Earth System Science: A New Program of Study at the University of Wyoming

Erin Campbell-Stone, Department of Geology and Geophysics,
University of Wyoming, Laramie, WY 82071, erincs@uwyo.edu

Trends in Geoscience

AGI: US Geoscience Enrollments (1955-2003)

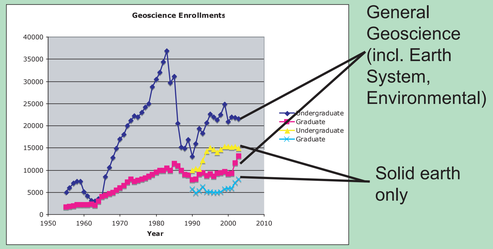


Figure 1. AGI data on student enrollment in the Earth Sciences. While 68% of undergraduate geoscience degrees are in traditional solid earth geosciences, only 55% of earth science graduate degrees are in these fields. (Figure provided by Carrick Eggleston.)

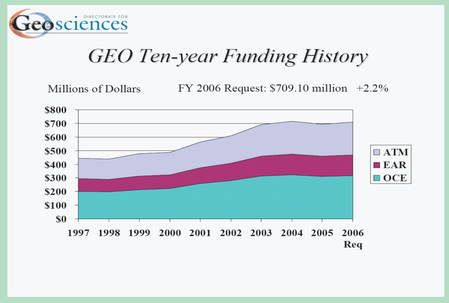


Figure 2. NSF funding trends. The funding for traditional Earth Science research has not increased as much as funding for Atmospheric Sciences and Ocean Sciences. (Figure provided by the Directorate for Geosciences.)

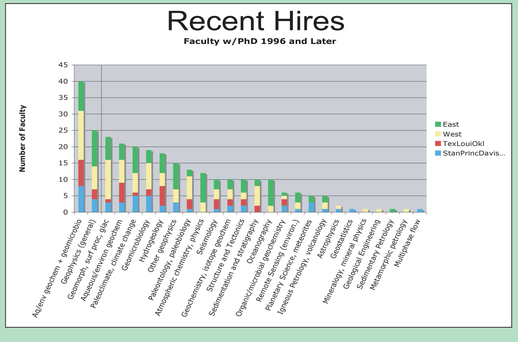


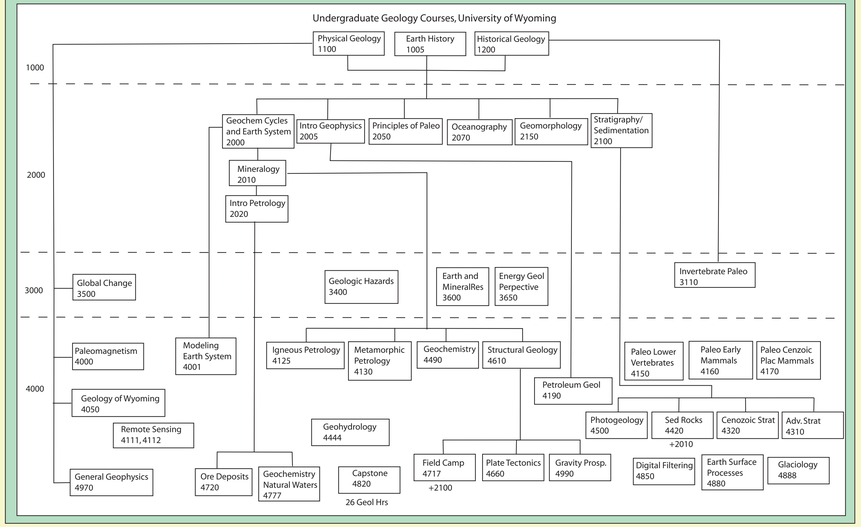
Figure 3. Recent hires at 70 randomly-selected universities in the United States. NOTE: The first two bars are combined fields and appear large relative to individual fields. (Figure provided by Carrick Eggleston.)

