CONTENTS

DEPARTMENT OF GEOLOGY FACULTY AND STAFF ............................................. 1
FACILITIES, LOGISTICS, AND MISCELLANEOUS HURDLES ................................. 1
FINANCIAL AID AND THESIS RESEARCH FUNDING .................................... 2
FACILITIES, EQUIPMENT AND COLLECTIONS
  Computer and Graphics Laboratories (SC305, SC110A, SC335) ............. 2
  Multimedia, Photographic and Audio Visual Equipment ...................... 3
  Murdock Analytical Chemistry Laboratories (SC347, 351, 361, 365, 369) .... 3
  General Computer Lab (SC11) .............................................................. 3
  Sedimentology Geology Lab (320) ......................................................... 3
  Groundwater Modeling Lab (SC328) ....................................................... 3
  Geophysics and Paleomagnetic Research Lab (SC3) ............................... 3
  Optical Mineralogy and Petrography Laboratory (SC344) ...................... 3
  Clay Minerals Laboratory (SC319) ....................................................... 3
  Photomicroscopy and Economic Geology Lab (SC326) ......................... 3
  X-ray Laboratory (SC370) ................................................................. 3
  Paleontology Facilities (SC323) ......................................................... 3
  Collections (SC006) .............................................................................. 3
  Geology and Biology Field Research Center (Fort Missoula) ............... 4
  Library, Maps, and Theses .................................................................... 4
  Electronics and Machine Shop (SC342) ................................................. 4
  Thin Section Shop/Rock Crushing Room (SC008) .................................. 4
  Other Facilities ...................................................................................... 4
GRADUATE STUDENT OFFICE SPACE ......................................................... 4
DEPARTMENTAL TALKS, FIELD TRIPS AND ACTIVITIES ............................. 4
PROFESSIONAL MEETINGS ...................................................................... 5
JOB HUNTING ............................................................................................ 5
REPORTING OF PUBLICATIONS AND PROFESSIONAL PRESENTATIONS .... 5
RESIDENCY POLICY .................................................................................. 5
  Establishing In-State Residency .......................................................... 5
GRADUATE PROGRAM IN GEOLOGY ......................................................... 5
  Thesis Publication ................................................................................. 5
  Admission ............................................................................................. 6
  Advising ................................................................................................. 6
  Student Files ........................................................................................ 6
  Course Load - Continuous Registration .............................................. 6
  Leave of Absence ............................................................................... 6
  Terminal Registration .......................................................................... 6
  Teaching and Research Assistant Course Load ................................. 6
  Transfer Credits ................................................................................. 7
  Grades ................................................................................................. 7
  Graduate Student Review ................................................................. 7
  The Master's Degree
    Courses ............................................................................................. 7
    Time Limit for Degree Work .......................................................... 8
    The Master's Thesis .......................................................................... 8
    Thesis Progress Report .................................................................... 8
    Completing the Thesis Draft .......................................................... 8
    Application for Graduation ............................................................ 9
    Thesis Defense ................................................................................ 9
    The Last Steps ................................................................................ 9
  The Doctoral Degree
    Courses ............................................................................................. 10
    Course Load and On-Campus Residency ........................................ 10
    Time Limit for Degree Work .......................................................... 10
    Graduate Student Review ............................................................... 10
    The Comprehensive Examinations ................................................ 11
    Admission to Candidacy .................................................................. 11
    The Doctoral Dissertation .............................................................. 11
    Dissertation Defense ...................................................................... 12
    Final Steps ....................................................................................... 12
DEPARTMENT OF GEOLOGY FACULTY AND STAFF

MARC S. HENDRIX, Ph.D., Stanford University (1992). Sedimentology and sedimentary basin analysis. Use of provenance, basin subsidence, and facies analysis to study the evolution of sedimentary basins and their applications to environmental and petroleum geology.


JAMES W. SEARS, Ph.D., Queen’s University, Kingston, Canada (1979). Field and structural geology including metamorphic fabric analysis, geometry and kinematics of orogenic belts, and Precambrian crustal evolution.

STEVEN D. SHERIFF, Ph.D., Chair, University of Wyoming (1981). Magnetic and gravity methods directed at environmental through orogenic scale problems, and paleomagnetic constraints on regional structure and tectonics.


EMERITUS PROFESSORS

DAVID ALT, Ph.D., University of Texas (1961). Regional and general geology.

JOHN WEHRENBERG, Ph.D., University of Illinois, 1956. Mineralogy, Forensic geology.

ROBERT WEIDMAN, Ph.D., University of California (Berkeley), 1959. Structural geology.

RAYMOND C. MURRAY, Ph.D., University of Wisconsin (1955). Carbonate petrology, forensic geology.


AFFILIATE FACULTY

ERIC BRAUN, Ph.D., University of Montana (1989). Geology and geochemistry of precious metal ore deposits.

CHRISTINE BRICK, Ph.D., University of Montana (1996). Environmental geochemistry and science education.


JAMES PETERSON, Ph.D., University of Minnesota (1952). Micropaleontology, stratigraphy, petroleum geology.

ROBERT C. THOMAS, Ph.D., University of Washington (1993). Assistant Professor of Geology, Western Montana College. Stratigraphy, sedimentology, and paleontology.

DEPARTMENT STAFF

CHRISTINE FOSTER, (SC 314) Administrative Associate. Christine takes care of all financial and budgetary matters for the department.

LOREENE SKEEL, (SC 311) Administrative Associate. Loreene assists faculty and students with academic procedures and requirements.

FACILITIES, LOGISTICS, AND MISCELLANEOUS HURDLES

We have tried to include University of Montana Graduate School requirements in these guidelines. In any cases where UM Graduate School requirements supersede the present edition of these guidelines or where the Graduate School
requirements are more stringent than those indicated herein, those of the Graduate School take precedence. Please use the Graduate School Web Site, http://www.umt.edu/grad, to obtain the most recent policies, procedures, forms, and deadlines. At the department level these rules are always evolving to adapt to changes in UM rules, faculty, and staff.

