

College of Arts and Science

Department of Geological Sciences

Modern geology has become a much more collaborative enterprise than it once was. The fields of biology, chemistry, math and physics — in partnership with the geological sciences — now contribute much to our knowledge of Earth. The department's great advantage lies in its emphasis on field studies and on the integrative nature of its approach.

Our Strengths

Geochemistry, for example, has become increasingly important in environmental-assessment studies and problem solving. That perspective is quickly expanding to bio-geochemistry, taking in complex interactions of rock, water and organic materials.

All of the department's faculty members teach undergraduate courses, and most have included undergraduate students in their research, through mentorship programs, field studies or senior-thesis advising. Teamwork has become essential because most of the problems geologists face today require an integration of knowledge and skills from many different subfields of geology and other sciences.

The curriculum focuses on the basic skills geologists need. Classroom assignments and field work both stress analytical thinking, oral communication and writing, because whatever career paths students follow, they will be expected to solve problems and help others understand the problems and the solutions.

The dozens of U.S. and international research sites where faculty members have worked include (in the United States) the New Madrid fault zone in Missouri and adjacent states, the Black Hills of South Dakota, the Ozark Mountains in Arkansas and Oklahoma, the Florida Keys, northern and central coastal ranges of California, and in east central and southeastern Alaska. Research sites abroad include Antarctica, Baja California Sur, Blake Nose in the north Atlantic, the Vienna Basin in Austria, mining districts in the Republic of Korea, Muroto Peninsula in Japan, Nankai Trench near Japan, the Barbados Ridge in the Atlantic Ocean, the Highland Border

in Scotland, County Mayo in Ireland, the Turkish coast in the southern Black Sea, the Middle East and the Mediterranean region of Syria and Lebanon.

Teaching and Learning

The advantage students gain from studying the geological sciences at MU is that the teaching models the profession. Students learn by doing and by working side by side with experienced geologists whose interests cover the field. Professors are interested in the success of their students and take pride in their accomplishments years after they graduate.

Majoring in Geological Sciences

The department offers a bachelor of science degree in geological sciences and a bachelor of arts degree in environmental geology. It also takes part in dual-degree programs with the Department of Civil Engineering and the Department of Soil and Atmospheric Sciences.

The BS program provides a rigorous foundation in the geological sciences, math, chemistry and physics. This program appeals to a great number of students because it provides broadly based preparation for those planning a career as a professional geologist or for graduate work in the geological sciences.

The BA program is designed for students who may be interested in environmental geology or are interested in a geology background for such areas as science education, environmental law, environmental policy or conservation management.

The dual-degree programs provide a strong background in two closely related

fields and are especially helpful for students interested in environmental geology or engineering geology.

The capstone course for the BS is a six-week field course taught at the department's permanent field laboratory in the Wind River Mountains of Wyoming. Here, the students apply the lessons of their course work to a wide variety of geological, hydrological and geophysical projects.

The capstone course for the BA is an individually designed course that allows students to pursue their interests. Ideally the course integrates hands-on training in the laboratory or field with communication skills.

Degree Requirements

(120 hours or more) BS Degree Program

GEOLOGICAL SCIENCES CORE CURRICULUM (52–53 HOURS)

Introductory option:

1100 Principles of Geology or 1200 Environmental Geology (4)

2350 Historical Geology (3)

2360 Historical Geology Laboratory (1)

2400 Surficial Earth Processes and Products (4) or 2100 Introduction to Soil Science (1–3)

3250 Mineralogy (5)

3300 Introduction to Geochemistry (3)

3600 Plate Tectonics (3)

3800 Sedimentary Environments and Facies (3)

3900 Igneous and Metamorphic Petrology (3–4)

4150 Structural Geology (4)

4992 Field Geology (6)

Additional geological sciences course at or above 2000 level

Three additional geological sciences courses at or above the 4000 level

RELATED COURSES (24–29 HOURS)

Professional Track

General Chemistry 1320, 1330

University Physics 2750, 2760

Analytic Geometry and Calculus 1500 and Calculus II & III 1700, 2300

General Track

General Chemistry 1320, 1330

College Physics 1210, 1220

Analytic Geometry and Calculus 1500 and Calculus II 1700

A&S FOUNDATION COURSES (33–34 HOURS)

Foreign language or foreign language alternative — an option tailored to student interests, which could include advanced courses in math, engineering, biology, chemistry, physics, soil science, geography, etc. (12–13).

English 1000 (3)

Social science and behavioral science (9)

Humanities and fine arts (9)

Two writing-intensive courses

BA Degree Program

GEOLOGICAL SCIENCES CORE CURRICULUM (34 HOURS)

Introductory option:

1200 Environmental Geology (4) or 1100 Principles of Geology (4)

2350 Historical Geology (3)

2360 Historical Geology Laboratory (1)

2400 Surficial Earth Processes and Products (4)

3110 Geology of Missouri (3)

3200 Rocks and Rock-forming Minerals (3)

3210 Rocks and Rock-forming Minerals Laboratory (1)

3800 Sedimentary Environments and Facies (3)

4100 Hydrogeology (3)

4991 Capstone in Environmental Geology (3)

Additional geological sciences course at or above 2000 level

Additional geological sciences course at or above the 4000 level

RELATED COURSES (19–21 HOURS)

General Chemistry 1320, 1330

College Physics 1210

Calculus for Social and Natural Sciences I 1400

Calculus for Social and Natural Sciences II 2100 or Statistical Methods in Natural Resources 2530

General Biology and Lab 1010 and 1020 or Basic Environmental Studies 1060 or General Botany 1200

A&S FOUNDATION COURSES (41–43 HOURS)

Foreign language (12–13)

English 1000 (3)

Social sciences (9)

Behavioral sciences (6)

Humanities and fine arts (12)

Two writing-intensive courses

Advising

All incoming students are advised by the departmental director of undergraduate studies. Students can explore career decisions with their adviser and other faculty members, depending on individual interests.

