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*Faculty member is in both the Geosciences and AOS departments.

Cover - Graduate student, Kyle Samperton, measures magmatic fabrics in the synmagmatically deformed floor of the Alpine Bergell Intrusion along the Swiss-Italian border, August 2011. Photo by C.B. Keller.

Pictured left are the north, front-facing doors of Guyot Hall, which serve as the main entrance to the department’s Great Hall. Built in the Tudor Gothic style of architecture, Guyot Hall was named for Princeton’s first professor of geology and geography, Arnold Guyot, faculty 1854-1884. Opening its doors in 1909, the building’s laboratories and collections of various branches of the natural sciences represented a major expansion of Princeton University’s teaching and research space in the development of graduate education.

Guyot Hall hosts the greatest number of educational gargoyles on campus—more than sixty-five. Above, appears the carvings of a Smilodon, the department’s mascot, and a dinosaur head that is reminiscent of a medieval dragon. They appear above the entrance doors to the wing. The biology wing (east end) is populated by living species gargoyles while the geology wing (west end) is decorated with carvings of extinct animals.
The Geosciences Department, together with its affiliated interdepartmental programs and institutes, serves as the central focus for the earth, atmospheric, oceanographic, and environmental sciences at Princeton.

It is a medium-sized department with currently 52 graduate students, 18 postdocs, and 19 faculty members.

The Department of Geosciences (GEO) offers Ph.D. programs in a range of disciplines including seismology, Earth history, mineral physics, geomicrobiology, tectonics, and environmental geochemistry. The Program in Atmospheric and Oceanic Sciences (AOS), which is concerned mainly with the physical aspects of weather and climate, is a part of the Department of Geosciences. Students with interdisciplinary interests, in the Earth’s carbon cycle or in atmospheric chemistry, for example, can create their own research program within GEO. The administration of the graduate program in AOS differs from that in GEO; the AOS program is described on their website: www.princeton.edu/aos/.

We offer an education that is both wide in scope, in response to the extreme complexity of the problems faced by geoscientists, and well grounded in the major sciences to provide full flexibility for continuing growth after the Ph.D. Our graduates find leading positions in academia, industry, consulting, and government.

The choice of a research advisor is as important as the choice of an institution. You may wish to explore research possibilities by contacting one or more of the faculty members listed in this brochure, and/or their students.

From the beginning of the first year, the emphasis in Geosciences is on research. Following consultation with an advisory committee (generally 3 members of the faculty), students start on a research project. Students give oral reports on the progress of their research near the end of their first year, and, as one component of the General Examination, they describe and...
defend their research project(s). All students take a General Examination within two years after arriving. Passing this exam qualifies them to continue toward a Ph.D.

Course requirements are flexible, though every student takes the two-semester course “Fundamentals of Geosciences” (GEO505/506) in the first year and normally completes six more one-semester courses by the end of the second year. Other requirements are decided on an individual basis and may depend on the discipline.

The Department of Geosciences currently has several associated faculty at the Geophysical Fluid Dynamics Laboratory (www.gfdl.noaa.gov). In addition, half a dozen graduate students from other departments (biology, chemistry, engineering) work in Guyot Hall with a Geosciences advisor.

Admission
A strong background in the sciences is a prerequisite for admission for the Geosciences and AOS Ph.D., but the program of study is designed for every student individually. We admit students who have majored in such diverse fields as chemistry, physics, mathematics, geology, biology, computer science, and engineering.

Because of the variety of backgrounds, we do not require a subject GRE test. The required General GRE scores form only one of the criteria that guide us in the admissions process.

Foreign students must show proficiency in the English language. The GRE and TOEFL/IELTS examinations are a first indication of English proficiency. We often conduct a telephone interview with foreign applicants before deciding on admission.

The application process for the GEO/AOS Program is fully electronic. To apply, you must go to the Princeton University, Graduate School website and use their electronic application. Before starting your electronic application please review the helpful tips and refer to the website for specific application requirements. See also: www.princeton.edu/gradschool

Financial Aid
In general, graduate students are supported (tuition plus stipend) for at least five years by First Year Fellowships provided by the University, project grants awarded to individual faculty members from outside agencies, and through an Assistantship in Instruction. A few Departmental or University Fellowships are also available. Students who are U.S. citizens are urged to apply for National Science Foundation, Department of Defense, NASA, or Hertz fellowships. Various funds are also available to support summer studies, fieldwork, and other research away from campus. The average time to obtain a Ph.D. in the Geosciences is five years, and in AOS four years.

Housing
The University provides a wide variety of housing within walking or biking distance from campus for both married and unmarried graduate students, and there is a shuttle service from graduate student housing to both the main and Forrestal campuses. The booklet Housing and Cost of Living for Graduate Students is sent to all newly admitted students and provides detailed

Ray coverage map for the inversion of seismic data. Beach balls show the location of earthquakes, triangles denote the location of seismographic stations, the color of stations represent the number of earthquakes they respond to (159 earthquakes and 338 seismographic stations are used in this study). Figure by Graduate Student, Hejun Zhu, Theoretical & Computational Seismology Research Group.
Laser spectrometers are used in the Mineral Physics Laboratory to characterize mineral properties and probe samples compressed to very high pressures.
Michael L. Bender  
Professor  
Ph.D., 1970,  
Columbia University  
e-mail:  
bender@princeton.edu  
website:  
www.princeton.edu/  
geosciences/people/bender  

Current Research Interests:  
Studies of paleoclimatology, ocean geochemistry and biogeochemistry, and plant physiology, including the development of innovative methods and instruments. Research topics include ice core studies of the last interglacial and beyond, seagoing studies of Southern Ocean biogeochemistry, studies of photosynthesis and respiration in phytoplankton and plants, and studies of fossil records of ocean chemistry and atmospheric CO2 in deep time.  

