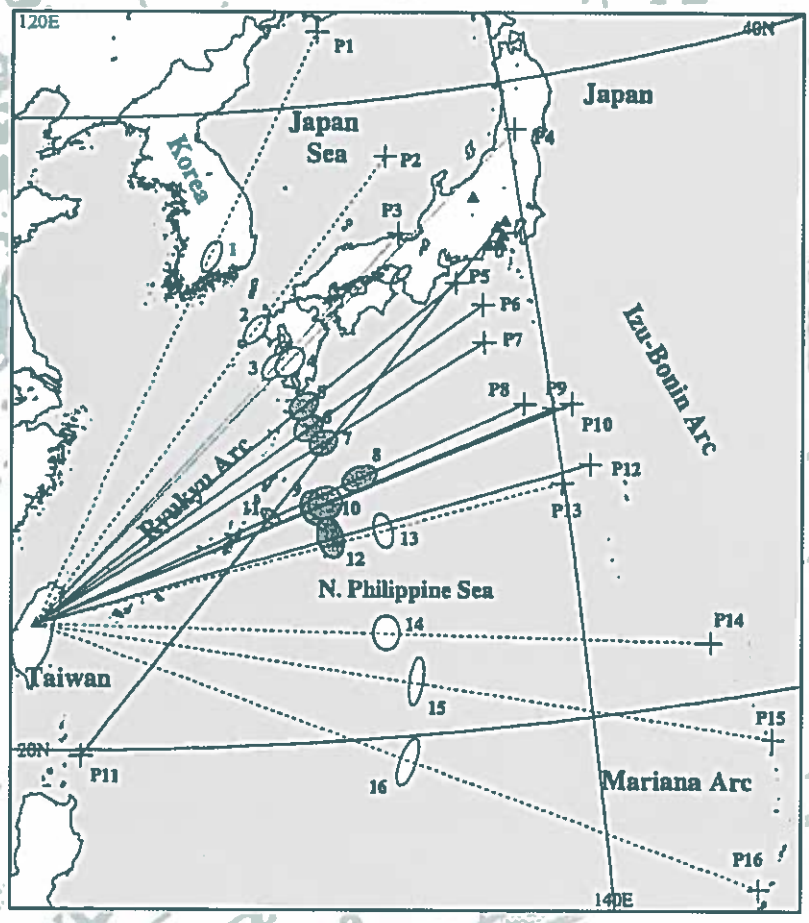
GeoSciences

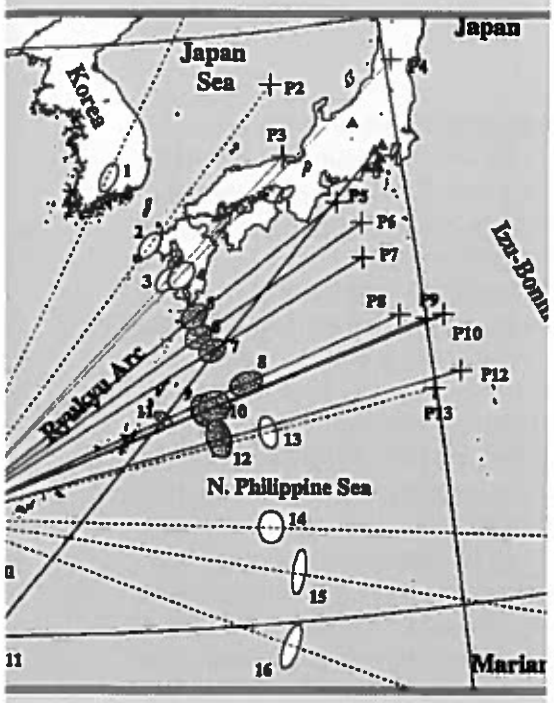
University of Illinois
at Urbana-Champaign



Department of Geology
Alumni Newsletter
Fall 1997

GeoSciences

Department of Geology Alumni Newsletter Fall 1997



About Our Cover:

This map shows the configuration and main results of the northern Philippine Sea experiment. Triangles mark the seismometers used in this study. Crosses mark epicenters of 16 deep earthquakes used to construct the seismic profiles (P1-P16). Ellipses show approximate locations of the mantle transition zone. Brudzinski and Chen found that the region of high velocities (dark shading) was much smaller than previously thought.

GeoSciences is the alumni newsletter for the Department of Geology, University of Illinois at Urbana-Champaign. It is published in the fall and spring of each year.

Department Head: Jay Bass; **Assistant to the Head:** Peter A. Michalove; **Editor:** Deborah Aronson; **Production:** LAS Office of Publications; **Administrative Secretary:** Terri George

http://www.geology.uiuc.edu/

From the Department Head

Jay Bass

Dear Alumni,

Since being appointed as the new department head this summer, I have been looking forward to meeting with alumni and hearing about your interests and ideas. There will be some opportunities for us to get acquainted at the GeoThrust meeting (Oct. 17-18), the national GSA meeting in Salt Lake City (the Geology Department will host a cocktail party Oct. 20), and at the AAPG meeting in Salt Lake City (we're holding a reception on May 18). I'll also be traveling in the coming spring for the sole purpose of meeting with as many alums as possible.

Meanwhile, there have been some recent developments in the department you might like to know about. Certainly, the most important news is the addition of two new assistant professors. Tom Johnson, a hydrogeologist who is profiled in this issue, joined our faculty last winter. This fall, sedimentary geologist Bruce Fouke is joining us. We'll profile him in depth in the next issue. Tom and Bruce are superb young scientists, and their presence will help us maintain our traditional strengths, while diversifying into new areas of teaching and research. We are indeed very fortunate to add these two faculty members at a time when competition for University resources is very intense.

