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Department of Earth & Planetary Sciences

The Redbeds

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Welcome to the 2009 *Redbeds*

The *Redbeds* is the annual newsletter of the Department of Earth and Planetary Sciences (formerly Geological Sciences) with reports on research, students, awards, funding, and comings and goings. Sent to over 700 alumni, the *Redbeds* is our primary means of informing alumni, friends, and colleagues of our recent accomplishments. Please write to us and tell us of your activities! Visit our alumni website http://geology.rutgers.edu/alumni.shtml

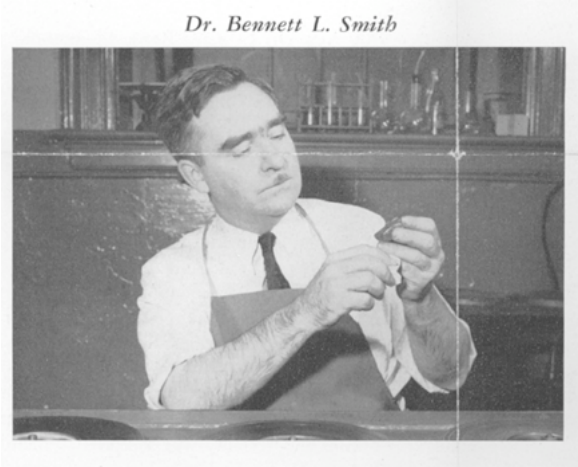
Bennett L. Smith Chair joint with Rutgers Business School

Contributed by Kenneth G. Miller and Richard K. Olsson

Rutgers has received $13 million, the largest private donation in its history, to construct a building for the Rutgers Business School (RBS) on the Livingston Campus and to endow a chair shared between the Department of Earth and Planetary Sciences (EPS) and RBS. The anonymous donation allocates $3 million for the Bennett L. Smith Endowed Chair in Business and Natural Resources. EPS/School of Arts and Sciences (SAS) and the RBS will be searching for a senior faculty member to work at the intersection of business, economics, natural resources and the environment. The position will have an interdisciplinary focus and represents a major collaborative effort between the RBS and EPS/SAS and the School of Arts and Sciences.

The donation recognizes the growing importance of environmental and energy issues in the 21st century and the need for policy to be guided by an understanding of the relevant science. We are looking to hire a tenured full professor who has experience working with energy and climate change issues as well as broad knowledge and understanding of relevant economic and business policies. The new professor will take the lead in developing research, teaching, and service capabilities in energy and environmental fields. With this new hire Rutgers seeks to build on the strength of: 1) a world-class geosciences department; 2) a growing Energy Institute, with interests in carbon capture and sequestration, non-food biofuels, solar power, and wind energy; and 3) a business school that is ranked in the top 10 in the country amongst recruiters. The proximity of a major flagship state university to business centers makes this a unique opportunity.

Bennett Smith was a faculty member in the Geology Department from 1951 to 1974 (the year he retired). A Canadian, he worked for many years as a geologist for the Sylvanite Gold Mines, Ltd. of Ontario in the Shield region, a producer of gold, silver, cobalt, nickel and other minerals. After this he attended Syracuse University where he earned his doctorate. He then joined Rutgers where he taught structural geology. At Rutgers his research focused on the metamorphic terrain of the New Jersey Highlands. He was noted for his field trips to the Adirondacks anorthosite belt.


Dr. Bennett L. Smith

New IMCS Director and the EOS Building

Contributed by Kenneth G. Miller

We welcome Francisco "Cisco" Werner as the second director of the Institute of Marine and Coastal Studies (IMCS), a unit now formally associated with the School of Environmental and Biological Sciences (SEBS). As reported in the Rutgers Focus (http://news.rutgers.edu/focus/issue.2008-04-08.6008280782/article.2008-04-09.8992882079), Cisco is an expert in the mathematical modeling of physical and biological processes in coastal oceans and shallow seas, has taught marine science at the University of North Carolina-Chapel Hill since 1993, and served as department chair for seven years. From 2002 to 2007 he chaired the Scientific Steering Committee of Global Ocean Ecosystem Dynamics (GLOBEC). He succeeds founding directory J. Fred Grassle, who is returning to research and teaching. President Richard L. McCormick said Werner is particularly well-suited to face the challenges of maintaining IMCS's excellence while expanding its role. "We're in the process of planning a new facility for our

earth, atmospheric and ocean scientists, and Cisco Werner, who had a lot to do with planning and building the new Science Complex at the University of North Carolina, will have a chance to put that experience to work at IMCS," McCormick said. "Fred Grassle created the IMCS and made it what it is; Cisco Werner will help us build on that foundation, literally as well as figuratively".

Proposed Earth and Ocean Sciences Building

One of Cisco's main goals is to make the Earth and Ocean Sciences (EOS) Building a reality. In discussions with Cisco on his arrival, the working name Earth, Ocean, and Planetary Sciences building will likely be shortened to the Earth and Ocean Sciences building to reflect that parity between the two primary units, IMCS and EPS that will occupy the building. EOS is a propitious name for not only is she the Greek goddess of the dawn who rose from her home at the edge of Oceanus, but also is the name of the Transactions of the American Geophysical Union.

The challenge to make the EOS building a reality will be to raise the $10 million of private donations to match the University contribution of $55 million. Cisco hit the ground running in approaching various private donors, foundations, and corporations for support. We are working closely with Cisco, the Rutgers University Foundation, and potential donors to raise these funds. Last year we reported a "kick-off donation of $100 thousand from EPS alumnus Alex Kulpecz, adding to a major pledge from PSEG and other contributions. Though the current financial crisis makes fund raising challenging, we continue in our efforts to make the EOS building a reality: this building will serve stakeholders in the state of New Jersey and enhance competitiveness by advancing understanding of marine, coastal, and earth sciences. We will keep you informed as news on the fund-raising and plans for the building evolve.

Rutgers Energy Institute

Contributed by Kenneth G. Miller and Paul G. Falkowski

Energy is not just oil, gas, and coal anymore. While our department has excellent ties with energy companies looking for oil and gas, it is also a leader in 21st century alternative energy research. Joint EPS-Institute of Marine and Coastal Studies Professor Paul Falkowski leads the Rutgers Energy Institute (REI, http://ruei.rutgers.edu/). The REI brings together a diverse group of engineers, chemists, geologists, biologists, environmental scientists, economists, and social scientists from departments and schools throughout the university. Major research themes include development of non-food biofuels, solar power, and wind/wave energy, carbon capture and sequestration (see below), and developing economic models of cost effectiveness of greenhouse gas mitigation.

At Rutgers, a team led by Joachim Messing, (Waksman Institute), Paul Falkowski (EPS/IMCS; pictured right) and Alan Goldman (Chemistry and Chemical Biology) are exploiting our strengths in grass breeding and basic science with a multi-tiered approach to reduce the need for food crops and increase usable biomass: 1) we are pioneering new species (*Lemna*) as well as improving targeted species (cultivated and non-cultivated) to exploit marginal water/land; 2) improving germplasm through a unique combination of molecular markers and genomeXenvironment interactions; 3) developing a monocot model (*Brachypodium distachyon*) plant system to facilitate basic biology aimed at understanding growth and lignin content; and 4) using translational genomics to import biofuel traits from sorghum into corn. We have developed the technology to produce engineered enzymes at high levels in plant leaves and we also have developed transgenic diatoms and chrysophyte algae with high intrinsic photosynthetic energy conversion efficiency and high lipid content.

Another major thrust for Rutgers REI scientists has been in photovoltaics. We are pioneering improving technologies that convert solar energy to electricity. This includes advancing the fundamental optical and electronic science required to produce solar cells and cultivating cost-efficient technologies that convert solar energy to hydrogen—an important renewable fuel.

Strategies to address global climate change by limiting atmospheric CO_2 concentration can be grouped into several major categories: energy efficiency and conservation, de-carbonization of fossil fuel powered electrical generation systems and transportation fuels, and acceleration of "natural" sink processes. Rutgers REI researchers led by Clinton J. Andrews and Frank A. Felder, from the Bloustein School of Planning and Public Policy, Richard Mammone from the School of Engineering, and Hilary Sigman, Economics, are developing a suite of economic models that

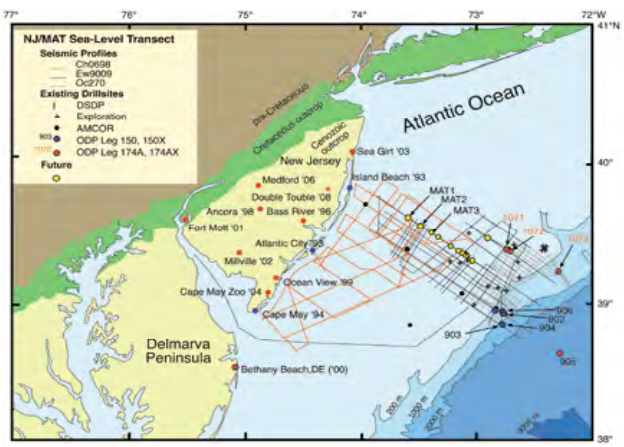
estimate the cost per CO_2 ton of various strategies. The REI is focusing research on wind energy technology by improving wind prediction capabilities along the New Jersey coastline in collaboration with the state of New Jersey and PSE&G. We are advancing conservation by merging fundamental research in materials science and technology with practical building applications and putting theory into practice with building improvements for homeowners - such as energy-saving techniques and equipment, healthier indoor air-quality systems, building material reuse, and solid waste reduction.

