced Practice in Public Health Nursing.** Dynamics of human behavior; application to public health nursing practice on staff, supervisory, administrative, consultant levels through analysis of case material. (3 cr per qtr; prereq #) Williams, K Fritz, von Bergen
178. **Seminar in Public Health Nursing Consultation.** (2 cr; prereq #) K Fritz
180. **Introduction to Biostatistics.** Variation; frequency distribution; probability; estimation; significance tests; binomial, normal, Poisson distributions; serial dilutions; most probable number. (6 cr; prereq sanitation and sanitary engineering students only, others #) Bearman
- 181-182-183. **Principles and Methods in Public Health Education.** Role of public health educator; group procedures; communication theory; mass media; program planning and evaluation. (3 cr per qtr; prereq #) Grout
190. **Field Work in Health Education.** Supervised field experience. (Cr ar; prereq 183, 227) Grout
- 191.^o **Science of Human Nutrition.** Surveys; nutrition status; undernutrition; malnutrition; dietetics in social relief and medical practice. (3 cr; prereq #) J Anderson, Keys
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. **Rehabilitation Nursing and Long-Term Patient Care.** Nursing problems associated with rehabilitation; selected experiences correlated with seminars. (Cr ar; prereq 171, 175) E Anderson and staff
200. **Research.** Opportunities will be offered by the school and by various co-operating organizations for qualified students to pursue research work. (Cr ar)
- 201A. **Topics in Biometry (Advanced Topics Vital Statistics).** (3 cr; prereq 140 with grade B) Thornton, Bearman
210. **Seminar: Public Health.** (Cr ar)
- 212.^o **Seminar: Public Health Engineering and Sanitation.** (Cr ar; prereq #) Bond
213. **Seminar: Epidemiology.** (Cr ar; prereq #) Schuman
214. **School Health Programs.** Review of major health problems among school children, methods of providing and evaluating school health services. (2 cr; prereq 107 or #)
- 215.^o **Maternal and Child Health.** Administration of well-child and antepartum conferences; psychosomatic problems of children. (Cr ar; prereq MD, #)
- 227.^o **Problems in Public Health Education Programs.** Independent study and experimentation in health education. (Cr ar; prereq #) Grout
230. **Field Practice in Environmental Sanitation.** (Cr ar; prereq #) Bond
- 241.^o **Epidemiology of Noncommunicable Diseases.** Application of basic epidemiologic principles to noncommunicable diseases and to trauma; selected disease examples. (3 cr; prereq 104) Schuman
- 261-262-263. **Alternative Patterns for Meeting Health Care Needs.** Future role of hospitals in light of patient needs and community services. (3 cr per qtr; prereq #) Hamilton, Stephan, Jaco
264. **Seminar on Medical Care Patterns Abroad.** Readings, discussions, guest lectures on relations between health services and other social institutions. (3 cr; prereq #) Stephan, Jaco
265. **Seminar on Research Studies on Health Services.** Appraisal of design, instruments, field-work procedures, and findings of existing studies. (3 cr; prereq #) Jaco
266. **Hospital Administration Topics.** Independent study under tutorial guidance on selected problems, current issues. (Cr ar; prereq #) Hamilton

RADIOLOGY**OFFERED AT THE MEDICAL SCHOOL****Professor**

Harold O. Peterson, M.D., *head*
Donn G. Messer, M.D.

Clinical Associate Professor

Daniel L. Fink, M.D.

Clinical Professor

J. Richard Aurelius, M.D.
Oscar Lipschultz, M.D.

Assistant Professor

Kurt Amplatz, M.D.
Merle K. Loken, Ph.D., M.D.

Associate Professor

Joseph Jorgens, M.D., Ph.D.

Graduates of class A schools who have completed at least 1 year of a satisfactory internship in a recognized hospital are eligible for appointment as medical fellows with stipend in radiology. Medical fellows 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. To qualify for the American Board of Radiology graduate students must obtain 6 months of graduate study in pathology or its equivalent in addition to the fellowship period. This course itself extends over a period of 3 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 co-operation 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 80 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 the newest type of roentgen therapy machines, two cobalt 60 teletherapy units, an adequate radium supply, and a radium emanation plant. 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 thor-

oughly 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. *Minneapolis 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. *Ancker Hospital, St. Paul*—Here, as in Minneapolis General Hospital, there is abundant opportunity to observe both acute and chronic processes. In addition, the tuberculosis division of this hospital gives opportunity for the study of tuberculosis in its various forms. Good research facilities are available. Assignment to this service is for a period of 6 months.

4. *Mount Sinai Hospital, Minneapolis*—This private hospital is affiliated with the University Teaching Program, has over 200 beds, and offers excellent opportunity for clinical work and research. Fellows are assigned to this service for a period of 3 months.

5. *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) 2 foreign languages or (b) 1 foreign language and the option of a collateral field of knowledge.

Master's and Doctor's Degrees—All fellows are expected to 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 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, physics, physiology, or anatomy.

102f,w,s. X-ray Conference. Weekly departmental meetings at which important cases seen in University, Minneapolis General, Ancker, and Veterans Administration hospitals during the previous period are reviewed. (1 cr)

110su. Radiation Biology Institute. Effects of irradiation on living systems. Radioisotopic procedures. Physics and chemistry fundamental to radiation biology and effects on all types of chemical and biological systems. (6 cr; prereq Plan B student in education)

111f,w,s,su. Medical Roentgenologic Conference. (1 cr per qtr)

124f,w,s,su. Pediatric-Roentgenologic Conference. (1 cr per qtr)

135f,w,s,su. Surgical Roentgenologic Conference. (1 cr per qtr)

163f,w,s,su. Neurosurgical-Roentgenologic Conference. (1 cr per qtr)

200f,w,s,su. Research in Roentgenology. Problems in Roentgen diagnosis. (Cr and hrs ar)

201f,w,s. 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 1964-65 and alt yrs)

202f,w,s,su. Cardiovascular Roentgenologic Conference. (1 cr per qtr)

203f,w,s. Radiological Physics I. Lectures and laboratory on physical principles in radiology. (2 cr per qtr; prereq 1st-yr residents)

204f,w,s. Tumor Clinic Conference. (Cr and hrs ar)

205f,w,s,su. Research in Radiation Therapy, Nuclear Medicine, and Radiobiology. (Cr and hrs ar; prereq #)

206f,w,s,su. Roentgenoscopy. Theory and practical application of roentgenoscopy particularly to diseases of the gastrointestinal tract, lungs, and heart. (3 cr per qtr; hrs ar)

- 207f,w,s,su. **Roentgen and Radium Therapy.** Treatments of patients under supervision both with medium and high voltage machines and with radium. Problems in connection with these treatments will be thoroughly discussed. (Cr and hrs ar)
- 208f,w,s. **Radiology Pathology Seminar.** Weekly presentations of pathology specimens, slides, and X-rays. (1 cr per qtr)
- 209f,w,s,su. **Roentgen Diagnosis.** Theory and practical application of Roentgen diagnostic methods to medical cases in general. (3 cr per qtr; hrs ar)
- 210f,w,s,su. **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 dark-room work. (2 cr per qtr; hrs ar)
- 217f,w,s. **Roentgenologic Conference on Chest Diseases.** (1 cr per qtr)
- 218f,w,s,su. **Radiobiology Seminar.** Discussion of research problems and current literature on biological effects of ionizing radiations. (1 cr per qtr; prereq #)
- 219w. **Fundamentals of Nuclear Medicine.** Lecture and laboratory exercises to orient the graduate student in medical sciences on principles and application of radioisotopes in medicine. (3 cr; hrs ar; prereq #)
- 220f,w,s,su. **Urologic-Roentgenologic Conference.** (1 cr per qtr)
- 236f,w,s. **Radioisotope Seminar.** (1 cr per qtr)
- 237f,w,s. **Radiological Physics II.** Lectures and laboratory on measurement of ionizing radiations. (2 cr per qtr; prereq 203)
- 238f,w,s,su. **Roentgen-Surgical Pathology Conference.** (1 cr per qtr)
- 240f,w,s,su. **Radiation Therapy Conference.** Discussion of details of treatments of specific patients. (1 cr per qtr)

OFFERED AT THE MAYO FOUNDATION

Professor

C. Allen Good, M.D., M.S., *head*,
Diagnostic Roentgenology
David G. Fugh, M.D.

Associate Professor

John R. Hodgson, M.D., M.S.

Assistant Professor

Donald S. Childs, Jr., M.D., M.S., *head*,
Therapeutic Radiology
Colin B. Holman, M.D., M.S.

Instructor

Hillier L. Baker, Jr., M.D., M.S.
Harley C. Carlson, M.D., Ph.D.
Malcolm Y. Colby, Jr., M.D., M.S.
George D. Davis, M.D., M.S.
Owings W. Kincaid, M.D., M.S.
George E. Plum, M.D., M.S.
Paul W. Scanlon, M.D., M.S.
Martin M. Van Herik, M.D., M.S.

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 275,000 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 in radiology.

Approximately 30 fellowships in radiology are offered in the Mayo Foundation, 10 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 3 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 first assistants 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) 2 foreign languages or (b) 1 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. **Radiologic Physics.** An extensive series of lectures and demonstrations on radiologic physics and its applications in diagnostic and therapeutic radiology. Given yearly October to April. M M D Williams, Orvis

M 252f,w,s,su. **Diagnostic Radiology.** At least 18 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. Good, Pugh, Hodgson, Davis, Holman, Baker, Kincaid, Plum, Carlson

M 253f,w,s,su. **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, Van Herik, Colby, Scanlon

Pathology. (See Department of Pathology)

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

(Including Divisions of General Surgery, Neurosurgery, Orthopedic Surgery, Plastic Surgery, Proctology, and Urology)

General Surgery

OFFERED AT THE MEDICAL SCHOOL

Professor

Owen H. Wangenstein, M.D., Ph.D., *head*
 Claude R. Hitchcock, M.D., Ph.D.
 William D. Kelly, M.D., Ph.D.
 C. Walton Lillehei, M.D., Ph.D.
 Richard L. Varco, M.D., Ph.D.

Clinical Professor

Orwood J. Campbell, M.D., Ph.D.
 Lyle J. Hay, M.D., Ph.D.
 Thomas J. Kinsella, 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

Joe Bradley Aust, M.D., Ph.D.
 Edward W. Humphrey, M.D., Ph.D.
 Richard C. Lillehei, M.D., Ph.D.
 Fletcher A. Miller, M.D., Ph.D.
 John F. Perry, Jr., M.D., Ph.D.

Yoshio Sako, M.D., Ph.D.

W. Albert Sullivan, M.D., M.S.

Clinical Associate Professor

George S. Bergh, M.D., M.S.
 Davitt A. Felder, M.D., Ph.D.
 Victor P. Hauser, M.D.
 N. Kenneth Jensen, M.D.
 Bernard G. Lannin, M.D., Ph.D.
 Carl O. Rice, M.D., Ph.D.

Assistant Professor

Victor A. Gilbertsen, M.D., M.S.
 Harlan D. Root, M.D., Ph.D.
 Peter A. Salmon, M.D., Ph.D.

Clinical Assistant Professor

Stuart W. Arhelger, M.D., Ph.D.
 Samuel W. Hunter, M.D., M.S.
 Earl G. Yonehiro, M.D., Ph.D.

Graduate work in surgery in the Medical School is designed to offer superior training to a limited number of fellows in 4 or more years of residence. The practical and scientific aspects of a well-rounded surgical course are emphasized equally. Each appointment is for a year, and reappointment is contingent upon continued superior performance.

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 is found in these departments. The minor subjects must be taken in one of the above departments. The proximity of the medical buildings and arrangement of courses afford opportunity for co-ordination 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, and urology.

Unexcelled opportunities for technical and experimental work under aseptic conditions comparable to a first-class operating room are offered in the laboratories of animal and experimental surgery. In these laboratories the fellow conducts investigative work for his thesis.

The University Hospitals fellowship provides a house surgeonship in the University Hospitals, with or without residence. Senior resident surgeons are chosen each year from among the surgical fellows, of whom there are approximately 30. First-year fellows, in turn, 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 general 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 Veterans Hospital in Minneapolis (25), Minneapolis General Hospital (10), Ancker Hospital in St. Paul (3), Mount Sinai Hospital (private) in Minneapolis (2). 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 University of Minnesota Hospitals.

Language Requirement—For the Ph.D. degree, either (a) 2 foreign languages or (b) 1 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.

The following courses are all given at all of the participating hospitals unless otherwise indicated. Registrants taking fellowships at Veterans Hospital, Minneapolis General Hospital, or Ancker Hospital should indicate which of these sessions they are in by adding after the course number either the notation "Section V" for Veterans Hospital or "Section G" for Minneapolis General Hospital or "Section A" for Ancker Hospital.

- 200f,w,s. 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) Wangenstein and staff
- 202f,w,s. Applied Surgical Anatomy on the Cadaver.** Weekly exercises in which the student prepares anatomical dissections on the cadaver illustrating anatomic principles important to the surgeon. University Hospitals. (1 cr per qtr) Staff
- 203f,w,s. 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
- 204f,w,s. 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) Wangenstein and staff
- 205f,w,s. 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) Wangenstein and staff
- 208f,w,s. Surgical Service.** 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) Wangenstein and staff
- 211f,w,s. 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) Wangenstein and staff
- 214f,w,s. Surgical Ward Conference.** A weekly exercise in which cases offering interesting problems are presented by the student. (1 cr per qtr) Wangenstein and staff
- 215f,w,s. 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) Wangenstein and staff
- 216f,w,s. Surgical Research.** Properly qualified students may undertake original investigation of problems in either experimental or clinical surgery. (1 cr per qtr) Wangenstein and staff
- 217f,w,s. Surgical Seminar.** Conference for reports on surgical literature with presentation and discussion of especially interesting cases and problems as well as research work by members of the surgical staff. (1 cr per qtr) Wangenstein and staff
- 218f,w,s. Surgery-Medical Pathological Conference.** A weekly exercise in which the student prepares instructive cases for review by the medical, surgical, and pathological staffs. (1 cr per qtr) Wangenstein and staff
- 219f,w,s. Surgical Literature Conference.** Leading surgical journals are assigned to the fellows, who read and report on important articles at weekly conferences. (1 cr per qtr) Wangenstein and staff
- 220f,w,s. Peripheral Vascular Surgery.** Diagnosis and treatment of peripheral vascular disease with the introduction of the surgical techniques of vascular surgery. (1 cr) Wangenstein and staff
- 221f,w,s. Surgery-Physiology Seminar.** Current research problems are presented for interdepartmental discussion and evaluation. (1 cr per qtr) Physiology and Surgery graduate staffs

OFFERED AT THE MAYO FOUNDATION

Professor

B. Marden Black, M.D., M.S.
 O. Theron Clagett, M.D., M.S.
 Deward O. Ferris, M.D., C.M., M.S. (Clinical)
 George A. Hallenbeck, M.D., Ph.D.
 Edward S. Judd, M.D., M.S.
 John W. Kirklin, M.D., M.S.
 Charles W. Mayo, M.D., M.S.
 James T. Priestley, M.D., M.S., Ph.D.

Assistant Professor

Philip E. Bernatz, M.D., M.S.
 Karl A. Lofgren, M.D., M.S.
 Hugh B. Lynn, M.D.
 Dwight C. McGoon, M.D.
 Thomas T. Myers, M.D.
 William H. ReMine, M.D., M.S.
 Richard E. Symmonds, M.D., M.S.
 John S. Welch, M.D., M.S.

Associate Professor

Oliver H. Beahrs, M.D., M.S.
 F. Henry Ellis, Jr., M.D., Ph.D.
 Joseph H. Pratt, M.D., M.S.

Instructor

Martin A. Adson, M.D., M.S.
 W. Spencer Payne, M.D., M.S.

Graduate training in general surgery at the Mayo Foundation combines the opportunities for advanced degree and surgical education. The usual 4-year program fulfills the requirements for the American Board of Surgery.

Fellows are appointed for 1 year with yearly reappointments contingent upon satisfactory performance. Schedules usually include 1 quarter of surgical diagnosis, 4 or 5 quarters of general operative surgery at the junior level, 2 or 3 quarters of a wide variety of surgical specialties, 2 quarters of surgical pathology, 6 quarters of general operative surgery at the senior level.

There is opportunity for alternate or supplemental assignments to include surgical research or physiology as well as surgical pathology. Requests for specific subspecialties during the fellowship may include anesthesiology, neurosurgery, orthopedic surgery, peripheral vein surgery, plastic surgery, proctology, radium and roentgen therapy, and urology.

Senior fellows in operative surgery who are best qualified may be appointed chief residents with accompanying increased responsibility. Additional senior level operative assignments may be made to the affiliated Rochester State Hospital.

Following the fellowship program, 1- or 2-year appointments are made in certain cases for advancement in cardiopulmonary and gastrointestinal surgery.

Operative services are principally located in the Rochester Methodist Hospital and St. Marys Hospital. A total of 600 surgical beds offer wide exposure to general and special surgical diseases.

Integrated group seminars, lectures, and meetings are held during each week.

Language Requirement—For the Ph.D. degree, either (a) 2 foreign languages or (b) 1 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. Peripheral Vein Surgery. Treatment of complications, surgical and medical, and varicose veins. Staff

M 252f,w,s,su. Operative Surgery. Second assistantship in operating rooms; substitute service as first assistant. Residence. Seminar. Staff

Operative Surgery in All Specialties of Surgery. (See specific departments)

Surgical and Fresh Tissue Pathology. (See Department of Pathology)

Research on Problems in Physiology. (See Department of Physiology)

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 THE MAYO FOUNDATION

Associate Professor

Raymond J. Jackman, M.D., M.S., *head*

Assistant Professor

John R. Hill, M.D., M.S.

Instructor

Markham J. Anderson, Jr., M.D., M.S.
Robert J. Spencer, M.D.

The major service in colon and rectal surgery extends over a period of 5 years and meets the requirements of the American Board of Colon and Rectal Surgery. It includes 6 months in a minor, usually surgical pathology, approximately 2 to 3

quarters in general medical and surgical diagnosis with special reference to gastro-intestinal diseases. Four quarters of the 5-year period are in the field of anorectal surgery and diagnostic proctoscopy. The major portion of the 5-year program, i.e., approximately 3 years, is in the field of general surgery with special reference to abdominal surgery in which emphasis is placed on conditions that involve the colon.

Master's Degree—Offered only under Plan A.

M 251f,w,s,su. Colon and Rectal Surgery. Jackman, Hill, Anderson

General Medical and Surgical Diagnosis. (See Department of Medicine)

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.

Neurosurgery

OFFERED AT THE MEDICAL SCHOOL

Professor

Lyle A. French, M.D., Ph.D., *director*

Instructor

Shelley N. Chou, M.D., M.S.
Jim L. Story, M.D.

Clinical Professor

Wallace P. Ritchie, M.D., Ph.D.

Master's and Doctor's Degree—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 co-ordination of clinical and laboratory work.

Special courses and conferences in the various clinical departments (Pediatrics, Psychiatry and Neurology, Radiology, Ophthalmology) are attended so that a well-rounded clinical training is obtained through both didactic courses and practical clinical experience.

The Division of Neurological Surgery is closely associated in its training program with the Division of General Surgery at the University and with the Section of Neurosurgery at the Mayo Clinic.

305f,w,s,su. 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) French, Chou, Story

308f,w,s,su. Neurosurgical Service. The neurosurgical fellow acts as house surgeon at University Hospitals. (4 cr) French, Chou, Story

- 311f,w,s,su. Operative Neurosurgery.** The neurosurgical fellow acts as first assistant at operations in University Hospitals, and later may be permitted to operate. (4 cr) French, Chou, Story
- 316f,w,s,su. Neurosurgical Research.** Problems in experimental or clinical surgery. (3 cr) French, Chou, Story
- 318f,w,s,su. Neurosurgical Conference.** A review of X-rays and case histories on neurosurgical service. (1 cr) French, Chou, Story

OFFERED AT THE MAYO FOUNDATION

Professor

J. Grafton Love, M.D., M.S., *head*
Collin S. MacCarty, M.D., M.S.

Associate Professor

George S. Baker, M.A., M.D., M.S.
Hendrik J. Svien, M.D., M.S.
Alfred Uihlein, M.D., M.S.

Assistant Professor

Frederick W. L. Kerr, M.D., M.S.

Instructor

Ross H. Miller, M.D., M.S.

Preparation for neurosurgery at the Mayo Foundation includes assignments in the Departments of Basic Neurologic Sciences, Neurology, and General Surgery. The Department of Basic Neurologic Sciences assignments include work in neurophysiology, neuroanatomy, and neuropathology. The training program of 4 years' duration preceded by 6 to 12 months of general surgery completes the requirements of the American Board of Neurological Surgery.

To acquire competence in neurologic surgery it is essential that the training in neurologic surgery itself be preceded by an adequate background in neuroanatomy, neuropathology, neurologic diagnosis, and neurologic ophthalmology. In addition it is highly desirable that some knowledge of other fields, such as neurooentgenology, neurophysiology, and electroencephalography, be obtained. To acquire a sound background in neurologic diagnosis, fellows in neurosurgery have an opportunity to work as assistants in the diagnostic sections of neurology and on the hospital services for periods of 6 months or more. For those who are qualified, opportunities to extend this training by acting as first assistants in neurology may be available. Training in neuropathology is under the supervision of the Section of Experimental and Anatomic Pathology. During the period of at least 9 months in which the fellows are assigned to the Department of Basic Neurologic Sciences, they see not only the specimens obtained at necropsy but also the pathologic specimens obtained at operation. They attend lectures on neuroanatomy and neurophysiology and have an opportunity to work on a problem in research leading to an advanced degree. The vast amount of material in the pathologic museum as well as the clinical records of patients with neurologic disease are available for fellows who wish to carry out research problems in this phase. Experience in neurosurgical procedures and in the preoperative and postoperative care of patients is acquired on the neurosurgical services. Opportunities are available to act as first assistant to one or more members of the staff and to operate under the supervision of the neurosurgical staff. All of these activities are so closely integrated that fellows in neurosurgery constantly have before them the relationship of the laboratory sciences to diagnosis and treatment in neurosurgery and allied fields.

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. Surgery of the Nervous System. Operative technique and study of special problems involved. Residence. Seminar. Love, Baker, MacCarty, Svien, Miller, Uihlein, Kerr

M 258f,w,s,su. 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)

Neuro-ophthalmology. (See Department of Ophthalmology)

Fellows in neurosurgery may also take work in general pathology, physiology, and general surgery. For details, see these departments.

Orthopedic Surgery

OFFERED AT THE MEDICAL SCHOOL

Clinical Professor

John H. Moe, M.D., *director*
Edward T. Evans, M.D.
Harry B. Hall, M.D.
Malvin J. Nydahl, M.D., M.S.

Clinical Associate Professor

Walter Indeck, M.D.

Clinical Assistant Professor

Edward H. O'Phelan, M.D., M.S.

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 Foundation. The Master's degree is offered only under Plan A.

Doctor's Degree—The division offers work leading to the Ph.D. degree.

