The Redbeds

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Rutgers, The State University of NJ
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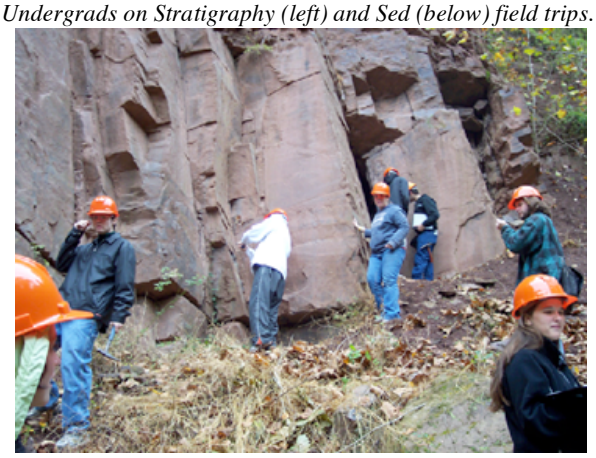
New Logo!

Welcome to the 2006 *Redbeds*

Since its reincarnation 10 years ago, the *Redbeds* has grown into a detailed report on research activities, students, awards, funding, and comings and goings in our department. Sent to over 700 alumni, the *Redbeds* is our primary means of informing alumni, friends, and colleagues of our most recent accomplishments. Please write to us and tell us of your activities!

Undergrads on Stratigraphy (left) and Sed (below) field trips.



New Synthesis of Global Sea-level Change

Contributed by Kenneth G. Miller

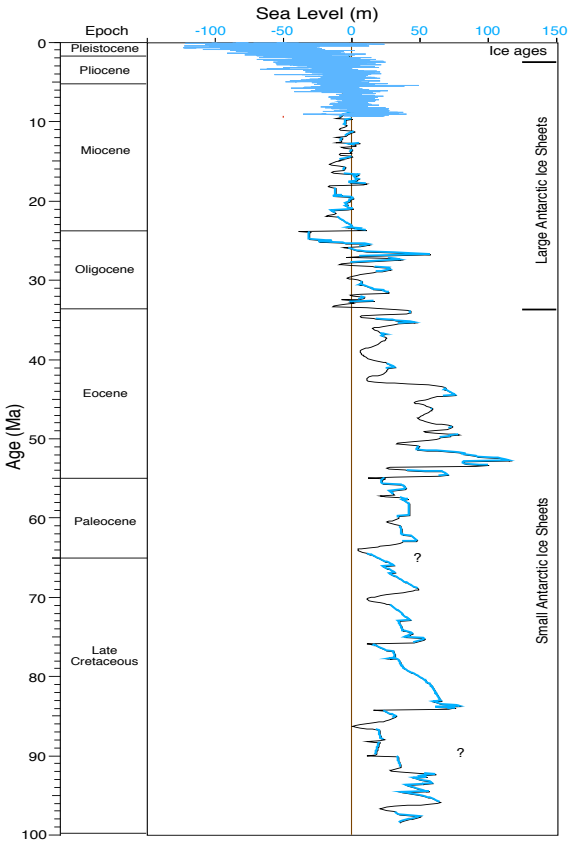
On Nov. 25, 2005, *Science* published an invited review paper *The Phanerozoic Record of Global Sea-Level Change* by K. Miller, M. Kominz (Western Michigan), J. Browning (Rutgers), J. Wright (Rutgers), G. Mountain (Rutgers), M. Katz (Rutgers), P. Sugarman (NJGS), B. Cramer (Oregon, former RU graduate student), N. Christie-Blick (LDEO) and S. Pekar (Queens, former RU graduate student). Building on a tradition of coastal plain studies begun by Dick Olsson in 1960 and his recognition of sequences in the coastal plain, the study focused on cores obtained by the NJ Coastal Plain Drilling Project (ODP Legs 150X and 174AX; Miller and Sugarman, co-chiefs). Using these cores, the authors derived a new global sea-level (eustatic) curve for the past 100 million years by backstripping, accounting for the effects of loading, subsidence, and compaction. The authors extended their record over the past 543 millions years by comparing with other published backstripped records and with Exxon Production Research (EPR) estimates (Vail et al., 1977; Haq et al., 1987).

The review paper calls into question several widely held tenets of geological sciences. Contrary to previous studies that have called for peak sea level at 5 ka, we show that global sea level has risen by 1 mm/yr over the past 5000 yr until the start of human-induced warming and sea-level rise. This establishes that about one half of the modern 2 mm/yr eustatic rise is attributable to human-induced global warming. We questioned the long-held assumption of an ice-free world during the greenhouse of the Cretaceous to Eocene, noting that the large, rapid sea level changes at that time require a significant Antarctic ice cap, albeit ephemeral. We also questioned the very high sea level stands of the Cretaceous, arguing that the peak was ~100 m above present and not the 250-300 m previously assumed. Previous studies have linked Cretaceous high sea level with periods of high seafloor spreading rates; the synthesis sheds doubt that seafloor spreading rates were as high as previously thought. We refuted the very high amplitudes of million-year scale sea-level changes postulated in a widely cited 1987 synthesis by EPR, though they corroborated the general timing of these changes. At the invitation of RU alumnus Chengjie Liu, Miller visited ExxonMobil Exploration Company in October to present the new sea-level curve. With the corporate reorganization, the Exploration Company is now the holder of the keys to the "Exxon cycle chart."

The new synthesis by Rutgers was well received by ExxonMobil Exploration Company. Rutgers and ExxonMobil have again begun to collaborate on educating the next generation of energy scientists (see Department News).

The implications of Recent global sea-level change to anthropogenic warming were heralded by Rutgers Media Relations who did an excellent job of getting coverage from the local papers (e.g., the *Star Ledger*) through the international press. As pointed out by Rutgers' Norb Psuty in the 1980's, sea-level change will continue to be a major issue for the State of New Jersey. A DEPE report on Recent sea-level change by RU undergraduate Alyssa Stanley, Miller, Sugarman, and M. Aucott (NJDEPE) formed the basis for the Recent portion of the synthesis. The DEPE report was highlighted in a press conference held by the governor on the beaches of Belmar. The take-home message is sea level is inexorably rising and that the rate of rise will certainly increase. By 2100, sea level will rise 0.4 m (1.3 ft) rise with a more devastating 1-2 m (3.3-6.6 ft) rise by 2200. You might not need to sell your shore real estate in the early 2100's, but beaches will continue to want to roll back by several hundred ft and beach maintenance will become increasing more difficult and costly. As illustrated by Psuty, the main effect of sea-level rise over the next few decades will be to exacerbate the effects of storm surges and coastal flooding. Though an increase in intensity of tropical and nor'easter storms has yet to be proven, recent events have suggested that coastal flooding is increasing. Ask the people of New Orleans.