The REI holds a public lecture series in May of each year, to which all *Redbeds* readers are invited to attend.

Carbon Capture and Sequestration

Contributed by Kenneth G. Miller

Carbon Capture and Sequestration (CCS) is likely an indispensable tool for reducing CO_2 emissions in this century, but very little is known about the geologic potential to store the captured CO_2 along the east coast of the U.S. where large CO_2 sources are numerous. Rutgers EPS scientists Ken Miller, Jim Browning, Yin Fan Reinfelder, and Greg Mountain are collaborating in evaluating CCS in New Jersey with New Jersey Geological Survey (NJGS) scientists Pete Sugarman and Don Monteverde (who received his Ph.D. from Rutgers EPS in 2008). They are launching a geologic investigation of the thickness and connectivity of saline aquifer sands beneath the New Jersey coastal plain and



Deep drilling sites and seismic profiles completed by the Rutgers team under the auspices of the Integrated Ocean Drilling Program

continental shelf, building on their drilling and seismic studies (see figure). To begin planning CCS in the state, the REI sponsored a one-day mini-conference on CCS on 27 Oct. 2008 at the Cook Campus Student Center. Chaired by Ying Fan Reinfelder, Ken Miller, and Carbozyme CEO Mike Trachtenberg (http://www.carbozyme.us/), the conference brought together stakeholders from the state of New Jersey, U.S. national laboratories, power companies, other academic institutions (including Harvard and Columbia), and representatives of the Midwest Regional Carbon Sequestration Partnership. The conference has prompted the state to move forward in planning for CCS.

Planning for CCS is proceeding on several levels in the state. The New Jersey Department of Environmental Protection, the NJGS, and Rutgers EPS are joining the Midwest Regional Carbon Sequestration Partnership. This should provide one year of phase 1 Department of Energy funds to characterize potential targets both onshore (led by the NJGS) and offshore (leg by Miller and Mountain from EPS). This will dovetail nicely with Integrated Ocean Drilling Program Expedition 313 that will drill three 800 m coreholes 30 miles offshore of Atlantic City after two summers of delays (G. Mountain, co-chief scientist, see article below; http://www.eso.ecord.org/expeditions/313/313.htm).

Dr. Mike Trachtenberg is a world leader in carbon capture. He has been a collaborator with the Rutgers Energy Institute on biofuel research, and will be our lead scientist in research for capturing CO_2 from industrial sources and streaming it to future injection sites.

A test hole is needed to demonstrate the feasibility of sequestration onshore in the NJ coastal plain. A team led by Miller and Reinfelder is proposing to drill a continuous corehole at the BL England plant (a coal-fired power plant) at Beasley's Point, NJ (total depth at least 3300 ft, ideally to basement at 4500 ft). This test well is needed to evaluate the suitability of Potomac Formation sediments at the site and along the New Jersey coast in general. We hope to determine: whether the sands are sufficiently porous, and extensive for storing large amounts of CO_2, are the confining units suitable to seal the plume for physical trapping, and is the groundwater chemistry favorable for geochemical trapping?

NJGS-Rutgers Drilling at Double Trouble

Contributed by James V. Browning, Peter J. Sugarman, and Kenneth G. Miller

The Double Township drillsite was one of the prettiest sites drilled as a part of the New Jersey drilling project. Located in Double Trouble State Park in the heart of cranberry country and drilled as the fall leaves were turning (October 2008) the Double Trouble hole was continuously cored to a depth of 860 feet as part of a cooperative effort among the New Jersey Geological Survey, Rutgers University, and the United States Geological Survey.

Drilling targeted thick upper Paleogene sands (the Toms River Member of the Shark River Formation) that comprise an important aquifer in Ocean County. The age and environment of deposition of these coarse-grained quartz and glauconite sands are not well known. We drilled at Double Trouble because this was believed to be the thickest occurrence of this unit in the state. Using an integrated

stratigraphic approach combining analyses of lithofacies, biofacies, and biostratigraphy we hope to discover the extent, and lateral relations of this unusual unit. We recovered thick lower Paleogene sediments to further our investigation of the relationship between global sea level and sequence boundaries along the Atlantic margin in the greenhouse world.

When not drilling, the drillers barbequed lunches and the scientific team ate royally for the duration. The Double Trouble cores, along with cores from previously New Jersey Coastal Plain sites (ODP Leg 174AX), are housed at the Rutgers/New Jersey Geological Survey Rift-Drift Core Repository. These cores have provided valuable material for undergraduate and graduate scientific studies at Rutgers, and other scientific institutions throughout the world for more than a decade.

IODP Expedition 313, NJ Shelf - This is the Year

Contributed by Gregory S. Mountain

Sea level is expected to rise by 1.2±0.4 m by the year 2100 due to global warming (see summary http://geology.rutgers.edu/pdf/CNSFsealevel.pdf), and will lead to shoreline encroachment that displaces millions of the world's inhabitants. In the coming year, several Rutgers geologists will participate in drilling offshore New Jersey to measure past sea-level change and understand the timing and magnitude of past changes and place the impending environmental change in a broader geologic context. Gregory Mountain will be Co-Chief scientist on Expedition 313 of the Integrated Ocean Drilling Program, and will be joined by Ken Miller, Jim Browning, Peter Sugarman, and Don Monteverde. There will be a total of 24 scientists in the international scientific party, and most will share the duties of 2-week rotations on and off a lift boat platform 60 km east-northeast of Atlantic City from May 1 through the end to July. Additional shore based work will continue at the IODP core repository in Bremen, Germany during the month of November. There the entire team will work in two 10-hr shifts per day describing, sampling, and analyzing their data.

D/V Juan in Katrina recovery ops in the Gulf of Mexico. A similar platform will be leased from Montco for Expedition 313.

Expedition 313 hopes to recover cores and logs from 3 sites (MAT1-3) drilled to 800 m below the seafloor in 30 m of water. These data will provide nearly complete records of 35 million years of sea-level change back to the late Eocene. It's already known that changes in the Antarctic ice cap have been the major cause of global sea-level change since the Eocene, but the magnitudes and details of how these changes have imprinted the geologic record remain unclear. Expedition 313 drill sites are ideally located to improve understanding of these first-order questions.

Expedition 313 will form a critical part of the New Jersey/Mid-Atlantic transect, a suite of boreholes drilled over the last 16 years in an effort to document global sea-level history. This transect has included drilling in deep water and onshore. Greg Mountain and Ken Miller were CoChiefs on the first effort when Deep Sea Drilling Program Leg 150 drilled into the continental slope in 1993. Also on that science party were Marie-Pierre Aubry, Beth Christensen, Mimi Katz and Mickey Van Fossen. Greg and Mimi were aboard the next effort in 1997 when the Ocean Drilling Program Leg 174A drilled into the outermost continental shelf. Throughout this time, Ken and a long list of Rutgers colleagues drilled 13 sites into the New Jersey coastal plain.

Despite the many successes of this NJ/Mid-Atlantic Transect, the critical zone for deciphering the sea-level history that lies in shallow-water regions has not been drilled. Drilling this "missing link" requires equipment commonly used in the energy industry and has been in high demand over the last several years. Ironically, the current downturn in oil prices may have a silver lining for the interests of Expedition 313.

We're very close to getting a Gulf of Mexico lift boat platform to sign a contract to re-deploy to the New Jersey continental shelf and begin drilling for science on May 1. We've been planning this for a very long time, but this looks like the year it will finally happen.

Swedish-US Collaborative Science in the Antarctic

Contributed by Rob Sherrell

More people have been in outer space than have traveled to the Amundsen Sea. Rob Sherrell served as co-Chief Scientist, leading an American contingent of twelve scientists from six US universities on the first of five planned US-Swedish collaborative expeditions using the Swedish

icebreaker *Oden*. The NSF has contracted with the *Oden*, the most capable conventionally powered (non-nuclear) icebreaker, to break a 12-mile channel through the heavy ice surrounding McMurdo Research Station, the largest research station on Antarctica, allowing the annual visit of the resupply ships. To reach this short but critical icebreaking job, the *Oden* traversed the Southern Ocean waters about a quarter of the way around Antarctica, from the tip of South America to the Ross Sea. The NSF and the Swedish Research Council recognized the transit as a research opportunity, and decided in 2007 to jointly fund 20 days of science time.