Current Students:  
Kuan Huang (huangk@princeton.edu)  
Audrey Yau (ayau@princeton.edu)  
Anne O’Leary (aoleary@princeton.edu)  

Recent Graduates:  
Ph.D.  
Gabrielle Dreyfus (“Dating an 800,000 Year Antarctic Ice Core Record Using the Isotopic Composition of Trapped Air,” 2008), U. S. Department of Energy.  
Makoto Suwa (“Chronologies for Ice Cores Constrained by their Gas Records and their Implications for Climate History for the Past 400,000 Years,” 2007), Japanese Foreign Service.  

Stephan A. Fueglistaler  
Assistant Professor  
Ph.D., 2002, ETH Zurich, Switzerland  
e-mail:  
stf@princeton.edu  
website:  
www.princeton.edu/aos/people/faculty/fueglistaler  

Current Research Interests:  
Interactions of dynamics, chemistry and radiation in the upper troposphere and lower stratosphere. Global distributions of atmospheric humidity and clouds.  

Current Students:  
Thomas Flannaghan (tflannag@princeton.edu)  
Claire Radley (cradley@princeton.edu)  

Thomas S. Duffy  
Professor, Associate Chair  
Ph.D., 1992,  
California Institute of Technology  
e-mail:  
duffy@princeton.edu  
website:  
geoweb.princeton.edu/research/Mineral-Phy/index.html  

Current Research Interests: Understanding the large-scale physical and chemical behavior of the Earth and other planets through experimental study of geological materials under extreme conditions of pressure and temperature.  

Current Students:  
Gregory Finkelstein (gfinkel@princeton.edu)  
Camelia Stan (cstan@princeton.edu)  
Jue Wang (juwang@princeton.edu)  

Recent Graduates:  
Ph.D.  
Zhu Mao (“Single-crystal Elasticity of Hydrous Mantle Minerals,” 2009), now at the University of Texas, Austin, TX.  
Sergio Speziale (“Elastic Properties of Earth Materials,” 2003), now at GeoForschungsZentrum, Potsdam, Germany.  
Sang-Heon Shim (“Stability, Crystal Structure, and Equation of State of Silicate Perovskites in the Earth’s Lower Mantle,” 2001), now a Professor at Arizona State University, AZ.  

M.A.  
Claire Runge, 2006  
Sutacha Hongsresawat, 2003  
Lisha Xie, 2009
John A. Higgins  
Assistant Professor  
Ph.D., 2009, Harvard University  
e-mail: jahiggin@princeton.edu  
website: www.princeton.edu/geosciences/people/higgins  

Current Research Interests: Reconstructions of past climates and the chemistry of the ocean and atmosphere using state-of-the-art methods and instruments. Research topics include Earth’s climate and atmospheric CO₂ over the last 65 million years, the chemistry of the ocean over geologic time, and global geochemical consequences of the rise of atmospheric O₂ and the evolution of life.

Gerta Keller  
Professor  
Ph.D., 1978, Stanford University  
e-mail: gkeller@princeton.edu  
website: www.princeton.edu/geosciences/people/keller  

Current Research Interests: Mass extinctions, catastrophes, and major environmental upheavals in Earth history. Application of micropaleontology, quantitative faunal analysis, stable isotope geochemistry and sedimentology to a wide variety of paleoclimatologic, paleoceanographic, and paleoecologic problems.

Current Students:  
Jahnvi Punekar (jpunekar@princeton.edu)  
Paula Maria Mateo (mmateo@princeton.edu)  

Recent Graduates:  
Ph.D.  
Brian Gertsch (“Biostratigraphy, Paleoenvironment and Geochemistry of the late Cenomanian Oceanic Anoxic Event 2 and the Cretaceous/Tertiary Boundary,” 2010), currently a Postdoctoral Researcher at Massachusetts Institute of Technology (MIT), MA.

Adam C. Maloof  
Associate Professor  
Ph.D., 2004, Harvard University  
e-mail: maloof@princeton.edu  
website: www.princeton.edu/geosciences/people/maloof  

Current Research Interests: Field geology and Earth history: Using sedimentary and volcanic rocks to extract information about Earth’s ancient magnetic field and the relative motion of continents, perturbations to the global carbon cycle, early animal evolution, climate change, and processes related to small meteorite impacts.

Current Students:  
Jonathan Husson (jhusson@princeton.edu)  
Blake Dyer (bdyer@princeton.edu)  

Recent Graduates:  
Ph.D.  
Nick Swanson-Hysell, (“Stratigraphic Records of Paleogeography, Climate and Ocean Chemistry from Two Late Proterozoic Basins,” 2011), currently a NSF Postdoctoral Fellow at the Institute of Rock Magnetism, University of Minnesota, Minneapolis, MN.

