American Geological Insitute

Geoscience Career
Frequently Asked Questions

1. General Questions

1.1 What are the geosciences?

Geoscience is the science of exploration, discovery, and Earth stewardship. The geosciences address all issues relating to Earth Systems, including the solid Earth, oceans, and atmosphere. The major applications of the geosciences are: exploration and responsible development of natural resources (oil, gas, coal, minerals, construction aggregate, water, soil), preservation of the natural environment, restoration from environmental damage, mitigation of geohazards such as earthquakes and landslides, and exploratory research like the Mars space mission and understanding El Niño.

By addressing these issues and developing solutions to problems affecting the Earth, geoscientists act as stewards of the Earth. Though much has been learned about the Earth through earth science, much more is yet to be discovered, especially as new problems face society, such as global climate change, advances in technology, and exhaustion of energy and raw material supplies.

Back to top

1.2 What are geoscientists and what do they do?

Geoscientists study the Earth's physical composition, structure, history, and the natural processes. They provide information to society for use in solving problems and establishing policies for resource management, environmental protection, public health, safety, and welfare.

Geoscientists are concerned about Earth issues. Is there a global warming trend? How and where should we dispose of industrial wastes? How can we satisfy society's growing demands for energy, yet conserve natural resources for future generations?

Geoscientists discover and develop supplies of fossil fuels, groundwater, construction materials and mineral ores. They understand the processes that affect the quality of the natural environment. They study and mitigate geohazards such as volcanic eruptions, earthquakes, floods, and landslides. They explore and discover new ideas about the natural world from the depths of the oceans and the core of the Earth to the outer reaches of space.

Most of all, geoscientists enjoy the Earth. It is an outdoor laboratory filled with opportunities to observe Earth processes in action. By applying knowledge of forces that shape the Earth, geoscientists seek to reconstruct the past and anticipate the future.

Back to top

1.3 What is a day in the life of a geoscientist like?

Most geoscientists say that they enjoy the challenge and diversity of their work and that there is no "typical" day. Geoscientists work with people, data, information, ideas, and technology. Computers have had a major impact on the gathering and interpretation of data in all areas of the geosciences. Geoscientists often work with other scientists and engineers in teams, reflecting the complexity of the problems they address. Information technology and the Internet have greatly increased the accessibility of data and the speed of communication among people worldwide, and has likewise affected the pace and diversity of the geosciences.

Geoscientists work in the field and laboratory, but most days are spent in the office. They gather and interpret data, generate ideas, and communicate the results of their work in writing, illustrations and in oral presentations.

Back to top

1.4 What are the different major subdisciplines of the geosciences?

The geosciences are composed of five major disciplines: geology, geophysics, atmospheric sciences, space sciences, and oceanography. There are numerous subdisciplines, reflecting diverse areas of specialization.

Some occupations in geology are:

Environmental geologists work to solve problems with pollution, waste disposal and urban development and hazards, such as flooding and erosion.

Geochemists investigate the nature and distribution of chemical elements in rocks and minerals.

Geomorphologists study the effects of Earth processes and investigate the nature, origin and development of present landforms and their relationship to underlying structures.

Glaciologists study the physical properties and movement of glaciers and ice sheets.

Hydrologists investigate the movement and quality of water.

Mineralogists study the formation, composition and properties of minerals.

Petrologists determine the origin and genesis of rocks by analyzing mineral or grain relationships.

Paleontologists study fossils to understand past life forms and their changes through time and to reconstruct past environments.

Petroleum geologists are involved in the exploration and production of oil and natural gas.

Sedimentologists study sedimentary rocks and the processes of sediment formation, transportation and deposition.

Stratigraphers investigate the time and space relationships of layered rocks and their fossil and mineral content.

Volcanologists investigate volcanoes and volcanic phenomena.

Some occupations in geophysics are:

Geophysicists decipher the Earth's interior and its magnetic, electric, and gravitational fields.

Seismologists study the location and force of earthquakes and trace the behavior of earthquake waves to interpret the structure of the Earth.

Some occupations in the atmospheric sciences are:

Atmospheric chemists investigate the chemical processes occurring in the atmosphere, such as the relationship between CFCs and ozone.

Atmospheric physicists study the effect of terrestrial, atmospheric, and space-based forces on the behavior of the atmosphere.

Climate modelers use mathematical techniques to simulate the interaction of physical forces on climate and climate change.

Meteorologists study the movement and energy distributions of the atmosphere, particularly with respect to their effect on weather.

Some occupations in the space sciences are:

Astronomers study celestial bodies, their movement, and location, using methods such as optical and radio astronomy.

Astrophysicists investigate the physical properties and interaction of forces in space, including electromagnetic radiation and the dynamics of time and matter.

