

# Geoscientists

## Summary



Geoscientists often work outdoors, sometimes in remote areas and in both warm and cold climates.

### Quick Facts: Geoscientists

<b>2012 Median Pay</b>	\$90,890 per year \$43.70 per hour
<b>Entry-Level Education</b>	Bachelor's degree
<b>Work Experience in a Related Occupation</b>	None
<b>On-the-job Training</b>	None
<b>Number of Jobs, 2012</b>	38,200
<b>Job Outlook, 2012-22</b>	16% (Faster than average)
<b>Employment Change, 2012-22</b>	6,000

## [What Geoscientists Do](#)

Geoscientists study the physical aspects of the Earth, such as its composition, structure, and processes, to learn about its past, present, and future.

## [Work Environment](#)

Most geoscientists split their time between working in offices and laboratories, and working outdoors. Doing research and investigations outdoors is commonly called fieldwork and can require extensive travel to remote locations and irregular working hours.

## [How to Become a Geoscientist](#)

Most geoscientist jobs require at least a bachelor's degree. In several states, geoscientists may need a license to offer their services to the public.

## [Pay](#)

The median annual wage for geoscientists was \$90,890 in May 2012.

## [Job Outlook](#)

Employment of geoscientists is projected to grow 16 percent from 2012 to 2022, faster than the average for all occupations. The need for energy, environmental protection, and responsible land and resource management is projected to spur demand for geoscientists in the future.

### **Similar Occupations**

Compare the job duties, education, job growth, and pay of geoscientists with similar occupations.

### **More Information, Including Links to O\*NET**

Learn more about geoscientists by visiting additional resources, including O\*NET, a source on key characteristics of workers and occupations.

## **What Geoscientists Do**

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Petroleum geologists (a type of geoscientist) search for oil and gas deposits that are suitable for commercial extraction.

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### **Duties**

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Geoscientists typically do the following:

- Plan and conduct field studies, in which they visit locations to collect samples and conduct surveys
- Analyze aerial photographs, well logs (detailed records of geologic formations found during drilling), rock samples, and other data sources to locate natural resource deposits and estimate their size
- Conduct laboratory tests on samples collected in the field
- Make geologic maps and charts
- Prepare written scientific reports
- Present their findings to clients, colleagues, and other interested parties
- Review reports and research done by other scientists

Geoscientists use a wide variety of tools, both simple and complex. During a typical day in the field, they may use a hammer and chisel to collect rock samples and then use sophisticated ground-penetrating radar equipment to search for oil or minerals. In laboratories, they may use x-ray and electron microscopes to determine the chemical and physical composition of rock samples. They may also use remote sensing equipment to collect data and advanced geographic information systems (GIS) and modeling software to analyze data.

Geoscientists often supervise the work of technicians and coordinate work with other scientists, both in the field and in the

lab.

Many geoscientists are involved in the search for and development of natural resources, such as petroleum. Others work in environmental protection and preservation, and are involved in projects to clean up and reclaim land. Some specialize in a particular aspect of the Earth, such as its oceans.

The following are examples of types of geoscientists:

**Engineering geologists** apply geologic principles to civil and environmental engineering. They offer advice on major construction projects and help in other projects, such as environmental cleanup and reducing natural hazards.

**Geologists** study the materials, processes, and history of the Earth. They investigate how rocks were formed and what has happened to them since their formation. There are sub-groups of geologists as well, such as stratigraphers, who study stratified rock, and mineralogists, who study the structure and composition of minerals.

**Geochemists** use physical and organic chemistry to study the composition of elements found in groundwater, such as water from wells or aquifers, and earth materials, such as rocks and sediment.

**Geophysicists** use the principles of physics to learn about the Earth's surface and interior. They also study the properties of Earth's magnetic, electric, and gravitational fields.

**Oceanographers** study the motion and circulation of ocean waters; the physical and chemical properties of the oceans; and how these properties affect coastal areas, climate, and weather.

**Paleontologists** study fossils found in geological formations to trace the evolution of plant and animal life and the geologic history of the Earth.

**Petroleum geologists** explore the Earth for oil and gas deposits. They analyze geological information to identify sites that should be explored. They collect rock and sediment samples from sites through drilling and other methods and test them for the presence of oil and gas. They also estimate the size of oil and gas deposits and work to develop sites to extract oil and gas.

**Seismologists** study earthquakes and related phenomena like tsunamis. They use seismographs and other instruments to collect data on these events.

