

Science of Earth Systems

Offered by the Department of Earth and Atmospheric Sciences
www.eas.cornell.edu

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Study of the earth sciences has never been more critical to society than it is today. Global climate change, dwindling energy resources, inadequate water supplies, and political strife over strategic minerals are global problems that are becoming more and more acute, while volcanic eruptions, earthquakes, tsunamis, and hurricanes threaten our increasingly concentrated populations and complex infrastructure with disaster on unprecedented scales. The Department of Earth and Atmospheric Sciences at Cornell University is a global leader in research directed toward understanding the fundamental processes that have shaped our planet, and is committed to providing students with the earth literacy needed to serve as informed citizens and wise stewards of the Earth.

The Science of Earth Systems major is an undergraduate program offered by the Department of Earth and Atmospheric Sciences to students in the College of Agriculture and Life Sciences, the College of Arts and Sciences, and the College of Engineering. The Science of Earth Systems program is unique in that it incorporates fundamentals of earth science with the emergence of a new and more complete approach, encompassing all components of the earth system—air, life, rock and water—to gain a comprehensive understanding of the world as we know it. Students may choose to focus on one of a number of disciplinary specialties such as geophysics or tectonics, or develop the broad expertise needed to understand the interactions between the diverse elements of earth and life in the past, present and future.

Science of Earth Systems graduates will be able to seek careers dealing with energy, mineral and water resources, natural hazards, weather and climate forecasting, ocean resources, and a host of environmental issues through employment in academia, government and the private sector. The major also prepares students for careers in environmental management and policy, law or medicine, science journalism and K-12 science education.

Major Requirements

Prerequisites for Admission to the Major

An understanding of the Earth requires a strong foundation in math and the basic physical and biological sciences. The requirements described below are the minimum requirements for the major. Students are strongly urged to complete additional math and basic science courses relevant to their concentration.

Students must be in good standing with their college and receive a **C- or better** in all prerequisite courses to be admitted to the major. Students still completing the prerequisites can be admitted to the major provisionally.

Students should visit www.eas.cornell.edu for specific course requirements

Mathematics	At least two courses in calculus
Physics	At least two courses in calculus-based physics
Chemistry	At least two courses in chemistry
Biology	At least one course in biology
Advisor-Approved Course in Math, Statistics, Computer Science, or Natural Science	In addition to the math, physics, chemistry, and biology requirements listed above, students are required to take an advisor-approved course in statistics, computer science, mathematics, or natural science (including, but not limited to, a course in astronomy, a second course in biology, or an additional course in physics or chemistry).

Major Requirements

Major Requirements

Students must receive a **C- or better** in all major required courses and take all major required courses for a letter grade.

Introduction	<ul style="list-style-type: none"> • EAS 2250 The Earth System
Core Courses	<p>Three courses selected from the following core course options:</p> <ul style="list-style-type: none"> • EAS 3010 Evolution of the Earth System • EAS 3030 Introduction to Biogeochemistry • EAS 3040 Interior of the Earth • EAS 3050 Climate Dynamics
Concentration Courses	Four concentration-appropriate courses at the 3000-level or above
Field Experience	<p>A concentration-appropriate field course such as:</p> <ul style="list-style-type: none"> • EAS 2500 Meteorological Observations and Instruments • EAS 4170 Field Mapping in Argentina • Courses in SEA Semester • Field courses offered at Shoals Marine Laboratory* • Field courses offered by another college or university* • Experience gained participating in field research with Cornell faculty (or REU at another institution)* <p>Field course options marked by an asterisk (*) require pre-approval by the faculty advisor and the SES Curriculum Committee</p>
Additional Required Courses	Students in the College of Engineering must also take a major approved elective at the 3000-level or above and three outside major electives. These courses must be approved by the student's advisor.

Concentration: Atmospheric Sciences

“I’m interested in...

...predicting weather phenomena, helping society prepare for hazardous storms, and studying climate change.”



Atmospheric Sciences is the study of the atmosphere, its processes, the effects other systems have on the atmosphere, and the effects of the atmosphere on these other systems.

