Ancient Earth History

Introduction

“I cannot doubt that all the [Cambrian] trilobites have descended from some one crustacean, which must have lived long before the [Cambrian - 520 Ma] age... Consequently, if my theory be true, it is indisputable that before the lowest [Cambrian] strata was deposited, long periods elapsed, as long as, or probably longer than, the whole interval from the [Cambrian] to present day. The case must at present remain inexplicable; and may be truly urged as a valid argument against the views here entertained.”


By 1859, Darwin had recognized the sudden appearance of animal fossils in the geologic record, after more than three billion years with just bacteria and algae (Figure 1), as the most significant challenge to his hypothesis for the origin of species. Adam Maloof, faculty, together with his graduate students Nick Swanson-Hysell and Catherine Rose, use original field observations coupled with geochemical and geophysical analyses of the sedimentary rock record to try to shed light on Darwin’s paradox. Did the rise of animals change the oceans, or did changes in the oceans allow animals to evolve? The Maloof group spends three to four months out of every year doing field work and is focused on developing records of climate, sea level, ocean-atmosphere geochemistry, and Earth’s magnetic field immediately before and during the radiation of animals to shed light on Darwin’s paradox. Some of their most exciting finds involve Earth losing its balance (true polar wander) and Earth’s oceans getting entirely sealed in a thick carapace of ice (snowball Earth) before animals appear, and Earth’s carbon cycle going haywire while animals proliferate (Cambrian explosion).

True Polar Wander

In Neoproterozoic (~800 million years ago, Figure 1) carbonate sediments of the Arctic (photo above and Figure 2), two >50° shifts in paleomagnetic direction are coincident with equally abrupt shifts in $\delta^{13}$C and transient changes in relative sea level. These observations may be explained by rapid changes in paleogeography associated with a pair of true polar wander (TPW) events and the attendant perturbations to the global carbon cycle and regional sea level. TPW is the wholesale rotation of the solid Earth (mantle + crust) relative to the liquid outer core, while Earth’s spin axis remains fixed with respect to the stars. TPW occurs as Earth attempts to maintain rotational equilibrium while the convecting mantle moves large masses around in Earth’s interior and on the surface. TPW occurs now as water and solid earth adjust to melting ice sheets, however the TPW we observe in the sedimentary record of Earth history may be of much larger magnitude.
Graduate student Nick Swanson-Hysell has conducted a successful test of this TPW hypothesis for global change in correlative Middle Neoproterozoic carbonate sediments in Central Australia that revealed unique constraints on the geography of the Rodinian supercontinent (before Pangea), and the state of the climate system before the Late Neoproterozoic ice ages that followed (Figure 1). Swanson-Hysell will present this work at the Annual Fall Meeting of the American Geophysical Union in December 2008.

Snowball Earth
Glacially-derived late Neoproterozoic sediments are exposed on every continent except for Antarctica. Paleomagnetic observations indicate that at least some of these glacial sediments were deposited at low latitudes, and field mapping demonstrates that deposition occurred in platformal marine basins. These data are evidence that ice sheets extended to sea level in equatorial regions. The glacial deposits are associated with chemical sediments such as banded iron formation and cap carbonates that may indicate long-term isolation of the ocean from the atmosphere. Together, these observations led Joe Kirschvink ’79 (Caltech) and Paul Hoffman (Harvard) to propose the snowball Earth hypothesis for global glaciation, where the entire ocean is sealed in ice for millions of years (Figure 1). However, a global caparace of thick sea ice may not be compatible with observations of (A) thick interbedded glacial and non-glacial deposits perhaps indicative of advancing and retreating temperate glaciers fed by a vigorous hydrological cycle, and (B) the survival of a diversity of eukaryotic lineages, including multicellular life, perhaps requiring open seas rather than just isolated refugia around cracks and volcanic islands.

The Marinoan succession in South Australia has the most robust syn- and post-glacial constraints on paleolatitude of any Neoproterozoic glacial deposit. The Flinders and Gammon Ranges of the Adelaide Rift contain spectacular, nearly continuous outcrop that spans 150+ km both along and across depositional strike. Together, these circumstances conspire to make South Australia an excellent location to study the pre-, syn- and post-glacial landscape in three dimensions across a range of water depths and sedimentary environments at the paleoequator. Graduate student Catherine Rose presented preliminary results from her study of the pre-, syn- and post-glacial sedimentary record of South Australia at the Annual Meeting of the International Association of Sedimentologists in Bochum, Germany in September, 2008. One of her outstanding finds is the diachronous nature of the cap-carbonate, a unique dolostone unit deposited in the aftermath of the snowball episode and recording the evolution of ocean chemistry changes during postglacial sea level rise (Figure 3).