We are also beginning a search for a new R.E. Grim Professor to replace Richard Hay. All of this activity underscores the University's commitment to an outstanding Geology Department.

Our success is due in large part to the hard work of our various alumni chapters and to Jim Kirkpatrick for all the work he has done to promote active cooperation with our alumni.

As had been noted in previous issues, the Texas/Louisiana chapter has succeeded in establishing a graduate fellowship. I'm happy to tell you that we have awarded the first fellowship to Michael Brudzinski, who also is profiled in this issue. Thanks to all of you, and especially to Tricia Santogrossi and Jack Threet, for all your efforts in making this campaign a success.

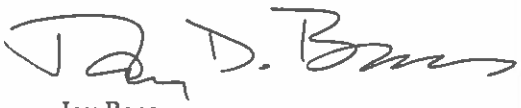
Our alumni in the Midwest have been hard at work raising gifts and pledges for a Midwest Undergraduate Research Scholarship, which will support undergraduate research projects with individual faculty members. Alumni in Kansas and Oklahoma, as well as a group in the Rocky Mountain States, are working to establish a fund to support field trips. I'm sure you will all agree that field experiences are one of the most important parts of our geological training, and they often account for some of the best memories from our student years. If any of you are interested in par-

ticipating in one of our trips, by all means let us know!

In looking at the future of the department, I have several other goals: I'd like to increase the size and national visibility of our research programs; we're going to work very hard to foster a closer relationship with industry; and we are planning an educational outreach and recruiting program. Our goal is to teach high school students about the range of opportunities in geosciences, show them the programs available at UIUC, and hopefully attract outstanding students to major in geology. I would welcome any alumni interested in participating in these new initiatives.

Again, I look forward to meeting as many of you as I can, and not only at formal departmental events. If you are in town, please stop by to visit the Department and say hello. You are *always* welcome!

Sincerely,



Jay Bass
Head, Department of Geology

Kirkpatrick Takes New Position, Department Gets New Head

Jim Kirkpatrick, who served as department head for nine years, stepped down this summer to accept a new position as executive associate dean for the College of Liberal Arts and Sciences (LAS) at the University of Illinois. The new department head is Professor Jay D. Bass, who assumed the position over the summer.

Bass has been in the Geology Department since 1984, arriving as an assistant professor. He was promoted to associate professor in 1988 and then to full professor in 1995. He received his B.S. from the City University of New York in math and geology in 1974 and his M.S. in geochemistry from Lehigh University in 1977. Bass received his doctorate in 1982 from the State University of New York, Stony Brook.

As a post-doctoral fellow at CalTech from 1982-84, Bass conducted research on Earth materials at high pressure using shock waves and also borehole geophysics.

Bass has served on a variety of departmental committees, most notably the Courses and Curriculum Committee, which restructured the undergraduate course offerings in the department, and chaired the department's Promotion and Tenure Committee. Nationally, he has served as a panel member in the Geophysics and Geochemistry Programs of the National Science Foundation.

Since arriving at UIUC, Bass has taught geophysics, introductory geology, mineralogy, various courses on the physics and chemistry of the Earth's interior, and Geology of the National Parks, a popular geology course for non-majors. He conducts research on seismic velocities and elastic properties of minerals and rocks at high pressure and high temperature, as well as on the chemistry of Earth's interior and the properties of silicate magmas. For much of this research Bass uses a type of laser light scattering called Brillouin scattering.

Kirkpatrick had been planning for some time to step down and devote himself to research, as we wrote in the previous issue of Geosciences. However, when Dean Jesse Delia asked him to become executive associate dean for LAS, Kirkpatrick agreed.

This is a new position; LAS has never had senior-level associate deans with substantial academic responsibility before. Kirkpatrick will help coordinate interactions between 21 LAS departments that include mathematics and physical, biological, and social sciences. One of his special tasks will be to help coordinate the reorganization of the School of Life Sciences (SOLS).

GeoNews

Students Receive Departmental Honors

Last May several geology students received departmental awards in recognition of their academic achievements.

Crystal Lovett and **Cathy Hier** received the Alumni Outstanding Senior Award.

The Estwing Award to an outstanding undergraduate went to **Maitri Venkataramani**.

Melinda Tidrick received the outstanding woman graduate student award.

The outstanding teaching assistant award for spring 1996 went to **David Finkelstein** and **Deborah Watson**; **Tara Curtin** was the outstanding teaching assistant for fall 1996.

Graduate student **Joel Johnson** received the Morris M. and Ada B. Leighton Award. This award, established in memory of Morris W. Leighton's parents, provides funds to support field work and research by an outstanding graduate student. The award will help Johnson in his study of the structural geology of the Illinois Basin. His work will incorporate both subsurface and outcrop data from selected locations in the region.

Undergraduate **Alex Glass** and graduate student **John Werner** have received the Norman Sohl Award in Paleontology this year. This award was established in the memory of one of our most distinguished alumni, Norman F. Sohl, B.S. '49, M.S. '51, Ph.D. '54, who died in 1993. Sohl spent much of his career at the Smithsonian Institution and was a leading authority on Cretaceous gastropods and biostratigraphy.

Glass used the award to study fossils from the Hunsrueck Slate geological formation, which is in the Rheinsche Gebirge region of Germany. The Hunsrueck Slate formation has a large number of exquisitely preserved sea lilies, star fish, brittle stars and other marine animals. Glass traveled throughout Germany, since the collections are scattered throughout the country. His research is part of the Nahecaris Project, a salvage operation run by the German government. "The award was like a gift from heaven," says Glass. "I had no idea it was coming, and I wouldn't have been able to do this research without it."