FINANCIAL AID AND THESIS RESEARCH FUNDING

Several forms of financial aid are available through the department. We are able to support a few graduate students with teaching assistantships (TAs) made available by the Graduate School. TAs are generally awarded to incoming students and, with satisfactory performance, continued for a second year for M.S. students and occasionally a third year for Ph.D. students. If a TA accepts a research assistantship, off-campus internship, or other comparable award in lieu of the TA, that generally will not extend the four-semester duration of the total award for M.S. students. A TA who resigns an assistantship for one or more semesters within the two-year period, and hopes to resume TA duties after returning, must first receive permission from the department to again hold the TA. If you don't do this, the TA will be awarded to someone else and you will lose the remainder of the TA award. Other opportunities, including occasional one-semester teaching assistantships, are advertised within the department.

Faculty members may also provide research assistantships through their grants and contracts or they may provide limited research funds from their grants. The number of research assistantships varies considerably from year to year, the direction of those funds is the responsibility of the individual faculty member with research support. Work study jobs in Geology are sometimes advertised in the department, general on-campus work study jobs are posted in the Financial Aid Office. You must qualify for work study through the Financial Aid Office before March 1. It is best to register for work study as soon as you arrive on the campus. Further information is available in the Financial Aid Office in the Lodge.

Many professional societies provide small grants to assist student research. These small grant programs include: Geological Society of America Penrose grants (February 15), Geological Society of America Harold T. Stearns Fellowship Program, American Association of Petroleum Geologists (January 15), Sigma Xi Scientific Research Society, November 1, February 1, and May 1), Tobacco Root Geological Society (MT), and the Montana University Joint Water Resources Research Center. Consult your thesis advisor about the possibility of putting together a proposal. If they are not available in the department office, application forms and a list of requirements can be obtained by writing:

1. Executive Director, Geological Society of America, P.O. Box 9140, Boulder, CO 80301, http://www.geosociety.org/prodev/grants/gradgrants.htm - travel awards are also available

2. AAPG Grants-In-Aid Program, P.O. Box 979, Tulsa, OK 74101, http://www.aapg.org


The National Science Foundation, the Department of Energy, NASA, and the American Chemical Society's Petroleum Research Fund award graduate fellowships as well as faculty research grants. These are highly competitive awards open mostly to faculty and Ph.D. candidates. Submitting a proposal, in collaboration with your dissertation advisor, to such a funding agency is expected of all Ph.D. candidates. Your advisor, our faculty, and the Graduate School office can provide necessary details on these fellowships and grants.

Other agencies worth contacting include the Montana Bureau of Mines and Geology, U.S. Geological Survey, U.S. Forest Service, Bureau of Land Management, and the Environmental Protection Agency. Faculty members can offer further advice. Some companies also supply support for graduate research. If you receive funding from a private firm, you need to get a letter from the company specifying that data you obtain can be included in your thesis which, on completion, will be available for public examination. A copy of this letter should be placed in your file. This is intended to protect you from a change in company management or someone later forgetting or changing their mind about what you can use in your thesis. Various other awards and scholarships are available at the university and within the Geology Department. We will notify you of these as they become available. The Graduate School and the department are occasionally able to provide travel funds to offset some of the costs for going to meetings to deliver papers. Check in the department office at least four weeks before the meeting to prepare the paperwork.

FACILITIES, EQUIPMENT AND COLLECTIONS

Room 309 is the department lounge. It houses the graduate student mailboxes, a community refrigerator, and a telephone. Due to volume and duty-cycle considerations, we reserve the photocopier machine in the department office (room 312) for administrative use. However, on occasion you will need to make copies for a class or for research in conjunction with your advisor. In these cases your advisor can make arrangements for use of the departmental copier.

Computer and Graphics Laboratories (SC305, SC110A, SC335)

The computer room houses MS-DOS/Windows and Macintosh computers set-up for number crunching and graphics applications, all are connected to the campus ethernet. First priority use of this facility is for Geology work. To set up a free account on one of UM's central computers, you simply need to log in and use "newacc" as your name, then follow the instructions. An account on a central computer will give you access to email, internet newsgroups, current contents of scientific journals and access to many library services. Additional Macintosh computers are available in the Geol. 100 lab (SC110A) when they are not in use by the freshman labs.
Multimedia, Photographic and Audio Visual Equipment

The department has three teaching rooms (SC348, SC111, SC304) equipped with VCRs, high resolution overhead projectors, computers, and audio systems. Although these are our main teaching rooms, they are also available for presentations and educational experimentations. We also own three slide projectors, and an extensive slide collection. These are available for use in the building on a reserve basis; classroom use has highest priority. Check with Jim Sears or the secretary. The department also has a collection of geological videotapes, check with Marc Hendrix. In the graphics shop (SC355) there is a departmental scanner and film recorder available for preparation of materials for your various presentations as well as digitizing equipment.

Murdock Analytical Chemistry Laboratories (SC347, 351, 361, 365, 369)

These labs contain ovens, balances, an ICP emission spectrometer, and an atomic absorption spectrophotometer. It also houses glassware, chemicals, and other basic laboratory equipment. You must get permission from Johnnie Moore to use this lab. You also must be signed up for specific classes to be able to use some of the equipment in these labs.

Computer Teaching Lab (SC11)

This lab, shared with the Physics Department, has fourteen computers used only for teaching purposes and homework use for students taking classes using the lab.

Sedimentary Geology Lab (SC320)

Marc Hendrix’s lab includes a sediment transport demonstration channel, Leitz orthoplan polarizing microscope with digital camera, and automatic point count tabulator.

Groundwater Modeling Lab (SC328)

Bill Woessner’s lab contains several MS-DOS/Windows computers that he and his graduate students use for various class and research assignments. Bill’s lab also includes hydrogeology field equipment from hand augers to a mobile water-chemistry unit.

Geophysics and Paleomagnetic Research Lab (SC3)

Steve Sheriffs’ lab includes all preparation apparatus and computerized data reduction system, a spinner magnetometer, AF thermal demagnetizing equipment, and 12 kG electromagnetic and magnetic susceptibility equipment. Associated geophysical equipment includes a Worden gravimeter, Gem proton precession magnetometer and gradiometer, EM-31 electromagnetic induction profiler, EG&G Smartseis 12-channel seismograph, sub-meter GPS, electrical resistivity equipment, UNIX workstation and a few MS-DOS/Windows computers.