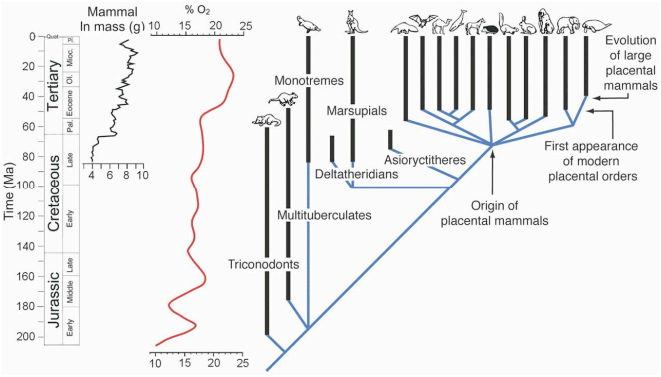
Above: simplified version of sea-level change over the past 100 million years. Blue portions constrained by data.



From phytoplankton to mammals: Rutgers links atmospheric oxygen levels to evolutionary trends

Contributed by Miriam E. Katz

The 30 September 2005 issue of *Science* published *The rise of oxygen over the past 205 million years and the evolution of large placental mammals*. Rutgers faculty P. Falkowski, M. Katz, K. Fennel, and M-.P Aubry, former Ph.D. student B. Cramer, former post-doc A. Milligan, and co-authors from Yale, Harvard, and the American Museum of Natural History. In this paper, they link the expansion of large-celled eukaryotic phytoplankton to the break-up of the supercontinent Pangea and opening of the Atlantic Ocean basin, driving an increase in the burial of organic matter on the seafloor. Because oxygenic photosynthesis is the source of this organic matter, excess burial should result in atmospheric CO_2 drawdown and O_2 increase; these predictions are confirmed by the research team's high-resolution carbon isotopic records and model simulations. The authors document that placental mammals first appear in the fossil record in the Late Cretaceous when O_2 achieved levels high enough to support their high metabolic rates and high reproductive O_2 requirements. A relatively rapid increase in O_2 levels occurred in the Eocene, corresponding to the first appearances of all modern placental mammal orders and an increase in the average



size of mammals; both require even higher O_2 levels.

This research attracted much media attention, including a feature spot on public television's NJN network. See:
http://news.nationalgeographic.com/news/2005/09/0930_050930_mammal_oxygen.htm/
www.sciam.com/article.cfm?articleID=00065C28-A06A-133D-A06A83414B7F0000/
www.nature.com/news/2005/050926/full/050926-13.html

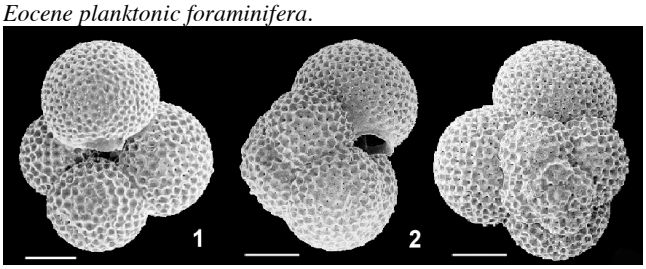
Forthcoming Atlas of Eocene Planktonic Foraminifera

Contributed by Bridget Wade

Planktonic foraminifera are a group of calcareous zooplankton used widely in biostratigraphy and paleoceanographic reconstructions, including estimates of sea surface temperatures, atmospheric CO_2 and ocean productivity. The highly successful Atlas of Paleocene Planktonic Foraminifera edited by Rutgers Emeritus Professor Richard Olsson, Christoph Hemleben, William Berggren and Brian Huber was published in 1999. This year will see the publication of the Atlas of Eocene Planktonic Foraminifera edited by Paul Pearson (UK), Richard Olsson (USA), Brian Huber (USA), Christoph Hemleben (Germany) and William Berggren (USA), with contributions from Helen Coxall (UK), Vlasta Premec-Fucek (Croatia),Isabella Premoli Silva (Italy) and Bridget Wade (USA).

This volume details the taxonomy, stratigraphic distributions, evolutionary phylogeny and paleoecology of 168 species of Eocene planktonic foraminifera. Three new genera and 10 new species are described and many holotypes are illustrated by Scanning Electron Microscopy for the first time. The comprehensive taxonomic discussions and plates will provide a fantastic resource for researchers of Eocene climate and biostratigraphy.

Below: Globoturborotalita bassriverensis, a new species of Eocene planktonic foraminifera.



Below: *Members of the Paleogene Planktonic Foraminifera Working back row: Paul Pearson, Bill Berggren, Chengjie Liu, Brian Huber; front row: Morana Hernitz Kucenjak, Silvia Spezzaferri, Vlasta Premec Fucek, Bridget Wade, Helen Coxall, Dick Olsson and Christoph Hemleben.*

Paleoenvironmental and Paleoclimatic Framework of Human Ancestry in East Africa

Contributed by Gail M. Ashley

Research continues by Gail Ashley and students in the East African Rift Valley studying the paleoenvironmental context of early humans. Interpretations of the climate and the geological record of freshwater resources in this arid region provide information on the physical conditions existing in areas where human evolution took place. It may also provide some answers on why human migrated out-of-Africa as early as nearly 2 million years ago. New student, Kelsey Bitting, is starting an interdisciplinary project with archaeologists studying the Holocene record on the margins of Lake Turkana to see if there is a possible link between subsistence strategies used by people (hunter-gatherer, fishing or pastoralism) and climate or climate change.

Left: Gail Ashley and graduate student Kelsey Bitting sitting by a section on the shoreline of Lake Turkana, northern Kenya.

