

# **University of Minnesota Medical School Duluth**

**2009-2011 Catalog**

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# University of Minnesota Mission Statement

The University of Minnesota, founded in the belief that all people are enriched by understanding, is dedicated to the advancement of learning and the search for truth; to the sharing of this knowledge through education for a diverse community; and to the application of this knowledge to benefit the people of the state, the nation, and the world.

The University's mission, carried out on multiple campuses and throughout the state, is threefold:

- **Research and Discovery**—Generate and preserve knowledge, understanding, and creativity by conducting high-quality research, scholarship, and artistic activity that benefit students, scholars, and communities across the state, the nation, and the world.
- **Teaching and Learning**—Share that knowledge, understanding, and creativity by providing a broad range of educational programs in a strong and diverse community of learners and teachers, and prepare graduate, professional, and undergraduate students, as well as non-degree-seeking students interested in continuing education and lifelong learning, for active roles in a multiracial and multicultural world.

- **Outreach and Public Service**—Extend, apply, and exchange knowledge between the University and society by applying scholarly expertise to community problems, by helping organizations and individuals respond to their changing environments, and by making the knowledge and resources created and preserved at the University accessible to the citizens of the state, the nation, and the world.

In all of its activities, the University strives to sustain an open exchange of ideas in an environment that embodies the values of academic freedom, responsibility, integrity, and cooperation; that provides an atmosphere of mutual respect, free from racism, sexism, and other forms of prejudice and intolerance; that assists individuals, institutions, and communities in responding to a continuously changing world; that is conscious of and responsive to the needs of the many communities it is committed to serving; that creates and supports partnerships within the University, with other educational systems and institutions, and with communities to achieve common goals; and that inspires, sets high expectations for, and empowers the individuals within its community.

## Introduction

This biennial catalog, the basic guide to the University of Minnesota Medical School Duluth, should be kept handy for repeated reference. For more information on policies, procedures, and requirements, contact the Office of the Senior Associate Dean, 113 Medical School (726-7571); the Office of Admissions, 180 Medical School (726-8511); the Office of Student Affairs, 174 Medical School (726-8873); or the Office of Curricular Affairs, 109 Medical School (726-7581). The area code for Duluth is 218; the zip code, 55812.

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This publication is available in alternative formats upon request. Please contact the Disability Service and Resources Center,

254 Kirby Student Center (218-726-8217 voice or 218-726-7380 TDD).

This catalog, produced by University Relations, also is available online at [www.catalogs.umn.edu/umdmmed/](http://www.catalogs.umn.edu/umdmmed/).

**Equal Opportunity**—The University of Minnesota is committed to the policy that all persons shall have equal access to its programs, facilities, and employment without regard to race, color, creed, religion, national origin, sex, age, marital status, disability, public assistance status, veteran status, or sexual orientation.

Inquiries regarding compliance may be directed to Deborah Petersen-Perlman, Director, Equal Opportunity, University of Minnesota, Duluth, 255 Darland Administration Building, 1049 University Drive, Duluth, MN 55812-2496 (218-726-6827) or the Director, Office of Equal Opportunity and Affirmative Action, University of Minnesota, 274 McNamara Center, 200 Oak

Street S. E., Minneapolis, MN 55455, 612-624-9547, [eoaa@umn.edu](mailto:eoaa@umn.edu). Web site: [www.eoaffact.umn.edu](http://www.eoaffact.umn.edu).

**Access to Student Educational Records**—In accordance with regents policy on access to student records, information about a student generally may not be released to a third party without the student’s permission. (Exceptions under the law include state and federal educational and financial aid institutions.)

Some student information—name, address, electronic (e-mail) address, telephone number, dates of enrollment and enrollment status (full time, part time, not enrolled, withdrawn, and date of withdrawal), college and class, major, adviser, academic awards and honors received, and degrees earned—is considered public or directory information. Students may prevent the release of public information. To do so, they must notify the records office on their campus.

Students have the right to review their educational records and to challenge the contents of those records. The regents policy is available for review online at [http://onestop.umn.edu/grades\\_and\\_transcripts/student\\_records\\_privacy.html](http://onestop.umn.edu/grades_and_transcripts/student_records_privacy.html) and at the Registrar’s Office. Questions may be directed to the Registrar, Solon Campus Center, Room 21 (218-726-8000).

Students are responsible for updating their personal information, which can be done online through the “Personal Information” link at <http://onestop.umn.edu>.

**E-Mail: the University’s Official Means of Communication**—Students are responsible for all information sent via their University e-mail account. Students who forward their University e-mail account are still responsible for all information, including attachments, sent to the account.

**Immunization**—Students born after 1956 who take more than one University class are required under Minnesota law to submit an Immunization Record form.

The form, which is sent along with the official University acceptance letter, must be filled out and returned to the Office of Student Affairs within 45 days after the beginning of the first term of enrollment in order for students to continue registering for classes at the University. Complete instructions accompany the form.

**Extracurricular Events**—No extracurricular events requiring student participation may be scheduled from the beginning of study day to the end of finals week. Exceptions to this policy



may be granted by the Senate Committee on Educational Policy. The Senate advises all faculty that any exemption granted pursuant to this policy shall be honored and that students who are unable to complete course requirements during finals week shall be provided an alternative and timely opportunity to do so.

**Smoke-Free Campus Policy**—Smoking is prohibited in all indoor facilities, including faculty and staff offices and the Plaza Food Court.



## General Information

Established in 1851 by an act of the Minnesota territorial legislature, the University of Minnesota is an autonomous body governed by a Board of Regents that enacts laws regulating the institution, controls expenditures, and acts on all staff changes.

The Board of Regents is composed of 12 members appointed by the state legislature. The president is the University's chief executive officer, serves as ex officio to the Board of Regents, and is directly responsible to that board.

The University of Minnesota Duluth (UMD) became a coordinate campus of the University of Minnesota by legislative act on July 1, 1947. It is administered by a chancellor who reports directly to the president of the University. The University of Minnesota Medical School Duluth is unique in that while it is one of seven colleges on the Duluth campus, it is also one of the colleges/schools of the University of Minnesota Academic Health Center that reports to the Office of the Senior Vice President for Health Sciences on the Minneapolis campus.

### History

The first classes in medicine at the University began in 1888 when three of the four private or proprietary medical schools located in Minneapolis and St. Paul offered their charters and resources to the state. In accepting this

offer, the regents assumed responsibility on behalf of the people of the state of Minnesota for medical education. In 1908 the remaining proprietary school was incorporated into the University of Minnesota Medical School, which continued until 1972 as the only medical school in Minnesota.

The inception and development of a medical school on the Duluth campus of the University of Minnesota can be traced back to 1966, when a group of concerned citizens and physicians organized themselves in Duluth under the leadership of S. H. Boyer, M.D. This group, the Northern Minnesota Council for Medical Education, was fully aware of the need for adequate health care facilities and personnel in northern Minnesota and Wisconsin. As a result of its strategic location, the Duluth-Superior area was championed as the site for future development of an area health science education center.

In response to the activities of the Northern Minnesota Council for Medical Education, the University of Minnesota Board of Regents published a statement on medical education in April 1968 proposing the establishment of a medical school. In January 1969, a special advisory panel of medical school deans and medical economists recommended overwhelmingly that Duluth be the site for a second medical school in Minnesota.

As a result of the panel's recommendation, the legislature in May 1969 appropriated funds to establish a basic science program for a medical curriculum at the Duluth campus of the University of Minnesota to increase the number of students choosing a career in family practice with a commitment to serve in a rural community. Then University president Malcolm Moos appointed an Ad Hoc Committee on Medical Education at the Duluth campus. Subsequently, the Carnegie Commission on Higher Education identified the Duluth-Superior area as one of nine regions in the United States where university health science centers should be established.

In the fall of 1970, Robert E. Carter, M.D. was appointed the school's first dean. The first class had 24 students, who enrolled in September 1972.

In 2004, the University of Minnesota School of Medicine Duluth was jointly accredited by the Liaison Committee on Medical Education with the University of Minnesota Medical School Minneapolis. The School of Medicine Duluth is now a campus of the University of Minnesota Medical School and formally changed its name to the University of Minnesota Medical School Duluth.

## Philosophy

A two-year curriculum of basic medical and clinical sciences is offered with principal clinical emphasis on rural family medicine and its interrelationships with other medical specialties. All students who successfully complete the two-year program in Duluth complete their remaining M.D. degree requirements at the University of Minnesota Medical School Minneapolis.

The mission of the University of Minnesota Medical School Duluth is to educate students who will practice family medicine in rural Minnesota and American Indian communities; to provide high quality academic and clinical education programs for professional, graduate, and undergraduate students; and to create distinguished research programs that advance knowledge in the health sciences, including rural and American Indian health issues.

The medical education objectives are accomplished by using many family medicine practitioners, as well as other primary care physicians, as preceptors and instructors throughout the two years of the program. These role models illustrate, through their instruction and example, the delivery of medical care in rural communities and how that care integrates with

medical services offered in urban settings. The rural preceptorship program in family medicine is specifically designed to meet these goals and to augment the supply of family physicians in the rural regions of Minnesota.

## Administration

The University of Minnesota Academic Health Center is organized under the Office of the Senior Vice President for Health Sciences. Each of the various Academic Health Center units in Minneapolis, as well as the University of Minnesota Medical School Duluth, is headed by a dean. The administrative center for the Medical School Duluth is located in 133 Medical School (218-726-7571).

## Faculty

The teaching staff includes 31 full-time basic and clinical sciences faculty. The entire faculty constitutes the governing body responsible for policy making. The school's Educational Policy Committee includes student representatives. The responsibility for selecting each year's entering class is delegated to the Committee on Admissions, whose members are chosen from the medical school faculty, the other UMD faculties, community physicians, and non-physician representatives from the region.

The part-time and voluntary clinical sciences faculty consists of more than 300 area physicians representing all the major medical specialties. Their close interrelationship with the full-time faculty in presenting the curriculum ensures a practical as well as academic approach to training family physicians. With exposure to patients beginning in the first semester, students become proficient in taking accurate medical histories and performing physical examinations under expert guidance. In addition, students spend ample time learning sciences basic to medicine.