Werner, who also received the award in 1994, used his award to study the Smithsonian Institution's collection of fossil scallops. His research focuses on how the scallops changed and how rapidly they did so. His trip to the Smithsonian in July was a success. He met and discussed his work with Dr. Thomas Waller (a world expert on fossil and recent scallops) of the National Museum of Natural History and took nearly 3,000 measurements on fossil scallops that ranged in provenience from Florida to North Carolina. The fossils ranged in age from one to three million years old.

Do you recognize this space? You should–it's the main lecture hall, room 228, getting a complete renovation.

Sedimentologist Joins Department

Sedimentologist Bruce Fouke has just joined the Geology Department as assistant professor.

"I'm thrilled to be here," says Fouke, who moved here with his wife, Ann, and their 10-month-old daughter Kaitlyn. "I love it here in Champagne-Banana!"

Fouke specializes in reconstructing the composition and history of ancient aqueous envi-

Bruce and Ann Fouke with daughter Kaitlyn at tide pools in Morro Bay, California.

ronments. He combines geology, biology and chemistry to quantitatively reconstruct paleo-fluids, which includes answering such questions as whether microbes lived in a given water environment, what the water was composed of chemically, and the ancient hydrology.

Fouke has worked on a wide range of projects, from ancient coral reefs to examining the Cretaceous-Tertiary (KT) meteorite impact that "dinged the dinosaurs." He has also worked with several oil companies.

"My specialty is applicable to a wide range of fields," says Fouke. "Almost every discipline, whether it's geosciences, archaeology or even veterinary medicine, has a need to know the history of water and porous media," says Fouke. "I guess, I live by the credo that variety is the spice of life," he adds with a grin.

This past summer, Fouke worked at NASA's Ames Research Center near San Francisco, where he was part of a research team in exobiology. That work has led him to the Mammoth Hot Springs in Yellowstone National Park, where he is studying how microfossils are preserved in order to better understand the presumed "microfossils" entombed in calcite cements in the Martian meteorite ALH84001.

The party honoring Richard Hay was held at Silvercreek Restaurant and was a great success. From left, Duane Moore, Ralph Langenheim, Jim Kirkpatrick and Shelley Roberts.

Geology Alum Honored by University of Waterloo

The Waterloo Centre for Groundwater Research at the University of Waterloo in Ontario, Canada, has initiated the Farvolden Distinguished Lecture Series. The series honors Dr. Robert Farvolden, Ph.D. '63, whose leadership was responsible for the foundation and development of the University of Waterloo's hydrogeological teaching and research facility. Farvolden died Sept. 13, 1995.

Stephen Foster, an assistant director at the British Geological Survey and visiting professor in contaminant hydrogeology at the University of London–Royal Holloway College, presented the inaugural lecture entitled "As the Land, so the Water: Assessing and Controlling Agricultural Impacts on Groundwater."

Check Us Out–http://www.geology.uiuc.edu/

Links to: Illinois State Geological Survey • Illinois State Water Survey • Environmental Council • NCSA

Profiles

First Texas-Louisana Fellowship Awarded to Graduate Student Mike Brudzinski

Mike Brudzinski, recipient of the first Texas/Louisiana Graduate Fellowship, reviewing "wiggle plots" with his advisor, Wang-Ping Chen.

Seismology graduate student Mike Brudzinski felt called to academia from an early age.

"I always enjoyed school tremendously," he says. "And I enjoy the combination of teaching and research. You are learning, and teaching what you are learning. It has always seemed like a very fruitful endeavor, regardless of what subject you study."

Brudzinski, who graduated in three years from Eckerd College with a double major in physics and marine science, received in 1997 the first Texas-Louisiana Fellowship from the Department of Geology in recognition of his outstanding achievements as a graduate student.

Alumni from Texas and Louisiana, led by Jack Threet and Patricia Santagrossi, recently created this endowment to provide a permanent source of fellowships to outstanding graduate students like Brudzinski.

"The fellowship was a great surprise and a great help," says Brudzinski. "I was planning on being a teaching assistant half-time this year, but thanks to the fellowship I only have to teach quartertime. That means I can devote more time to my research."

This is one of many honors for Brudzinski, who as an undergraduate was valedictorian, did research for three (now published) papers, attended four professional conferences and received numerous awards. He attributes his success as an undergraduate to his mentor, Sarah Kruse, and to his first undergraduate research conference, which made it clear that there was more to academia than just classes. "One unusual aspect of Mike's background is that he had a lot of research experience as an undergraduate," notes his advisor Wang-Ping Chen, professor of geology.

Brudzinski's graduate school experience has been very positive so far, as well. He received the Geology Alumni Fellowship upon his arrival at Illinois in 1995, as well as a scholarship from the Society of Exploration Geophysics.

"Mike has been very successful because he has a good combination of characteristics, which include intelligence, perseverance, a great ability to work with other people, a good ear for advice and an outgoing personality," says Chen. "Mike has a very positive outlook on things. He is not flustered by roadblocks, which, of course, are common in research."

Seismographic Study of the Mantle

These days, Brudzinski can most often be found hunched in front of a computer, reading seismographic data, or "wiggle plots," from around the world in order to understand the mantle transition zone.

The mantle is made up of an upper and a lower portion. Between the two layers is the mantle transition zone, about 400-660 kilometers deep.

"The transition zone is an interesting region because people want to know about the differences between the upper and lower mantle," says Brudzinski. "We are asking questions like, how the upper and lower mantle are related, and what effect the mantle transition zone might have on tectonic processes within the Earth.