An expedition like this is normally 2 years of planning; this one was put together in 2 months. The main goals of the cruise, which took seven weeks and finished up at McMurdo Station on Jan. 6, 2008, were to carry out biogeochemical studies in the Amundsen and Ross Seas, focusing on both the ice-covered areas and the open water polynyas (open waters surrounded by ice), with the goal of understanding fundamental changes likely to occur as a result of rapid climate change. Although numerous technical problems plagued the science crew for the first two weeks of the cruise, US and Swedish personnel worked together to solve them, fabricating new parts from found objects on board, Apollo-13 style.

The Amundsen polynya appears on satellite images as the most productive water (high chlorophyll) of the Southern Ocean, but ours is the first study of regional interactions between primary producers and water chemistry. We investigated interactions of iron and other trace metals, persistent organic pollutants, microbial activity and genetic make-up, zooplankton dynamics, CO_2 exchange, and sea ice physics. Our measurements showed that the Amundsen was extremely productive during our visit. We are testing the hypothesis that iron, a critical nutrient lacking in most Southern Ocean waters, is supplied in unusual amounts from the Antarctic continent in this region, possibly augmented by the accelerating glaciers in this region.

Interactions between the US and Swedish scientists were productive and collegial, despite some interesting cultural differences. The scenery was out of this world and the wildlife was abundant and fascinating. At one point, penguins, leopard seals, and killer whales were all present within 50 yards of the ship.

Darwin Bicentennial at Rutgers

Contributed by Marie-Pierre Aubry

The concept of "organic evolution" preceded Darwin, but it was not accepted until a mechanism was offered to explain how a species might transform into a new one. By introducing the idea that species evolve via natural selection, Darwin changed forever the way we, humans, conceive of our place in the natural world. Let us not ever forget that Darwin concluded his fundamental work, *The Origin of Species*, by offering this profound thought "There is a grandeur in this view of Life." No wonder then that universities around the country—the western world indeed—are preparing to celebrate Darwin's birthday two centuries ago, on 12 February 1809. Several departments at Rutgers University are organizing their own scientific festivities. Our own Department of Earth and Planetary Sciences is devoting its Geology Museum Open House on 31 January 2009 to celebrating Darwin's birthday. Rutgers University is joining in this celebration by involving undergraduate students so as to make them familiar with the scientific basis of the Theory of Evolution. Under the leadership of Dr. Marie Logue, The Office of Undergraduate Education has chosen an original approach to the celebration, with special events being spread between 12 February and 24 November 2009, the 150th anniversary date of the publication of *The Origin*. The program will soon be available on the web.

Expanding Mass Spectrometry at Rutgers

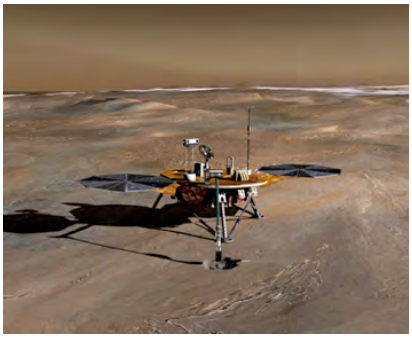
Contributed by Richard Mortlock and James D. Wright

Our department will add three mass spectrometers to the four already in Wright labs plus three in IMCS. Plans have been drafted to expand the existing Stable Isotope lab, doubling the current lab space and number of stable isotope mass spectrometers. This renovated space will become the new home to two VG PRISM stable isotope mass spectrometers that are being transferred from the Fairbanks/Mortlock lab at Lamont-Doherty (see highlight on the addition of Professor Fairbanks to our department). The added instrumentation will expand on current analytical capabilities, including high-precision $\delta^{18}O$ and D/H measurements of water that permit staff and students the opportunity to develop new isotope tracers. The department has also negotiated the release of the PLASMA 54 multicollector ICP-MS from Lamont-Doherty. This instrument will be used to continue the Fairbanks/Mortlock U-series dating programs (sea level, radiocarbon calibration), which was recently moved to Rutgers. The P54 mass spectrometer will also provide high-precision measurements in other isotopic systems (U/Pb, Sr-isotopes, REE, Li). We anticipate the instrument will be installed and operating by spring 2009.

Mars, The Next Frontier

Contributed by Gail M. Ashley

The introductory course *Mars, The Next Frontier* (460:222) is being taught for the third time by Jeremy Delaney and Gail Ashley, spring semester, 2009. Each year exciting new science and images pour in from Mars.



In 2008, the Phoenix Lander (right) reinvigorated the search for Life on Mars. At its landing site near the Martian North Pole, the Phoenix Lander recovered abundant evidence of ice and liquid water. The search for extraterrestrial life received a massive 'shot in the arm' from these results.

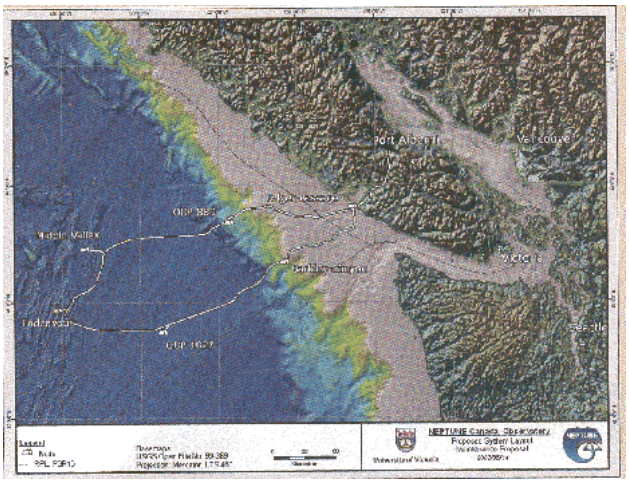
The Phoenix Lander, 45 years of space missions to Mars, and the scientific bonanza resulting from those missions, are the subjects of the EPS course 460:222, “Mars, The Next Frontier". We have been fortunate to have occasional guest lecturers who have been involved in the planning and execution of missions to bring first-hand experience and excitement to the class.

Illuminating Seafloor Hot Springs on an Ocean Ridge

Contributed by Peter A. Rona

Plate tectonics poses a tremendous challenge to geologists because most of the Earth’s action occurs at plate boundaries which lie submerged in the ocean. Processes at plate boundaries such as volcanism, earthquakes and hot springs which interact over time scales from hours to years have been largely investigated by oceanographic research cruises which give only a snapshot of how these processes work. The new National Science Foundation Ocean Observatories Initiative (OOI) is designed to overcome these limitations by supporting moored instrument arrays to monitor processes in the water column (tides, currents) and cabled seafloor observatories to power and communicate with instruments that monitor ocean ridge processes (earthquakes, volcanism, hot springs).

Peter Rona and Karen Bemis (EPS and IMCS) with their partners from the Applied Physics Laboratory of the University of Washington have just received a major multi-year NSF OOI engineering grant to develop a sonar system to image and measure the flow of black smokers and seepage from seafloor hot springs, connect the sonar to a regional seafloor cabled observatory called “NEPTUNE Canada” being installed at a hydrothermal field on the Juan de Fuca Ridge nearly 200 miles off the coast of British Columbia, and begin transmission of images of the flow to the scientific user community. You have probably seen photographic images of black smokers which only illuminate the initial few meters of plume rise owing to the rapid attenuation of light through water. However, the research team has



demonstrated with earlier versions of their sonar system mounted on Human Occupied Vehicles (HOV) like the famous *Alvin* and Remotely Operated Vehicles (ROV) that they can use sound to illuminate the dynamic stem of the plume as it rises tens of meters in the water column, as well as the warm water seeping from the surrounding seafloor. Illuminating the black smoker plume is like trying to

visualize a tall tree using a small flashlight that only illuminates the base of the trunk. Using sound is like adding a powerful searchlight that illuminates most of the rest of the tree. With their sonar connected to the NEPTUNE Canada cable the system is being designed to monitor the hydrothermal flow and transmit the images onshore for years. In coordination with monitoring of earthquakes and volcanic activity, these long term acoustic observations open the possibility of understanding how seismic, volcanic and hydrothermal processes actually interact at a submerged plate boundary.

Dinosaur Extinction: the Jersey Story

Contributed by Kenneth G. Miller

In 1960, Dick Olsson published a seminal paper on the Cretaceous/Paleogene (K/P) boundary, documenting 3 survivor taxa from the mass extinction, two named after Monmouth County, NJ (*Hedbergella monmouthensis* and *H. holmdelensis*). In 1978, Dennis Kent (now an EPS Professor) predicted that the K/P boundary, constrained to Chron C29r, occurred within an interval of less than 0.5 myr. This prompted the Alvarez team to measure iridium at outcrops in Italy. The Alvarez hypothesis was born: impact of a 10 km diameter asteroid caused the K/P mass extinction that wiped out the dinosaurs. A decade of acrimony ensued until then graduate student Allen Hildebrandt found ground zero centered near the small village of Chicxulub, Mexico. Carl Swisher (now EPS Vice Chair) first dated the crater as the same age as the K/P boundary, and most scientists accepted the impact hypothesis. Gerta Keller of Princeton contested this by claiming both stepwise extinction and impact before the extinctions. In 1996, drilling at Bass River, NJ implicitly linked impact ejecta with the extinctions, strengthening the Alvarez hypothesis (Olsson et al., 1997).