Planetary geologists study the moon and other planets to understand the evolution of the solar system.

Some occupations in oceanography are:

Biological oceanographers focus on life in the ocean and how it is affected by chemical and physical processes.

Chemical oceanographers study the chemical composition of the ocean and its relationship to the lithosphere and biological processes.

Physical oceanographers study the natural processes and dynamics of the ocean and its interaction with the solid Earth.

Back to top

1.5 Geoscientists study the Earth, but do they deal with the environment?

Geoscientists are stewards of the Earth. In particular, most geoscientists focus on the physical and chemical aspects of the interaction among humans, flora, and fauna, and the Earth. They intrinsically deal with Earth's environment and environmental issues all the time. Environmental geologists provide scientific counsel and advice on the preservation of the environment, on the remediation of ecologically damaged areas, and on the environmental impact of land development. Hydrologists study problems concerning the supply of groundwater. Soil scientists address the fertility and health of soil for growing crop. Environmental geologists are employed at all levels of federal, state and local government to help frame and enforce legislation, environmental codes and regulations.

Back to top

1.6 I understand how atmospheric scientists, astronomers, and oceanographers differ, but what is the difference between a physical geographer and a geologist?

Physical geography is in many respects a geoscience. However, geographers generally study the distribution of features, such as hills, cities, and climatic zones, on the Earth's surface. Geologists examine the processes of the Earth - including its surface - in an attempt to understand the Earth system.

Back to top

1.7 Where can I find out more about the geosciences and geoscientists?

The best sources are people and publications. Both your library and professional groups have publications the geosciences. A good place to start is by reading some general geoscience publications, such as Geotimes..

Talk to people. Visit professional geoscientists or geoscience faculty/teachers and discuss your interests and their experiences as a geoscientist. And perhaps most effectively, join a geoscience class or club and take a field trip, so that you can begin to experience first hand the exciting world of the geosciences.

Back to top

2. Education Questions

2.1 What area of studies should I pursue to work as a geoscientist?

Normally, geoscientists pursue a college education in their field of study, with most continuing to higher degrees in their specialty. If you know the general area that interests you, such as geology, oceanography, space, or atmospheric science, begin by taking the required introductory classes. Other related course you will need to take include chemistry, physics, and math, at least through calculus.

Also, many subdisciplines in the geosciences are combinations of earth science and other science and engineering disciplines. For example, paleontology is a combination of geology and life science. A strong base in fundamental science provides the flexibility to pursue any of the diverse pathways available in the geosciences.

Back to top

2.2 For geology, what is field camp? Do I really need to take it?

Field training is a common component of most geology programs. This course provides the concentrated training in field techniques required to work in the geosciences.

Classroom training comes alive in the field, providing the sense of scale, spatial relationships, and heterogeneity difficult to appreciate in the classroom or laboratory.

Further, it synthesizes your previous classroom-based training, teaches you to visualize in three dimensions, to proficiently extrapolate location data into the "bigger picture," and to work effectively as a team. Field camp today is not your professor's field camp! Many field camps now address subjects such as hydrology, geohazards, and groundwater mapping and may use data from remote sensing or employ GIS (Geographic Information System) techniques. Many employers will look for field work experience in your training.

Back to top

2.3 How much education do I need? Can I get a job with a bachelor's degree?

Usually a master's degree is required for major professional entry-level positions. As in any profession, the best jobs go to the best qualified applicants. Students contemplating a professional career in the geosciences should consider getting an advanced degree. A Ph.D. is needed for advancement in college teaching and in most higher-level research positions.

Back to top

2.4 What classes should I take?

The curriculum provided by a geoscience department provides the core for your education and professional preparation. However, since the geosciences are physical sciences, it is advisable to take additional science courses outside of geology, as well as math, statistics, and business courses to help solidify your grounding. Standard bachelor's degrees require 30-35 hours of advanced geoscience course work. Master's degrees require an additional 30 hours of course work.

Back to top

2.5 What other skills do I need?

There are additional technical and non-technical skills outside the strict geoscience education requirements that will enhance your development. The most important skills are to learn how to learn, to experiment, to gain diverse early experiences, and discover how to think analytically and solve problems. Because of the nature of geoscience and technology today, a strong basis in mathematics, statistics, and computers helps develop your analytic skills.

In science, as in most disciplines, effective communication, especially the ability to sell your ideas, is required to successfully complete your work. The ability to express yourself orally and in writing is an essential skill. Additional important skills include the ability to work with others, understand business and economics and manage your own career.

Most geoscientists find themselves working with others. They may be team members, clients, corporate management, investors or politicians. Very little can be accomplished without the ability to collaborate and work with and through other people. Seek opportunities to gain experience working with others.

It is increasingly important that all geoscientists understand the business that employs their services. A course in business, finance or economics will be an asset.