Meteoric Mayhem in Ole Virginny: Drilling Cape Charles, VA

Contributed by Andrew Kulpecz

Faculty and graduate students from the Department of Geological Sciences participated in the cooperative drilling of the late Eocene (35.7 Ma) Chesapeake Bay Impact Structure (CBIS). Scientists and personnel from the USGS, International Continental Scientific Drilling Program (ICDP), Drilling Observation and Sampling of Earth's Continental Crust (DOSECC), state geological surveys (Virginia and Delaware), and multiple international universities collaborated to evaluate the immediate and long-term effects of the impactor. CBIS is the world's 7th largest impact crater, measuring 53 miles (85 km) in diameter. It is unique because the impact occurred on a rhealogically varied continental shelf, instantly vaporizing seawater, unconsolidated clastic sediments, and granitic basement while generating massive tsunamis that traversed the Atlantic Ocean. The crater's setting on a fully marine passive margin allowed for immediate burial and preservation of the structure, avoiding the erosion and tectonic deformation that plagues other terrestrial impact sites. CBIS also offers a unique opportunity to evaluate the transition from catastrophic (e.g., tsunamiites, impact generated breccia, etc.) to uniformitarian processes (normal marine clays and silts). The Rutgers team, highlighted by Ken Miller, Jim Browning, and Ph.D. student Andrew Kulpecz, is attempting to understand the post-impact stratigraphic evolution of the crater. CBIS offers the thickest upper Eocene through Miocene section on the Atlantic Coastal Plain, allowing for a detailed analysis of sea-level change, sediment supply, and subsidence on crater sequences and how they compare to contemporaneous units in New Jersey and Delaware.

Continuous, 24 hr/day, drilling of the Eyresville, VA corehole commenced in mid-September and lasted until early December, reaching a total depth of 5,795 ft (1,766.3 m). Coring of the post-impact sedimentary section provided exceptional recovery (>98%) until the contact with impact-generated sedimentary breccia at ~1,500 ft. Drilling of the clastic impact breccia (very poorly sorted clayey sand matrix with clasts of Cretaceous through Eocene lithology) proved successful, although the underlying mega-block breccia threatened the project's overall success. 10-40 ft thick blocks of Cretaceous red clay expanded into the drill hole, trapping the drill bit and suspending drilling operations until a second hole was drilled to bypass the problem. Granite was unexpectedly reached at ~3,600 ft, much shallower than expected. Coring of the fractured granite persisted for numerous days, causing concern as to whether the granite was a thick block that had fallen into the crater or if it was undifferentiated basement. Questions were answered on November 11th when the drill bit exited the ~800 ft granite mega-block into impact-generated clastic breccia. Drilling operations continued through the breccia into an interval of Suevite (melted rock) that was underlain by deformed schist and pegmatite (thought to be "true" basement). Sampling parties for the Eyreville core are scheduled for the spring of 2006.

View of the Cape Charles drillsite, Sept. 2005 by D. Powars.

RU Geograds Invade AGU

Contributed by James D. Wright, Kenneth G. Miller, and Michael J. Carr

The annual meeting of the American Geophysical Union in San Francisco, CA (5-9 Dec., 2005) experienced an excellent representation by Rutgers graduate students, including 7 from the Department of Geological Sciences. The graduate students received partial support ($300 each) for travel to the meeting from the Steven K. Fox Student Fund. Your generous contributions to the fund has encouraged our students to present papers and increased the profile of Rutgers at national and international meetings.

Four of our paleoceanography students presented posters emanating from post-cruise work using data and cores collected during *R/V Knorr* cruise 166-14. Faculty members Greg Mountain and Jim Wright along with Co-PI Pat Manley from Middlebury College led the cruise to the North Atlantic during the summer of 2002. A major objective during the cruise was to collect seismic data and a suite of cores to evaluate past changes in deep ocean circulation. Sam Henderson (M.S. student) presented a poster measuring stable isotopes and grain sizes with a temporal resolution approaching 20 yr. Lauren Neitzke (M.S. student) reconstructed the deep flow on the Eirik Drift for the past 250 kyr. Her presentation identified three distinct modes of deep ocean circulation during this period. Aurora Elmore (Ph.D. student) studied two cores from the Gardar Drift. Her results suggest that deep

currents flow along the Gardar Drift remained relatively constant for much of the last glacial/interglacial cycle. If confirmed, this is exciting because many geochemical proxy records indicate large changes in deep ocean circulation over this time period. Ryan Earley used high-resolution seismic records to study a series of large-scale bedforms on the Eirik Drift. These current controlled features were deposited during the early Pliocene and indicate a deep current in the North Atlantic that was much stronger than the present. This deep current may have been partly responsible for the warm early Pliocene climates. Other paleoceanographers included Jim Wright who co-chaired a session at the meeting, Ken Miller, presenting a paper on sea level, Don Monteverde (graduate student) who gave a poster on Miocene nearshore sequences, and Mimi Katz who presented a paper on long-term biogeochemical cycles.

The Volcanology group was represented at AGU by graduate students Estaban Gazel and Ian Saginor, who were located together on the Thursday AM poster session in a highly visible position near the entrance. Their posters were well attended, providing a nucleus for Central American researchers, including Mike Carr and Grads Lina Patino (NSF) and Jim Walker (Northern Illinois Univ.) who gathered for lunch. In the evening, Lina gathered the Costa Rican Ph.D. students from Geomar, Rutgers and Michigan State for dinner with Ian and Mike. A full day with many new contacts and renewals of relationships.

Post-Doc Profile: Bridget Wade

Contributed by Richard K. Olsson

Dr. Bridget Wade is finishing her first year at Rutgers as a research fellow, funded by a Lindemann Trust Fellowship. Bridget completed her higher education in the UK, receiving a 1st Class B.Sc. in Environmental Science: Biogeoscience from the University of Leeds, a M.Sc. in Micropalaeontology from University College London and a Ph.D. in Geology and Geophysics from the University of Edinburgh. She came to Rutgers after serving in a Postdoctoral position at Cardiff University, Wales. She has been appointed a Postdoctoral Associate for 2006 at Rutgers. Bridget has been studying Oligocene climate dynamics and the paleobiology of planktonic foraminifera. She has been an active member of the Paleogene Planktonic Foraminifera Working Group of the International Subcommission of Paleogene Stratigraphy and is a coauthor of two chapters in the forthcoming Atlas of Eocene Planktonic Foraminifera. She recently was elected as Chair of the Oligocene Planktonic Foraminifera Working Group that will prepare an atlas of Oligocene planktonic foraminifera. Bridget's current interests focus on the geochemistry of planktonic foraminifera using $\delta^{18}O$ and $\delta^{13}C$ isotope measurements. These measurements are key to understanding the paleobiology of these microscopic marine organisms that occupied various parts of the water column in the oceans. They provide information on paleotemperature of ocean water (i.e., climate) and the productivity of water masses. Marked changes occurred on Earth during the transition from a warm climate in the Eocene (greenhouse world) to the colder Oligocene (icehouse world) when ice began to cover Antarctica. These changes are recorded in the geochemistry of the foraminiferal shell since the shell grows in equilibrium with the chemistry of ocean water where a species lived. In the study of the so-called Eocene-Oligocene boundary Bridget has traveled to Tanzania to participate in a UK-funded drilling project to recover cores in sediments that span this boundary. She has also obtained many samples from cores obtained by the ODP and Exxon-Mobil that cross this boundary in the Atlantic and Pacific Oceans, and the Gulf of Mexico, in addition to various outcrop samples. At Rutgers, she is collaborating with Bill Berggren and Dick Olsson on the taxonomy and geobiology of Eocene-Oligocene planktonic foraminifera and with Ken Miller and Jim Wright on isotopic studies. In 2006 she will also collaborate with Yair Rosenthal of the Marine and Coastal Studies Institute on Mg/Ca geochemistry of foraminifera to study transient climates during the Eocene and Oligocene. In addition, she is planning professional activities at the forthcoming meetings of Forams 2006 International meetings in San Paolo, Brazil and at the Annual GSA meeting in Philadelphia. Bridget is shown above in the group photo of Paleogene Planktonic Foraminifera Working Group.