At the 2006 GSA, two teams reported datasets that appeared to contradict the impact hypothesis. Gerta Keller reprised two decades of contrarian hypotheses by claiming that there were multiple impacts, that the Chicxulub impact predated the extinctions by 300 kyr, and a younger impact caused the extinctions (although note: in 2008, she retraced her position claiming that Deccan trap volcanism caused the extinction). Neal Landman of the American Museum of Natural History reported an iridium anomaly below a bed of well-preserved (Lagerstätten) uppermost Cretaceous mollusks. The stage was set for a continuation of the great debate.

Ken Miller, Dick Olsson, Jim Browning, and Pete Sugarman obtained funding from the NSF for a campaign of shallow coreholes in New Jersey to investigate the K/P boundary. In the fall of 2008, this team worked with "Little Gene" Cobbs, head driller of the USGS ERMT, to use a new auger coring technology to core 7 sites, 14 holes in 10 days. We are testing 3 hypotheses stimulated by the work of Landman: 1) the Lagerstätten fauna post-dated and survived the K/P impact; 2) the iridium anomaly was displaced ~20 cm in outcrops studied by Landman, even as it is displaced by ~6 cm at Bass River (Olsson et al., 1997); and 3) the Lagerstätten is actually displaced and is the product of a tsunami. We recovered over 500 ft of core to test these hypotheses and will report back next year. In the meantime, if you want to hear the full story to date, Miller and Olsson will do a duet at the Geology Museum Open House in January 2009 (see last page).

Undergraduate Volcano Competition: Learning through Destruction

Contributed by Alex Nikulin

One of the major challenges of teaching introductory level undergraduate classes at Rutgers is often the sheer size of our undergraduate classes, with as many as a 100 students enrolled in Geology 201, Earthquakes and Volcanoes every year. A setting like this often results in a lack of student interaction with each other and the instructor. Having taught Geology 201, Earthquakes and Volcanoes, for two consecutive semesters I introduced a unique extra credit project that seems to bridge the interaction gap and encourage student collaboration, which, in turn, seems to correlate to student participation, attendance and, in the end, student performance in the class.

Inspired by the popular "Mythbusters" television show airing on the Discovery channel, students of Earthquakes and Volcanoes were asked to construct a working model of an active volcano and present it to the class. Students were graded on the model itself, a 5-minute PowerPoint presentation to the class, and, of course, much to everyone's enjoyment, on the quality of the "eruption." The project was structured in the form of a competition, where student groups acted as teams competing for a set of prizes; the competitive nature of the project seems to bring out some of the most impressive student work.

In the end, students who completed the project had a much better understanding of material covered in the course, their final grades, on average, were a letter grade higher than the class average. It was truly inspiring to see students show interest in the topic and take initiative in the class. I hope the Volcano Competition becomes a traditional event in this and other courses offered by our department.

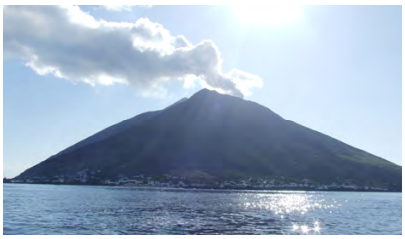
Field Trip to Italian Volcanoes

Contributed by Pablo Ruiz, Sara Mana, and Esteban Gazel

The Fall 2008 *Volcanology* course was taught by invited professor Dr. Andrea Borgia and included a field trip to Italy to study spectacular volcanoes. Some are currently active, others were historically active, but each has something unique to teach us.

Our journey began in Sicily where we visited Mount Etna, the largest active volcano in Europe. Guided by Marco Neri (Istituto Nazionale di Geofisica e Vulcanologia), we visited old lava flows, cinder cones and inside hornitos, including a visit to the present eruptive vent in the "Valle del Bove", observing an active lava flow from just 2 m away. We also saw mud volcanoes and outcrops of the oldest lavas from Etna and evidence of the Pernicana Fault.

Next, we went to the Aeolian Islands where we climbed to the top of Vulcano, which the Romans believed was the chimney to the god Vulcan's workshop. We walked across active fumaroles and around the main crater giving us an incredible view of the archipelago.



On the way from Vulcano to Stromboli we made a quick stop at Lipari to see a huge pumice deposit and an obsidian lava flow located in the northern part of the island. We also got to see the eruption of Stromboli from our boat. At Stromboli, we climbed to the top of the peak during the night to watch the lava fountains up close. These lava fountains result from mild to moderate eruptions of incandescent volcanic bombs.

In Naples, we visited the ruins of the Roman cities Pompeii and Herculaneum to see the effects of the catastrophic eruption of Mount Vesuvius in 79 AD. At Mount Vesuvius we walked over old lava flows in the Valle dell'Inferno and examined the fractures and other evidence of volcanic spreading. At the Osservatorio Vesuviano we learned about the methods used by Italian seismologists and volcanologists to monitor volcanoes. Afterwards, we took a train to Rome and then north to Tuscany to our final stop on the field trip.

In Tuscany, we went to Mount Amiata to see a hydrothermal field and learn how the Italians are converting the volcano's heat into electricity.

While in Italy, we met amazing people, ate delicious food, and learned about the Italian culture, making this one of the best learning experiences we have ever had. We would like to thank Michael Carr, Andrea Borgia, Carl Swisher, and the Graduate School for support.

Sea Level, Siberia, Russia

Contributed by Svetlana Mizintseva

This past fall, the Siberian division of the Russian Academy of Sciences held the Fourth National meeting on the Cretaceous system of Russia and adjacent countries. Themes of the conference included theoretical, methodical, and practical questions of Cretaceous stratigraphy and paleogeography. Significant attention was given to correlation of Cretaceous deposits from different regions, and problems in the use of various stratigraphic methods. The meeting provided an opportunity to discuss Cretaceous sea-level studies from New Jersey in an international meeting and to learn about Cretaceous research in Russia.

The conference took place in Novosibirsk, an academic city in Siberia. Novosibirsk is the third largest city in Russia with 1.5 million people. Lying on the banks of the Ob River, it is known at the Russian Chicago. The winters in Siberia are very severe, cold and snowy and summers are hot and dry. Even though the Siberian climate is sharply continental, the climate of the Novosibirsk region is considered healthy because of the large number of sunny days and low humidity.

Most presentations at the symposium were on Russian platform stratigraphy. The Russian platform is the central part of the large Eurasian craton. It was tectonically stable and covered by shallow seas throughout most of the Mesozoic. Excellently preserved fossils in the extensive deposits provide the basis for biostratigraphic control and paleobathymetric estimates. Sahagian et al. (1996) constructed eustatic curve for the Russian platform.

I presented the sea-level estimates derived from the New Jersey Coastal Plain and preliminary interregional correlations with the Russian platform. The records between the two regions are remarkably similar (Miller et al., 2005). However, precise correlation is a major concern because of uncertainties in age control and paleobathymetry. Nevertheless, the sequence stratigraphic approach used in the New Jersey Coastal Plain resonated amongst our Russian colleagues and encourage revisiting the Russian platform with new methodological approach. I will apply integrated sequence stratigraphy and Sr- isotope age control to the Russian platform Cretaceous section. Russian colleagues Dr. Alekseev and Beniamovstiky from the Moscow Paleontological Institution greeted this idea with interest, support, reference material, and samples.

I was glad to participate in the Cretaceous symposium and have the opportunity to collaborate with Russian scientific community. I would like to acknowledge the Department of Earth and Planetary Sciences and NSF for financial support.

Field Camp at YBRA: Back to the Future

Contributed by Peter Shipton and Kenneth G. Miller

Rutgers has a long history with the Yellowstone Bighorn Research Association (YBRA). Steve Fox, then a Princeton student and later Professor at Rutgers, attended the first Princeton- YBRA Field Camp in 1933 and encouraged generations of Rutgers students to attend YBRA. He put me and Bob Marvinny on the Princeton van out to "Red Dog" Montana in 1977 Things changed over the years with U. Penn. operating the camp from the 1980's to recently. We were distressed to see the YBRA camp not renewed by Penn last year, only to find it rising like a phoenix under the leadership of the University of Houston. Using funds from the **Larry Gordon and Steve Fox Student Funds**, we partially supported undergraduate **Peter Shipton** to attend YBRA. His report of his experience, partially funded by alumni donations, will touch the hearts of all of us who attended YBRA. Here is Peter's report:

Fanshawe Lodge, YBRA, Red Lodge, Montana, http://www.geosc.psu.edu/

"The first day at camp we were introduced to the faculty. Dr. Marv Kauffman had been teaching here for 50 years and he is one of the authors of the Red Lodge Stratigraphic column. Marv was a very smart knowledgeable guy, who is passing the torch to Houston professor Dr. Alex Robinson, a structural and high grade metamorphic geologist.

We began with a Brunton Compass mapping exercise. By plotting angles and paces to each consecutive point, and connecting back to the first known benchmark, we were able to calculate our total error in the measurements.