Optical Mineralogy and Petrography Laboratory (SC344)

Equipment includes 20 petrographic microscopes, five reflecting microscopes, a large research microscope, two 4-axis universal stages, video thin-section projection equipment, refractometers, index of refraction oils, and sundry related items. Don Hyndman is in charge and will issue microscopes for thesis work as the demands of class use permit. The room also houses collections of thin sections for mineral and rock identification and for class use.

Clay Minerals Laboratory (SC319)

This lab, supervised by Gray Thompson, contains a Sharples centrifuge, an International centrifuge, and other basic tools necessary for preparation and analysis of clays.

Photomicroscopy and Economic Geology Lab (SC326)

This lab contains equipment for production of photographs of thin sections, rocks, and fossils. See Don Hyndman or Ian Lange or George Stanley for use of the photomicroscope, and Ian Lange for use of the cathodoluminescence and fluid inclusion equipment.

X-ray Laboratory (SC370)

The X-ray lab has two scanning X-ray diffractometers, a thoroughly obsolete X-ray spectrometer, and several single crystal and powder diffraction cameras. Consult Gray Thompson for use of this lab.

Paleontology Facilities (SC323)

The paleontology facilities include computers and paleontology database management software and equipment for preparation and study of most fossils. Special equipment includes an air abrasive machine, a dental lathe, cutting and grinding tools, vibratools, and molding and casting compounds. An acid laboratory in SC 324 is designed for organic and inorganic acid processing of fossils in the rock matrix. Check with George Stanley.

Collections (SC006)

The department maintains a research collection of fossils with more than 90,000 specimens that include many type specimens. The collection, housed in SC 006, is available for student and faculty projects under the direction of George Stanley (http://www.cs.umn.edu/geology). The petrology collection contains material used in past faculty and student research projects as well as rock suites from around the world. Thin sections and some field notes are also filed in this collection. This collection, in SC006, is under the supervision of Don Hyndman. The Dana Mineral Collection is in SC350. It contains more than 3,000 mineral specimens and almost 1,000 suites for special research. Gray Thompson oversees this collection which is limited to research use.
Geology and Biology Field Research Center
(Fort Missoula)

This center houses the Geology Environmental Earth Systems Research Laboratory including a workshop, hydrogeology-geochemical labs and constant temperature chambers. The facility is used to design, develop, and construct innovative hydrogeologic and geochemical field sampling and monitoring equipment, and to conduct experiments elucidating the geochemical processes influenced by microbes in groundwater and vadose zone environments. Marc Hendrix, Bill Woessner, and Johnnie Moore direct this facility.

Library, Maps, and Theses

Geological publications and books are in UM's Mansfield Library; online references (e.g. GeoRef) and Science Citation Index, are available on the library's main floor. The Mansfield library is a repository collection of U.S. Geological Survey topographic, geologic, and geophysical maps of the northern Rocky Mountain region. This is a good reference collection, but the maps cannot be checked out from the library. We also have computer access to other major library search facilities, such as the Colorado Association of Research Libraries, via the internet. A few paleontology publications are in SC304. If you notice an important omission or weakness in the collection, please let your advisor or the department chair know; we'll do our best to add your suggestion to the collections. The Don Smith Memorial Library, SC305, within the department also has some books and materials pertinent to research in Montana.

For your field work and research you'll have to supply your own maps. Topographic maps are available for purchase from several locations, including Missoula Blueprint, the Trailhead, PipeStone Mountaineering, High Country Sports, the Montana Bureau of Mines and Geology in Butte, and the U.S. Geological Survey in Denver. The Geology Department also has a collection of geological and topographic maps and a file of LANDSAT–ERTS imagery of Montana for 1972 and 1973 (multispectral prints, 70 mm diapositives, 70 mm negatives). Associated with the maps and photos are a zoom transfer scope, zoom stereoscope, light table, optical color enhancer, and a reflecting projector. Jim Sears oversees the department map library.

Departmental B.A., theses, M.S. theses, and Ph.D. dissertations, are on file in SC311. They cannot be removed from that room. Check with the secretary if you want to see them. Copies that can be checked out are available in the Mansfield Library. The Mansfield Library also holds a large number of Ph.D. dissertations and M.S. theses from other Universities about the geology of Montana, Idaho and Wyoming.

Electronics and Machine Shop (SC342)

This is the shop used to maintain departmental equipment. The shop is not open for general use. Nearby, the Physics Department maintains an extensive machine shop which can occasionally be used for construction of research instrumentation; talk to your faculty advisor about any proposed projects.

Thin Section Shop/Rock Crushing Room (SC008)

This shop includes cut-up and slibbing saws, grinders and polishers for student and faculty use. George Stanley is in charge of this shop. You must get checked out with George to use any of the equipment. The rock crushing room contains a rotary-jaw crusher, a chipmunk crusher, rock splitter, and a Ro-tap machine. Sieves are available from Johnnie Moore. Check with George Stanley before using this equipment and clean the equipment thoroughly when you are finished.

Other Facilities

The department maintains ties with many other departments and institutions which can provide facilities unavailable at the university. The Biological Station at Yellow Bay on Flathead Lake is an excellent base for field research. It includes a new analytical lab primarily for water quality studies. The Chemistry Department on campus maintains an EG&G Ortec XRF. Johnnie Moore can tell you how to gain access to those facilities.

Our students occasionally use major lab facilities at other universities and state or federal labs. Cooperative agreements for these facilities can sometimes be arranged for your research; the need and opportunity may come up as your research progresses.

GRADUATE STUDENT OFFICE SPACE

The Geology Department allocs office space to graduate students according to the following priorities:

1. Teaching assistants have first priority. Professors in the freshman courses prefer that teaching assistants in those courses be in the downstairs offices, near the Geology 100 laboratories.

2. University supported research assistants have second priority.

3. All other graduate students have next priority.

4. Students working on a thesis or dissertation who must be away from campus for a semester or less may retain their office space.

We have a limited amount of space for an enthusiastic group of students. Thus we are not always able to provide as much space as some people need but we are almost always able to supply some space to each of our graduate students. You may not change your desk assignment with authorization from the Geology Office secretary.

