EARTH AND PLANETARY SCIENCES

Kline Geology Laboratory, 203.432.3124
http://earth.yale.edu
M.S., M.Phil., Ph.D.

Chair
Maureen Long

Director of Graduate Studies
Jay Ague

Professors Jay Ague, David Bercovici, Ruth Blake, Mark Brandon, Derek Briggs, David Evans, Alexey Fedorov, Debra Fischer, Jacques Gauthier, Shun-ichiro Karato, Jun Korenaga, Maureen Long, Jeffrey Park, Noah Planavsky, Peter Raymond, James Saiers, Mary-Louise Timmermans, John Wettlaufer

Associate Professors Bhart-Anjan Bhullar, Matthew Eisaman, Pincelli Hull

Assistant Professors Juan Lora, Alan Rooney, Lidya Tarhan, Jordan Wostbrock

FIELDS OF STUDY

Fields include geochemistry and petrology, geophysics, ice physics, mineral physics, seismology and geodynamics, structural geology and tectonics, paleontology and paleoecology, oceanography, meteorology, cryospheric dynamics, and climatology.

Students admitted in 2020 or earlier have the option of receiving a degree in either Geology and Geophysics or Earth and Planetary Sciences. Students admitted in 2021 and subsequent years will receive a degree in Earth and Planetary Sciences.

SPECIAL REQUIREMENTS FOR THE PH.D. DEGREE

There is no formal language requirement and no required curriculum. Students plan their course of study in consultation with their adviser to meet individual interests and needs and to lay the foundations for dissertation research. At the end of the first year the faculty reviews the standing of each student. A student recommended for continuation in the Ph.D. program will be so notified. Some students may be encouraged at that time to pursue only the M.S. degree. At the end of the second year the faculty reviews each student's overall performance to determine whether the student is qualified to continue for the Ph.D. degree. In order to qualify, a student must have met the Graduate School Honors requirement and maintained a better than passing record in the areas of concentration. Also, a student must have satisfied the requirements of the Qualifying Exam by having completed two Research Discourses termed (according to their degree of development) the Minor and the Major Discourses. The Major Discourse will be presented at the Qualifying Presentation, followed by an extended question period wherein the student must successfully defend both Discourses. Remaining degree requirements include a dissertation review in the third year; the preparation and defense of the dissertation; and the submission of the dissertation to the Graduate School.

Teaching experience is regarded as an integral part of the graduate training program in Earth and Planetary Sciences. For this reason, all students are required to serve as teaching fellows for two terms during the course of their predoctoral training. Students who require additional support from the Graduate School must teach additional terms, if needed, after they have fulfilled the academic teaching requirement.

In addition to all other requirements, students must successfully complete EPS 710, Responsible and Ethical Conduct of Research, prior to the end of their first year of study.

MASTER'S DEGREES

M.Phil. See Degree Requirements under Policies and Regulations.

M.S. Awarded only to students who are not continuing for the Ph.D. Students are not admitted for this degree. Minimum requirements include satisfactory performance in a course of study (typically six or more courses with at least one Honors grade in a graduate-level class) that is approved by the director of graduate studies (DGS), and a research project with the approval of the DGS and the student's thesis committee.

Program materials are available at http://earth.yale.edu or upon request to the Director of Graduate Studies, Department of Earth and Planetary Sciences, Yale University, PO Box 208109, New Haven CT 06520-8109; email, dgs@eps.yale.edu.

COURSES

EPS 519a, Introduction to the Physics and Chemistry of Earth Materials Shun-ichiro Karato
Basic principles that control the physical and chemical properties of Earth materials. Equation of state, phase transformations, chemical reactions, elastic properties, diffusion, kinetics of reaction, and mass/energy transport.

EPS 525a, Vertebrate Paleontology Jacques Gauthier
Phylogeny and evolution of the major clades of vertebrates from Cambrian to Recent, as inferred mainly from the fossilized remains of the musculoskeletal system (cranial, axial, and appendicular skeletons). Special attention given to the evolution of vertebrate feeding, locomotor, and sensory systems.