Our first mapping project was Elk Basin, a doubly plunging anticline that straddles Montana and Wyoming. Since the 1930s, the Basin has been an oil field, currently with 435 separate well pumps. The first day, we drove around the area to familiarize ourselves with the local formations. At the end of the day, we went to an area that contained all of the members we were mapping. There we used Jacob's staffs to measure the thickness of each member. Once we began the project, we were split into groups of 3 and each took a 3 km by 1.5 km area (an area that was said to require at least 45 strikes and dips). We were dropped off at a location that we chose within our area, and hiked through while mapping. The technique of mapping was what Dr. Robinson called "sky mapping". Once at a high enough vantage point, one looks at the area and locates it on the contour map. Then by eyeing the contacts between members, the contact line gets drawn on the map.

Our second project was a Glacial Mapping exercise in the Rosebud Valley. We learned about the different sounds that highly weathered and less weathered rocks make when hit with a hammer. At this point, Dr. Robinson left the camp, and Tom Lapen from UH and Peter Crowley from Amherst came. Our first exercise with them was a schematic diagram of Clarks Fork Canyon. The outcrop showed an overturned anticline with a large fault cutting through the structure.

The next activity was what Dr. Crowley affectionately called "The Death March." This hike goes from the Precambrian basement rocks, through the column to the top of the Frontier Formation, the bottom of the strat column in our first project. In this area we encounter the Chugwater Formation that consists of deep brown red Triassic sandstones and mudstones much like those near Rutgers

One of my favorite projects was mapping of the Bear Tooth Mountain front, surrounding the camp, an area of spectacular geology. The thicker formations in this area, two very strong dolomites, were overturned and nearly vertical. The peaks these formations made were 10-20 meters thick, and hundreds of meters tall. Here we encountered fault breccias and intrusive igneous diabase. The structure of this area was very complex. There are two coincidental anticline-syncline pairs along the front of the Bear Tooth Mountains. These sets of folds are offset by strike-slip faults that were caused by the massive uplifting fault that created the mountain range.

We drove south over the Bear Tooth Mountains, where a flat plateau has formed. The mountain range is very old, and the top surface is composed of Precambrian granite. Because this is so hard to weather, the surface has reached an equilibrium of weathering which causes a flat top. In contrast, the Absaroka Mountains, that formed from Eocene volcanics, are jagged and uneven.

Clark's Fork Canyon, Wyoming. Credit: Phil Norbec http://www.geosc.psu.edu/

We visited the Stillwater mine, a huge deposit that produces chromite and platinum. The current estimates of its size are 5 to 6 kilometers thick and at least 40 kilometers long. It was formed by intrusive magma driving crystallization.

Our final professors were Dr. Mike Murphy (U. Houston), Dr. Rob Thomas (Western Montana), and Dr. Tom Kalakay from the (Montana, Bozeman). These guys were my favorite group of teachers and the most fun of the entire faculty. They took us on a day driving through Yellowstone. We did not see Old Faithful, but we did see mud geysers and sulfur springs and learned about the formation of Yellowstone. A caldera formed during the Absaroka event from the hot magma being driven towards the surface, causing thermal uplift in Yellowstone, and extensional faulting in the Teton Range. Once the thermal force of uplift decreased, the Yellowstone Caldera collapsed.

After Yellowstone, we went to Grand Teton National Park. The Tetons are an amazing mountain range. Since they are young, the mountains have jagged features and many of the original faulting is clearly exposed. In addition to being able to see the faults, the Teton Mountains are full of visible igneous dikes. Here were learned to identify the fault scarp line and well as the reason that there is a depression, usually filled with water, at the front of the mountains.

My experience at YBRA was better than I could have imagined. YBRA is a beautiful place, surrounded by interesting geology, and outside of a really fun, quaint town. I learned a great deal in this field course, including how to use the geologic knowledge I acquired at RU. I would whole-heartedly encourage anyone needing a geologic field camp to consider YBRA..

Department News

Contributed by Kenneth G. Miler, Chair of Earth and Planetary Sciences

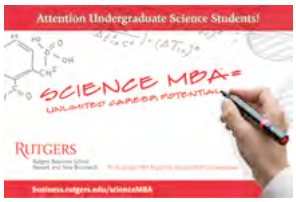
The past year saw an 11% budget cut at RU and a global financial crisis. Despite the grim times, we were able to hire Assistant Professor Silke Severmann, Distinguished Visiting Professor Rick Fairbanks, and mass Spectrometry Research Associate Rick Mortlock (see profiles below). In 2009, we may be one of only a few SAS departments able to hire due to the anonymous donation of the Bennett Smith Chair (see lead article). We have been able to survive the financial crisis and support undergraduate and graduate students only through the increased support of our alumni and the contributions of our outstanding faculty, which must certainly rank in the top 25, if not the top ten in Earth Sciences. We offer strong, caring, yet rigorous undergraduate and graduate programs and provide a sense of family for faculty, staff, students, and alumni. Yet, dark times are ahead with portent of even more significant departmental budget cuts, students losing support as loans and endowments shudder, and the prospect of raising funds for an Earth and Oceans building at Cook looking uncertain. With this yin and yang, I review the state of the department in 2009.

The recently re-named Department of Earth & Planetary Sciences, School of Arts and Sciences consists of 23 tenure/tenure-track faculty, four hard/soft money research faculty, three Emeriti, and two Distinguished Visiting Professors. We have 25 full-time and five part-time graduate students, 30 majors, and 30 minors.

Our department is noted for its excellent teaching. We reached a milestone this year by teaching 4,000 of the 20,000 undergraduates in the School Arts Sciences to top teaching rankings (>4.2 on teaching and course quality at to 100- and 200 level). We are a caring and well-liked department that touches most SAS students. We are reaching out in the Byrne First-year seminars, introduced last year. I again offered my *Climate and sea level change: should I sell my shore house* course to 16 first-year students (including my son Rob who is a SAS student); the highlights included trips to the beaches and an overflight of the Jersey shore in a Cessna. Peter Rona also reprised his Byrne seminar, *Oceanography: Opportunity in Research and Careers*.

A new course allowing majors to receive credit for internships with local firms was developed this year by Gail Ashley, Undergraduate Director.

In addition to the Joint Endowed Chair in Energy (see lead article), we have an exciting new collaboration with the "RBS" (Rutgers Business School): Science MBA. Students will complete a regular Geological Science major and will take MBA courses in years 4 and 5; they will be graduated with both a B.S. in Geological Sciences and an MBA from the RBS: http://business.rutgers.edu /default.aspx?id=1562 I can testify from personal experience that the New Brunswick RBS is fabulous (Ken Jr. was graduated from RBS in 2007) and it is ranked as the #10 business school in the country for recruiters. Joining forces of EPS and the RBS will be a powerful combination for our students.



Undergrads continue to enjoy full employment now in Environmental Geology. It is hard to predict opportunities in energy companies for undergraduates due the wild fluctuations in oil prices. We encourage our students interested in energy companies to get a masters degree with thesis in Geological Sciences.

Our graduate program continues to get stronger. Thanks to Graduate Program Director and Vice Chair Carl Swisher, industry support from ExxonMobil, and support from the Graduate School New Brunswick, we have increased the number of supported students to 25. We are a major feeder school for industry (Exxon/Mobil one of their to 10 schools), Chevron, BHPBilliton) and are reaching out to Indonesian professionals in a joint effort with ExxonMobil. But we are not just industry. Our Ph.D.'s are well represented in academia (Michigan State, LDEO, Wisconsin, RPI, RU, Queens, Appalachian State, University of Iceland, Georgia State).

The diversity of our graduate students was displayed at our International Holiday Party held Dec. 11 at the Geology Museum. Our graduate students provided pot-luck dishes representing their ethnic heritages. Our graduate students and staff hail from Indonesia (4), Costa Rica (2), Trinidad, People's Republic of China, Italy, Venezuela, Turkey, Russia (2), Peru, Puerto Rico, and Peru, and half of them are women. We are a remarkably diverse family, which is all the more pointed since we had only one international student in 2002. In my holiday remarks, I borrowed from the stump speech of our new Executive Dean, a RU alumnus. He notes that Rutgers has been striving to be Berkeley or Michigan. He says, "I do not want to be like Michigan, I want Michigan to be like us. Walk through the campus in Michigan and compare it to ours. We are the most diverse state university in the country."

Our research strengths include micropaleontology, stratigraphy, geophysics, biogeochemistry, structure, Quaternary studies and VGP (volcanology, geochemistry, petrology). In micropaleontology, we are the strongest in U.S., with only Utrecht of similar strength. Our coastal plain drilling project completed its 13 hole this year, its 16th year. We trail IODP in longevity (30 years), but we are the most long-lived continental drilling project. As documented in the "Kudos" section, we have an internationally award winning faculty; for example, of the 20 National Academy Sciences Members at RU, 3 are in our department. Our publications are excellent; for a flavor: http://geology.rutgers.edu /recentpapers. shtml

Our department is in the forefront of interactions between the School of Arts and Sciences and the School of Environmental and Biological Sciences (formerly Cook). We are in a unique position because we must be close to both mother SAS and father SEBS due to the fact that we share faculty with Institute Marine Coastal Sciences (5 joint SAS/SEBS faculty), Environmental Sciences (2 joint SAS/SEBS faculty), and Anthropology (1). We have excellent ties not only with our Dean of SAS Doug Greenberg, but also SEBS Dean Bob Goodman. Walls are coming down at Rutgers.