- 401. Orthopedic Conference.** Review of X-rays and case histories of patients on the orthopedic inpatient or outpatient service. (3 cr) Peterson, Moe, Arnesen, and staff
- 403. Fractures.** The orthopedic fellow acts as house surgeon on the fracture service at Minneapolis General Hospital. (5 cr) Nydahl and staff
- 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, Arnesen, and staff
- 407. Pediatric Orthopedics.** The orthopedic fellow acts as house surgeon at Gillette State Hospital for Crippled Children. (5 cr) Moe and staff
- 408. Orthopedic Service.** The orthopedic fellow acts as house surgeon at the University Hospitals. (5 cr) Moe, Arnesen, and staff
- 410. Orthopedic Pathology.** Seminar for systematic review of pathology of ossified tissues and soft tissues of the extremities. (2 cr) Moe and staff
- 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, Arnesen, and staff
- 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, Arnesen, and staff
- 416. Orthopedic Research.** Problems in experimental or clinical surgery. University Hospitals. (5 cr) Moe, Arnesen, and staff

OFFERED AT THE MAYO FOUNDATION

Professor

H. Herman Young, M.D., M.S., *head* (Clinical)
William H. Bickel, M.D., M.S.
Mark B. Coventry, M.D., M.S.
Joseph M. Janes, M.D., M.S.
Paul R. Lipscomb, M.D., M.S.

Assistant Professor

Edward D. Henderson, M.D., M.S.
Einar W. Johnson, Jr., M.D., M.S.
C. Roger Sullivan, M.D., M.S.

Instructor

Anthony J. Bianco, M.D., M.S.
Norman W. Hoover, M.D., M.S.
Patrick J. Kelly, M.D., M.S.
Lowell F. A. Peterson, M.D.

Associate Professor

John C. Ivins, M.D., M.S.

Orthopedic surgery at the Mayo Foundation 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 and vascular problems of the extremities 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 processes. An active emergency service at the St. Marys and Methodist Hospitals handles emergency cases in close co-operation 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 Foundation 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.

At the present time twelve 4-year fellowships are available annually for fellows showing a special interest and aptitude for orthopedic surgery. The service includes orthopedic diagnosis, operative and nonoperative orthopedics, service in specialties closely allied to orthopedic surgery, and a minor in either pathology or anatomy. Gross specimens and microscopic slides of all orthopedic conditions are readily available for study while regularly scheduled lectures cover the field of surgical pathology. 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 weekly during the academic year.

Fellows majoring in orthopedic surgery will be given ample opportunity to serve as first assistants in the operating room and office and may work in the Department of Physical Medicine. Senior fellows, under staff supervision, likewise care for the orthopedic patients in the Rochester State Hospital.

Through special arrangements, each fellow majoring in orthopedic surgery at the Mayo Foundation spends 6 months either at Gillette State Hospital, St. Paul, Minnesota, or at Chicago Memorial Hospital, Chicago, Illinois, or at Eastern New York Orthopedic Hospital, Schenectady, New York, where more intensive experience in the care of orthopedic conditions in children may be secured.

Fellows 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 14 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. 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. Young and staff

M 252f,w,s,su. Orthopedic Surgery. One year in service is offered to fellows majoring in orthopedic surgery. Seminar. Young 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.

Plastic Surgery

OFFERED AT THE MAYO FOUNDATION

Professor

John B. Erich, M.D., D.D.S., M.S., *head*

Associate Professor

Kenneth D. Devine, M.D.

Instructor

Edward L. Foss, M.S., D.D.S., M.D.

John C. Lillie, M.D., M.S.

Thaddeus J. Litzow, M.D., M.S.

James K. Masson, M.D., M.S.

Fellowships in plastic surgery at the Mayo Foundation include training in all aspects of this surgical specialty; the program in plastic surgery deals with cosmetic as well as reconstructive and reparative surgery and involves congenital and acquired defects of the entire body. Included in the work of this section is the treatment of burns, the management of tumors of the head and neck, and the care of traumatic injuries of the maxillofacial region. Through special arrangements each fellow is assigned for a period of from 6 months to 1 year to the Woods Veterans Administration Hospital in Milwaukee, Wisconsin, or to the Hines Veterans Administration Hospital in Hines, Illinois, where he receives more intensive training in plastic problems relating to the hand and extremities.

Fellowships in plastic surgery involve a 6 to 9 months' assignment in the Methodist and St. Marys Hospitals, where each fellow is instructed in the pre- and post-operative care of patients on the plastic service and where he works as second assistant in the operating rooms. For at least 18 months, every fellow is assigned to advanced responsibilities under the supervision of the consultants in the section of plastic surgery; in this phase of the training program, the fellow receives instruction in the diagnosis and evaluation of plastic problems and acts in a position of responsibility in the operating rooms and in the diagnostic section at the Mayo Clinic. Opportunities are available for study in the fundamental sciences (pathology and anatomy) under supervision of members of the faculty. Seminars are held regularly.

Training in plastic surgery at the Mayo Foundation meets the requirements of the American Board of Plastic Surgery and includes 3 years of resident training in general surgery and 3 years in plastic surgery. The applicant is encouraged to secure his general surgery training at the Mayo Foundation. However, any applicant may, if he so desires, receive his general surgery training elsewhere, providing that the hospital in which such training is obtained is approved by the American Medical Association. The 3-year fellowship in plastic surgery allows time for special training in this surgical specialty and for laboratory or clinical investigative work leading to an advanced degree.

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. Second assistantship 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. First assistantship in operative service. Staff

Surgical and Fresh Tissue Pathology. (See Department of Pathology)

Anatomy. (See Department of Anatomy)

Proctology

Work leading to the Master's degree with a major in proctology is described under the heading Colon and Rectal Surgery. For a list of faculty and course work see this section of this bulletin.

Urology

OFFERED AT THE MEDICAL SCHOOL

Professor

Charles D. Creevy, M.D., Ph.D., *director*

Assistant Professor

Milton P. Reiser, M.D., M.S.

Clinical Associate Professor

Baxter A. Smith, Jr., 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, Minneapolis General, or Ancker Hospitals.

Master's Degree—Offered under Plan A only.

Doctor's Degree—This department offers work leading to the Ph.D. degree.

- 250f,w,s,su. Urological Surgery. (4 cr per qtr) Creevy and staff
 251f,w,s,su. Cystoscopy and Urological Diagnosis. (4 cr per qtr) Creevy and staff
 252f,w,s,su. Urological Conference. (4 cr per qtr) Creevy and staff
 253f,w,s,su. Research in Urology. (4 cr per qtr) Creevy and staff
 254f,w,s. Urological Seminar. (3 cr per qtr) Creevy and staff
 255f,w,s. Urological Radiological Conference. (3 cr per qtr) Creevy and staff
 256f,w,s. Urological Pathological Conference. (3 cr per qtr) Creevy and staff
 257f,w,s. Use of the Artificial Kidney. (3 cr per qtr) Creevy and staff

OFFERED AT THE MAYO FOUNDATION

Professor

Ormond S. Culp, M.D., *head*
 Edward N. Cook, M.D., M.S.
 John L. Emmett, M.D., M.S.
 Gershom J. Thompson, M.D., M.S.

Assistant Professor

James H. DeWeerd, M.D., M.S.

Instructor

David C. Utz, M.D., M.S.

Associate Professor

Laurence F. Greene, M.D., Ph.D.
 Thomas L. Pool, M.D., M.S.

Major training in urology extends over a period of 3 to 4 years. Trainees who have completed the requirement of the American Board of Urology of a year in general surgery or a year in sciences basic to urology before coming here may complete their urologic training in 3 years; those who wish to receive this basic training in the Mayo Foundation branch of the Graduate School may do so, thus extending the period of training to 4 years. A minimum of 1 year is devoted to diagnosis and treatment of diseases involving the urinary tract. Surgical training includes at least 2 years in all phases both open and transurethral. On the surgical services at the Methodist and St. Marys Hospitals, daily rounds with one of the consultants provide ample opportunity for thorough discussion of individual cases. Junior and senior fellows participate in the management of all problems, assist at all operations, and, as their experience increases, are given added responsibilities in keeping with their ability to handle the work involved. By the time he completes his training the candidate will have performed the standard urologic operations.

Surgical procedures include transurethral prostatic resection, transurethral removal of vesical neoplasms, lithotripsy, manipulation of ureteral calculi, all phases of renal surgery such as nephrectomy, pyelolithotomy, plastic operations on the renal pelvis, ureterolithotomy, ureterointestinal anastomosis, total and partial cystectomy

for bladder tumors, suprapubic, retropubic, and perineal prostatectomy, and plastic operations for hypospadias and other urethral and genital abnormalities.

Excretory urographic and cystoscopic conferences are held daily where roentgenograms, including pyelograms, are interpreted with discussion of cystoscopic findings. Each fellow has an opportunity to perform hundreds of cystoscopic examinations.

Opportunity for the fellows to receive training in general surgery in addition to that obtained under the urologic staff (which is in all phases of genitourinary surgery) can be provided if candidates desire this; they may act as assistants to general surgeons who are also interested in those phases of surgery which to some extent overlap such as gynecologic procedures for the correction of vesicovaginal fistula, urinary incontinence, etc., adrenal surgery, etc.

Conferences and seminars are held regularly. Fellows are expected to attend weekly staff meetings and special lectures on other phases of medicine and surgery.

Opportunity to extend a period of training by working in experimental surgery in the Medical Sciences Laboratories and to work with the artificial kidney is available to those who wish to do so and are deemed qualified. Most degree candidates elect a period of 6 months in the surgical pathology laboratory to meet the degree requirement for a minor field.

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. Urologic Diagnosis and Special Urologic Treatment. Cystoscopic examination. Urography; both retrograde and excretory. History-taking and clinical examinations in diseases of the genitourinary tract. Study and treatment of acute and chronic infections of the genitourinary tract. Seminar. Staff

M 252f,w,s,su. Genitourinary Surgery Including Endoscopic and Open Procedures. Cook, Culp, DeWeerd, Emmett, Greene, Pool, Thompson, Utz

M 253f,w,s,su. General Surgery, Gynecological Surgery. Staff (See these departments)

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.

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*Department of Physical Medicine
and Rehabilitation*

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1963-1965



- Occupational Therapy
- Physical Therapy

Bulletin

of the UNIVERSITY of MINNESOTA

UNIVERSITY OF MINNESOTA

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Dortha L. Esch, B.S., O.T.R., Instructor in Occupational Therapy
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 Donna L. Pauley, B.S., A.R.P.T., Clinical Supervisor of Physical Therapy
 Clarence A. Sicard, B.S., O.T.R., Clinical Supervisor of Occupational Therapy
 Robert L. Bollinger, B.S., O.T.R., Principal Prevocational Therapist
 Shelby Clayson, B.S., A.R.P.T., Assistant Supervisor of Physical Therapy
 Mildred Henly, B.S., O.T.R., Assistant Supervisor of Occupational Therapy
 Rudolph A. Ptak, B.S., A.R.P.T., Assistant Supervisor of Physical Therapy
 Ann F. Armstrong, M.A., Supervisor of Speech Pathology
 Joanne Montgomery, M.S., Social Worker

Contributing Faculty

Gaylord W. Anderson, M.D., Dr.P.H., Professor and Director, School of Public Health
 Paul M. Arnesen, M.D., Instructor in Orthopedic Surgery
 A. B. Baker, M.D., Ph.D., Professor and Director, Division of Neurology
 Annie Laurie Baker, M.A., Professor and Director, Department of Social Service
 Alice R. Carlson, R.R.L., Medical Record Librarian
 James R. Dawson, M.D., Professor and Head, Department of Pathology
 Edna L. Fritz, M.A., Professor and Director, School of Nursing
 Clifton A. Gayne, Ph.D., Professor and Chairman, Department of Art Education
 John E. Harris, M.D., Professor and Head, Department of Ophthalmology
 Donald W. Hastings, M.D., M.A., Professor and Head, Department of Psychiatry and
 Neurology
 Arnold Lazarow, M.D., Ph.D., Professor and Head, Department of Anatomy
 Francis W. Lynch, M.D., M.S., Professor and Director, Division of Dermatology
 Howard F. Nelson, Ph.D., Professor and Chairman, Department of Trade and Industrial
 Education
 John H. Moe, M.D., Clinical Professor and Director, Division of Orthopedic Surgery
 Clarence J. Rowe, M.D., Clinical Associate Professor of Psychiatry
 Kenath H. Sponsel, M.D., Lecturer in Orthopedics
 Maurice B. Visscher, M.D., Ph.D., Professor and Head, Department of Physiology

Department of Physical Medicine and Rehabilitation

PHYSICAL THERAPY

Physical therapy is concerned with the treatment of disease or injury by the effective properties of heat, light, water, electricity, massage, and by therapeutic exercises and rehabilitation techniques. These techniques are carried out by the physical therapist under the direction of the physician.

Because of the complexity of the equipment to be used and the exacting nature of the duties to be performed, it is essential for the therapist to be well grounded in the fundamental sciences of anatomy, physiology, pathology, physics, and psychiatry.

Qualifications for a career in physical therapy are much the same as those for any other profession in the field of medicine. The essentials are good health, tact, emotional stability, personal integrity, and an interest in science and the medical field.

Employment opportunities in this field are extremely varied and almost unlimited. It is the purpose of the programs described in this bulletin to prepare well-trained physical therapists to take their place in the wide field of medicine and perform their duties intelligently and efficiently to the benefit of the patient.

The University of Minnesota offers a 4 year curriculum leading to a bachelor of science degree in physical therapy. Graduates are eligible for registration with the American Registry of Physical Therapists. They are also eligible to join the American Physical Therapy Association, the national professional organization.

Admission Requirements

Applicants for admission to the freshman or sophomore year of the Course in Physical Therapy must meet the requirements of the College of Liberal Arts. It is recommended that prospective students take physics, algebra, or geometry in high school. (See *Bulletin of General Information* for specific requirements and procedures.) Graduates of accredited high schools may enter at the beginning of any quarter, but the curriculum as outlined is based on entrance in the fall. After completion of 2 years in the College of Liberal Arts, students must apply for transfer to the Course in Physical Therapy. At this time applicants are considered for entrance to the junior class. The sequence of courses in the professional school (the last 2 years) cannot be altered and must begin in the fall. Applications are also considered from students who have completed equivalent courses at other accredited colleges and universities. Transfer students from other schools should apply for admission with advanced standing to the Office of Admissions and Records, University of Minnesota, Minneapolis 14, in accordance with the *Bulletin of General Information*.

Selection of students for the junior year will be based on scholastic standing (C+ average in the basic science courses) 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.

Nonresidents note section on Admission in the *Bulletin of General Information*.

Further information relating to requirements and training may be obtained from the Physical Therapy office, 860 Mayo Memorial, University of Minnesota, Minneapolis 14. Telephone Fe 9-7311, extension 2721.

General Information

College Expenses

Fees—For complete information about fees and expenses, consult the Bulletin of General Information.

Housing—Information about residence halls may be obtained from the Director of University Housing, 108 Westbrook Hall. 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 white uniforms and white duty shoes for clinical practice.

Loans and Scholarships

Information on scholarships and loans open to all University of Minnesota students is listed in the Bulletin of General Information. Further information may be obtained by writing the Bureau of Student Loans and Scholarships, 201 Eddy Hall. Information on local and national scholarships specific to physical and occupational therapy may be obtained through the respective offices.

Curriculum

To make certain that all prerequisite courses are completed on time, students should submit a tentative 2-year program for approval by the physical therapy director. Ninety quarter credits including the following courses or their equivalents must be completed before admission to the fall quarter of the junior year:

(Quarter credits are shown in parentheses)

Elementary Human Anatomy (5)	From the following social sciences (10)
Human Physiology (4-6)	Humanities
General Inorganic Chemistry (10)	History
Physics (5-6)	Sociology
General Biology (10)	Political Science
General Psychology, plus 3	Philosophy
additional credits (9)	Anthropology
Freshman English (12-15)	Social Science

Registration for the freshman and sophomore years at the University of Minnesota takes place in the College of Liberal Arts. During that period students are subject to the regulations of that college. Programs must be approved each quarter by a faculty adviser in the Department of Physical Medicine and Rehabilitation.

Although a minor is not required, electives are somewhat guided to prevent scattering. The following program is suggested in order to include courses which are offered only once a year:

FRESHMAN YEAR

(Credits are shown in parentheses)

<i>Fall</i>	<i>Winter</i>	<i>Spring</i>
Engl A, Engl 1A, Engl 1B or Comm 1 (4-5)	Engl B, Engl 2A, Engl 2B or Comm 2 (4-5)	Engl C, Engl 3A, Engl 3B or Comm 3 (4-5)
Biol 1 (5)	Biol 2 (5)	GC 7A—Physics (5)
Social science (3)	Social science (3)	PMed 2A (1)
Elective (3)	Elective (3)	Social science (3)
		Elective (3)

SOPHOMORE YEAR

<i>Fall</i>	<i>Winter</i>	<i>Spring</i>
GeCh 4 (5)	GeCh 5 (5)	Anat 4 (5)
Psy 1 (3)	Psy 2 (3)	Psychology (3)
PubH 50 (3)	Phsl 51 (6)	Electives (6)
Electives (3)	Electives (3)	

JUNIOR YEAR

<i>Fall</i>	<i>Winter</i>	<i>Spring</i>
Anat 58 (5)	PMed 4 (1)	Path 60 (3)
PMed 50 (2)	PMed 58 (2)	PMed 61 (5)
PMed 54 (1)	PMed 70 (3)	PMed 63 (1)
PMed 57 (1)	PMed 82 (3)	PMed 60B (3)
PMed 60A (6)	PMed 83 (5)	PMed 80A (4)
	PMed 97 (2)	PMed 87 (3)

SENIOR YEAR

<i>Fall</i>	<i>Winter</i>	<i>Spring</i>
NPsy 171A (2)	PMed 64 (1)	PMed 89 (18)
NPsy 171B (2)	PMed 68 (3)	PMed 90 (1)
PMed 80B (5)	PMed 80C (4)	
PMed 85 (5)	PMed 88 (3)	
PMed 98 (3)	PMed 91 (1)	
	Elective (3)	

OCCUPATIONAL THERAPY

Occupational therapy is a profession which employs mental and physical activities as remedial treatment. Occupational therapists work under the direction of a physician and use arts, crafts, educational subjects, and recreation to aid the patient in his recovery. In rehabilitation, therapists are trained to assist with the activities of daily living and evaluate the patient's interests and skills in various work areas.

Occupational therapy offers unlimited opportunities for qualified therapists because the demand for them is greater than the supply. Graduates are employed in general, orthopedic, psychiatric, and children's hospitals. Schools for the blind, deaf, and exceptional children also hire therapists as do rehabilitation centers, homes for the aged, sanatoriums, and homebound services.

The University of Minnesota offers an occupational therapy curriculum of 4 years plus 3 months of clinical training during the summer after the junior year. Upon completion of the prescribed curriculum, the students receive the degree of bachelor of science in occupational therapy.

The Course in Occupational Therapy is approved by the Council on Medical Education and Hospitals 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. Registered occupational therapists are urged to become members of this organization whose purpose it is to promote the use of occupational therapy, to advance standards of education and practice, to encourage research, and to engage in other activities advantageous to the profession and its members.

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. (For specific requirements and procedures see *Bulletin of General Information*.) Graduates of accredited high schools may enter at the beginning of any quarter, but the curriculum as outlined is based on entrance in the fall quarter.

At the end of the sophomore year, students having a total of 90 quarter credits, including the required courses for occupational therapy, or their equivalents, may make application for entrance into the Department of Physical Medicine and Rehabilitation, College of Medical Sciences. Students who have completed 2 years toward occupational therapy should apply for admission to the professional school by contacting the Office of Admissions and Records of the University. Students must make application and file complete transcripts with the Office of Admissions and Records before July 1 of the year in which they expect to enter the course as juniors. Selection of students will be based on scholastic standing (at least C+) and upon character and personal fitness as disclosed by personal interview. Selections will be made as early as possible and students notified promptly. Those accepted will transfer into the College of Medical Sciences, Department of Physical Medicine and Rehabilitation, Course in Occupational Therapy. Students attending institutions other than the University of Minnesota during their freshman and sophomore years must meet the same requirements for admission. Nonresidents note section on Admission in the *Bulletin of General Information*.

Each student must pass a physical examination in the University Health Service. Any student who is not physically able to do the work required of a therapist will not be accepted.

Further information relating to requirements and training may be obtained from the Occupational Therapy office, 860 Mayo Memorial, University of Minnesota, Minneapolis 14. Appointments may be made by calling Federal 9-7311, extension 2721.

General Information

College Expenses

Fees—For complete information about fees and expenses, consult the *Bulletin of General Information*.

Housing—Information about residence halls may be obtained from the Director of University Housing, 108 Wesbrook Hall. 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 white uniforms and white duty shoes for clinical practice.

Loans and Scholarships

Information on scholarships and loans open to all University of Minnesota students is listed in the *Bulletin of General Information*. Further information may be obtained by writing the Bureau of Student Loans and Scholarships, 201 Eddy Hall, University of Minnesota, Minneapolis 14. Information on local and national scholarships specific to occupational therapy may be obtained through the Occupational Therapy office.

Curriculum

The work of the first 2 years of the Course in Occupational Therapy is taken in the College of Liberal Arts. If the work is taken at the University of Minnesota, the courses listed for the freshman and sophomore years are required. Students who have taken the first 2 years of work at other institutions must have the equivalents of these courses. It is recommended that prospective students take biology, physics, chemistry, and art in high school.

The curriculum includes 9 months of clinical training in various types of hospitals or services such as psychiatric, tuberculosis, general, orthopedic, and children's hospitals, rehabilitation centers, etc. During this period students work a full day which includes treatment of patients, attendance at lectures, staff meetings, and clinics. They are under the supervision of a qualified registered occupational therapist. Maintenance is usually provided at clinical affiliation centers.