For a more extensive list of geoscientist specialties, visit the [American Geosciences Institute](#) .

People with a geosciences background may become professors or teachers. For more information, see the profile on [postsecondary teachers](#).

## Work Environment

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Geoscientists frequently work outdoors so they can study geological aspects of the Earth, such as geysers, up close.

Geoscientists held about 38,200 jobs in 2012. Industries employing the most geoscientists in 2012 were as follows:

Oil and gas extraction	26%
Engineering services	16
Management, scientific, and technical consulting services	12
State government, excluding education and hospitals	7
Federal government, excluding postal service	7

Nearly a third of all geoscientists worked in the mining, quarrying, and oil and gas extraction industry in 2012. Also, about 3 out of 10 geoscientists were employed in Texas in 2012, because of the prominence of those activities in that state. Workers in natural resource extraction fields usually work as part of a team, with other scientists and engineers. For example, they may work closely with petroleum engineers to find and develop new sources of oil and natural gas.

Most geoscientists split their time between working in the field, in laboratories, and in offices. Fieldwork can take geoscientists to remote locations all over the world and can be physically and possibly psychologically demanding. For example, oceanographers may spend months at sea on a research ship, and researchers studying advanced topics may need to collaborate with top scientists around the world.

The search for natural resources often takes geoscientists involved in exploration to remote areas and foreign countries. When in the field, geoscientists may work in both warm and cold climates, in all types of weather. They may have to travel by helicopter or four-wheel drive vehicles and cover large areas on foot. Having outdoor skills such as camping and boat-handling skills may be useful.

## Work Schedules

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Most geoscientists work full time. They may work long or irregular hours when doing fieldwork. Geoscientists travel frequently to meet with clients and to conduct fieldwork.

## How to Become a Geoscientist

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Laboratory experience is important for prospective geoscientists.

Geoscientists typically need at least a bachelor's degree for most entry-level positions. In several states, geoscientists may need a license to offer their services to the public.

## Education

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Geoscientists need at least a bachelor's degree for most entry-level positions. However, some workers begin their careers as geoscientists with a master's degree. A Ph.D. is necessary for most basic research and college teaching positions.

A degree in geosciences is preferred by employers, although degrees in physics, chemistry, biology, mathematics, engineering, or computer science are usually accepted if they include coursework in geology.

Most geosciences programs include geology courses in mineralogy, petrology, and structural geology, which are important for all geoscientists. In addition to classes in geology, most programs require students to take courses in other physical sciences, mathematics, engineering, and computer science. Some programs include training on specific software packages that will be useful to those seeking a career as a geoscientist.

Computer knowledge is essential for geoscientists. Students who have experience with computer modeling, data analysis, and digital mapping will be the most prepared to enter the job market.

Many employers seek applicants who have gained field and laboratory experience while pursuing a degree. Summer field camp programs offer students the opportunity to work closely with professors and apply their classroom knowledge in the field. Students can gain valuable experience in data collection and geologic mapping.

## Important Qualities

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**Communication skills.** Geoscientists write reports and research papers. They must be able to present their findings clearly to clients or professionals who do not have a background in geosciences.

**Critical-thinking skills.** Geoscientists base their findings on sound observation and careful evaluation of data.

**Interpersonal skills.** Most geoscientists work as part of a team with engineers, technicians, and other scientists.

**Outdoor skills.** Geoscientists may spend significant amounts of time outdoors. Familiarity with camping skills, general comfort being outside for long periods of time, and specific skills such as boat handling or even being able to pilot an aircraft could prove useful for geoscientists.

**Physical stamina.** Geoscientists may need to hike to remote locations while carrying testing and sampling equipment when they conduct fieldwork.

**Problem-solving skills.** Geoscientists work on complex projects filled with challenges. Geoscientists need to use and analyze complex sources of data. Evaluating statistical data and other forms of information to make judgments and inform the actions of other workers requires a special ability to perceive and address problems.

## Licenses, Certifications, and Registrations

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Geoscientists need a license to practice in some states. Requirements vary by state but typically include minimum education and experience requirements and a passing score on an exam.

## Pay

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Geoscientists	
Median annual wages, May 2012	
Geoscientists, except hydrologists and geographers	\$90,890
Life, physical, and social science occupations	\$60,100

**Total, all occupations**

\$34,750

Note: All Occupations includes all occupations in the U.S. Economy.  
Source: U.S. Bureau of Labor Statistics, Occupational Employment Statistics

The median annual wage for geoscientists was \$90,890 in May 2012. The median wage is the wage at which half the workers in an occupation earned more than that amount and half earned less. The lowest 10 percent earned less than \$48,270, and the top 10 percent more than \$187,200.