Cambrian Explosion
542 million years ago, a global negative carbon isotope anomaly marked the abrupt last-appearance of the Ediacaran fauna (Earth’s first “animal experiment”). During the ensuing 20 million years, extreme volatility in the carbon cycle occurred on timescales much shorter than any previous era in Earth history. With the first appearance of animals that made hard shells out of carbonate, the volatility in the carbon cycle was severely reduced. This pattern is remarkably similar to the record of carbon cycle variability and biotic recovery in the aftermath of the Permian-Triassic boundary (the largest mass extinction in Earth history). What is the link between biomineralization of animal hard parts and the global carbon cycle?

Maloo continues to work in Morocco where the Anti-Atlas margin preserves the only expanded (>2.5 km of sediment, Figure 4) record of
Early Cambrian carbonates in the world that is punctuated by more than forty volcanic ash horizons that may be dated directly using single zircon U/Pb methods. Two U/Pb ages have already allowed them to calibrate the absolute age of the carbon cycle transition that attended the appearance of hard parts. They have also shown that this transition took only 430±260 thousand years, nearly an order of magnitude faster than all previous models had predicted. Currently Maloof is exploring the importance of coupling between carbon and sulfur cycles and he recently returned from field work at new Cambrian sites in Morocco and South China. Maloof will present this work at the Annual Fall Meeting of the American Geophysical Union in December 2008.

Conclusions

Darwin’s paradox of the abrupt first appearance of animals remains one of the most puzzling observations to Earth historians. Despite the impressive collection of new observations since Darwin’s original synthesis, the debate still rages about what aspects of Earth’s changing surface and climate drove animal evolution, and vice versa. In the Maloof group, they feel that progress will be made toward answering these questions by engaging in extended field campaigns, coupled to a wide range of geochemical and geophysical measurements to create the most multi-disciplinary new records of global change that they can. The observations and interpretations associated with true polar wander, snowball Earth and the Cambrian explosion all test what most scientists consider the limits of global change, and give them insight into what Earth was like and how it worked just before and during the radiation of the first animals.

This article was contributed by Adam Maloof, faculty. Read more about his group’s research at http://geoweb.princeton.edu/people/maloof/index.html. Please visit the display case at the top of the stairs on the 2nd floor of Guyot Hall to see the actual rock record of the topics discussed in this article.

Reducing Poverty, Preventing Conflict

Gregory van der Vink ’83, faculty, and Christel Bottcher Hennet ’89 have launched Terrametrics LLC, a company devoted to environmentally-sustainable development. Clients range from the Poverty Reduction Program at The World Bank to real estate investment firms, international developers, agencies concerned with conflict, and financial institutions evaluating risk.

Finding scientifically-sound solutions to policy issues provides intellectually challenging and rewarding work for van der Vink and Hennet. Their goal is to demonstrate that economic development, environmental sustainability, and cultural integrity can be pursued simultaneously and are mutually supportive.

Currently, Terrametrics’ largest project is to reduce poverty in Africa by promoting economic growth. Designing the development of 15,000 acres in Ghana, they take advantage of the high evaporation rates and proximity to the ocean, to develop a large solar salt production facility, shown here, as an economic driver for the community, to address Iodine Deficiency Disorder, and create a habitat for several species of birds and fish.

A quarry producing construction materials, using laterite to reduce CO₂ emissions, can address Ghana’s chronic housing shortage. The quarry dust, used to manufacture the floor of the salt crystallization ponds, will mix with precipitating gypsum from the evaporating seawater to form a strong, solid bed for harvesting the salt. Plans also include a mosquito net manufacturing plant to help reduce the occurrence of malaria in infants, and a research and education center where students and researchers can use the property as a “natural laboratory” to test ideas in environmentally-sustainable development.