## Graduate Programs

The University of Minnesota Medical School Duluth faculty is actively involved in training graduate students. Programs leading to the doctor of philosophy degree are offered in two interdisciplinary programs; integrated biosciences and toxicology, or under the aegis of the corresponding programs on the Twin Cities campus and the University of Minnesota Graduate School in the following areas: biochemistry, molecular biology and biophysics; microbiology, immunology, and molecular pathobiology; cellular and integrative physiology; and pharmacology. Cooperative programs at the



master's degree level are offered by these same departments. The medical school faculty also participates in the graduate education of students in the Departments of Sociology-Anthropology, Biology, and Chemistry on the UMD campus. Information about graduate programs at the Medical School Duluth may be obtained by contacting the appropriate program at the University of Minnesota Medical School Duluth, 1035 University Drive, Duluth, MN 55812-2487.

The University of Minnesota Medical School Duluth is one of four cosponsors of the Family Practice Residency Program that is based at the Duluth Family Practice Center. Together, the Miller-Dwan Medical Center, St. Luke's Hospital, St. Mary's Medical Center, and the University of Minnesota Medical School Duluth compose the Duluth Graduate Medical Education Council, Inc. For information on the residency program, write to Tom Day, M.D., Director, Duluth Family Practice Center, 330 North Eighth Avenue East, Duluth, MN 55805.

### American Indian Programs

The Center of American Indian and Minority Health (CAIMH) at the University of Minnesota Medical School Duluth offers programs for American Indian students considering career possibilities in medicine and other health care professions.

The Native American Center of Excellence addresses the issues of poor health and health disparities in American Indian communities. The center provides culturally sensitive medical education for American Indians, prepares American Indian physicians for practice in American Indian communities, educates non-Indian health care providers and medical educators about American Indian health issues. The center also coordinates a junior faculty development program for the University of Minnesota Medical School on the Twin Cities campus and conducts research regarding American Indian health. CAIMH is funded by the Division of Health Professions Diversity, Bureau of Health Professions, Health Resources and Services Administration, Department of Health and Human Services (HRSA), HRSA/5D34-MBO3016.

Native Americans Into Medicine (NAM) enables disadvantaged undergraduates to better assess their motivation for studying medicine. Aspects of anatomy, physiology, physical diagnosis, and other medically related subjects as well as math and science enrichment are offered during the six-week summer portion of the program. The NAM program, established in 1973, is funded by the Health Careers Opportunity Program, Division of Health Professions Diversity, Bureau of Health Professions, Health Resources and Services Administration (HRSA), Department of Health and Human Services, 5 D18 HP02951.

Participation in these programs does not guarantee acceptance to the University of Minnesota Medical School Duluth. For more information on any of these programs, contact Joy Dorscher, M.D., Director, Center of American Indian and Minority Health, University of Minnesota Duluth, 182 Medical School, 1035 University Drive, Duluth, MN 55812-2487 (218-726-7235).

### Duluth Medical Research Institute

The Duluth Medical Research Institute (DMRI) was established in 2007 to facilitate innovative, collaborative translational research on campus and in the community. Building on the many strengths of the Duluth research community, the Medical School Duluth envisions a successful and nationally recognized translational and clinical research institute.

The DMRI is developing a strong environment for translational research by promoting biomedical research, supporting innovation, facilitating linkages, and providing funding for

pilot grants. In addition, members have access to grant writing and submission support, laboratory space, office and clinical research space, and major facilities and equipment.

The DMRI was intentionally designed to extend beyond the medical school campus and welcomes members from across the university, local colleges, hospitals, and clinics. Its goal is to bring new biomedical knowledge and technologies to the community more efficiently by working together in order to improve quality of life for all.

**Resources**—The DMRI has established core facilities and services to support translational and clinical research. These include an assay unit, imaging core, flow cytometry facility, genomics and proteomics nodes, biostatistics core, and a medical editing and proofreading service. For additional information, see the Web site at [www.med.umn.edu/duluth/DMRI/](http://www.med.umn.edu/duluth/DMRI/).

**Seminar Schedule**—The DMRI hosts research seminars throughout the year. A listing of upcoming seminars is available at: [www.med.umn.edu/duluth/DMRI/seminars/](http://www.med.umn.edu/duluth/DMRI/seminars/).

**Contact Information**—Duluth Medical Research Institute, University of Minnesota Medical School Duluth, 308 SMed, 1035 University Drive, Duluth MN 55812, 218-726-8513, [dmri@d.umn.edu](mailto:dmri@d.umn.edu), [www.med.umn.edu/duluth/DMRI/](http://www.med.umn.edu/duluth/DMRI/).

## Facilities

The University of Minnesota Medical School Duluth moved into a new facility in March 1979. In 1997, an addition to this facility was opened that added student small group learning space, expanded faculty research laboratory facilities, administrative space for Admissions and Student Affairs personnel, and an expanded Learning Resource Center. The Medical School Duluth is fully contained in this building, which includes classrooms, teaching laboratories, student study and lounge areas, faculty and staff offices, and labs and animal facilities.

The University of Minnesota Medical School Duluth has established affiliation agreements with St. Luke's Hospital and Miller-Dwan and St. Mary's Duluth Clinic Health System. These hospitals and clinical facilities provide medical students with access to an extremely diverse patient population from the northern regions of Minnesota, Wisconsin, and Michigan.

## UMD Library

Students and faculty in the Medical School Duluth and College of Pharmacy Duluth, have access to both the UMD library as well as the resources of the Health Sciences Libraries (Bio-Medical Library, Veterinary Medicine Library and the Wangenstein Historical Library of Biology and Medicine) on the Twin Cities campus. The health sciences collection has been strengthened considerably by the addition of full-text electronic resources that enable students and faculty to access library materials from their office, home, or lab. Students who prefer studying in the library will find a beautiful and functional building containing nearly 300 new computers, 20 state-of-the-art group study rooms for private study, and carrels equipped with connections for laptop computers.

Reference service, database training and searching, and library instruction are available from the Reference Services Librarian, Sunshine Carter (L 276; 218-726-6693; [scarter@d.umn.edu](mailto:scarter@d.umn.edu)), who also works with librarians in the Twin Cities to share teaching materials. If the life sciences librarian is not available, assistance can be found at the reference desk on the second floor of the library (218-726-8100). The reference desk is open September through May, 9:00 a.m. to 9:00 p.m., Monday through Thursday, and 9:00 a.m. to 5:00 p.m. on Friday. It is also open on weekends. To arrange a tour of the library or for an overview of library services contact Sunshine Carter, Reference Services Librarian (L 276; 218-726-6693; [scarter@d.umn.edu](mailto:scarter@d.umn.edu)).

The library's books, journals, videos, and other materials can be located by searching the online library catalog, available on the Web at [www.d.umn.edu/lib](http://www.d.umn.edu/lib). The catalog presents the location and status of an item, whether, for example, a book is checked out or on the shelf. Search options enable patrons to search health sciences materials exclusively. Items not available on the Duluth campus may be requested, free of charge, by submitting a request through the Health Sciences Libraries (HSL) Web site at [www.biomed.lib.umn.edu/services/ordering](http://www.biomed.lib.umn.edu/services/ordering) to the Document Delivery staff at the HSL who will provide the material from the Twin Cities campus or from other library on interlibrary loan.

Electronic sources of health sciences information are accessed from the library's electronic resources Web site. Patrons will find a select list of indexes and databases that focus on medicine. PubMed/Medline, the world's premier index of medical research is located here as is

## General Information

MD Consult, a full-content database covering all aspects of current clinical information. MD Consult provides access to a number of clinical reference books, medical journals, clinical practice guidelines and more. Additional databases provide access to Elsevier Science journals and many Wiley publications.

Electronic resources can also be identified from the Health Sciences Libraries Web site at [www.biomed.lib.umn.edu/](http://www.biomed.lib.umn.edu/). The Health Sciences Libraries in the Twin Cities also provide consultation for students and community-based faculty who serve as preceptors for medical and pharmacy students. Special resources have been identified for those faculty at [www.biomed.lib.umn.edu/help/guides/preceptors](http://www.biomed.lib.umn.edu/help/guides/preceptors). For additional assistance with HSL collections and service please call the Reference Desk at 612-626-3260 or send e-mail to [medref@umn.edu](mailto:medref@umn.edu).

## SIM Center

The SIM (Simulation in Medicine) Center provides hands-on experience for medical students with a variety of sophisticated manikin human patient simulators, including a birthing simulator, a pelvic examination simulator, a pediatric patient simulator, and an adult patient simulator. Students also are taught the basics of ultrasound assessment by learning the FAST exam (Focused Assessment with Sonography in Trauma).

## UMD Health Services

UMD Health Services is located at 615 Niagara Court between Goldfine and Lake Superior Halls and next to Heaney Hall. UMD Health Services is open from 8 a.m. to 4 p.m., Monday through Friday. Appointments are encouraged; to schedule one, call 218-726-8155. For more information, visit [www.d.umn.edu/hlthserv/](http://www.d.umn.edu/hlthserv/).

Services available to students who have paid the health fee include general outpatient medical care, physical exams, gynecologic services, and sports medicine. Laboratory and X-ray services and minor surgery may be billed to patients' health insurance. In addition, Health Services also provides some medications to students (with pricing comparable to local pharmacies), as well as individual and group counseling and therapy services to those experiencing ongoing or situational psychological or behavioral difficulties. It has an active health education department, with trained peer educators who teach students about health issues important to

student life, and a wellness outreach program to help students develop healthier lifestyles. Programs focus on the developmental needs of University students and are designed to maximize their potential, so they can fully benefit from the academic environment and University experience.

Students with after-hours and weekend emergencies can receive care from emergency physicians at St. Luke's Hospital (218-249-5616); St. Mary's Hospital (218-786-4357); St. Luke's Urgent Care (218-249-6095); or SMDC Urgent Care (218-786-6000). These services are provided at the student's expense.