David M. Medvigy  
Assistant Professor  
Ph.D., 2006, Harvard University  
e-mail: dmedvigy@princeton.edu  
website: www.princeton.edu/scale  

Current Research Interests: Interactions between Earth’s climate and vegetation; terrestrial carbon budgets; impacts of deforestation on weather and climate.

Current Students:  
Jaya Khanna (jkhanna@princeton.edu)
François M. M. Morel
Albert G. Blanke, Jr.,
Professor of Geosciences
Associated Faculty
Department of Chemistry
Associated Faculty
Princeton Environmental Institute
Associated Faculty Civil and Environmental Engineering
Ph.D., 1971, California Institute of Technology
e-mail: morel@princeton.edu
website: www.princeton.edu/morel
Current Research Interests: The study of trace elements and their interaction with the microbiota in the environment.
Current Students:
Jenna Losh (jlosh@princeton.edu)
Johanna Goldman (johannag@princeton.edu)
Recent Graduates:
Ph.D.
Dalin Shi (“Effects of Ocean Acidification on Iron Availability and Requirements in Marine Phytoplankton”, 2011), now at Xiamen University, China.
Yan Xu (“Novel Metalloenzymes in Marine Phytoplankton: A Link Between Trace Elements and Macronutrients in the Oceans,” 2008), now at Princeton University, Princeton, NJ.

Satish B. Myneni
Associate Professor
Ph.D., 1995, Ohio State University
e-mail: smyneni@princeton.edu
website: www.princeton.edu/geosciences/people/myneni
Current Research Interests: Environmental geochemistry, chemistry of mineral-water and bacteria-water interfaces, aqueous speciation, ion solvation and complexation, chemistry of iron in terrestrial and marine systems, organic biogeochemistry, and the chemistry of natural organohalogenes.

Current Students:
Matthew Frith (mfrith@princeton.edu)
Nyssa Crompton (crompton@princeton.edu)
Emily Jayne (ejayne@princeton.edu)
Bjorn von der Heyden (bvon@princeton.edu)

Recent Graduates:
Ph.D.
Alessandra Leri (“Halogen Dynamics in Environmental Systems: An X-Ray Spectroscopic Study,” 2007), now an Assistant Professor at Marymount Manhattan College, New York, NY.

Tullis C. Onstott
Professor of Geosciences
Ph.D., 1981, Princeton University
e-mail: tullis@princeton.edu
website: www.princeton.edu/southafrica/
Current Research Interests: Application of molecular, geochemical, and isotopic techniques to Arctic permafrost impacted by global warming, to deep subsurface microbiology, hydrocarbon degradation and CO2 sequestration, and to the search for life on Mars.
Current Students:
Brandon Stackhouse (bstackho@princeton.edu)

Recent Graduates:
Ph.D.
M.A. Shannon Tronick, now a Missions Operation Engineer at Jet Propulsion Laboratory in Los Angeles, CA.

Michael Oppenheimer
Albert G. Milbank Professor of Geosciences and International Affairs, Woodrow Wilson School
Ph.D., 1970, University of Chicago

Current Research Interests: Physical climate changes, the impacts of these changes, and potential human and ecological responses to these impacts including adaptation and emissions reduction policies. Research topics include modeling of the ice sheet dynamics; ice-ocean interactions and sea level rise; paleoclimatic evidence on sea level rise; probabilistic assimilation of diverse evidence on ice sheet contributions to sea level; impacts of climate variability and change on human migration; decision making under uncertainty by experts and policy makers and the process of scientific assessment.

Recent Graduates:

Ph.D.
Christopher Little, (“Glaciological control of ice shelf basal melting, and implications for the coupled response,” 2010).

Samuel G. Philander
Knox Taylor Professor of Geosciences
Ph.D., 1970, Harvard University

Current Research Interests: Oceanic Circulation, Ocean-Atmospheric Interactions; Climate Fluctuations, Paleoclimates.

Recent Graduates:

Ph.D.
Andrzej Wittenberg (“ENSO Response to Altered Climates,” 2002) now at GFDL, Princeton, NJ.

Allan M. Rubin
Professor
Ph.D., 1988, Stanford University

Current Research Interests: Earthquake and fault mechanics, seismology, magma transport, rock fracture in crustal deformation.

Current Students:

Jessica Hawthorne (jchawtho@princeton.edu)
Pathikrit Bhattacharya (pathikri@princeton.edu)
Enning Wang (enningw@princeton.edu)

Recent Graduates:

Ph.D.
Alon Ziv (“Application of Fracture Mechanics to Geophysical Problems,” 2001), now at Ben-Gurion University of the Negev, Beer-sheva, Israel.
Yuri Fialko (“Fluid-Driven Fractal and Melt Transport Through Lithosphere on Earth and Terrestrial Planets,” 1998), now at Scripps Institution of Oceanography, UCSD, La Jolla, CA.

Jorge L. Sarmiento
George J. Magee Professor of Geoscience and Geological Engineering
Director, Program in Atmospheric and Oceanic Sciences
Ph.D., 1978, Columbia University

Current Research Interests: Oceanic Circulation, Ocean-Atmospheric Interactions; Climate Fluctuations, Paleoclimates.

Recent Graduates:

Ph.D.
Andrzej Wittenberg (“ENSO Response to Altered Climates,” 2002) now at GFDL, Princeton, NJ.
website: www.princeton.edu/aos/people/faculty/jorge_sarmiento

Current Research Interests: Global Carbon Cycle, Ocean Biogeochemical Dynamics, Ocean Circulation, Paleoceanography.