DEPARTMENTAL TALKS, FIELD TRIPS AND ACTIVITIES

Lecturers from other institutions visit the department from time to time. The Geology Department hosts the "Tuesday Outrage," a forum for someone's latest bright idea or,
occasionally, a travel-log. The local chapter of Sigma Xi (Scientific Research Society) sponsors two scientific seminars per month in SC 304 or 348 at noon on Thursdays. The Geology Club promotes social activities and service to the department, including field trips. Many field trips organized as part of regular course work are open to other students; ask the professor leading the trip you are interested in. You are encouraged to participate to the fullest in department sponsored field trips. You are expected to attend department lectures as part of broadening your geological education. Watch the bulletin boards and e-mail for notices of these events.

PROFESSIONAL MEETINGS

The Geology Department encourages you to attend professional meetings and present papers based on your research. Such meetings include regional and national meetings of the Geological Society of America, American Geophysical Union, American Chemical Society, American Association of Petroleum Geologists, and many others. As support, the Geology Department regularly organizes a van or two to transport attendees to various professional meetings. Given even modest student pressure, we can usually provide some financial resources to aid a group of students wishing to travel to professional meetings in the west. The Graduate School commonly provides a modest stipend for students presenting papers.

JOB HUNTING

We regularly promote our students to various employers of geoscientists. As a result, we get some interviewers in the department and often have job notices posted on bulletin boards near the main office. Notices and letters advertising many other positions are posted on the wall opposite the Geology Department office. If you wish, the department will keep your resume on file in the office even that an employer should call you to fill a position. Supply a resume to the secretary, and keep it up to date.

REPORTING OF PUBLICATIONS AND PROFESSIONAL PRESENTATIONS

Sometimes scholarship or job opportunities come up on short notice and we have to make a decision based on the information we have on file. Your file should contain a record of any awards, publications, and professional presentations you make. Please help us keep your file current by giving the secretary written notice of your awards, publications, or presentations. In the case of an award, simply photocopy your award notice letter. Provide a copy of your abstract or publication. Additionally, add these to your resume and make sure we have a current copy of your resume.

RESIDENCY POLICY

Establishing In-State Residency

All UM students and applicants are classified as either in-state or out-of-state for admission and fee purposes. The following are general guidelines a student must follow to verify in-state status. To apply for residency in Montana a student must:

- Reside in Montana for 12 continuous months. The 12-month period begins when the student takes one of the following actions:
  - Registers an automobile in Montana
  - Obtains a Montana driver’s license
  - Registers to vote in Montana
  - Purchases a home in Montana
  - Files a Montana individual income tax return

During the 12-month period, the person must do those things required by law of a Montana resident. At a minimum, that includes licensing an automobile, obtaining a Montana driver’s license and filing a Montana individual income tax return on any money earned in Montana.

Establishing residency in Montana during this 12-month period may not always be sufficient to be classified in-state for admission and fee purposes. Each residency case is based on a unique set of facts. Attending school during the 12-month period and taking more than 6 credits per semester, for example, would not support the assumptions for in-state classifications.

The Registrar’s Office at The University of Montana has more specific information on residency on their web site at www.umt.edu/registrar. Applicants and students can also contact the Graduate School at 406-243-2572 with any questions about residency requirements.

GRADUATE PROGRAM IN GEOLOGY

The University of Montana Graduate School sets most deadlines and makes many of the rules that affect your graduate program. Be sure to read the most recent Graduate Catalog and meet the deadlines by checking their annual timetable. The Graduate School regularly distributes this information.

Thesis Publication

We strongly advise you to submit your thesis research for publication in an appropriate professional journal. Each publication in a peer-reviewed journal is an important step in your career. It significantly strengthens your resume and represents a contribution and commitment to your area of research. Successful publication in a national journal is a vital step in recognition and in competition with your peers.

To facilitate the publication of your research results, we encourage you to write your thesis or dissertation as a manuscript to be submitted to the Geological Society of America Bulletin, Sedimentology, Tectonics, Geophysical Review Letters, or other appropriate scientific journals. As you read the literature in your field, note the presentation style, keep a set of the best written papers, recognize what belongs in a paper. Designate those aspects of your thesis that do not belong in a paper to an appendix. Thus when you complete your thesis and your advisor and committee
have approved it, you will be close to submitting a manuscript. Often one or more of your committee members, or students in the same research group, may be coauthors on the final manuscript. While the best Master's theses result in one publication, Doctoral dissertations are usually a set of publications.

Presentations of your research at national and regional meetings, and the published abstracts that accompany them, are a good organizing step on the way to a publication. Our students and faculty regularly contribute to meetings of the Geological Society of America, the American Geophysical Union, American Water Resources Association, American Chemical Society, and other similar professional groups. The department and the Graduate School may help defray the expense of presenting a paper at a professional meeting.

Admission

Our graduate students come from across the nation; we regularly have a few foreign students in residence. Most of our graduate students were geology majors as undergraduates. We also encourage students with other majors to enter the Geology Graduate Program. We do not require you to have an exact equivalent of our undergraduate curriculum in geology. Rather, those with deficiencies in geology, or with different undergraduate programs, will meet with their prospective thesis advisor and non-thesis advisor to design a suitable schedule of remedial course work. You must have completed one year of calculus, physics, and chemistry and must maintain at least a B average in all course work taken. By petition to the Geology Faculty you may be able to substitute advanced study in one of these disciplines for a deficiency in another. Occasionally the Departmental Graduate Committee admits an individual into the Geology program with provisional status because of deficiencies in their course work or a grade point average below 3.00/4.00. If you have provisional status, to gain full admission you must make up any deficiencies during your first year. All courses taken while on provisional status must be taken for grade.

The Graduate School requires you to have taken the verbal, analytical, and quantitative parts of the Graduate Record Examination before you can be admitted. The Geology Department does not require you to take the advanced Geology Graduate Record Examination.

Advising

When you arrive on campus we will assign you a non-thesis advisor. Before registration for courses each semester, you should meet with your assigned non-thesis advisor. That person will review your academic background, help plan your program of course work, monitor your progress in courses and thesis work, guide you to appropriate faculty for thesis advising, and provide general assistance with academic problems. Even though you ultimately will be working closely with your thesis advisor and committee, your non-thesis advisor will help prepare a list of planned courses for your file.

Student Files

Your academic file is kept in the Geology office and is only open to the faculty and you. Use of your file is subject to federal privacy regulations. Your file is not to be taken out of the office except for advising. Please keep an up-to-date professional resume in your file. A resume is useful to the faculty, for instance, when writing letters of recommendation and when nominating students for awards. You will find an updated resume useful while applying for jobs, grants, and scholarships.