To summon an ambulance for serious emergencies, students should call 911. For mental health emergencies, call the Miller Dwan Crisis Line at 218-723-0099. UMD Health Services advises students to call the 1-800 phone number on their insurance card prior to going to a hospital or urgent care center. UMD Health Services does not pay for services at these locations.

## Housing

For housing information, contact the Housing Office, University of Minnesota Duluth, 149 Lake Superior Hall, 2404 Oakland Avenue, Duluth, MN 55812-1107 (218-726-8178).

## Student Government

Medical students elect student representatives who serve on faculty committees with voting privileges. Due to the small class size, a close student-faculty relationship exists, and all students are encouraged to contribute ideas for the development of the school. This is especially beneficial, because all the administrative officers of the University of Minnesota Medical School Duluth are also members of the teaching faculty.

Medical students have representatives to national organizations (Association of American Medical Colleges, American Medical Student Association) and are encouraged to participate in all-campus activities and government.

## Recreational Activities

All University recreational facilities are open to medical students, including the Kirby Student Center and physical education facilities. Medical students participate in the UMD intramural program and other informal recreational activities.

### Duluth

Duluth is located on the western most shore of Lake Superior and shares its harbor with Superior, Wisconsin, forming the head of the Great Lakes-St. Lawrence Seaway system. Duluth is the gateway to America's largest wilderness reserve and many of Minnesota's most scenic vacation areas. The Spirit Mountain ski area, within the city limits of Duluth, is one of the country's most well-equipped recreational facilities. Close to Duluth are the Boundary Waters Canoe Area Wilderness (part of the Superior National Forest), many major ski areas, and excellent hunting and fishing sites. The varied climate provides opportunity for participation in a broad range of outdoor sports. In addition, indoor facilities for sporting activities

in Duluth include ice rinks, swimming pools, and gymnasiums. Musical and dramatic performances and art exhibits are offered by the Duluth Symphony Orchestra, Tweed Museum of Art, Duluth Playhouse (the nation's oldest community theater), Duluth Art Institute, Minnesota Ballet, and Junior Symphony. Much of Duluth's cultural entertainment is presented in the city's Entertainment and Convention Center. The wide range of cultural activities and achievements adds another dimension to Duluth's importance as a regional center in northern Minnesota.





# Admission and Financial Considerations

## Admission

The University of Minnesota Medical School Duluth gives priority consideration to applicants who are residents of Minnesota and who wish to become family practice physicians in rural Minnesota or an American Indian community. Other applicants who demonstrate a high potential and motivation for practicing medicine in rural Minnesota or American Indian communities will also be considered for admission. The University of Minnesota is committed to providing equal opportunity to students from minority groups and educationally disadvantaged backgrounds and the University of Minnesota Medical School Duluth encourages members of these groups to seek admission to its program. Applicants must have completed all requirements for a baccalaureate degree by the time of possible matriculation.

In evaluating applicants, the Committee on Admissions (COA) considers the entire academic record, the results of the Medical College Admissions Test (MCAT), supplemental information provided by the applicant, letters of evaluation, and personal interviews. Applicants also are evaluated on factors such as motivation, service record, interpersonal communication skills, sensitivity, breadth of interests, and attitudinal characteristics considered essential for medical practice. Two of the most significant

qualifications for applicants are a demonstrated capacity for excellence in scholarship in an academic discipline of their own choice, and personal and background traits that indicate a high potential for becoming a family practice physician in a small town/rural Minnesota setting or an American Indian community.

## Essential and Desired Qualities

The University of Minnesota Medical School is looking toward the future of medicine and the skills and knowledge future physicians will need. Applicants must demonstrate commitment to delivering compassionate and quality care, as well as a high degree of personal integrity and skill in communicating with diverse groups. They should be self-directed individuals who are committed to lifelong learning.

The essential and desired qualities for an ideal medical student are:

1. Commitment to Improving the Human Condition.
  - Commitment to human service (essential): Sustained and meaningful commitment could be demonstrated by—but not be limited to—volunteer, work, or academic experiences.
  - Understanding of medicine (essential)

- Commitment to care of the underserved (desired)
  - Commitment to community and global care (desired).
  - Commitment to rural care (desired in Twin Cities applicants, essential in Duluth applicants)
2. Professional Conduct.
- Honesty (essential): Honesty and integrity, particularly regarding instances of personal failings or mistakes, are essential for accountability.
  - Compassion (essential): Evidence could be provided by evaluations, prior employment, or experience in other roles that require compassion.
  - Self-awareness (essential): Students should know their own strengths and weaknesses and know when to ask for help.
  - Ethical behavior (essential)
3. Outstanding Interpersonal Skills.
- Communication skills (essential): Oral and written communication skills must be excellent, both to share knowledge and to convey empathy.
  - Teamwork skills (essential): Requires acknowledging other team members' expertise, accurate self-assessment, assuming leadership when appropriate, and subsuming individual interests to the work of the team.
  - Tolerance (essential)
  - Leadership experiences (desired)
  - Diversity experiences (desired)
4. Effective Dedication to Lifelong Learning.
- Intellectual curiosity (essential)
  - Scientific aptitude (essential): Students should demonstrate a fundamental appreciation of how the scientific method is applied to the discovery of medical knowledge and to medical practice.
  - Potential for academic success (essential)
  - Psychological resilience (essential): Emotional stability, skills to cope with stress, an ability to deal with sacrifice and hardship, maturity, good judgment, and an ability to defer gratification are needed
  - Creativity (desired)
  - Research experiences (desired; essential in M.D./Ph.D. applicants)

### Required Courses

- One quarter or one semester of biology (with lab)
  - One quarter or one semester of chemistry (with lab)
  - Four additional quarters or semesters in the life sciences (biology, genetics, zoology, botany, parasitology, etc.), biochemistry, chemistry, or physics. At least two classes should be upper level courses.
  - One quarter or semester of upper level humanities or social sciences with an extensive writing component
- In addition to the required courses, the following types of courses are recommended to optimally prepare applicants for the medical school curriculum:
- Biochemistry
  - Ethics
  - Genetics
  - Psychology
  - Statistics
  - Independent learning courses
  - Seminar-type courses involving small group discourse

### Application Procedures

The University of Minnesota Medical School Duluth follows the recommended application procedures of the Association of American Medical Colleges (AAMC). These procedures are detailed in the most recent Medical School Admission Requirements, published annually in April by the AAMC. Anyone interested in attending medical school should consult this book because it contains useful information about all U.S. medical schools. It is available in most college libraries and counseling offices. For a personal copy, visit [www.aamc.org/students](http://www.aamc.org/students) and select "Publications."

The AAMC sponsors the American Medical College Application Service (AMCAS), a centralized application processing service for applicants to participating U.S. medical schools. Like the other participating schools, the University of Minnesota Medical School Duluth is completely autonomous in reaching its own admissions decisions. All applicants must follow the steps listed below as closely as possible. Re-applicants must submit a new application each year.

## Admission and Financial Considerations

1. Applicants must take the Medical College Admissions Test (MCAT). If test scores are older than three years, the MCAT must be retaken.  
  
The MCAT has subtests in four sections: biological sciences, physical sciences, verbal reasoning, and a writing sample. Scores are automatically sent to all schools the applicant designates on the AMCAS application.
2. Applicants begin the AMCAS application process online at [www.aamc.org/students/amcas/start.htm](http://www.aamc.org/students/amcas/start.htm). Beginning with the entering class of 2010, the Duluth and Twin Cities campuses of the University of Minnesota Medical School will have a unified AMCAS identity. Applicants will designate the University of Minnesota Medical School—Minneapolis/Duluth on their AMCAS application whether they intend to apply to the Twin Cities, Duluth, or both campuses.
3. Applicants must ask each U.S. college and university they attended to forward official transcripts of coursework directly to AMCAS. AMCAS must receive the transcripts no later than two weeks after the November 15 application deadline.
4. Applicants must submit the completed application to AMCAS, as soon as possible after June 1 but no later than November 15.
5. When the application has been received from AMCAS, an e-mail is sent to the applicant with a link to a Web site where the applicant indicates whether he or she is interested in applying to the Duluth program, the Twin Cities program, or both. Each campus will continue to have its own separate supplemental application process. The applicant will receive additional directions for the supplemental application from the selected program(s).

Applicants should complete the supplemental information form and provide the \$75 application fee or a copy of the AMCAS fee waiver document within one month. The supplemental information form, of major importance in the evaluation process, expands on the information in the AMCAS application. Applicants are asked to provide a brief residential history and answer a set of open-ended questions on special experiences, attitudes, and values. The questions require introspection and self-knowledge and are intended to provide a greater understanding of the applicant's motivation and life experiences to the COA.

The supplemental information form includes a section on prerequisite coursework. Because course names vary greatly by college, this form

helps determine which requirements the applicant may have met. Applicants who are accepted must send final transcripts of their college work as soon as they are available.

Clear and brief answers to the supplemental information form questions are appreciated. If an applicant is reapplying, substantial improvement in areas considered weaknesses on the previous applications recommended.

Letters of evaluation from faculty and other persons who know the applicants well are to be forwarded to AMCAS by the evaluator after they have been requested.

### Deferred Acceptance

Any accepted applicant may request, by June 1, to defer matriculation for one academic year only. Reasons need not be specified. After June 1, deferrals are granted at the discretion of the associate dean for admissions or her representative. Each person selecting deferral must reapply through the AMCAS Deferred/Delayed Matriculation Program, and may not apply to other schools.

### Early Decision Program

The University of Minnesota Medical School Duluth participates in the Early Decision Program (EDP), which is operated by AMCAS and requires interested applicants to

1. apply to only one U.S. medical school. AMCAS must receive the application and all official transcripts by August 1. The MCAT must be taken before the application is submitted to AMCAS.
2. provide the school with required supplemental information by September 1.
3. attend that school if offered a place there under EDP.

EDP allows applicants to receive a prompt admission decision from the school by October 1; be reconsidered, if the COA elects, in the regular applicant pool if not accepted under EDP; and arrange to apply to additional schools if not accepted under EDP.