Mini-Conference at RU

Contributed by Kenneth G. Miller

A conference on *Relationships among seafloor spreading, long-term sea level, and ocean chemistry changes from Late Cretaceous to Present* was held on June 21 and 22, 2005 on Busch. Changes in seafloor spreading rate have long been implicated in long-term sea-level variations, continental flooding, and ocean chemistry changes. In particular, intervals of high ocean crust production rates such as the Late Cretaceous have been causally linked to high global sea level and high global CO2 due to increased outgassing. However, a recent study has questioned the empirical basis for high seafloor spreading rates during the Late Cretaceous. Backstripping and continental flooding studies have also questioned the very high sea-level estimates (230 m above present) for the Late Cretaceous. Similarly, the assumption of a relationship between geochemical fluxes and spreading rates has been questioned. This conference brought together a diverse group of tectonophysicists, stratigraphers, and geochemists to engender discussions on the fundamental question, what is the relationship of global tectonic changes to sea level and global geochemistry? A complete summary of the conference is available in EOS vol. 86 no. 37 p. 335-336, Sept. 13, 2005.

Department News

Contributed by Kenneth G. Miler

Mike Carr has officially been out of the deans' office for one year, but we still have excellent relations with Faculty of Arts and Sciences (FAS) including the new Dean of Natural and Mathematical Sciences David Madigan and the Executive Dean, Holly Smith. FAS recognizes the achievements of our department, including leadership on numerous international panels and board, the inclusion of two National Academy of Sciences members (Dennis Kent and Bill Berggren), and numerous awards won by faculty and students (see "Kudos"). Carl Swisher has been appointed as Graduate Director and Gail Ashley has been appointed as Undergraduate Director. They have taken over graduate and undergraduate responsibilities previously held by the Chair, Ken Miller. This reflects the expansion of the department and the divestment of power that has largely been in the hands of the Chair.

We are awaiting a bond issue to pay for the Earth, Oceans, and Planetary Sciences building (EOPS) to be built at Cook. This building will be a ~110,000 sq ft (gross)/60,000 sq ft net "green" building that will house Geological Sciences and provide expansion space for the IMCS. The EOPS building is one of the top two planned academic buildings at Rutgers. This building is an essential element to unify our faculty in one building and increase the profile of Earth, Ocean, Atmospheric, and Planetary Sciences at Rutgers. The Rutgers Foundation will be working on raising several million dollars in private contributions that will make the building feasible (i.e., the bond issues will only pay for a maximum of about 55 m$ of the 63 m$ needed). Alumnus Alex Kulpecz has been working with the foundation to approach industry to obtain support for the new building

One of the more exciting advances in 2005 was the donation of the ExxonMobil Exploration Company Fellowship in Biostratigraphy and the resumption of energy company recruitment in the Department of Geological Sciences. ExxonMobil has generously supplied $30,000/year for three years for a Fellowship. Recognizing the aging population of scientists in the energy industry, ExxonMobil is concerned that the next generation of energy scientists is not being prepared. The Graduate Program in Geological Sciences at Rutgers has an excellent record of educating masters and Ph.D. students in three areas of particular interest to exploration companies: micropaleontology, sequence stratigraphy, and structural geology and petroleum geology. We are arguably the strongest micropaleontology program in the United States (with Aubry, nannofossils; Berggren, Browning, Katz, Miller, Olsson, Wade, and Wright, foraminifers) and ExxonMobil has identified micropaleontology as one area where new scientists are sorely needed. We are very grateful to ExxonMobil for their support. ChervronTexaco has also recognized the importance of our graduate program by recruiting at Rutgers for the first time in a generation. Both Mark Baum (structure) and Alicia Kahn (nannofossils) will join Chevron with permanent positions, and Andrew Kulpecz has been offered a summer intern with the company. We are optimistic that ExxonMobil will recruit here next year and are looking to developing a series of short courses for industry scientists at Rutgers. Finally, other energy companies are recognizing the importance of Rutgers's research in Geological Sciences, with Husky Oil, Unocal, Chevron-Texaco, Norsk Hydro, Conoco, and ExxonMobil, contributing ~$5,000 per company to the structural geology group for student support.

The number of majors is back to nearly 30. We continue to teach more and more students by adding 13 sections of 101, two sections of a new course *Oceanography* (taught with joint IMCS faculty), a new course on *Mars*, for a total of over 3000 students per year. Our teaching rankings are outstanding (>4.0/5.0). Our graduate program is steady with 18 full-time and 12 part time students. Our recent graduate students are doing very well finding positions in academia, the energy industry, and environmental consulting companies.

We are currently proposing a new option for a M.S. in Environmental Geosciences. The option is designed to meet the needs of environmental research agencies, such as the NJ Geological Survey, environmental regulatory agencies, such as NJ Department of Environmental Protection, and the thriving environmental consulting industry in the state and the region. The program consists of 27 credits of course work and 3 credits of a capstone paper on an internship project. The core curriculum includes a selection of courses in Geophysics, Geochemistry, Hydrogeology, Geomorphology, Regional Geology, Environmental Internship, and Technical Proficiency such as writing and computer skills. The program is designed with flexibility to attract students from a broad range of backgrounds, including geological sciences, environmental sciences, civil and environmental engineering, and other related sciences and technologies. All new courses will be offered in the evenings to meet the needs of working professionals.

The traditional Christmas party is held at the Geology Museum and we are in our third year of a spring party that begins with graduate students poster session over beer, followed by a cookout. We would love to see you!

We have set a goal to make the Department of Geological Sciences at Rutgers one of the top programs in the country. We have distinguished ourselves as a major center for global biogeochemistry, volcanology, paleoceanography, paleomagnetism, radiometric dating and time scales, Quaternary Studies, meteoritics, and structure. In reviewing other programs around the country, we have begun to realize that we are amongst not only the top 25, but probably in the top 10, particularly in general geology, paleontology, and geochemistry.