Students joined van der Vink and Hennet during a January assessment trip to Ghana to evaluate the housing environment, learn about solar salt production, and establish a partnership with the local university. Educating the next generation of scientist on adaptation to environmental change, human-induced and natural, is part of Terrametrics LLC’s mission. Van der Vink brings his experiences back to Princeton, contributing to his popular courses: Geo/Env 399: Environmental Decision-Making, and Geo/Env 499: Dealing with Natural Disasters. <gvdv@princeton.edu; www.terrametricsllc.com>

Hess Photo Mystery Solved

Thanks are due to Jim Merritt ’66, writer and former editor of the Princeton Alumni Weekly (PAW). He responded that the photo of Hess, taken by Fitz Gor for Life magazine c. 1960, was acquired from Time Life, Inc. in 1979, and used to illustrate an article he wrote about Hess in University magazine that also ran in the Sept. 24, 1979 issue of PAW. Later, he used the article and photo in the 2000 PAW centennial anthology, which he edited. With his permission, the pdf file of the Hess article is now on the departmental website.
Princeton GeoGrad Reunion in Northern California, September 15-22, 2008

There were a total of 73 in attendance with 40 alumni, one postdoc, and two emeriti faculty. Highlights of the reunion: a visit to the San Andreas Fault with Eldridge Moores *63 as guide followed by lunch in a cathedral of coast redwood trees; geology of the Coast Ranges (Moores), followed by a hilarious tour of a Napa Valley Winery; lectures on Wine Terroir, the History of Gold in California, and Global Warming; and evening happy hours; a tour of the Empire Mine (hard rock gold) and the geology of the Sierra Nevada (Moores); a trip up the Feather River Canyon (Moores); and a geological tour de force of Lassen Volcanic National Park with Patrick Muffler *62 and Mike Clynne as guides. A grand time was had by all!

Guust Nolet Retires

Guust Nolet, faculty 1991-2008, returned to Europe after 17 years in the Department. He is now a faculty member at Géosciences Azur, Université de Nice/Sophia Antipolis in France. One of his first accomplishments after arriving in his new country was to be selected with 105 European top researchers in the natural sciences to receive the prestigious "Advanced Grant" of 2.5 million Euro from the new European Research Council. “It looks like the balance of research funding is swinging back to the other side of the Atlantic; the European Union is eager to reverse the brain drain,” says Nolet. He misses Princeton, but “I tend to get restless and seventeen years was enough - it’s been longer than any other place I’ve been.” A graduate of the University of Utrecht in the Netherlands, he earned his Ph.D. there and served on that faculty for 15 years before coming to Princeton.

Nolet is a pioneer in development of seismic tomography – imaging of the deep Earth – and designed the first portable digital seismic arrays for field studies of the Earth’s interior structure. He led efforts to organize the archiving and distribution of digital seismic data from global networks, both in Europe and in the United States. He was a longtime member of the board of directors of the Incorporated Research Institutions for Seismology (IRIS), a consortium of more than 100 universities. As a result of the work he and others did to get digital seismology off the ground, scientists around the world can log on to the internet to obtain seismic data within minutes of the occurrence of an earthquake. Nolet’s scientific accomplishments include the documentation of convection currents - plumes - deep in the Earth’s mantle, using theoretical advances for the analysis of seismic waves developed with the late Tony Dahlen, faculty 1970-2007.

Nolet taught the popular course, Earthquakes, Volcanoes and Other Hazards, and was a teacher at many summer schools, including the International Center for Theoretical Physics in Trieste, Italy, which mainly serves students from underdeveloped countries. He is the author of A Breviary of Seismic Tomography (Cambridge University Press) and co-editor of five other books. He is a member of the Royal Netherlands Academy of Sciences, The Academia Europaea, and the American Academy of Arts and Sciences. His honors include the Gutenberg Medal from the European Geophysical Society and the Bownocker Medal from Ohio State University.

<nolet@geoazur.unice.fr>
Tromp Joins Faculty

After a sixteen-year absence from Princeton, Jeroen Tromp *92, a native of the Netherlands, joined the faculty as Blair Professor of Geology and Professor of Applied & Computational Mathematics this fall. Tromp received his bachelor’s degree (1988) from the University of Utrecht, the Netherlands, and his master’s (1990) and Ph.D. (1992) from Princeton, where he worked with the late Tony Dahlen, faculty 1970-2007. Tromp taught at Harvard University, 1992-2000, rising to the rank of professor, followed by eight years at California Institute of Technology, most recently as Professor and Director of the Seismological Laboratory (2003-2008).

Tromp’s research interests are in theoretical and computational seismology. Using modern numerical algorithms in conjunction with high-performance computing, he simulates 3D seismic wave propagation in acoustic, (an)elastic, and poroelastic media. The simulations account for lateral variations in compressional and shear wave speeds, density, topography and bathymetry, ellipticity, anisotropy, attenuation, fluid-solid interactions, self-gravitation, rotation, and the oceans. He simulates wave propagation at regional scales, e.g., in southern California or Taiwan, as well as at the scale of the entire globe.

