



DEPARTMENT OF
GEOSCIENCES
COLLEGE OF EARTH AND
MINERAL SCIENCES

FROM TIM BRALOWER, DEPARTMENT HEAD

Dear Alums:

It has been another busy and productive year in the Department of Geosciences. Speaking of productive, Professor Barry Voight officially retired at the end of June after an illustrious 32-year career in the Department. Barry remains as active as ever with field programs in the Caribbean and Indonesia, several large funded projects and a number of students and post-docs working with him. You can never replace a professor as talented as Barry, but I am happy to announce that Peter La Femina from the University of Miami will arrive on campus in Summer 2006 as an assistant professor and continue Barry's legacy of volcanology, among a number of other interests.

Our professors continue to be recognized for high-quality teaching, research and service. Notable this year are highly prestigious awards to two young faculty members: the GSA Donath (Young Investigator) Medal to Professor Demian Saffer and a Packard Foundation Fellowship in Science and Engineering to Professor Peter Wilf. Saffer was recognized for already making fundamental contributions in an extraordinarily broad range of areas including accretionary prism mechanics, groundwater flow, subduction zone friction, heat transport, and tectonic faulting. Wilf, a paleobiologist with a remarkable record of innovative research on the climatic record of fossil leaves, joins a highly select group of geoscientists who have been Packard fellows, including our own Richard Alley and Sue Brantley. Several senior professors were honored this year with campus awards. Professor Jim Kasting won the prestigious Penn State Faculty Scholars Medal for Outstanding Achievement. Jim's research has led to deep and broad advances in our understanding of planetary habitability and evolution. Professor Rudy Slingerland was honored by EMS with the Wilson Award for Excellence in Teaching for his dedication to superb quality education in the classroom and field. Last, but not least, Professor Mike Arthur won the EMS Wilson Award for Outstanding Service for his long-term, deep commitment to the Department and its programs.

We have an exceptional group of gifted and hard-working students. Our graduate program has grown significantly over the last five years, largely at the PhD level. Both MS and PhD students also have been remarkably successful in winning national awards for their achievements. The list of these excellent students is too long to include here, but we acknowledge them later in this newsletter. We also are extremely proud of the success of our graduates on the job market. Something few people know is that the department ranks seventh nationally in the number of degrees awarded to current tenure track faculty in US universities. The quality of our undergraduate students remains extremely high, and many of them go on to graduate programs around the country. Our faculty are deeply committed to offering an array of field experiences for our undergraduates, and we showcase some of these trips later in the newsletter.

Nationally, the Geosciences workforce is changing significantly with increasing numbers of women and minorities, and I am happy to say that we are participating in this demographic shift. Our own student body is now near 50% female, and in the last year we have made a number of key advances in recruiting minorities into the Geosciences. Professor Tanya Furman was awarded a highly competitive NSF grant to partner with Jackson State University in Mississippi and Penn State Delaware County to build integrated educational and research programs. Professor Andy Nyblade also received a major NSF award to collaborate with North Carolina A&T in developing research programs with University of the Witwatersrand and a number of other African universities.

On behalf of the faculty, staff and students, please keep in touch with any news.

With best wishes,

FROM THE DEAN'S DESK



The beginning of 2005 marked the completion of a new strategic plan for the College of Earth and Mineral Sciences. The College continues to focus on its “theme” of providing the breadth and depth of a powerful research university with the sense of community and commitment to teaching of a small liberal arts college. The plan has three overall objectives: (1) to create the most student-centered college in Penn State history, (2) to develop a diversity and climate that will empower future generations of scholars, and (3) to advance the capabilities and reputations of the College’s departments and institutes.

Dean, Eric J. Barron

The College has made great strides in each of these three objectives, but these goals are far from simple. There must be tangible steps to bring what appear to be lofty goals into reality. Our commitments to innovation and excellence must be enduring if we are to be truly successful. Our response to these challenges is exactly what makes the EMS and the Geosciences strategic plans so interesting. Our “student-centered” plan of action is full of rich examples of how we can provide opportunities and experiences for our students. EMS proposes to develop a unique scholars program that isn’t just based on classroom performance but also promotes experiences such as international study, internships, undergraduate research, service learning, informal education, student leadership, and on-line learning. Students who actively participate in a wealth of experiences and in fact are eager for opportunity are likely to be the best employees no matter what sector of the workforce. Our efforts to promote diversity and an enabling climate have shown real signs of success over the last several years. But, in stepping back to examine our efforts, the College has realized that every department is now highly involved in programs designed to promote interest in our disciplines that start with pre-high school children, extend to junior and senior high schools, involve college-bound seniors, and actively work to attract outstanding students into graduate school. So, what emerges from our Strategic Plan is a consistent, cohesive, and continuing EMS pipeline program that represents a powerful commitment to recruiting a diverse student body. The goals that are focused on strengthening our research programs are equally exciting. EMS is proposing to take steps toward creating “the energy university” at Penn State. The College is examining an extensive renovation project to create the space for an educational and research initiative in Geohazards, Geomechanics, and Geofluids as a major effort to link faculty from the Department of Geosciences with the Department of Energy and Geo-Environmental Engineering. AESEDA (the Alliance for Earth Science, Engineering, and Development in Africa) is chalking up one success after another with the funding of AfricaArray, a major NSF human capacity-building proposal, and growing funding from industry.

I have cited only a few examples. Please take a look at the full strategic plan on the EMS homepage (<http://www.ems.psu.edu>). It is a clear statement that the College is truly looking to the future. It is equally clear that we see the future as one that is multi-dimensional and embodies the integration of every element of the University’s mission in teaching, research and service.

NEW RESEARCH AND TEACHING PROGRAMS

New Center for Environmental Kinetics Analysis

The National Science Foundation (NSF) has awarded a team of Penn State scientists \$6.7 million to create the Center for Environmental Kinetics Analysis (CEKA). The CEKA team will be managed by Susan L. Brantley, Director of the Earth and Environmental Systems Institute in Penn State's College of Earth and Mineral Sciences, and James Kubicki, Associate Professor in the Department of Geosciences. An additional \$2.5 million from the Department of Energy (DOE) Office of Science, Division of Environmental Remediation Sciences will support collaboration with DOE geochemists. Brantley and her team received the award from NSF's Division of Chemistry and Earth Sciences under their Environmental Molecular Science Institute (EMSI) program. More information on the program, including application procedures for students, can be found at <http://www.ceka.psu.edu> or by contacting ceka@psu.edu

The Center for Remote Sensing of Ice Sheets — or CReSIS — received \$19 million from the National Science Foundation's Science and Technology Program. CReSIS is a multidisciplinary, multi-institution research center led by the University of Kansas, with Penn State, Elizabeth City (N.C.) State University, Haskell Indian Nations University, Ohio State University and the University of Maine as core partners. Sridhar Anandakrishnan, Associate Professor of Geosciences and the Earth and Environmental Sciences Institute is the Associate Director for Science of the center. Evan Pugh Professor Richard Alley and Research Prof. David Pollard are also members of the center. Researchers believe sea level rise associated with melting of polar ice sheets could affect more than 100 million people and decimate coastal areas — some of the most expensive property in the world. Using a multidisciplinary approach, CReSIS will work to create new technologies for studying polar ice and new means of interpreting the data. The effort will center on remote sensing and integrate expertise in electrical engineering, information technology, aerospace engineering, glaciology, and geophysics.

