

# GEOLOGICAL SCIENCES AND GEOPHYSICS

## PREPARATION FOR THE MAJOR

### High School Preparation

Recommended as part of or in addition to the UC admission requirements:

- One to two years of chemistry,
- One year of physics,
- Mathematics through trigonometry and/or pre-calculus.
- Earth Science course (if available).

### Transfer Preparation

To make normal progress in the major, complete the following courses in your first two years:

#### All majors:

- One course in physical geology and one course in historical geology, both with laboratory,

#### Geological Sciences majors:

- One year of general chemistry with laboratory,
- One year of physics,
- One year of calculus.

#### Geophysics major:

- One year of general chemistry with laboratory.
- One-and-a-half to two years of physics with laboratory.
- Two years of calculus with applied differential equations.
- One course in introductory computer programming.

Please see the UCSB *General Catalog* ([www.catalog.ucsb.edu](http://www.catalog.ucsb.edu)) or your school counselor for more information on course preparation. California community college students should see [www.assist.org](http://www.assist.org).

Geological science is the study of the earth—of its rocks, minerals and records of ancient life, and of the physical, chemical and biological processes, past and present, at work in the earth's interior, on its surface, and within its envelope of water and air. An applied science, geoscience draws from a number of disciplines, mixing the practical with the theoretical.

On the practical side, geoscientists locate water, oil and minerals in the earth. They help engineers and architects design structures that withstand earthquakes. They study the effects of erosion, the likelihood of volcanic eruptions, and the evolution of rivers, lakes and aquifers. They develop methods to evaluate and clean up the environment. Geoscientists also study the history of the climate and oceans in order to construct models which predict future changes. Geoscientists are playing a central role in the debate about global warming.

On the theoretical side, much of geoscience involves looking at the earth's history over vast stretches of time. Geoscientists use the fossil record to study the evolution of life and to develop theories that explain rates of evolutionary change and the causes of mass extinctions. Geoscientists investigate the formation of mountains, valleys and deserts. Using a variety of techniques, geoscientists estimate the age and composition of rock formations and then reconstruct a picture of what the earth used to look like. Geoscientists have brought about a scientific revolution during the past 30 years through the development of plate tectonics, the theory that explains the growth and movements of the continents and ocean floors.

Geoscientists also study the structure of the earth's interior, using seismic waves, gravity and magnetic fields to uncover what lies below the continents. Geological study extends above the continents to the moon and the planets, with geoscientists taking an active part in the planning of space explorations and in the development of theories that explain how planets are formed.

Some geoscientists study remote regions: mountains in Alaska, volcanoes at the bottom of the ocean, or craters on the moon. Others study their neighborhood, mapping faults that run below Santa Barbara or modeling the erosion along the coastline. Still others focus on the fundamental aspects of the science—the chemistry and physics of rocks and minerals.

## The Major

UCSB's Department of Earth Science offers eight undergraduate degrees:

- Bachelor of Arts (BA) in Geological Sciences, and the same degree with an emphasis in science education;
- Bachelor of Science (BS) in Geophysics,
- Bachelor of Science (BS) in Geological Sciences, and the same degree with emphases in Earth and Planetary Science, Earth Systems, Geohydrology or Paleobiology.

The BS in Geological Sciences requires more Geological Science courses and fewer general education courses than does the BA. Also, the emphases within the BS require additional elective courses.

Introductory college courses required in preparation for the majors include physical and historical geology. Physical geology focuses on the earth's structure and composition and the physical and chemical processes that affect it. Historical geology focuses on the earth's evolution and that of its life forms. Basic geology courses such as mineralogy (the study of the formation, composition, and properties of minerals), petrology (determining the origin and genesis of rocks by analyzing their mineral or grain relationships), stratigraphy (investigating the time and space relationships of layered rocks and their fossil and mineral content), paleontology (the study of fossils in order to understand past life forms and their evolution and to reconstruct past environments), and structural geology (the study of the deformation, fracturing, and folding that has occurred in the earth's crust) comprise the bulk of the geology student's training. Also required are courses in mathematics, computer science, chemistry, physics, and technical writing. A geoscientist must have good writing skills to prepare accurate, understandable technical reports. Geology majors take four years of lecture and laboratory courses, ending with an intensive six and one-half week summer course in geological field work.

### **Careers in Geoscience**

To pursue a career in geoscience, students need at least a bachelor's degree with a strong background in chemistry, physics, mathematics and geoscience. Students who are interested in paleontology also need a solid background in biology. As in any profession, the best jobs go to the most highly qualified candidates, and a graduate degree is required for most entry-level professional positions. Therefore, students who are planning professional careers in geoscience should consider earning an advanced degree. UCSB's undergraduate program prepares students for graduate study in geoscience and related fields.

Students interested in the Geological Sciences or Geophysics majors are invited to call or write to:

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