In May 2012, the median annual wages for geoscientists in the top five industries employing these scientists were as follows:

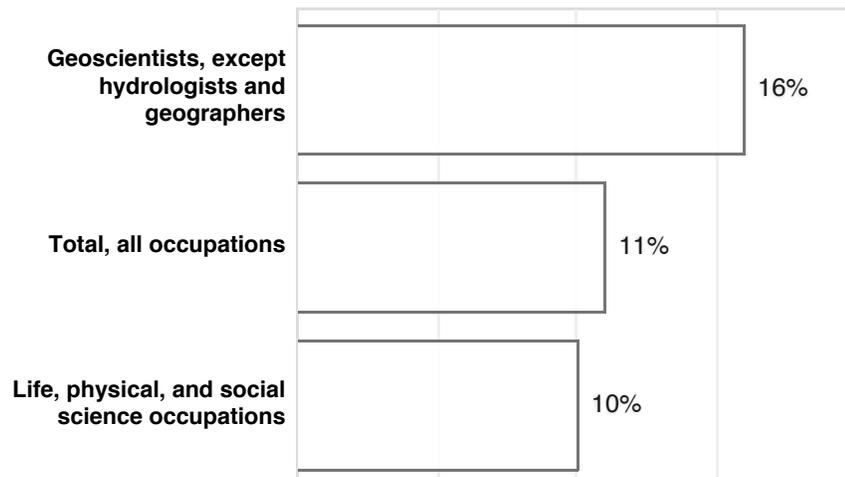
Oil and gas extraction	\$137,750
Federal government, excluding postal service	94,830
Engineering services	74,360
Management, scientific, and technical consulting services	74,020
State government, excluding education and hospitals	62,030

Most geoscientists work full time and may work long or irregular hours when doing fieldwork. Geoscientists travel frequently to meet with clients and to conduct fieldwork.

## Job Outlook

### Geoscientists

Percent change in employment, projected 2012-22



Note: All Occupations includes all occupations in the U.S. Economy.  
Source: U.S. Bureau of Labor Statistics, Employment Projections program

Employment of geoscientists is projected to grow 16 percent from 2012 to 2022, faster than the average for all occupations. The need for energy, environmental protection, and responsible land and resource management is projected to spur demand for geoscientists in the future.

Horizontal drilling and hydraulic fracturing are examples of new technologies that are expected to increase demand for geoscientists. These technologies allow for the extraction of previously inaccessible oil and gas resources, and geoscientists

will be needed to study effects they have on the surrounding areas. As oil prices remain high or increase into the future, even more technologies will likely be introduced that expand the ability to reach untapped oil reserves or introduce alternative ways to provide energy for the expanding population.

Geoscientists will be needed in planning for the construction of wind farms, geothermal power plants, and solar power plants. Alternative energies such as wind energy, geothermal energy, and solar power can use large areas of land and impact wildlife and other natural processes. In addition, only certain areas are suitable for harvesting these energies. For example, geothermal energy plants must be located near sufficient hot groundwater, and one task for geoscientists would be studying maps and charts to decide if the site is suitable.

An expanding population and the corresponding increased use of space and resources may create a continued need for geoscientists.

## Job Prospects

Job opportunities should be excellent for geoscientists, but particularly those who earn a master's degree. In addition to job growth, a number of job openings are expected as geoscientists leave the workforce due to retirement and other reasons.

Geoscientists with a doctoral degree will likely face competition for positions in academia and research.

Fewer opportunities are expected in state and federal governments than in the past. Budget constraints are likely to limit hiring by state governments and federal agencies such as the U.S. Geological Survey. In addition, more of the work traditionally done by government agencies is expected to be contracted out to consulting firms in the future. Most opportunities for geoscientists are expected to be related to resource extraction; in particular, gas and oil exploration and extraction operations.

### Employment projections data for Geoscientists, 2012-22

Occupational Title	SOC Code	Employment, 2012	Projected Employment, 2022	Change, 2012-22		Employment by Industry
				Percent	Numeric	
<b>Geoscientists, except hydrologists and geographers</b>	19-2042	38,200	44,200	16	6,000	<a href="#">[XLS]</a>

SOURCE: U.S. Bureau of Labor Statistics, Employment Projections program

## Similar Occupations

This table shows a list of occupations with job duties that are similar to those of geoscientists.