Current Students:
Kelly Kearney (kkearney@princeton.edu)
Joe Majkut (majkut@princeton.edu)
Hannah Zanowski (zanowski@princeton.edu)

Recent Graduates:
Ph.D.
Daniele Bianchi (“Processes Controlling the Distribution of Biogeochemical Tracers in the Ocean,” 2011), McGill University, Montreal, QC.
Irina Marinov (“Controls on the Air-Sea Balance of Carbon Dioxide,” 2005) now at Woods Hole Oceanographic Institution (WHOI), Woods Hole, MA.
Curtis Deutsch (“Biogeochemical Constraints on the Modern and Glacial Oceanic Nitrogen Cycle,” 2003), now at UCLA, Los Angeles, CA.
David Baker (“Sources and Sinks of Atmospheric CO2 Estimated from Batch Least-Squares Inversions of CO2 Concentration Measurements,” 2001), now at National Center for Atmospheric Research (NCAR), Boulder, CO.

Blair Schoene
Assistant Professor
Ph.D., 2006, Massachusetts Institute of Technology

e-mail: bschoene@princeton.edu
website: www.princeton.edu/geosciences/people/schoene

Current Research Interests: Tectonic and geochemical evolution of the lithosphere, using techniques in geochronology, geochemistry, structural geology and petrology; Measuring the timescales of events through Earth history through the integration of high-precision geochronology, field geology, and geochemistry; calibrating the geologic timescale and U-Pb geochronology technique development.

Current Students:
Jon Husson (jhusson@princeton.edu)
Brenhin Keller (cbkeller@princeton.edu)
Kyle Samperton (ksampert@princeton.edu)

Daniel M. Sigman
Dusenbury Professor of Geological and Geophysical Sciences Ph.D., 1997, MIT/WHOI Joint Program in Oceanography e-mail: sigman@princeton.edu

website: www.princeton.edu/geosciences/people/sigman

Current Research Interests: The use of stable isotopes to study the nitrogen cycle, today and in the past; the interaction of biogeochemical cycles with ocean circulation and climate, focusing on recent glacial cycles and the controls on atmospheric carbon dioxide; construction of geochemical models for Earth history studies; chemical oceanography; sediment geochemistry.

Current Students:
Dario Marconi (dmarconi@princeton.edu)
Karen Ellis (kkimm@princeton.edu)
Kristen Karsh (Kristen.Karsh@csiro.au)
Mathis Hain (mhain@princeton.edu)
Sarah Fawcett (sfawcett@princeton.edu)
Xingchen Wang (xingchen@princeton.edu)

Recent Graduates:
Peter DiFiore (“Nitrate Isotope Dynamics in the Southern Ocean,” 2009), now Associate Head of Portfolio Research and Analytics, Cartesian Capital Group, LLC, New York, NY.
Abby Ren (“Development and Paleoeceanographic Application of Planktonic Foraminifera-bound Nitrogen Isotopes,” 2010), now NOAA Global Change Postdoctoral Fellow at Lamont-Doherty Earth Observatory, Palisades, NY.
Frederik J. Simons  
Assistant Professor  
Ph.D., 2002, Massachusetts Institute of Technology (MIT)  
e-mail: fjsimons@princeton.edu  
website: www.frederik.net  
Current Research Interests: Geophysics; structure and evolution of continents; seismic waveform analysis and tomography; topography and gravity anomalies; development of oceanic instrumentation; earthquake early warning studies; theoretical spectral analysis; theoretical geodesy; satellite measurements and inverse problems.  
Current Students:  
Yanhua Yuan (yanhuay@princeton.edu)  
Recent Graduates:  
M.A.  
Dong V. Wang, 2010, now at University of North Carolina, Chapel Hill, NC.  

Jeroen Tromp  
Blair Professor of Geology  
Professor of Applied & Computational Mathematics  
Director of the Princeton Institute for Computational Science & Engineering (PICSciE)  
Ph.D., 1992, Princeton University  
e-mail: jtromp@princeton.edu  
website: www.princeton.edu/geosciences/tromp  
Current Research Interests: Theoretical and computational seismology. Development and implementation of numerical methods for forward and “adjoint” simulations of wave propagation in acoustic, elastic, and poroelastic media over a broad range of spatial and temporal scales. The current focus is on Earth imaging and “adjoint tomography” in exploration, regional and global seismology.  

Bess B. Ward  
Professor, Chair  
Ph.D., 1982, University of Washington  
e-mail: bbw@princeton.edu  
website: www.princeton.edu/nitrogen  
Current Research Interests: Nitrogen cycling in marine systems: Nitrification, denitrification and anammox in oxygen minimum zones (OMZs), phytoplankton nitrogen assimilation in the surface ocean. Investigations of functional diversity of marine microbes using molecular and stable isotope approaches to link microbes to N transformation processes. Current projects include cruises to the Eastern Tropical North and South Pacific to investigate denitrification and anammox in the OMZs, and cruises in the subtropical and subarctic North Atlantic to investigate nitrate utilization by eukaryotic phytoplankton.  
Current students:  
Sarah Fawcett (sfawcett@princeton.edu)  
Andrew Babbin (babbin@princeton.edu)  
Xuefeng (Nick) Peng (xpeng@princeton.edu)  
Qixing (Jimmy) Ji (qji@princeton.edu)  
Recent Graduates:  
Silvia Newell (“Nitrogen Cycle Processes in Low-Oxygen Marine Environments,” 2010), Boston University, Boston, MA.  
Gregory O’Mullan (“Diversity and Composition of Ammonia Oxidizing Bacterial Assemblages in Aquatic Environments,” 2005), Queens College, City University of New York, NY.
Michael L. Bender*  
Professor, (also see page 4)  
Ph.D., 1970, Columbia University  
AOS website: www.princeton.edu/aos/people/faculty/michael_bender/  
Current Research Interests: Biogeochemistry and Paleoclimate.