NSF awarded \$900,872 for Dr. Tanya Furman's project **Building and Maintaining a Pipeline for Diversity**. This four-year program builds upon the strengths and successes of a pilot project funded by OEDG in 2002. The partnership between The Pennsylvania State University and Jackson State University, with collaborative support from SECME, Inc., Upward Bound Math and Science, and the SROP summer internship program, provides longitudinal opportunities, training, mentoring and support for students and faculty members from underrepresented groups to achieve success in the Geosciences. Integrated programs conducted in Pennsylvania and Mississippi are combined in a robust approach to recruitment and retention of students of color. Through this program, Jackson State will become the first historically black institution to have a Department of Geosciences. New undergraduate courses focused on African geology and resources, and developed with the John A. Dutton e-Education Institute, will be available at Jackson State, Penn State and other institutions. This program dovetails with Furman's work in AESEDA, where she is serving as Acting Director for the 2005-2006 academic year.

AFRICAARRAY

AN INITIATIVE TO PROMOTE COUPLED TRAINING AND RESEARCH PROGRAMS FOR BUILDING AND MAINTAINING A SCIENTIFIC WORKFORCE FOR AFRICA'S NATURAL RESOURCE SECTOR

AfricaArray is a long-term (20 years) initiative to promote, in the full spirit of NEPAD (New Partnership for Africa's Development), coupled training and research programs for building and maintaining a scientific workforce for Africa's natural resource sector. Africa's natural resource sector (petroleum, minerals, and water, in particular) is a major driving force for economic development. Africa is a primary source of strategic and base metals for the world market. Petroleum production from sub-Saharan African countries alone may provide 25% of U.S. oil imports by 2015. Water resources are needed for supporting sustainable livelihoods throughout the continent, and in some countries geothermal reservoirs provide an important energy source.

The name "*AfricaArray*" refers to an *array* of shared training programs, an *array* of shared scientific observatories, scientists across the continent working on an *array* of shared projects, and above all, a shared vision that Africa will retain capacity in an *array* of scientific fields vital to the development of its natural resource sector.

Initially, *AfricaArray* will focus on geophysics to:

- Maintain and develop further geophysical training programs in Africa, in response to industry, government and university needs.
- Promote geophysical research in Africa, and establish an Africa-to-Africa research support system.
- Obtain geophysical data, through a network of shared observatories, to effectively study scientific targets of economic and societal interest, as well as fundamental geological processes shaping the African continent.

For more information, visit <http://africaarray.psu.edu/> or contact Dr. Andrew Nyblade, email: andy@geosc.psu.edu

NEW UNDERGRADUATE MAJOR OFFERED IN GEOSCIENCES



Undergraduate students boating on Green Lake in New York State. Collecting specimens will help them to better understand the geobiology of the lake.

In Summer 2005 we launched our newest degree program—the Geobiology Bachelor of Science.

Geobiology is the interdisciplinary study of the Earth and its biosphere. It embraces the history of life and its interactions with the earth over geologic time; it also includes study of interactions between living organisms and physical and chemical processes in the modern environment on Earth, and possibly elsewhere in the universe. Thus, geobiology encompasses the fields of paleobiology and paleontology, biogeochemistry, geomicrobiology and astrobiology.

The degree program provides students with a strong background in general science and especially in Geosciences and Biology, with core selections from both disciplines. Geobiology is critical to the study of environmental quality, global change and environmental-human health interactions, all of which have profound importance in legal, economic and policy arenas. For more information, visit www.geosc.psu.edu/undergrads/degrees/geobi.htm

New research results published in *Science* by Professor Charles Ammon yield important clues on the dynamics of the Great Sumatran Earthquake of December 26th, 2004

The earthquake that generated the Sumatran-Andaman Islands tsunami caused massive devastation, but exactly what happened beneath the ocean is the focus of modeling activities by an international team of geoscientists.

"The earthquake rupture ran a distance equivalent to the distance from Jacksonville, Fla. to Boston, Mass.," says Charles J. Ammon, Associate Professor of Geosciences at Penn State. "This earthquake lasted just under 10 minutes, while most large earthquakes take only a few seconds and movement probably continued past that which we can determine from seismic information."

Ammon and his colleagues looked at what happened during the Sumatra-Andaman Earthquake on Dec. 26, 2004 and the subsequent earthquake on March 28, 2005, using a variety of models. "We were trying to map out spatially and temporally what was going on," he adds. "The last earthquake in this size range happened more than forty years ago. This is the first time these models could be constructed for such a large earthquakes."

Previous earthquakes in the range of the Sumatra-Andaman great earthquake occurred in Kamchatka, Russia in 1952; the Aleutians in 1957; southern Chile in 1960, and Prince William Sound, Alaska in 1964, long before current computational methods for modeling earthquakes were possible. Also, during the earlier large earthquakes, groups such as the Incorporated Research Institutes for Seismology, a National Science Foundation-supported group, and the Federation of Digital Broadband Seismographic Networks, an international group, did not exist. These two

groups provided the global seismological data that made the models possible. The researchers report in a special section of today's (May 20) issue of *Science* that "the 25 December 2004 Sumatra-Andaman and the 28 March 2005 earthquakes produced the most extensive high-quality broadband seismic data ever recorded for great earthquakes."

Great earthquakes usually occur along subduction zones and the Sumatra-Andaman earthquake was no exception. Subduction occurs when one of the Earth's tectonic plates slides beneath another of the Earth's plates. In this case the eastern edge of the Indo-Australian plate is sliding beneath the western edge of the southeastern Eurasian plate.

The researchers found that the earthquake originated and was strongest just north and west of the island of Sumatra, Indonesia and decreased in strength as it ruptured north to the Nicobar and Andaman Islands, India in the Bay of Bengal. "The earthquake in Dec. 2004 started slowly with relatively little slip in the first minute," says Ammon. "After 40 to 60 seconds, there was a large amount of energy released."