At Princeton Tromp will apply these computational techniques to problems in exploration seismology and tackle the tomographic inverse problem. By numerically calculating the derivative of a misfit function that expresses the differences between the synthetic and observed seismograms, the inverse problem may be solved iteratively. The construction of this derivative involves the interaction between the wave field for the current model and a wave field obtained by using time-reversed differences between the data and the current synthetic seismograms as simultaneous sources. Such simulations are referred to as adjoint calculations, an approach first made popular in the atmospheric and oceanic sciences. There is a close correspondence between adjoint methods and the ‘banana-doughnut’ finite-frequency sensitivity kernels made famous by Dahlen and Guust Nolet, faculty 1991-2008. These new techniques should result in sharper images of the Earth’s interior. <jtromp@Princeton.edu>

A Century of Princetonian Research

The Tatman Formation in the Big Horn Basin of Wyoming is nearly unique among lithologic units because of its particular appeal to Princeton geologists. Originally named by William J. Sinclair, faculty 1905-34, and Walter Granger in 1912, its dark-colored clastics were recognized as being of lacustrine origin and occupied higher elevations of the interior of the Bighorn Basin. As Glenn L. Jepsen ’27 *30, faculty 1930-71, pursued his quests for fossil vertebrates in the area, the Tatman Formation remained elusive, yielding little fossil evidence of its age, although presumably Eocene. It remained for Franklyn B. Van Houten ’41, faculty 1946-84, to give it a comprehensive description, as well as that of the underlying Eocene Willwood Formation, in his dissertation, published in 1944.

In 1970, Jepsen renewed his interest in the Tatman Formation, prospecting for fossils with his field expedition, which included David C. Parris ’70. They found the first few fossil mammals from the formation, which confirmed its Eocene age, but provided little further information.

During the last several summers, New Jersey State Museum field parties (see photo), led by Parris, have located further fossil localities in the Tatman Formation. All of the conclusions of the earlier Princetonian investigations have been confirmed, but it is hoped that a comprehensive flora and also faunas of both invertebrates and vertebrates will all be found. Small quarries have yielded many turtles, crocodiles, and fish, so a thorough interpretation of the Tatman Formation paleoenvironment may be expected soon.

Photograph of a lower first molar of Phenacodus vortmani, an Eocene ungulate (hoofed) mammal. This is an important specimen for biostratigraphic dating of the Tatman Formation. The anterior of the tooth is at the left, and largest dimension is 6.7 mm.

Blair Professorship of Geology (1864)
The gift of John I. Blair, Trustee of Princeton, 1866-1899

1864 - 1884 Arnold Guyot
1886 - 1930 William Berryman Scott ’77
1933 - 1934 Alexander H. Phillips ’87 *99
1937 - 1956 W. Taylor Thom, Jr.
1958 - 1959 Arthur F. Buddington *16
1964 - 1969 Harry H. Hess *32
1988 - 2007 John Suppe
2008 - Jeroen Tromp *92
The Paintings of Benjamin Waterhouse Hawkins 1876-1878

Cretaceous Life of New Jersey (PP336)

Pleistocene Edentates of Patagonia (PP331)

Tertiary Mammals of Europe (PP328)

Early Jurassic Marine Reptiles (PP329)

Carboniferous Coal Swamp (PP335)

Triassic Life of Great Britain PP330

Moas of Prehistoric New Zealand (PP333)
Jurassic Life of Europe (PP340)

Triassic Life of Germany (PP326)

Silurian Shore at Low Tide (PP334)

Devonian Life of the Old Red Sandstone (PP337)

Pleistocene Fauna of Asia (PP339)

Attack in Pleistocene England (PP338)

Irish Elk and Palaeolithic Hunter (PP332)

The Glacial Epoch in Europe (PP327)
Illustrated in this issue are fifteen paintings by the prolific Victorian artist and naturalist, Benjamin Waterhouse Hawkins 1807-1894 (See BOOKS). Hawkins created the world’s first life-size models of dinosaurs that went on view in 1854 at London’s Crystal Palace, and later, for natural history exhibits in New York and Philadelphia. Hawkins arrived in Princeton in the early 1870s to lecture on paleontology at the behest of Arnold Guyot, and in 1874 was awarded an honorary degree for his service to the college. Two years later he was commissioned by President McCosh to create seventeen scenes of prehistoric life and geology for the Elizabeth Marsh Museum of Geology and Archaeology located in what is now the Faculty Room at Nassau Hall. Of the original seventeen, only fifteen survive. In 1909, his paintings were installed in the new museum area of the newly built Guyot Hall. In 2001 all had been removed for storage and safe-keeping at the Princeton University Art Museum, while Guyot was extensively renovated. Many of our alumni may remember some of these that graced the third-floor corridor walls as the museum was progressively dismantled after the Second World War.

