

Value of the Geosciences



Geoscience explores solid earth, water, atmosphere, and space. Basic geoscience research at federal, state, and academic institutions helps us find and extract natural resources such as oil and natural gas, understand and protect our environment, monitor and prepare for natural disasters such as earthquakes and drought, and learn about conditions on distant planets.

WHAT DO THE GEOSCIENCES INCLUDE?

- Water research to **ensure water quality and quantity**
- Petroleum geology to **identify and recover energy resources**
- Natural hazard science to **help ensure safer, more resilient communities**
- Soil science to **monitor soil quality and health for agriculture and construction**
- Environmental geology to **protect and provide a healthy environment**
- Economic geology to **locate and extract mineral resources**
- Coastal geology to **support sustainable use of coastlines**
- Oceanography to **protect maritime productivity and ocean commerce**
- Atmospheric research for **weather forecasting and climate modeling**
- Planetary science to **better understand Earth and other planets**
- Geoscience education to **cultivate a society that understands the Earth**

VALUE ADDED

- Geoscientists contributed at least **\$91 billion** to U.S. GDP in 2014.¹
- Geoscientists are projected to contribute **\$109 billion** to U.S. GDP by 2024.¹
- The geosciences employed roughly **325,000** geoscientists in the U.S. in 2014.¹
- The National Science Foundation provides **64%** of all funding for basic geoscience research at universities in the U.S.²
- In 2015 energy production from oil, natural gas, coal and renewables including geothermal nearly equaled all U.S. energy consumption. U.S. scientific and technological advances helped get to this landmark.³

¹ Wilson, C. E. (2016) The Status of the Geoscience Workforce 2016. American Geosciences Institute, Alexandria, VA. <http://www.americangeosciences.org/workforce/reports>

² <https://www.nsf.gov/geo/about.jsp>. National Science Foundation

³ <http://www.eia.gov/totalenergy/data/monthly/index.cfm>



GEOSCIENCE & NEW FRONTIERS

Investigating critical minerals. Critical minerals are essential components in numerous defense, computing, clean energy, and communications technologies. Currently, the U.S. is 100 percent reliant on foreign sources for 18 mineral commodities. The USGS Mineral Resources Program uses cutting edge technology, including hyperspectral imaging, to discover potential mineral resources that could help make U.S. manufacturers less reliant on foreign sources for critical minerals.

Improving biomarkers for Alzheimer's, cancer, and osteoporosis. The National Science Foundation Geosciences Directorate (NSF GEO) is helping fund a workshop that will examine the applications of advanced isotope geochemistry — traditionally used in geoscience to identify components of rocks or air — as biomarkers for diseases such as Alzheimer's and cancer.

Tracking severe storms and wildfires. Data from satellites built and maintained by the National Aeronautics and Space Administration (NASA), National Oceanic and Atmospheric Administration (NOAA), and U.S. Geological Survey (USGS) help geoscientists conduct long-term global observations of the land, oceans, and atmosphere. Data collected from these satellites provides high-resolution images of wildfires, early warning for severe storms, enhanced weather prediction capabilities, and real-time storm tracking. Community decision makers use this information to anticipate

and mitigate threats to life and infrastructure. The U.S. private sector has leveraged these federal investments into more than 350 domestic commercial weather companies that generate an estimated \$3 billion in annual revenues.

Learning about life on other planets. Researchers funded by NSF GEO are investigating how Earth's harshest environments, such as below the Antarctic ice sheet and high in the Atacama Desert, sustain life, which could serve as an analog for life on other planets.

Harnessing energy from the ocean. Geoscience research and development contributes to harnessing safe domestic energy from alternative and traditional sources. Wave-powered energy research sponsored by the Department of Energy (DOE) helped private-sector companies to develop ocean buoys that convert wave movement into electricity. The DOE estimates that wave, tidal, riverine currents, and ocean thermal energy gradients could supply more than half of the United States' annual electricity consumption.

Evaluating winter road conditions to save lives and money. NSF GEO is currently funding research that applies high-speed snowflake imaging technology to improve our recognition of severe, cold-weather road conditions to allow weather and transportation departments to quickly evaluate road conditions during winter storms.

The Geopolitics Working Group (GWG) is comprised of a broad array of geoscience societies and organizations, including the American Association of Petroleum Geologists, the American Geophysical Union, the American Geosciences Institute, the American Institute of Professional Geologists, the American Meteorological Society, the Association for the Sciences of Limnology and Oceanography, the Association of Environmental & Engineering Geologists, the Consortium for Ocean Leadership, the Geological Society of America, the National Ground Water Association, the Seismological Society of America, the Society for Mining, Metallurgy, and Exploration, and the Soil Science Society of America.

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