As noted above, we have strong ties to the Rutgers Energy Institute (http://rei.rutgers.edu/) headed by Falkowski. In addition, we have a presence in the Climate and Environmental Change Initiative (http://climatechange. rutgers.edu).

Last year I wrote about the initiation of the School of Arts and Sciences. I can tell you from personal experience that the new school is a great improvement: my son Rob Miller enrolled in SAS this fall and I attended all of the requisite orientations. To repeat the bottom line stated in the last two Redbeds: application procedures are clearer, students' course requirements are much more uniform, the individual campuses continue to offer lifestyle differences, and overall the quality of student life is improved.

There is no denying that times are hard and painful financial cuts have happened and more are coming. But I see that we have bold new leadership with Doug Greenberg and Bob Goodman; together with The Executive Phil Furmanski and President McCormick, they have been doing a great job in positioning Rutgers to be relatively stronger versus other universities. We will survive.

I want to wish everyone a better year and thank your for your support of the Department of Earth and Planetary Science

Kudos, External Funding, and Comings/Goings

Undergraduate **Kate Coleman** graduated with High Honors from our department and was awarded the Sol Seid Award from the NJ Water Environment Association.

Undergraduate **Erick Geiger** graduated with Honors in both Geology and Marine Sciences and was awarded the Vinton Gwinn Award from our department.

Graduate students **Mike Durcanin, Aurora Elmore, Ashley Harris,** and **Sam Henderson** were all awarded GSA research grants. It was a sweep!

Graduate student **Lauren Neitzke** received a grant from the Evolving Earth Foundation fand a travel grant from GSNB to attend a workshop for graduate students interested in teaching/graduate education "On the Cutting Edge, Preparing for an Academic Career in Education."

Graduate student **Morgan Schaller** was awarded the best paper award from the Hydrology section of the American Geophysical Union.

Graduate Student **Ian Saginor** accepted a position as Assistant Professor at Keystone College.

Graduate student **Andrew Kulpecz** successfully defended a Ph.D. and accepted a job with Chevron.

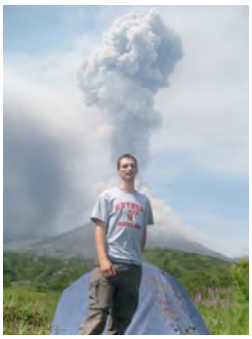
Graduate student **Sam Henderson** successfully defended a Ph.D. and accepted a job with ExxonMobil.

Graduate student **Ryan Earley** has secured a position as a submarine fiber optic cable route engineer with Tyco Telecommunications' Marine Route Survey group.

Graduate student **Alissa Henza** received a travel grant for £400 (~$800) to attend the Fault Zones conference at the Geological Society of London in September.

Graduate student **Ryan Earley** completed an internship with Chevron working on proprietary tomographic 3D pre-stack depth migration velocity and anisotropy analysis software and workflows.

Graduate students **Ashley Harris**, **Kelsey Bitting**, **Alissa Henza**, and **Lauren Nietzke** completed internships in '08 with energy companies



Graduate student **Alex Nikulin** received 2 months of support from an NSF-funded study and research program administered by the University of Alaska. These funds supported summer learning, and then applying, seismological methods of study of active volcanoes (St. Helens in Washington State, Bezymyanny in Kamchatka). This work is in collaboration with the Russian Academy of Sciences branch in Kamchatka.

Kelsey Bitting received the AAPG Richard W. Beardsley named grant for $2000.

Graduate student **Aurora Elmore** received grant from the Geochemical society and a travel grant from the Rutgers Graduate School.

Pablo Ruiz and **Svetlana Misintseva** were among ~30 graduate students invited to participate in a Rift Basins Seminar held by ExxonMobil in May.

Graduate student **Svetlana Misintseva** was awarded a graduate fellowship of $5000 fro the GCSSEPM Foundation. The award noted "This is the first time we have awarded above our stated amount and it is because we believe in your ability and the importance of the project."

Graduate student **Mike Durcanin** and Professors **Martha Withjack** and **Roy Schlische** arranged for the donation of a major piece of software (~$500k) from Schlumberger. Petrel exploration software allows for the integration of geophysics, geology, and reservoir engineering.

Professor **Gregory Mountain** arranged the donation of several licenses of Landmark Graphics' SeisWorks and ProMax; these exploration-industry-standard packages bring modern geophysical tools to our labs and classrooms.

Jim Browning was promoted to Assistant Research Professor.

Professor **Ying Fan Reinfelder** was awarded a $800,000 grant from EPA's Science To Achieve Results (STAR) - Consequences of Global Change for Water.

Dr. **Vadim Levin** was promoted to Associate Professor with tenure in the Department of Earth and Planetary Sciences.

Professor **Rob Sherrell** was awarded a grant entitled "A coral skeleton P/Ca proxy for surface ocean phosphate: testing and calibration" by the NSF Chemical Oceanography and Marine Geology and Geophysics Programs at a level of $430,947.

The American Chemical Society Petroleum Research Fund awarded $99,563 to Professor **Yair Rosenthal** "Assessing the Potential of B/Ca in Planktonic Foraminifera as a Proxy of Seawater pH: a Sediment Trap Calibration."

Professors **Yair Rosenthal** and **Mark Feigenson** were awarded an NSF grant for "Foraminifera as a proxy for seawater neodymium: Core-top calibration and down-core application for reconstructing Holocene variability in the Indonesian Throughflow (ITF)."

The Rutgers Board of Governors announced that **Carl Swisher** has been promoted to Professor I.

Professor **George McGhee** was elected a Member of the Konrad Lorenz Institute for Evolution and Cognition Research in Altenberg, Austria, a Centennial Fellow of the Paleontological Society, and was invited to an expenses-paid workshops on symmetry at the University of Leiden, the Netherlands and evolutionary development at the University of Valencia, Spain.

The National Geographic Society funded Professor **Marie-Pierre Aubry** and Distinguished Visiting Professor **Bill Berggren** for another round of Geoarcheological studies in Egypt.

Professor **Gail Ashley** was chosen as a distinguished alum by the Geosciences Department, Univ. of Massachusetts, Amherst. This is the second such award, the first award (2007) went to Herman Zimmerman, former Division Director at NSF.

Professor **Paul Falkowski** gave a Plenary lectures at last year's AGU Ocean Sciences meeting in Orlando and he delivered the Carl Sagan Lecture at last Fall's AGU meeting.

Professor **Dennis Kent's** paper in Proceedings of the National Academy of Sciences, *CO_2 levels in response to the collision of India and Asia,* was covered in an article in Science News.

Professor **Paul Falkowski** was interviewed on NPR's All Things Considered, where the subject was "Study: Oxygen Levels Have Varied Little Over Ages." The podcast is available at: http://www.npr.org/templates/story/story.php?storyId=94076329

Professors **Ken Miller** and **Dennis Kent** were awarded a grant entitled "Archiving and Advancing Core Curation and Database Management of ODP Legs 150X and 174AX cores: The Rutgers U.S. Atlantic Margin Core Repository" from the NSF Marine Geology and Geophysics Program $160,643.

Professors **Martha Withjack** and **Roy Schlische** were awarded an NSF grant of $205,400 for "The Influence of Pre-existing Zones of Weakness on the 3D Geometry and Evolution of Extensional Faults and Folds."

Professor **Ken Miller**, **Jim Browning, Dick Olsson**, and **Pete Sugarman** were awarded a grant entitled "Drilling the Cretaceous/Paleogene boundary in NJ: Testing the relationship of geochemical anomalies to event beds" from the NSF Sedimentary Geology Program for $135,000 for two years.

Professor **Peter Rona** was awarded $199,597 by NSF for his proposal "Acoustic Instrumentation for Imaging and Quantifying Hydrothermal Flow, Juan de Fuca Ridge" and $12,400 and $30,000 by NOAA.

Professor **Paul Falkowski** was elected to Fellowship in the American Academy of Microbiology.

New Faculty profile: Silke Severmann

Contributed by Kenneth G. Miller

We are delighted to welcome Dr. **Silke Severmann** as an Assistant Professor joint with Earth and Planetary Sciences, School of Arts and Sciences and the Institute of Marine and Coastal Sciences, School of Environmental and Biological Sciences. Dr. Severmann's research interests lie in the cycling of metals, nutrients, carbon and sulfur as they relate to the Earth's biogeochemical evolution. Her joint appointment reflects her interest in the ancient geological records at the dawn of life to the processes that control primary productivity in the modern ocean. To this effect she studies chemical and isotopic tracers in oceans, lakes and rivers to gain a better understanding how the interactions between physical, chemical and biological processes are recorded the sedimentary archive. In particular, she has made

significant contributions to the development of "heavy" stable isotopes, such as Fe and Mo, as new paleo-proxies. The development of a diverse range of paleo-proxies, and their ground-truthing in analogous modern environments, is key to unraveling the geological record of the evolving ocean and atmosphere, and the early evolution of life.