FRESHMAN YEAR

(Credits are shown in parentheses)

<i>Fall</i>	<i>Winter</i>	<i>Spring</i>
Engl 1A (4) or Engl 1B (4)	Engl 2A (4) or Engl 2B (4)	Engl 3A (4) or Engl 3B (4)
Biol 1 (5)	Biol 2 (5)	Anat 4 (5)
Art 1 (5)	ArEd 18 (3) or ArEd 19 (3)	Art 45 (3)
PE 1 (1)		Hum 23 (3)
Total (15)	Total (15)	PMed 1 (1) Total (16)

SOPHOMORE YEAR

<i>Fall</i>	<i>Winter</i>	<i>Spring</i>
ArEd 53 (3)	PubH 3 (2)	Phsl 4 (4)
GC 7C (5)	Soc 1 (3)	PMed 5 (2)
Ind 2 (3)	Psy 2 (3)	ArEd 54 (3)
Psy 1 (3)	CD 80 (3) or FamS 25 (3)	Ind 15 (3)
PMed 3 (2)	Ind 12 (3)	Electives (3)
Total (16)	Electives (3) Total (17)	Total (15)

JUNIOR YEAR

<i>Fall</i>	<i>Winter</i>	<i>Spring</i>
PMed 2B (1)	PMed 66 (1)	PMed 61 (5)
PMed 54 (1)	PMed 72 (3)	PMed 63 (1)
PMed 57 (1)	PMed 75 (3)	PMed 73 (3)
PMed 71 (2)	PMed 83 (5)	PMed 77 (5)
PMed 74 (3)	PMed 92 (3)	PMed 84 (2)
Anat 58 (5)	Psy 144 (3)	Psy 145 (3)
NPsy 171A-B (4)	Total (18)	Total (19)
Total (17)		

TENTH QUARTER*(I and II Summer Terms)*

PMed 94 (18)

SENIOR YEAR

<i>Fall or Spring</i>	<i>Winter and Fall or Spring</i>
PMed 55 (2)	PMed 95-96 (18 per qtr)
PMed 67 (2)	
PMed 76 (3)	
PMed 78 (3)	
PMed 93 (2)	
Electives (3)	
Total (15)	

DESCRIPTION OF COURSES

Physical Medicine and Rehabilitation (PMed)

1. **Introduction to Occupational Therapy.** Orientation. Films showing hospital occupational therapy programs. Tours of hospitals and rehabilitation centers. Discussion and reports following trips. (1 cr)
- 2A. **Orientation to Physical Therapy and Rehabilitation.** History and opportunities of the profession; survey of techniques; field trips to physical therapy departments. (1 cr; prereq #)
- 2B. **Orientation to Physical Therapy and Rehabilitation.** Physical therapy and rehabilitation procedures; survey of techniques and application; observation of treatment in the physical therapy clinic, University Hospitals. (1 cr for OT students)
3. **Orientation to Occupational Therapy.** Survey of the profession through lectures, films, and tours. Methods of treatment including demonstrations. Observation in clinics. (2 cr)
4. **Orientation to Occupational Therapy.** Introduction to treatment techniques and their application. Observation of treatment in occupational therapy clinics. (1 cr for PT students)
5. **Therapeutic Recreation.** Instruction in application of recreational activities for hospital and convalescent patients. (2 cr)
50. **Physics for Physical Therapy.** Mechanics, heat, light, and electricity as applied to physical medicine and rehabilitation. Lectures and laboratory demonstrations with participation by students. (2 cr)
54. **Medical Terminology.** Etymology and use of medical terms. (1 cr)
55. **Process of Rehabilitation.** Public laws; community agencies; job opportunities and trends; rehabilitation programs relating to handicapped persons. (2 cr)
57. **Ethics and Administration.** Lectures covering appropriate conduct of therapists; orientation to the hospital; professional and related organizations. (1 cr)
58. **Bandaging, Aseptic, and Isolation Techniques.** Methods and principles of bandaging, splinting, and taping; care and wrapping of the amputee stump; medical asepsis includes preparation for and cleansing and dressing of wounds; isolation procedures for all contagious diseases. Laboratory practice of all techniques. (2 cr)
- 60A. **Theory and Technique of Thermo-, Photo-, and Hydrotherapy.** Lectures, demonstrations, student practice, and clinical applications to patients under supervision. (6 cr)
- 60B. **Theory and Technique of Electrotherapy.** Lectures, demonstrations, student practice, and clinical application to patients under supervision. (3 cr)
61. **Theory and Technique of Physical Medicine and Rehabilitation Applied to Medical Sciences.** Lectures include related fields of surgery, orthopedics, pediatrics, dermatology, medicine, neurology, and speech. (5 cr)
63. **Junior Clinic in Physical Medicine and Rehabilitation.** Correlation clinic. Presentation of hospital cases, with emphasis on therapeutic problems to be treated by occupational and physical therapists. (1 cr)
64. **Senior Clinic in Physical Medicine and Rehabilitation.** (1 cr)
66. **Introduction to Scientific Literature.** Use of source material; evaluation of literature; techniques of scientific writing. (1 cr)

67. **Methods of Scientific Research.** Fundamentals of research design; evaluation and presentation of data; preparation of manuscript. (2 cr)
68. **Applied Anatomy.** Review of joint structures, muscles, nerves, and function. Diseases and injuries causing impairment of function and deformities are reviewed and correlated to physical medicine and rehabilitation. (3 cr)
70. **Theory and Technique of Massage.** Methods of applying various types of massage, their therapeutic indications, and physiological effects. Laboratory demonstration and practice. Supervised clinical practice. (3 cr)
71. **Theory of Occupational Therapy.** The practical application of occupational therapy in the major medical fields. Professional ethics and etiquette. Organization and administration. Interdepartmental relationships. (3 cr)
72. **Theory of Occupational Therapy.** Principles of treatment for pediatrics, the tuberculous, and patients with medical and surgical conditions. (3 cr)
73. **Theory of Occupational Therapy.** Application of occupational therapy to treatment of psychiatric patients; current theories, problems, and practices. (3 cr)
- 74-75. **Techniques of Occupational Therapy.** Laboratory instruction in craft skills; adaptation of these to specific disabilities. (3 cr per qtr)
76. **Techniques of Occupational Therapy.** Laboratory instruction in the maintenance, operating procedures, and safety precautions of power woodworking equipment. (3 cr)
77. **Study of Physical Disabilities.** Techniques of treatment of patients with physical disabilities. Evaluation and training in activities of daily living. Lecture and laboratory. (5 cr)
78. **Principles and Practice of Occupational Therapy.** Experience in planning and conducting a research project with therapeutic application. (3 cr)
- 80A-B-C. **Theory and Technique of Therapeutic Exercise.** Scientific application of exercise programs for specific disabilities, including the practical application of all types of apparatus. Lectures, demonstrations, and student practice. Supervised clinical practice. (13 cr)
82. **Physiology of Muscles, Nerves, and Circulation.** Specific physiological basis for physical therapy. (3 cr)
83. **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 co-ordinated movement. Theory and technique of muscle testing and joint measurement. Lectures, laboratory demonstration and practice, clinical application under supervision. (5 cr)
84. **Theory and Technique of Rehabilitation Procedures.** Working knowledge of the principles used in rehabilitation of the physically handicapped, from the bed patient to ambulation. Lectures, demonstration, and practice. (3 cr)
85. **Theory and Technique of Rehabilitation Procedures.** Ambulation and all activities of daily living. Total program of treatment for specific disabilities. (5 cr)
- 87-88. **Clinical Practice.** Clinical application of techniques under supervision in the physical therapy departments of the affiliated hospitals. (3 cr per qtr)
89. **Clinical Practice.** One-quarter, full-time clinical application of techniques in the affiliated hospitals in the Twin Cities. (18 cr)
- 90-91. **Senior Conference.** Discussion of problems arising during clinical practice. (1 cr per qtr)

- 92. Preliminary Hospital Practice in Occupational Therapy.** Supervised preclinical experience in the University Hospitals. (3 cr)
- 93. Orientation to Prevocational Therapy.** Practical experience and observation in a rehabilitation center. Job analysis and development of work units as used in prevocational evaluation. Field trips. (2 cr)
- 94-95-96. Clinical Training in Occupational Therapy.** A total of 9 months of supervised training in affiliated hospitals. (18 cr per qtr)
- 97. Introduction to Scientific Research.** Use of source material, evaluation of literature, fundamentals of medical research, graphic presentation of data, technique of writing. (2 cr)
- 98. Special Problems in Physical Therapy.** Opportunity to participate in selected research areas. (Cr ar; prereq 97)

4/24/64

Division of Medical Technology

1963-1965



Theory and technique are correlated through clinical experience.

Bulletin

of the UNIVERSITY of MINNESOTA

How to Use This Bulletin

The Bulletin of the Division of Medical Technology for 1963-1965 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
- Registration Procedures
- Fees
- Health Examinations
- Residences
- Student Aid
- Placement
- Student Organizations
- Degrees
- National Certification
- College Regulations

Curriculums. This section contains specific course requirements and quarterly programs.

- Medical Technology
- Course for Medical Laboratory Assistants
- 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 *Bulletin of General Information* and the *Bulletin of the College of Liberal Arts*. 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 14.

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 14.

UNIVERSITY OF MINNESOTA

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The Board of Regents is composed of The Honorable Charles W. Mayo, M.D., Rochester, First Vice President and Chairman; The Honorable Marjorie J. Howard (Mrs. C. Edward), Excelsior, Second Vice President; The Honorable Daniel C. Gainey, Owatonna; The Honorable Richard L. Griggs, Duluth; The Honorable Bjarne E. Grottum, Jackson; The Honorable Robert E. Hess, White Bear Lake; The Honorable Fred J. Hughes, St. Cloud; The Honorable A. I. Johnson, Benson; The Honorable Lester A. Malkerson, Minneapolis; The Honorable A. J. Olson, Renville; The Honorable Otto A. Silha, Minneapolis; and The Honorable Herman F. Skyberg, Fisher.

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Edmund G. Williamson, Ph.D., Dean of Students

MEDICAL TECHNOLOGY

(A division of the Department of Laboratory Medicine)

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Gerald T. Evans, M.D.C.M., Ph.D., Professor of Medicine; Director, Department of Laboratory Medicine
Ellis S. Benson, M.D., Professor and Director, Division of Hospital Laboratories
Ruth F. Hovde, M.S., Associate Professor and Director, Division of Medical Technology
Verna L. Rausch, M.S., Assistant Professor; Training Co-ordinator
Jean E. Jorgenson, B.S., Instructor; Co-ordinator of Medical Laboratory Assistants Program
Grace Mary Ederer, M.P.H., Assistant to the Director, Division of Hospital Laboratories

Faculty

Paul Alexander, M.D., M.P.H., Instructor; Assistant Director, Division of Clinical Laboratories
Wallace Armstrong, M.D., Ph.D., Professor and Head, Department of Biochemistry
Robert Bridges, M.D., Associate Professor; Consultant in Clinical Microbiology
Frances Casey, B.S., Instructor, Veterans Administration Hospital
Kathleen Clayson, B.S., Instructor, Chemistry Laboratory
James R. Dawson, M.D., Professor and Head, Department of Pathology
Joycelyn Duncan, B.S., Instructor, Microbiology Laboratory
Esther F. Freier, M.S., Assistant Professor; Hospital Chemist
Lorraine M. Gonyea, M.S., Assistant Professor, Hematology Laboratory
Kathryn Hammer, M.S., Instructor, Chemistry Laboratory
Patricia Hanauer, M.S., Assistant Professor, Hematology Laboratory

Arnold Lazarow, M.D., Ph.D., Professor and Head, Department of Anatomy
 Paul H. Lober, M.D., Ph.D., Associate Professor of Pathology; Hospital Pathologist
 Elaine B. McMaster, M.S., Assistant Professor, Pathology Laboratory
 Douglas Nelson, M.D., Instructor, Hematology Laboratory
 Joseph W. St. Geme, M.D., Assistant Professor of Microbiology; Hospital Bacteriologist
 Arthur Sanders, B.S., Instructor, Veterans Administration Hospital
 John Spizizen, Ph.D., Professor and Head, Department of Microbiology
 R. Dorothy Sundberg, M.D., Ph.D., Professor of Anatomy; Hospital Hematologist
 Maurice Visscher, M.D., Ph.D., Professor and Head, Department of Physiology
 Franklin G. Wallace, Ph.D., Associate Professor of Zoology; Consultant in Parasitology
 Lila Wengler, B.S., Instructor, Blood Bank Laboratory
 Edmond Yunis, M.D., Instructor; Director of Blood Bank
 Jorge Yunis, M.D., Instructor, Medical Genetics Laboratory
 Newell R. Ziegler, M.D., Ph.D., Associate Professor of Bacteriology and Immunology;
 Consultant, Blood Bank

Laboratory Staff

Blood Bank Laboratory

- ¹ Sandra Benson, B.S.
- ² Mary Alice Grewe, B.S.
- ² Patricia Koors, B.S.
- ² Clareyse Nelson, B.S.
- ² Carole Sahlstrand, B.S.
- ² Janet Svardal, B.S.
- ² Joanne Wetmore, B.S.

Chemistry Laboratory

- ² Joan Aldrich, B.S.
- ² Karen Bisset, B.S.
- ² Ruth Brown, B.S.
- ² Barbara Cohen, B.S.
- ² Esther Damron, B.S.
- ² Nancy Frailing, B.S.
- ² Solveig Gerstenkorn, B.A.
- ² Jessie Hansen, B.S.
- ¹ Mavis Hawkinson, B.S.
- ² Helen Huber, B.A.
- ² Sandra Johnson, B.A.
- ² Wendy Kline, B.S.
- ² Mary Jane Moore, B.S.
- ² Carolyn Moosbrugger, B.A.
- ² Carol V. Nelson, B.S.
- ² Aija Vikmanis, B.S.
- ² Livija Vilinskis, B.S.
- ² Marlene Wilke, B.S.

Electrocardiography and Basal Metabolism Laboratory

- ² Eloise Greenwood, B.S.
- ² Margaret Halsted, B.S.

Heart Catheterization Laboratory

- ² Joanne Kerns, B.S.
- ² Ethel Schneider, B.S.
- ² Gretchen Stuart, B.S.

Hematology Laboratory

- ² Audrey Christenson, B.S.
- ² Lucille Elmer, B.S.
- ² Kathryn Grave, M.S.
- ² Dorothy Knutson, B.S.
- ² Joan Lottsfeldt, B.S.
- ² Loreen Pelowske, B.S.
- ² Ruth Rosendahl, B.S.
- ² Phyllis Segal, B.S.
- ² Ella Spanjers, B.S.
- ² Elizabeth Stiene, B.S.
- ² Elizabeth Stone, B.S.
- ² Marian Templeton, B.S.
- ² Jean Urbank, B.S.
- ² Betty Weisel, B.S.

Medical Genetics Laboratory

- ⁵ Ann Cihac, B.S.
- ⁵ Inez Ness, B.S.

Medical Laboratory Assistant Program

- ² Elizabeth Lundgren, A.B.
- ² Karen Ringsrud, B.S.

Microbiology Laboratory

- ² Donna Dauwalter, B.S.
- ² Roberta Farnham, B.S.

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

- ¹ Joanne Floeder, B.S.
- ³ Renelda Hess, B.S.
- ³ Marilyn Hopp, B.S.
- ³ Audrey Kondrak, B.S.
- ³ Carol Timmons, B.S.
- ³ Marcia Weber, B.S.
- ³ Phyllis Weiss, B.S.

Night Technologists

- ³ Ruth Cadwell, M.S.
- ³ Gordon Herbst, B.S.
- ³ Helen Kennedy, B.A.
- ³ Judy Schelde, B.S.
- ³ Helen Vanderveen, B.S.
- ³ Judy Winsor, B.S.

Pathology Laboratory

- ³ Barbara Chapman, B.S.
- ³ Joanne Koski, B.S.
- ³ Clarice Olson, B.S.
- ³ Joanne Samuelson, B.S.

Research Laboratories

- ⁶ Sandra Christensen, A.B.
- ⁵ Grace Engler, B.S.
- ⁴ Ben Hallaway, M.S.
- ⁵ Carol Nelson, B.S.
- ⁵ Maija Stumbris, B.S.
- ⁶ Regina Vijjums, B.S.
- ⁶ Lois Wilcox, B.S.

-
- ¹ Principal Medical Technologist
 - ³ Student Technologist Supervisor
 - ⁴ Associate Scientist
 - ⁵ Junior Scientist
 - ⁶ Laboratory Technologist

Division of 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 practical 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, electrocardiography, basal metabolism, 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.

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 *Bulletin of General Information*. Qualified applicants, men or women, may enter at the beginning of any quarter, but the curriculum outlined is based on entrance in the fall quarter. If a student enters at any other quarter, Summer Session attendance may be necessary to make up the irregularities in the student's program.

It is recommended that prospective students take mathematics, physics, chemistry, and biology in high school.

Admission with Advanced Standing—After 1 or more years 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 a month or more before the quarter a student plans to enter.

In some instances, students transferring from other colleges may be able to make up their deficiencies, such as in bacteriology and chemistry by attending Summer Session classes. This would make them eligible for admission to the special medical technology courses as much as 1 year earlier than would be possible otherwise. Transfer students with 3 or more years of college training elsewhere will be permitted to begin the senior year as soon as all required courses are completed. Because certain of these courses are offered only at the University, it is usually necessary for transfer students to spend 1 or more quarters in attendance before beginning the senior practical work. It is necessary for all students to earn at least 49 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 Building, University of Minnesota, Minneapolis 14, 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

Dates for registration in this course and specific procedures to be followed are published each quarter in the Official Daily Bulletin of the *Minnesota Daily*.

Students registering for the first time should present their admission certificate to the Office of Admissions and Records in Morrill Hall before proceeding with registration at the Medical Technology office.

All students in either the preprofessional curriculum in the College of Liberal Arts or in the Division of Medical Technology are requested to submit registrations each quarter to advisers in the Medical Technology office for approval and assistance with program planning.

Fees

For complete information about fees and expenses, consult the *Bulletin of General Information*.

Health Examinations

In addition to the physical examinations required on admission, all students are expected to arrange for appointments at the University Health Service for medical examination and necessary immunizations both before entering and after completing the senior year. This procedure is required as a protection for the student.

Residences

Information about residence halls may be obtained from the Director of University Housing, 108 Westbrook Hall. Information about private rooming houses is furnished by the Student Housing Bureau, 209 Eddy Hall.

If you select quarters in residences not already approved by the University, you must have the approval of the director of the Student Housing Bureau before occupying them, unless you are over 21, or married.

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 January 15. There are also other scholarships and merit awards offered annually to students in recognition of outstanding achievement records.

For students needing financial assistance, loan funds have been established to help any student who is making normal progress toward an educational objective. 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 Title II of the National Defense Education Act of 1958 should apply through the Bureau of Student Loans and Scholarships. 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 Bureau of Student Loans and Scholarships.

For students needing part-time employment to meet school expenses, the Student Employment Bureau, 30 Wulling Hall, is maintained. It should be pointed out that each of the first 3 years of 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. During the fourth year, the hospital courses require as much time as a full-time position, and no student should arrange for outside or part-time work that will interfere with such a program.

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.

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

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 over-all B average in preclinical courses. 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, the completion of the practical work, and a total of 186 credits and 372 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 3.5 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 study 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.

Successful passing of the examination makes the technologist eligible for membership in the American Society of Medical Technologists and its local and state affiliated groups. Full information is available in the Medical Technology office.

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 *Bulletin of the College of Liberal Arts*.

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.

CURRICULUMS

A. Bachelor of Science Program in Medical Technology

Freshman and Sophomore Years—Registration is in the College of Liberal Arts. The following courses or their equivalents must be completed before admission to the junior year:

(Credits are shown in parentheses)

AnCh 57—Quantitative Analysis (4) Anat 4—Elementary Anatomy (5) Biol 1-2—General Biology (10) Comm 1-2-3—Communication (12) (or) Engl 1A-2A-3A—Freshman English (12) (or) Engl 1B-2B-3B—Freshman English (12) (or) Engl A-B-C—Freshman Literature and Composition (15) (or) Exemption from requirement GeCh 4-5—Principles of Chemistry (10)	GeCh 6—Principles of Solution Chemistry (4) Math 10—College Algebra (5) MedT 10-11-12††—Orientation in Medical Technology (3) MedT 30-31-32††—Case Presentations (3) MicB 53—General Microbiology (5) OrCh 61-62—Elementary Organic Chemistry (8) Phys 2-3—Introduction to Physical Sciences (6) Zool 54—Histology (5) Electives to make a total of 90 credits for 2 years' work
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There is no essential limitation to the subjects which may be taken as electives. However, a program that includes scattered electives will not be approved.

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 A, 1A, 1B, or Comm 1	Engl B, 2A, 2B, or Comm 2	Engl C, 3A, 3B, or Comm 3
Math 10	Biol 1	Biol 2
GeCh 4	GeCh 5	GeCh 6
MedT 10	MedT 11	MedT 12
Electives	Electives	Electives

SECOND YEAR

<i>Fall</i>	<i>Winter</i>	<i>Spring</i>
AnCh 57	OrCh 61	OrCh 62
Zool 54	Phys 2	Phys 3
MedT 30	MicB 53	Anat 4
Electives	MedT 31	MedT 32
	Electives	Electives

Junior Year—The following courses must be completed before assignment to the senior year of hospital training can be made.

(Credits are shown in parentheses)

Anat 165—Hematology (4) MdBc 100-101—Biochemistry (14) MedT 51-52—Introduction to Medicine and Pathology (4) MedT 60—Blood Group Serology (2)	MedT 61—Introductory Clinical Hematology (2) MedT 62—Introduction to Clinical Chemistry (3) MicB 102—Medical Microbiology (4) MicB 116—Immunology (4) Zool 51—Introductory Animal Parasitology (5)
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†† Students who transfer into the medical technology program after the freshman year are exempt from the MedT 10-11-12 requirement. Students who transfer into the medical technology program after the sophomore year are exempt from both the MedT 10-11-12 and 30-31-32 requirements.

The following program arrangement is suggested:

THIRD YEAR

<i>Fall</i>	<i>Winter</i>	<i>Spring</i>
Anat 165	MicB 116	MedT 52
MdBc 100	MdBc 101	MedT 60
Zool 51	Phsl 60	MedT 61
	MedT 51	MedT 62
		MicB 102

Senior Year—Students are not eligible to begin the year of clinical training until they have completed all the requirements of the first 3 years. The scholastic standing in the first 3 years determines the order in which students are assigned to the clinical year. Students may enter the year of clinical training each quarter.

FOURTH YEAR

(53 weeks)

Clinical laboratory training in the laboratories of the University of Minnesota Hospitals includes the following courses in medical technology:

(Credits are shown in parentheses)

70A—Clinical Chemistry (10)—10 weeks	80A—Clinical Microbiology (7)—8 weeks
70B—Advanced Clinical Chemistry (6)—6 weeks	80B—Special Clinical Microbiology (3)—3 weeks
73—Electrocardiography and Basal Metabolism Testing (2)—2 weeks	82—Clinical Immunology (5)—5 weeks
75A—Clinical Hematology (6)—6 weeks	85—Histologic Techniques (3)—3 weeks
75B—Advanced Clinical Hematology (4)—4 weeks	90—Applied Laboratory Methods (2)—5 weeks

B. Course for Medical Laboratory Assistants

The Course for Medical Laboratory Assistants offered by the General Extension Division of the University of Minnesota in co-operation with the College of Medical Sciences aims to prepare young women for work as nonprofessional technical assistants to medical technologists and doctors in clinical laboratories. This course combines instruction in fundamental principles in selected phases of laboratory techniques with clinical experience in hospital laboratories.

Requirements for Admission—Graduation from high school with college aptitude ratings of 50 or higher is required. (College aptitude rating is the average of the high school percentile rank and the college aptitude percentile rank.) Applicants must have completed a course in high school chemistry. Preference is given to residents of Minnesota.

Program—Twelve consecutive months of training include 2 quarters in residence on the campus in day classes and 2 quarters in practical experience in laboratories of participating hospitals in Minnesota.