### Early Admission Scholars Program

*University of Minnesota Medical School Duluth and UMD Swenson College of Science and Engineering*

The Early Admissions Scholars (EAS) Program educates family practice physicians who will establish practices in rural/small town settings of Minnesota or American Indian communities. This program is designed for undergraduate

students who have been accepted to the University of Minnesota Duluth (UMD) and who demonstrate superior scholastic ability and personal development during their first three undergraduate years of college.

Students are selected for the program during their junior year of college. Residents of Minnesota who have resided in small communities of less than 25,000 for the major portion of their lives and who have demonstrated a high potential for practice in a rural/small town setting or American Indian community will be considered. Admission is based on junior-year standing, GPA, performance in prerequisite courses, and faculty recommendations. Important personal qualities include maturity, stamina, leadership, motivation for medicine, interpersonal communications skills, compassion, and medical/volunteer experience. Applicants who satisfy these criteria may be provisionally admitted until the medical school has considered the results of the MCAT. Applicants take the MCAT by July in the year of matriculation. Applicants should obtain an average score of 9 in each of three categories (verbal reasoning, physical sciences, and biological sciences) with no score lower than 8 in order to matriculate at the medical school. Qualified applicants are invited for two interviews scheduled in March.

The program leads to a bachelor of science degree in biomedical sciences awarded by UMD Swenson College of Science and Engineering and to the M.D. degree granted by the University of Minnesota Medical School. The curriculum for both degrees takes seven years to complete, three years of undergraduate and four years of medical school. The B.S. degree in biomedical sciences will be awarded after successfully completing the first year of medical school. After two years of a basic science curriculum at the Medical School Duluth, students automatically transition to the Medical School in Minneapolis for their third and fourth years. Students in the EAS program also transition to Minneapolis under the same requirements: passage of Step 1 USMLE and satisfactory completion of all coursework during the first two years of medical school.

Prior to matriculation, EAS applicants must complete work for the UMD liberal education requirements. They are also expected to complete a substantial portion of the first three years of any undergraduate major program in the College of Science and Engineering. Students must meet with an adviser to design a curriculum tailored to individual needs. Students must maintain a 3.50 overall and 3.50 science undergraduate GPA to progress to the Medical School.

## Technical Standards for Admission

Because of the Medical School's obligation to ensure patients receive the best medical care possible, candidates for admission and the M.D. degree must meet the following technical standards.

Candidates for the M.D. degree must have abilities and skills of five varieties, including observation; communication; motor; conceptual, integrative, and quantitative; and behavioral and social. Technological compensation can be made for some handicaps in some of these areas, but candidates should be able to perform in a reasonably independent manner. The use of a trained intermediary means that candidates' judgment must be mediated by someone else's power of selection and observation.

**I. Observation:** Candidates must be able to observe demonstrations and experiments in the basic sciences, including but not limited to physiologic and pharmacologic demonstrations in animals, microbiologic cultures, and microscopic studies of microorganisms and tissues in normal and pathologic states. Candidates must be able to observe a patient accurately at a distance and close at hand. Observation necessitates the functional use of vision and somatic sensation. It is enhanced by the functional use of smell.

**II. Communication:** This skill includes speech, reading, and writing. Candidates should be able to speak, hear, and observe patients in order to elicit information, describe changes in mood, activity, and posture, and perceive nonverbal communications. Candidates must be able to communicate effectively and sensitively with patients and communicate with all members of the health care team in both oral and written form.

**III. Motor:** Candidates should have sufficient motor function to elicit information from patients by palpation, auscultation, percussion, and other diagnostic maneuvers. Candidates should be able to do basic laboratory tests (e.g., urinalysis, CBC), carry out diagnostic procedures (e.g., proctoscopy, paracentesis), and read EKGs and X-rays. Candidates should be able to execute motor movements reasonably required to provide general care and emergency treatment to patients. Examples of emergency treatment reasonably required of physicians are cardiopulmonary resuscitation, administration of pressure to stop bleeding, opening obstructed airways, suturing simple wounds, and the performance of simple obstetrical maneuvers. Such actions require coordination of both gross and fine muscular movements, equilibrium, and functional use of touch and vision.

**IV. Intellectual, Conceptual, Integrative, and Quantitative:** These abilities include measurement, calculation, reasoning analysis, and synthesis. Problem solving, the critical skill demanded of physicians, requires all of these intellectual abilities. In addition, candidates should be able to comprehend three-dimensional relationships and to understand the spatial relationships of structures.

**V. Behavioral and Social:** Candidates must possess the emotional health required for full use of their intellectual abilities, the exercise of good judgment, the prompt completion of all responsibilities attendant to the diagnosis and care of patients, and the development of mature, sensitive, and effective relationships with patients. Candidates must be able to tolerate physically taxing workloads and function effectively under stress. They must be able to adapt to changing environments, display flexibility, and learn to function in the face of uncertainties inherent in the clinical problems of many patients. Compassion, integrity, concern for others, interpersonal skills, interest, and motivation are all personal qualities that are assessed during the admissions and education processes.

### Advanced Standing

The University of Minnesota Medical School Duluth selects applicants only for the first year of medical studies.

### Multicultural Applicants

The University of Minnesota is committed to providing equal opportunities to students from minority groups and from educationally disadvantaged backgrounds. In accord with the regents' statement of January 12, 1979, the University of Minnesota Medical School Duluth encourages members of underrepresented minority groups to seek admission to the Medical School Duluth.

### Immunization Requirements

The following list of required/recommended student immunizations and vaccinations comply with Minnesota state law and Occupational Safety and Health Administration regulations.

If contraindicated for medical reasons, some of these vaccine requirements can be waived, but the student is required to file a waiver documenting the medical exemption.

If an immunization is declined for conscientiously held beliefs, the student must complete a conscientious exemption.

Upon admission, students are required to submit proof of the following immunizations and vaccinations:

- Measles/Mumps/Rubella documentation or positive titre
- Tuberculosis Skin Test (Mantoux)
- Documentation of a two-step Mantoux test. Once enrolled, evidence of an annual Mantoux test or a statement from a provider attesting that the student does not have active tuberculosis (TB) is required.
- A student with a positive Mantoux must show a documented treatment plan to assure that there is not a risk of transmission to students, faculty, or patients.
- Hepatitis B series or documented immunity.
- Record of DTP or Diphtheria/Tetanus within the last 10 years, along with documentation of the vaccine or titre.
- Varicella Zoster, positive history, or positive titre
- An annual influenza immunization is strongly recommended.

Students who are noncompliant cannot register for an academic year without the appropriate immunizations. Students must carry documentation of immunizations to early practice/shadowing experience, service-learning, and clinical rotation sites. A student's failure to have all required immunizations and vaccinations may influence the University's ability to place the student in clinical rotations.

### Rural Physician Associate Program

Each year through the Rural Physician Associate Program (RPAP), up to 40 third-year medical students, accompanied by their spouses and families, study primary health care in Minnesota communities under the experienced supervision of the community physicians, RPAP staff, and medical school faculty. Many physician-preceptors devote their time and resources to this unique medical/educational/community partnership.

October through July, these selected students work closely with community health care professionals. They learn through daily experiences the values, systems, and environment of patient care and medical practice in non-metropolitan settings throughout Minnesota. Since the inception of the RPAP in 1971, more than 1000 medical students have participated in

the program under the tutelage of experienced physician-preceptors in 106 Minnesota communities.

Contact RPAP at 612-624-3111; fax 612-624-2613; [rpapumn@umn.edu](mailto:rpapumn@umn.edu); [www.rpap.umn.edu](http://www.rpap.umn.edu).

## Dual M.D./M.P.H. Program

This program is for medical students who wish to pursue concurrent study in the University's nationally recognized School of Public Health. After completing the two-year preclinical curriculum on the Duluth campus and having received a passing score on the Step 1 USMLE, students accepted into the program take courses in the School of Public Health on the Twin Cities campus and begin work on their graduate project for one year. Following this year, they continue with the two-year clinical portion of the Minneapolis Medical School curriculum, during which time they complete their graduate project. At the end of the five-year program, students receive an M.D. and M.P.H. degree.

Students may apply to enter the program before their second year at University of Minnesota Medical School Duluth.

## Residence and Reciprocity

**Residence**—Because the University is a state institution, Minnesota residents pay lower tuition than nonresidents and, in many programs, receive priority consideration for admission. To qualify for resident status, students must reside in Minnesota for at least one calendar year before the first day of class attendance. For more information, contact the Resident Classification and Reciprocity Office Chair, 139 Darland Administration Building, 1049 University Drive, Duluth, MN 55812 (218-726-8799).

**Reciprocity**—Residents of North Dakota and South Dakota who attend the University of Minnesota may apply for reciprocity privileges and pay a tuition rate comparable to the resident rate. Application for reciprocity is separate from the regular admission application. Eligible students should obtain a reciprocity application form from their home state reciprocity program office. Processing of the form by a student's home state will take from four to six weeks. Nonresidents who have not applied or are not eligible for reciprocity, will be charged nonresident tuition rates.

Applicants should contact the following offices as reciprocity contracts can change yearly.

North Dakota Board of Higher Education  
State Capitol Building  
600 East Boulevard Avenue, Dept. 215  
Bismarck, ND 58505-0154  
Phone: 701-328-4113  
[www.ndus.nodak.edu](http://www.ndus.nodak.edu)

South Dakota Board of Regents  
Reciprocity Program  
Box 2201  
Brookings, SD 57007  
Phone: 605-688-4497  
[www.sdbor.edu](http://www.sdbor.edu)

## Tuition and Fees

University of Minnesota medical students attend three semesters their first year and two semesters their second year.

	2009-10 tuition per term including summer	
	Resident	Nonresident
First year	\$10,176	\$12,812
Second year	\$9,691	\$12,202

Under the innovative "Cost of Degree" Tuition Policy, tuition, once determined, remains fixed until the completion of the M.D. degree.

Fees	
First year	\$2,915*
Second year	\$2,172*

\*All fees are subject to change. See [www.med.umn.edu/duluth/admissions/](http://www.med.umn.edu/duluth/admissions/) for current tuition rates.

Students must purchase books, ophthalmoscopes, otoscopes, and white coats; laboratory coats for gross anatomy are purchased in the first year of medical school. Books and supplies are approximately \$2,594 for the first year and \$1,902 for the second year.