Thomas L. Delworth  
Lecturer  
Ph.D., 1994, University of Wisconsin  
e-mail: tom.delworth@noaa.gov  
AOS website: www.princeton.edu/aos/people/faculty/delworth/index.xml  
Current Research Interests: Decadal to Centennial Climate Variability and Change

Leo Donner  
Lecturer  
Ph.D., 1983, University of Chicago  
e-mail: Leo.J.Donner@noaa.gov  
AOS website: www.princeton.edu/aos/people/faculty/leo_donner/  
Current Research Interests: Cloud and Convective Processes in the Atmospheric General Circulation

Stephan A. Fueglistaler*  
Assistant Professor, (also see page 4)  
Ph.D., 2002, Institute for Atmospheric and Climate Science, ETH Zurich  
AOS website: www.princeton.edu/aos/people/faculty/fueglistaler/  
Current Research Interests: Atmospheric Physics

Stephen T. Garner  
Lecturer  
Ph.D. 1986, Massachusetts Institute of Technology (MIT)  
e-mail: Steve.Garner@noaa.gov  
AOS website: www.princeton.edu/aos/people/faculty/stephen_garner/  
Current Research Interests: Tropospheric Dynamics at the “Meso-scale” where Planetary Rotation has Only a Weak Control Over the Flow

Robert W. Hallberg  
Lecturer  
Ph.D., 1995, University of Washington  
e-mail: Robert.Hallberg@noaa.gov  
AOS website: www.princeton.edu/aos/people/faculty/robert_hallberg/  
Current Research Interests: Ocean Dynamics and Numerical Ocean Model Development

Isaac M. Held  
Lecturer with Rank of Professor,  
Ph.D. 1976, Princeton University  
e-mail: Isaac.Held@noaa.gov  
AOS website: www.princeton.edu/aos/people/faculty/isaac_held/  
Current Research Interests: Large-scale Atmospheric Dynamics and Climate Modeling

Larry W. Horowitz  
Lecturer  
Ph.D., 1997, Harvard University  
e-mail: Larry.Horowitz@noaa.gov  
AOS website: www.princeton.edu/aos/people/faculty/larry-horowitz/  
Current Research Interests: Atmospheric Chemistry

Denise L. Mauzerall  
Professor,  
Department of Civil and Environmental Engineering  
Ph.D., 1996, Harvard University  
e-mail: mauzeral@princeton.edu  
website: www.princeton.edu/~mauzeral/  
Current Research Interests: Air Quality Impacts on Health, Energy, and Climate Change

Ngar-Cheung (Gabriel) Lau  
Lecturer with Rank of Professor  
Ph.D., 1978, University of Washington  
e-mail: Gabriel.Lau@noaa.gov  
AOS website: www.princeton.edu/aos/people/faculty/ngar-cheung_lau/  
Current Research Interests: Atmospheric General Circulation; Large-Scale Air-Sea Interactions

*Faculty member is in both the Geosciences and AOS departments.
Sonya A. Legg  
Lecturer  
Ph.D., 1992, Imperial College, University of London  
e-mail: Sonya.Legg@noaa.gov  
AOS website: www.princeton.edu/aos/people/faculty/sonya_legg/  
Current Research Interests: Ocean Turbulence and Mixing

David M. Medvigy*  
Assistant Professor, (also see page 5)  
Ph.D., 2006, Harvard University  
AOS website: www.princeton.edu/aos/people/faculty/medvigy/index.xml  
Current Research Interests: Climate and the Terrestrial Biosphere

Michael Oppenheimer*  
Albert G. Milbank Professor of Geosciences and International Affairs, Woodrow Wilson School, (also see page 7)  
Ph.D., 1970, University of Chicago  
website: www.princeton.edu/step/people/faculty/michael-oppenheimer/  
Current Research Interests: Climate and Environmental Policy

Isidoro Orlanski  
Lecturer with Rank of Professor,  
Ph.D. 1967, Massachusetts Institute of Technology (MIT)  
e-mail: Isidoro.Orlanski@noaa.gov  
AOS website: www.princeton.edu/aos/people/faculty/isidoro_orlanski/  
Current Research Interests: Cyclones and Fronts

Stephen W. Pacala  
Professor, Department of Ecology and Evolutionary Biology  
Director, Princeton Environmental Institute  
Ph.D. 1982, Stanford University  
e-mail: pacala@princeton.edu  
EEB website: www.princeton.edu/eeb/people/display_person.xml?netid=pacala&display=Faculty  
Current Research Interests: Plant Ecology and Biology; Biosphere, Atmosphere, and Hydrosphere Interactions