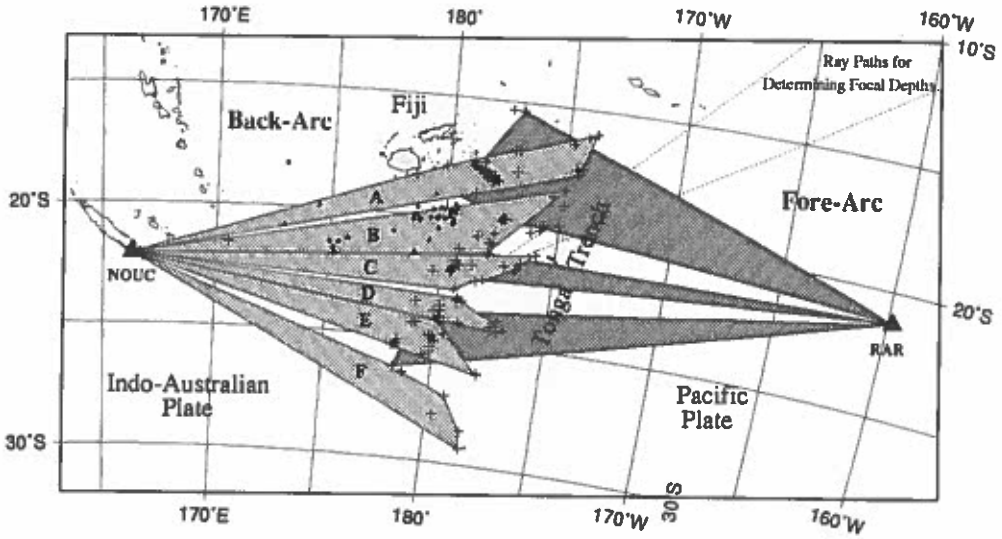
"I look at waveforms, or seismic wave data, and try to determine the seismic wave speeds, which contain information related to the composition and temperature of the Earth. I put the model of seismic wave speeds into a program that creates synthetic seismograms and then compare those synthetic seismograms to the real recorded data in order to investigate the velocity structure of the Earth." When Brudzinski finds areas where the data don't fit the model, he refines the model and tries to explain reasons for the deviance.

Brudzinski recently co-authored a paper with Chen that examines the velocity model for the northern Philippine Sea. Seismologists have thought that this entire region was fast, which indicated the presence of subducting lithosphere in the middle of the mantle transition zone. Brudzinski and Chen found instead that the region of high velocities was much smaller than previously thought. They also found that the high velocities were in the lower transition zone, not in the middle of the transition zone.

"We think this is a better explanation because, if the lithosphere is subducting it makes sense it would rest at the bottom of the tub, so to speak," says Brudzinski.

Chen points out that this finding raises new questions. "We know the lithosphere is subducting in this region, but based on our most recent findings, it would beg the question, 'where IS the rest of the crust?'" he says.

Brudzinski's current research focuses on similar questions in the Tonga Trench region, identified by a group of islands east of Australia near Fiji. The Tonga-Fiji region is home to half of the world's deep earthquakes, and seismologists have identified high velocities in the mantle transition zone similar to those found in the northern Philippine Sea. He and Chen will compare the plentiful Tonga-Fiji data to their findings in the northern Philippine Sea and see what



Map showing the configuration of the Tonga-Fiji experiment. The Tonga-Fiji region is home to half of the world's deep earthquakes and seismologists have identified high velocities in the mantle transition zone, which may be similar to those found in the northern Philippine Sea. Triangles mark the seismometers and crosses mark epicenters of deep earthquakes used in this study. Brudzinski and Chen are investigating whether the velocity structure in this region supports the presence of subducted slab stagnant within the transition zone.

they can learn.

"...Heart and Soul of Geophysics"

Although Brudzinski has always been interested in science, he didn't narrow in on geophysics until college.

"Based on the number of turtles and frogs I brought home as a kid, my mom always thought I'd be going into biology," says Brudzinski. "But in college I realized that physical principles are a lot more interesting to me than biology, and these same principles are the heart and soul of geophysics."

Brudzinski chose to attend Eckerd College, a 1,400-student school in St. Petersburg, Fla., because of its strong marine sciences program. After a few classes he found that he preferred physics and physical principles to biology. Marine geophysics allowed him to apply the principles of physics to "lots of data provided by the Earth."

The gregarious and earnest Brudzinski flourished at Eckerd, and became deeply involved in both academics and campus life. By the time he graduated, he knew he wanted to continue studying geophysics, but he wasn't sure what area. He was drawn to Illinois and seismology in part because of MIT-trained Chen.

"He's very intense about research, and I am too, so our personalities mesh," says Brudzinski of Chen. "His reputation in the department is something of a slave driver, but we get along really well.

"Coming to the University of Illinois also appealed to me because I'm originally from Chicago, my fiancee (Erika Bondarowicz) was here in school, and they offered me the Geology Alumni Fellowship," adds Brudzinski.

> "Mike has been very successful because he has a good combination of characteristics, which include intelligence, perseverance, a great ability to work with other people, a good ear for advice and an outgoing personality,"

Big Fish, Small Pond

Moving from Eckerd to Illinois was shifting from being a big fish in a small pond to a small fish in a much bigger pond.

"Eckerd was really good for me," acknowledges Brudzinski. "But I am enjoying Illinois, too. Resources were pretty thin at a small school like Eckerd, particularly when it came to research.

"There are tremendous resources here, but you're pretty much on your own, since the school is so big. Still, geology is self-contained and I've gotten to know many people in the department," says Brudzinski. "Illinois also gives me a chance to be around other geologists, whereas at Eckerd I was in a marine science department and there weren't very many geologists."

In addition to spending time with geologists and with Bondarowicz, Brudzinski tries to find time for his latest pet turtle, Kermit.

