Geological Sciences

Geological sciences concern the Earth's entire physical makeup and the history of the physical and biological events that occurred within and upon it over the past four and a half billion years. Geological scientists are curious about the whole Earth, from its ancient past to its present and future, and they use the tools of chemistry, physics, biology, mathematics, and other sciences to study the Earth.

Mineralogists study the formation, composition, structure, and properties of minerals. Petrologists determine the mode of origin of rocks by analyzing the relationships of their minerals. Structural geologists study deformation of the Earth's crust. Sedimentologists study the formation of sediment and its transportation, deposition, and conversion into solid rock.

Geophysicists chart the changing positions of continents, study the near surface and deep structure of the Earth, and measure its electrical, gravitational, and magnetic fields. Geochronologists determine the age of rocks from precise measurements of the proportions of stable decay products from natural radioactive elements. Geochemists investigate the distribution of natural chemical elements in minerals and rocks. Aqueous geochemists study the distribution of chemical elements in surface and subsurface water and ice.

Planetary geologists study the moon and other planets of our solar system to understand the Earth's development and to discover clues about the origin and possible future development of the Earth. Glaciologists study the properties of ice, the movement of glaciers and ice sheets, and the effects glaciations have on world climate. Paleontologists study fossils to document the origin and evolution of life, reconstruct past environments, and study the effects of ancient climate change on the biosphere. Stratigraphers investigate and interpret the sources of sediment, the depositional environments of sedimentary rocks from their fossil and mineral content, and the geochemistry to understand ancient global change in the hydrosphere-atmosphere-lithosphere system.

Economic geologists explore the world for deposits of valuable mineral resources. Hydrogeologists study how subsurface water migrates and determine ways to prevent contamination of known subsurface water supplies. Environmental geologists study the hazards of flooding and erosional mass movement in urbanized areas and the threat of groundwater pollution from careless waste disposal. Seismologists study the Earth's interior from earthquake waves and monitor the risks to urbanized areas from nearby active fault zones. All cooperate in understanding the Earth.

Pursuing Geological Sciences at Ohio State

It is essential that high school students get a very good foundation in English, mathematics, science, and, if possible, computer science. The college preparatory program in many high schools is usually the most demanding, and the most applicable. Earth scientists must communicate their findings to others.

Geological Sciences Requirements

The School of Earth Sciences offers two major programs, a BA (Bachelor of Arts) and a BS (Bachelor of Science). Both programs involve preparation for the major and the major program itself. The BS program is recommended for students who intend to pursue postgraduate study.

BA Program Preparation for the major consists of the following courses in basic science and mathematics: 10 credit hours of General Chemistry; Algebra and Trigonometry, Elementary Functions, or Calculus and Analytic Geometry; 10 credit hours of biological sciences; and five credit hours each of Physical and Historical Geology. The BA major consists of at least 40 credit hours of course work in geological sciences at the 200 level or above.

BS Program Preparation for the major consists of the following courses in basic science and mathematics: ten credit hours of General Chemistry, fifteen credit hours of Calculus and Analytic Geometry, ten credit hours of Introductory Physics, five credit hours of biological science, five credit hours each of Physical Geology and Historical Geology, and five additional five credit hour courses in chemistry, mathematics, physics, engineering graphics, statistics, or zoology. The BS major consists of Mineralogy, Petrology, Structural Geology, a senior thesis, Field Geology I and II, and 10 additional credit hours in geological sciences at the 600 level.

Co-Curricular Opportunities

Ohio State offers many opportunities for students to learn and grow outside of the classroom. These range from cooperative education (co-op) and internships to study abroad programs to student organizations. Co-ops and internships place students in professional environments while they are Ohio State students. Ohio State offers more than 100 study abroad programs in 40 countries around the world. In addition, there are hundreds of student organizations on campus to meet the interests of a diverse student population.

These experiences enable students to gain valuable work experience, learn about cultures, and take on leadership roles before they enter the workforce. All of these experiences enhance learning and may provide an advantage in the job market.

