



Bachelor of Science in Geology

www.geology.pitt.edu/uprogs.html

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Geology is not just rocks. Geology is a diverse science that seeks to understand the workings of almost every aspect of the modern and ancient Earth. If you love **nature**, **science**, and **variety**, you should consider geology:

Nature: Geologists are fascinated by the workings of the natural world. Perhaps your curiosity has led you to observe the patterns of flowing water and erosion, or think about what fossils say about their ancient world, or to pick up interesting rocks along a trail. Perhaps you just like the wilderness. Recent geology majors have hiked the Appalachian Trail, gone backpack camping with 'at-risk youth' in the Utah deserts, bicycled across North America, plumbed the depths of unexplored caves, and traveled to Mongolia in pursuit of summer research. All geology majors take a six-week summer field camp that features extensive hiking in the western U.S., Italy, New Zealand, or some other place, depending on the field camp they choose.

Science: Although Pennsylvania high schools treat the Earth sciences as a 'soft' science suitable for those who don't like physics or chemistry, geology is in fact a rigorous science that garners hundreds of millions of dollars in National Science Foundation research support each year. To see whether geology is a good major for you, try Physical Geology (0040) and the Physical Geology Lab (GEOL 0055). Then be sure you are comfortable with the required physics, math, and chemistry (see requirements below)!

Variety: Geology has always deployed an interdisciplinary mix of physics, chemistry, biology, math, and natural science to understand the mysteries of nature. It has also always focused on the solid Earth (rocks, minerals, mountain belts, volcanoes, earthquakes, sedimentary basins, oil and gas deposits, etc.) as well as the history of life (paleontology) and its impact on the Earth. In recent decades, geologists have become increasingly concerned with the history of the Earth's climate, how the physical and chemical behavior of the oceans has changed over time, and how drifting continents and evolving life have interacted to control the composition of the atmosphere and oceans and hence to control global climate. We also examine how human activities have recently impacted our environment, including the quality of air, water, and landscape. Finally, recent NASA missions have revolutionized planetary geology: how do other planets work, is (or was) there life on other planets and why are they so different from the Earth?

Core requirements of the Geology Major:

- **Physical Geology (GEOL 0040)** covers basic geology: plate tectonics; minerals; the recognition and origin of igneous, sedimentary, and metamorphic rocks; volcanic systems; the recognition and origin of geologic structures; earthquakes, the determination of geologic time; and how erosion, rivers, groundwater, beaches, glaciers, and other surface systems operate. Memorize this class and you will go far!
Majors may take **Geology (GEOL 0800)** OR **Natural Hazards (GEOL 0820)** OR **Environmental Geology (GEOL 0860)** instead of GEOL 0040. However, the weekly recitations in 0800 and 0860 cut out one third of the material covered in GEOL 0040. GEOL 0040 is not more difficult; it just better covers the introductory material.
- **Physical Geology Lab (GEOL 0055)** gives you plenty of hands-on experience identifying rocks and minerals and working with maps, aerial photographs, and satellite images. The wide variety of labs (from groundwater to geologic maps to plate tectonics) gives you an excellent sampling of the types of problems that geologists actually work on. This is an excellent companion class to GEOL 0040, GEOL 0800, GEOL 0820, or GEOL 0860.
- **History of the Earth (GEOL 0060)** focuses on the causes and effects of short- and long-term climate change, on the history of the oceans and the continents, and on interpreting the many geochemical and geologic clues that are used to reconstruct the history of the planet. A weekly lab focuses on the practical aspects of inferring local and regional geologic history based on rock samples, fossils, and various types of other data.
- **Mineralogy (GEOL 1001)** covers the recognition of a wide variety of geologically important minerals and the

fundamental factors that determine their basic properties. The class covers the symmetry present in 2- and 3-D objects, the actual 3-D atomic architecture of different minerals, the impact of ionic size and charge on crystal chemistry and mineral properties, and how polarized light allows accurate mineral identification under high-power microscopes. These may sound like obscure topics, but they are actually pretty interesting!

- **Igneous and Metamorphic Petrology (GEOL 1003)** focuses on using the compositional and textural clues in igneous and metamorphic rocks to understand their origin and, by extension, the history of a given region. This class takes you deep into the mysteries of mineral crystallization in liquids of complex compositions and how these processes affect everything from rock and mineral textures to volcanic eruption styles. This class is an important prerequisite for our upper-level course in volcanology.
- **Sedimentology and Stratigraphy (GEOL 1020)** has three main components. The first looks at fluid dynamics and sediment transport in the context of modern depositional systems (alluvial fans, sand dunes, lakes, rivers, deltas, beaches, continental shelves, reefs, and the deep ocean). The second combines careful rock observations with your knowledge of depositional systems to determine how given sedimentary sequences were deposited. The final part, stratigraphy, covers the surprisingly subtle science of applying a time scale to the rock record.
- **Structural Geology (GEOL 1100)** provides an array of analytical techniques that are used to unravel the complex and highly varied processes of deformation that characterize the world's mountain belts and fault zones. A theoretical understanding of how rocks are deformed under a variety of temperature, pressure, and stress conditions is combined with observations made on rocks, outcrops, and geologic maps in order to unravel the complex history of deformed regions.
- **Summer Field Camp (GEOL 1960)** is the capstone experience for the geology major. Most of the above classes include lab experiences and many include field trips in order to give you the practical skills you need to do geology. However, the whole undergraduate experience is comprehensively integrated in summer field camp. Summer field camps vary, but all involve setting students loose in the wilderness to identify the rock units in a given area, map their distribution, understand their significance, and thereby infer the Earth's history within the map area. People come back from summer field camp saying, "Now I feel like a *real* geologist!"

Science Co-requisites:

- Three calculus classes: MATH 0220, 0230, 0240
- Two chemistry classes: CHEM 0110, 0120
- Two physics classes: PHYS 0174, 0175

- Exploration Geophysics (GEOL 1410)
- Environmental Geochemistry (GEOL 1515)
- Geology of the Planets (GEOL 1701)

Sample Geology Electives: Geology majors need nine credits from at least three classes numbered 1000 or above. Here is a partial list:

- Groundwater Geology (GEOL 1051)
- Environmental Science, Ethics, and Public Policy
- Paleoclimates (GEOL 1052)
- Geomorphology (= landform study; GEOL 1060)

GIS Certificate: The Certificate in Geographic Information Systems is a great opportunity to earn electives while acquiring a range of software and image analysis skills (aerial photos, maps, and satellite images) that are highly sought after by both public and private employers. Check out our web site for classes and more information.

Q: What do I do with a geology degree?

A: Anything you want! If you love nature and science, a geology degree should give you the skills you need for the sort of job you'd enjoy, whether or not it is as a geologist. For example, your scientific and mapping skills are great training for jobs in parks and forestry management, museum work, science education, urban and suburban planning, and many other jobs that involve nature and/or resource issues. Geology majors are also highly competitive when it comes to on-campus job fairs. Like business people, geologists analyze a lot of factual information and make rational decisions (hypotheses) based on incomplete information. Like business people, geologists are comfortable analyzing numerical data and with explaining the results and significance of their data. Within the field of geology, there are environmental and geotechnical jobs for people with BS degrees. A master's degree opens up better jobs in these fields, plus oil and gas exploration jobs (which can be enormously rewarding, both financially and intellectually). With a PhD and a lot of hard work, a job at a university or government lab may be yours. If you are worried about getting a job when you graduate, pursue as many internships as possible! This allows you meet potential employers, learn about real-world opportunities, and sample different types of work.