Areas of research and career opportunities in the field of geological sciences are vast, shedding light on potential career paths.

- Energy and mineral resources: development of conventional and alternative resources
- Organic geochemistry: transformation of organic matter to oil, natural gas and coal; the study of organic materials in the environment; and the use of organic compounds to mitigate environmental problems
- Water quality: acid precipitation, contamination of water supply by hazardous waste and wastewater treatment
- Water resources: processes of water movement and assessment of volumetric budgets and water quality for surface water and groundwater
- Waste disposal: disposal and storage of solid waste, hazardous chemicals and radioactive waste
- Geotechnical engineering: integration of geology and engineering in construction, transportation and waste disposal
- Land instability: subsidence, landslides, karst-forming processes, shoreline retreat, coastal flooding, coastal erosion, river flooding and soil erosion
- Plate tectonics: integrated study of dynamic earth, plate motions, plate boundaries and mountain building
- Solid earth geophysics: seismic waves,

magnetic/gravity anomalies, electrical resistivity, heat flow and interior structure

- Earthquakes and volcanic hazards: global distribution, physical causes, prediction and forecasting and hazard mitigation
- Marine geology and geophysics: origin of rocks and sediments on the sea floor, and morphology, structure and evolution of ocean basins
- Paleo-oceanography: reconstruction of physical, chemical and biologic conditions and global climate change through geologic time
- Paleontology and biostratigraphy: study of biosphere evolution through fossil record
- Structural geology: faults, fractures, folds and rock deformation
- Physical sedimentology: mechanics of sediment transport in alluvial systems, glacial systems and ocean basins
- Sediment diagenesis: chemical and physical transformation of sand and mud to rock
- Aqueous geochemistry: chemical interactions between fluids and solid geologic materials
- Economic geology: chemical and physical processes associated with formation of ore deposits
- Igneous petrology and geochemistry: origin of magmas, volcanic rocks and plutonic rocks
- Metamorphic petrology: chemical and physical changes in rocks at high temperatures and pressures
- Science education: teaching in elementary and secondary schools, colleges and universities
- Government agencies: environmental law, land-use planning, public policy, water resources, geological surveys, soil surveys and basic and applied research

Geology Club

The Geology Club is an active group of undergraduate and graduate students on and off campus. For more information on their activities, see their Web site: web.missouri.edu/~umcasgeolclub

Value of a Geology Major

Alumni surveys confirm that MU students who majored in the geological sciences have found careers and professional success in a broad range of areas.

Whatever they do, they leave MU with an understanding of how to integrate different kinds of knowledge to address problems or goals and with the ability to

analyze information and communicate it effectively — skills they know they can depend on in any job or profession.

Many graduates find employment with consulting firms, state or federal agencies, or petroleum companies. Others enter graduate programs at MU or other leading universities.

Missouri Admission

The University admits students on the basis of their chances for success here.

The main criteria are the high-school curriculum, test scores and class rank.

Applicants are expected to have followed a college-preparatory program with at least 17 units of credit, as follows (one unit equals one year):

Four units of English

Two units emphasizing composition or writing skills are required; one unit may be in speech.

Four units of mathematics

Acceptable courses include algebra I, geometry, algebra II, pre-calculus/trigonometry/analytic geometry, calculus and math analysis. Courses such as computer math, programming, consumer math and accounting are not acceptable.

Three units of science

At least one must be a laboratory course, such as earth science, biology, chemistry or physics. Courses such as general science and agricultural science are not acceptable.

Three units of social studies

Examples are world history, American government and principles of democracy.

Two units in a single foreign language

One unit in fine arts

If you think you might want to major in geological sciences, consider taking advanced science courses at your school or community college, if available.

Scholarships

If you apply for financial aid, you will be made aware of any scholarships for which you are eligible. The Department of Geological Sciences also has a number of endowed undergraduate scholarships:

- Mr. and Mrs. Richard Boyd Scholarship
- James G. Mitchell Scholarship
- Mrs. Mabel Patterson Scholarship
- Raymond E. Peck Scholarship
- Edmund and Mary L. Raymond Scholarship
- Pearl Todd Sando Scholarship
- Fred Strothmann Scholarship

How to Apply

For information about applying to the geological sciences program, call or write:
Department of Geological Sciences

101 Geological Sciences Building

University of Missouri

Columbia, MO 65211

Phone: 573-882-6785

Fax: 573-882-5458

E-mail: bennetka@missouri.edu

Web: geology.missouri.edu

For information about applying to MU, call or write:

Office of Admissions

230 Jesse Hall

Columbia, MO 65211-1300

Phone: 573-882-7786

800-225-6075 (toll free in Missouri and Illinois)

Fax: 573-882-7887

E-mail: mu4u@missouri.edu

Web: www.missouri.edu

The University of Missouri does not discriminate on the basis of race, color, religion, national origin, ancestry, sex, age, disability or status as a disabled veteran or veteran of the Vietnam era. For more information, call Human Resource Services at 573-882-4256 or the U.S. Department of Education, Office of Civil Rights.