Fees—For the first 2 quarters on campus, tuition and incidental fees are \$310. No tuition is charged for the last 2 quarters in training. (University fees are subject to modification without notice.)

Certification—Upon satisfactory completion of all class work, hospital training, and comprehensive examinations, a certificate of completion is awarded by the General Extension Division of the University of Minnesota. The student upon satisfactory completion of the course is also eligible for certification by examination by the Minnesota Society of Clinical Pathologists and the Minnesota Society of Medical Technologists.

For further information about this course write to the General Extension Division, 54 Nicholson Hall, or to the Medical Laboratory Assistant office, Box 198, Mayo Memorial Building, University of Minnesota, Minneapolis 14.

C. 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 problems and in making satisfactory progress toward their solution. Familiarity with the bibliography of the special area and correct citation of authorities are expected. The thesis must be

finished and registered in the office of the Graduate School at least 8 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.

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 *Bulletin of the Graduate School* 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 14.

DESCRIPTION OF COURSES

Other courses which are equivalent or more comprehensive may be substituted for the required courses. The quarterly *Class Schedule* issued at the time of registration should be consulted for class hours and any special fees.

Medical Technology (MedT)

All courses numbered 50 or above are open only to students registered in the Division of Medical Technology.

- 10-11-12. **Orientation in Medical Technology.** Orientation in the principles and practices in medical technology. (1 cr per qtr; 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; prereq soph only)
- 51-52. **Introduction to Medicine and Pathology.** Relation and use of clinical laboratory methods in clinical medicine. Introduction to clinical pathology. (4 cr)
- 60. **Blood Group Serology.** Introduction to fundamental principles and laboratory techniques in blood grouping and cross matching. (2 cr)
- 61. **Introductory Clinical Hematology.** Fundamental techniques in hematology. (2 cr)
- 62. **Introduction to Clinical Chemistry.** Introduction to fundamental principles of laboratory procedures in clinical chemistry. (3 cr)
- 70A. **Clinical Chemistry.** Basic methods and techniques used in clinical chemistry and urinalysis. (10 cr)
- 70B. **Advanced Clinical Chemistry.** Laboratory methods and additional experience in special procedures used in clinical chemistry. (6 cr)
- 73. **Electrocardiography and Basal Metabolism Testing.** Principles and practice in the use of electrocardiographs and metabolors. (2 cr)
- 75A. **Clinical Hematology.** Application and use of laboratory methods in hematology. Morphology of blood cells. (6 cr)
- 75B. **Advanced Clinical Hematology.** Special projects and techniques in hematology. (4 cr)
- 80A. **Clinical Microbiology.** Identification of bacteria by microbiologic techniques. Correlation with clinical cases. (7 cr)
- 80B. **Special Clinical Microbiology.** Practice in serological methods, identification of parasites and fungi. (3 cr)
- 82. **Clinical Immunology.** Application of technical methods in procurement of blood and in blood grouping and cross matching for transfusions. (5 cr)
- 85. **Histologic Techniques.** Preparation of tissue specimens for microscopic study. (3 cr)
- 90. **Applied Laboratory Methods.** Review of laboratory methods with independent work including night duty. Orientation in related hospital practices. Term paper required. (2 cr)
- 110, 111. **Advanced Clinical Laboratory Techniques.** Assignment on individual basis for observation, study, and practice in special problems; techniques and methodology in 1 or 2 of the units of the Clinical Laboratories (bacteriology, chemistry, hematology, histology, or immunology). (5 cr per qtr)

120. **Seminar in Medical Technology.** Review and discussion of current literature; presentation and discussion of research being carried on in the department. (1 cr)
- 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)
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)

Anatomy

- Anat 4. **Elementary Anatomy.** Elementary human anatomy. (5 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 54)

Biochemistry

- MdBc 100-101. **Biochemistry.** (14 cr; prereq organic chemistry and physics)

Chemistry

- GeCh 4-5. **Principles of Chemistry.** Introduction to chemistry from the standpoint of atomic structure; periodic properties of the elements and compounds derivable from structural considerations; laws governing the behavior of matter, theories of solution, acids, bases, and equilibrium. (10 cr)
- GeCh 6. **Principles of Solution Chemistry.** Laboratory work in systematic qualitative analysis of the cations with lectures on solutions, ionization, chemical and physical equilibria, oxidation and reduction, etc. (4 cr; prereq GeCh 5)
- AnCh 57. **Quantitative Analysis.** Introductory course covering the general principles and methods of quantitative analysis, both gravimetric and volumetric. Typical problems are assigned and attention is given to proper laboratory practice. (4 cr; prereq GeCh 11)
- OrCh 61-62. **Elementary Organic Chemistry.** Discussion of important classes of organic compounds, both aliphatic and aromatic, together with some heterocyclic compounds. Laboratory work includes the preparation of typical substances. (8 cr; prereq 12-15 cr in chemistry)

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 A-B-C. **Freshman Literature and Composition.** Identical with Engl 1A-2A-3A, except that it puts even greater emphasis upon literature. Composition 6 credits, literature 9 credits. (15 cr; prereq assignment to Category 1, 1A or 2; see note above)

Engl 1A-2A-3A. Freshman English. Identical with Engl 1B-2B-3B, except that it puts greater emphasis upon literature. Composition 6 credits, literature 6 credits. (12 cr)

Engl 1B-2B-3B. Freshman English. Concentrates upon developing the student's skill in writing exposition, with an introduction to literary types as the chief means of providing subject matter for the writing. The literature read consists of novels, short stories, plays, and poems, both English and American. (12 cr)

Comm 1-2-3. Communication. Helps students use the English language more effectively, with constant practice in speaking and writing, in listening and reading. 1: Use of language to convey meaning through its structural patterns and its words; social attitudes toward language practices. 2: Use of language to influence human behavior. 3: Special effects of mass communication upon the recipient; critical reception of mass communication. Six regular conferences with instructor; use of speech equipment; special conferences with speech consultant if indicated. (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 Y or high school higher algebra)

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 4 cr in biological sciences)

MicB 102. Medical Bacteriology. Pathogenic bacteria, especially in their relationship to disease; principles of infection and immunity; microbiological techniques for laboratory diagnosis and antibiotic determination. (4 cr; prereq 116)

MicB 116. Immunology. Interactions between host and parasite; serologic procedures; hemolysis; antigen and antibody; opsonins, serums, vaccines, toxin, antitoxin, complement fixation; neutralization, precipitative and agglutinative reactions, blood grouping, atopy, anaphylaxis. (4 cr; prereq 53)

Physics

Phys 2-3. Introduction to Physical Science. Demonstration lectures on the principles of physics and the physical phenomena underlying these principles. (6 cr; prereq high school algebra and plane geometry)

Physiology

Phsl 60. Human Physiology. Lectures, conferences, and laboratory. (6 cr; prereq courses in biochemistry and human or mammalian anatomy)

Zoology

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)

Zool 51. Introductory Animal Parasitology. Parasitic protozoa, worms, and arthropods, and their relation to diseases of man and animals. (5 cr; prereq Biol 2)

Zool 54. Histology. Microscopic structure of the tissues and organs. (5 cr; prereq Biol 2)

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Supplement to the

UNIVERSITY OF MINNESOTA BULLETIN
SCHOOL OF NURSING, 1963-1965

Notice of Change in First-Year Course Requirements for
Plan B—Basic Professional Nursing Program

The following first-year course requirements for Plan B of the Basic Professional Nursing Program are effective as of September 1964. This statement replaces that which appears on page 20 of the 1963-1965 School of Nursing bulletin.

PLAN B

First-Year Course 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. Of these 45 quarter credits, 36 must be distributed as follows:

Group A—Freshman English (3 qtrs)

Group B or E—Foreign language or humanities (8)

Group C—Social science: Anth 2A required (8)

Group D—Natural science: GeCh 4 and 5 (10); NSci 3 (5)**

The remaining credit requirement must be fulfilled by selections from any of groups B, C, D, and E described below:

A. Freshman English

Engl A-B-C—Freshman Literature and Composition (composition portion) (8)

(or) Engl 1A-2A-3A—Freshman English (composition portion) (8)

(or) Engl 1B-2B-3B—Freshman English (composition portion) (9)

(or) Comm 1-2-3—Communication (12)

(or) Exemption from requirement

(All students are required to have an English Classification Card before registration for one of these courses)

** Students who transfer from another college may substitute 5 quarter credits of general biology.

Dorothy E. Titt, M.A.
Hannah K. Walseth, M.A.
Elizabeth A. Whitney, M.A.

Grace M. Frejlach, B.S.
Dorothy P. Geis, M.Ed.
Clarine O. Grefe, B.S.
Helen B. Hansen, M.Ed.
Muriel D. Hudak, B.S.
Frances D. Moncure, M.Ed.
Helen J. Peterson, M.Ed.
Joann R. Rusch, M.S.
Marian J. Town, M.Ed.

Instructor

Mary Ann L. Baas, M.Ed.
Peggy J. Brown, M.S.N.
Irene L. Bryant, M.P.H.
Nancy L. Cook, M.A.

Nursing Service Staff of University Hospitals

Florence J. Julian, M.N.A., Professor and Director of Nursing Services
Betty M. Pederson, M.N.A., Assistant Director of Nursing Services and Associate Professor
Alvhild M. Berggren, B.S., Nursing Supervisor and Instructor
Beverly Brostrom,** B.S., Assistant Nursing Supervisor and Instructor
Margaret J. Clipper,** B.S., Nursing Supervisor and Instructor
Jane Filerman, B.S., Nursing Supervisor
Cecile Kume,** M.N.A., Nursing Supervisor and Instructor
Elva Norden, B.S., Nursing Supervisor and Instructor
Mary L. Richmond, B.S., Nursing Supervisor
Irmagene Sanford, B.S., Nursing Supervisor
Dorothy Schneider, M.N.A., Nursing Supervisor and Instructor
Genevieve A. Scholtes, B.S., Nursing Supervisor and Instructor
Frances M. Sullivan, B.S., Nursing Supervisor and Instructor
Margaret L. VanderKraan, B.S., Nursing Supervisor and Instructor
Sylvia A. Zeller, B.S., Nursing Supervisor

** Participate in direct instruction of students in Plan A, Basic Professional Nursing Program.

School of Nursing

GENERAL INFORMATION

Development of the School—The interest and effort of Dr. Richard Olding Beard led to the opening of the School of Nursing on March 1, 1909. Although the early 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. 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. In 1958 the University of Minnesota School of Nursing Foundation was established. Its purpose is the improvement of patient care through appropriate assistance to the school in carrying forward nursing education, research, and community service. This evidence of widespread interest and support for the school attests to the public's concern for quality in the preparation of personnel for such a needed service as nursing.

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. 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 transitions in the concepts of sound education for nursing. The first programs leading to professional Masters' degrees were initiated early in the 1950's.

Today preparatory programs are available for both practical and professional nursing. The basic nursing program is designed to prepare students for the beginning practice of professional nursing and, upon satisfactory completion, students are awarded the degree of bachelor of science in nursing. Students graduating from this program are eligible to write the licensing examination offered by the Minnesota Board of Nursing. Satisfactory performance on this examination entitles the applicant to practice as a registered nurse in Minnesota.

Graduate nurses who have completed an educational program in nursing leading to a diploma or an Associate degree may enroll for baccalaureate studies in nursing in a program with purposes and content similar to that of the basic program. Expanding knowledge in the practice of nursing now requires a broad preparation in nursing *per se* as a foundation for graduate preparation in specialized areas of functioning within nursing.

Preparation for the more expert practice of nursing, for teaching, and for administrative responsibilities in organized nursing services is made available in the several offerings that lead to an appropriate Master's degree. All of the school's programs that are eligible at this time to have applied for accreditation carry such accreditation by the National League for Nursing, the body recognized by the National Commission on Accrediting as having this responsibility in nursing education.

The School of Nursing is one of several units in the College of Medical Sciences of the University of Minnesota. The rich and varied resources of the University Hospitals are adjacent to the school and are utilized for student learning experiences in all nursing programs. Learning opportunities in public health nursing are made available in the several public health nursing agencies in the area. Faculty in various educational units of the University, such as the Graduate School, Medical School, School of Public Health, College of Education, College of Liberal Arts, and General

College, participate with the faculty in the School of Nursing as appropriate in program development.

School of Nursing Programs

PRACTICAL NURSING PROGRAM

The purpose of this 4-quarter program is to provide opportunity for the student to develop as an individual as well as to prepare for practical nursing. With indirect supervision by registered nurses, the graduate of an approved practical nursing program is prepared to give nursing care to patients in situations that are relatively free of complexity. She also assists professional nurses, in a close working relationship, in giving nursing care to patients in more complex situations.

In order to accomplish its purpose the curriculum provides opportunity for the student in practical nursing to attain the following objectives:

1. The ability to communicate effectively.
2. An awareness of the principles of human behavior.
3. An increasing ability to perceive the needs of others and of self.
4. A general understanding of the nature, cause, and effects of any mental or physical stress on the person.
5. The ability to participate in the planning, implementation, and evaluation of nursing care with the supervision of professional nurses and physicians.
6. A recognition and appreciation of her role and responsibilities as a member of the health team.
7. An awareness of her responsibility to utilize opportunities for continued development as a licensed practical nurse.

Having attained these objectives, the graduate of this program is ready to assume responsibilities of a beginning practitioner in practical nursing. She is eligible to write the appropriate licensing examination offered by the Minnesota Board of Nursing. Satisfactory performance on this examination entitles the applicant to practice as a licensed practical nurse (L.P.N.) in Minnesota.

BACCALAUREATE PROGRAMS IN NURSING

The University of Minnesota School of Nursing in keeping with the educational philosophy of the University assists undergraduate students to attain a broad base of knowledge and understanding which makes life more meaningful and helps the individual become an effective member of society and of the nursing profession.

The purpose of the baccalaureate programs in the School of Nursing is to provide opportunities for students to gain a body of knowledge, skill, and understanding appropriate to the practice of professional nursing. The scope of these learnings and the degree of skill in their application are such that individuals are enabled upon completion of the programs to function in first-level positions in nursing and to gain additional understandings and proficiency through formal and informal postbaccalaureate study and informed participation in nursing care.

In accord with the philosophy underlying the programs, 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, co-ordinate, and evaluate nursing care.
9. A continuing development of abilities in accordance with the individual's interest and potentialities.
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 through the promotion of health, the prevention of illness, and the care and rehabilitation of the sick.

Basic Professional Program—Students were admitted to the nursing major in a revised basic program for the first time in the fall quarter of 1962. In this same quarter the last students to be enrolled in a 16-quarter basic program were admitted to the nursing major in that program. The purpose and objectives of both these programs are described above. Admission requirements and description of the revised program appear later in this bulletin.

Baccalaureate Program for Graduates of Associate Degree or Diploma Programs—A nursing program, leading to the degree of bachelor of science in nursing, is designed to prepare the graduates of either Associate degree or diploma programs for professional nursing practice in beginning positions in hospitals, public health nursing agencies, and other settings such as schools and industry where the services of professional nurses are required.

MASTERS' PROGRAMS

The School of Nursing conducts a program leading to the degree of master of nursing administration that is designed to prepare qualified professional nurses for administrative positions in organized nursing services.

Students interested in pursuing the teacher preparatory program leading to the degree of master of education enroll in the College of Education. Faculty in the School of Nursing provide advisement for these students and instruction in those courses in nursing and nursing education essential to the accomplishment of the purpose stated.

Advanced preparation in psychiatric nursing leading to a master of science degree is offered through the Graduate School. School of Nursing faculty members holding Graduate School appointments serve as advisers and provide nursing instruction for these students.

Masters' programs in nursing provide opportunity for the student to broaden and deepen her general nursing competence and to develop further skills in clinical nursing, teaching, or administration through a variety of learning experiences including supervised practice.

The broad range of opportunities in an institution of higher education can enrich the students' understanding of many other professional disciplines and provide opportunity to explore resources for the continuing development of the art and science of nursing.

Graduate study assists the student to further define personal and professional goals, is flexible enough to allow for the unique interests of individuals, and fosters the ideal of independent and continuing study as a way of life for professional functioning.

In accord with these beliefs, the Masters' programs have been developed to provide opportunity for students to grow toward achievement of the following objectives:

1. Increased understanding of the health needs of society and skill in assessing and meeting the nursing needs of individuals and groups.
2. Knowledge and competence in a specialized field of nursing: clinical nursing, teaching, or administration.
3. An appreciation of resources for continuing growth.
4. Increased appreciation of research and research methodology.
5. Increased understanding of and a feeling of responsibility for assuming a leadership role in nursing.
6. Enthusiasm for the potential of the nursing profession, and its interdependent relationship to other professional disciplines.

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 pre-requisite 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 14.

SHORT TERM COURSES

Noncredit, short-term courses are offered from time to time at the Center for Continuation Study. 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.

GENERAL EXTENSION DIVISION OFFERINGS

The School of Nursing offers through the General Extension Division certain 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 by correspondence.

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 *Bulletin of Evening and Special Classes* and the *Bulletin of Correspondence Study Courses*.)

Admission—General Information

1. Application forms for admission or transfer to any of the nursing programs are procured from and returned completed to the Office of Admissions and Records, University of Minnesota, Minneapolis 14.

2. Applicants for admission to the School of Nursing must meet the general requirements for admission to the University as well as the special requirements established by the School of Nursing for entrance into various of its programs, including a report of a physical examination. Applications to any program are accepted from both men and women, married or single.

All applications are individually reviewed by the Admissions Committee of the School of Nursing after an initial evaluation by the Office of Admissions and Records. The processing of records may require as long as 12 weeks. Prospective students should submit their applications by April if they hope to enroll the following fall quarter.

3. 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 3 semester credits of religion courses. Religion courses do not transfer as history courses.

Graduates of nursing programs leading to an Associate degree or a diploma should request the nursing school 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.

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.

4. Applicants who are, or have recently been, employed full time or not less than half time, should request the employer to submit a written recommendation to the Office of Admissions and Records at the time of application.

5. Applicants may be requested to submit additional information or take additional tests. Instructions will be sent to the applicant by the Office of Admissions and Records, or by the Admissions Committee of the School of Nursing.

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

Admission—Specific Nursing Programs

PRACTICAL NURSING PROGRAM

1. Students are admitted only in the fall quarter of each year. Application is open to high school graduates or those meeting the requirements for admission to the University by examination as provided for in individual cases. Minimum age requirement is 17 years.

2. Applicants should submit applications by April 15. Since the application procedure will be started in many instances in the senior year of high school, action of the Admissions Committee will be provisional until evidence of high school graduation is submitted. Non-high school graduates may be given individual consideration in selected instances.

3. Level of high school achievement and scholastic aptitude test scores are considered in determining eligibility for this program.

4. All applicants are required to take the National League for Nursing Pre-Admission and Classification Examination (P.A.C.E.) which is administered through the University of Minnesota Student Counseling Bureau (101 Eddy Hall, Minneapolis Campus) at a cost of \$6 to the applicant and to have an interview with a faculty member of the School of Nursing. Instructions for making these arrangements will be sent to each applicant after the application form is received by the Office of Admissions and Records.

BASIC PROFESSIONAL NURSING PROGRAM

1. High school students interested in preparing for the practice of professional nursing at the University of Minnesota will find it helpful, when possible, to include in their high school programs 2 units of mathematics, 3 units in social studies, and 3 units in natural science inclusive of biology and either physics or chemistry.

2. Applicants are admitted to the nursing major in the fall quarter only.

3. Students planning to transfer to the School of Nursing from the College of Liberal Arts of the University of Minnesota or from another accredited college or university should submit application to the Office of Admissions and Records by April 15. 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.

4. Any substitutions or exceptions in prerequisite courses are determined by the Admissions Committee.

5. A grade point average of 2.00 (C average) is the minimum requirement for admission. Preference is given to those applicants with higher averages, especially when the number of qualified applicants exceeds the number to be admitted.

BACCALAUREATE PROGRAM FOR GRADUATES OF ASSOCIATE DEGREE OR DIPLOMA PROGRAMS IN NURSING

1. Students are admitted in fall quarter. Applications should be submitted to the Office of Admissions and Records by April 15.

2. Advanced standing credits for a diploma program in nursing are granted without recognition of specific courses.

3. Advanced standing credits for graduates of nursing programs leading to an Associate degree are determined on an individual basis.

4. The applicant must have achieved a minimum of a C average for any college work taken prior to application for admission and have ranked in the upper one-third of her school of nursing class.

MASTERS' PROGRAMS

(Master of Nursing Administration, Master of Education with Major in Nursing Education, and Master of Science in Psychiatric Nursing)

1. The desirable time to begin any program is the fall quarter of each year. Applicants who wish to begin study at another time should consult with a faculty adviser prior to submitting an application. Prospective students are encouraged to submit application for admission to the Office of Admissions and Records by April.

2. Scholastic achievement considered minimal for admission to these programs includes a rank in the upper one-third of the class in the nursing program from which an applicant graduated, and a B average in prior undergraduate college work.

3. Post-baccalaureate credits earned in other universities will generally not be granted transfer credit toward meeting the requirements for these degrees.

4. Applicants admitted to the nursing administration major will be admitted directly to the School of Nursing.

5. Applicants admitted to the psychiatric nursing program will be enrolled in the Graduate School. School of Nursing faculty will serve as advisers to these students. (See *Bulletin of the Graduate School*, Plan B.)

Applicants admitted to the nursing education major will be enrolled in the College of Education. School of Nursing faculty serve as advisers to these students. (See *Bulletin of the College of Education*.)

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, work experience.

4. Upon request, academic records of adult special students are reviewed by the Admissions Committee to determine eligibility for transfer to degree candidacy.

FOREIGN 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 14.

2. Based on past experience it has been found that a minimum of 4 years of study is usually necessary to earn a baccalaureate degree, while a minimum of 2 years is generally necessary to meet requirements for a Master's degree.

3. Special arrangements can sometimes be made to provide appropriate course enrollment for individual nurses who do not qualify for admission to any organized program leading to a degree, or who wish to enroll for a limited time.

4. 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) certification of good health; and (d) possession of a student or other appropriate visa.

Requirements for Continuance and Graduation

STUDENT SCHOLASTIC STANDING

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.

GRADING SYSTEM

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 held accountable for the information contained in this *Class Schedule*.

A mark of F is given when a student does not complete successfully the work of a course, and no credit is accorded for it. All courses in majors in the School of Nursing must be successfully completed before the student can proceed in the given program. A recommendation by the Student Scholastic Standing Committee is necessary to enable a student to repeat a nursing course which she has failed.

PROBATION

When the grade point average in a given quarter falls below 2.00 (C average) for students enrolled in any nursing program, 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 students by the Committee on Student Scholastic Standing. A second 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.

CONTINUANCE AND GRADUATION

See also the *Bulletin of General Information*. 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 necessitate that students withdraw from nursing programs. In addition, students in given programs must have met the requirements described below for each.

Practical Nursing

For continuance in and graduation from this program, students must have received a passing grade in each required course. A grade of D in any required course will be considered a basis for probationary status. A student who receives more than two final grades of D in nursing courses will not be allowed to complete the program.