Samuel G. Philander*  
Knox Taylor Professor of Geosciences, (also see page 7)  
Ph.D., 1970, Harvard University  
AOS website: www.princeton.edu/aos/people/faculty/george_philander/  
Current Research Interests: General Circulation, Ocean-Atmospheric Interactions, Climate Fluctuations, and Paleoclimates

V. Ramaswamy  
Lecturer with Rank of Professor  
Ph.D., 1982, SUNY-Albany  
e-mail: V.Ramaswamy@noaa.gov  
AOS website: www.princeton.edu/aos/people/faculty/v._ramaswamy/  
Current Research Interests: Radiative Transfer, Climate Perturbations by Greenhouse Gases and Aerosols Cloud-Climate Interactions; Regional and Global Climate Variations and Change

Jorge L. Sarmiento*  
George J. Magee Professor of Geosciences and Geophysical Engineering, (also see page 7)  
Director, Program in Atmospheric and Oceanic Sciences  
Ph.D., 1978, Columbia University  
AOS website: www.princeton.edu/aos/people/faculty/jorge_sarmiento/  
Current Research Interests: Ocean Biogeochemistry and Circulation

James A. Smith  
Professor  
Chair and Professor of Civil and Environmental Engineering  
Director, Program in Geological Engineering  
e-mail: jsmith@princeton.edu  
website: hydrometeorology.princeton.edu/  
Current Research Interests: Hydraulics and Hydrometeorology

Geoffrey K. Vallis  
Lecturer with Rank of Professor,  
Ph.D. 1981, Imperial College, University of London  
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Faculty Emeriti and Senior Scientists

Geosciences

William E. Bonini  
George J. Magee Professor of Geophysics and Geological Engineering,  
Professor of Geosciences and Civil Engineering, Emeritus  
Ph.D., 1957, University of Wisconsin

Kenneth S. Deffeyes  
Professor of Geosciences, Emeritus  
Ph.D., 1959, Princeton University

Lincoln Hollister  
Professor of Geosciences, Emeritus  
Ph.D., 1966, California Institute of Technology

W. Jason Morgan  
Knox Taylor Professor of Geology, Emeritus  
Professor of Geophysics, Emeritus  
Ph.D., 1964, Princeton University

Guust Nolet  
George J. Magee Professor of Geoscience and Geological Engineering, Emeritus  
Ph.D., 1976, University of Utrecht

Robert A. Phinney  
Professor of Geosciences, Emeritus  
Ph.D., 1961, California Institute of Technology

John Suppe  
Blair Professor of Geology, Professor of Geosciences, Emeritus  
Ph.D., 1969, Yale University

Standing from left to right are William Bonini, Lincoln Hollister, and Robert Phinney, local Geosciences Emeriti.

Atmospheric & Oceanic Sciences

George Mellor  
Professor of Mechanics, Mechanical and Aerospace Dynamics, Emeritus  
Senior Oceanographer  
Sc.D., 1957, Massachusetts Institute of Technology (MIT)

Syukuro Manabe  
Senior Meteorologist, Atmospheric and Oceanic Sciences  
Ph.D., 1958, Tokyo University, JP

Kirk Bryan  
Senior Meteorologist, Atmospheric and Oceanic Sciences  
Ph.D., 1957, Massachusetts Institute of Technology (MIT)

Kikuro Miyakoda  
Senior Scientist, Associated GFDL, Emeritus  
Ph.D., 1961, Tokyo University, JP
Suzan van der Lee *96
Associate Professor
Cornell University

Princeton provided me with the opportunity to complete a vast amount of research on a topic that was of great interest to the geosciences community. This experience has been of crucial importance in the rest of my career. After graduating, I spent 2.5 years as a postdoc at the Department of Terrestrial Magnetism of the Carnegie Institution of Washington, where I installed seismic stations in southern Africa and did research on seismograms from southern Africa and South America. After that I joined the staff at the Earth Sciences Department of the Federal Institute of Technology (ETH) in Zurich, Switzerland. In 2003 I moved to Northwestern, where I teach, advise graduate and undergraduate students, and continue my research in seismology.

I chose Princeton because of the excellence of the professors in geosciences and Princeton being very well known and in an attractive location. I also very much liked the campus. The Princeton environment is very green and peaceful. Once that starts to be boring, NYC is an hour away by train. Additionally, the graduate students are a diverse and active group. Of course one needs an Ivy League undergraduate degree in order to be able to read the Princeton graduate degree diploma!

Chris Andronicos *99
Associate Professor
Cornell University

Being a Princeton alum was key in getting a job. There are a lot of good geologists out there, but having a degree from Princeton definitely got my applications looked at more critically than I think they would have if I went to a different school. Since graduating from Princeton, I was an Assistant Professor teaching structural geology at the University of Texas at El Paso, then moved on to Cornell University. I work with undergraduate, MS, and Ph.D. students on a variety of research projects in the U.S., Mexico, and Canada geared towards understanding the evolution of the continental lithosphere and the fundamental processes that drive crustal deformation.

I applied to the University of New Mexico, MIT, and Princeton for graduate school. I was from Albuquerque, so MIT and Princeton were the better choices for me, and Princeton seemed like a much friendlier place than Cambridge after visiting both places. I also had a 2-year-old child at the time and Princeton was a much better place to have children. Finally, my future advisor did a good job of recruiting me with a great field-based research project.