These paintings are representative of Hawkins’ scientific acumen and rich imagination that played a pivotal role in helping to popularize science in the 19th century. Unfortunately, over the years the condition of the paintings has deteriorated so that they are now in great need of conservation. The two large reproductions shown, on pages 6 and 7, have been restored, but the other thirteen have not. It would certainly be nice if our alumni could contribute to a fund for the restorations. A conservator estimated that it would take slightly over $2500 a painting. Would you like to help make this possible? If so, send a contribution to the department for the Waterhouse Hawkins Fund, so that future generations will be able to enjoy and be enlightened by Hawkins’ remarkable depictions of prehistoric life. Lisa Arcimano, Manager of Campus Collections, generously contributed these comments and was instrumental in making available these pictures for The Smilodon.

News

Marv Kauffman ’60 and Don Wise ’57 (above) attended the 60th Anniversary of the founding of the Department of Earth and Environment at Franklin and Marshall College. This was celebrated by convening alumni graduating from that department in the first 30 years for a Reunion in March, 2008. During those formative years — the 1950’s, 60’s and 70’s — there was a cadre of professors, who were especially close to the students and each other. Princetonians honored were Kauffman, Wise, and Dusty Ritter ’64, all of whom received their undergraduate degrees from F&M. Kauffman noted that Reg Shagam ’56, also taught at F&M on two separate occasions. <marvsuekauffman@hotmail.com>

Sam Sawkins ’63 writes that after Princeton, he spent two years as a postdoc at Durham University and three years on contract with a British technical aid team in Peru. This entailed fieldwork and evaluation of mineral prospects in the Andes, and provided him with an important base for later research into the genesis of metal deposits. In late 1967, he joined the Geology Department at the University of Minnesota. During his time there he had some bright graduate students, one of whom was the younger brother of Bob Rye ’65. Research projects ranged from Alaska through Newfoundland to the Andes, South Africa, and the Philippines. The fundamental controls of various ore generating systems led him to probe their relationships to plate tectonics. The result was a book on the subject that enjoyed two editions and was pirated by both the Russians and the Chinese. In 1991 he took early retirement, took up sailing, and voyaging in the Pacific and Atlantic. He now lives in Urbanna, VA, an area known for its fine oysters in the winter and crabs in the summer. <ssawkins@oasisonline.com>

Bill MacDonald ’65, Professor of Geological Sciences at the State University of New York, Binghamton, was in Princeton for six weeks in spring, 2008. His current research interest is, Meteorite impact structures in South America. He spent time at Princeton to use the excellent library facilities and for discussions with Gerta Keller, faculty, on dating and correlating impacts. <wdmacdon@binghamton.edu>

At the 2008 Goldschmidt Conference meeting in July in Vancouver, British Columbia, there was a symposium in honor of Tim Dreaver ’68, titled, “Rates of geochemical processes and their application to natural systems.”

Walter Alvarez ’67, (on right) was awarded the degree of Doctor Honoris Causa at the University of Oviedo, in Asturias, Spain. The March ceremony was extremely formal, in Spanish, but the printed program had a Latin translation. There was a choir singing motets, the form of the ceremony and the academic regalia go back to the Middle Ages. This was a very special occasion for him, because his great grandfather was born on a farm in the mountains west of Oviedo. <platetec@berkeley.edu>

Janny Sisson ’85 is now at the University of Houston as co-director of the learning center and director of the field camp. The learning center is a room of computers with tutoring aids for the introductory level, as well as mineralogy courses. The learning center can reach 1000 students in physical geology, 200 in historical geology, 100 in climate change and meteorology, and 87 in mineralogy. She will teach a sec-
tion of introductory geology next spring, her only required teaching.  More importantly, they want her to spend time on research.  <j_sisson@netzero.com>