Baccalaureate Nursing Programs

For continuance in and graduation from these programs, students must have received a passing grade in each required subject, and an average of C for the total credits (and major courses) completed. In the last year of either program of study, each student must apply for the appropriate degree through the Office of Admissions and Records and pay the requisite graduation fee. Each student will be issued a Balance Sheet which is an official statement of the extent to which the requirements for the degree being sought are being met.

Bachelor of Science Programs in Nursing Education and Nursing Administration

(Students no longer being admitted to these programs)

A total of 186 credits and 372 grade points (the number of grade points must be at least twice the number of credits) in required courses including physical education is needed for graduation from the nursing education program. Graduation from

the nursing administration program requires a total of 180 credits and 360 grade points.

During the junior and senior years a grade point average of 2.00 (C average) for all courses taken must be maintained, whereas a grade point average of 2.50 (C+ average) is required in the major courses in either nursing education or nursing administration (45 credits).

For admission to student teaching in nursing education, or field instruction in nursing administration, the student is required to have a grade point average of 2.50 in completed courses in either the nursing education or nursing administration major, including clinical nursing courses. A student who is required to cancel registration in the nursing administration practicum is not eligible for graduation with a major in nursing administration.

Residence Requirements—A minimum of 45 credits must be earned while in residence in the School of Nursing. Of these, at least 30 credits must be earned in the senior year. Correspondence courses and extension classes do not count as residence credits, excepting only extension classes offered in Minneapolis, St. Paul, or Duluth.

Programs Leading to the Degrees of Master of Education and Master of Nursing Administration

For continuance and graduation from these programs students must have satisfactorily completed a minimum of 45 credits in resident study. Satisfactory completion of course work, field experience, projects, and examinations is required for the granting of degrees. In nursing administration a grade point average of 2.50 (C+ average) is required in all course work, and a grade point average of 3.00 in the required courses in nursing administration. In education a grade point average of 3.00 (B average) is required in the 45 credits of work taken in courses numbered 100 and above.

A health examination must be taken at the University Health Service within 1 year of the date on which the degree is to be granted.

During the last quarter of study in programs leading to a Master's degree each student must apply for the appropriate degree through the Office of Admissions and Records and pay the requisite graduation fee. Each student will be issued a Balance Sheet which is an official statement of the extent to which the requirements for the degree sought are being met.

Master of Science Program in Psychiatric Nursing

For requirements related to continuance in and graduation from this program, see the *Bulletin of the Graduate School*, Plan B, programs.

Honors, Certificates, and Degrees

Graduation with Distinction or with High Distinction—These honors are not automatic, but are conferred to 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 high distinction must have attained an over-all grade point average of at least 3.00 (B average) or 3.5 (B+ average) respectively.

Certificate—Upon satisfactorily completing the requirements of the practical nursing curriculum students are issued a certificate.

Degrees—When students satisfactorily complete requirements in any of the programs described in this bulletin, the conferring of the appropriate degree is recommended to the Board of Regents of the University of Minnesota by the faculty of the School of Nursing. Completion of the baccalaureate nursing programs leads to the degree of bachelor of science in nursing. The degrees of bachelor of science in nursing administration and master of nursing administration are conferred upon those registered nurses who complete satisfactorily the outlined requirements for the respective degrees.

Students enrolled in the College of Education are recommended for degrees by the faculty of that college.

Expenses (1963-64)

For details regarding tuition, fees, maintenance, and other costs, see the current *Bulletin of General Information*. Students enrolled in Plan A of the basic nursing program should also refer to the information relative to maintenance costs that is given under the Plan of Instruction for the program on page 19 of this bulletin. Students in this program pay an incidental fee for only 2 of the 10 quarters in the nursing major.

All students provide their own uniforms as necessary and, with the exception of students enrolled in Plan A of the basic program, are responsible for having them laundered. Students in Plan B of the basic program pay approximately \$40 for their uniforms, and those in the practical nursing program pay approximately \$25. 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 in either the practical or basic nursing programs is to be worn by them 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 Bulletin of General Information)

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 main library and the Bio-Medical Library 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:

Student activities—Student Activities Bureau, 106 TSMa; (or) Coffman Union Program office, 229 Coffman Memorial Union

Financial help—Bureau of Student Loans and Scholarships, 5 TNM

Part-time employment—Student Employment Bureau, 30 Wulling Hall

Improvement of study skills—Educational Skills Clinic, 101 Eddy Hall

Problems of speech or hearing—Speech and Hearing Clinic, 225 Shevlin Hall

Off-campus housing—Student Housing Bureau, 209 Eddy Hall

Health needs—University Health Service building

Legal concerns—Legal Aid Clinic, 133 Fraser Hall

Counseling—Academic 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.

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 14, Minnesota, by association members. The University of Minnesota Hospitals (on the Minneapolis Campus) can usually arrange for a limited number of students to do special or general staff nursing during evening or week-end hours. Students seeking other employment opportunities are advised to consult with the Student Employment Bureau.

Residence Accommodations—All students except those in Plan A of the basic program in nursing meet their own maintenance costs throughout their stay at the University. Students living within commuting distance of the Minneapolis Campus of the University 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, 108A Westbrook Hall, University of Minnesota, Minneapolis 14, or consulting the *Bulletin of General Information*. Maintenance is provided for students in Plan A of the basic program in nursing except during the experience in public health nursing. This provision for housing applies only to those students who elect to live in the nursing dormitory.

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. Those students paying a quarterly incidental fee have available to them the health services described in the *Bulletin of General Information*. 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.

Students in Plan A of the basic nursing program do not pay the incidental fee during 8 quarters of the 10-quarter major in nursing. These students must meet the cost of hospital care at University Hospitals which is in excess of 1 month per year of residence in the school. Further, they are responsible for meeting costs incident to medical or hospital care incurred during learning experiences conducted away from the University campus.

Married students who become pregnant are asked to notify their faculty advisers as early as possible to provide adequate time for educational planning in view of the individuals' needs and adherence to maternity policies existing in institutions or agencies where students participate in planned learning experiences.

Student Loans—High school seniors and University students who apply for a loan from funds established by the National Defense Education Act should request application blanks from the Bureau of Student Loans and Scholarships on the Minneapolis Campus, the Student Personnel Services on the Duluth Campus, or the Office of Student Services on the Morris Campus. These application blanks should be submitted to any of the above offices between April 1 and June 1. High school seniors may apply for a National Defense Loan before their application for admission to the University has been acted upon.

The Bureau of Student Loans and Scholarships 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. They are eligible to submit an application 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 Avenue, St. Paul 14, Minnesota.

Freshman Scholarships—Scholarships for entering freshmen, chosen from among top graduates of Minnesota high schools, are offered through the Bureau of Student Loans and Scholarships, Minneapolis Campus. 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.

University students enrolled in the general education courses prerequisite to the nursing major in the baccalaureate programs are eligible to apply for general scholarship funds after completion of 2 quarters at the University. Application forms and information about scholarships may be obtained from the Bureau of Student Loans and Scholarships. Information about these awards is also announced through the Official Daily Bulletin.

Direct blood descendants of World War I veterans who were in the service 6 months before the 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 August 15, November 15, or February 15. 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 Bureau of Student Loans and Scholarships. Recommendation of students to receive scholarships is made by the Scholarships, Honors, and Awards 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 the first or second week of fall, winter, and spring quarters. Applications should be submitted to the Bureau of Student Loans and Scholarships early in these quarters. Application for summer and fall quarters are acted upon during the preceding spring quarter meeting of the scholarship committee.

The School of Nursing extends appreciation to the following individuals and groups for their contributions to scholarships.

Alumni, staff, and friends of the School of Nursing (Katharine J. Densford Scholarship)
Hennepin County Tuberculosis Association (Dr. E. S. Mariette Memorial Scholarship)
Nursing College Board and Powell Hall Governing Association (Marion L. Vannier Scholarship)

Railway Business Women's Association of the Twin Cities

Sigma Theta Tau

University of Minnesota School of Nursing Foundation

Joseph E. Dahl Company (Joseph E. Dahl Scholarship in Nursing)

Family and friends of Suzanne J. Doehring (Suzanne Doehring Memorial Scholarship in Nursing)

Children, relatives, and friends of Freda Kantor (Freda Kantor Scholarship in Nursing)

Woman's Auxiliary to the Minnesota State Medical Association (Margaret Scheman Wahlquist Memorial Scholarship)

Other Scholarships and Traineeships—The Minnesota State Legislature has enacted a law which provides scholarship funds for residents of Minnesota enrolled in basic professional 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 School of Nursing, 125 Owre Hall, or the Minnesota Board of Nursing, 530 Minnesota Building, St. Paul. 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 May 15. Scholarship payment will not begin until the third quarter of the nursing major.

The Professional Nurse Traineeship Program of the United States Department of Health, Education, and Welfare provides awards to qualified registered nurses enrolled 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, 125 Owre Hall.

Students planning to pursue a career in psychiatric nursing may write to the School of Nursing, 125 Owre Hall, for information related to psychiatric and mental health traineeships.

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 19, New York.

The United States Army has two financial assistance programs for nursing students: (a) The Army Student Nurse Program is 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 Registered Nurse Student Program is for selected registered nurses enrolled in baccalaureate or Master's degree 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 of 3 years which will include time spent in training. Information about these programs may be obtained from the Army Nurse Corps counselor at Army recruiting offices.

The United States Navy has two financial assistance programs for nursing students: (a) 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 apply for appointment at the beginning of their senior year. (b) The Nursing Education Program provides an opportunity, on a competitive basis, for enlisted WAVES to participate in a baccalaureate program in basic professional nursing. Participants must agree to serve, upon graduation, on active duty as a Navy Nurse Corps officer 1 year for each year of education received. Information about these programs may be obtained from the Navy Nurse Corps counselor in Navy recruiting offices.

The United States Air Force has a financial assistance program for registered nurse students enrolled in baccalaureate or Master's degree programs. Participants must agree to serve on active duty as an Air Force Nurse Corps officer for a period of 2 years for each year of financial assistance received. Information about this program may be obtained from the United States Air Force Nurse Corps counselor at any Air Force recruiting office.

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.

Student Organizations—There are many University-wide student organizations emphasizing social, cultural, social service, recreational, and religious interests. Within the School of Nursing the student government association is the Nursing College Board, 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.

PROGRAMS OF STUDY

I. Program Leading to Certificate in Practical Nursing

Qualified applicants are admitted to this program at the beginning of the fall quarter only. The program requires 4 consecutive quarters of full-time study. The student is enrolled for 12-16 credit hours per quarter; approximately one-third of total credit is in general education courses.

As part of the practical nursing courses, the student has a laboratory schedule which includes supervised clinical experience in the care of medical and surgical patients, mothers, babies, and children, and requires approximately 20 hours per week during winter, spring, and summer terms.

Required Courses

(Quarter credits shown in parentheses)

General College

- GC 10B, 10C—Human Biology (6)
- GC 2A—Psychology in Modern Society (5)
- GC 2C—Psychology of Human Development (3)
- GC 3B—Food Selection and Purchase (3)
- GC 41A—Man and Society (5) or other social studies elective with permission of adviser

- GC 32A—Oral Communication (3)
- (or) GC 30B—Fundamentals of Usage (3)

School of Nursing

- PN 1—Introduction to Practical Nursing (5)
- PN 7—Personal and Vocational Relationships (2)
- PN 15A-B-C—Survey of Nursing Needs (12)
- PN 16, 17, 18—Nursing (24)

The American Red Cross First Aid Course is required for graduation. If a student does not have a current Red Cross first aid certificate upon admission, the course must be taken during the first 2 quarters of the program.

II. Programs Leading to Bachelor of Science Degree in Nursing

PLAN A—BASIC PROFESSIONAL NURSING PROGRAM

(Admission discontinued after fall quarter, 1962)

The last students enrolled in the nursing major of Plan A were admitted in fall quarter, 1962, and completed the general education requirements listed below prior to that date.

Course Requirements in General Education

(Quarter credits shown in parentheses)

- Engl A-B-C—Freshman Literature and Composition (composition portion) (6)
- (or) Engl 1A-2A-3A—Freshman English (composition portion) (6)
- (or) Engl 1B-2B-3B—Freshman English (composition portion) (9)
- (or) Comm 1-2-3—Communication (12)
- (or) Exemption from requirement

- (All students are required to have an English Classification Card before registration for one of these courses)
- Personal health or hygiene (2)
- Biol 1-2 (10)
- InCh 4-5 (10)
- Sociology or social science (9)
- History or political science or economics (5-6)

Child psychology or child development (3)	Psy 1-2 (6)
First aid (2)	Electives (40-45)
(or) Current Red Cross First Aid Certificate for the standard course	Total (95)
Physical education (5)	

Plan of Instruction—Nursing Major

To meet the requirements of the Plan A nursing major, the student enrolls in the School of Nursing for 10 quarters, earning from 12-17 credits each quarter. At the beginning of the third quarter in the program, maintenance (board, room, and uniform laundry) is provided either in Powell Hall or in nurses' residences of other agencies where the student may be having learning experiences, with the exception of the period during which the student is assigned to public health nursing field experience. During this quarter, the student provides her own maintenance. Beginning the third quarter when maintenance is provided, the student is scheduled for 30 hours of clinical laboratory experience each week of the year with the exception of 7 weeks of vacation occurring, 2 at the end of the 4th quarter, 4 at the end of the 8th quarter, and 1 between the 9th and 10th quarters.

Course Requirements in Nursing Major

Course No.	Title	Clinical Assignment (weeks)	Credits	Quarter
<i>Biological Sciences</i>				
Anat 3	Elementary Anatomy		5	1st
MicB 53	General Bacteriology		5	2nd
Phcl 9-10	Pharmacology		4	3rd-4th
MdBc 50	Physiological Chemistry		4	1st
Phsl 51	Human Physiology		6	2nd
<i>Behavioral Sciences</i>				
NPsy 172	Human Behavior in New and Stress- ful Situations		3	3rd
<i>Public Health</i>				
PubH 53	Introduction to Public Health.....		5	6th, 8th
<i>Home Economics</i>				
HE 72	Nutrition		2	1st
<i>Nursing</i>				
Nurs 17-18	Introduction to Clinical Nursing.....	Selected Experience	12	1st-2nd
Nurs 50-51	Medical and Surgical Nursing	24	20	3rd-4th
Nurs 54-55	Physiopathology of Illness		4	3rd, 4th
Nurs 56	Nursing in the Operating Room	6	6	5th, 6th, 7th, 8th, 10th
Nurs 58	Orthopedic Nursing	2	2	5th, 6th, 7th, 8th, 10th
Nurs 59	Gynecologic Nursing	4	4	5th, 6th, 7th, 8th, 10th
Nurs 60	Maternity Nursing	12	12	5th, 6th, 7th, 8th
Nurs 61	Pediatric Nursing	12	12	5th, 6th, 7th, 8th
Nurs 66	Neurologic Nursing	4	4	5th, 6th, 7th, 8th, 9th
Nurs 67	Psychiatric Nursing	8	8	5th, 6th, 7th, 8th, 9th
Nurs 87	Public Health Nursing	12	12	8th, 9th, 10th
Nurs 88	Continuity of Nursing Care	4	5	9th, 10th
Nurs 95	Orientation to Nursing Management..	4	5	9th, 10th
Nurs 96	Nursing in the Outpatient Depart- ment	4	5	9th, 10th
Nurs 98	The Nursing Profession		3	7th
Total credits			148	

The following list comprises a possible sequence for the 10-quarter enrollment in the School of Nursing:

THIRD YEAR

<i>Fall</i>	<i>Winter</i>	<i>Spring</i>	<i>Summer</i>
Anat 3 (5)	MicB 53 (5)	Phcl 9 (2)	Phcl 10 (2)
MdBc 50 (4)	Phsl 51 (6)	NPsy 172 (3)	Nurs 51 (12)
HE 72 (2)	Nurs 18 (6)	Nurs 50 (8)	Nurs 55 (2)
Nurs 17 (6)		Nurs 54 (2)	

FOURTH YEAR

<i>Fall</i>	<i>Winter</i>	<i>Spring</i>	<i>Summer</i>
Nurs 56 (6)	Nurs 60 (12)	Nurs 61 (12)	Nurs 66 (4)
Nurs 58 (2)	PubH 53 (5)	Nurs 98 (3)	Nurs 67 (8)
Nurs 59 (4)			

FIFTH YEAR

<i>Fall</i>	<i>Winter</i>
Nurs 87 (12)	Nurs 88 (5)
	Nurs 95 (5)
	Nurs 96 (5)

PLAN B—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 page 9 of this bulletin for information about admission requirements.) Students in this program will pay tuition, fees, maintenance, and other costs incidental to their learning experiences throughout the program.

First-Year Course 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. Of these 45 quarter credits, 36 must be distributed as follows:

- Group A—Freshman English (3 qtrs)
- Group B or E—Foreign language or humanities (9)
- Group C—Social science: Anth 2A required (9)
- Group D—Natural science: NSci 4 and 5 required (6)††

The remaining credit requirement must be fulfilled by selections from any of groups B, C, D, and E described below:

A. Freshman English

- Engl A-B-C—Freshman Literature and Composition (composition portion) (6)
- (or) Engl 1A-2A-3A—Freshman English (composition portion) (6)
- (or) Engl 1B-2B-3B—Freshman English (composition portion) (9)
- (or) Comm 1-2-3—Communication (12)
- (or) Exemption from requirement

(All students are required to have an English Classification Card before registration for one of these courses)

†† Students who transfer from another college may substitute 6 quarter credits of general chemistry for NSci 4 and 5.

B. Foreign Language

C. Social Science

- | | |
|--|---|
| 1. Anthropology | 4. Political science |
| 2. Economics and business administration (except accounting, type-writing, shorthand, and office procedures) | 5. Psychology |
| 3. Geography | 6. Sociology |
| | 7. Social science (interdepartmental courses) |

D. Natural Science

1. Biological sciences: botany, zoology, general biology (Biol 1-2 or 1A-2A)
2. Physical sciences: astronomy, chemistry, geology, physics, Physical World (NSci)
3. Mathematics (except higher algebra and mathematics of investment)

E. Humanities

- | | |
|-----------------------|---|
| 1. Art | 5. Humanities |
| 2. English literature | 6. Music |
| 3. Foreign literature | 7. Philosophy |
| 4. History | 8. Speech and theater arts (except Spch 6, 6A, 9, and 39) |

(A maximum of 4½ quarter credits of religion will be accepted to meet Group E requirement)

Course Requirements for the Nursing Major

The total credit requirement in Plan B maintains a balance between credits in general education, and credits in the nursing major and courses related thereto. During most of the quarters of the second, third, and fourth years, the students will be enrolled for courses in both general and professional education. There will be 1 summer of study included in the program which will follow the third academic year.

Second-, Third-, Fourth-Year Course Requirements

(Credits shown in parentheses)

- | | |
|-------------------------------------|---|
| Psy 1-2—General Psychology (6) | NPsy 172—Human Behavior in New and Stressful Situations (3) |
| Psy 4-5—Laboratory Psychology (4) | PubH 53—Introduction to Public Health (3) |
| CD 80—Child Psychology (3) | Nurs 30—Nursing in Perspective (3) |
| Psy 144-145—Abnormal Psychology (6) | *Nurs 40—Study of Patient Behaviors (4) |
| Anat 3—Elementary Anatomy (5) | Nurs 54-55—Physiopathology of Illness (4) |
| MicB 53—General Bacteriology (5) | *Nurs 57—Nursing Diagnosis (5) |
| MdBc 50—Physiological Chemistry (4) | *Nurs 62-72-82A,B—Nursing Intervention (21) |
| Phcl 9—Pharmacology (3) | **Nurs 92A-B-C—Nursing Synthesis (18) |
| Phsl 51—Human Physiology (6) | |

Second-, Third-, Fourth-Year Electives

The remainder of the total minimum credit requirement (195) shall be fulfilled by selections from any of Groups B, C, D, or E described above. One-half of

* Includes concurrent experience in various clinical areas.

** This sequence of courses for the senior year is in the process of being developed. The substance of these courses will be inclusive of the nursing care of individual patients, the care of patients in settings other than the hospital, and the leadership of nursing personnel in the care of groups of patients.

the total elective credits earned during the junior and senior years must be earned in Upper Division courses.

Suggested Plan of Enrollment

SOPHOMORE YEAR

Fall	Winter	Spring
Anat 3 (4)	Phsl 51 (6)	MicB 53 (5)
MdBc 50 (4)	Psy 2 (3)	CD 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)	

JUNIOR YEAR

Fall	Winter	Spring	Summer I	Summer II
Nurs 54 (2)	Nurs 55 (2)	Psy 145 (3)	Nurs 82A (4)	Nurs 82B (4)
Nurs 57 (5)	Psy 144 (3)	Nurs 72 (6)	Electives (3)	Electives (3)
Phcl 9 (3)	Nurs 62 (7)	Electives (6)		
Electives (5)	Electives (3)			

SENIOR YEAR

Fall	Winter	Spring
Nurs 92A (6)	Nurs 92B (6)	Nurs 92C (6)
PubH 53 (3)	Electives (9)	Electives (9)
Electives (6)		

PLAN C—BACCALAUREATE PROGRAM FOR GRADUATES OF ASSOCIATE DEGREE OR DIPLOMA PROGRAMS IN NURSING

This program is planned for graduates of associate degree or diploma programs who wish to secure education for the practice of professional nursing and to broaden their own cultural and scientific background.

Students admitted to this program at the start of fall quarter in a given year will pursue concurrent general and professional education throughout. A minimum of 195 quarter credits is necessary for graduation.

The nursing courses which are offered in sequence are planned to provide opportunity for further development of understandings and skills in nursing, as well as to permit integration of knowledge, skills, and attitudes accruing from general education courses.

Course Requirements

(Credits shown in parentheses)

Engl A-B-C—Freshman Literature and Composition (composition portion) (6)	Psy 4-5—Laboratory Psychology (4)
(or) Engl 1A-2A-3A—Freshman English (composition portion) (6)	CD 80—Child Psychology (3)
(or) Engl 1B-2B-3B—Freshman English (composition portion) (9)	Anth 2A—Cultural Anthropology (5)
(or) Comm 1-2-3—Communication (12)	NPsy 172—Human Behavior in New and Stressful Situations (3)
(or) Exemption from requirement	PubH 53—Introduction to Public Health (3)
(All students are required to have an English Classification Card before registration for one of these courses)	Phsl 51—Human Physiology (6)
Psy 1-2—General Psychology (6)	Nurs 20—Nursing in Contemporary Society (3)
	Nurs 54-55—Physiopathology of Illness (4)
	Nurs 65-75-85††—Scientific Approaches to Nursing Care (18)
	Nurs 92A-B-C††—Nursing Synthesis (18)

†† Includes concurrent experience in various clinical areas.

†† This sequence of courses for the senior year is in the process of being developed. The substance of these courses will be inclusive of the nursing care of individual patients, the care of patients in settings other than the hospital, and the leadership of nursing personnel in the care of groups of patients.