Usually, this subduction fault stays locked between earthquakes, but away from the fault, the plates move at a rate of 1.5 to 2 inches a year. Pressure builds up at the fault over the years until, during an earthquake, they abruptly slip past each other, one going downward and the other moving upward. This creates not only horizontal, but vertical movement during an earthquake. In some places, the Sumatra-Andaman earthquake moved nearly 50 feet in a combination of horizontal and vertical motion.

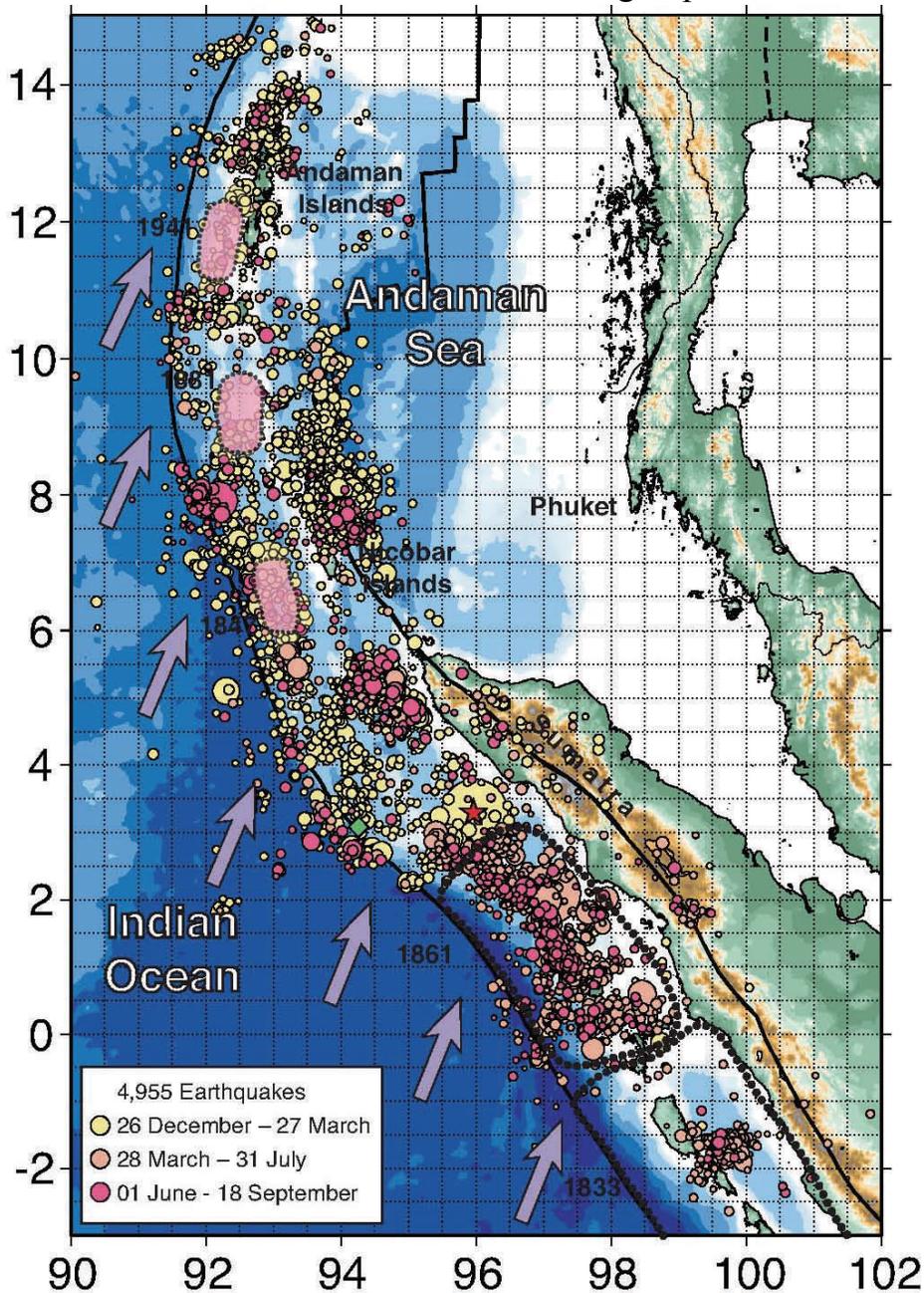
The researchers used different approaches and different data sets to create their models. Their goal was to map

out the rupture history and variation along the fault. Ammon created a 1-dimensional model using seismic surface wave data, an Oxford University team created a 2-dimensional model using seismic body wave data and California Institute of Technology and URS Corporation used different combinations of body and surface waves for their models. The models showed that the length of the first earthquake was about 960 miles, began just northwest of Sumatra and moved through the Nicobar Islands to the Andaman Islands decreasing in intensity. Fault movement from this earthquake was nearly all north of the epicenter. The largest slip, that of about 50 feet, occurred just off Sumatra. The models also showed that the March 2005 earthquake began south of the first earthquake and was much shorter in both time and space. These are the largest two earthquakes recorded on modern equipment.

The models suggest a speed of one to two miles per second for the speed at which the earthquake expanded northward. The models also suggest that the fault continued to move, albeit much more slowly long after the seismic signals from the earthquake became too slow to record. "We were lucky to have lots of data to use for our models," says Ammon. "We had a very broad range of frequencies available from which to draw our data."

(see image on following page)

Ammon Science article graphic

Fisher Serves as Top Scientist on Tsunami: Ground Zero Project

Tsunami: Ground Zero will follow a group of top scientists as they embark on a mission to discover exactly what caused last year's tsunami and to determine how future catastrophes can be predicted and the tragic loss of life can be prevented. Darlow Smithsonian Productions has assembled the world's foremost scientific authorities in a truly international project, including seismologists, geophysicists, biologists, oceanologist and computer modellers, who will spend 18 days aboard the MV Performer, a purpose built deep-water research ship in the Indian Ocean. The project is being filmed exclusively for a BBC, Discovery and ProSieben documentary. Don Fisher, Professor of Geosciences, will lead the Tectonics and Seismology Team, whose mission is to interpret the seafloor displacements as input to an earthquake model that will provide better hindcasting of the overall seafloor displacements. His team includes Dr. Yang Shen from the University Rhode Island and Tim Masterlark from Science Applications International Corporation, SAIC.