Peter Davis *86 and Michael Foose *74 visited Tripoli recently to discuss with Libyan authorities the establishment of a Global Seismographic Network (GSN) station in Libya.  Foose coordinates USGS activities in Africa and the Middle East, and Davis is the Executive Director at UC San Diego of Project IDA (International Deployment of Accelerometers).  IDA operates one-third of the GSN for the IRIS Consortium, a group of over 100 universities including founding member, Princeton.  <pdavis@ucsd.edu>

Since October 2007, Jason Albert '92 has been Director of International Intellectual Property Policy at Microsoft, Redmond, WA.  He enjoys the job, although it is a switch from the privacy compliance work he had been doing over the previous year or so with Chevron in San Ramon, CA.  <jasonalb@microsoft.com>

Sara Carena '03 was part of team that led a trip across the Alps from Germany through Austria to the south alpine front north of Venice for the geology department at Ludwings Maxmillian University, Munich.  “It was fabulous,” reports John Suppe, faculty 1971-2007, who was along on the trip and took Carena’s picture in the Italian Alps.  <scarena@geophysik.uni-muenchen.de>

Pam Walsh '07 sends hello from the Gulf of Mexico, where she works on board the Western Regent with Schlumberger/Western Geco.  The Regent crew is working with other boats to shoot a deepwater seismic survey.  The techniques they are using are new and this means they come with plenty of challenges and surprises.  She recently switched departments from data acquisition to working almost entirely in geophysics and data processing — which is awesome.  On shore, she is splitting time between office rotations in Houston, TX, where she works with the deep water marine data processing team for the same survey, breaks at home in Washington, DC, and wandering.  <pamela.j.walsh@gmail.com>

Raleigh Martin '08 is beginning his first year in the Ph.D. program at the University of Pennsylvania’s Department of Earth and Environmental Science studying theoretical sedimentology.  <raleighm@sas.upenn.edu>

Katy Barnhart '08, at the University of Colorado, Boulder, is studying lower crustal xenoliths and exposed basement rocks from southwestern Montana.  She spent the summer in Princeton continuing her thesis work on New Mexican Proterozoic basement with Lincoln Hollister, faculty, then driving to Colorado with Jesse Chadwick '08, and continuing field work in New Mexico and Montana.  <kathy.barnhart@gmail.com>

Jesse Chadwick '08 is working in Princeton as a full time staff member putting order back into the department’s mineral and rock collections.  chadwick@princeton.edu.

Eugene Franco '08 is working in natural gas trading in New York, at National Grid US, a subsidiary of a British utility.  <efranco@gmail.com>

Tess Cecil-Cockwell '08 is a field engineer in drilling and measurements with Schlumberger, the oilfield services company.  Currently undergoing training in the Southern states, she will move to Alaska to live in Anchorage and work in Prudhoe Bay.  <dtess.cc@gmail.com>

Last May, Karin Sigloch *08 sent regards from Ludwings Maximilian University, Munich.  Visiting also were Jason Morgan *04 (faculty 1967-04) on the left, and their host Peter Bunge (faculty 1998-03).  Note the Munich pretzels.  Was the Bavarian beer off camera?  <sigloch@Princeton.edu>

The Reunion Reception was on May 30th in Guyot Great Hall.  Those signing in were:  Bill Bonini ’48; Peter Carney ’53; John C. Stone II ’53; Don Laws ’57; Elaine Harkins ’73; Susan Petty ’73; Jenny Barends Spalding ’78; Clark Reed ’78; Sally Andersen Willig ’83; Shirley Lake Rouse ’83; David Hohmann ’88; Kevin Kuechler ’88; Michael Deal ’97; Sarah Albano ’98; Ann Marie Lavigne ’98, Bill Langin ’99; Andrew Batchelor ’03; Sarah Brownlee ’03; Andrew Jarrett ’03; Ale Hakala ’03; Yinan Wang ’05; Jeffon Harding ’07; Pam Walsh ’07; and Logan West ’07.
Around the Department

In the faculty area: Jeroen Tromp *92 from CalTech has been appointed the Blair Professor of Geology and Professor of Applied & Computational Mathematics (see Article). Larry Horowitz, NOAA/GFDL, has been appointed lecturer in Geosciences, teaching atmospheric chemistry. Hiram Levy II, AOS faculty, has stepped down from teaching, but remains a GFDL scientist. The Structures and Tectonics Division of the Geological Society of America has given the 2008 Career Contribution Award to John Suppe, faculty, 1971-2007, with the citation given by John Shaw ’93, Harvard’s departmental chair.