Kudos, External Funding, and Comings/Goings

Undergraduate **Michael Durcanin** received $780 from the GSA for *The petrology and petrography of middle Pleistocene volcanics; Kapthurin Formation, Kenya* in a project directed by Gail M. Ashley.

Graduate student **Ian Saginor** was awarded $2000 by the GSNB for Pre-dissertation Research.

Graduate student **Sam Henderson** was awarded $24,953 by US Science Support for a project titled *The Accumulation History on Eirik Drift during the Quaternary: Implications from Grain Size Measurements*; the project is in collaboration with Jim Wright.

Graduate student **Louise Bolge** received an honorable mention on her paper at AGU. http://margins.wustl.edu/MARGINS_Prize/MARGINSPrize2004.html

Graduate student **Godwin Mollel** was awarded a Baldwin Fellowship from the Leakey Foundation for 2005-2006.

Graduate student **Alissa Henza** received support to attend an annual workshop of the IRIS consortium in June and a $1200 GSA Graduate Research Grant from the Geological Society of America.

Graduate student **Alicia Kahn** accepted an internship from Chevron to work in the Stratigraphy and Biostatistics team in summer 2005, received a $2000 scholarship from Chevron for this year's research, and was awarded the John Mason Clark 1877 Fellowship in Paleontology and Geology.

Bridget Wade has accepted a post doc at Rutgers' Institute of Marine and Coastal Sciences. She will work with Yair Rosenthal doing Mg/Ca and integrating these studies with oxygen and carbon isotopic studies with Jim Wright, Mimi Katz, and Ken Miller. Bridget will also take the lead on the Oligocene planktonic foraminiferal atlas, continuing on the tradition of Olsson et al.'s Paleocene and Eocene atlases.

James D. Wright was promoted to Associate Professor with tenure.

A paper by **George McGhee** et al. made the #1 spot in the "Top 25 Hottest Articles" in the journal *Palaeogeography, Palaeoclimatology, Palaeoecology* during the last quarter (October-December) of the year 2004: *Ecological ranking of Phanerozoic biodiversity crises: ecological and taxonomic severities are decoupled* http://top25.sciencedirect.com/?journal_id=00310182. George gave an invited lecture, "A Spatial Approach to Evolutionary Constraint", at the Konrad Lorenz Institute for Evolution and Cognition Research in Vienna, Austria, where he was in residence as a Fellow.

Martha Oliver Withjack was a keynote speaker at an international research conference sponsored by the Geological Society of London, Compressional *deformation within passive margins: nature, causes & effects*, October 19-20, 2005.

Paul Falkowski was named a Rutgers Board of Governors Professor.

Gail M. Ashley was named as President–elect of the American Geological Institute (AGI). The AGI is an umbrella organization for nearly 50 scientific societies and a geoscience community of more than 100,000 geologists, geophysicists and other earth scientists. Fundamental missions of AGI are the design of rigorous science curricula for K-12 education in the US and to provide geological information to federal and state governments for support of policy decisions. Ashley is looking forward to the challenges of the position. She plans to head up a campaign to (1) counter the growing movement from religion-based groups to legislate the teaching of unscientific alternatives to the theory of evolution, and (2) support thorough investigations of the role of humans in global climate change and report these findings without yielding to current political fashions and pressures.

Dennis Kent was awarded *Docteur Honoris Causa* from the Institute de Physique du Globe de Paris. Previous award winners include Don Anderson, Stan Hart, Dan McKenzie, Keith O'Nions, Steve Sparks, and Don Turcotte. This very high honor was recognized by a special presentation at the Sorbonne in December.

Ken Miller was selected as a JOI/USSAC Distinguished Lecturer for 2006-2007.

The Joint Oceanographic Institutions (JOI) appointed **Gregory Mountain** to the Science Planning Committee (SPC) of the Integrated Ocean Drilling Program (IODP) and **Ken Miller** to the Science Planning and Policy Oversight Committee (SPPOC) of the Integrated Ocean Drilling Program. SPC provides advice to IODP Management International. SPPOC is the highest-level advisory committee within IODP, providing long-range planning and programmatic overview.

In addition to the two papers highlighted above (Miller et al., 2005; Falkowski et al., 2005), several faculty members had high-profile papers published in *Science* and *Nature*:

1) **D.V. Kent** and L. Tauxe, Corrected Late Triassic Latitudes for Continents Adjacent to the North Atlantic **(Science 307:240-244)**
http://www.sciencemag.org/cgi/content/abstract/307/

5707/240?etoc
2) Thibault, **Y. Rosenthal,** et al., Stable sea surface temperatures in the western Pacific warm pool over the past 1.75 million years, 433, 294 - 298 Nature;

3) **C. Herzberg**, Mantle geochemistry: Big lessons from little droplets,
http://www.nature.com/nature/journal/v436/n7052/full/436789b.html ;

Alumnus perspective on the energy industry

Contributed by Alex Kulpecz

There are many reliable sources to touch the pulse of the energy industry that offer in-depth and comprehensive analyses. This perspective is for those whose career or interest touches lightly on the subject and is not meant to replace those other sources. Of course, the big news of this industry is experienced at the gas pump and all of us have strong opinions ranging from 'how much can a gallon really cost?' to 'when will the oil run out?'.

The recent rise in oil prices follows from the commodity nature of oil products. After several years of languishing global oil demand due to lax economic growth (1998-2004 prices ranged $10-30's per barrel), oil demand has taken off reflecting the sustained growth in world economies including the USA, Europe, India and China. World demand increased from around 80 million bopd to approximately 84 million bopd with China and India posting the largest percentage gains of substantial users. The price of oil is related to the excess capacity that can be produced by companies, countries, and OPEC and the markets' view of sufficient oil being available to meet expanding demand of the world. The history of oil pricing shows that when excess production capacity shrinks and either natural disaster or political uncertainty in producing countries rises, the market pushes up prices.

So what will happen to prices tomorrow? Given the commodity nature of oil, you can bet that there will be swings in the price. There will be downward pressure on the price when the economies of the world cool from this recent expansion. Supermajor (ExxonMobil, Shell, BP, etc) and State (i.e., Saudi, Iran, Iraq, etc) oil companies have learned the lessons of past; if very expensive capacity is created in the market quickly after large price rises, then oil prices crash soon afterwards. Trying to match the growth of production to the vagaries of economic growth is difficult if not impossible, so we set the stage for the sinuosity of oil pricing. Given the finite nature of hydrocarbon sources, one can guess that there will be a steady increase in the rolling average of the price of oil, but significant volatility in the cyclical price around that rolling average. Predicting oil prices is not easy!!