NEW FACES DEPARTMENT WELCOMES NEW FACULTY



Dr. Kamini Singha

My research interests are motivated by problems in hydrogeology, and focus on the integration

of geophysical techniques into hydrogeologic studies. I investigate the links between the spatially exhaustive geophysical parameters we measure in the field to the chemical, physical, and biological properties and processes we're interested in better understanding. I collect geophysical and hydrologic field and laboratory data, and work to quantify the links between these data through numerical modeling.

I received my B.Sc. in Geophysics from the University of Connecticut, and my Ph.D. in Hydrogeology from Stanford University. I also worked at the USGS Branch of Geophysics for three years, largely on problems associated with fluid flow in fractured rock. My current research projects deal with under-

standing the effect of spatially variable sensitivity of geophysical methods in estimating hydrogeologic parameters of interest, such as water content or contaminant concentration, and the processes that change these parameters through time. I'm working on developing electrical and radar tomography methods, in specific, to help us understand processes associated with fluid flow and contaminant transport, aquifer storage and recovery, and bioremediation in shallow aquifers.

Besides hydrogeophysics, I enjoy cycling, rock and ice climbing, and yoga.



Dr. Marueen Feineman

I was born in Denver, Colorado and spent my early childhood in Ohio before moving to Pennsylvania at age 9. Spending my teenage years along the banks of the Delaware River was what first interested me in geology.

I received my B.A. in Earth and Planetary Science from Johns

Hopkins University in 1995. In 1996, I spent several months as a volunteer for the U.S. Geological Survey at the Hawaiian Volcano Observatory mapping and sampling active lava flows on Kilauea, which is where my love of igneous petrology was born. After two years as an environmental consultant in Emeryville, CA, I entered what was then the Department of Geology and Geophysics (later renamed Earth and Planetary Science) at U.C. Berkeley in 1998. A few years later I became a Student Employee Graduate Research Fellow at Lawrence Livermore National Laboratory, working jointly between U.C. Berkeley and LLNL, earning my PhD from Berkeley in 2004.

My research combines geochemistry, igneous petrology, and metamorphic petrology to understand the inner workings of subduction zones. Since

leaving Berkeley last year, I have been a post-doctoral research fellow at the Institute for Study of the Earth's Interior, Okayama University at Misasa, Japan, where I am using major element, trace element, and isotope geochemistry to understand the formation of Daisen Volcano. Daisen is located in the Southwest Japan Arc, about 1/2 hour from my house. Southwest Japan is a famously "hot" subduction zone, and Daisen has previously been presented as an example of a volcano generated by melting of the subducting slab. My current work focuses on testing the validity of this theory.

When I'm not in the lab, my interests include hiking, climbing, yoga, movies, reading fiction, photography, wine, and cooking. I am very much looking forward to rejoining my soon-to-be husband, Matt, and our dog Nugget in the U.S. this fall.

GSA HONORS DICK PARIZEK



Dr. Richard Parizek

These photos are from a special dinner party held in honor of Richard Parizek during the 2004 GSA Meeting

Photos on this page are provided courtesy of Lennie Konikow



BARRY VOIGHT RETIRES

In June 2005, Barry Voight rounded-out over four decades of teaching, research and service at Penn State. He joined the then Department of Geology in 1964 immediately after completing his Ph.D. at Columbia. Interspersed with enriching professorships at TU Delft, at the University of Toronto, at MacQuarrie University, and at UCSB, he has thrived here ever-since.

His initial interests were in structural geology, engineering geology, and rock mechanics, but with a burgeoning interest in the science of rockslides and avalanches. His edited two-volume (1970) set under the same moniker is a classic text, firmly established him as a doyenne of mass movement, and led to a series of early appointments on topical National Research Council committees.

Two focal threads of scientific curiosity – an avowed interest in rockslides, and a focus on stress measurement consummated at divergent plate boundaries (Iceland) – ultimately converged to result in an early career-realignment; that to wholesale volcanology. The particular flavor of this interest was one that married an improved scientific understanding of volcanic processes with a then desperate need for improved hazard management.

This career realignment was spurred in part by the exploits of an uncle who had island-hopped in a B-17 in the Pacific theater – providing a visceral connection with Mayon and Galunggung, Lamington and Rabaul – names which would otherwise remain as mere locations on the map.

This growing interest was given further momentum by the cataclysmic eruption at Mt St Helens, in

May 1980 – for many, Barry's name is synonymously linked with this event – and a number of classic publications resulted. The most significant of these ultimately garnered the George Stephenson Research Medal from the Institution of Civil Engineers (London), and was the ground work for elected fellowship to GSA and his receipt of the GSA's Jahns Distinguished lecture-ship for 1992. This notoriety is the subject of a cameo in Dick Thompson's book *Volcano Cowboys*, depicting Barry's brusque, but scientifically on-the-mark, introduction to the pre-eruptive monitoring efforts of the fully-primed Mt. St Helens.

His activities surrounding the destructive lateral blast of Mt St Helens propelled a realigned interest in the physics of geologic materials, now applied to quantifying the hazards of volcanoes. Attached to the USGS Volcano Hazards Response Team for the last 25 years, he has provided service in science and hazard assessments at a broad list of volcanoes and related crises. These include Mt St Helens both pre- and post-May 18 1980, at other Cascade volcanoes, at Mts. Sanford and Redoubt (Alaska), at Nevado del Ruiz, Galeras, and Nevado del Huila (Colombia), at Cotopaxi (Ecuador), at Merapi (Indonesia), Pinatubo (Philippines), Popocateptl (Mexico), and most recently, a long-term engagement with Montserrat, WI. Other activities have included Bezymianny and Sheveluch in Kamchatka, Semeru and Merapi in Indonesia, and Etna and Stromboli in Italy. And for these services he has received the gratitude of many, and in some cases, as in the instance of Legaspi (a Philippines city

threatened by a volcano) he has received the "keys to the city."

These assignments provided intellectual foci which ultimately resulted in an important empirical method of generalizing rate-to-failure effects in materials and geo-materials in general, and to eruption forecasting in particular. These contributions provided a practical method to fit observational data to a time-to-failure – as a method for improved early warning and evacuation. For this achievement he was a recipient of the *EMS Wilson Research Award (1990)* and the *PSU Faculty Scholar Medal for Outstanding Achievement in Research and Engineering (1992)*, with a second award from the *US National Research Council (1990)* to keep his *1984 NRC Award company*.

These scientific activities were interspersed with practical management of both potential and actual disasters. The eruption of Nevado del Ruiz in Colombia in 1986, and the resulting snowmelt-triggered lahar which engulfed the town of Armero with catastrophic consequences, resulted in an important retrospection of the vagaries of hazard management. The resulting publication of "*Countdown to Catastrophe*" is a classic work which draws parallels with Albert Camus' allegorical *La Peste*, also highlighting the breadth of his eclectic literary interests.