Examples of Concentration Courses:

EAS 3340 Microclimatology
EAS 3410 Atmospheric Thermodynamics and Hydrostatics
EAS 3420 Atmospheric Dynamics
EAS 3520 Synoptic Meteorology I
EAS 4350 Statistical Methods in Meteorology and Climatology
EAS 4470 Physical Meteorology

Example of Field Experience:

EAS 2500 Meteorological Observations and Instruments

Examples of Careers:

Air Quality Consultant
Environmental Planner/Consultant
Government Meteorologist
Hazard Remediation Consultant
National Weather Service Forecaster
Private Weather Consultant
Science Education Specialist

Concentration: Environmental Geosciences

“I’m interested in...

**...correcting environmental pollution,
and solving local to regional scale problems.”**



Environmental Geosciences is the study of the chemical, physical, geological, and biological processes and reactions that govern the composition of the natural environment.

Examples of Concentration Courses:

BEE 3710 Physical Hydrology for Ecosystems
BIOEE 4780 Ecosystem Biology and Global Change
EAS 4550 Geochemistry
EAS 4620 Marine Ecosystem Sustainability
EAS 4800 Our Changing Atmosphere
PLSCS 3650 Environmental Chemistry: Soil, Air, and Water

Example of Field Experience:

Course offered at another university

Examples of Careers:

Environmental Planner/Consultant
Government Researcher
Groundwater Conservationist
Hydrogeologist
Science Education Specialist

Concentration: Geological Sciences

“I’m interested in...

...the big picture of how the Earth works, and Earth’s past, present, and future.”



Geological Sciences is the study of the fundamental chemical, physical, and biological processes that operate in and on the Earth, how these processes interact, and how these interactions have changed over Earth’s History.

Examples of Concentration Courses:

EAS 4010 Fundamentals of Energy and Mineral Resources
EAS 4050 Active Tectonics
EAS 4260 Structural Geology
EAS 4340 Exploration Geophysics
EAS 4540 Petrology and Geochemistry
EAS 4780 Stratigraphy

Example of Field Experience:

EAS 4170 Field Mapping in Argentina

Examples of Careers:

Environmental Planner/Consultant
Hazard Remediation Consultant
Government Researcher
Petroleum and Mineral Exploration Geologist
Science Education Specialist
Soil Scientist

Concentration: Ocean Sciences

“I’m interested in...

...understanding the role of the ocean in regulating Earth’s climate and providing ecosystem services to society.”



Ocean Sciences is the study of the world ocean and the processes within it: marine ecology and ecosystem dynamics; marine biogeochemistry; physical oceanography; and marine geophysics and geology.

Examples of Concentration Courses:

EAS 3500 Dynamics of Marine Ecosystems in a Changing Ocean
EAS 3530 Physical Oceanography
EAS 3540 Ocean Satellite Remote Sensing
EAS 3555 Biological Oceanography and Ocean Biogeochemistry
EAS 4620 Marine Ecosystem Sustainability
EAS 5050 Fluid Dynamics in the Earth Sciences

Example of Field Experience:

SEA Semester

Examples of Careers:

Oceanographer
Marine or Fisheries Ecologist
Marine Fisheries Manager
Environmental and/or Resource Manager
Ocean Policy Maker
Naval Oceanographer

Field Program

Field Mapping in Argentina

(Offered: Every Other Summer)

The Cornell University/University of Buenos Aires summer course in field mapping and geology of the Central Andes is based in the Precordillera range in San Juan Province, Argentina.

The field area is marked by spectacular rock exposures and superb examples of geologic phenomena in an active tectonic environment. The first part of the course is based on field exercises that include mapping of recently active faults, Precambrian metamorphic rocks including a Precambrian ophiolite, Paleozoic to Tertiary sedimentary rocks, and Tertiary volcanic rocks. The second part includes two mapping projects and a four day field trip with study exercises in the adjacent Frontal and Main Andean Cordilleras.

Students enroll in the course (EAS 4170 Field Mapping in Argentina) through Cornell University Summer Sessions. The course fulfills the field course requirement for students majoring in Science of Earth Systems.

<http://www.eas.cornell.edu/eas/academics/camps/andes.cfm>



Students in the Field



Jillian Lyles '13 engaged in quantitative whale surveying!



Tim Clements '15 in the field at Mount St. Helens!