So what is the industry doing about this uncertain, but important future? It is focused at bringing secure resources to the marketplace at competitive prices. Consumers aren't happy when the price of a gallon doubles in the short term. We've all heard the arguments about how much a gallon of oil has not grown in price compared to other costs such as a gallon of spring water or milk, but still the wallet suffers. Other countries have decided to tax oil in an attempt to reduce consumption (in London where I live most of the year, it is about $7.50 a gallon), but it tends to have a surprisingly mild effect on those who can afford to drive and penalizes the poor who are forced to mass transit while filling the holes in government budgets unassociated with energy policy. In the end, oil companies focus on what they do best; applying technology and excellent human resources to provide this current lifeblood to world economies. The larger policy of how the world will transition into the more sustainable use of energy is rightly being debated in the public and political arenas.

Technological research is focused across a broad array of industry challenges. I've listed five challenges, but some of you could add your own;

Challenge 1: Increased Recovery factors of 'immovable' oil, or the oil from the reservoir rock matrix that has been left after primary production and secondary/tertiary techniques such as waterfloods, surfactant floods and the injection of carbon dioxide. We know exactly where this oil is, in depleted or depleting oil fields. Increasing recovery factors just several percent provides the world with another decade or more of reserves.

Challenge 2: Finding the unswept oil during production. As we all know, reservoirs are not homogeneous. The variability of facies changes inherent in the geologic framework creates significant movable oil to be missed during production phases. The better one can model the reservoir including geological uncertainty, the more oil that can be produced from existing and newly discovered reservoirs. The use of detailed seismic processing to follow the sweep of oil from a reservoir (4D seismic) combined with new reservoir modeling and measurement techniques is leading the way.

Challenge 3: Reduced life-cycle costs. The operating costs of a field with a lifespan of 20-40 years impacts the economics of producing oil and gas from a field. The more remote the location (deep, deep water, artic conditions, or environmentally sensitive regions), the worse the effect on the economics of attempting to recover the hydrocarbons. Research ranges from subsea robotics, multi-lateral and intelligent recompletions downhole after drilling, slim boreholes during drilling, three phase flow in pumps to making stronger, cheaper pipelines constructed like toilet paper rolls! The constant innovation of this supposed 'sunset' industry matches the science and technology applications other supposed exciting industries (hi tech, pharmaceuticals etc).

Challenge 4: Exploration techniques. Seismic interpretation and the growth of processing power have unlocked the creativity of the geophysicist and geologist to view alternative scenarios and manage risk in exploration. Virtual workrooms now allow one to enter the reservoir world and visualize the structural and stratigraphic complexities of reservoirs. Remote sensing from satellites and sniffing technologies continue to mature and provide new clues when applied to basinal studies. There is so much happening in the seismic processing side, you'll just need to pick up some journals or visit a contractor office to get a flavor!

Challenge 5: Human Resources. The demographics of the oil industry are no secret. Visit any of the major companies and you'll find a new flock of talented young men and women joining those who are nearing 50 years of age, and little in-between. The career prospect of the new graduate is immense. The major oils are not known for lowering standards, so the competition stays intense, but job satisfaction using the latest technologies and team dynamics is there for the taking.

Whether your perspective is that we need to switch to alternative forms of energy today or tomorrow, the exploration and production of hydrocarbons will continue to be an exciting venue for geologists to apply their knowledge and provide research for meeting the needs of people and societies.

Alexander Kulpecz holds a BA (1975) and MSc (1978) in Geology from Rutgers. He has an MBA from Henley Management College (UK) and is working on a Ph.D. at Imperial College (London) on reservoir characterization of deltaics. He was a Senior VP at Royal Dutch Shell, sits on the boards of Petroplus (Europes largest independent refiner) and Scotlands ITI Energy (venture capital for energy research) and is an executive advisor to Candax Energy and Ignis Petroleum.

Alumna profile: Lawra Dodge

Contributed by Gail M. Ashley

Lawra Dodge (B.A. 83) is President and CEO of EXCEL Environmental Resources, Inc. a highly successful company she started in 1994. Based in North Brunswick, EXCEL has 15 employees comprised of a unique team of geologists, environmental scientists, engineers, real estate professionals and support staff. Under Lawra's management, EXCEL has carved out a niche in the highly competitive and dynamic environmental industry. Their forte is innovative problem solving and tackling complex environmental problems with unique solutions. They have a long track record of solving problems that others have said could not be solved. EXCEL is on the cutting-edge of the "Brownfields" regulatory reform and has pioneered successful redevelopment projects for both municipal and commercial clients. Using in-house real estate development capability EXCEL cleverly builds in the cost of clean-up into cost of development in returning contaminated sites to productive use.

After graduation she worked for a company involved in remediation and clean-up including field work in Level A protection (high hazard materials). She then transitioned into projects that included site investigations which then led to her managing major clean-up projects costing up to 100 million dollars. Discouraged by the glass ceiling for women professionals in large environmental/engineering firms she left and became an independent consultant and within a year started her own business. Lawra deftly balances career and family. Her husband is an attorney and they have three children (a daughter in middle school) and 2 ½ year old twins.

Alumni News

Please send alumni news to Ken Miller kgm@rci.rutgers.edu

Rutgers Floods Academia
Several of our graduates are professors and have launched successful careers:
Beth Christensen Adelphi University
Dan Deocampo California State University Sacramento
Cindy Liutkus Appalachian State University
Lindsay McHenry Univ. of Wisconsin-Milwaukee
Steve Pekar Queens College
Harold Connolly was granted tenure at Kingsborough Community College.
Lina Patino was granted tenure at Michigan State and accepted a position as a rotator at NSF

Lesley Patrick was admitted to CUNY doctoral program in Earth and Environmental sciences.

Brenda Ekwurzel (MS 1987; PhD Columbia 1998) is now a climate scientist with the Union of Concerned Scientists in Washington, DC. The Union is a nonprofit group with a core of scientists and engineers that collaborate with colleagues across the country to conduct technical studies on renewable energy options, the impacts of global warming, the risks of genetically engineered crops, and other related topics. They share research results with policymakers, the news media, and the public. Since finishing her Ph.D., Brenda was on the faculty at University of Arizona (Tucson).

A paper by **Stephen F. Pekar**, N. Christie-Blick, K. Miller, and M. Kominz *Quantitative constraints on the origin of stratigraphic architecture at passive continental margins: Oligocene sedimentation in New Jersey, U.S.A.* was selected as

the 2003 Outstanding Paper in the Journal of Sedimentary Research.