Health insurance is mandatory. The University plan for AHC students can be found at: [www.shb.umn.edu/duluth/ahc-students.htm](http://www.shb.umn.edu/duluth/ahc-students.htm).

## Student Employment

Medical students are strongly discouraged from engaging in work outside their medical school studies. Prospective students should carefully scrutinize their projected financial needs through the years of medical school and make appropriate arrangements to meet these needs through the help of parents, personal savings, and loans. Medical school is demanding and it is to the student's disadvantage to diminish this critical and important experience with outside commitments.

### Scholarships and Loans

Financial aid is available in the form of regional scholarships, federal loans to students in the health professions, special loan funds, and designated prizes. With few exceptions, students must be accepted for admission and be regularly enrolled to qualify for these funds. Most financial assistance is administered by the University's Office of Student Finance or by the Minnesota Medical Foundation (see below). Sources of financial aid are limited and generally available only to those who demonstrate financial need.

### Minnesota Medical Foundation

The Minnesota Medical Foundation (MMF) is a nonprofit organization that raises millions of dollars annually for health-related research, education, and service at the University of Minnesota Medical School. The Duluth campus has a rich history of individual and corporate philanthropy that supports the advancement of health-related education and research, including student scholarships, endowed chairs and professorships to attract and retain outstanding educators, and discretionary funds to support emerging educational and research priorities. MMF also administers two loan programs to assist medical students. The emergency loan program provides cash loans for 90 days with no interest or carrying charges. The loan amount can be up to \$600 with the understanding it is to be repaid within 90 days. The long-term loan program provides cash loans interest free up until the date the student graduates. Once the student graduates the loans roll into a five-year term loan with interest at 6 percent. The amount of the loan is determined by the University of Minnesota Duluth Medical School Administration office. Long-term loans are considered part of the student's overall financial aid package. On the Duluth Campus, contact the MMF director of development, Michelle Juntunen at 218-726-6876 or Dina Flaherty at 218-726-6548. MMF offices on the Minneapolis campus are located at 200 Oak Street S.E., Suite 300, Minneapolis, MN 55455-2030, 1-800-922-1663.



# Curriculum

## Overview

The University of Minnesota Medical School Duluth curriculum originally was developed by the faculty in consultation with members of the University of Minnesota's Medical School in Minneapolis, practicing physicians in the community, and curricular consultants from many other medical schools. Over the years, the curriculum has evolved into a strong academic and clinical program with continued input from practicing physicians and faculty.

During the two years of study, students are exposed to the various basic, behavioral, and clinical sciences to prepare them for continuing their studies in Minneapolis.

For medical students entering in the fall of 2009, the first-year curriculum will include presentations in applied anatomy, clinical pathology conferences, an introduction to rural primary care medicine, coursework in the clinical and behavioral sciences, and the following integrated courses: principles of basic medical sciences, histopathology, hematopoiesis and host defenses, dermatology and the musculoskeletal system, and the nervous system. This coursework is correlated with the appropriate clinical examples and incorporates the latest features of computerized and CD program instruction. During the second year for those students, clinical material will again be

correlated with basic science presentations in the following integrated courses: the gastrointestinal hepatobiliary system, respiratory medicine, fluids and electrolytes, the cardiovascular system, the endocrine and reproductive system, and integrated clinical medicine. Additional courses in the behavioral sciences are offered in the second year (behavioral medicine, medical social-psychology and psycho-social-spiritual aspects of life-threatening illness) as well as ongoing clinical pathology conferences and a medical epidemiology and biometrics course. During this year, the student spends more time in clinical settings and receives more intensive instruction in clinical medicine. During these first two years of medical school, elective courses are offered as follows: summer internship in medicine; seminars in Indian health, medical education through diversity and service; the healer's art; longitudinal obstetrics; and rural academy of leadership.

For medical students entering in the fall of 2010, the first-year curriculum will include an introduction to rural primary care medicine, coursework in the clinical and behavioral sciences in social and behavioral medicine course blocks, and the following integrated courses; foundations of medicine; skin and musculoskeletal medicine; neurological medicine; immunology, hematology and oncology. This coursework is correlated with the

appropriate clinical examples and incorporates the latest features of computerized and CD program instruction as well as instruction in our human patient simulation center. Students will also complete five weeks of experiential learning in a Rural Health Scholars program, incorporating rural community preceptorship experiences, service learning projects, and longitudinal care experiences with an assigned panel of patients. During the second year for those students, clinical material will again be correlated with basic science presentation in the following integrated courses: cardiovascular, respiratory, renal and acid-base; gastrointestinal medicine; hormonal and reproductive medicine. During this year, the student spends more time in clinical settings and receives more intensive instruction in clinical medicine. Second year students will also complete two additional social and behavioral medicine course blocks and two additional Rural Health Scholars program blocks. During these first two years of medical school, elective courses are offered as follows: summer internship in medicine; seminars in Indian health, medical education through diversity and service; the healer's art; longitudinal obstetrics; and rural academy of leadership.

During both years of study, students participate in the Family Practice Preceptorship Program. In the first year, each student is assigned to a family practitioner within the immediate geographic area and is introduced to medicine as practiced in its actual setting. Later in the first year and during the second year the preceptorship involves the student with physicians who practice in nonurban areas of northern Minnesota and Wisconsin.

The combination of classroom and clinical experiences throughout the two years enables students to acquire the necessary knowledge of the scientific basis for medical practice while at the same time reinforcing this knowledge by active participation in patient care. Students are assured of adequate preparation for continuing their studies.

### Grades and Progress

Examinations and other forms of evaluation of student performance are administered by the various departments and, in some cases, by interdepartmental teaching teams. Grades are reported as O (outstanding), E (excellent), S (satisfactory), I (incomplete), or N (no credit), and appear as such on the official University transcript.

The Scholastic Standing Committee of the School Assembly is charged with the responsibility of monitoring each student's performance while

enrolled. Academic probation is one mechanism used by the faculty to signal that a student's standing in the medical school is in jeopardy. In circumstances where the development of clinical skills, the acquisition of knowledge, or personal conduct in a clinical setting is inconsistent with a student's potential capability as a physician, the Scholastic Standing Committee may recommend dismissal of the student to the School Assembly.

### Courses and Symbols

Courses listed are required for first- and second-year medical students. Most required and elective medical courses are open to upper division undergraduate and graduate students through special arrangement if space is available and approval of the appropriate adviser(s) and course instructor(s) is obtained.

The following standard symbols are used throughout the course descriptions in lieu of footnotes.

Prereq.....Prerequisite.

DGS .....Director of Graduate Studies.

.....In prerequisite listings, comma means "and."

#.....Approval of the instructor is required for registration.

%.....Approval of the department offering the course is required for registration.

### Department of Anatomy, Microbiology, and Pathology

Patrick C. J. Ward, M.B., B.Ch. FASCP,  
*department head*

#### Division of Anatomy and Cell Biology

##### Professor

Arlen R. Severson, Ph.D., *division head*

##### Associate Professor

Stephen W. Downing, Ph.D.

Donna J. Forbes, Ph.D.

M. Kent Froberg, M.D., *adjunct*

Jon M. Holy, Ph.D.

Lillian A. Repesh, Ph.D.

##### Senior Research Associate

Richard L. Leino, Ph.D.

Anatomy and cell biology deals with the structural basis of human medicine (from macrostructure to ultrastructure) and its correlation with function. Human gross anatomy, embryology, histology, and neuroanatomy are taught as part of several integrated courses in the medical school curriculum. Considerable emphasis is placed on basic-clinical science correlations throughout the study of the anatomical sciences. Anatomy and cell biology

introduces the medical student to much of the basic language and anatomical concepts used in clinical practice.

## Division of Medical Microbiology and Immunology (MICB)

### Professor

Richard J. Ziegler, Ph.D.  
Arthur G. Johnson, Ph.D., *emeritus*

### Associate Professor

Benjamin L. Clarke, Ph.D.

Medical microbiology and immunology components of courses familiarize students with concepts basic to understanding infectious diseases and their management. Characteristics of important pathogenic members of the microbial world—bacteria, viruses, fungi, and parasites—are discussed, with emphasis on communicability, invasive properties, toxigenicity, and lab identification. The multifaceted immune response of the host to infectious agents is defined and characterized. In addition, the aberrant response of the immune system resulting in allergic and pathological reactions is addressed.

## Division of Pathology and Laboratory Medicine (PATH)

### Professor

Patrick C. J. Ward, M.B., B.Ch. FASC, *division head*  
Arthur C. Aufderheide, M.D., *emeritus*

### Associate Professor

M. Kent Froberg, M.D., *adjunct*

### Assistant Professor

Kristine Krafts, M.D.

### Clinical Assistant Professor

Sarah J. Lundeen, M.D.  
Thomas C. Nelson, M.D.  
Patrick A. Twomey, M.D.  
Daniel P. Vandersteen, M.D.  
Krista U. Warren, M.D.  
Geoffrey A. Witrak, M.D.

Human pathology is the study of anatomic changes in body tissues occurring in disease states. Correlation between anatomic changes and clinical signs and symptoms under disease conditions is emphasized. Special effort is made to integrate subject matter with the content of courses taught in other disciplines.

## Graduate Courses

### MICB 5545. Immunobiology. (3 cr. Prereq-#)

The immune system, including the cells and molecules which work cooperatively to resist disease and aberrations resulting in immune disorders.

### MICB 5555. Molecular Pathogenesis: Current Concepts.

(3 cr. Prereq-BIOL 2201 or equiv, BIOL 4501 or equiv or #; spring, odd years)

Study of current discoveries in microbial pathogenesis and the molecular techniques used in elucidating pathogenic mechanisms of viral, bacterial and parasitic agents. A survey of current literature related to human infectious disease including malignant transformation.

### MICB 5591. Problems in Medical Microbiology and Immunology. (1-4 cr [max 8 cr]. Prereq-Open to med students or qualified upper div and grad students with #)

Independent study on tutorial basis. Emphasis on basic and clinical microbiology problems, including immunology. Investigative work and appropriate reading arranged with tutorials consistent with interests and capabilities of individual students.