Silke received her Ph. D. in 2000 from the School of Ocean and Earth Science, National Oceanography Centre (NOC), Southampton University, UK. She has had post-doctoral experience in Clark Johnson's lab at UW Madison and Tim Lyon's lab at UC Riverside, and thus should be considered to have specialty talents in this unique field. Her talents in reconstructing the early chemistry of our planet are complemented by expertise in our department, including joint EPS/IMCS faculty members P. Falkowski, Y. Rosenthal, and R. Sherrell, but she alone understands the nuances of transition metal isotope geochemistry. Her duties are to conduct research in this unique field and to teach courses in Fe geochemistry and oceanography.

New Faculty profile: Richard G. Fairbanks

Contributed by Kenneth G. Miller

Rutgers was fortunate to attract Dr. **Richard G. Fairbanks** as a Distinguished Visiting Professor. Rick formally retired as a Professor at Lamont-Doherty Earth Observatory and Columbia University in January 2008. He decided that his research interests were more closely tied to those in our department and moved his active NSF grants, laboratory support (including Research Associate Rick Mortlock, see above) and laboratory to Rutgers (see above). Rick received a B.S. from St. Lawrence University and his Ph.D. from Brown. He subsequently established the coral and foraminiferal gas mass spectrometry laboratory at Lamont. Winner of the prestigious AGU Ewing Medal, his citation by Peter Eisenberger summarizes his scientific accomplishments:

"Rick Fairbanks has made major scientific contributions to a diverse range of ocean science topics including (1) sea-level history, (2) deepwater circulation, (3) plankton ecology and chemistry, (4) tracer oceanography, especially coastal waters, (5) ENSO/monsoon reconstructions on long time scales, and (6) mass spectrometry design and automation.

"Fairbanks is best known for his 'scientific home run' on Barbados. After spending several years on offshore drill design, prototyping, and field-testing, Fairbanks set out for Barbados to core the drowned Pleistocene reefs. Equipped with 200 tons of drill equipment he installed on a chartered Navy missile-test ship, Fairbanks and crew recovered the Rosetta Stones of Pleistocene studies. The science achievements first published by Fairbanks and his students were three-fold. First, they measured the most detailed and accurate sea-level record documenting the demise of the last ice age and identified key amplifiers of climate change. Second, they calibrated the radiocarbon dating method via the uranium nuclides and identified long-term change in the Earth's magnetic field intensity. Third, they measured major changes in the sea surface temperature in the tropics over the past 30,000 years, breaking a long-standing paradigm on the constancy of tropical sea surface temperatures.

"The results had major scientific impacts over a range of scientific disciplines. For example, the Barbados sea-level record is the most complete available, and as a result of its uranium-series dating accuracy, the pulsed nature of sea-level change has been documented. The calibration of the radiocarbon timescale led to the discovery that the carbon-14 clock was offset by more than 5,000 years ~25 ka, impacting many results and debates in Pleistocene research. These findings contribute to our understanding of the Earth's magnetic field, cosmic ray production rates, rates of human evolution, and climate change. An equally startling finding showed that the tropics varied by 5°C, a finding quite relevant to global warming concerns today.

"One of the early pioneers in the study of deepwater circulation, Fairbanks and his students used geochemical tracers to document modulations of North Atlantic Deep Water (NADW) in the Pleistocene. Using stable isotope and trace element proxies of deepwater temperature and nutrients, Fairbanks and his students studied the world's oceans, with a unique emphasis on the Southern Ocean, a key region to monitor net changes in the NADW production. They were the first to document the important role of air-sea exchange in modifying the carbon isotope chemistry of surface and intermediate waters.

"Over much of his career, Fairbanks has worked with biologists Peter Wiebe, Alan Be, and Sharon Smith to study the vertical distribution and isotope and trace element chemistry of marine plankton… unravel[ing] processes controlling the vertical distribution and chemistry of planktonic foraminifera.

"Some know Fairbanks best through his research on the origin of coastal waters and his use of the oxygen and hydrogen isotope tracers of the water molecule. Credited with documenting the Labrador sources of New England coastal waters, Fairbanks and colleagues are actively involved in applying the isotope tracer technique to coastal waters ranging from the Arctic to the Antarctic.

"In 1978, Fairbanks and Richard Dodge demonstrated that long-lived coral skeletons could be sampled at biweekly resolution for temperature, salinity, and incident radiation reconstructions. Their results were confirmed by many investigators around the world and led to one of the most rapidly growing fields of paleoceanography: ocean/climate reconstructions via geochemical proxies in corals. In particular, studies of ENSO and the Asian monsoon climate systems have made great gains using these methods pioneered by Fairbanks and Dodge more than 20 years ago.

"Fairbanks's strength in engineering has greatly contributed to his scientific accomplishments in the lab and at sea. Fairbanks's mass spectrometry automation designs are found in hundreds of laboratories around the world, substantially improving the data quality and the productivity of many mass spectrometry laboratories.

New Research Associate profile: Rick Mortlock

Contributed by James D. Wright

Rick Mortlock joins the Department as Research Associate from the Lamont-Doherty Earth Observatory of Columbia University. Rick will be supporting the operation and maintenance of the expanded Stable Isotope Mass Spectrometry Lab (Wright) and will be establishing a Uranium series dating program to support the Fairbanks/Mortlock coral based research. Rick received his B.A. from the University of Pennsylvania (1981) and an M.S. in Chemical Oceanography from the Florida State University (1985). Rick spent his early career conducting research on the biogeochemical cycling of Ge and Si in the ocean, with geochemist Flip Froelich. Since 1995 he has collaborated with Rick Fairbanks and has conducted research on Pleistocene sea-level change, ocean circulation, and radiocarbon calibration using fossil corals. Rick has participated in three wire-line drilling expeditions to sample fossil reefs and while at LDEO he developed U/Th and U/Pa radiometric dating methods using the PLASMA 54 Mass spectrometer (see above) and served as manager of the Lamont-Doherty ICP-MS facility.

Alumni gathering at GSA

Contributed by Kenneth G. Miller

The department held an alumni dinner i at the GSA meeting in Houston, TX. We had originally planned to have the dinner at the Terms of Endearment room of Brennans, reprising our successful gathering at AAPG two years ago, but Hurricane Ike had other plans: Brennans burned down in the storm. We here On the Banks were aware that many of our Houston area alumni suffered property losses and great inconvenience from Ike, with many still without electricity at the time of the meeting. We discussed whether it was appropriate to have a celebration of Rutgers Geology in Houston this year. But, the Geological Society of America decided that the show must go on. We had difficulty finding a suitable venue for the outing, especially one that could fit in any sort of academic budget. Hard work by Paul Kuznekoff of the Rutgers Foundation and the department found what turned out to be an excellent venue: the "17" restaurant in the Alden Hotel. Paul and I hosted 23 alumni and faculty to a great dinnert! After dinner, the attendees had to pay by listening to me regale them with stories of the accomplishments of Rutgers EPS. If you have read this far in the *Redbeds*, then you have the gist of my speech. My apologies to any Houston area alumni who were overlooked; we used the most recent database of the foundation to try to invite everyone in the area, but there were some obvious oversights (sorry, Mark!). We hope to have a gathering in Denver AAPG in June, 2009, so if you are planning on attending that meeting, please drop me an e-mail kgm@rci.rutgers.edu.

Alumna profile: Lina Patino

Contributed by Gail M. Ashley

Lina Patino came to the US from Medellin, Colombia. As a Cook undergraduate (1990), she did an independent research project with Michael Carr discovering the importance of geochemistry to solve geologic problems. Lina's interest in research and education led her to continue on for graduate degrees in the department working with Mike Carr and Mark Feigenson. Talented as a geochemical analyst she ran the DCP-AES and later Gene Hall's ICP-MS. She has published 33 journal papers; her research interests are subduction zone magmatism in Central America and the Philippines and chemical changes during incipient weathering of volcanic rocks. After completing graduate school at RU, she went to Michigan State University to set up and manage the ICP-MS lab. She taught mineralogy, petrology, and analytic geochemistry for 6 years at Michigan State University before moving to NSF in Washington, DC in 2005 to work in thee Earth Sciences Division (EAR).

Lina is Director of NSF-EAR Education and Human Resources Program. This position has allowed her to effectively combine her two passions: research and science education. The goals of the EAR-E&HR Program are to build strong research-based knowledge in the geosciences community via teaching, learning and evaluation in science and mathematics. She encourages activities that integrate research with education (such as REU Program) and helps focus activities that help to prepare a diverse, globally engaged US workforce for the future. She developed and is overseeing the review and awarding of the Earth Sciences Postdoctoral Fellowships. These are competitive and are for highly qualified investigators within 3 years of obtaining their PhD to carry out an integrated program of independent research and education. The program supports researchers for a period of up to 2 years with fellowships that can be taken to the institution or national facility of their choice. Lina has accomplished amount in a short time and stands as great role model from Rutgers.