In the mid-1990's, the resurgence of volcanic activity at the Soufrière Hills volcano on the Caribbean island of Montserrat provided a renewed focus – this time closer to home. This early human crisis, and the long-term ramification of the contributing science has been his secondary mistress of the past decade – MaryAnne is the enduring-first.

Here he has made important contributions in observational volcanology, especially through the hazardous installation of precision geodetic instruments close-in to the volcano summit. These instruments have yielded important data on the cyclic processes – in timeframes of hours to months – which had heretofore remained unobserved. Interpretations of these geodetic data, and the underlying processes they expose remain at the forefront of contemporary advances in physical volcanology.

These studies have resulted in multiple contributions to *Science and Nature*, and to an edited special volume of *Geophysical Research Letters* (1998) on the science behind the crisis, and in multiple contributions to the Geological Society (London) *Memoir* on the same.

His most recent immersion in this has been the CALIPSO project, for which he is the director and *force majeure*. This network of four precision strainmeter, tiltmeter, seismic and continuous GPS stations, installed around Soufrière Hills volcano, has captured important process-defining data – and continues to do so. The array serves as the first prototype of NSF's evolving Plate Boundary Observatory being installed in the western United States.

Few faculty can surpass the salubrious distinctions accorded Barry – whether it is having a student in a sleeping bag dragged-off by a grizzly bear in field camp (urban myth or urban truth?), turning up with a soused John Ramsay ready to perform in front of a temperate administration, or as the originator of the children's show – *Where in the World is Our Esteemed Professor* (recast by the producers as*Carmen Sandiego*).



Barry Voight and Discovery Channel film crew, the devastated city of Plymouth, Montserrat, WI, May 2002

This refrain has echoed the halls from countless generations of students – vainly seeking their instructor. In this he embodies the phenotype of the absent-minded professor – but this is merely an aberration, as the underlying distraction is an abject devotion to curiosity-driven science – a preoccupation which has permeated his scientific life.

Apart from his science, his humanity is best evidenced in the importance of family, friends, and associates, in his life. Working in an innately dangerous field, this has included the untimely death of colleagues such as Harry Glicken who died on Unzen – and for whom Barry championed and produced a memorial volume of *JVGR*. At home, he and MaryAnne have been consummate bon-vivants, and countless students and colleagues, visitors and friends, have benefited from the warm embrace of their home.

A consummate reader, he is well read, has a particular interest in biographies of Churchill, and a penchant for corresponding with colleagues in idiomatically-perfect French. His keen sense of history is epitomized by the survival of Rob Scholten's line drawings on the chalkboard in his office, throughout his multi-decade occupancy. The mess of his office is legendary. Students have been rumored to have been lost, without trace, in the morass of papers, book, and rock samples which populate the space. Surprisingly, such a filing system works well for him - he is able to quickly and precisely recall the locations of items filed many years previously.

So, as you consider the many accolades afforded him over his continuing career, raise a Carib in one hand, and a tea punch in the other, and join me in toasting Barry's current triumphs, and in anticipating his many future successes.

Contributed by Derek Elsworth

FACULTY HONORS AND AWARDS

James F. Kasting, Distinguished Professor of Geosciences was recently selected as a **Penn State Faculty Scholar Medal Award Winner**. Dr. Kasting's deep and broad contributions to the understanding of planetary habitability and evolution, through research, teaching and service, made him extremely worthy of this great honor. The award is given in recognition of scholarly or creative excellence represented by a single contribution or a series of contributions around a coherent theme. Kasting was nominated for his research focus on the "faint young sun" paradox in the area of physical science. Models of solar evolution suggest a major increase in energy reaching Earth over our history, yet geological evidence indicates liquid water throughout, with near-misses at the "snowball Earth" intervals.

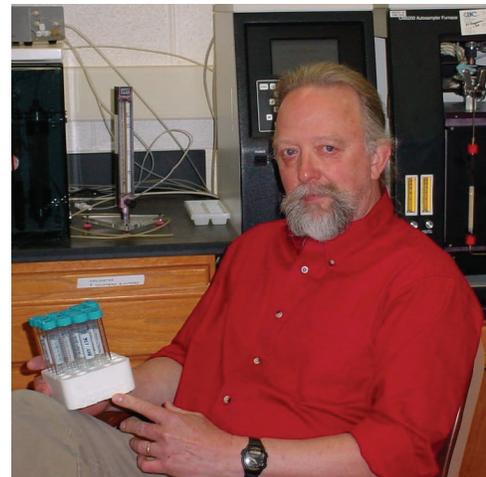


Saffer Named GSA Young Investigator Award Recipient

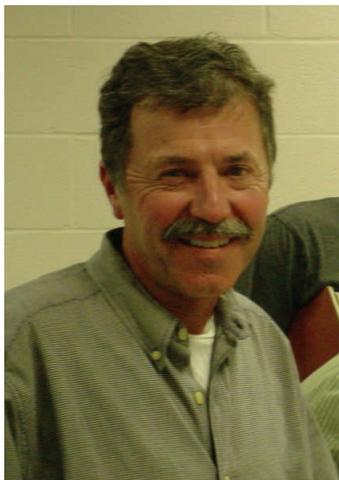
Demian Saffer, Assistant Professor in the Department of Geosciences, was named the recipient of The Donath Medal, the Geological Society of America's Young Investigator Award. This young scientist award was established in 1988 to be awarded to a young scientist for outstanding achievement in contributing to geologic knowledge through original research that marks a major advance in the earth sciences.

Wilson Award for Outstanding Service

Michael Arthur, Professor of Geosciences possesses a track record of extensive service to the College rooted in profound loyalty and dedication to the success of its programs. As Department Head of Geosciences from 1991-1997, Arthur dedicated himself entirely to the Department, and his leadership was instrumental in the new levels of excellence and success attained by the faculty and students. He initiated a significant transformation in the department resulting in programs with international reputations in geophysics, organic geochemistry, and paleobiology. Arthur has a well-deserved reputation as a caring and compassionate leader who is always willing to take on new responsibilities that serve his department.