Princeton was a great learning experience for me. I had done research before coming to Princeton, but working on my Ph.D. I think I really learned how to formulate good questions and follow them through to the end. The research community in Princeton really pushes you to be the best without being unfriendly. I found the things I was best at and learned how to push others to achieve their best. This was possible because of the intellectual freedom you are given at Princeton.

The thing I remember most about Princeton was the diverse group of people I had the opportunity to work with and meet. I grew up in the West and had never really traveled except in the USA. At Princeton I met people from all corners of the world. Additionally, people did very diverse research, everything from global change to seismic wave propagation. It was a great place to meet people who were very different from myself. Also, Princeton was one of the nicest places I have ever lived. The seasons were great and the easy access to New York and Philadelphia was a big plus.

My graduate experiences at Princeton changed my life for the better. The faculty at Princeton are outstanding, the research opportunities are excellent, and the Princeton area is a very nice place to live. I made friends at Princeton that I expect I will be in contact with for the rest of my life. It was a great experience.

Sergio Speziale ’03
Research Fellow
GFZ German Research Centre for Geosciences
Working towards a Ph.D. in Princeton is an incredible experience for many reasons. Being a Princeton alumnus opens great opportunities to find prestigious positions, but above all, being there as a graduate student is an extraordinary life experience. Princeton University offers... practically everything! Princeton is a prestigious University with a tradition of excellence in many disciplines. The campus hosts a diverse community made of students and professors from everywhere in the world, and it is a lovely green place to enjoy outdoor life.

The Ph.D. program offered by the Department of Geosciences is strongly research oriented, so that since the very first moment students can be engaged in cutting-edge research. The community in the Department is so diverse covering many areas of Earth Sciences and the interaction with people involved in completely different projects is very stimulating. In addition, the large network of collaborations of all the research groups grants almost continuously the presence of visiting scientists whose seminars complement an already rich program of weekly talks.

The enormous advantage of being in a high-profile research university as Princeton is that you can always satisfy your curiosity in a variety of fields just looking in the many departments on-campus. Attending advanced seminars in other research areas is sometimes the way to give new direction to a Ph.D. project, and a perspective to a whole scientific career!

Now I am a research fellow at the Geo-Research Center (GFZ) in Potsdam, Germany, where I study the physical properties of minerals of the deep interior of the Earth and I have built a new laboratory for the determination of the elastic properties of materials under very high pressures. In supervising my students’ work, I constantly take advantage of the great lessons that I learned in my years at Guyot Hall. The person and the scientist I am are the result of the combination of all the experiences of my life. In many senses I owe a great deal to my experience in Princeton. The years I spent there are among the best of my life.

Meredith Galanter-Hastings *04
Assistant Professor
Brown University

A number of factors influenced my decision of [on] where to go to graduate school: Is the university located in a place where I think I would enjoy living? How well does the existing program fit my research interests? How
The Trezona Formation fossils pre-date the oldest known calcified fossils by ~90 million years. The Earth History Group have traced cross-sections of individual fossils by serially grinding and scanning each sample at a resolution of 50.8 μm. From these images they constructed three-dimensional digital models of the fossils.

Happy are the other graduate students? How long does it typically take to graduate? What are recent graduates of the program doing now? Princeton scored positively in terms of all of these questions, at the time and in retrospect.

Princeton is a beautiful place to live. I really enjoyed living in a small town with the benefit of an easy train ride to major metropolitan cities like New York and Philadelphia. On a daily basis, I loved the walk-ability between my apartment, town and the school; being in a small town afforded more opportunities for time with friends, cooking, jogging, seminars, and of course working late in the lab!

In deciding to join the Geosciences program at Princeton I was certainly influenced by the prestige of the University and the faculty. I could trust that whatever direction my career took (e.g., academia, government, or private industry) I would benefit from the education I received at Princeton. I continue to benefit from the rigor and depth of my education in the Department of Geosciences and the ability to participate in world-class research in the Department of Atmospheric Sciences at the University of Washington. From there, I joined the faculty at Brown University in Providence, RI.

In the Joint Institute for Study of the Atmosphere and Ocean that supported my research in the Department of Atmospheric Sciences at the University of Washington. From there, I joined the faculty at Brown University in Providence, RI.

Gregory O’Mullan *05
Assistant Professor, School of Earth and Environmental Sciences, Queens College, City University of New York (CUNY)
Adjunct Associate Research Scientist, Lamont-Doherty Earth Observatory of Columbia University

Princeton’s reputation continues to open doors to new and exciting opportunities. My graduate training at Princeton provided me with the skills and confidence needed to succeed as a teacher and researcher. During my years at Princeton I was challenged intellectually and encouraged to excel in both the laboratory and classroom. My most valuable training occurred during lab meetings. These weekly meetings brought together a truly impressive group of microbiologists, oceanographers and geochemists to discuss papers and evaluate research plans. It is hard not to succeed when surrounded by such talented faculty, staff and fellow graduate students.

I chose to attend Princeton due to the combination of world-class faculty and the opportunity to conduct interdisciplinary research. There were no barriers to collaboration and I was fully integrated into both the Department of Geosciences and the Department of Ecology and Evolutionary Biology. These diverse interactions were essential to my training as an environmental microbiologist. The departments are not especially large, making it easy to get to know everyone and to become involved in departmental activities. I really enjoyed my years in graduate school and I feel fortunate to have had the opportunities offered by Princeton.