EPS 529a, Introduction to Geodynamics Jun Korenaga
This introductory course starts with the basics of continuum mechanics and covers a range of topics in geodynamics and relevant fields including the structure and dynamics of lithosphere, thermal convection and magmatism, Rayleigh-Taylor instability and plume dynamics, geoid and dynamic topography, and the thermal history of the core and geodynamo.

EPS 530a, Natural History of Reptiles and Amphibians Bhart-Anjan Bhullar
A survey of the phylogeny, biogeography, and natural history of living reptiles and amphibians, with consideration of the fossil record. Emphasis on broad-scale evolutionary patterns, environmental interactions, and behavior. Open to undergraduates with permission from instructor. Incorporates specimens from the Yale Peabody Museum. No prerequisites, although introductory college-level biology is recommended.

EPS 535a, Physical Oceanography Alexey Fedorov
An introduction to ocean dynamics and physical processes controlling the large-scale ocean circulation, ocean stratification, the Gulf Stream, wind-driven waves, tides, tsunamis, coastal upwelling, and other oceanic phenomena. Equations of motion. Modern observational, theoretical, and numerous other techniques used to study the ocean. The ocean role in climate and global climate change.

EPS 538a / ASTR 520a, Computational Methods in Astrophysics and Geophysics Paolo Coppi
The analytic and numerical/computational tools necessary for effective research in astronomy, geophysics, and related disciplines. Topics include numerical solutions to differential equations, spectral methods, and Monte Carlo simulations. Applications are made to common astrophysical and geophysical problems including fluids and N-body simulations.

EPS 620a, Essentials of Earth and Planetary Sciences Jun Korenaga
EPS faculty take turns to teach what they think everyone in the EPS department should know about their own field (geophysics, geology, geochemistry, atmospheric, ocean, climate dynamics, and paleontology).

EPS 659a, Data Analysis in Earth and Environmental Sciences Jeffrey Park
Introductory course in geoscience data analysis and time series methods, with emphasis on multiple-taper time series techniques. Examples drawn from seismological, paleoclimate, and historical climate data. Weekly computer assignments. Python proficiency helpful.

EPS 703a / E&EB 930a, Seminar in Systematics Jacques Gauthier
Topics and class time are chosen by the participants, and have included reading books and/or a series of papers on particular topics (e.g., homology; morphological phylogenetics; evolution of egg colors and exposed nesting in dinosaurs/birds; origin of snake ecology; conflicts between morphology and molecules; role of fossils in phylogenetic inference).

EPS 710a, Ethical Conduct and Scientific Research Staff
This seminar is required of all graduate students and must be completed within the first year. Postdoctoral associates supported by NSF funding are also required to take this course. Topics include: how to do science; how to treat data correctly (data management); mistakes and negligence; research misconduct; responding to suspected violation of standards; sharing of research results; the peer-review process; collaboration; authorship and the allocation of credit; conflict of interest; cultivating a respectful, inclusive, harassment-free scientific workplace; and science and society. This course is in addition to the online ethics module, The Yale Guide to Professional Ethics, that must be completed by all GSAS students within the first term of study, regardless of source of financial support. o Course cr

EPS 721a, Topics in Geobiology Lidya Tarhan and Jordan Wostbrock
In this course, students explore recent papers and discuss emerging ideas concerning life-environment interactions through Earth's history, with a particular focus on integrating paleontological, sedimentological, and geochemical records.

EPS 790a, Colloquium in Earth and Planetary Sciences Staff
This course focuses on discussion of emerging research across the Earth and planetary sciences. ½ Course cr

EPS 830a, Earth's Past Climates Alan Rooney
This seminar focuses on advanced topics in climate science from a geochemical perspective. We cover intervals from Deep Time to the Anthropocene. Meetings are for two hours, once a week, and are organized around readings from the primary research literature. Undergraduates require permission from the instructor. Enrollment limited to twelve.