"Kermit is the best pet I've ever had," says Brudzinski earnestly. "He has an amazing amount of personality ... for a turtle. He has moods just like a person. Sometimes he's lazy, scared, excited, or just plain bored. Even in the pet store he was playing peek-a-boo from behind a log with me. At home he's great because he's totally low maintenance. He can go a week without food, he doesn't smell bad, and he can climb just about anything. You don't have to pay attention to him, but he's there to play with when I have time, which isn't often these days, I'm afraid."

Hopefully, Kermit understands.

Johnson Tracks Ground Water Using Isotrope Ratio "Fingerprints"

Tom Johnson working in his "clean lab." Because the samples he works with are so infinitesimal, the slightest dust particles can contaminate his work. Johnson wears special clothes, including shoes, to work in this lab.

Tom Johnson, assistant professor of geology, started out in igneous petrology, took a two-year break from academics, and metamorphosed into a hydrogeologist.

"After taking that break I decided I wanted to do something with more of an applied approach," said Johnson, who received his Ph.D. from the University of California, Berkeley, in 1995.

The shift was not as dramatic as it might have appeared, notes Johnson.

"Many of the aspects of high-temperature geochemistry that I worked on in igneous geology are surprisingly easy to apply to low-temperature geochemistry," Johnson observes. "It turns out not to be a very big jump."

Johnson concentrates on the application of chemical measurements, particularly isotope ratios, in studies of ground-water flow and solute transport. Most of his current research involves isotope ratios, such as $^{87}Sr/^{86}Sr$, that are very useful as tracers of ground-water movement and the chemical reaction of water with rock.

"Isotope ratios give you a way to fingerprint elements from different sources," says Johnson. "Although the use of isotope ratios is a well-established technique, applying these measurements to ground water is relatively new," says Johnson. "For this reason I find my research more and more compelling. Some of the things I'm working on now, no one else in the world is doing. I find that really exciting."

In one such project, Johnson has succeeded in developing the first practical techniques for measuring natural variations in selenium (Se) isotope ratios.

Cretaceous rock formations all over the western US, among other places, are very high in selenium. Selenium is toxic in high concentrations, which can be fatal to wildlife. The most dramatic illustration of this situation is found at the Keterson Wildlife Refuge. The refuge had several large ponds that attracted migrating aquatic birds. However, the ponds were created using agricultural waste water from soils high in selenium. Consequently, in 1983-84 those migrating birds died by the thousands due to selenium poisoning.

Activity at the Keterson site has quieted down, but a new concern is wastewater from oil refineries located on San Francisco Bay. There is concern about the effect of the effluent, which is also high in selenium, on the bay's ecology. Johnson hopes to use his isotope ratio research to fingerprint the sources of selenium, and to determine whether they are naturally occurring or manmade. This will help determine how to remove the selenium from the environment or

render it inert, he says.

Selenium in Nature

A second use for the isotope ratio study of selenium is to give information about how selenium behaves in the natural environment, Johnson says.

There are several different forms of selenium in the environment, and there are wide variations in their mobility and bioavailability. The more bioavailable the form, the more toxic it is. Selenium can be taken from the toxic form and transformed, by either biological or chemical processes, into a relatively inert material. Johnson's goal is to study selenium in nature and understand how it cycles.

Multiple Sources and Routes of Contamination

Johnson, who has been at the Geology Department for only nine months, is also continuing to work on projects he began as a post-doctoral researcher at the Lawrence Berkeley National Laboratory in California.

One is a study of $^{87}Sr/^{86}Sr$ ratios in ground water of the Snake River Plain aquifer of Idaho, which provides information on where water is flowing and at what speeds.

"The hydrogeology is difficult in this region because the basaltic/fractured rocks of the aquifer are very chaotic and flow conditions are hard to predict," says Johnson, who has found that groundwater flow is channeled into "fast flow zones."

This finding could greatly influence understanding of contaminant transport.

Johnson also has been involved in site characterization of the proposed nuclear waste repository at Yucca Mountain.

"It is very difficult to predict the behavior of such a site for ten thousand years, as is mandated by law, and this requires a geological perspective," says Johnson. "$^{87}Sr/^{86}Sr$ ratios of ancient ground water are recorded in secondary calcite crystals; these data tell us about the long-term behavior of the hydrologic system."

In conjunction with the Illinois State Geological Survey, Johnson also plans to look at nitrate contamination in ground water around the Decatur, Illinois, area caused by fertilizer run-off from nearby farms. Using techniques similar to those he's using in his selenium studies, Johnson will measure $^{15}N/^{14}N$ ratios and $^{18}O/^{16}O$ ratios to help identify the source of the nitrates. He hopes the information he gains will help identify, for example, which fertilizer is causing a particular contamination.

"This approach is very close to the selenium approach," says Johnson. "If we can fingerprint the isotope ratios, it might identify the different sources of nitrates in ground water. I'm also hoping it will help us understand the processes that break down nitrates, particularly the process of de-nitrification, which can change nitrates into harmless nitrogen gas. Certain shifts in the isotope ratios over time, for example, will help us find evidence for de-nitrification."

Isotope ratio research also might come into play in a future project Johnson hopes to collaborate on with Steve Marshak, professor of geology in the department. That project involves looking at isotope ratios of helium coming from major fault structures in the mid-continent. It would involve using helium isotope ratios as a fingerprint for fluids leaking from the mantle into the crust.

> The Keterson Wildlife Refuge had several large ponds that attracted migrating aquatic birds. However, the ponds were created using agricultural waste water from soils high in selenium. Consequently, in 1983-84 those migrating birds died by the thousands due to selenium poisoning.

Transitioning to Champaign-Urbana

Johnson's seemingly bottomless supply of energy extends not only to his numerous research projects, but to his teaching responsibilities.

When he first arrived, Johnson took on the responsibility of teaching a new course on isotope measurements in hydrogeology.