Bennett Kapili '16 with the Curiosity Rover during an internship at the Jet Propulsion Lab!

Luke Baranek '16 in Argentina!



Kelsey Kingsbury '15 exploring sediment habitats!

Undergraduate Research

Cornell University is an international leader in research on key aspects of earth structure and evolution.

Faculty in the Department of Earth and Atmospheric Sciences are deeply committed to a mixture of basic and applied research, to the training of graduate students to be future international leaders in research in both academe and industry, to engaging individual undergraduate students in research experiences, and to infusing our courses with insights that come from our research.



We strongly encourage all students majoring in Science of Earth Systems to participate in undergraduate research during their time at Cornell University. Participating in undergraduate research is one of the best ways for students to learn about their field, gain experience, and make contacts that will help them throughout their career.

We also encourage students majoring in Science of Earth Systems to consider completing a senior honors thesis as part of the Science of Earth Systems Honors Program.

Examples of Recent Senior Honors Theses

“Satellite-Derived Glacier Speeds and Elevation Change Rates for Ross Island, Antarctica”—Nicole Abib '16

“Grassland Restoration: The Effects of Organic Amendments on Carbon Emissions”—Mariela Garcia '16

“Secondary Mission Objectives and Payload for a Mars Sample Return Lander”—Bennett Kapili '16

“A Theoretical Apex System Using Morphometric Methods to Address Taphonomic Problems with High-Spired Gastropods”—Erynn Johnson '15

“An InSAR Study of the Western U.S.”—Alana Semple '15

“The Relationship Between Carbon Fluxes, Precipitation, and Soil Properties, Along a Climate Gradient, Kohala Volcano, Hawai'i”—Kathryn Bland '14

“Dead Snails Do Tell Tales: Invasive Rat Predation on Fossilized Endemic Snails at Makauwahi Cave, Kaua'i”—Emma Reed '14



Graduate School



70% of graduates from the Science of Earth Systems major at Cornell University are attending or have attended graduate school.

Universities that our alumni are attending or have attended for graduate education include:

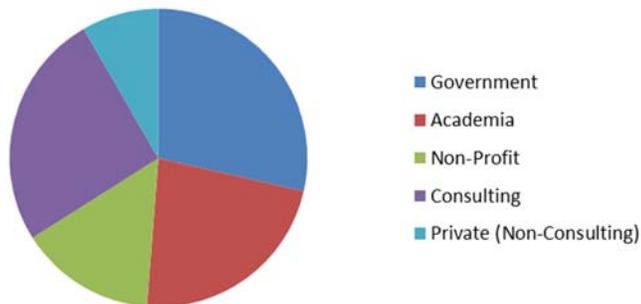
Brown University
Columbia University
Cornell University
Harvard University
Johns Hopkins University
Massachusetts Institute of Technology
University of Arizona
University of California—Berkeley
University of California—Davis
University of California—Santa Cruz
University of Michigan
University of Washington
Yale University

According to a survey of Science of Earth Systems alumni conducted in 2011 by the Department of Earth and Atmospheric Sciences

Science of Earth Systems graduates have careers in a wide range of fields. Some examples include:

Air Pollution
Climate Change
Disaster Recovery and Business Continuity Planning
Ecosystem Ecology
Education
Environmental Consulting
Environmental Law
Geophysics
Hazardous Waste Policy and Analysis
Hydrology
Mineral Exploration
Paleontology
Physical Oceanography
Planetary Science
Radiation Protection Services
Structural Geology
Volcanology
Water Resources Engineering

Employment Sector of Employed Science of Earth Systems Alumni



Average Income (1-3 years after graduation): \$40,000-\$50,000

Average Income (6-7 years after graduation): \$60,000-\$70,000

*According to a survey of Science of Earth Systems alumni
conducted in 2011 by the Department of Earth and Atmospheric Sciences*

Interesting Things in Snee Hall...

...Timothy N. Heasley Mineralogical Museum

See rare and beautiful gemstones!

...Seismographs

Watch earthquakes as they happen around the world!

...Fossils

See dinosaur footprints and mastodon tusks!

...Science of Earth Systems Program Office

Learn about the Science of Earth Systems major!

Visit us in Snee Hall!