FACULTY HONORS AND AWARDS



Wilson Award for Excellence in Teaching

Rudy L. Slingerland, Professor of Geosciences, exemplifies a high standard of teaching in the Department of Geosciences. Slingerland's lectures are skillfully focused and precise, while incorporating useful anecdotes and analogies that bring the lessons into better light. He explains the development of theories, provides rich examples of experiments, and shows comparisons to field observations in a manner highly parallel to a good research method. He reflects the knowledge and organization of thought that comes with writing a book on the subject, yet he ventures into relevant, interesting, and obscure discussions on the philosophy and history of the science. His engaging style extends beyond the normal classroom. Slingerland always places the technical details of learning into useful content. He exemplifies a higher standard of teaching through his unconditional willingness to interact with students.

Faculty Mentoring Award in Earth & Mineral Sciences

Lee Kump, Professor of Geosciences was recognized for his enthusiasm and dedication to both the personal and professional development of students. His abilities as a scientific advisor make him an invaluable contributor to the mentoring of students in Geosciences.



Gladys Snyder Education Grants

Kevin Furlong, Professor of Geosciences, received recognition for his project "Active learning in large enrollment classes: Learning modules that work."

STUDENT AWARDS AND HONORS

Please join us in recognizing the outstanding achievements of the following students.

37th Annual Graduate Student Symposium



Shawn Goldman, Co-First Prize Award
Oral Presentation by a PhD Student
(Post-Comprehensive Exam)

Courtney Turich, Co-First Prize
Award, Oral Presentation by a PhD
Student (Post-Comprehensive Exam)



Anthony Riccardi, First Prize Award
Oral Presentation by a PhD Student
(Pre-Comprehensive Exam)



Courtney Johnson, First Prize Award
Oral Presentation by a MS Student



Joe Razzano, First Prize Award
Petroleum Industry Related Oral
Presentation

Tsubasa Otake, First Prize Award
Poster Presentation



Nate Harkins, Co-Second Prize
Oral Presentation by a PhD Student
(Pre-Comprehensive Exam)



Chris Junium, Co-Second Prize Award
Oral Presentation by a PhD Student
(Pre-Comprehensive Exam), and Third Prize
Award, Poster Presentation



Andrew Rathbun, Second Prize Award
Oral Presentation by a MS Student

Derek Sawyer, Second Prize Award
Petroleum Industry Related Oral
Presentation



Minoo Kosarian, Co-Second Prize
Award, Poster Presentation



Winchelle Ian Sevilla, Co-Second Prize
Award, Poster Presentation

Other Noteworthy Recognitions

American Geophysical Union Outstanding Student Paper Award: **Alexis K. Navarre and Tye J. Numelin**

EPA STAR Fellowship: **Bryn Kimball**

University Graduate Exhibition, 2nd Place Physical Sciences & Mathematics: **Daniel R. Hummer**

Richard R. Parizek Graduate Fellowship: **Tyrone O. Rooney**

(Continued on following page)

STUDENT AWARDS CONTINUED

Society of Sedimentary Geology International Fluvial Conference, Best Student Paper: **Doug Edmonds**

NASA Earth System Science Graduate Student Fellowship: **Nate Harkins**

Bunton-Waller Graduate Award: **Kristen D. Morell**

University Graduate Fellowship: **Audrey L. Hucks**

Anne C. Wilson Graduate Student Research Award: **Audrey Hucks, Jessica Jewell, Matthew J. O'Donnell**

EMS Centennial Graduate Research Award: **Maggie Benoit**

Marathon Alumni Centennial Graduate Fellowship: **Doug Edmonds, Audrey Hucks, Joseph Razzano III, Heather Savage**

Arnulf I. Muan Graduate Fellowship: **Elizabeth M. Hausrath, James J. Moran**

NSF Graduate Research Fellowship: **Heather Buss, Patrick Gorman, Elizabeth Hausrath**

ExxonMobil Fellowship: **Leo E. Peters**

Fulbright New Zealand Graduate Student Award: **Huw J. Horgan**

Edward H. Krauss Crystallographic Research Award: **Christina L. Lopano**

Undergraduate Student Awards

The Robert F. Schmalz Award in the Department of Geosciences: **Melissa Pardi**

The James and Nancy Hedberg Scholarship in Geosciences: **Robert Hegemann, William Koch**

The Joseph Berg Award for Undergraduate Research in Geosciences: **Todd Engelder, Jacob McCartney**

The Ronald A. Landon Endowment in Hydrogeology: **Matthew Rogers, Kimberly Kline**

The Barton P. Cahir Award Endowment in Earth and Mineral Sciences: **Jeff Creamer**

The Arthur P. Honess Memorial Fund: **Jeff Creamer, Laurie Eccles, Katherine Hinkel**

The Benjamin F. Howell, Jr. Award in Geosciences: **Neil Stapley**

The Frank Dachille Memorial Award in Geochemistry: **Theresa Menotti**

The Chevron Texaco Undergraduate Diversity Scholarship: **Monty Beharry, Ku Rafidah Ku Shafie**

17 students participating in the Summer 2005 Geosciences Field School program received awards from the following funds:

**Thomas F. Bates Undergraduate Research Enhancement Fund,
David P. Duff Gold Undergraduate Scholarship Fund in Geosciences,
Kappmeyer-Isaacs Field Camp Award,
Earl S. Lenker Fund for Field Studies in Geosciences,
Edwin L. Drake Memorial Scholarship,
David M. Demshur Undergraduate Research Endowment in Geosciences,
Reif Undergraduate Summer Field Camp Endowment.**

We appreciate the generosity of the many contributors who make these funds possible.

GRADUATE STUDENT RESEARCH



Significant temperature fluctuations, moderate floral turnover, and several large mammalian turnover events occurred during the late Paleocene and early Eocene (56.5 – 52.5 Ma). However, plant-insect interactions, a dominant feature of terrestrial ecosystems, are not well-known during this interval. Fossil angiosperm leaves preserve insect feeding damage and

can therefore be used to study changes in insect herbivory.

The primary objective of my Ph.D. thesis research is to document changes in insect herbivory through the late Paleocene and early Eocene in Wyoming's Bighorn Basin, with the aim of understanding the principal factors that caused the observed variations. Modern and paleontological studies indicate that temperature, precipitation, leaf nutrient content, floral diversity, and the Cretaceous-Tertiary extinction can influence insect herbivores.

I am currently conduct-

ing insect damage censuses at seven fossil leaf localities in the Bighorn Basin. At each fossil locality, I count one thousand angiosperm leaves and characterize the insect damage on each leaf. Insect damage is first divided into four functional feeding groups: external foliage feeding, galling, mining, and piercing and sucking. These groups are then further subdivided into more than 90 discrete morphologies of damage, which have been described by Dr. Peter Wilf, my advisor, and Dr. Conrad Labandeira, a Smithsonian paleo-entomologist who is also on my committee. I will then use a variety of proxies to estimate paleo-

temperature, precipitation, and nutrient levels.