After leaving Princeton, I joined the Lamont-Doherty Earth Observatory of Columbia University to help develop a new Earth Microbiology Initiative. My interdisciplinary training was immediately put into action. I am now an Assistant Professor in the School of Earth and Environmental Sciences at Queens College, City University of New York.
Research Snapshot

**Atmospheric and Oceanic Sciences**
The coupled ocean and atmosphere system interacts with life to set the physical and chemical conditions of Earth’s surface. At Princeton, we use multi-scale models of varying complexity to study stratosphere-troposphere interactions, the importance of topography and the terrestrial biosphere in regulating climate, the coevolution of atmospheric pCO2, ice volume and sea level, decadal to millennial oscillators in the climate system, and ocean tracers as a means to understand the cycling of climatically important molecules.

**Faculty:**
- **Stephan Fueglistaler:** Atmospheric dynamics and transport, water vapour and clouds; climate
- **David Medvigy:** Vegetation-climate interactions; deforestation feedbacks; terrestrial carbon budgets; atmospheric variability
- **Michael Oppenheimer:** Climate change, ice sheets, sea level
- **George Philander:** Ice ages, ocean-atmosphere interactions, ocean circulation
- **Jorge Sarmiento:** Ocean biogeochemistry, circulation, climate using global models and observations

**Biogeochemistry**
Geochemical and biological processes modify Earth’s surface (atmosphere, soils, sediments, oceans, groundwater). At Princeton, we study nutrient availability and biological productivity in the surface ocean, global nitrogen and carbon cycling, the importance of metals in oceanic and soil environments, ocean acidification, and the role of extremophiles in geochemical cycling on Earth and potentially Mars.

**Faculty:**
- **Michael Bender:** Ocean biogeochemistry, paleoclimate, history of ocean chemistry
- **François Morel:** Trace metal biogeochemistry, phytoplankton, ocean acidification, carbon and nitrogen fixation
- **Satish Myneni:** Aquatic and soil chemistry, colloids and surfaces, chemical speciation, trace element biogeochemistry, natural organohalogens, spectroscopy and microscopy
- **Tullis Onstott:** Permafrost, subsurface biosphere, molecular biology, microbiology, stable isotopes, mars, extremophiles
- **Daniel Sigman:** Paleooceanography, paleoclimate, nitrogen cycle, stable isotopes, carbon and nutrient cycles in Earth history
- **Bess Ward:** Microbial ecology of the ocean’s N cycle, functional diversity of marine phytoplankton

**Geophysics**
Geophysics focuses on the physical properties of Earth at all scales, from atomic to global. At Princeton, we study the physical properties of minerals in Earth's deep interior with high pressure experiments, we develop images of Earth's 3D structure using seismic tomography, we study the physics of earthquakes and the laws of friction, we model wave propagation using vast parallel computers, and we study subtle changes in Earth's gravity to model processes as diverse as plate tectonics and the growth and decay of ice sheets.

**Faculty:**
- **Tom Duffy:** Mineral physics, diamond anvil cell, high pressure, mineralogy, shock compression, earth's interior, planetary interiors, vibrational spectroscopy, synchrotron X-ray diffraction
- **Allan Rubin:** Fault mechanics, earthquake nucleation, earthquake physics, microseismicity, magma transport, dike propagation
- **Frederik Simons:** Global geophysics, seismology, geodesy, spectral analysis, inverse theory, wavelet analysis, satellite observations, large-scale tectonics, earthquake early warning
- **Jeroen Tromp:** Theoretical & computational seismology, global seismology, exploration seismology, helioseismology, tomography, seismic interferometry, seismic imaging, inverse methods

**Geology**
The rock record contains information about the coevolution of life, climate and Earth’s deep interior. At Princeton, we study Earth’s ancient magnetic field, the relative motion of continents, the growth, deformation, and stabilization of Earth’s lithosphere, perturbations to the global carbon cycle, paleontological evidence for animal evolution and mass extinction, and the history of climate change.

**Faculty:**
- **John Higgins:** Geochemical reconstructions of past climates, isotope geochemistry, global biogeochemical cycles, rock-water interactions, planetary habitability
- **Gerta Keller:** Paleontology, stratigraphy, geochemistry of major catastrophes (volcanism, impacts) in earth history
- **Adam Maloof:** Earth history, sedimentology, stratigraphy, stable isotopes, paleomagnetism, paleogeography, paleoclimate, neoproterozoic, cambrian, carboniferous, pleistocene
- **Blair Schoene:** Geochronology, thermochronology, Earth history, tectonics, geochemistry, lithospheric evolution, magmatic processes

**Associated Programs**
- **Program in Atmospheric and Oceanic Sciences (AOS)**
- **Princeton University BIOS Graduate Program in Ocean Studies (BIOS)**
- **Princeton Environmental Institute (PEI)**
- **Princeton Institute for the Science and Technology of Materials (PRISM)**
- **Geophysical Fluid Dynamics Laboratory (NOAA/GFDL)**
- **Princeton Institute for Computational Science and Engineering (PICSciE)**
- **Program in Science, Technology, and Environmental Policy (STEP)**
Special thanks to former students whose reminiscences about their Geosciences studies appear throughout this brochure.

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