Course Load - Continuous Registration

Graduate students in degree programs must register for credits each Fall and Spring semester (with exceptions including some distance learning programs, or the School of Education where students may be registering primarily in the summer). The number of credits each term should be that deemed by the supervising unit to be commensurate with the use of facilities, involvement of faculty, and demonstrated progress in the degree program. Graduate students must register for thesis or dissertation credits each semester they are working on them.

1. 16 credits during regular session
2. 16 credits during full summer session, and
3. 8 credits during summer half-session

Leave of Absence

Students must petition for a leave-of-absence if they are not continuously registered. Students who step out of their graduate programs without an approved leave-of-absence for more than two consecutive semester terms will be dropped from their program's roster and will need to petition their program and the Graduate School for readmission. The petition for readmission will require an evaluation of the student's progress and a plan with timetable for completing the degree. Not all students will be readmitted.

Terminal Registration

All graduate students must register for at least one credit in their final term. Reenrolled students who took unauthorized leave may, on the recommendation of the Graduate School based on discussions with the department, be required to register for FOUR terminal credits for not meeting the continuous registration requirements. If you leave the state for a year, you will be subject to out-of-state tuition even if you were previously a resident.

Teaching and Research Assistant Course Load

The Graduate School requires all full-time Teaching and Research Assistants to carry at least nine graduate credits per semester. The Geology Department requests anyone with a tuition waiver to carry 15 graduate credits per semester because for those with a tuition waiver it costs no more and the larger number of credits helps support the department. These credits may include Geol. 599 (thesis research) or Geol. 699 (dissertation research).
Undergraduate level courses are acceptable for this course load requirement if they are deemed appropriate to your program. These undergraduate credits do not apply to your graduate degree requirements, unless designated UG in the catalog. They also must meet the restrictions on undergraduate credits. Foreign students or veterans that are not full-time TAs or RAs must take a minimum of 9 credits, or a maximum of 15 graduate credits per semester. TAs and RAs are required to prepare an approved thesis proposal in their first year of residence, in order to continue to receive financial support.

Transfer Credits

Graduate transfer credits for Geology courses will not be allowed from a school that does not have a graduate program in Geology. After satisfactory performance in graduate courses at the University of Montana, and upon recommendation of the department chairman, up to 9 credits may be transferred from another school after one semester of residence at the University of Montana. Thesis credits and credits for courses with grades of C or lower are not transferable.

Grades

A grade average of B or better must be maintained throughout your graduate program. Courses with grades of C or lower are not acceptable for the degree program, but are included in the calculation of your grade point average. Grades of N (continuing) and P/NP (Pass/Not Pass) are given for credits in Thesis Research, Geol. 599, and Dissertation Research, Geol. 699. Many courses numbered Geol. 500 or above, including Geol. 580, 581, 592, 593, 584, and 597, are graded on a Pass/Not Pass basis. The instructor may offer any of these courses for a letter grade. If a seminar is offered on a graded basis, it must be taken for a grade to apply toward a degree program.

Graduate Student Review

The Geology faculty reviews your progress at least once a year. Routine reviews are conducted during the spring semester for new students, and in fall semester for returning students. The department chair will convey the results to you.

The Master's Degree

Master's degree requirements include: A minimum of 28 credit hours in formal course work plus six credit hours of thesis research for a total of 34 semester credits. The Geology Department expects you to develop your own thesis projects, and you may find that a challenging task that demands significant time during your first year. Try to take the bulk of your course work during your first year then devote the second year to additional course work and thesis research. Aim for completing your thesis at the end of your second year. Even with this goal, most students find themselves finishing their thesis in the fall of their third year. Note that if your thesis requires summer field work, your thesis proposal must be accepted before the end of Spring Semester, and the field work completed during the first summer, in order for you to complete your Master's in two years.

Courses

Only courses designated for graduate credit in the university catalog apply to the 34 credits beyond the Bachelor's degree required for graduation. Graduate students must register for at least 4 credits each semester while working towards a degree. Here are the requirements of the Department of Geology and the Graduate School:

1. Master's thesis proposals should be submitted and accepted at the latest two weeks before the end of spring semester of your first year in residence. We make this requirement so you will be well-prepared for summer research, and so we can adequately evaluate your plans and to allow us to make some small department grants to help support that research. If you need an exception to this rule please talk to your non-thesis advisor and your thesis advisor, and petition the faculty before April 1 of your first year in residence. Geol 502, required of all first year graduate students, is designed to guide your experimental design and preparation of a thesis proposal.

2. A minimum of 34 semester credits beyond the B.A. are required for the degree. A minimum of 20 credits, excluding Geol. 599 and 699, must be geology courses.

3. Although you can sign up for more thesis credits, a maximum of six credits of Geol. 599, Thesis Research, can be applied toward your degree.

4. No more than 10 credits are allowed for UG courses at the 300 and 400 level, that is courses carrying the undergraduate/graduate credit designation.

5. Core curriculum courses required for a B.A. in geology at the University of Montana, or their equivalent taken elsewhere, are not valid for graduate credit.

6. Cognate science courses, taken outside the Geology Department, may be required, depending on your field of study, advisor, or your research. The purpose of cognate work is to provide breadth to your program as well as to supply you with knowledge that may be valuable in your research work. Cognate courses are generally in Math, Physics, Chemistry, or Computer Science. The nature of the cognate work will be decided in consultation with your thesis committee.

7. Because the specific topic varies for each offering, seminars, with course numbers 58x, may be taken more than once, with the consent of the instructor. You must petition the faculty to go beyond a maximum of five credits in any seminar designation.

8. A maximum of three credits for field trip courses can be applied towards M.S. and Ph.D. degrees.

A minimum of 24 credits applied toward the degree must be taken on the University of Montana - Missoula campus. A
maximum of eight credits of course work may be repeated upon approval of the department.

**Time Limit for Degree Work**

The Graduate School requires that the Master's degree be completed within five years of beginning course work at the University of Montana. This includes any credits being transferred from another university. You are not excused from program time limitations by virtue of a Leave of Absence except when the leave is granted prior to commencing course work. The Graduate Dean's five-year time limitation notwithstanding, the Geology Department expects you to finish within two to three years. If you wish to take a leave of absence or delay your admission to the program, a "Request for Leave of Absence from the M.S. Program" form must be completed and sent to the Graduate School. Such a leave of absence is for a maximum of one calendar year. A 12-month extension to a leave of absence may be granted by the Graduate School upon receipt of a written request from the student and concurrence of the Geology Department.