For more information, check these web sites:

Geological Sciences: earthsciences.osu.edu
College of Mathematical & Physical Sciences: www.mps.ohio-state.edu
Ohio State: osu.edu
Admissions: undergrad.osu.edu
Multicultural Center: multiculturalcenter.osu.edu

Curriculum Sample —BS in Geological Sciences

This is a sample list of classes a student may take to pursue a BS in Geological Sciences. Since university students need more than specific education in a narrow field, they also will take classes to complete the General Education Curriculum (GEC). The GEC will allow students to develop the fundamental skills essential to collegiate success across major programs. Course work options satisfying the GEC often come from a variety of academic areas of study allowing students to tailor their GEC toward their interests. Note: This sample represents one of several possible paths to a degree in Geological Sciences.

Freshman Year:	
Physical/Historical Geology	10
Introductory Paleontology	5
Calculus/Analytic Geometry	10
General Chemistry	10
Physics: Particles and Motion	5
Biology: Energy Transfer and Development	5
MPS Survey	1
Total hours	**46**

Sophomore Year:	
Introductory Mineralogy and Crystallography	5
Introductory Petrology	5
Geomorphology	5
Physics: Thermal Physics and Electrostatics	5
Calculus/Analytic Geometry	5
English Composition	5
GEC (arts & humanities)	10
GEC (social sciences)	5
Total hours	**45**

Junior Year:	
Structural Geology	5
Field Geology (Summer Quarter)	9
Engineering: Programming and Graphics	4
Introduction to C++ Programming	4
Introduction to Statistical Analysis	5
GEC (foreign language)	15
GEC (social sciences	5
GEC (second writing course)	5
Total hours	**52**

Senior Year:	
Advanced Geological Sciences Option	10
Senior Thesis	1
Science course options	15
GEC (arts & humanities)	15
GEC (social sciences)	5
Total hours	**46**

Honors & Scholars Programs

Ohio State offers the Honors & Scholars programs to create an environment of intellectual support and stimulation within a close-knit community of high-ability undergraduate students. Through these programs, students have access to smaller classes, as well as enhanced undergraduate research opportunities, close working relationships with faculty, priority scheduling, and unique housing options.

Honors & Scholars programs represent great opportunities to be part of a smaller community within a large university. Good candidates for these programs will receive additional information after admission to the university. Learn more about the Honors & Scholars program at honors-scholars.osu.edu.

Career Prospects in Geological Sciences

Earth scientists work outdoors in the field and indoors in laboratories and offices. The field may be at sea, deep in the oceans, or on land in mountains, plains, deserts, or polar ice sheets. For some, it is all of the above. Laboratories and offices may be located at universities, corporations, or on federal, state, county, civic, or private premises. Sometimes, the lab is on the site as well as indoors. Almost all of them identify and describe samples of the natural material (soil or sediment, minerals or rocks, fossils or trace fossils), which they collect, and study.

Sampling of Earth materials requires equipment, from a rock pick to a drilling rig, and final identification and description of these samples usually requires use of one or more of the following laboratory instruments: X-ray diffractometer, electron microscope, seismograph, nuclear magnetic resonance analyzer, cryogenic magnetometer, special optical microscope, mass spectrographs, Mossbauer spectrograph, supercomputers, geographical information system (GIS), lots of specialized software, and, always, a personal computer. Some Earth scientists monitor drilling and take samples from deep boreholes. Some dredge samples from the deep oceans. Some sample landfills. Some design equipment to sample gas and dust from the outer limits of the atmosphere. They all study samples, and many travel to Antarctica. One Earth scientist has even been to the moon.

A recent American Association of Petroleum Geologists survey of starting salaries for graduates with a BS in geological sciences (2007) can be as high as $72,300 annually. Starting salaries for MS graduates (2007) averaged $86,600 and Ph.D. graduates' salaries (2007) averaged $95,000. Civic employers tend to pay least; corporate employers tend to pay most. State and federal governments tend to fall in between. Graduates with a BA in geological sciences usually start employment at the low end of the BS salary range.

Revised August 2008. For the most up-to-date information on the geological sciences program, please visit earthsciences.osu.edu.

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