### MICB 8333. FTE: Master's. (1 cr. Prereq-Master's student, adviser and DGS consent)

### MICB 8444. FTE: Doctoral. (1 cr. Prereq-Doctoral student, adviser and DGS consent)

### MICB 8554. Advanced Immunology and Immunobiology. (2 cr. Prereq-5545 or #)

Detailed study of mechanisms involved in immunologic defense. Emphasis on concepts and current literature.

### MICB 8666. Doctoral Pre-Thesis Credits. (1-18 cr. Prereq-Max 18 cr per semester or summer; doctoral student who has not passed prelim oral)

### MICB 8777. Thesis Credits: Master's. (1-18 cr. Prereq-Max 18 cr per semester or summer; 10 cr total required [Plan A only])

### MICB 8888. Thesis Credits: Doctoral. (1-18 cr. Prereq-Max 18 cr per semester or summer; 24 cr required)

## Department of Behavioral Sciences (BHSC)

### Professor

Mustafa N. al' Absi, Ph.D. (joint with Family Medicine)  
James G. Boulger, Ph.D. (joint with Family Medicine),

#### *Department Head*

Richard M. Eisenberg, Ph.D.  
Barbara A. Elliott, Ph.D. (joint with Family Medicine)  
Frederic W. Hafferty, Ph.D.

### Associate Professor

Gary L. Davis, Ph.D.,  
Richard G. Hoffman, Ph.D.  
Jane Hovland, Ph.D.  
Robert Gibson, Ph.D., *emeritus*

### Clinical Associate Professor

Tamara J. Dolenc, M.D.  
Fred T. Friedman, M.D.

### Clinical Assistant Professor

Steven J. Bauer, M.D.  
Peter Miller, M.D.  
Steven J. Sutherland, M.D.  
Tracy Tomac, M.D.

The offerings in this discipline provide an analysis of those facets of human behavior that bear most heavily on the practice of medicine. The courses encompass both the social science of medicine (e.g., analysis of the medical profession, the hospital as a social system, and the doctor-patient relationship) and social science

in medicine (e.g., the impact of social attitudes on illness behavior, interviewing techniques, and the developmental process). In addition, the student is given a solid grounding in behavioral medicine and psychopathology.

### Required Courses—First Year

**BHSC 6211. Medical Sociology.** (1 cr. Prereq—Regis med student)  
Advanced aspects of sociology and its application to areas of medical science. Emphasis on doctor-patient relationship, role of medicine in society, and institutionalization of medical care through hospitals, medical schools, and medical profession.

**BHSC 6230. Medical Psychology: Interviewing.** (1 cr. Prereq—Regis med student)  
Psychological aspects of interviewing in health care settings; interpersonal communicative skills and problems; techniques of rapport building and history taking.

**BHSC 6652. Human Behavioral Development and Problems.** (4 cr. Prereq—Regis med student)  
Human psychological development throughout life; normal cognitive, learning, social, and personality development; problems expressed during various stages of life in the family and other settings. Assessment/treatment described as relevant to practice of family medicine.

**BHSC 6701. Medical Ethics.** (2 cr. Prereq—Regis med student; no Grad School cr)  
Basic concepts and skills of medical ethics, including core values, clinical issues, and case analysis.

### Required Courses—Second Year

**BHSC 5591. Studies in Medical Behavioral Sciences.** (2 cr. Prereq—Regis med student, #)  
Selectives on topics in general medical behavioral science, typically including women's mental health issues, chronic pain, socialization into medicine, aging, hypnosis, and others.

**BHSC 6200. Behavioral Medicine.** (1 cr. Prereq—Regis med student)  
Introduction to contemporary behavioral medicine. Interface of biological, psychological, and social factors in a range of health issues, including stress, substance abuse, chronic pain and illness, cardiovascular disease, obesity, and infectious diseases.

**BHSC 6260. Psycho-Social-Spiritual Aspects of Life-Threatening Illness.** (2 cr. Prereq—Regis med student)  
Psychological, social, and spiritual coping of patients, families, and health care professionals as they experience life-threatening illnesses. Effective intervention strategies for health care professionals are emphasized. Post-death responses of families and care providers.

### Graduate Courses

**BHSC 5491. Problems in Medical Behavioral Sciences.** (1-6 cr. Prereq—Med or upper div or grad student, #; max 6 cr to Grad School program)  
Independent study on a tutorial, seminar, or lecture basis. Investigative work, lecture material, and/or appropriate reading and discussions designed according to interest and capabilities of individual student.

## Department of Biochemistry and Molecular Biology (MDBC)

### Professor

Matthew T. Andrews, Ph.D. (joint with Biology)  
Lester R. Drewes, Ph.D., *department head*  
Joseph R. Prohaska, Ph.D.  
Jean F. Regal, Ph.D.  
Kendall B. Wallace, Ph.D.  
Paul M. Anderson, Ph.D., *emeritus*

### Associate Professor

Subhash C. Basak, Ph.D., *adjunct*  
Benjamin L. Clarke, Ph.D., *adjunct*  
Thomas E. Huntley, Ph.D., *emeritus*  
Wilmar Salo, Ph.D., *emeritus*

### Assistant Professor

Grant Anderson, Ph.D., *adjunct*  
Clay Carter, Ph.D., *adjunct*  
Robert T. Cormier, Ph.D.  
Ken Dornfeld, M.D.

### Research Assistant Professor

Patricia Scott, Ph.D.

Courses with components in biochemistry and molecular biology (MED 6520, MED 6541, MED 6566, MED 6573, MED 6724) introduce students to the molecular basis of cell life processes. This includes an examination of the central molecules of life—DNA, RNA, and protein; methods for exploring protein and genes and the power of genomic technology; interplay between three-dimensional structure and biological activity (function); generation and storage of metabolic energy; biosynthesis of macromolecules; and transmission and expression of genetic information. Advanced courses cover biochemical aspects of endocrinology, nutrition, neurochemistry, and other topics related to specific tissues or organ systems. Those areas of biochemistry and molecular biology most closely related to the medical sciences and clinical medicine are emphasized.

An elective course in neurobiochemistry (MDBC 5501) expands on basic aspects of brain development, metabolism function, and mechanisms of memory.

### Graduate Courses

**MDBC 5201. Topics in Biochemistry.** (3 cr. Prereq—CHEM 3322 or CHEM 4341 or #; A-F only)  
In-depth coverage and expansion of selected biochemical principles introduced in introductory undergraduate courses.

**MDBC 5202. Cellular and Molecular Biology.** (3 cr. Prereq—BIOL 2101 or BIOL 5231 or CHEM 4342 or #; A-F only)  
In-depth coverage of selected topics in cellular and molecular biology. Most topics will have been introduced in undergraduate courses.

**MDBC 5501. Neurobiochemistry.** (2 cr. Prereq—CHEM 3322 or CHEM 4342 or #)  
Current concepts on anatomical and compositional

properties of brain; membranes and transport; neurotransmission; receptors and signal transduction mechanisms; energy, carbohydrate, protein, lipid, and nucleic acid metabolism; development and diseases of the central nervous system.

**MDBC 8151. Biochemistry Seminar.** (1 cr [max 4 cr]. Prereq—Biochem or chem grad student or #)  
Current topics in biochemistry.

**MDBC 8294. Current Research Techniques.** (1-3 cr [max 4 cr]. Prereq—Biochem or chem grad student or #)  
Research projects in biochemistry, each carried out in research lab of a faculty member.

**MDBC 8333. FTE: Master's.** (1 cr. Prereq—Master's student, adviser and DGS consent)

**MDBC 8444. FTE: Doctoral.** (1 cr. Prereq—Doctoral student, adviser and DGS consent)

**MDBC 8666. Doctoral Pre-Thesis Credits.** (1-18 cr. Prereq—Max 18 cr per semester or summer; doctoral student who has not passed prelim oral)

**MDBC 8777. Thesis Credits: Master's.** (1-18 cr. Prereq—Max 18 cr per semester or summer; 10 cr total required [Plan A only])

**MDBC 8888. Thesis Credits: Doctoral.** (1-18 cr. Prereq—Max 18 cr per semester or summer; 24 cr required)

## Department of Family Medicine and Community Health (FMED)

### Departmental Faculty

Jeffrey Adams, M.D.  
Raymond Christensen, M.D.  
Joy Dorscher, M.D.  
Barbara Elliott, Ph.D.  
Alan Johns, M.D.  
Glenn Nordehn, D.O.  
Susan Nordin, M.D.  
Jennifer Pearson, M.D.  
Ruth Westra, D.O., *department head*

### Joint Faculty Members With Behavioral Sciences

Mustafa al'Absi, Ph.D.  
James Boulger, Ph.D.

### Duluth Family Medical Center Faculty

Thomas Day, M.D., director  
David Hutchinson, M.D.  
Kim Krueger, M.D.  
Meghan Mahoney, M.D.  
Roger Waage, M.D.

### Family Medicine Adjunct Faculty

For listing, please call 218-726-7802 or 218-726-8552.

The department offers coursework in basic, supportive, and applied areas. Students should be able to competently take a complete history and perform a complete physical examination by the end of their first year. Diagnostic skills are strengthened throughout the second year, primarily through didactic lectures and clinical involvement with selected patients. The family practice preceptorship enables the student to assess practice characteristics of a number of family physicians in different locations.

## Required Courses—First Year

**FMED 6101. Family Medicine.** (2 cr. Prereq—Regis med student)  
Lectures and seminars on disease syndromes affecting human organ systems and on disease prevention with reference to health issues in epidemiology, environment, and public health; exposure to community preventive health and alternative medicine programs; provides basic foundation in current computer technology.

**FMED 6121. Preceptorship I.** (1 cr. Prereq—Regis med student)  
Students spend periods with area physician in family medicine observing problems encountered in this type of practice and methods by which health care is delivered.

**FMED 6122. Preceptorship II.** (4 cr. Prereq—Regis med student)  
Students spend periods with area physician in family medicine observing problems encountered in this type of practice and methods by which health care is delivered.