Electives

The remainder of the total minimum credit requirement (195) shall be fulfilled by selection from any of Groups B, C, D, and E described on page 21 of this bulletin. Twenty-four (24) quarter credits must be distributed as follows:

Group C—Social science (9)

Group D—Natural science (6)

Group E—Humanities (9)

(A maximum of 4½ quarter credits of religion will be accepted to meet Group E requirement)

An additional requirement is that in 2 of Groups B, C, D, and E the total credits must be 15. From 22-24 credits in Groups B, C, D, and E must be earned in Upper Division courses.

Suggested Plan of Enrollment

SOPHOMORE YEAR

<i>Fall</i>	<i>Winter</i>	<i>Spring</i>	<i>Summer</i>
Engl (4)	Engl (4)	Engl (4)	Electives (15)
Psy 1 (3)	Psy 2 (3)	CD 80 (3)	
Psy 4 (2)	Psy 5 (2)	NPsy 172 (3)	
Nurs 20 (3)	Phsl 51 (6)	Anth 2A (5)	
Electives (3)			

JUNIOR YEAR

<i>Fall</i>	<i>Winter</i>	<i>Spring</i>
Nurs 65 (6)	Nurs 75 (6)	Nurs 85 (6)
Nurs 54 (2)	Nurs 55 (2)	Electives (9)
Electives (7)	Electives (7)	

SENIOR YEAR

<i>Fall</i>	<i>Winter</i>	<i>Spring</i>
Nurs 92A (6)	Nurs 92B (6)	Nurs 92C (6)
PubH 53 (3)	Electives (9)	Electives (9)
Electives (6)		

III. Programs Leading to Specialized Baccalaureate Degrees

Admission to these programs was discontinued after fall quarter 1961 except for those students with substantial advanced standing who could complete requirements by spring 1964. Advanced standing credits for a diploma program in nursing are granted as blanket credits, i.e., specific courses taken in the diploma nursing program are not recognized. Evaluation of college courses taken elsewhere is done by the Office of Admissions and Records and the Admissions Committee of the School of Nursing. Students who have been granted blanket credit that includes college or university courses comparable to those required in either program may be exempted from specific courses on recommendation of the department concerned. This exemption does not reduce the total number of credits required for graduation.

NURSING ADMINISTRATION PROGRAM

The following requirements apply to those students already enrolled in the program, and who can complete all courses by spring 1964.

General Course Requirements

(Credits shown in parentheses)

Comm 1-2-3, Engl A-B-C, Engl 1A-2A-3A, or Engl 1B-2B-3B (12-15) or exemption	Human physiology (4-6)
CD 80—Child Psychology (3)	Sociology or social science (6-8)
Political science, history, or economics (5)	Total (36-43)
Psy 1-2—General Psychology (6)	

Requirements for the Nursing Administration Major

(Credits shown in parentheses)

NuAd 170—Foundations of Nursing Administration (3)	NuAd 175-176—Elements of Nursing Administration (10)
NuAd 177—Practicum in Nursing Administration (15)	NuEd 162—Personnel Work in Nursing (3)
Nurs 165—Work Simplification in Nursing (4)	PubH 53—Introduction to Public Health (5)
Clinical nursing (12)	Elective in nursing, nursing education, or public health (3)
NuEd 69—Survey of Conditions and Trends in Nursing (3)	Total (58)

Electives—The student usually has about 40 elective credits available in the nursing administration program. Of these, at least 25 quarter credits are to be chosen from fields outside nursing and nursing administration. The total credit requirement, including electives in general or professional courses, is 180 quarter credits. It is recommended that half of this requirement be in general or liberal education courses.

NURSING EDUCATION PROGRAM

The following requirements apply to those students already enrolled in the program, and who can complete all courses by spring 1964.

General Course Requirements

(Credits shown in parentheses)

Comm 1-2-3, Engl A-B-C, Engl 1A-2A-3A, or Engl 1B-2B-3B (12-15) or exemption	Physical education (5)
CD 80—Child Psychology (3)	Human physiology (4-6)
Psy 1-2—General Psychology (6)	Total (36-43)
Sociology or social science (6-8)	

Requirements for the Nursing Education Major

(Credits shown in parentheses)

Ed 55N—Introduction to Teaching Nursing (5)	NuAd 160—Ward Administration (3)
EdT 51A-B—The Teaching of Nursing (10)	PubH 53—Introduction to Public Health (5)
NuEd 69—Survey of Conditions and Trends in Nursing (3)	HEd 180—The School and Society (3)
NuEd 171—Curriculum of the School of Nursing (3)	Clinical nursing (12)
NuAd 170—Foundations of Nursing Administration (3)	Elective in nursing, nursing education, nursing administration, or public health (3)
	Total (50)

Electives—The student has about 50 elective credits available in the nursing education program. It is recommended that all students, and especially those anticipating further study at the graduate level, plan to include courses that are foundational to a liberal education. The total credit requirement, including electives in general or professional courses is 186 quarter credits. Desirably half of this requirement should be in general or liberal education courses.

IV. Programs Leading to Graduate Professional Degrees

Candidates for the graduate programs will have completed a baccalaureate degree with satisfactory scholastic record. The content of the undergraduate program will be reviewed and recommendations regarding the student's graduate program made on the basis of the general and professional education therein. In general, transfer credit for postbaccalaureate courses completed in other universities will not be granted toward requirements for a degree from this University. All transcripts presented by the applicant will, however, be considered in evaluating qualifications for admission and in individual program planning.

Students should be prepared, if necessary, to accept assignment for field experience outside the Twin Cities.

MASTER OF NURSING ADMINISTRATION PROGRAM

The course of study is so organized as to provide a central group of courses in nursing service administration with complementary instruction in such areas as public administration, educational administration, business administration, hospital administration, and personnel administration. Emphasis is placed on the development of increased understanding of human behavior, skill in identification and solving of nursing problems, and appreciation of the role of professional nursing in improving patient care.

The course requires a minimum of 45 quarter credits distributed as follows:

(Credits shown in parentheses)

Nursing (3)	Related fields (9)
Nursing administration (12)	Electives (6)
Field experience in nursing administration (15)	Total (45)

Variation in the distribution of credits requires approval of the major adviser and the School of Nursing Committee on Student Scholastic Standing.

The following courses are required of all candidates and are arranged in a 3-quarter sequence:

Nurs 190—Foundations of Nursing (3)	NuAd 199D—Field Experience in Nursing Service Administration (15)
NuAd 191, 192—Principles of Administration Applied to Nursing Service Administration (12)	(or) NuAd 199S—Field Experience in Nursing Service Administration (15)
PubH 161—History and Development of Hospitals (3)	IR 152—Principles of Industrial Relations: Labor Marketing (3)
Pol 121—Municipal Administration (3)	
(or) Pol 131—Public Administration (3)	

Other courses are to be selected by the student in consultation with a major adviser from any course offerings numbered 100 and above.

Candidates who did not complete an undergraduate major in nursing administration or its equivalent (including field experience) will be required to include the following in addition:

NuAd 193—Principles of Administration Applied to Nursing Service Administration (6)
Electives (5-6)

MASTER OF EDUCATION PROGRAM IN NURSING EDUCATION

The course of study is so organized as to provide a central group of courses in nursing education with an opportunity for study in related fields. Emphasis is placed on the development of increased understanding of human behavior, skill in guidance

of learning, and effective functioning as a faculty member of a school of nursing. Candidates must meet the general requirements for the master of education degree as described in the *Bulletin of the College of Education* with the exception of a teaching minor in an academic field. Final comprehensive examinations in education are required.

The program requires a minimum of 45 credits distributed as follows:

(Credits shown in parentheses)

Nursing (6)	Field experience in teaching (9)
Nursing education (12)	Electives (9)
Education (9)	Total (45)

Variation in distribution of credits requires approval of the major adviser and the College of Education Committee on Student Scholastic Standing.

The following courses are required of all candidates, and are arranged in a 3-quarter sequence:

Nurs 190—Foundations of Nursing (3)
EdCI 199E—Internship (9)

NuEd 197E, 198E—Advanced Teaching of Nursing (9)

Other courses are to be selected by the student in consultation with a major adviser from course offerings numbered 100 and above. At least 6 of the elective credits must be selected from fields other than nursing and education.

Candidates who did not have courses in educational psychology, educational philosophy, and supervised practice teaching in undergraduate programs will be required to include them in the master of education program. These courses do not constitute a part of the 45 required credits.

V. Program Leading to Master of Science Degree

This is a Plan B program in the Graduate School providing a field of concentration in psychiatric nursing and study in related fields. Emphasis is placed on developing competence in providing expert nursing care to mentally ill persons. Candidates must meet the general requirements for the master of science degree, Plan B, as listed in the *Bulletin of the Graduate School*. A program for the total course of study is submitted after completion of 9-15 credits. Approval of the program by the Medical Sciences Group Committee of the Graduate School constitutes acceptance for candidacy for the degree.

The program requires a minimum of 58 quarter credits distributed as follows:

Nursing (19)	Social work (3)
Seminar and field practice (16)	Related fields (18)
Public health (2)	

The following courses are required of all candidates and are arranged in a 5-quarter sequence:

Nurs 190—Foundations of Nursing (3)	Nurs 193—Seminar in Psychopathology (3)
Nurs 191—Foundations of Psychiatric Nursing (3)	Nurs 181A, B—Research in Nursing (4)
Nurs 192A, B, C—Seminar and Field Practice (16)	PubH 108—Statistical Decision (2)
	SW 275—Social Group Work (3)
	Nurs 195—Problems in Nursing (6-9)

Other courses are to be selected by the student in consultation with her major adviser. Not less than 18 credits must be taken in at least 2 related fields with a minimum of 6 credits required in each.

DESCRIPTION OF COURSES

The following courses are taught by members of the School of Nursing faculty and/or by co-operating 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 *Bulletin of the Summer Session*.

The description of the required courses and electives in the various curriculums which are taught by other departments of the University are found in the bulletins of the respective educational units. Most of such courses will be in the *Bulletin of the College of Liberal Arts*, the *Bulletin of the College of Education*, the *Bulletin of the General College*, and in the all-University *Class Schedule*.

Explanations

Course Numbering—A course is designated by a departmental prefix and number, and possibly a letter. It will have the same number regardless of the quarter in which it is offered.

Course Prefixes in Use in the School of Nursing—

- PN—Practical Nursing
- Nurs—Nursing
- NuAd—Nursing Administration
- NuEd—Nursing Education

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.

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:

† To receive credit, all courses after the single dagger must be completed.

§ No credit is given if credit has been received for equivalent course listed after the section mark.

¶ Means "concurrent registration" in (i.e., must be taken simultaneously).

A sharp sign means that students must obtain the consent of the instructor before attempting to register for the course.

△ Consent of the School of Nursing must be obtained.

PRACTICAL NURSING (PN)

1. **Introduction to Practical Nursing.** Orientation to role of practical nurse as member of the health team; basic needs of people; basic principles and skills in assisting in the total care of patients. (5 cr)
7. **Personal and Vocational Relationships.** Consideration of total responsibility of licensed practical nurse in hospital, home, and community. (2 cr)
- 15A-B-C. **Survey of Nursing Needs.** Based on use of scientific method in solving nursing problems common to all patients; selected nursing problems are discussed with emphasis on the way in which they are encountered in care of hospitalized patients. During the summer, emphasis on care of individual and family in home and community; consideration of nursing problems arising in situations other than general hospital. (4 cr per qtr; prereq 1)

- 16, 17, 18. **Nursing.** Solutions to selected nursing problems common to all patients discussed as they apply to the patient found in medical, surgical, orthopedic, neurological, obstetric, pediatric, or other clinical areas. During clinical experience, student is guided in defining and meeting nursing needs of individual patients. (8 cr per qtr; prereq 1, ¶15A, or ¶15B, or ¶15C)

NURSING (Nurs)

- 17-18. **Introduction to Clinical Nursing.** Principles and practice of selected nursing skills utilizing classroom and hospital laboratory; overview of development of nursing; responsibilities of the nurse in prevention of illness and care of sick. (6 cr per qtr)
20. **Nursing in Contemporary Society.** Exploration of philosophies of nursing and their development in a changing society; implications for individual nurse's growth and contribution to society. (3 cr; prereq regis in Nurs, Plan C)
30. **Nursing in Perspective.** Study of evolution of philosophies of nursing; goals of nursing and their differentiation from those of other health disciplines. (3 cr; prereq regis in Nurs, Plan B, Psy 5 or ¶Psy 5)
40. **Study of Patient Behaviors.** Data collection and analysis: identification of significant patient behaviors through discussion and clinical experience. (4 cr; prereq 30)
- 50-51. **Medical-Surgical Nursing.** Progressive development of understandings and skills used in identifying and meeting needs of adult patients in medical-surgical areas with application of principles from natural and behavioral sciences. (20 cr)
- 54-55. **Physiopathology 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 57-62 or ¶Nurs 65-75)
56. **Nursing in the Operating Room.** Principles of aseptic technique; knowledge and skill in performing nursing functions in operating rooms; broad perspective of social, economic, and emotional factors in nursing care of surgical patients. (6 cr)
57. **Nursing Diagnosis.** Hypothesis formulation and testing; selection of most probable inference, based upon behavioral data and appropriate generalizations. (5 cr; prereq 40)
58. **Orthopedic Nursing.** Principles in nursing care of orthopedic patients; clinical learning experiences in their care. (2 cr)
59. **Gynecologic Nursing.** Development of understandings and skills necessary for meeting the needs of women with disorders of the generative system; nursing measures of radiation therapy; psychological aspects of normal physiological processes. (4 cr)
60. **Maternity Nursing.** Assisting patients' physiological and psychological adjustment in the maternity cycle through identification of needs and selection of appropriate nursing approaches to meet these needs. (12 cr)
61. **Pediatric Nursing.** Application of knowledge from natural, behavioral, and medical sciences in care of ill infant, preschool and school-age child, and adolescent; identification and solution of problems related to illness, handicapping conditions, maintenance of health in infancy and childhood. (12 cr; prereq CD 80)
62. **Nursing Intervention.** Identification of appropriate principles for determining nursing treatment. (7 cr; prereq 57)
65. **Scientific Approaches to Nursing Care.** Development of observational skills, identification of patient behaviors, formulation of generalizations, derivation of hypotheses. (6 cr; prereq NPsy 172)
66. **Neurologic Nursing.** Principles of nursing care of neurologic patients. Directed observation and participation in care of neurologic patients. (4 cr)
67. **Psychiatric Nursing.** Principles of nursing care as these relate to the psychiatric patient; understanding of therapeutic, rehabilitative, and preventive aspects; dynamics

- of human behavior; effect of psychological stress upon the nursing needs of the mentally ill. (8 cr)
68. **Nursing Care of Psychiatric Patients.** Classes, observation, and experience in care of psychiatric patients. (4 cr [open for credit to registered nurses who have not had psychiatric nursing experience in basic program]; prereq Δ)
72. **Nursing Intervention.** Development, application, and evaluation of nursing treatment based on nursing diagnosis and identified principles. (6 cr; prereq 62)
75. **Scientific Approaches to Nursing Care.** Development of nursing diagnosis based upon validation of hypotheses; identification of principles for selecting nursing treatments. (6 cr; prereq 65)
- 82A, B. **Nursing Intervention.** Application, evaluation, and modification of nursing treatment. (4 cr each; prereq 72)
85. **Scientific Approaches to Nursing Care.** Selection, application, and evaluation of nursing treatments. (6 cr; prereq 75)
87. **Public Health Nursing.** (Same as PubH 62 and PubH 65) Instruction and supervised experience in public health nursing in selected public health agencies. (12 cr)
88. **Continuity of Nursing Care.** Study of ways in which communities meet needs of patients; application of this knowledge in care of patients. (5 cr)
95. **Orientation to Nursing Management.** Experience in analyzing needs of patients with complex nursing problems and in planning programs of nursing care to meet these needs; experience in functioning as a leader of a team in executing plans of nursing care; orientation to the role of head nurse as she relates to team leader. (5 cr)
96. **Outpatient Nursing.** Study and observation of the ways in which the nurse works with others on the health team in planning care for patients in the outpatient department. (5 cr)
98. **The Nursing Profession.** Factors and values in society as these relate to the development of professions generally and to the professionalizing process in nursing. Examination of the responsibilities of nurses and organized nursing in terms of historical influences, changing needs, and altering interrelationships within the health fields. (3 cr)
111. **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 weeks; prereq grad nurse and Δ)
- 151A, B. **Clinical Nursing.** Identification of nursing needs of patients; application of selected scientific principles and concepts to the solution of nursing care problems. (6 cr per qtr; prereq Phsl 4 or 51, CD 80)
165. **Work Simplification in Nursing.** Studies in nursing; methods of analyzing and improving practices; individual problems or participation in group studies. (4 cr)
- 181A, B. **Research in Nursing.** Investigation of research in nursing; research methodology; development of a study design. (2 cr per qtr; prereq regis in grad prog)
190. **Foundations of Nursing.** Investigation of the role of nursing in promotion of health and care of the ill or helpless. (3 cr; prereq regis in grad prog)
191. **Foundations of Psychiatric Nursing.** Current trends related to educational programs; the changing role of the psychiatric nurse in society. (3 cr; prereq 190 or ¶190)
- 192A. **Psychiatric Nursing Seminar and Field Practice with Individual Patients.** Seminar explorations of dynamic nursing care concurrent with individually supervised clinical experience. (3 cr; prereq 191)
- 192B. **Psychiatric Nursing Seminar and Field Practice with Groups.** Study of group process via experience with recreational or work-oriented patient groups. (5 cr; prereq 192A, SW 275)
- 192C. **Psychiatric Nursing Seminar and Field Practice in the Community.** Study of the psychiatric nurse's role in present and future community mental health. (3 cr; prereq 192B)

193. **Seminar in Psychopathology.** Seminar with psychiatrist relating clinically observed patient behavior to psychopathology. (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 prog and Δ)

NURSING ADMINISTRATION (NuAd)

110. **Field Practice in Nursing Administration.** Individually planned experiences for selected students. (Cr ar; prereq Δ)
160. **Ward Administration.** Principles of administration applied to a nursing unit; analysis and maintenance of nursing service; planning and assisting in clinical teaching programs. (3 cr; prereq 170)
170. **Foundations of Nursing Service Administration.** Principles of administration as applied to hospital nursing service. (3 cr [no cr to grad students in nursing administration])
173. **Fundamentals of Education in Nursing.** Identification of learning situations; selection and planning of learning experiences; methods of instruction for individuals and groups; evaluation. (3 cr; prereq 170 or #)
175. **Elements of Administration in Nursing.** Organization and role of nursing service in hospitals; role of team leader, head nurse, and supervisor in planning and directing patient care. (5 cr; prereq 170)
176. **Elements of Administration in Nursing.** Role of research in improving nursing services; administration of personnel services; evaluation of nursing service. (5 cr; prereq 177)
177. **Practicum in Nursing Administration.** Field experience and seminar. Observation and participation in selected nursing service activities in a hospital under guidance of field preceptor and faculty. (15 cr; prereq 175)
191. **Principles of Administration Applied to Nursing Service Administration.** Aims and organization of nursing service; staffing; planning and directing nursing care. (6 cr; prereq regis in M.N.A. program or #)
192. **Principles of Administration Applied to Nursing Service Administration.** In-service education; standardization of nursing procedures; communications; budgeting for nursing service. (6 cr; prereq 191)
193. **Principles of Administration Applied to Nursing Service Administration.** Community resources and agencies; legal considerations in nursing service. (6 cr; prereq 192)
195. **Problems in Nursing Administration.** Individual study of a problem in administration of hospital nursing service. (1-9 cr; prereq regis in grad prog and Δ)
- 199D. **Field Experience in Nursing Service Administration.** Field experience and seminar. Observation and participation in selected activities of a director or assistant director of nursing service in a hospital; individual or group investigation of a nursing problem. (15 cr; prereq 192)

NURSING EDUCATION (NuEd)

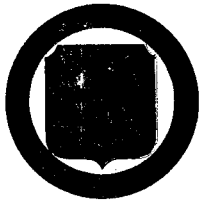
69. **Survey of Conditions and Trends in Nursing.** Exploration of nursing problems in contemporary society; historical development; factors in the social structure affecting nursing; evolving professional nursing obligations. (3 cr)
162. **Personnel Work in Nursing.** Principles and techniques of personnel work; applications to nursing; emphasis on recruitment, selection, orientation, motivation, communication, evaluation, and morale maintenance. (3 cr)
168. **Evaluation of Achievement.** Principles and techniques for construction of classroom tests; other methods of evaluation; factors influencing reliability and validity of evaluation. (3 cr; prereq sr, Ed 55N or NuAd 173 or #)

- 171. The Curriculum of the School of Nursing.** Principles of curriculum development applied to educational programs in nursing. (3 cr; prereq 69, EdT 51A-B or #)
- 175. Educational Administration in Nursing.** General orientation to the functions involved in administering educational programs in nursing; responsibilities of faculty members. (3 cr; prereq sr or #)
- 195. Problems in Nursing Education.** Individual study of a problem in the field of nursing education. (1-9 cr; prereq regis in grad prog and Δ)
- 197E. Advanced Teaching of Nursing.** Investigation of research in learning and teaching; implications for nursing. (3 cr; prereq regis in MED prog, Nurs 190 or #)
- 198E. Advanced Teaching of Nursing.** Identification of problems of learning. Individual and group methods of problem solving. (6 cr; prereq 197E and ¶EdCI 199E)
- EdT 51A-B. Teaching of Nursing.** Principles underlying the teaching of nursing; planning and evaluation of instruction; observation and study of teaching in nursing school situations; supervised practice in teaching of nursing subjects. (4 cr for 51A, 6 cr for 51B; prereq sr, Ed 55N)
- EdCI 199E. Internship.** Advanced supervised teaching and practice work for candidates for the master of education degree. (9 cr; prereq regis in MED prog, NuEd 197E)

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COLLEGE OF VETERINARY MEDICINE
UNIVERSITY OF MINNESOTA BULLETIN

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.

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In addition to this particular bulletin, the student should also consult the *Bulletin of General Information* 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 *Bulletin of the College of Agriculture, Forestry, and Home Economics*. 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.
- † 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 mark 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."

UNIVERSITY OF MINNESOTA

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COLLEGE OF VETERINARY MEDICINE

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(256 Veterinary Science)
Ralph L. Kitchell, D.V.M., Ph.D., Professor and Associate Dean, College of Veterinary
Medicine (239C Veterinary Science)

College of Veterinary Medicine

GENERAL INFORMATION

The buildings of the College of Veterinary Medicine at the University of Minnesota are located in the southeast quarter of the St. Paul Campus, immediately north of Commonwealth Avenue, and extend from Boyd Avenue on the west to the State Fair Grounds on the east.