John Carey (Ph.D. 1996) is working for Petrel Robertson a consulting firm in Calgary, Alberta, Canada. He is repatriated. After graduating John was a post-doc with Don Swift's modeling group at Old Dominion U. and taught for a few years at University of Texas-Pan American (Edinburgh, TX).

Andrew Rowan (MS, 1988; PhD Environmental Sciences, 2001) is now Director of the New Jersey Office of GIS, which is part of the state's Office of Information Technology. The Office is charged with coordinating the implementation of GIS technologies across all state agencies, oversees large-scale data development projects such as the statewide aerial photography coverage, and also operates the server infrastructure for the state's web-based mapping initiatives (such as NJDEP's IMAP site). After finishing his PhD Andy was Director of The GIS Center at Stony Brook-Millstone Watershed Association, a non-profit organization in Pennington.

Amber B. Granger (B.S., M.S. 2005) has accepted a position as a geologist with Haley and Aldrich in Parsippany.

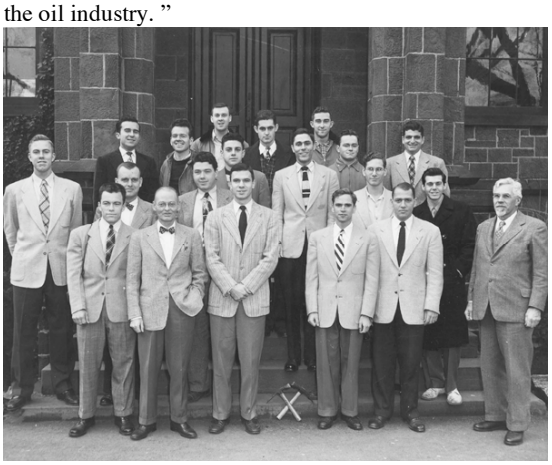
Al Melillo reports: "I was on the RU Geology website the other day and was impressed with the size of the faculty and the breadth of their research…" Al lived in New Orleans working with Chevron and survived Katrina. "We are OK and staying in Millersville, MO with my wife's sister. A neighbor says that a large tree in on our roof, but otherwise house looks OK. Understand that we had hurricane force winds for about 10 hours and storm surge of 8', but I do not believe we flooded. Info is sparse and often contradictory. We are awaiting word from Chevron on what to do next. "

Kenneth E. Kramer reports: "I graduated from Rutgers with a degree in Geology in 1983. I am currently living in Saipan in the Commonwealth of the Northern Mariana Islands working with the USDA-NRCS as a Soil Conservationist for 11 years, now. Before moving out here, I lived in Guatemala and in Gabon with the U.S. Peace Corps and worked as an Environmental Geologist in Pasadena, CA. This area has been in the news lately because of Anatahan, the volcano that has been erupting, since May 2003. Of course, the Marianas Trench isn't very far away, either. The vog reminds me of LA, when I used to live there. Usually, we have the best air on the planet. "

John Anton reports: "It was nice to run into Michael Carr at the Geology Open House in January 2004. The last time I heard him lecture was when I took his Min/Pet III course during my senior year (Class '85). I didn't realize he was such a terrific lecturer until I attended his presentation in January...ha! All kidding aside, his talk was excellent and it is pleasing to know that current and future RU geology students have the opportunity to be trained under his guidance as well as other members of the fine staff. My time is divided between my family and teaching geology and physics courses at Brookdale Community College, environmental consulting, and dinosaur paleontology. I have recently completed a manuscript for a text on dinosaurs which is currently under review by various potential publishers. I am indebted to my former professors at the RU geology department (and Temple U. where I conducted my graduate studies) for the invaluable training received. Best wishes to all."

Wayne Isphording reports: Thanks for the recent copy of the "Redbeds". I read in the issue that you were soliciting funds for the Steven K. Fox Student Fund. Steve was my Ph.D. thesis advisor (1966), having to take over as chair for the last 2 months because of the retirement of Dr. Martens. Both were outstanding individuals and it was an honor to have both on my committee. Since leaving Rutgers in "66 I have been at the University of South Alabama where I am now senior professor in the department and was recognized several year back as the university's Distinguished Professor. I have done an extensive amount of work (environmental chemistry) in Central America and Russia and am currently one of two persons who teach Forensic Geology in the US. I have served as an expert witness on nearly 50 court cases. spanning the gamut form murder, arson, industrial sabotage, etc. I have just completed, and had accepted , a chapter on the Forensic Use of Heavy Minerals (reviewed by R.C. Murray). I was eligible for retirement 5 year ago but, what the heck, it's still fun teaching and I continue to do so and usually teach an overload. I have been asked by the Alabama Geological Survey to write a monograph on the geology, geochemistry, and sedimentology of the Mobile Bay-Mobile Delta System and that should keep me reasonably busy. Hence, I have been active since leaving the "hallowed halls" and look forward to some national meeting that will allow me to pay a long delayed visit to the campus. I see Dick Olsson and R.C. Murray each year at GSA and, occasionally, a former member of the faculty (now at Michigan State), Tom Vogel. I am glad to see that the department has persevered and grown and am proud to say that I am an alumnus Keep up the great work! "

We regret to report the death of **Robert M. Sneider**, RC and GSNB. From the AAPG Explorer "Robert M. Sneider, independent geologist and 2001 recipient of the AAPG Sidney Powers Memorial Award, died Oct. 29, just three weeks after the death of his wife, Ramona. He was 76. Sneider, a New Jersey native, received his bachelor's and master's degrees from Rutgers University and served in the U.S. Army in Korea as a front line combat engineering officer. He returned to the University of Wisconsin and received a doctorate in economic geology and mining engineering, then went to work for Shell Oil after meeting Gustavus E. Archie, who became his friend and mentor over his 17 years at Shell. In 1974 he and a Shell associate formed Sneider and Meckel Associates, and through the 1970s he was involved in projects that resulted in the discovery of over a dozen new fields, including the giant Elmsworth deep basin gas area of western Canada in conjunction with Canadian Hunter Exploration. In 1981 Sneider founded Robert M. Sneider Exploration. His son, John, is a geologist and partner. Two other children are also involved in the oil industry. "



Rutgers Geology Club, 1951. Robert Sneider is first row, second from the right.