These sites span four major climate changes that occurred during the early Paleogene: a gradual warming during the last two million years of the Paleocene; an abrupt temperature increase at the start of the Eocene (the Paleocene-Eocene Thermal Maximum or PETM); an early Eocene cool period; and a rapid warming to maximum Cenozoic temperatures 53 Ma. I am particularly interested in the impact of the PETM on insect herbivores because this warming event provides a model for modern-day global warming.

Contributed by Ellen Currano

UNDERGRADUATE STUDENT RESEARCH

Living in Africa for five years and SCUBA diving among coral reefs for seven years have contributed to a genuine interest in my senior thesis: "The Impact of Saharan Dust on Coral Reefs in San Salvador, Bahamas." Saharan dust originates from tiny sand particles crushing against each other as wind blows over the crest of massive sand dunes in various deserts in Africa. The tiny particle sizes that result allow the dust to become airborne where it can then travel thousands of miles through large storm systems across the Atlantic Ocean before depositing

on islands such as San Salvador, Bahamas.

By collecting core samples from *Montastrea annularis* coral in San Salvador, I predict that the coral bands contain a record of increasing dust fluxes from the Sahara to the Bahamas, and that the growth rates of corals have diminished in the Bahamas over the last several decades due to various anthropogenic effects. In order to test this hypothesis, my thesis advisor Dr. Lee Kump and I constructed a plan to drill 2-cm diameter core samples of *Montastrea annularis* coral located among various patch reefs around San Salvador. With the

help of Lisa Greer, professor of marine geology at Washington and Lee University, we created a coring device consisting of a hand-held pneumatic drill, a custom-made diamond-studded 40-cm long drill core and bit, and a SCUBA diving compressed air tank. Managing this equipment and drilling underwater proved to be a challenging and exhausting experience; however, the result – five 30-cm to 40-cm long core samples containing 40 to 70 years worth of data – was rewarding. Digital x-radiographs of the core samples show promising

data that can assist with further analysis in determining elemental concentrations (specifically magnesium, iron, and strontium), oxygen isotope values, and calcification rates to determine the overall impact of Saharan dust on coral reefs.

Contributed by Lauren Koelmel



Dr. Lee Kump & Lauren Koelmel patching the core they drilled from the *Montastrea annularis* coral

ALUMNI NEWS

Hellers give \$300,000 to the GeoSystems Initiative

Doug and Ellen Heller have generously supported the Petroleum GeoSystems Initiative with a \$300,000 gift. “The oil and gas industry offers some of the most exciting and diverse career opportunities for geoscientists and engineers” says Heller. “I’m excited that Penn State is pursuing innovative approaches to train future leaders for this industry and I want to help strengthen that effort.” Doug earned his B.S. in Geosciences at Penn State in 1979. He is a partner in Heller, Hickox & Company, a private equity firm that specializes in making oil and gas equity investments involving recapitalizations, restructurings, bankruptcy plans and turn arounds.



Doug Heller

Peter Flemings, co-director of the Initiative, states “Doug and Ellen’s generous gift has already made a big impact: our students are eagerly mapping on new Linux hardware. His endowment contribution will help us in the years ahead.” \$250,000 was placed in the Doug and Ellen Heller Endowment. A cash gift of \$25,000 was used to upgrade the software and hardware used by the Initiative and \$25,000 will be used as a challenge match for new innovative research directions in the oil and gas industry.

The GeoSystems Initiative is an interdisciplinary Master's Degree program that links the Department of Energy and GeoEnvironmental Engineering (Petroleum and Natural Gas Engineering Section), the Department of Geosciences, and corporate partners. The Initiative recognizes that many fundamental research problems lie at the interface of Geosciences and Petroleum Engineering and that interdisciplinary scientists trained in problem-based collaborative research will be tomorrow's industry leaders. Further information on the GeoSystems Initiative can be found at: <http://hydro.geosc.psu.edu/Geosystems/geosystems.html>.

Robert L. Folk ('46, '50, '52 Geosciences) is the 2005 Hosler Award recipient for the College of Earth and Mineral Sciences (EMS) at The Pennsylvania State University. Dr. Folk is the J. Nelle Gregory Emeritus Professor of Sedimentary Geology at the University of Texas, Austin. After receiving his B.S., M.S., and Ph.D. in Geosciences from Penn State, he began his professional career by taking a position at Gulf Oil Company. By 1952, he was back in an academic setting and accepted a position at the University of Texas. His research includes, but is not limited to, carbonate, sandstone, and chert petrology, and the study of sedimentary textures and the existence of nannobacteria. He has published 85 papers, numerous abstracts, and the book *Petrology of Sedimentary Rocks*. Dr. Folk has been lauded as an outstanding speaker and teacher. Among his awards is the Geology Foundation Outstanding Teaching Award from the University of Texas, Mr. & Mrs. G. Moses Knebel Distinguished Teaching Award, and Sorby and Penrose Medals. He was selected as an Honorary Member in the Society of Economic Paleontologists and Mineralogists where he was awarded the W. H. Twenhofel Medal.

Steve Scott, PhD in Geochemistry and Mineralogy, 1968 and currently Chair of the Department of Geology at the University of Toronto, received a Docteur *honoris causa* from the Université de Bretagne Occidentale (University of Western Brittany) at a special ceremony held at the European University Marine Institute in Brest, France. In bestowing the honour, UBO President Jean-Claude Bordéré cited Steve as being “à la fois un chercheur exceptionnel et un remarquable pédagogue” (both an exceptional researcher and remarkable educator). The President also commented on Steve’s and his wife’s, Joan, attachment to Brittany noting that they own a small house on the coast.

Steve has held an invited professorship at UBO for the past 10 years where he introduced the concept of an intensive short course. The course on seafloor hydrothermal metallic sulfide deposits and their ancient analogues on land has attracted annually as many as 60 students from a dozen countries

THE COAL RESEARCH SECTION MARCHING ON

*This article concludes our feature stories from the 2003 & 2004 Newsletter editions.
We are appreciative of story contributions by Dr. Alan Davis and Dr. William Spackman.*

A new Energy and Fuels Research Center was created in 1988 to broaden the scope of activities of the Coal Research Section into a wider spectrum of energy-related endeavors. Davis, who had been appointed Director of the Section following Spackman's retirement became Director of the Center, a continuing goal of which was to foster interdisciplinary research with the involvement, wherever possible, of federal, state and industrial sponsorship. The Coal Co-op continued to support faculty and students in College-wide research programs, and through its contracts the Department of Energy funded the research topics of many Geosciences, Mining, Mineral Processing and Fuel Science students.