	OCCUPATION	JOB DUTIES	ENTRY-LEVEL EDUCATION	2012 MEDIAN PAY
	<a href="#">Agricultural and Food Scientists</a>	Agricultural and food scientists work to ensure that agricultural establishments are productive and food is safe.	<a href="#">See How to Become One</a>	\$58,610
	<a href="#">Anthropologists and Archeologists</a>	Anthropologists and archeologists study the origin, development, and behavior of humans. They examine the cultures, languages, archeological remains, and physical characteristics of people in various parts of the world.	Master's degree	\$57,420
	<a href="#">Atmospheric</a>	Atmospheric scientists study		



**Scientists,  
Including  
Meteorologists**

the weather and climate, and how it affects human activity and the earth in general.

Bachelor's degree

\$89,260



**Civil Engineers**

Civil engineers design, construct, supervise, operate, and maintain large construction projects and systems, including roads, buildings, airports, tunnels, dams, bridges, and systems for water supply and sewage treatment.

Bachelor's degree

\$79,340



**Environmental  
Engineers**

Environmental engineers use the principles of engineering, soil science, biology, and chemistry to develop solutions to environmental problems. They are involved in efforts to improve recycling, waste disposal, public health, and water and air pollution control.

Bachelor's degree

\$80,890



**Environmental  
Scientists and  
Specialists**

Environmental scientists and specialists use their knowledge of the natural sciences to protect the environment and human health. They may clean up polluted areas, advise policy makers, or work with industry to reduce waste.

Bachelor's degree

\$63,570



**Geological and  
Petroleum  
Technicians**

Geological and petroleum technicians provide support to scientists and engineers in exploring and extracting natural resources, such as minerals, oil, and natural gas.

Associate's degree

\$52,700



**Hydrologists**

Hydrologists study how water moves across and through the Earth's crust. They can use their expertise to solve problems in the areas of water quality or availability.

Master's degree

\$75,530



**Petroleum  
Engineers**

Petroleum engineers design and develop methods for extracting oil and gas from deposits below the earth's surface. Petroleum engineers also find new ways to extract oil and gas from older wells.

Bachelor's degree

\$130,280

Postsecondary teachers instruct students in a wide variety of academic and

	<a href="#"><u>Postsecondary Teachers</u></a>	vocational subjects beyond the high school level. They also conduct research and publish scholarly papers and books.	<a href="#"><u>See How to Become One</u></a>	\$68,970
	<a href="#"><u>Chemists and Materials Scientists</u></a>	Chemists and materials scientists study substances at the atomic and molecular levels and the ways in which substances react with each other. They use their knowledge to develop new and improved products and to test the quality of manufactured goods.	Bachelor's degree	\$73,060
	<a href="#"><u>Mining and Geological Engineers</u></a>	Mining and geological engineers design mines for the safe and efficient removal of minerals such as coal and metals for manufacturing and utilities.	Bachelor's degree	\$84,320
	<a href="#"><u>Natural Sciences Managers</u></a>	Natural sciences managers supervise the work of scientists, including chemists, physicists, and biologists. They direct activities related to research and development, and coordinate activities such as testing, quality control, and production.	Bachelor's degree	\$115,730
	<a href="#"><u>Physicists and Astronomers</u></a>	Physicists and astronomers study the ways in which various forms of matter and energy interact. Theoretical physicists and astronomers may study the nature of time or the origin of the universe. Physicists and astronomers in applied fields may develop new military technologies or new sources of energy, or monitor space debris that could endanger satellites.	Doctoral or professional degree	\$106,360

## Contacts for More Information

For more information about geoscientists, visit

[American Geosciences Institute](#)

For information about petroleum geologists, visit

[American Association of Petroleum Geologists](#)

To find job openings for geologists, geophysicists, or oceanographers in the federal government, visit

[USAJOBS](#)

For information on federal government education requirements for geoscience positions, visit

[U.S. Office of Personnel Management](#)

**O\*NET**

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[Geoscientists, Except Hydrologists and Geographers](#)

**Suggested citation:**

Bureau of Labor Statistics, U.S. Department of Labor, *Occupational Outlook Handbook, 2014-15 Edition*, Geoscientists, on the Internet at <http://www.bls.gov/ooh/life-physical-and-social-science/geoscientists.htm> (visited April 02, 2014).

**Publish Date:** Wednesday, January 8, 2014

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