**The Master's Thesis**

As you begin to zero in on a thesis topic, you should start talking with faculty members who may share your interests. As discussed above you should propose a thesis committee and present a thesis proposal before the end of your first year. A minimum of three committee members is required: two from the Geology Department, one from another science department. Your main thesis advisor, that is the chair of your committee, will be chosen by agreement between you, that person, and the departmental chair. After you have assembled your committee, the Department Chair will nominate your thesis committee to the Graduate School, and the Graduate Dean will ratify the committee's appointment, generally within two weeks.

The first step in launching a thesis is your thesis proposal. Your proposal should describe a worthwhile geologic problem of reasonable scope, the experiments and methods you intend to use to investigate the problem, and your expected results. The proposal, no more than four pages long, is intended to help you evaluate the project, organize your thinking, and promote efficient use of field and lab time. First, submit a draft proposal to your thesis advisor. After your advisor and you agree on the proposal, the two of you will schedule a meeting of your thesis committee and you will submit it to the remainder of your thesis committee. Likely, your committee will have some suggestions and comments to include in the final draft. After your committee approves your proposal and signs the cover sheet, ask the department secretary to prepare copies for each member of the faculty.

The proposal should have the following form:

a. title page
b. statement of problem and the objectives of your research
c. methods of investigation and expected results
d. tentative work schedule and a budget
e. pertinent references in the format of a major professional journal such as the Geological Society of America Bulletin or the Journal of Geophysical Research.

The Geology faculty will discuss your thesis proposal at a regular faculty meeting. Upon the approval at that meeting, the Department Chair will sign and date copies of the proposal for your file, for you, and for your thesis advisor.

**Thesis Progress Report**

A thesis typically involves field and/or lab work during the summer of your first year. You should keep your whole committee aware of your progress, don't leave anybody out until the last minute as they may well discover a flaw or potential improvement in your experimental methods. To aid our guidance and keep the department informed of your progress we will also request a thesis progress report in the fall of your second year as part of our student evaluation process. Thus you will submit a brief written report outlining your thesis progress to your thesis committee early in the subsequent fall, and meet with them to discuss the direction of the project.

**Completing the Thesis Draft**

Efficient researchers begin writing early during their research. It clarifies thinking and focuses the collection of data and redesign of your experiments. Allow a few months for primarily writing your thesis and fine-tuning your work. Plan to take several hours of Geol. 599, Thesis Research, during your last semester of graduate school to allow time for analysis and writing. The best method for rapid and timely completion is to regularly discuss your research, data, and interpretation with your advisor and your committee. Taking advantage of the expertise of your other committee members will make for a better quality thesis, help avoid last minute problems, and likely lead to a timely completion. Regular feedback, and the direction of your science, is part of your committee's job.

Typically it will take more than a month or two, and at least a couple of rough drafts, before your advisor agrees that your thesis is ready for the rest of your committee. Once your thesis advisor approves the draft, submit copies to other members of your committee. Expect at least one more iteration on your writing before the committee decides that the thesis is defensible.

Once your committee declares your thesis defensible, the committee chair must sign and date the title page of the thesis draft. The signature will mean that the committee has read the draft and considers it ready for defense. The Graduate School Dean must receive this copy at least three days before your presentation and exam date, and at least eighteen days before the end of the semester in which you intend to graduate. The Dean will sign off on the title page also, and the draft will then be returned to the department via campus mail. A copy of your thesis draft must also be placed in the department office for review by department
faculty immediately after your committee decides that the thesis is defensible. This copy must be available to the entire faculty for one full week before the thesis examination. Arrange the times and places for both the public thesis presentation and the exam with the Department's secretary.

You cannot expect the approval and defense process to happen in a week or two. The best way to streamline the process includes regular interaction with your advisor and committee and making sure they are informed of the schedule you are interested in. Remember, we encourage you to write your thesis or dissertation as a manuscript going to a professional journal. Thus emulate the writing style, references, and organization of your chosen journal in your earliest drafts. Separate peripheral experiments, models, and data and put them in appendices. Concentrate on your writing. Review your freshman writing manual, a manual of style for English, and look for suggestions to authors for the journal of your choice. A well-written, high quality first draft requires fewer iterations to your advisor and committee.

Application for Graduation

At least one semester before the Master's degree or Ph.D. degree is to be awarded, the student must submit to the Graduate School three copies of the Application for Graduation form and a graduation fee. See the Calendar of Deadlines on their website, http://www.umt.edu/grad, for the exact dates to file paperwork. The Graduate School will conduct a degree audit and send two copies of this form back to the Geology Department (one departmental copy and one student copy) early in the graduating semester. The department and student should note any problems and rectify them at least two weeks prior to the end of the final semester by using a Graduation Amendment Form. If the student fails to meet the original graduation date as requested on the form, the student may request the application be reactivated for the following semester by notifying the Graduate School one semester prior to the revised completion date.

Thesis Defense

The thesis defense has two parts; a public oral presentation to students and faculty, and other interested members of the public, and the oral examination conducted by the faculty. The presentation typically has 30 to 50 minutes allotted to the presentation and several minutes for questions from the audience. At the end of a semester, two thesis talks may be scheduled during the same seminar period. Thus defend early in a semester to make sure you get adequate time to sell your science to the audience. The final exam follows your public talk. The exam includes the defense of the thesis as well as questions designed to test your general grasp of topics related to your research. Your thesis committee conducts the exam, but the exam is open to interested members of the university faculty as well. There are three possible outcomes of the exam:

a. Pass with thesis accepted as it stands.
b. Pass with minor revisions required on thesis.
c. Fail, or major revision required on thesis.

If you should fail that exam, do what your committee asks, and defend again after the waiting period required by the Graduate School. You may pass the second exam with no more than one dissenting vote. Only one repeat exam is permitted. You may not defend your thesis after the last day of spring semester or before the first day of fall semester. We discourage thesis presentations during finals week. The exam must be held during the period of the regular semester and must be completed at least 15 days before you graduate.