Abstract

In light of recent trends in geoscience enrollment and federal research funding, the University of Wyoming has designed a new program of study to compliment existing degrees in Geology and Geophysics, and Environment and Natural Resources. This new program is Earth System Science, which will provide an integrated approach to issues of global environmental change. The curriculum is designed to examine interactions among components of the Earth system, including the anthrosphere, atmosphere, biosphere, hydrosphere, and lithosphere. Although the coursework overlaps within the Geology and Geophysics, Environment and Natural Resources, and Earth System Science programs, the three degrees have very different emphases. The Geology and Geophysics degree is centered on strong traditional geoscience curriculum, the Environment and Natural Resources program is interdisciplinary but focuses on public policy, and the Earth System Science degree is an interdisciplinary degree with a rigorous science component.

BS in Geology and Geophysics

This degree requires traditional Geology courses in Mineralogy, Structural Geology, etc, as well as two semesters of Chemistry, Math through Calculus II, and one semester of Physics.



Environment and Natural Resources

The ENR undergraduate major is essentially a double major; students must complete the requirements of a second "affiliated major" in addition to the requirements of the ENR program. The goal of the ENR major is to add a breadth of knowledge to the depth of understanding in a traditional discipline, examining ENR issues from political, scientific, cultural, sociological, and legal aspects. This program attracts students predominantly from Economics and Finance, Geography, Rangeland Ecology and Watershed Management, and American Studies. Very few students from Geology and Geophysics participate in this program.

ENR Core Courses + Electives
(16 credit hours)

ENR 1100 ENR Problems and Policies
ENR 2000 Environment and Society
ENR 3000 Approaches to ENR Problem Solving
ENR 3900 ENR Seminar
ENR 4500 Risk Analyses and Management
ENR 4890 Topics in ENR
ENR 4900 ENR Assessment Practice
ENR 4970 Internship

Additionally:
18 credit hours outside of affiliate major (no more than 4 hours in one area of study) in:
- Environmental Science and Natural Resource Management
- Physical and Earth Science
- Biological Science
- Social Science
- Humanities
- Statistics

Earth System Science

Students majoring in ESS declare a concentration in one of the following areas: Anthropology, Atmospheric Science, Biology, Botany, Geography, Geology and Geophysics, or Soil Science.

ESS Core courses:

ESS 1000 The Earth System
ESS/Geol 2000 The Chemical Earth
ESS/Geog 3480 Environmental Change
ESS 4001 Modeling the Earth System
ESS 4950 Earth System Exploration
ESS 4970 Internship

ESS Foundation Courses:

Biol 1010 General Biology
Biol 2XXX Microbiology, Animal Biology or Plant and Fungal Biology
Chem 1020 General Chemistry I
Chem 1030 General Chemistry II
Math 2200 Calculus I
Math 2205 Calculus II
Physics 1310 College Physics I
One from GIS List:
- Geog 4200 Geographic Information Systems
- Anth 4160 GIS in Anthropology

One from Remote Sensing List:
- Bot/Geol/Geog 4111 Remote Sensing of Environment
- Bot/Geog 4140 Remote Sensing and Natural Resource Management
- Atsc 4XXX Atmospheric Remote Sensing

One from Biogeochemistry List
- Bot 4780 Biogeochemistry
- Geol 3500 Global Change: A Geologic Perspective
- Geol 4777 Geochemistry of Natural Waters
- Soil 4535 Soil Biogeochemistry

Geology and Geophysics Concentration Courses:

Geol 1100 Physical Geology
Geol 2005 Introduction to Geophysics
Geol 2010 Mineralogy
Geol 2100 Stratigraphy and Sedimentation
Geol 4610 Structural Geology
Geol 4280 Capstone
Two courses from the Geol list:
- Geol 2020 Intro to Petrology
- Geol 2050 Principles of Paleontology
- Geol 4444 Geohydrology
- Geol 4880 Earth Surface Processes
- Geol 4970 General Geophysics

Discussion Points:

The ESS program of study began this year and, as of yet, no students have registered. Will this program be attractive to undergraduates?

In the traditional Geology and Geophysics program, many undergraduates struggle with Math, Chemistry and Physics requirements. ESS is even more scientifically rigorous; will this deter students from participating?

Some faculty advocate creating narrow, traditional paths of study for undergraduate education, such as a geochemistry track or a geophysics track. ESS is based on a broad, interdisciplinary curriculum. Will this help or hinder students seeking jobs with a bachelor's degree or hoping to enter graduate school?