"I enjoyed teaching very much, but there was more preparation and organization than I anticipated," he acknowledges with a grin. This fall Johnson is teaching an upper-level hydrogeology course to undergraduate geologists and engineers. At the same time, he'll have his first graduate student and will hire a post-doctoral researcher to work on the Snake River Aquifer project.

Although he spent a decade in California, Johnson comes from the East Coast. Growing up in Suffern, New York, not far from Columbia University's Lamont-Doherty Geological Observatory, Johnson wanted to attend a small, liberal arts college. He chose Amherst College, which traditionally has been strong in geology.

"For a college of its size, Amherst's geology department is huge," says Johnson. "There are five geology faculty for a student body of about 1,600, whereas at the University of Illinois, for example, there are perhaps ten times as many students and there are 14 geology faculty."

As an undergraduate, Johnson received a research fellowship at California Institute of Technology in Pasadena the summer before his senior year. That project became his senior thesis on igneous petrology, for which he received the Walter F. Pond Prize in Geology from Amherst.

Johnson not only had a rewarding experience at Amherst; his college connection led him–albeit circuitously–to meet his wife, Zanne Newman.

"We met in California while mountain biking," Johnson remembers. "She was wearing an Amherst jacket, so I struck up a conversation with her. Ironically, it turns out she was there when I was there. She went to Wellesley and had spent her junior year as an exchange student at Amherst. I ended up inviting her to a party I was having."

Johnson doesn't have the time to bike–or the mountains to bike on–these days, but he's settling in just the same. He is particularly excited and energized about being at the University of Illinois.

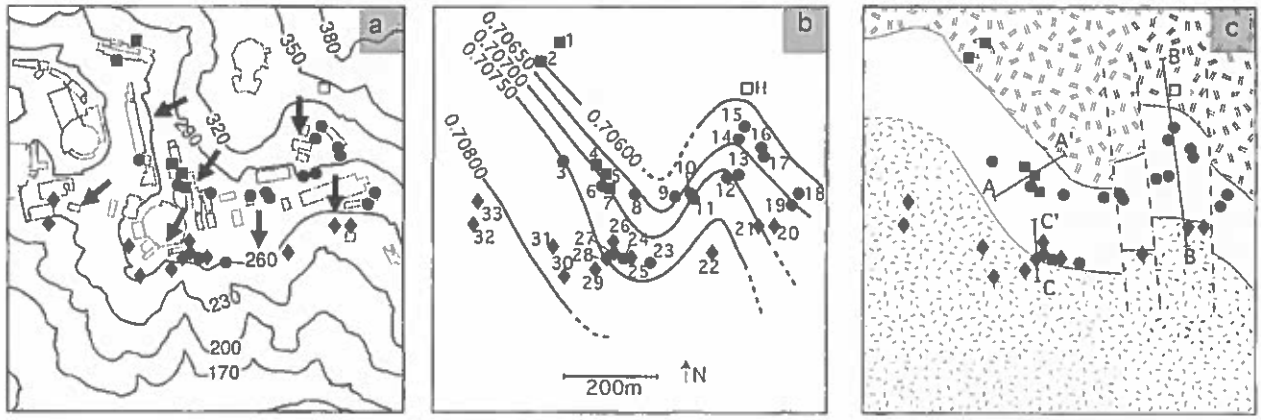
"One of the things that made this position so appealing to me is that we are in a phase of hiring new faculty," says Johnson. " I think everyone is excited to add new people with new ideas and energy to complement the existing strengths of the department."

Adjusting to Midwest weather, however, was a different matter. Johnson, Newman and their two sons, one-year-old Lucas and three-year-old Charlie, arrived in Champaign-Urbana in the middle of the winter.

"I wouldn't do that again if I could help it," says Johnson ruefully.

With the support of the department, Johnson and his family are feeling more at home.

"The department has been very welcoming and that has made the transition from California a lot easier for me, as well as for my wife and our sons," says Johnson.



The figure above shows three aspects of the Lawrence Berkeley Laboratory groundwater system. a) Topographic contours in meters, locations of buildings, and approximate ground-water flow direction. b) Contour plot showing the evolution of $^{87}Sr/^{86}Sr$ in ground water as it flows through the site. c) The complex geology of the site, with basalt overlying Miocene and Cretaceous siltstones that dip 30 degrees to the north. Ground water inherits relatively low 87Sr/86Sr values from the basalt, then flows into and interacts with the higher $^{87}Sr/^{86}Sr$ siltstones. The strong gradient in the Sr isotopes indicates very slow ground-water flow.

Witherspoon Provides "Powerful Role Model" Throughout Successful Career

Petroleum engineer and hydrogeologist Paul Witherspoon, Ph.D. '57, is internationally renowned as an imaginative and creative researcher. He has spent his career studying, among other things, how fluids flow through fractured rock. He also has served as an outstanding mentor to numerous other researchers who have gone on to become very successful hydrogeologists.

Witherspoon was awarded the 1997 University of Illinois Geology Alumni Achievement Award. He adds that honor to a string of top awards and honors, including being elected to the National Academy of Engineering and as a foreign member of the Academy of Sciences of Ukraine, in recognition of his work there following the Chernobyl nuclear disaster. He was recently elected a fellow of the American Association for the Advancement of Science, and just last year received the distinguished service award from the hydrogeology division of GSA. Earlier in his career, Witherspoon received the Horton Medal, the top award from the American Geophysical Union for "outstanding contributions to the geophysical aspects of hydrology."

The American Geophysical Union also honored him with the Horton Prize for the best paper in hydrology (published in Water Resources Research in 1969), and the GSA awarded him the 1972 O.E. Meinzer award for an article titled Field Determination of the Hydraulic Properties of Leaky Multiple Aquifer Systems. Witherspoon shared both of these top awards with former student Shlomo Neuman, now Regents' Professor in the Department of Hydrology and Water Resources at the University of Arizona, Tucson.