2005 Colloquia

Spring semester

Jan. 19 Ying Fan Reinfelder, Rutgers University (Host: Ken Miller) *Modeling terrestrial water cycle: Can we leave out the groundwater?*

Jan. 26 Christopher Sommerfield, University of Delaware (Host: Greg Mountain) *Humans as a Geomorphic Agent in the Hudson and Delaware Estuaries*

Feb. 02 Gisela Winckler, LDEO (Host: Brent Turrin) *Extraterrestrial 3He in marine sediments - a promising tool for paleoceanography*

Feb. 09 Benjamin Horton, University of Pennsylvania (Host: Ken Miller) *The application of diatoms, foraminifera and pollen in sea-level research from active and passive coastal margins*

Feb. 16 Michael Oppenheimer, Princeton University, (Host: Peter Sugarman / Ken Miller) *Global Warming and the Major Ice Sheets: Flood or Trickle?*

Feb. 23 Martin Roy, LDEO (Host: Brent Turrin/Carl Swisher) *Constraints on the regolith hypothesis for the middle Pleistocene transition from the glacial sedimentary record of the north-central U.S.*

Mar. 02 David Jutson, RWEDEA (Host: Alicia Kahn) *Biostratigraphic investigations of the Silverpit Impact Crater, British Sector, North Sea: Evidence towards confirming the age and origin of the structure*

Mar. 09 Baerbel Hoenisch, LDEO (Host: Brent Turrin) *Quantitative pCO2 reconstructions from boron isotopes in planktonic foraminifera*

Mar. 23 Bill Jenkins, WHOI (Host: Brent Turrin) *The subtropical nutrient spiral: how the ocean controls biological productivity on decade-timescales*

Mar. 30 Jennifer Cole, LDEO (Host: Gail Ashley / Brent Turrin) *Direct Dating of Sedimentary Rocks with U-Pb Carbonate Ages*

Apr. 06 Brad Singer, University of Wisconsin-Madison (Host: Carl Swisher / Brent Turrin) *Structural and temporal requirements for geomagnetic field reversal deduced from 40Ar/39Ar dated lava flows*

Apr. 13 Rob Gawthrope, AAPG Distinguished Lecture (Host: Brent Turrin) *Sedimentary Response to Fault Evolution in Rift Basins: Insights from the Golf of Suez, Greece, and the North Sea*

Apr. 20 Terry Plank, Boston University (Host: Mike Carr/Mark Feigenson) *Wet Melting at Subduction Zones*

Apr. 27 Duane Champion, U.S. Geological Survey (Host: Brent Turrin/Dennis Kent) *Dispersion of the Geomagnetic Field*

Fall Semester

Sept. 7 Yuan Gao, Princeton University (Host: Alec Gates) *Mineral dust and its impacts on global biogeochemical cycles*

Sept. 14 Uri ten Brink, USGS Woods Hole (Host: Vadim Levin) *Anisotropy in the Dead Sea Rift*

Sept. 21 Ethan Baxter, Boston University (Host: Carl Swisher) *Partitioning of Noble Gases Between Crustal Minerals: Implications for Geochronology*

Sept. 28 Karl Turekian, Yale University (Host: Paul Falkowski) *Os isotope variations in seawater through the Cenozoic: Relation to tectonics and weathering*

Oct. 5 Rob Rogers, University of Puerto Rico (Host: Mike Carr) *Evolution of the tectonic terranes of northern Central America*

Oct. 5 Special Joint Geological Sciences – IMCS Seminar, Peter Westbroek, University Leiden, Holland (Host: Paul Falkowski)

Oct. 12 Charlie Mandeville, American Museum of Natural History (Host: Mike Carr) *Stable Isotopic and Petrologic Evidence for Open-System Degassing During the Climactic Eruption of Mt. Mazama, Crater Lake, Oregon*

Oct. 26 John Flynn, American Museum of Natural History (Host: Dennis Kent) *Cenozoic Andean paleoenvironments and tectonic history: Evidence from fossil mammals*

Nov. 2 William Ruddiman, University of Virginia (Host: Dennis Kent) *Human Influences on Climate during Recent millennia*

Nov. 9 Ted Moore, University of Michigan (Host: Mimi Katz) *JOI Distinguished Lecturer Series: The Once and Future Warm Earth*

Nov. 16 Ken Miller & Greg Mountain, Rutgers University (Host: Ying Fan Reinfelder) *Phanerozoic global sea-level changes: the next steps*

Nov. 28 Tom Johnson, University of Minnesota (Host: Gail Ashley / Ken Miller) *Paleoclimate Results from the Great Lakes of the East African Rift* Valley: So What?

Nov. 30 Nathan Yee, Rutgers University-Newark (Host: Gail Ashley) *Microbial Biomineralization: Insights from Microscopic, Spectroscopic, and* Genetic Studies

Dec. 14 Roger Hewins, Rutgers University (Host: Mike Carr) *Chemical and isotopic fractionation in the solar nebula*

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 generous have allowed us to leverage University funds to purchase field vehicles for the department, help support the Rutgers field camp, and leverage (at better than 20:1) buying all of the "wonderful toys" (e.g., the 6 mass spectrometers so vital for our research). Just last year, our 1996 van was totaled by an out-of-control driver; we will be replacing this van this year because of your help (again at 5 k$ vs 20 k$ university contribution. We also acquired a new laser ablation ICPMS this past year by leveraging 5 k$ in Development dollars against a >$500,000 machine!

We are also actively seeking contributions to the **Steven K. Fox Student Fund.** This fund was created in Steve's memory specifically to support undergraduate 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 unrestricted fund to specifically support students, including awards for summer field camps, and graduate student field and meeting support. The fund is the lifeblood for helping students. We are delighted to have had a pledge of $5,000 from an anonymous donor this year that made our student support possible. Our goal to convert this fund to an endowed fund once the principal has grown large enough for us to support these activities from the income.

GEOLOGY MUSEUM

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

OPEN HOUSE

Saturday, January 28, 2006
9:00 a.m. to 4:00 p.m.

PRESENTATIONS 123 Scott Hall

10:00 a.m.

EXTINCTION
IN GEOLOGIAL TIME

Dr. George McGhee
Department of Geological Sciences
Rutgers University, New Brunswick, NJ

11:00 a.m.

DIVING ON THE TITANIC:
An adventure to the ultimate shipwreck

David Bright, President
Nautical Research Group, Inc
Flemington, NJ

2:00 p.m.

AFRICAN RIFT VALLEY GREAT LAKES:
A 15 million year journey through Africa's past

Dr. Andrew Cohen
Department of Geosciences
University of Arizona, Tucson, Arizona

3:00 p.m.

BORN AMONG GIANTS:
The surprising story of the
solar system's violent origins

Dr. Jeff J. Hester
Department of Geological Sciences
Arizona State University, Tempi, Arizona

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.

ALL EVENTS FREE **NO REGISTRATION** **PLEASE POST**

Educators who attend Museum presentations can receive credit toward their professional development requirements. The Geology Museum is registered as a Provider with the NJ Department of Education.