It is also important for everyone to understand how to plan and manage their own careers. The prospect that you will work for a single employer lifelong is slim. You need to know how to create your own career path to achieve your own career and life goals.

Back to top

2.6 Are there entrepreneurial opportunities in the Geosciences? Are many geoscientists self- employed?

The geosciences have a long tradition of entrepreneurship, especially in the exploration and discovery of natural resources. Independent petroleum geologists have been a creative driving force in the progress of the petroleum industry since its inception. The environmental industry is dominated by relatively small consulting firms led by geoscientists and engineers.

In the wake of recent corporate and governmental downsizing in the 80's and 90's a large number of outplaced geoscientists entered the consulting fields in their specialty area. Success in this area requires particular dedication. If you are motivated to do this you need to seek out successful people and discover what experiences you need in order to pursue this pathway.

Back to top

2.7 I am going to graduate school. Where do I start?

Much of determining the appropriate graduate school is centered on your specific interests and finding an appropriate faculty adviser. Most geoscience professional societies and colleges provide information about various graduate programs. After identifying appropriate schools, you should visit the campus, talk with faculty members, and try to identify a specific faculty advisor. Note that the graduate student - advisor relationship is important, and both the graduate student and the faculty advisor should have generally compatible professional interests and be willing to work together.

Back to top

2.8 How am I ever going to afford graduate school?

Most geoscience graduate students receive some type of financial support. Many graduate programs will not offer admission unless they can provide the student with some sort of support. The most common types of graduate student support are Graduate Teaching Assistantships, Graduate Research Assistantships, Fellowships, and student loans. Most assistantships pay a subsistence level allowance, but normally include tuition remission and access to the university facilities necessary for your research. Though one will not become rich on graduate student support, most people manage with the funding they are given.

Back to top

2.9 Should I focus my education toward being a generalist in my field or should I consider being a specialist early in my career?

You need to build flexibility into your career plan. That requires solid basics in math and science as well as the geosciences to give the core foundation to your education. Beyond that you would be well served to seek diverse experiences in a variety of geoscience fields early in your career. There is time later to specialize and integrate your experience as a mature professional.

Back to top

3. Job Opportunities

3.1 Are there jobs available for geoscientists?

Yes, currently there are over 120,000 people in the United States working as geoscientists. So jobs do exist. Be aware that employment trends can vary both as a function of the general economy and the cyclical nature of many earth-science industries. For instance, energy industry employment of geologists declined during the late 1980s and early 1990s. But now with stable oil prices, advanced technology, and changes in the global economy, there is increased hiring in the petroleum industry. Over the near term there will be a shortage of

qualified people. This represents a complete reversal of the hiring practices of the industry over a one year period and illustrates how quickly fortunes can change.

Hiring in environmental geology is related to government policy and enforcement of environmental codes. Hiring in engineering geology is tied to the construction industry. Research jobs depend largely on government commitment to programs like space exploration or ocean and atmospheric studies.

The message is that there are cycles in all phases of the geosciences, just as there are in aerospace and other fields. If you have a strong interest in the geosciences you should not be dissuaded by short-term cycles. Rather you should be aware of the driving forces of change that can influence your career, and plan to be adaptable over your career.

See the Career Stats section of this web site to learn how many people are working in the various areas of the geosciences.

Back to top

3.2 What sectors of the economy provide the most opportunities for geoscientists?

The economic sector with the most jobs varies by geoscience subdiscipline. Generally, industry, academia, and the federal government are the largest employers of geoscientists. Most geologists work in industry, either in mineral extraction, petroleum, or environmental firms. However, consulting, academia, and state and local government agencies as well as the federal government are viable options.

The message for you as an individual is to know what you want to do. Statistics can tell you how most geoscientists are employed, but you are seeking just one job out of the range of opportunities, or at least just one at a time. Look at the Careers Stats section for more information about employment levels in the different sectors of the economy.

Back to top

3.3 What are the future prospects for the geosciences?

The future of the geosciences will be influenced by advances in technology as well as the economic climate and the politics of governments. There are challenges in the exploration of space, the oceans, as well as energy, raw material, and environmental needs worldwide. Geoscientists will utilize advancing technology to meet these challenges for years to come. For example, some engineering geologists expect to see lunar bases built on the moon and remote sensing geologists expect to explore the moons of Jupiter.

Back to top

3.4 Where do I begin my job search?

Your job search starts now, not just when you really need a job. It starts by building a network of contacts, and gathering information about what it is like to work in your chosen field. Your "job search" is one step in the overall process of choosing and building a career.