"If it weren't for Paul Witherspoon, I wouldn't have had a research career," says Neuman. The Israeli native came to the United States in the mid-1960s to get a master's degree in hydrogeology, then return home and solve Israel's water problems. Instead, Witherspoon set him on a research career, and Neuman has been very successful–one of many successful researchers Witherspoon has guided.

"I've been able to work with a large group of talented men and women," says Witherspoon.

In addition to Neuman, those students include Al Freeze, Witherspoon's first Ph.D. student in geological engineering, who is now a well-known consultant working on contamination problems in the U.S., as well as Europe. One of his first women doctoral students, Jane Long, has just been selected to be dean of McKay School of Mines at the University of Nevada, in Reno. And many of Witherspoon's students are affiliated with the Lawrence Berkeley National Laboratory (LBNL), including Gudmundur Bodvarsson, who is head of the Nuclear Waste Group at LBNL.

Natural Curiosity

What makes Witherspoon's career unique, says Craig Bethke, Ph.D. '85 and geology professor at the University of Illinois, is that "he is an incredibly broad person professionally. He has a real curiosity. When he wonders how something works, he examines it, he solves it to his satisfaction and moves on to the next project. He is very imaginative and very popular among his colleagues."

Neuman agrees. "One of the things that made Paul so inspirational as a teacher was that he was constantly on the lookout for new and interesting problems and ways to address them," says Neuman. "He also has always provided a cheery, self-effacing, but powerful role model for generations of students and colleagues."

Witherspoon's projects have included examining the effect of topography on regional ground water flow through heterogeneous geologic media, helping develop new mathematical solutions to problems associated with pumping tests in multilayer aquifers and fractured rocks, developing computer models of flow systems, and examining the relationship between fracture roughness, normal stress and fluid flow, and on the thermomechanical properties of fractured rock samples.

Colleagues all describe Witherspoon as an outstanding teacher and one-of-a-kind researcher, yet he didn't always know he wanted to go into research or teaching. The son of man who worked in the natural gas industry, Witherspoon grew up

outside of Pittsburgh. He entered petroleum engineering via the University of Pittsburgh, receiving his B.S. in 1941.

After graduating, Witherspoon spent several years with Phillips Petroleum in Oklahoma and Texas. During World War II, the company received a big defense plant contract to make synthetic rubber in Borger, Tex. Witherspoon was among the group of technicians and engineers who designed, built and put in operation the plant that would make butadiene–one ingredient of the synthetic rubber–from butane.

In 1945 with the end of the war, Witherspoon returned to Oklahoma and met his future wife, Elizabeth Talbott, who was working for Phillips Petroleum.

After several more years of working for Phillips, Witherspoon was ready for a change. While not planning on pursuing an academic career, he did decide to get more education.

"At this point I realized that I needed a better background if I wanted to progress in my career," Witherspoon says.

On to Urbana

That realization led him to the University of Kansas, where he earned a master's in petroleum engineering physics in 1951. Immediately upon graduating, Witherspoon was hired to serve as head of the Illinois State Geological Survey (ISGS) division of petroleum engineering in Urbana.

While working at the ISGS, Witherspoon discovered the importance of storing natural gas underground in aquifers and especially of selecting geologic conditions where there would be no escape of gas through an overlying caprock.

Since then, Witherspoon has worked on numerous large underground storage projects, developing between 20 and 25 projects all over Illinois, Indiana, Iowa and Minnesota.

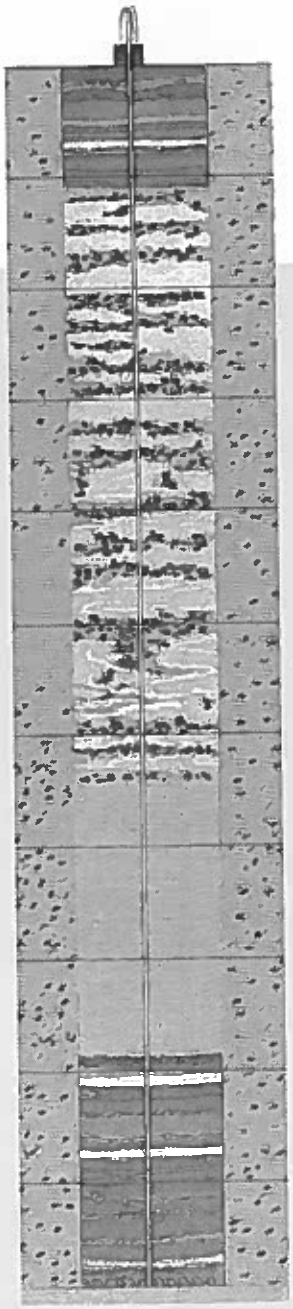
While based in Urbana with the ISGS, Witherspoon furthered his

Clockwise from left: Paul Witherspoon; The Witherspoon clan in Washington, D.C. last spring to recognize Paul and Elizabeth's 50th wedding anniversary, stand on Pennsylvania Avenue by a statue of John Witherspoon, who signed the Declaration of Independence; at a party celebrating Paul Witherspoon's 60th birthday, Ralph E. Grim (left) and Witherspoon pay close attention to the proceedings.

education by working on his Ph.D. at the University of Illinois. His roots in engineering showed in his choice of research area for doctoral dissertation, which, he says, was more engineering-based than geology.

"Dr. Ralph Grim, a very broad-minded individual, agreed to supervise my thesis, which developed from work I'd done in petroleum engineering," Witherspoon remembers. "I had been studying the nature of Illinois crude oil. Using an ultracentrifuge that can operate at 60,000 RPM and was available at the Department of Chemistry, I spun out the colloidal material in Illinois crude. The material looked like asphalt and affects oil flow. I proved, using this special equipment, that asphalt exists as colloidal material."