The Last Steps

After you defend your thesis you need to:

1. Prepare final copies of your thesis that conform with Graduate School format. Complicated diagrams, photos, or tables should be at the end of the thesis as appendices, following the references. Photos and complex detailed diagrams such as large maps will need to be specially printed. Missoula Blueprint and Photo/Graphics do that sort of thing. Consult with the faculty for advice. If all else fails, put large maps in a pocket in the back of the thesis, but remember that theses are read mostly in photocopy, and such maps rarely survive that process intact. We suggest you present as many of your maps and diagrams as possible on 8 ½" x 11" paper with 1 ½" left-hand margins and 1" right-hand margins. This will avoid reducing procedures and the printing of special maps, thus saving you both time and money.

2. Write an abstract and get your advisor's initial of approval. It will become page ii of the thesis. (The Graduate School requires three initialed copies of the abstract.)

3. Prepare an original and at least seven photocopies of your thesis with the abstract, at least one copy for yourself, three for the Graduate School, one for the library thesis collection and one for each member of your committee. The Graduate School can help advise you to get everything in final form for copying and binding. Shaffner's University Bindery, Shaffner's University Bindery, Shaffner's University Bindery, for professional book binding and Kinko's Copy Center for less expensive bindings, can bind theses for you. The copies submitted to the Graduate School will be bound by the university, but the additional copies are your responsibility.

4. Deposit the three unbound copies, and three initialed copies of the abstract, with the Graduate School and pay the required binding fee.

5. Where it is appropriate, your advisor may require you to place a representative collection of samples, specimens, thin sections or other materials in the departmental collections. These may include samples specifically discussed in the thesis.

6. Clean up all lab and office space you used and return
any departmental equipment and keys (remember to claim your key deposits!). Be sure to return any books or other items borrowed from the faculty.

We want to stay in touch with you after you leave Missoula, so please leave an address with the secretary and update it when you move. We try to issue a yearly newsletter, we may need to write to you about your thesis, as well as to keep up with the progress of your career.

The Doctoral Degree

Many of the requirements of the Master's degree also apply to the Doctoral degree. When first admitted to graduate school, you are not automatically admitted to the Doctoral program. You must first file for admission to candidacy with the Graduate School, after meeting other requirements. Normally Doctoral candidates have already completed a Master's degree. Only rarely is a student admitted to the Doctoral program directly from the Bachelor's degree; we recommend these students complete a Master's degree en route to their Ph.D. Regardless, such students may expect to complete substantially more coursework before the comprehensive exam and admission to Doctoral candidacy.

There are five general requirements for the Doctorate: residence, course work, comprehensive examinations, admission to candidacy, and the dissertation.

Courses

A minimum of 60 graduate credits beyond the Bachelor's degree is required for the Ph.D. degree at The University of Montana. Additional coursework beyond the minimum of 60 credits may be required by a committee consisting of your nonthesis advisor (assigned when you arrive on campus) and your dissertation committee. Up to 30 of the 60 credits may be granted if you enter with a Master's degree.

a. Courses designated G or UG in the University of Montana catalog are courses for which graduate credit is given. Graduate credit is given only for courses in which a grade of "B" or higher is earned. Up to 9 similarly designated graduate courses from other colleges and universities may be transferred to your UM Ph.D. program if they are deemed acceptable by the Department of Geology and the Graduate Dean.

b. No more than 10 geology credits at the 300 and 400 level designated UG may be applied toward the Ph.D. degree. This limit includes courses taken for the Masters. A maximum of 14 credits of Geol. 699, dissertation research, may be applied toward the degree. A minimum of 30 graduate credits in formal geology courses, exclusive of Geol. 699, are required for the Ph.D. degree. Graduate courses taken in a Master's program may be applied toward this minimum of 30 credits.

c. A minimum of 16 graduate credits of course work must be taken outside of the Geology Department. This course work must comprise a coherent program relevant to your dissertation research and/or professional goals. This cognate-area course work, approved by your non-dissertation advisor and dissertation advisors, should be completed by your fourth semester in residence. Courses taken for the Master's degree may be applied toward the 16 credit cognate requirement with the approval of your non-dissertation advisor and dissertation advisor. Cognate courses are generally in Math, Physics, Chemistry, or Computer Science. Some courses in the life sciences may be suitable for paleontology students.

d. Cognate science courses, taken outside the Geology Department, may be required, depending on your field of study, advisor, or your research. The purpose of cognate work is to provide breadth to your program as well as to supply you with knowledge that may be valuable in your research work. Cognate courses are generally in Math, Physics, Chemistry, or Computer Science. The nature of the cognate work will be decided in consultation with your committee.

e. If you have an extensive background in relevant industry or governmental work in geology-related sciences you may be able to arrange a special program designed to fit your needs. Such a program may include reduced or modified formal course requirements and residence requirements. Such a program will be designed with the help of your non-dissertation and dissertation advisors and must meet the approval of the Department of Geology faculty and the Dean of the Graduate School.

Course Load and On-Campus Residency

A minimum of three semesters, two of which must be consecutive and before admission to candidacy, must be spent in graduate residence at the University of Montana. A full semester of residence is at least nine approved credits in any semester or five credits plus certification by the Department Chair that full-time work is being undertaken toward the Doctoral degree. With prior approval of the Geology Department and Graduate School Dean, a student admitted to candidacy may register for and receive credit for dissertation research done in absentia. The Graduate School requires all full-time Teaching and Research assistants to carry at least nine graduate credits per semester. The Geology Department requests any graduate students with TAs or RAs including tuition waivers to carry at least 15 graduate credits per semester because for those with a tuition waiver it costs no more and the larger number of credits helps support the department. These credits may include two-four credits of Geol. 699.

Time Limit for Degree Work

All requirements for the degree must be completed within seven years of commencing graduate course work at the University of Montana. You are not excused from program time limitations by virtue of a Leave of Absence except when the Leave is granted prior to commencing course work.
Faculty review of your progress will consider whether your work reflects the superior professional quality appropriate to a Doctoral candidate.