In March 1991, the Center moved to redesigned facilities the centerpiece of which was its microscope laboratory. The new location was on the east side of campus in the Academic Projects Building, which although adjacent to the Combustion Laboratory and other facilities of the Fuel Science Program, meant that the easy collaboration with colleagues and students in Geosciences was impaired. A short time later, refrigerated storage was secured for the Penn State Coal Sample Bank in the old Foods building on the west side of campus.

Some trends in the types of studies conducted by Geosciences students over the years had already become apparent. Whereas earlier investi-

gations of the changes involved in the conversion of plants to peat employed microscopic analysis only, later work incorporated the techniques of organic geochemistry (Scott Stout). Likewise, spectral fluorescence photometry was used successfully to probe the chemical structure of coal (Rui Lin), and the methods of basin analysis were applied to interpret coal maturation in Pennsylvania (Etuan Zhang) and petroleum generation (Sedat Inan). Earlier, Dave Hoover had produced a microscope hot-stage movie showing for the first time in real time how coke is formed from petroleum pitch via the mesophase mechanism, amazing attendees at the 1979 Carbon Conference held at Penn State. The range of subject matter pursued by our Geosciences' students also included interpretation of the climates and environments of coal deposition (Costas Karytsas, Joe Senftle, Sue Rimmer, Suzanne Russell, Sherry Allshouse, Debbie Kuehn), use of the optical properties and fabric of coals to determine burial, stress and thermal histories (Jim Hower, Jeff Levine), the systematics of coal organic and inorganic composition (Claudia True, Joe Gerencher, Dave Glick), use of the techniques of polymer science to interpret the macromolecular structure of coal (George Cody), the modes of occurrence of pyrite and their influence on its liberation during coal preparation (J. Reyes, Tim White) and the automation of microscopic methods (Dave Hoover, Ken Kuehn). Bob Rathbone proved

that coal depositional environment and photooxidation during analysis have profound effects on coal maceral fluorescence phenomena. Other efforts undertaken with support of the Center included the development of improved models for predicting the generation of acid mine waters in coal mining operations. As a rough estimate, about half of the theses written by our students were basic geological studies while the other half were more applied.

Department of Energy funding for the Sample Bank and Database continued until 1999; the final contract also provided for Penn State to study the solid residues and reactor solids produced by coal liquefaction pilot-plant and bench-scale experiments which then were taking place around the country. We had long been evaluating the success of such operations through microscope study, showing that reactor solids could be produced by coking through the formation of mesophase selectively from the more highly functional components, and by the production of carbonates from low-rank coals with high exchangeable cation contents. Gary Mitchell and Lillian Wakeley were two of the pioneers in this kind of study. Other research assistants on the Section staff, including Jeff Quick and Dave Bensley, contributed to our publication of scientific results. Our productivity and knowledge base was also benefitted by interactions with visiting scholars from China.

(Continued on following page)

COAL RESEARCH CONTINUED

Others came to Penn State to learn through the many short courses in coal characteristics and processing and the theory and practice of organic petrology organized by the Coal Research Section. In 1992 a joint meeting of the International Committee for Coal Petrology and The Society for Organic Petrology was held at Penn State. Over one hundred special research reports, many of them covering geological subject matter, were maintained by the Section and made available free of charge.

Between 1986 and 1991 a remote-access, on-line Pennsylvania Coal Marketing Database provided production, quality and consumption data, and between 1990 and 1993 an effort funded by the Gas Research Institute investigated the methane-bearing potential of coal seams.

The latest stage in the history of the Coal Research Section began in 1993 when the administration of the Energy and Fuels Research Center was taken over by the Energy Institute. The facilities became the Coal and Organic Petrology Laboratories, a title which more accurately reflected their true function. The Laboratories maintained an affiliation with the Department of Geosciences until Davis' retirement in 1997 (all three of the professional staff had Penn State Geosciences graduate degrees under their belts), when the Labs became part of the Energy Institute. Gary Mitchell is the only staff member remaining; he continues many of the original functions, conducting research, dispensing coal samples, data and wisdom to Penn State faculty and students and around the world, and teaching a course in organic petrology.

Sad to relate, there are several colleagues and alumni of the Coal Research Section and its subsequent incarnations who are no longer with us. This list includes Tate Ames, Jim Bayer, Bill Berry, Alex Cameron, Mike Chemerys, Don Cole, Jane Dolsen, Maria Fedale, Ed Koppe, Don Krebs, Gerhard Kremp, Debbie Kuehn, Bob Sohon and Francis Ting.

Our graduates have moved into positions within, related to and remote from coal research. Some remained within the womb of academia in geology departments in the US and abroad. Two of our alumni have been Deans of science colleges. In earlier days a good many graduates joined the staff of steel companies, to use and improve the methods of predicting coke properties first developed with Penn State input. Because the laboratory techniques of assessing petroleum maturation are the same as those first used in coal studies, several of our graduates have entered the petroleum industry. Other areas of employment have been with coal companies, environmental consultancies, the law, police forensics, state and federal government and computer applications. Some of our alumni returned to their native Germany, Canada, India, Greece, Turkey and Columbia.

Now, whenever anyone asks "Whatever happened to the Coal Research Section?" you will be able to answer "It's no longer in Deike Building, but its influence and its alumni are marching on."

FRIENDS OF GEOSCIENCES

*The following families and individuals have given generously to the Department during this past fiscal year (July 1, 2004 - June 30, 2005). Without their thoughtful contributions, we would not be able to recruit, retain and reward outstanding students each year. If you wish to make a contribution to any of the Department's Endowments or Scholarships, please contact :
College of Earth and Mineral Sciences Office of Development, 116 Deike Building, University Park, PA 16802
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We are extremely grateful to the many wonderful alumni and friends of the Department of Geosciences who have made gifts and created endowments to support our programs. Your support is very important to the Department in a wide variety of ways.

Private funding is essential in the face of dwindling state appropriations. In the 2005-06 academic year, the Commonwealth of Pennsylvania appropriations to Penn State comprise only about 12 percent of the University's annual budget.

Rapidly rising tuition rates are fueling a critical need for increased support from our friends and alumni to help students off-set their educational expenses. In addition to tuition, students are faced with other educational costs such as fees, books, field trips, and research expenses.

High priority areas we would like you to consider supporting are listed below. Many of these initiatives are highlighted in this newsletter. I do hope you will take advantage of this opportunity to help support our students. Thank you in advance.

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