There are several avenues that you can use to look for your first job. Most jobs are found through personal contacts, not through response to ads. Develop and use your contacts. Your academic advisor knows your work well and should be aware of the general opportunities in your field. Contact alumni of your department who are practicing professionals. Tell them what you are looking for and listen to the information and advice they provide. The professional societies offer employment services to members. Check them out. Professional publications such as Geotimes, Science, and Nature include classified ads for geoscience employment. Use the resources of your university career centers. Also, do not forget to use the Internet, especially for seeking job opportunities in large organizations such as the federal government.

Above all, make every effort to gain firsthand experience in the field in which you are interested. You need ways to find out what it is like to work in your field. Part-time work, summer internships, work experience before you commit to graduate school are all possibilities.

Back to top

3.5 What else should I know to pursue a career in science and technology, and the geosciences in particular?

Know what is important to you. Examine your interests, what you do best and like best and make an informed choice about a career. Find out about career opportunities through your own process of research and discovery. Separate out what you assume to be true from what you know to be true. Challenge your own assumptions and well-meaning advice of others. It is your career.

Back to top

3.6 What are the best web sites for information about careers in science and technology and the geosciences in particular?

Visit the Links section of the AGI Careers web site, where an updated list of appropriate career links is maintained.

Back to top

4. Salary Levels

4.1 How much can I expect to earn as a geoscientist?

As with all professions, the starting salaries vary based on the level of education and skills you have. They also vary with business cycles and economics of particular industries. In the early 1990s, the range of average starting salaries for graduates with bachelor's degrees was $21,000 to $36,000. Starting salaries for those with master's degrees ranged from $24,000 to $38,500 and from $30,000 to $44,000 for those with Ph.D's. As a general guide, you may refer to the mean salary statistics available here on the Geoscience Careers web site. In general, experienced geologists with a bachelor's degree tend to earn about $40,000 per year, with salaries averaging as high as $77,300 for doctorate-level geologists in industry. The other geosciences have similar mean salary levels, and university faculty generally average about $60,000 per year.

Back to top

4.2 How quickly can I move up the ladder in a typical geoscience job?

In part, your upward mobility depends on the employment sector you select. In the petroleum industry and most private-sector positions, early advancement in rank can be expected every 2-3 years for your first 10-15 years of employment. As in most cases, as you advance up the ladder in later years, there are fewer opportunities for promotions.

However, the downsizing and restructuring of industry and government have removed many layers of management. In many organizations, the "ladder" is not what it used to be.

You need to do some self-discovery to find out whether or not management is the area to which you aspire. Many companies have salary structures designed to compensate increased value of technical professionals somewhat parallel to the management ladder. You will find that you are expected to increase your values and influence in the organization continuously throughout your career. Becoming a supervisor/manager/executive is one strategy or pathway to increased influence. Becoming a productive and influential technical professional is another pathway. The key to building influence in your career is your ability to learn, to absorb new knowledge, and apply it effectively in your work. The strategies to do this are up to you.

Back to top

5. Quality of Life

5.1 Where are geoscience jobs geographically located?

Geoscience jobs are available in many locations. Government jobs in the geosciences are available in all sections of the country, especially the western United States. Industry jobs are generally concentrated in the South Central U.S., reflecting the influence of the petroleum industry. A table of where geoscience jobs are is available on the Geoscience Careers web site, under the employment statistics section of Career Stats.

Large international companies have interests and staff worldwide. The opportunity to live and work overseas depends on matching your interests with those of potential employers. Long assignments overseas are not as common as they once were although the opportunity to travel certainly is. Travel experience and facility with foreign languages and cultures are significant assets to people wishing to work overseas.

Back to top

5.2 Can I really spend my whole career in the geosciences?

Yes, geoscientists with a quality educational background and continuing educational training are suited to address a broad range of problems and issues. Geoscientists are, by their training, flexible and readily adapt as the societal needs and demands on the geosciences change. For example, over the past decade, with downsizing in the petroleum sector, many geoscientists moved into the environmental sector.

It is important that you decide what you want to do. You control your own career. If you make flexibility and solid basics a part of your educational plan, you will be able to adapt to the uncertainty of change and sustain a career in the geosciences indefinitely.

Back to top

5.3 How can I become more involved in the profession?

Build a personal network of contacts including practicing professional geoscientists. Join a geoscience professional society. The societies offer current information on research and employment in their particular fields. There are many professional societies in the geosciences - some broad, others very specialized. Many societies offer substantial student discounts on membership, journals, and meeting-registration fees. Try to attend professional meetings if possible. Most major meetings will offer free registration for students who volunteer to help at a couple of sessions; there will still be plenty of time for you to sit in on other sessions as well. Contact the particular societies hosting the meetings for information.

Seek summer and/or part-time work in the geosciences. Find ways to discover what people do on a day-to-day basis. If at all possible go on field trips with experienced professionals to see what and how they observe and describe geological features and processes.