The Comprehensive Examinations

If you start our program with a Master's degree you need to complete the comprehensive exams within your first three semesters. If you start with a Bachelor's degree you need to complete the comprehensive exams by the end of your seventh semester in our program. You must begin fulfilling your cognate science requirements during your first year in residence. The comprehensive exams include two parts: written and oral. The written portion of the comprehensive exam tests your knowledge in three broad areas of the geosciences. Geology Department faculty members with research expertise in the chosen areas prepare and evaluate the written exams. You select those areas, and the associated faculty or their substitutes, from the following list:

- Paleontology and Stratigraphy - Stanley, Hendrix, Winston
- Groundwater Geology - Woessner and Hinman
- General Geochemistry - Hinman, Moore
- Petrology and mineralogy - Hyndman, Sears, Thompson
- General Geophysics - Sheriff
- Structure and Tectonics - Sears, Sheriff, Hyndman
- Economic Mineral Deposits - Lange

You may substitute an exam in one of the cognate sciences (math, physics, chemistry, computer science, or biology) for one of the choices above. If you choose an exam from a cognate science, an exam committee member with research expertise in that field will participate in writing and evaluating the exam. With the consent of your committee and the Geology Department you may establish an alternative sub-discipline for the exam or add committee members who are adjuncts of the department or professors at any of the UM campuses. If you fail the written portion of the exam, you may, at the discretion of the examiners, take the exams one more time after 90 days. A second failure is final.

After you pass the written exam, you take the oral part. This tests your knowledge in your area of specialty. The oral exam centers on your presentation and defense of a dissertation proposal and another paper. The second paper may be: 1) your M.S. thesis, 2) a paper that you have published or have in preparation for a professional journal, or 3) a distinctly different research proposal. The dissertation proposal defended at the oral exam may be different from the one that forms the basis of your Ph.D. research. Normally, you will submit the final dissertation proposal to a national funding agency. These documents must be distributed to the oral exam committee, and a copy placed in the Geology office ten days before the exam. The written exam committee, plus one other faculty member of the Geology Department and at least one faculty member from a cognate science area, administer the oral exam. The dissertation advisor cannot chair the oral exam committee. Members of the oral exam committee, except the dissertation advisor, are not necessarily members of the dissertation committee. Any interested university faculty member may attend your oral exam and ask appropriate questions.

Admission to Candidacy

The Graduate School does not require any notification from students or their programs immediately following the successful completion of the comprehensive examination in doctoral programs; the department will maintain a record of successful completion of the examination. At least one semester prior to graduation, the student must file an Application for Graduation form with the Graduate School. The Graduate School will conduct a degree audit and send two copies of this form back to the Geology Department early in the graduating semester. The dissertation committee chair will sign the department's copy of the form and return it to the Geology secretary who will forward it to the Graduate School with the dates the student successfully completed the comprehensive examination, language requirement (if applicable), and dissertation defense. Receipt of the department's copy of this form by the Graduate School indicates that the student successfully completed the departmental degree requirements. The student's degree will be awarded after receipt of the final unbound copies of the dissertation and all other Graduate School requirements have been met.

The Doctoral Dissertation

Beginning work on your dissertation follows the same process as in the Master's thesis; please refer to that section of this manual.

Your dissertation proposal, or an outline of it, with the signatures of all committee members and a time schedule, must be submitted to the Graduate School Dean at least three semesters before the date of expected completion of the dissertation and defense. It is subject to review by the University Graduate Committee. You will need a minimum of five committee members, four from Geology and one from another science department. Although your dissertation proposal cannot be formally approved until after your admission to candidacy is granted by the Graduate School, we encourage you to begin thinking about it, and working on it, early in your stay at UM. For those Ph.D. students with joint research between the University of Montana and Montana Tech or other units of the university system, specific requirements will be adapted in consultation between your thesis advisor, other thesis advisors, and the Geology Department chair.

Most Doctoral candidates spend the better part of a year writing their dissertations during a few years of field and lab work. Normally, your Doctoral dissertation will consist of independent manuscripts submitted to, or published in, national professional journals. Thus we encourage you to prepare and present your results as your research progresses. National and regional meetings of professional societies and timely journals provide an ideal venue for such presentations. As your research evolves, you should regularly update your committee and discuss your progress.
with each committee member. Provide your dissertation committee with written progress reports every fall semester.

When you approach completion of your research, your advisor will approve an iteration of your combined manuscripts for dispersal to the remainder of your committee. These copies of the committee draft and abstract must be distributed to committee members at least four weeks before your anticipated defense date and seven weeks before the end of the semester you expect to graduate. The Graduate School has guidelines for typing the abstract. Upon committee approval, the committee draft goes to the Graduate Dean for approval at least one week before the defense, and at least four weeks before the end of the semester of expected graduation. The Dean will return the copy with comments to the dissertation advisor within one week. Your committee will then meet to discuss the acceptability of the draft. Your dissertation committee members will notify the Graduate Dean that your committee draft is defensible no later than one week before the scheduled defense.

**Dissertation Defense**

Schedule the oral defense of your dissertation after your committee has approved the draft. Place a copy of the accepted and corrected committee draft of your dissertation in the department office at least one week before the defense for inspection by any university faculty member. The defense will be no later than three weeks before the end of the semester in which the degree is to be granted; defenses are not conducted during summer sessions.

The dissertation defense has two parts; a public oral presentation and the examination conducted by the faculty. The public presentation is open to all students and faculty of the department and any other interested people. Usually the presentation will last about 35 to 45 minutes with the remainder of the hour open for discussion and questions.

The final defense before your dissertation committee and members of the university faculty follows the public presentation. The purpose of this defense is to test your general comprehension of the dissertation project and related material. Following a period of questioning, your committee will meet in closed session to vote. Possible outcomes are:

1. Unanimous pass and the dissertation accepted as is.

2. Unanimous pass with minor revisions to the dissertation.

3. Failure of defense that, in most cases, will lead to major revisions to the dissertation. If a failing vote is cast, you must do whatever your committee requires, and may defend again after 30 days. You may pass the second defense with one dissenting vote. A second failure is final.

Upon successful completion of your defense, your committee signs and forwards the appropriate form to the Geology secretary who will deliver it to the Graduate School.

**Final Steps**

The Geology Department requires you to submit your completed dissertation to a national refereed journal. Normally this will result in two or three separate manuscripts. Hopefully some of this happened during the course of your research. You must sign publication agreements with University Microfilms and pay the cost of binding and microfilm reproduction; the Graduate School will provide the details. One extra copy of the title page must be submitted with the microfilm agreement. You may apply for a copyright on your dissertation at an additional charge.