In the staff area: Debbie Fahey, departmental manager since 2001, was honored as a recipient of the new Donald Griffin ’23 Management Award. It recognizes administrators who wish to develop leadership and management skills. Fahey plans to attend the Center for Creative Leadership Program for Women Leaders using the award stipend.

The new graduate students are: Nathan W. Eichelberger, Bates College, Lewiston, ME; Gregory J. Finkelstein, Washington University, St. Louis; Mathis P. Hain, University of Potsdam, Germany; Brandon T. Stackhouse, University of Texas, Austin; and Jue Wang, University of Science and Technology, Hefei, China; Hejun Zhu, Peking University, China: Yang Luo, CalTech; and in AOS, Andrew Babbin, Columbia University; Ilissa Ocko, University of Michigan, Ann Arbor; John Paul Reid, Dartmouth College; and Amanda O’Rourke, University of California at Davis.

Farewells: Postdoc Patrick McGinn, who worked with François Morel, faculty, is now a Microalgae Research Officer at the Institute of Marine BioScience, National Research Council of Canada, Halifax, Nova Scotia; postdoc Thomas Wichard working with Morel, returns to Friedrich-Schiller-University Jena, School of Chemical and Earth Science, Institute for Inorganic and Analytical Chemistry, Jena, Germany; Punyasloke Bhadury, who worked with Bess Ward, faculty, now has a position starting a new Marine Biodiversity research group at the National Forestry Laboratory in India; postdoc Mark Panning joins the faculty of the Department of Geosciences, University of Florida, Gainesville; and postdoc Huub Douma is with GXT-ION Geophysical, Houston, but based in Princeton.

Farewells from AOS and their new positions: Recently completing their PhDs, Gang Chen will postdoc at MIT; and Cynthia Randles, is a research scientist at NASA-Goddard, MD., Yi Huang postdocs at Harvard; and postdocs Charles Stock and Whit Anderson are with NOAA/GFDL, Princeton; and departing is technical staff member, Jennifer Simeon.

Visiting faculty and scientists: Spending a sabbatical year with Satish Myneni’s group are: Anne Kotchevar, associate professor in organic chemistry, California State University, East Bay, who will focus on the speciation of natural organohalogens and the biogeochemical processes involved in their formation; and Gustavo Martinez, research scientist, University of Puerto Rico, who will be working on phosphate-mineral interactions and its influence on P dynamics in tropical lakes; Hiroaki Yamagishi from the National Institute for Environmental Studies, Atmospheric Measurement Section, Tsukuba, Ibaraki, Japan, is a visiting researcher with Michael Bender, faculty.

New postdoctoral research staff: Tarje Nissen-Meyer *08, Christina Morency, and Daniel Peter moved from CalTech to join Tromp’s group; Jaime Palter, from Duke University in physical oceanography and the Marine Sciences Institute, Barcelona, Spain, is a postdoc teaching fellow through Princeton’s Council on Science and Technology, and will work on physical controls on ocean biogeochemistry with Jorge Sarmiento, faculty; Yan Xu *08 (EEB) joins Morel working on the physiology of marine phytoplankton and on the regulation of expression of metalloenzymes that are involved in major nutrient acquisition in coccolithophores and diatoms; Kritee from Rutgers joins Danny Sigman, faculty, to work on lab studies of denitrification and its isotope dynamics; and Bror Johson from Boston University joins Michael Bender, faculty.

New postdoctoral research staff at AOS: Junfeng Liu ’06 joins Larry Horowitz, faculty, moving from PhD/postdoc work in the Woodrow Wilson School with Denise Mauzerall, associated faculty, on intercontinental transport of air pollutants and associated impacts on health; Salil Mahajan (Texas A&M) joins Geoff Vallis and Rong Zhang (GFDL) working on the role of air-sea interactions in the remote influence of the Atlantic on tropical Pacific climate; and Zhbin Sun, University of Maryland, Baltimore County, joins Leo Oey, research scientist, to help develop and improve high-resolution ocean models.

AOS technical Staff: Ni-Zhang Golaz, Princeton Environmental Institute, joins Sarmiento, faculty, in carbon cycle research involving numerical modeling and statistical data analysis.

Lorenz *81 to Lead AAPG

Recently, Lorenz was in the Sidi el Kef oil field, Tunisia, assessing core fracture and learning the finer points of camel trading.