Veterinary Medicine as a Career—Veterinary medicine is the medical science dealing with the health and reproduction of animals and poultry. The study of veterinary medicine is concerned with gaining a thorough knowledge of the fundamental biologic and physical sciences relating to animal functions in health and disease. In the clinical years one also learns to correlate and apply this knowledge to the many areas of professional service. With this broad biologic knowledge and clinical training, the veterinarian may choose from among many challenging and interesting career opportunities following graduation. Individuals with almost every kind of interest, if they are devoted to animals and like biomedical work, can find a position in veterinary medicine that will bring them happiness, satisfaction, and a rewarding career.

Professional Service and Activities—About 60 per cent of the veterinarians in the United States are engaged in private practice, either general or specialized. At present this usually means caring for large animals in rural areas or small 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 the search for knowledge through research and the satisfaction of disseminating this knowledge as teachers in colleges and universities.

A large number of veterinarians serve as professional 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 as field specialists, consultants, and executives.

Increasing Opportunities in the Future—At present the demand for doctors of veterinary medicine far exceeds the supply. New areas of service are constantly developing and expanding, such as space biomedical programs, comparative medical research and public health. With the tremendous growth in population we will need more food-producing animals. The expansion in size of herds and flocks will offer 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 more than double 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 until, at present, there are 18 colleges of veterinary medicine with approximately 4,000 students.

Veterinary 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 a large number of 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 was admitted in the fall quarter of 1947 and received its degrees 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 fully 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.

Facilities

The facilities of the College of Veterinary Medicine, University of Minnesota, are housed in four major and several minor buildings. Most of the formal classes are taught in the former while research equipment and research animals are housed in the latter. This college is well equipped in respect to facilities, scientific instruments, and teaching aids for student instruction. Some of the buildings and facilities will be discussed briefly in the following paragraphs.

Veterinary Anatomy—Anatomy of domestic animals is taught in the Veterinary Science building. The department has one lecture room, dissecting rooms for gross anatomy, locker room, and rooms for teaching histology, embryology, and neuroanatomy. In addition, there are offices and graduate laboratories for the staff.

Veterinary Physiology and Pharmacology—Physiology and pharmacology of domestic animals are taught in a large temporary building adjacent to the Veterinary Clinic. The laboratories, preparation rooms, and animal quarters are on the first and second floors, and offices and graduate laboratories are on the third floor. Due to the recent completion of modern large and small animal student laboratory

facilities in the Veterinary Science building, several of the laboratory classes in veterinary physiology and pharmacology meet in that building.

Veterinary Bacteriology and Public Health—Veterinary bacteriology and public health are taught in the Veterinary Science building. The lecture room is on the first floor; modern, well-equipped laboratories are located on the second floor. The offices, small laboratories, and facilities for preparing media and specimens also are located on the second floor.

Veterinary Pathology—Veterinary pathology is taught on the first floor of the Veterinary Science building, as well as in the Veterinary Clinic. Basic principles of pathology are taught in the laboratory, museum, and lecture room located in the Veterinary Science building. Post-mortem and clinical laboratory classes are taught in the Veterinary Clinic.

Veterinary Parasitology—Veterinary parasitology shares facilities with pathology in regard to lecture rooms, laboratories, and clinic facilities. Offices, office-laboratories, and preparation rooms for pathological and parasitological specimens also are on the first floor of the Veterinary Science building. Classes in laboratory diagnosis of parasitisms are taught in the clinical laboratories of the Veterinary Clinic.

Veterinary Medicine and Clinics—The clinical services are taught principally in the third and fourth years of the professional curriculum in veterinary medicine. The primary fields of study are in medicine, obstetrics and reproductive health, surgery, and radiology. Staff from several departments of the college participate in the daily clinic teaching program. The Veterinary Hospital is well equipped to provide for treatment and care of all classes of animals. Hospitalization is available for approximately 60 dogs, cats, or other small animals. Accommodations are also available for 50 cattle, horses, sheep, or swine. Supporting diagnostic procedures when needed are available through the best of X-ray equipment and well-equipped clinical and post-mortem laboratories.

Ambulatory Clinics—To supplement the training received in the hospital three ambulatory clinic services are provided by the Veterinary Hospital. Two are from the St. Paul Campus. One provides general veterinary services for the University livestock and animals in the immediate vicinity. The other service is designed to provide clinical training and experience in reproduction. This service, staffed by members of the Department of Veterinary Obstetrics and Gynecology, provides fertility examination programs for 21 herds or about 2,000 cattle. Similar work is also provided for horses.

The third service is located at Maple Plain, Minnesota. A modern clinic building designed to fulfill the needs of a general practice and student housing is provided. Regular farm calls are made daily to provide service to livestock owners of the area and experience for the students in treating cases on the farms. This practice also provides modest laboratory facilities to offer modern diagnostic aids. Calls are dispatched by 2-way radio to either of 2 staff and student teams.

Veterinary Obstetrics and Gynecology—Classes in veterinary obstetrics and gynecology are taught in the Veterinary Clinic classrooms and laboratories.

Veterinary Surgery and Radiology—Classes in veterinary surgery are taught in facilities provided in the original Veterinary Building on the St. Paul Campus. The facilities of the Veterinary Clinic are used in teaching radiology and also advanced courses.

Other Facilities—Other facilities which are of obvious advantage and deserve mention are located on or near the St. Paul Campus. The veterinary library contains all recent veterinary literature and many other professional periodicals. The Veterinary Diagnostic Laboratory now located in a separate new building, provides fourth-

year students with the opportunity to observe the large number of specimens that are presented to the laboratory for examination and diagnosis.

The facilities of the meat-packing establishments in St. Paul are utilized for instruction in meat inspection and hygiene. Students are able to acquaint themselves with the functions of the State Livestock Sanitary Board through occasional contacts with its representatives located in St. Paul.

At the present time the College of Veterinary Medicine has facilities to provide students with an excellent professional education for a career in veterinary medicine.

Evaluation of Work

Grades—If a student is doing passing work in a course, he will be given 1 of 4 passing grades: A, B, C, D. The grade of C indicates that the work was of average quality; B and A indicate higher levels of achievement; D denotes work of inferior quality. The grade F (failure) is given for work which in the opinion of the instructor does not deserve college credit.

The grade of I (incomplete) usually, but not necessarily, indicates that the instructor considers a student's performance incomplete for the quarter. The grade of I must be changed to a permanent letter grade before 6 weeks of the succeeding quarter has elapsed. If such change is not recorded within the prescribed time, the grade will automatically revert to F.

Grade Point Average—To measure quality of work, grade points are assigned to the various letter grades as follows: each credit of A, 4 points; each credit of B, 3 points; each credit of C, 2 points; each credit of D, 1 point. The grade of F does not carry any grade points. There is a minimum grade point average requirement in the College of Veterinary Medicine. For a more complete discussion see Scholarship Requirements under Professional Curriculum.

Student Personnel Services

Faculty Advisers—In the College of Veterinary Medicine, each class has an adviser. The adviser is concerned with interpreting the program for the students and with their general progress. When a student has problems which need special individual attention, the adviser may refer him to other faculty members, an appropriate college officer, or to a specialized counseling agency. Students are urged to consult class advisers regarding any matter requiring attention.

All-University Personnel Services—The personnel agencies listed below are available to the student at any time. He may consult them with or without referral from a faculty adviser.

Student Counseling Bureau—This bureau is located at 101 Eddy Hall on the Minneapolis Campus. A representative is available at 101 Coffey Hall, St. Paul Campus. The bureau provides help and advice on personal problems and on problems of vocational choice.

Student Activities Bureau—This bureau has offices in Temporary North of Mines, Minneapolis Campus, and at 101 Coffey Hall, St. Paul Campus. This bureau and the program consultants of the Minneapolis Campus Student Union and St. Paul Campus Student Center are helpful in the matter of participation in extracurricular activities.

Bureau of Student Loans and Scholarships—If a student is in need of financial help, he may apply at this bureau, located in 104 Wesbrook Hall, Minneapolis Campus.

Student Housing Bureau—For help in finding a suitable room or apartment, a student may consult this bureau. Offices are located at 209 Eddy Hall, Minneapolis Campus, and at 101 Coffey Hall, St. Paul Campus.

Student Employment Office—For a part-time job on or off campus a student may apply to the various heads of departments or to the Student Employment Office, 30 Wulling Hall, Minneapolis Campus.

Study Skills—Help may be obtained for improvement of study skills such as reading at the Department of Rhetoric, 230 Agricultural Engineering Building, St. Paul Campus, or at the Educational Skills Clinic, 101 Eddy Hall, Minneapolis Campus.

Speech and Hearing Problems—The student having such problems should consult the Department of Rhetoric, St. Paul Campus.

Veterans' Benefits—102 Morrill Hall, Minneapolis Campus.

Adviser for Foreign Students—Foreign students should keep in contact with the adviser for foreign students, 302 Eddy Hall, Minneapolis Campus.

Health Problems—Consult the Health Service staff, Minneapolis or St. Paul Campuses.

Co-ordinator of Religious Activities—211 Eddy Hall, Minneapolis Campus.

Student Government

Student Council—The student Council directs and co-ordinates student activities and encourages student leadership throughout the St. Paul Campus. Its membership is drawn from all major areas of the College of AFHE and from the College of Veterinary Medicine.

The council co-operates with the Minnesota Student Association and the Senate Committee on Student Affairs. It brings questions from the student body to the administration of the colleges and discusses and reaches decisions on matters of general interest.

Honor System—Under the provisions of the Student Self-Government Honor System, the students of the College of Veterinary Medicine rather than the faculty conduct 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 student and student; the faculty does not place the student on his honor. Under the honor system the faculty permits students to conduct examinations.

If the 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 it is clear that scholastic dishonesty has occurred, the commission concerned recommends to the Committee on Admissions and Scholastic Standing of the faculty an appropriate penalty to be levied on the offending student.

The honor system is essentially a preventive, rather than a punitive, system and provides for great freedom of action on the part of students on this campus. New students are urged to discuss the honor system with students previously registered in the college.

Staff-Student Liaison Committee—The purpose of this committee, composed of a student representative from each class and of certain staff members, is to maintain a helpful relationship between members of the student body and the faculty. When the student questions or encounters situations which in his opinion need clarification, he is urged to bring the problem to the attention of this committee. Likewise, faculty members may refer certain problems to the committee.

Student 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 may be found organized groups and facilities which satisfy the needs and inclinations of all.

College of Veterinary Medicine—Within the college itself there exist student organizations which are dedicated to the common interest in veterinary medicine. These include Phi Zeta, an honorary society which sponsors lectures presented by outstanding scientists in the field of veterinary medicine; Alpha Psi, a social fraternity for veterinary students; and the Student Chapter of the American Veterinary Medical Association, a preprofessional society which sponsors lectures by outstanding medical scientists and performs a variety of service and social functions on behalf of the student body.

St. Paul Campus—The new St. Paul Campus Student Center is the focal point for social life on the St. Paul Campus. A varied recreational program is provided here. Such campus-wide organizations as the Toastmasters and Toastmistresses, and Punchinello, a dramatics organization, enable the students to exercise and improve special skills and hobbies. The churches near the campus have student programs with counselors or directors. Some maintain student centers with recreational and dining facilities. Students enrolled in the college may also participate in campus-wide student government organizations such as the Student Council and the Student-Faculty Intermediary Board. 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 according to schedules posted in the men's locker room.

Minneapolis Campus—Students are eligible to participate in the numerous activities of the Minneapolis Campus. These include a hikers' club, canoe club, YMCA and YWCA, and many other organizations bringing together students having common interests.

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, 101 Coffey Hall, St. Paul Campus.

University residence halls on the St. Paul Campus include Bailey Hall (a co-educational residence); Brewster, Dexter, and North Halls for men students; and Meredith Hall for women. Meals for all halls are served in the Dining Center. All residence halls require a contract for the academic year of 3 quarters. The 1962-63 rates range from \$257 to \$307 per quarter. Further information on residence halls may be secured by writing directly to Miss Myrtle Gagnon, Bailey Hall, St. Paul Campus, University of Minnesota, St. Paul, Minnesota 55101.

Married students may live in University-operated housing in Commonwealth Terrace, a new apartment development on the St. Paul Campus. The one bedroom units rent for \$70 per month, the two bedroom units for \$80 per month. The units are unfurnished and the rent includes all utilities except telephone.

The Student Housing Bureau will assist students in locating suitable housing in approved and supervised off-campus locations, if desired.

Room rents for single rooms range from \$25 to \$35 per month and double rooms range from \$20 to \$27.50 per month per student. Eating accommodations are available in the University-operated Dining Center on the St. Paul Campus, and in student-operated co-operatives.

Off-campus apartment rents vary from \$75 to \$130 per month and may be furnished or unfurnished. Available are listings of apartment vacancies throughout the Twin Cities area. 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.

Trailer parking space is not provided at the University, but there are private trailer parks located outside the Twin Cities limits, and upon request a list of these places will be sent by mail.

Estimated Expenses per School Year

1. Tuition and incidental fee per school year	
Resident (\$140 per quarter)	\$420
Nonresident (\$310 per quarter)	930
2. Microscope, dissecting set, insurance on equipment (first year only)	410
3. Books and laboratory equipment	125

Awards and Scholarships

Caleb Dorr—Usually a sum of approximately \$200 per year is available to the College of Veterinary Medicine. This sum is subdivided into four separate awards and given to the individual with the best cumulative GPA in each class. As an example, for 1961-62 the breakdown was as follows: Senior Class, Gold Medal; Junior Class, \$100; Sophomore Class, \$85; Freshman Class, \$50.

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

Women's Auxiliary to the American Veterinary Medical Association—Annual award of \$50 to the senior student for outstanding contributions to student activities on the campus.

Women's Auxiliary to the Minnesota State Veterinary Medical Association—Annual award of \$25 to the junior student in the College of Veterinary Medicine selected on the basis of need and scholarship.

Duluth Kennel Club Award—An award of \$100 to the junior student showing the most promise and interest in small animal medicine.

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

Merck Veterinary Medicine Award—An award of a Merck Veterinary Manual to a student in each of the junior and senior classes in the College of Veterinary Medicine on the basis of their scholastic records.

Caleb Dorr Special Scholarship Prizes—An award, usually a book, 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 a GPA of 3.5 or better.

In addition to the above-mentioned awards and scholarships, students in the College of Veterinary Medicine are in competition with other University students on the St. Paul Campus for the following:

Danforth Foundation Leadership Training Scholarship—Available to freshmen in the College of Veterinary Medicine. This is given to a student who shows outstanding leadership qualities. Camp expenses for 2 weeks are paid.

Johnson Foundation Scholarship—Available to freshmen and sophomores. \$200-\$250 is awarded for the best GPA, general ability, activities, and personal qualities.

Alpha Zeta Traveling Scholarship—When a veterinary student receives this award, it is used to help defray expenses to the American Veterinary Medical Association Convention.

Undergraduate Sigma Xi—This award is based on scholastic performance, general ability, and research potential.

Loans and Financial Aids

It is possible to obtain loans which are administered by the Bureau of Student Loans and Scholarships of the University of Minnesota or the Women's Auxiliary of the American Veterinary Medical Association as follows:

National Defense Student Loans are available through the University to students whose backgrounds indicate superior ability. These loans have a maximum limit of \$1,000 per year with a total limit of \$5,000. Interest is at 3 per cent per annum beginning 1 year after graduation. Payments may be deferred until after graduation and may be spread over a period of 10 years.

The **University of Minnesota** has funds for loans which are available to students who have completed at least 2 quarters of academic work. The limit of indebtedness is \$750 for any 1 year and the total indebtedness which may be incurred as a student is \$1,500. The interest rate on these loans is 3 per cent per annum until graduation. After graduation the interest rate is 5 per cent per annum. Payments may be deferred until after graduation and may be spread over as many as 10 years.

The **Women's Auxiliary of the American Veterinary Medical Association** has funds for loans which may be made to selected senior veterinary students, junior veterinary students, or to graduate students. The limit of indebtedness allowed is \$500. These loans bear an interest rate of 2 per cent 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.



ADMISSIONS AND CURRICULUMS

Training in veterinary medicine includes 2 years of collegiate study in a pre-veterinary curriculum and 4 years of professional study in the College of Veterinary Medicine. The preveterinary requirements may be obtained at either the Minneapolis or St. Paul Campuses of the University of Minnesota, or at another institution offering the required courses.

The Preveterinary Curriculum

Admission Requirements and Suggested Preparation

1. If preveterinary studies are to be made at the University of Minnesota, high school units as follows must be presented for admission: 3 units in English, 2 units in mathematics (1 unit in elementary algebra and 1 unit in plane geometry or higher algebra) and 1 or more units in natural science or agriculture.

2. Students not having completed both plane geometry and higher algebra while in high school will require preparatory course work at extra cost to themselves. If a student finds it impossible to take both courses and has the choice of taking one or the other, plane geometry should be selected. Completion of trigonometry while in high school is also recommended as the student with an acceptable performance will not be required to take Math T, Trigonometry, at the college level.

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

Curriculum

A minimum of 90 quarter credit hours of work at the college level is required for entrance into the professional curriculum of the College of Veterinary Medicine. These include:

English—12 credits

English or Rhetoric (communication), 9 credits; public speaking, 3 credits

Humanities—5 credits

Humanities, comparative literature or philosophy

Chemistry—25 credits

General inorganic and qualitative, quantitative and organic (must include laboratory)

Mathematics—10 credits

Trigonometry and college algebra or their equivalent

Physics—8 credits

Should include mechanics, heat, electricity, sound, and light, with laboratory; college algebra and trigonometry or their equivalent must be prerequisites

Biology—10 credits

General biology, zoology, or zoology and botany (must include laboratory)

Selected areas—10 credits

Must be in at least 2 of the following areas: agricultural economics, anthropology, economics, geography, history, political science, psychology, social science, sociology, or a foreign language

Other electives

Sufficient additional electives should be chosen to give at least 90 quarter credits (2 academic years) of college work. These electives may be selected on the basis of the student's interest in a broad educational program.

Students without farm experience may wish to elect courses in animal and dairy husbandry and poultry science.

Students planning a career in academic or research fields are encouraged to take additional courses in chemistry and mathematics.

The Professional Curriculum

Procedure for Gaining 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 forms should be obtained from the Office of Admissions and Records at the beginning of the fall quarter of the second year of the preveterinary program. All candidates are required to take the following admissions tests during the early part of the second year of their preveterinary program: Minnesota Multiphasic, Strong Vocational Interest Inventory, Veterinary Aptitude Test. Each candidate will receive detailed information relative to the scheduling of the tests shortly after he has filed his completed application form. The results of these tests will be forwarded to the Office of Admissions and Records, University of Minnesota, St. Paul, Minnesota 55101.

The completed application form for admission should be returned to the Office of Admissions and Records as soon as possible, but definitely not later than November 1.

Students who have taken their preveterinary work at schools other than the University of Minnesota must submit, or have forwarded, to the Office of Admissions and Records two complete transcripts which include all preveterinary work taken during the first year of their preveterinary program. A \$5 fee is charged for evaluation of preveterinary credits submitted by nonresidents of Minnesota. A complete transcript of all preveterinary work should be forwarded to the Office of Admissions and Records when the preveterinary program is completed.

Selection of Candidates—Students are selected for admission to the first year of the professional curriculum on the basis of their scholastic standing in the required preveterinary studies, their scores in the veterinary aptitude tests, their interest, character, and personal fitness for the practice of veterinary medicine. First choice is given to residents of Minnesota, second choice to residents of adjoining states which do not have veterinary medical schools, third choice to other nonresidents who have acceptable reasons for attending the College of Veterinary Medicine at the University of Minnesota.

Nonresidents are accepted only if their scholarship has been excellent and other qualifications indicate they have unusual promise for the study of veterinary medicine or a career in science.

In the selection of candidates for admission to the College of Veterinary Medicine a personal interview is required with members of the veterinary faculty or other persons designated by the dean of the college. Selections 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, dependent upon their satisfactory completion. In most instances no final decision will be made until a complete transcript of all preveterinary course work has been received and evaluated.

Procedure Following Admission—All applicants will be informed as to the status of their application on or about May 15. All inquiries or material relative to any application or to the admission requirements of the College 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 must be paid within 10 days and will not be returned if the applicant fails to matriculate.

Registration—The Office of Admissions and Records announces the registration dates for each quarter. If you are accepted for admission, the dates of registering and detailed instructions 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.

Special Needs—All students are required to provide their own microscope. If a used microscope is purchased, it is necessary to have the equipment examined and approved by a member of the faculty. This item will be used throughout the entire 4 years of 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.

Class Attendance—In the College of Veterinary Medicine attendance is compulsory for certain classes. In many courses, because of their nature, attendance is required at all times. If you miss class for good reasons beyond your control, you have the privilege of requesting the instructor's assistance in making up the class work you miss. The instructor is under no obligation, however, to give assistance if you willfully or deliberately absent yourself from class, although there are situations in which he may properly wish to do so.

The following situations will be accepted by instructors as reasons that would justify absence from class and a request for assistance in making up work: (a) illness certified by the Health Service or by the family physician; (b) emergencies caused by a death or serious illness in the immediate family; (c) emergencies approved by the Committee on Admissions and Scholastic Standing; and (d) participation in University-approved, co-curricular activities (certification that a student was absent from class because he was engaged in such activities will be made by the dean of students).

If you wish to make up work, you should confer directly with the instructor in regard to the justification for your absence and the possibility and ways of making up the class work. The Committee on Admissions and Scholastic Standing will enter into the situation only when special emergencies (item C above) are involved and as an appeal agency.

Grades—Quarterly grades will be given on the same basis as outlined in the General Information section of this bulletin.

Scholarship Requirements—A student shall obtain a grade point average of 1.50 or higher for any one quarter. Students failing to obtain a grade point average above 1.50 or receiving a grade of "failure" shall automatically be dropped from the professional curriculum. Those having a grade point average between 1.50 and 2.00 shall be placed on probation.

A grade point average of 2.00 must be maintained for each year to continue in the succeeding year of the professional curriculum.

The Committee on Admissions and Scholastic Standing may grant permission for repeating 1 to 3 quarters of work. Permission will not be given for repeating more than 1 year in the 4-year curriculum. A grade point average of 2.50 or higher is required for each quarter of work repeated. If a single course is repeated, the grade earned must be above the median C. A grade point average of 2.00 must be maintained in nonrepeat courses that are taken. Substitute courses will be considered

as repeat courses and will not be permitted without prior approval of the Committee on Admissions and Scholastic Standing.

Readmission—If a student is dropped, he may not be reinstated without the permission of the Committee on Admissions and Scholastic Standing. Credits earned at other institutions during the period of suspension will not apply toward graduation from the University of Minnesota unless permission was given in advance by the Committee on Admissions and Scholastic Standing. If permitted to return, the student will be placed on probation and may be dropped again at any time when his work is unsatisfactory.

Degrees Offered and Requirements—The College of Veterinary Medicine will recommend students for the following degrees:

1. *Bachelor of science* (B.S.) degree, without designation, following completion of the first 2 years of veterinary studies with a grade point average of 2.00 or above and a minimum of 192 credit hours of work.