**FMED 6501. Clinical Pathology Conferences I.** (1 cr. Prereq—Regis med student)  
Applying knowledge gained in pathology and laboratory medicine to an unknown clinical case in order to work through a differential diagnosis.

## Elective Courses—First Year

**FMED 6957 Medical Education for Diversity and Service.** (1 cr. Prereq—Regis Duluth med student)  
Group setting allows students who will not travel to share in intercultural medical education experiences of those who do. Experience preparation/debriefing exercises.

**FMED 6977. Family Connection.** (1 cr. Prereq—Regis med student, #; cannot be regis for FMED 6987; limited enrollment)  
Introduces first-year medical students to family health care concepts through contact with an assigned family in conjunction with their local family physician; lectures and small-group discussions.

**FMED 6987. Obstetrical Longitudinal Course.** (1 cr. Prereq—Regis med student, #; cannot be regis for FMED 6977; limited enrollment)  
Introduces first-year medical students to obstetrical care through small-group lectures and discussions while following an obstetrical patient on a longitudinal basis in conjunction with a local family practitioner or OB specialist.

**FMED 6997. Rural Academy of Leadership.** (1 cr; Prereq—Preregis med, #; spring, offered periodically)  
Learn how to use interests and talents in the community through volunteer service and leadership. Consists of lecture/discussion sessions and training/orientation retreat to prepare for volunteer activities at a local free clinic. Includes a community service project that culminates in a presentation to others at the end of the course.

## Required Courses—Second Year

**FMED 6441. Clinical Rounds and Clerkship I.** (1 cr. Prereq—Regis med student)  
Clinical practicum, hospital based, covering core material in family practice, internal medicine, obstetrics, pediatrics, surgery. Patient work-ups with discussion by preceptor.

**FMED 6442. Clinical Rounds and Clerkship II.** (2 cr. Prereq—Regis med student)  
Clinical practicum, hospital based, covering core material in family practice, internal medicine, obstetrics, pediatrics, surgery. Patient work-ups with discussion by preceptor.

## Curriculum

### **FMED 6461. Preceptorship III.** (2 cr. Prereq—Regis med student)

Students spend periods of time with a physician in family practice in rural/small communities of Minnesota and Wisconsin observing methods by which health care is delivered.

### **FMED 6462. Preceptorship IV.** (3 cr. Prereq—Regis med student)

Students spend periods of time with a physician in family practice in rural/small communities of Minnesota and Wisconsin observing methods by which health care is delivered.

### **FMED 6502. Clinical Pathology Conferences II.** (1 cr. Prereq—Regis med student)

Applying knowledge gained in pathology and laboratory medicine to an unknown clinical case in order to work through a differential diagnosis.

## Undergraduate and Graduate Course

### **FMED 5591. Independent Study.** (1-8 cr [max 12 cr]. Prereq—%)

Intensive, independent study project of student's interest in medical research, interdisciplinary fellowship, preceptorship in rural health care delivery, or another medical area approved by Department of Family Medicine.

## Elective Course

### **FMED 6967. Healer's Art.** (1 cr. Prereq—Regis med student, #; limited enrollment)

Provides a basis for inquiry and discussion between medical students and clinical faculty on topics that are entwined within the practice of medicine.

## Additional Courses—Residents

### **FMED 7100. Clinical Family Medicine.** (5-15 cr [max 90 cr]. Prereq—%; no Grad School cr)

Supervised care of patients of all ages emphasizing continuous, primary, preventive, acute, and chronic care in all general diagnostic categories.

## Interdisciplinary (MED)

### Required Courses—First Year

#### **MED 6420. Introduction to Rural Primary Care.** (2 cr. Prereq—Regis med student)

Introduces medical students to rural medicine and community health assessments through lecture, panel discussions, small group encounters, and rural community visits.

#### **MED 6505. Applied Anatomy.** (8 cr. Prereq—Regis med student)

Adult gross structure taught using regional approach with strong emphasis on functional and clinical applications. Basic-clinical science correlation conferences held frequently to emphasize applied anatomy of a region.

#### **MED 6510. Histopathology.** (6 cr. Prereq—Regis med student)

Integrated course correlating normal structure and function of cells, tissues, and organs of the body with examples of pathological changes that take place within these cells, tissues, and organs during disease processes.

#### **MED 6520. Principles of Basic Medical Science.** (9 cr. Prereq—Regis med student)

Introduction to cellular homeostatic principles and mechanisms associated with normal and abnormal structure and function. Basic science principles of integrative medical sciences. Interdisciplinary sessions emphasize fundamental concepts of biochemistry,

molecular biology, anatomy, microbiology, physiology, and pharmacology.

#### **MED 6541. Hematopoiesis and Host Defenses.** (9 cr. Prereq—Regis med student)

Introduction to principles of human immunology and hematology. Basic science principles, including pharmacology and pathology together with clinical aspects of innate and acquired immunity within context of hemato-lympho-reticular system.

#### **MED 6573. Nervous System.** (11 cr. Prereq—Regis med student)

Interdisciplinary study of human nervous system, including consideration of eye and ear. Basic sciences of anatomy, behavioral science, biochemistry, microbiology, pathology, pharmacology, and physiology correlated with clinical material.

#### **MED 6788. Dermatology and Musculoskeletal System.** (5 cr. Prereq—Regis med student)

Interdisciplinary study of integument and musculoskeletal system. Basic sciences of anatomy, microbiology, pathology, pharmacology, and physiology correlated with clinical material.

### Required Courses—Second Year

#### **Med 6301. Medical Epidemiology and Biometrics.** (3 cr. Prereq—Regis med student; no Grad School cr)

Basic elements of biostatistics, including descriptive and inferential statistics, study design, probability statistics and ordering and interpreting diagnostic tests. Topics in clinical epidemiology and epidemiologic methods.

#### **MED 6566. Cardiovascular System.** (7 cr. Prereq—Regis med student)

Integrated comprehensive overview of cardiovascular system. Anatomical, biochemical, physiological, pathological, and pharmacologic aspects of heart, blood vessels, and blood, including histology, embryology, anatomy, gross and microscopic pathology, as well as clinical features, diagnosis, and pharmacological therapy.

#### **MED 6724. Gastrointestinal Hepatobiliary System.** (6 cr. Prereq—Regis med student)

Interdisciplinary integrative course discusses fundamental concepts of anatomy, physiology, nutrition, pathology, clinical medicine, and microbiology as they relate to issues of gastrointestinal and hepatobiliary system.

#### **MED 6728. Respiratory System.** (5 cr. Prereq—Regis med student)

Maintenance and regulation of human internal environment by the respiratory system. Histology of upper airways and lungs; respiratory gas exchange; introduction to respiratory component of acid-base balance. Integrative lab covering cardiovascular-respiratory adjustments to exercise.

#### **MED 6746. Fluids and Electrolytes.** (4 cr. Prereq—Regis med student)

Introduction to principles and mechanisms associated with human renal and genitourinary function in health and disease. Integrates anatomical, physiological, pharmacological, pathological, immunological, and basic clinical aspects of renal and genitourinary systems in context of fluid and electrolyte homeostasis.

#### **MED 6762. Endocrine and Reproductive System.** (5 cr. Prereq—Regis med student)

Structure and function of endocrine and reproductive systems. Essential background for understanding findings of clinical medicine related to endocrine regulation of reproduction and homeostasis.

**MED 6773. Integrated Clinical Medicine.** (6 cr. Prereq–Regis med student)

Integration of basic, clinical, and behavioral science principles to understand the human body and its integrative function and psychosocial responses, especially in multisystem conditions. Emphasizing evidence-based medicine principles, health issues are explored over the life cycle from pediatrics to geriatrics.

**MED 6997. Summer Internship in Medicine.** (3-12 cr. Prereq–Regis med student, satisfactory completion of first yr medical school; no Grad School cr)

Medical students, typically between their first and second year of medical school may elect to participate in either directed clinical experiences in small communities or research studies.

## Undergraduate and Graduate Courses

**MED 3998. Human Biology and Behavior Topics.** (1-10 cr [max 12 cr]. Prereq–#)

Advanced undergraduate or graduate students can study in depth normal human biology and behavior. During the academic year, students may elect to enroll in one or several subtopics. No basic science clinical correlation.

**MED 6023. Seminars in Indian Health.** (1-2 cr. Prereq–Regis med student)

Current issues impacting health of Indian people. Causes of morbidity and mortality, including social, cultural, and economic issues. Discussion focuses on solutions to problems in context of Indian communities.

## Department of Physiology (PHSL) and Pharmacology (PHCL)

### Professor

B. Göran Hellekant, D.V.M., Ph.D.

Lois J. Heller, Ph.D.

George J. Trachte, Ph.D.

Lloyd Beck, Ph.D., *emeritus*

### Associate Professor

Benjamin L. Clarke, Ph.D.

Janet L. Fitzakerley, Ph.D.

John Keener, Ph.D., *adjunct*

David E. Mohrman, Ph.D., *emeritus*

Edward K. Stauffer, Ph.D.

Lorentz E. Wittmers, Jr., M.D., Ph.D., *department head*

### Assistant Professor

Jeffrey Gilbert, Ph.D.

Irina Haller, Ph.D., *adjunct*

Teresa Rose-Hellekant, D.V.M., Ph.D.

Physiology is the science that studies the principles governing the functions of biological systems such as the nervous, cardiovascular, renal, respiratory, and endocrine systems. A number of course hours are devoted to demonstrating the applicability of physiology to various clinical disciplines through integrative sessions that emphasize basic physiologic principles.



Pharmacology is the science concerned with the actions of drugs, chemicals, and other biologically active agents on biological processes. The sequence of courses in pharmacology deals with principles of drug action; prototype drugs and their congeners and how each of these drugs affects biochemical and physiological processes; the manner and mechanism whereby drugs can ameliorate or correct pathological processes; clinical toxicology; and drugs used in emergency situations. Because drugs only alter existing biochemical, physiological, or pathological processes rather than produce *de novo* effects, an extensive knowledge of these related disciplines will normally be required as preparation for the study of pharmacology.