Alumni News

Please send alumni news to Ken Miller kgm@rci.rutgers.edu and list "alumni" in message heading

Alicia Kahn was profiled in "Next* Chevron Technology http://www.chevron.com/Documents/Pdf/Chevron2008NextMagazine.pdf

Robin Evensen writes: "I came across the link for the RU Geology Alumni and thought I would send an email. I graduated in 1998 from Cook with a BS in Geological Sciences - and pursued a Master's at the University of Maine, with a concentration in hydrogeology. I worked for 5 years as an environmental consultant, on projects including remediation of Camp Evans/Fort Monmouth, Maxwell House demolition, hazardous materials inventory at Picatinny Arsenal, and before I left, I was contracted with Region 3 of the EPA to delist Superfund sites. My heart was always in teaching though, and I eventually got my teaching certificate - and have been teaching for 4 years. I am at Roxbury High School, and I teach Honors and Special Ed/Remedial Geo-Physical Science (formerly Earth Science) and AP Environmental Science. If you have any students who have questions about either field, consulting or education, they can email me."

Aaron Weshnak reports: "I graduated geology with a minor in marine science in Jan. 2006 and had stratigraphy with you in 2004. I'm going to Kean for a Master in Education Secondary science."

Chris Townsley reports: "I am no longer in Geology but still have a passion for the field (more as a hobby now)."

I spoke to **Bill Sparks.** We had hoped to meet up with his wife Grace and my wife Karen (RU Princess on State of Rutgers website) at the Papa John's Bowl on Dec. 29 in Birmingham, AL. A minor medical emergency sidetracked his trip, but we had an excellent exchange via phone and e-mail on recent developments in academics and athletics at RU. Bill is fine and continues to be a contributor to our undergraduate field program.

Richard "Dick" Enright reports: "Sorry that I can't make the Houston meeting to see you all. I have spent my limited travel funds for the year already. I will definitely be at the Portland GSA next year. I was in New Orleans as Ike and Gustav went by a few weeks ago. The French Q has not yet recovered from Katrina."

I ran into **Eric Vowinkel** at Ed Levy's retirement party. He reports: "I have been playing basketball with Ed and company for over 30 years on Thursday nights during summer breaks. My degrees from RU have been in Environmental Science but I had 30 credits in geology from the RU Geology department when I graduated in 1975. Steve Fox and Richard Olsen had a big effect on my undergraduate life and Steve had written a letter of recommendation for me for graduate school. I loved paleontology and marine ecology (Dr. Loveland was also a mentor). However, I went in the direction of ground-water quality for my M.S. over in the Environmental Sciences curriculum and got my Ph.D. later in life in 1997 with Chris Uchrin in Environmental Sciences. My Ph.D. thesis was titled "Numerical rating model using a geographic information system to determine the vulnerability of water from public supply wells in New Jersey to contamination by pesticides". With my knowledge of the 3-D aspects of the NJ Coastal Plain I was able to determine which public supply wells were not susceptible because they were in confined parts of aquifers and the times of travel of ground water from the land surface to old to be contaminated by human activities at the land surface. I have a unique job at USGS in West Trenton. As part of my duties (my 30 year anniversary date is December 23, 2008) I am on the Rutgers Campus one day a week (usually on Tuesdays) and serve as a liaison between USGS and Rutgers. My mission is to hook up scientists from Rutgers and USGS to do research together. I have an appointment as an Adjunct Associate Professor at the UMDNJ School of Public Health where I teach a graduate level course titled "Hydrology and Public Health". I am also a Liaison to EPA Region 2 and go to EPA Edison or New York City offices to develop program usually on Thursdays."

William "Bill" H. Matulewicz, writes "I've been in the environmental consulting industry since graduation, mainly on South Jersey sites. We do a lot of landfill design and permitting, along with the usual assortment of contaminated soil and ground water investigations resulting from underground storage tanks, industrial sites, agricultural pesticides etc. A few of the more interesting projects were pilot testing of an innovative cleanup technology with a research group from the University of Waterloo, landfill siting in Massachusetts, mineral resource evaluation in N. Jersey (sand and gravel extraction in glacial terrain), and even wet basements in a condo project on the Palisades Sill in Jersey City. I've tapped into the department's wealth of NJ knowledge on a couple of projects. I live in Delanco (on the Delaware R. in Burlington County), where I'm active with land use and conservation planning efforts at the local and county levels. I've fortunately managed to maintain friendships with quite a few of my fellow geology classmates over the years. I try to get up for a colloquium at least once a year when I can make a case for a job related topic (or even if I can't!). The colloquia are a refreshing respite from the "dirty dirt" geology I deal with day to day - even more so since I don't have to take notes. And it's always fun to chat with my old profs over a slice of pizza.

Wally Dow, Chief Geochemist, EOG Resources, Inc., reports that he has "forty-three years of industry experience in petroleum exploration worldwide, including thirty-six years in the application of organic geochemistry and petroleum systems analysis in basin evaluation and risk appraisal of petroleum prospects. Presented numerous oral and poster presentations at professional society meetings and participated in many training schools for oil companies and professional organizations."

Joe Francica RC '78 writes: "Just a quick note to say thanks for another wonderful Redbeds issue. It's hard to believe that Rutgers has undergone such monumental changes such as the change in name and the impending construction of the EOPS building. Good luck with construction plans. Also, it is always great to see a photo of Steve Fox on the back page. I've got great memories of trips to bang on outcrops every Friday afternoon. And finally, I'm happy to report that I'm the new president of the Rutgers Alumni Association for Alabama. All 26 of us. Maybe we'll get some new Geology graduates to work down south as I hear there is lots of activity in the Black Warrior Basin."

Jack English, Area Manager Chevron Global Exploration New Ventures, writes: will be at AAPG in San Antonio, so I would be glad to hear of any Rutgers gatherings there. I had the good fortune to be visiting Al Kulpecz when Andrew was making his decision to work for either Chevron or Exxon. We are very glad he decided to join us. The visit with Al was great. I have some good pictures from our tours of south England. " **Editors note: we are planning an activity for AAPG June 2009 in Denver.**

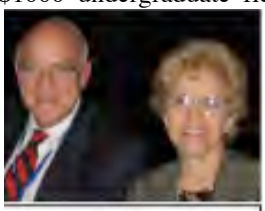
How to help us

The Geology Development Fund is the mechanism for directing alumni contributions to the department. To help the Department, please specify the Geology Development Fund on your contribution. Each month, we get a list of alumni supporters and respond with a thank you (usually). Your gifts also have allowed us to leverage University funds to purchase field vehicles for the department.

If your primary interest is supporting student research, and scholarship, please consider contributing to the **Steven K. Fox Student Fund** or the **Gordon Family Field Fund.** The Fox fund was created in Steve's memory specifically to support under-graduate and graduate student research, field work/camps, etc. To direct contributions to this fund, specify Geology Department Steven K. Fox Student Fund on your contribution. Theses monies will be used as an unrestricted fund to specifically support students, including awards for summer field camps, partial subsidy for Rutgers field camp, and graduate student field and meeting support. We now award $500 toward expenses for graduate and undergraduates to present papers at international meetings. This support has greatly stimulated student participation at meetings and is greatly appreciated.

Steve Fox

The **Gordon Fund** is an endowed fund used to specifically support field camp. We are delighted to have had several pledges that made our student support possible. We plan to award numerous $500 and one $1000 undergraduate field scholarships for the 2009 field season. Steve and the Gordon Family would be proud of your support for these activities.



Larry and Norma Gordon

GEOLOGY MUSEUM

Rutgers, The State University of New Jersey
presents the thirty-ninth annual

OPEN HOUSE

Saturday, January 31, 2009
9:00 a.m. to 4:00 p.m.

PRESENTATIONS 123 Scott Hall

10:00 a.m.

MAMMOTH GENOMICS

Dr. Stephan Schuster
Department of Biochemistry
and Molecular Biology
Pennsylvania State University
University Perk, Pennsylvania

11:00 a.m.

DINOSAURS OF ANTARCTICA

Dr. William Hammer
Department of Geology
Augustana College
Rock Island, Illinois

2:00 p.m.

DRILLING THE CRETACEOUS/PALEOGENE EXTINCTIONS IN NEW JERSEY

Dr. Kenneth G. Miller
Dr. Richard K. Olsson
Department of Earth and Planetary Sciences
Rutgers University, New Brunswick, N.J.

3:00 p.m.

EVOLUTION AND GEOLOGIC TIME:
The Unity of Life

Dr. Marie-Pierre Aubry
Department of Earth and Planetary Sciences
Rutgers University New Brunswick, N.J.

ROCK AND MINERAL IDENTIFICATION 202 Geological Hall

MINERAL SALE 135 Scott Hall

Information:

William Selden, Collections Manager at (732) 932-7243 rwselden@rci.rutgers.edu
The Museum entrance is the iron gate on the corner of George and Somerset Street in New Brunswick, NJ.