2. *Doctor of veterinary medicine* (D.V.M.) following satisfactory completion of the 4 years of the professional curriculum with a grade point average of 2.00 or above and a minimum of 235 credit hours of work.

Required Courses

The student enrolled in the College of Veterinary Medicine has few problems in the selection of courses. His curriculum is prescribed according to standards established by the Council on Education of the American Veterinary Medical Association. There is virtually no free academic time available for the pursuit of formal studies in other schools and colleges. All members of a given class move together through the 4-year curriculum. The first 2 years are devoted to mastery of the so-called basic science courses. These include biochemistry, anatomy, physiology, pharmacology, microbiology, pathology, and parasitology. Actual clinical experience is not gained until the student attains third-year status. By this time he has gained an insight into the fundamentals of normal and abnormal functions of the body. This knowledge is integrated and expanded upon in the more applied courses such as those in medicine, surgery, and public health. Required courses are indicated under Description of Courses.

Animal Science Courses

Veterinary students are required to enroll in AnHu 71, Feeds and Feeding, during their junior year. In addition they must elect any two of the following during their senior year:

- AnHu 63—Swine Production
- Poul 61—Industry Feeding and Production Practices
- DyHu 120—Feeding and Management
- AnHu 65—Beef Cattle Production



DESCRIPTION OF COURSES

Department of Veterinary Anatomy (VAna)

Professor

Ralph L. Kitchell, D.V.M., Ph.D., *head*
Alvin F. Weber, D.V.M., Ph. D.

Assistant Professor

Marion R. Fedde, Ph.D.

Instructor

Janis Priedkalns, D.V.M.

- 100. Orientation for Veterinary Students.** History of veterinary medicine, various phases of veterinary medical endeavor, and matters pertaining to professionalism. (1 cr; prereq #)
- 101. Anatomy of the Dog.** Detailed study of gross anatomical structures and their functions. (7 cr; prereq #)
- 102. Anatomy of Nonruminants.** Anatomy of the horse, pig, and poultry as compared to the dog. (5 cr; prereq 101 or #)
- 103. Anatomy of Ruminants.** Anatomy of the cow and sheep. (3 cr; prereq 102 or #)
- 106. Veterinary Surgical Anatomy.** Topographical anatomy of domestic animals as applied to surgery and the practice of veterinary medicine. (1 cr; prereq 103, VMC 101, #)
- 130. Veterinary Neuroanatomy.** Functional study of the gross and microscopic anatomy of the central nervous system and special sense organs of domestic animals. (3 cr; prereq 101, 151, #)
- 150. Comparative Prenatal Development of Domestic Animals.** Microscopic and gross anatomical studies of the origin and development of body organ systems and morphological considerations of fetal-maternal relationships. (4 cr; prereq #)
- 151-152-153. Microscopic Anatomy of Domestic Animals.** Microscopic studies of tissues and organs of domestic animals. (3 cr for 151, 4 cr for 152, 5 cr for 153; prereq #)
- 154. Morphology of Animal Cells and Intercellular Substances.** Detailed study of the components of the basic tissues of the animal body. (3 cr; prereq 151, #; offered 1963-64 and alt yrs)
- 190. Seminar in Veterinary Anatomy.** (1 cr; prereq 101, 151, #)
- 191x. Special Studies in Veterinary Anatomy.** Individual problems in gross anatomy, histology, embryology, neurology, hematology, and histological techniques. (1-5 cr per qtr; regis for more than 1 qtr permitted; prereq 151, or equiv, #)

FOR GRADUATE STUDENTS ONLY

- 201, 202. Comparative Veterinary Neurology**
- 203x. Experimental Comparative Veterinary Neurology**
- 250. Morphology of Animal Cells and Intercellular Substances**
- 251x. Histological and Ultrahistological Techniques**
- 252. Applied Optical Methods in Veterinary Medical Research**

Department of Veterinary Bacteriology and Public Health (VBac)

Professor

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

Associate Professor

Robert K. Lindorfer, Ph.D.

Assistant Professor

Keith I. Loken, D.V.M., Ph.D.

Instructor

Calvert T. Larsen, D.V.M.

Lecturer

Jack G. Flint, D.V.M.
 C. C. Hamilton, D.V.M.
 Robert B. Mericle, D.V.M.
 N. J. Osterholt, D.V.M.
 James H. Steele, D.V.M., M.P.H.
 Daniel F. Werring, D.V.M.

- 53. 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; prereq 10 cr in chemistry, 4 cr in biological science)
- 101. General Veterinary Bacteriology and Immunology.** Lectures and laboratory on the classification, morphology, and physiology of bacteria; the bacteriology of water, sewage, milk, and food. Basic principles of infection and immunity. (6 cr; prereq 10 cr in zoology, 13 cr in chemistry, #)
- 102. Pathogenic Bacteria and Fungi.** Lectures and laboratory on animal pathogens with emphasis on basic mechanisms of infection. (6 cr; prereq 101 or equiv, #)
- 103. Veterinary Virology.** Lectures and laboratory on the basic techniques of virology. Emphasis on viral and rickettsial agents causing animal diseases. (4 cr; prereq 102 or equiv, #)
- 125-126-127. Veterinary Public Health.** Principles of epidemiology; selected diseases of man and of animals transmissible to man; principles and methodology of food hygiene including meat, poultry, milk, and other foods as related to animal and human health; veterinarians' relationship to public health and animal disease control agencies. (4 cr for 125, 3 cr for 126, 2 cr for 127; prereq 103, VPAP 153, #)
- 128. Problems in Veterinary Bacteriology and Public Health.** (Cr ar; prereq 103 or equiv, #)
- 131. Poultry Diseases.** Lectures dealing with diseases of poultry. (4 cr; prereq 103, VPAP 153 or equiv, #)

FOR GRADUATE STUDENTS ONLY

- 201x.* Advanced Poultry Diseases
- 205x.* Advanced Veterinary Bacteriology
211. Seminar: Veterinary Bacteriology
221. Advanced Veterinary Public Health

Department of Veterinary Medicine and Clinics (VMC)

Professor

Harvey H. Hoyt, D.V.M., Ph.D., head
 Donald G. Low, D.V.M., Ph.D.
 George W. Mather, D.V.M., Ph.D.
 Dale K. Sorensen, D.V.M., Ph.D.

Associate Professor

Robert A. Merrill, D.V.M.

Assistant Professor

Donald W. Johnson, D.V.M., Ph.D.
 Wallace M. Wass, D.V.M., Ph.D.

Instructor

Robert T. Boschert, D.V.M.
 Ralph Farnsworth, D.V.M.
 LaRue W. Johnson, D.V.M.
 Peter B. Little, D.V.M.
 Robert G. Shoup, D.V.M.

- 101. Veterinary Physical Diagnosis.** Fundamentals of clinical veterinary medicine, procedures in physical diagnosis and restraint of animals. (4 cr; prereq regis in 2nd yr VMed)
- 102. General Veterinary Medicine.** Principles of general medicine, effects of disease processes on the body systems and the interrelationships of functional disturbances. (4 cr; prereq 101)

- 103. Large Animal Medicine.** A study of the diseases of the skin, musculoskeletal system, respiratory system, cardiovascular system, hemic and lymphatic system, and digestive system. (4 cr; prereq 102)
- 104. Large Animal Medicine.** A study of the diseases of the urinary system, endocrine system, nervous system, and organs of special sense. Discussions of metabolic diseases, nutritional deficiencies and toxic diseases affecting several systems or the body as a whole. (5 cr; prereq 103)
- 106. Small Animal Medicine.** A study of the diseases of the skin, musculoskeletal system, respiratory system, cardiovascular system, hemic and lymphatic system, and digestive system. (5 cr; prereq regis in 3rd yr VMed)
- 107. Small Animal Medicine.** A study of the diseases of the urogenital system, endocrine system, nervous system, and organs of special sense. Discussion of infectious diseases, nutritional deficiencies and toxic diseases affecting several systems or the body as a whole. (4 cr; prereq 106)
- 110. Clinics.** (For 3rd yr VMed) Medical, obstetrical, radiological, surgical, and ambulatory clinics and laboratory examination of diseases of animals. (5 cr; prereq 101)
- 111. Clinics.** (For 3rd yr VMed) Continuation of 110. (5 cr; prereq 110)
- 112. Clinics.** (For 3rd yr VMed) Continuation of 111. (5 cr; prereq 111)
- 114. Clinical Conference.** (For 3rd yr VMed) Group discussion of clinical cases. (1 cr; prereq regis in 3rd yr VMed)
- 115. Clinical Conference.** (For 3rd yr VMed) Continuation of 114. (1 cr; prereq 114)
- 116. Clinical Conference.** (For 3rd yr VMed) Continuation of 115. (1 cr; prereq 115)
- 121. Clinics.** (For 4th yr VMed) Medical, obstetrical, radiological, surgical, and laboratory examination of diseases of animals including ambulatory clinics. (3 cr; prereq 112)
- 122. Clinics.** (For 4th yr VMed) Continuation of 121. (5 cr; prereq 121)
- 123. Clinics.** (For 4th yr VMed) Continuation of 122. (5 cr; prereq 122)
- 124. Clinics.** (For 4th yr VMed) Continuation of 123. (5 cr; prereq 123)
- 126. Clinical Conference.** (For 4th yr VMed) Group discussion of clinical cases. (1 cr; prereq #)
- 127. Clinical Conference.** (For 4th yr VMed) Continuation of 126. (1 cr; prereq 126)
- 128. Clinical Conference.** (For 4th yr VMed) Continuation of 127. (1 cr; prereq 127)
- 130. Veterinary Jurisprudence 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 regis in 4th yr VMed)
- 131. Infectious Diseases of Large Animals.** Principles of the host-parasite relationship, including mechanisms of resistance, epizootiology, and preventive medicine. Discussions of the bacterial, mycotic, viral, and rickettsial diseases of large animals, affecting the body as a whole, emphasizing the pathogenesis, symptomatology, differential diagnosis, treatment, prevention, and control procedures. (5 cr; prereq 104)
- 132. Preventive Veterinary Medicine.** Principles and application of preventive medical procedures for specialized practice. (5 cr; prereq regis in 4th yr VMed)
- 137. Animal Diseases and Poisonous Plants.** Systematic study of important plants poisonous to animals. Special emphasis is placed on identification, toxicology, diagnosis, and treatment. (3 cr; prereq 104)

FOR GRADUATE STUDENTS ONLY

- 201. Advanced Veterinary Medicine**
- 202. Advanced Diagnosis, Therapeutics of Animal Diseases**

- 203. Seminar
- 204. Medical Conference

Department of Veterinary Obstetrics and Gynecology (VObs)

Professor

Raimunds Zemjanis, D.V.M., Ph.D., *head*

Instructor

William F. Brown, D.V.M.

Assistant Professor

William F. Cates, D.V.M., Ph.D.

- 101. Veterinary Obstetrics.** Lectures covering physiology and pathology of pregnancy, obstetrics, and diseases of the newborn. Laboratory practices in manipulative obstetrics. (4 cr; prereq VMC 101, #)
- 102. Animal Reproduction.** Lectures covering physiology and pathology of reproduction, artificial insemination, and breeding management. (4 cr; prereq VMC 101, VMC 113, #)

FOR GRADUATE STUDENTS ONLY

- 201x. Advanced Diagnostic Methods
- 204x. Special Problems in Animal Reproduction
- 206x. Comparative Physiology of Reproduction
- 210, 211, 212. Advanced Endocrinology of Reproduction

Department of Veterinary Pathology and Parasitology (VPaP)

Professor

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

Instructor

John C. Schlotthauer, D.V.M.

Assistant Professor

William J. Bemrick, Ph.D.
N. Ole Nielsen, D.V.M., Ph.D.
Victor Perman, D.V.M., Ph.D.

- 101. Veterinary Parasitology.** Systematic and biological 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, #)
- 102. Veterinary Parasitology.** Helminth parasites and parasitic diseases of animals with emphasis on principles of control. (5 cr; prereq #)
- 151. General Veterinary Pathology.** Descriptions, discussions, gross and microscopic demonstrations of tissue reactions, including retrogressive and inflammatory changes, neoplasms, and reparative processes. (5 cr; prereq VBac 101, #)
- 152. Special Veterinary Pathology.** Systematic study of the diseases of the respiratory, cardiovascular, digestive, hemopoietic, urinary, genital, endocrine, nervous, locomotor systems. (5 cr; prereq 151, #)
- 153. Special Veterinary Pathology and Pathology of Infectious Diseases of Animals.** (5 cr; prereq 152 or equiv, #)
- 154. Veterinary Clinical Pathology.** Application and interpretation of laboratory tests used in clinical diagnosis in domestic animals. (2 cr; prereq 153, #)
- 156. Diseases of Fur-Bearing Animals.** Etiology, symptomatology, and treatment of diseases of fur-bearing animals. (2 cr; prereq 153, VMC 122, #)

157. **Veterinary Necropsies.** Necropsy, techniques, examinations of tissue sections, and preparation of records. (1-3 cr per qtr; prereq 153, #)
158. **Veterinary Surgical Pathology.** Neoplasms, surgical biopsies, necropsy material, together with a review of the pertinent literature. (1-3 cr; prereq 153, #)

FOR GRADUATE STUDENTS ONLY

- 201x.° **Advanced Veterinary and Poultry Pathology**
- 202x.° **Seminar: Veterinary Pathology**
- 203x.° **Neoplasms of Domestic Animals**
- 205x.° **Advanced Veterinary Clinical Pathology**
- 240x.° **Advanced Veterinary Parasitology**
- 241x.° **Problems in Veterinary Parasitology**

Department of Veterinary Physiology and Pharmacology (VPP)

Professor

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

Assistant Professor

Harold E. Dziuk, D.V.M., M.S., Ph.D.
 John P. Sullivan, D.V.M., Ph.D.

Instructor

Edward F. Jankus, D.V.M.

- 105-106-107-108. **Animal Physiology.** Physiology of circulation, respiration, digestion, kidney function, nervous system, and special senses in the domestic animals. (5 cr for 105 [lect], 2 cr for 106 [lab], 3 cr for 107 [lect], 2 cr for 108 [lab]; prereq VAna 153, MdBc 103, #)
109. **Physiology of the Endocrine and Reproductive Systems.** Function and regulation of the endocrine organs and reproductive system in domestic animals. (3 cr; prereq 108, #)
120. **Seminar in Animal Physiology.** (2 cr; prereq 109, #)
130. **Problems in Animal Physiology.** (Cr ar; prereq 109, or Phsl 106-107, #)
151. **Veterinary Pharmacology.** Local and general anesthetic, analgesic, antipyretic, analeptic, and autonomic drugs. (5 cr; prereq 108, or equiv, #)
152. **Veterinary Pharmacology.** Cardiovascular, chemotherapeutic, anthelmintic, and gastrointestinal drugs. (3 cr; prereq 151, or equiv, #)
153. **Veterinary Pharmacology.** Diuretics, fluid therapy, toxicology, and endocrine drugs. (3 cr; prereq 152 or equiv, #)
161. **Seminar: Veterinary Pharmacology.** (Cr ar; prereq 152 or equiv, #)
171. **Problems in Veterinary Pharmacology.** (Cr ar; prereq 152 or equiv, #)

FOR GRADUATE STUDENTS ONLY

205. **Physiological and Pharmacological Research Techniques in Large Animals**

Department of Veterinary Surgery and Radiology (VSR)

Professor

John P. Arnold, D.V.M., Ph.D., *head*
 Francis A. Spurrell, D.V.M., Ph.D.

Assistant Professor

Donald H. Clifford, D.V.M., M.P.H., Ph.D.
 I. M. Gary Gourley, D.V.M., Ph.D.
 Griselda F. Hanlon, D.V.M., M.S.

Associate Professor

Edward A. Usenik, D.V.M., Ph.D.

- 101. Principles of Veterinary Surgery.** General fundamentals of surgery as applied to the systems of the body; discussion of inflammation with relation to tissue repair; principles of anesthesia, preoperative evaluation, and postoperative care. (5 cr; prereq VMC 101, ♯)
- 102. Special Veterinary Surgery.** Lectures in surgical procedures of small animals; laboratory exercises covering selected small animal operations. (5 cr; prereq 101, ♯)
- 103. Special Veterinary Surgery.** Lectures in surgical procedures of large animals; laboratory exercises covering selected large animal operations. (5 cr; prereq 101, ♯)
- 104. Lamenesses of Domestic Animals.** Etiology, diagnosis, and treatment of lamenesses of domestic animals. (1 cr; prereq 103, ♯)
- 121. Veterinary Radiology.** Preparation and interpretation of radiographs and fluoroscopic examinations in veterinary medicine, consideration of radiant energy as a therapeutic agent and discussion of protective measures against radiation hazards. (3 cr; prereq VMC 113, ♯)
- 131. Heredity in Animal Disease.** Application of genetic principles to animal disease problems with emphasis upon specific inheritable and familial conditions in domesticated species. (3 cr; prereq VMC 104, ♯)

FOR GRADUATE STUDENTS ONLY

- 210x.° Advanced Veterinary Radiology**
- 219. Fundamentals of Nuclear Medicine**
- 220. Anesthesia**
- 225. Advanced Small Animal Surgery**
- 230. Advanced Large Animal Surgery**
- 235. Radiation Biology**

Department of Veterinary Diagnostic Laboratories

Professor

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

Instructor

Martin E. Bergeland, D.V.M.

*Assistant Professor*Donald M. Barnes, D.V.M., Ph.D.
Glen H. Nelson, D.V.M.

Courses Primarily for Students in Agriculture

- VBac 130. Poultry Disease Control.** General anatomy of the fowl, physiology of digestion and reproduction, and prevention and control of the more important diseases affecting poultry. (3 cr; prereq Biol 2, Poul 1, MicB 53; offered 1963-64 and alt yrs)
- VMC 52. Animal Hygiene.** Principles of animal health and disease, with emphasis on prevention, control, and eradication. (5 cr)
- VPP 41-42. Systemic Mammalian Physiology.** Function of the heart, lungs, digestive tract, kidney, nervous system, and reproductive organs in domestic animals. (4 cr for 41, 2 cr for 42; prereq OrCh 41, 42, ¶BioC 3 for 41, 41 for 42)

Courses Provided by Other Colleges

- AnHu 63. Swine Production.** Adaptability, breeding, feeding, care, and management of commercial and purebred swine. (3 cr; prereq 37, 37A, 62 or ♯)
- AnHu 65. Beef Cattle Production.** Adaptability, breeding, feeding, care, and management of commercial and purebred beef cattle. (3 cr; prereq 37, 37A, 62 or ♯)

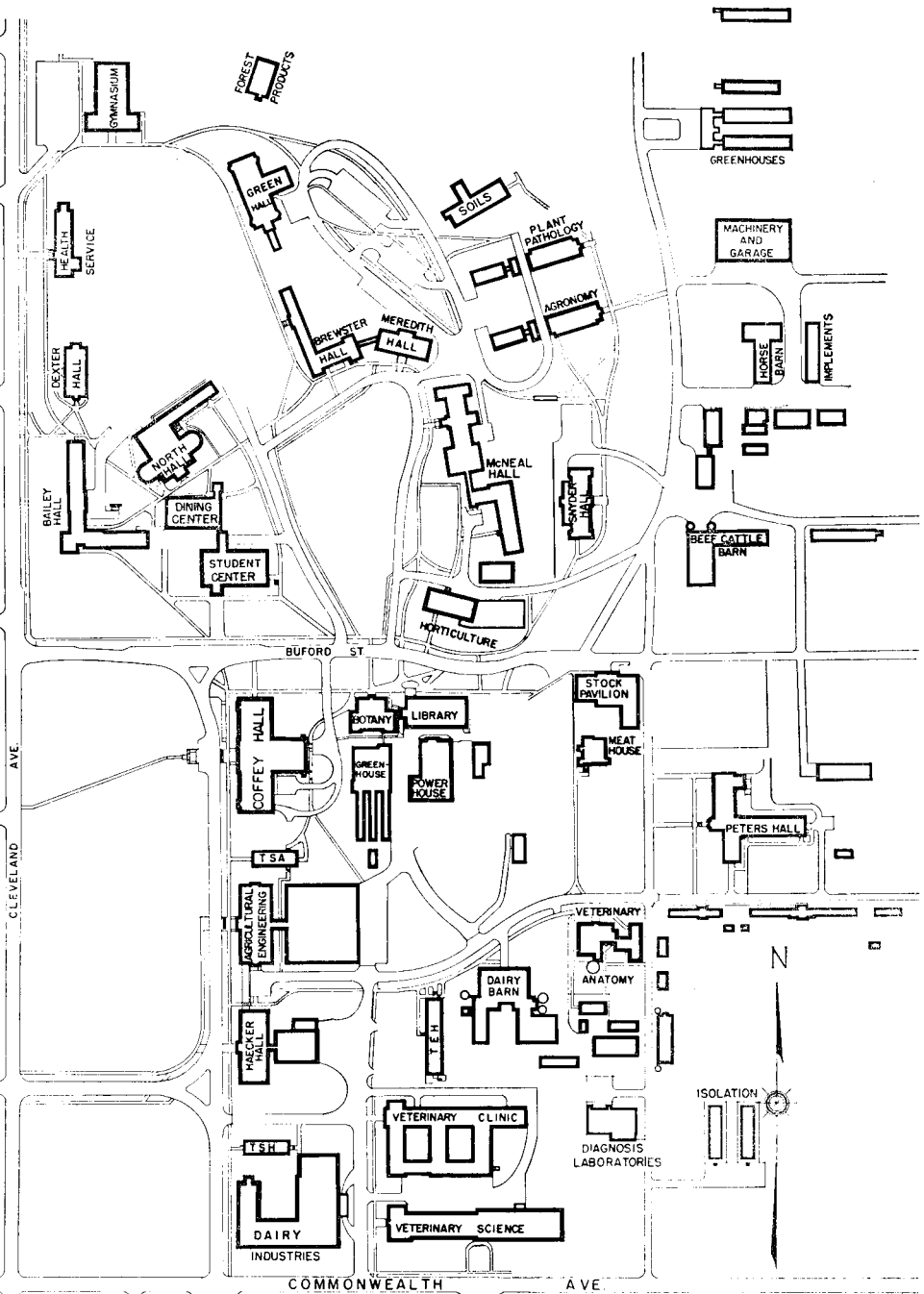
AnHu 71. Feeds and Feeding. Nutrient requirements of farm animals. Characterization of feeds and their use in rations for cattle, sheep, swine, and horses. Lecture and laboratory. (3 cr; prereq regis in 3rd yr VMed)

DyHu 120. Feeding and Management. Status of dairy industry, cow population trends, breeds of dairy cattle, type classification, budgets, housing requirements, milking techniques and equipment, production records, dairy husbandry practices and methods. (3 cr; prereq Vet Med sr or #)

MdBc 102-103. Physiological Chemistry

Poul 61. Industry Feeding and Production Practices. Current production standards and systems with emphasis on management and feeding practices, for commercial egg, broiler, and turkey operations. (3 cr, §57, §59; prereq Vet Med sr or Δ)





ST. PAUL CAMPUS