Congratulations to John Lorenz ’81, who has been elected as President of the American Association of Petroleum Geologists (AAPG) for the term, 2009-2010. AAPG is the world’s largest professional geological society with more than 31,000 members. Since its founding in 1917, the AAPG has been a pillar of the worldwide scientific community. Lorenz worked for 26 years at Sandia National Laboratories, Albuquerque, NM, but left several years ago and hung out a consultant’s shingle for fun. He has been busy ever since. Mostly he does reservoir characterization, trying to understand the origins, distribution, and effects of fractures. He lives in rural New Mexico, in a house on a runway, and teaches flying – in what currently passes for spare time. <johnlorenz@geoflight.net>
Deaths

Norman Henderson Donald, Jr. ’36
August 19, 2007

George Orlando Morgan ’38
June 11, 2007

Reginald Shagam *56
April 19, 2008

* * *

Theodore C. Forseman, Machine Shop (-1970-86)
August 21, 2008

Degrees and Awards
As of Commencement June 3, 2008

Ph.D.
Gang Chen AOS *07, Mechanisms that control the latitude of jet streams and surface westerlies.

Mark Montague Davidson, Sulfate reduction in the deep terrestrial subsurface: A study of microbial ecology, metabolic rates and sulfur isotope fractionation.

Seoung Soo Lee AOS *07, Aerosol effects on clouds and their sensitivity to numerical representations of microphysics.

Tarje Nissen-Meyer, Full-wave seismic sensitivity in a spherical Earth.

Haewon Park, Cadmium carbonic anhydrase of marine diatoms: Diversity and expression.

Cynthia Ann Randles AOS *07, Impacts of carbonaceous cerams on climate: Examination of the sensitivity of simulated regional climates to absorbing and scattering aerosols.

Karin Sigloch, Multiple-frequency body-wave tomography.

Bianca Jane Silver, The nutritional and energetic constraints on life in the deep biosphere of the South African gold mines.

MA
Silvia E. Bulow *07
Susannah McGregor Dorfman *08
Nicole Katherine Gotberg *08
Kelly Anne Kearney *08
Sean Patrick Long *08
Yves Plancherel *07
Dalin Shi *08

AB/BSE
Katherine Ruth Barnhart GE +*
Daphne Tess Marion Cecil-Cockwell GE +*
Jesse Socorro Chadwick*
Eugene Ruben Franco
Raleigh Lewis Martin GE +++†
Bamidele Tokunbo Otemuyiwa *
Ryan Eugene Truchelut +++*
    - Highest Honors+++
    - Honors +
    - Elected to Society of Sigma Xi *
    - Elected to Tau Beta Pi National Engineering Society†

Prizes
Arthur F. Buddington Award
Katherine Ruth Barnhart
Ryan Eugene Truchelut
Edward Sampson ’14 Prize in Environmental Geosciences
Raleigh Lewis Martin
Sheldon Judson ’40 – William Bonini ’48 Teaching Award
Raleigh Lewis Martin
Benjamin F. Howell ’13 Junior Prize
John Carlos Fleming ’09
Chairman’s Award
Daphne Tess Marion Cecil-Cockwell

Books


Petrology and petrography of sedimentary rocks, especially lacustrine beds, and modern sand composition are Picard’s specialty. Now retired, he taught geology at University of Utah for 36 years and along the way became a writer of poems and essays. His work has appeared over the years in geological publications, such as Geotimes and Journal of Geoscience Education. This collection has interesting and varied themes – many are about geology and Wyoming.


The first full-length biography of Waterhouse Hawkins is based on years of meticulous research in libraries, archives and museums in England and the US, including family papers, letters, sketchbooks, private records previously unavailable. Bramwell, a direct descendent of Hawkins, and Peck, a Senior Fellow at the Academy, have produced a beautifully illustrated work about this British artist and naturalist of the Victorian age, who significantly changed the way society thought about the world and its pre-human inhabitants. (See centerfold)
Rossbacher *83 Celebrates 10th Anniversary as University President

Lisa Rossbacher *83 was honored in September celebrating her tenth anniversary as president of Southern Polytechnic State University in Marietta, GA. She has led the university through significant growth and expansion. Among other achievements during her presidency, she added ten new degree programs, including engineering, and implemented a campus-wide effort to reduce consumption of natural resources and to conserve energy. Lisa Pratt *82, Indiana University, was the Symposium speaker on “Confronting the technical and ethical challenges of a Mars Sample Return Mission.” <rossbach@spsu.edu>