## Undergraduate and Graduate Courses

**PHCL 4094. Directed Research in Pharmacology I.** (1-10 cr [max 10 cr]. Prereq–Upper div sci major, #)

**PHCL 5001. Introduction to Pharmacology.** (2 cr. Prereq–BIOL 1011, CHEM 1151-1152, CHEM 2521-2522, PHYS 3011 or #) Elementary course in pharmacology. Actions and use of drugs in selected health conditions.

**PHCL 5094. Directed Research in Pharmacology II.** (1-10 cr [max 10 cr]. Prereq–Grad student, #)

**PHCL 5204. Pharmacology Seminar.** (1 cr [max 4 cr]. Prereq–Grad student, #) Presentation of selected research problems and current journal articles.

**PHCL 5702. Intracellular Signaling.** (2 cr. Prereq–PHSL 5601 or IBS 8103, #; spring 09, odd yrs only) Comprehensive study of the intracellular processes used by mammalian cells to respond to signals from other cells.

**PHCL 8333. FTE: Master's.** (1 cr. Prereq–Master's student, adviser and DGS consent)

**PHCL 8444. FTE: Doctoral.** (1 cr. Prereq–Doctoral student, adviser and DGS consent)

**PHCL 8666. Doctoral Pre-Thesis Credits.** (1-18 cr. Prereq–Max 18 cr per semester or summer; doctoral student who has not passed prelim oral)

**PHCL 8777. Thesis Credits: Master's.** (1-18 cr. Prereq–Max 18 cr per semester or summer; 10 cr total required [Plan A only])

**PHCL 8888. Thesis Credits: Doctoral.** (1-18 cr. Prereq–Max 18 cr per semester or summer; 24 cr required)

## Curriculum

**PHSL 3011. General Physiology.** (4 cr. Prereq—BIOL 1761, CHEM 1102 or #)

Lectures and demonstrations illustrate key aspects of function and mechanisms of action of major organ systems. Primarily for students preparing for nursing, dental hygiene, pre-professional programs, communication disorders, life science teaching, majors in natural sciences.

**PHSL 5211. Literature Seminar.** (1-2 cr [max 2 cr]. Prereq—#)

Oral presentation of written literature review and research data reflecting student's research interests and thesis research results.

**PHSL 5292. Readings in Physiology.** (1-3 cr [max 3 cr]. Prereq—#)

Topics in physiology selected for each student; written reviews prepared and discussed.

**PHSL 5294. Research in Physiology.** (1-15 cr [max 15 cr]. Prereq—#)

Introduction and use of lab techniques and equipment used for research in various subspecialties of physiology, including neurophysiology, cardiovascular physiology, endocrinology, respiratory and transport process, electrophysiology, and renal physiology.

**PHSL 5601. Physiology of Organ Systems I.** (4 cr. Prereq—BIOL 2101 or BIOL 2201 or CHEM 3322 or CHEM 4341 or #)

Survey of physiologic functions and interrelationships of organ systems in mammals (musculoskeletal, cardiovascular, renal, respiratory, nervous, endocrine, and reproductive). Framework for understanding physiological processes, allowing students to integrate knowledge gained at molecular level with functions of whole organism.

**PHSL 5602. Physiology of Organ Systems II.** (2 cr. Prereq—5601 or #)

Advanced study of organ system functions in context of interaction of organism with environment.

**PHSL 5701. Sensory Physiology.** (2 cr. Prereq—PHSL 5601 or IBS 8103, #; spring, even yrs only)

Comprehensive study of mammalian sensory processing, with a focus on the auditory, visual and gustatory systems.

**PHSL 8333. FTE: Master's.** (1 cr. Prereq—Master's student, adviser and DGS consent)

**PHSL 8401. Physiology of Aging.** (2 cr. Prereq—5601, #)

In-depth study of several theories concerning physiological processes that appear to set the limits of maximum human life span.

**PHSL 8405. Muscle Physiology.** (2 cr. Prereq—5601, #)

In-depth review and discussion of physiological processes involved in muscle contraction from subcellular events to neural-controlled function of whole muscle (skeletal, cardiac, and smooth muscle).

**PHSL 8415. Topics in Endocrinology.** (2 cr. Prereq—5601, #)

Selected topics of current endocrine research interest examined in depth; historical background, questions posed by current research, and implications of current research for future development in the area.

**PHSL 8441. Transport Processes.** (2 cr. Prereq—5601, #)

In-depth quantitative approach to transport processes in biological systems.

**PHSL 8444. FTE: Doctoral.** (1 cr. Prereq—Doctoral student, adviser and DGS consent)

**PHSL 8666. Doctoral Pre-Thesis Credits.** (1-18 cr. Prereq—Max 18 cr per semester or summer; doctoral student who has not passed prelim oral)

**PHSL 8777. Thesis Credits: Master's.** (1-18 cr. Prereq—Max 18 cr per semester or summer; 10 cr total required [Plan A only])

**PHSL 8888. Thesis Credits: Doctoral.** (1-18 cr. Prereq—Max 18 cr per semester or summer; 24 cr required)

## Graduate Programs

### Integrated Biosciences Ph.D. and M.S.

**Director of Graduate Studies: Professor George Trachte**

The all-university integrated biosciences graduate program offers study toward the doctor of philosophy (Ph.D.) degree and master of science (MS.) degree under Plan A (coursework and original thesis). The program has two areas of emphasis: cell, molecular, and physiological (CMP) biology and ecology, organismal, and population (EOP) biology. Additional information can be found at [www.d.umn.edu/ibs](http://www.d.umn.edu/ibs).

**IBS 5101. Biochemistry and Molecular Biology.** (3 cr; Prereq—Chem 4341 or equiv; A-F only, spring every year)

**IBS 8011. Integrated Biological Systems.** (2 cr; Prereq—IBS grad student; A-F only, fall, every year)

**IBS 8012. Integrated Evolutionary Processes.** (2 cr; Prereq—8011, IBS grad student; A-F or Aud, spring, every year)

**IBS 8020. Integrated Biosciences Colloquia.** (1 cr [max 4 cr]; Prereq—IBS grad student; S-N only, fall, spring, every year)

**IBS 8030. IBS Research Club.** (1 cr [max 5 cr]; Prereq—IBS grad student; S-N or Aud, fall, spring, every year)

**IBS 8094. Rotations.** (1 cr; Prereq—IBS Graduate Student; S-N only, fall, spring, every year)

**IBS 8099. The Biological Practitioner.** (1 cr; Prereq—IBS Graduate Student; S-N or Aud, fall, every year)

**IBS 8102. Cell, Molecular and Developmental Biology.** (3 cr; Prereq—5101, CHEM 4342 or equivalent, IBS Grad School student; A-F only, spring, even years)

**IBS 8103. Comparative Animal Physiology.** (3.0 cr; Prereq—One year of college biol, two years of college chem; 8011, IBS Grad School student; A-F only, spring, odd years)

**IBS 8201. Ecological Processes.** (2 cr; Prereq—8011, IBS Grad School student; A-F or Aud, spring, fall, based on instructor availability)

**IBS 8333. FTE: Master's.** (1 cr; Prereq—Master's student, adviser and DGS consent; No Grade, fall, spring, summer, every year)

**IBS 8444. FTE: Doctoral.** (1 cr; Prereq—Doctoral student, adviser and DGS consent; No Grade, fall, spring, summer, every year)

**IBS 8666. Doctoral Pre-Thesis Credits.** (1-6 cr [max 12 cr]; Prereq—Doctoral student who has not passed prelim oral; no required consent for 1st/2nd registrations, up to 12 combined cr; % for 3rd/4th registrations, up to 24 combined cr; doctoral student admitted before summer 2007 may register up to four times, up to 60 combined cr; No Grade, fall, spring, summer, every year)

**IBS 8777. Thesis Credits: Master's.** (1-18 cr [max 50 cr]; Prereq–Max 18 cr per semester or summer; 10 cr total required [Plan A only]); No Grade, fall, spring, summer, every year)

**IBS 8888. Thesis Credit: Doctoral.** (1-24 cr [max 100 cr]; Prereq–Max 18 cr per semester or summer; 24 cr required; No Grade, fall, spring, summer, every year)

## Toxicology (TXCL)

Toxicology, the science of poisons, is devoted to identifying and quantifying potential noxious agents in our environment. Additional information can be found at: [www.d.umn.edu/medweb/toxicology](http://www.d.umn.edu/medweb/toxicology).

**MED 5085. Medical Research Ethics (Responsible conduct of Research).** (1 cr; Prereq–#, no Grad School cr; S-N only, fall, every year)

**TXCL 5000. Directed Research in Toxicology.** (1 cr; Prereq–#, no Grad School cr; S-N only, fall, every year)

**TXCL 5545. Introduction to Regulatory Medicine.** (2.0 cr; Prereq–Grad School student or #; A-F or Aud, spring, offered periodically)

**TXCL 8012. Advanced Toxicology I.** (3 cr. Prereq–5011, CHEM 4341 or #; A-F only)

**TXCL 8013. Advanced Toxicology II.** (3 cr. Prereq–8012, CHEM 4342, PHSL 5601 or #; A-F only)

**TXCL 8100. Investigative Toxicology.** (1 cr [max 2 cr]. Prereq–8013 or #; A-F only)

**TXCL 8333. FTE: Master's.** (1 cr. Prereq–Master's student, adviser and DGS consent)

**TXCL 8444. FTE: Doctoral.** (1 cr. Prereq–Doctoral student, adviser and DGS consent)

**TXCL 8666. Doctoral Pre-Thesis Credits.** (1-18 cr. Prereq–Max 18 cr per semester or summer; doctoral student who has not passed prelim oral)

**TXCL 8777. Thesis Credits: Master's.** (1-18 cr. Prereq–Max 18 cr per semester or summer; 10 cr total required [Plan A only])

**TXCL 8888. Thesis Credits: Doctoral.** (1-18 cr. Prereq–Max 18 cr per semester or summer; 24 cr required)

**TXCL 8888. Thesis Credits: Doctoral.** (1-18 cr. Prereq–Max 18 cr per semester or summer; 24 cr required)



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