As Witherspoon was completing his dissertation, the idea of an



A Different Kind of Learning Experience

In 1952, one of the first large aquifer storage projects that stored natural gas underground was being undertaken at Herscher, Illinois, near Chicago. The goal was to store natural gas in a naturally occurring underground aquifer and have it on hand during the winter months when demand was high.

Although the project was ultimately successful, the team had some difficulties to overcome and mistakes to learn from.

"The company started pumping the gas in too fast and the pressure got too high," remembers Witherspoon. "This meant that the sandstone developed cracks and gas leaked out of the caprock into abandoned water wells. (By this point Herscher had already developed its own water supply and the residential wells were no longer used).

"Well, the water/gas mixture spewed out of the old wells just like fountains. Little boys discovered a great amusement in running down the back alleys and throwing matches at the wells, which erupted in fountains of flame.

"We all learned that you have to choose the right kind of geologic structure to store gas. It can't leak or crack and it has to have a tight caprock."

Ultimately the problems were solved and the storage project has been very successful, but not before a company representative had to visit a woman keeping a lion in a cage in her living room. Although the woman lived too far away to have the leaks affect her, she was convinced her lion was ill because of tainted water. A member of the company was dispatched to visit with her and her lion and explain the situation. Quite unnerving to have your conversation stopped dead by a lion roaring in your ear.

academic career began to appeal to him.

"The six years at the ISGS gave me an idea of the nature of academia and between the time I spent at Kansas and at the University of Illinois, I became more and more academically inclined," says Witherspoon.

Wide-Ranging Career

As luck would have it, just at this point, a full professorship in mineral technology opened up at the University of California, Berkeley. Witherspoon successfully completed his thesis and showed up at Berkeley in 1957, where he's been ever since.

"I think the department was somewhat surprised that I found a great job that quickly," says Witherspoon with a laugh.

Over the last 40 years Witherspoon's research has spanned a wide range of topics, including the flow of ground water through fractured rocks, the migration of contaminated ground water through the subsurface, and the problem of isolating high level radioactive waste underground.

Witherspoon's curiosity, open-mindedness and ability to apply concepts from one field to another have helped change the direction of the field of hydrogeology, as interest moved toward fractured rock, one of his fields of expertise.

Hydrogeologists historically have been interested in producing water. That meant they looked for permeable materials, like sand, rather than fractured rock, which is not always permeable. But by the 1970s interest arose within the discipline in the extraction and storage of heat and the storage of waste–especially radioactive waste. These needs required impermeable rocks, rather than permeable ones.

In 1973, Witherspoon began work at LBNL and helped establish the Earth Sciences division. One of the first activities of the division was to study the Stripa mine, an old iron ore mine in Sweden that had fractured granite surrounding the ore about 1,000 feet underground.

Witherspoon's curiosity, open-mindedness and ability to apply concepts from one field to another have helped change the direction of the field of hydrogeology, as interest moved toward fractured rock, one of his fields of expertise.

Witherspoon helped arrange a bi-lateral agreement that enabled the LBNL to conduct innovative research underground. By extending the tunnels a few hundred feet into the granite, his team conducted three years of research in one of the first large-scale rock laboratories in the world.

"This was the first underground granitic laboratory, and we demonstrated the need to get underground in order to study rock," says Witherspoon. "It has become one of the standard things you do and there are many other such labs today, though it's very expensive."

In "Retirement"

Although officially retired in 1989, Witherspoon has continued to work wherever his curiosity and interest have led him. He has traveled to Ukraine and Russia to help people there overcome the effects of radioactive fallout from Chernobyl. Last year, he was lecturing to specialists in China on the problems of developing a radioactive waste site in the Gobi Desert.

Witherspoon also is applying his expertise in fractured rock to the Yucca Mountain project, where the Department of Energy (DOE) plans to store more than 70,000 metric tons of high-level radioactive waste underground. Witherspoon is currently serving on an advisory committee to review the work that DOE is doing to provide justification for selecting Yucca Mountain as a suitable storage site.

While Witherspoon doesn't know where his next project will lead him, whether back to fractured rock, on to radioactive soil or in an entirely new direction, one thing is certain. Another question will pose itself, and Witherspoon will be in hot pursuit of the answer.

Alumni News

Obituaries

Newell E. Fogelberg, who attended the U. of I. and studied geology in 1939, died recently. He lived in Boulder, Co.

Hugh Gerard Walk, B.S. '41, M.S. '47, died in November, 1996. His wife, Marjorie, writes that he "suffered with cancer for a long while before his death, which was ultimately caused by a massive stroke." Walk taught geology at Marietta College in Ohio after graduating. He then worked 21 years for Texaco prior to starting a paleoconsulting company from which he retired in 1980. He is survived by his wife; three sons; one daughter; and their spouses; seven grandchildren; and four greatgrandchildren.

Alan Dean Buck, B.S. '50, died April 22 in Muskogee, Okla. He was 72. Born in Waynesville, Ill., Buck served in the armed forces in Europe from 1943-46. He was employed by the U.S. Army Corps of Engineers as a research geologist for more than 35 years at Waterways Experiment Station. Buck, who also received a master's degree in materials science from Purdue University in 1964, received a number of awards, including Secretary of the Army Research and Study Fellowship, American Institute's Wason Medal for Research and election as a "Fellow" of the American Concrete Institute. Survivors include his wife, Anne Burster Buck; two sons, Andrew Dean Buck of Clearwater, Fl., and Christopher George Buck of Springerville Ariz.; one daughter, Jennifer Buck Proctor of Tulsa, Okla.; one brother, Gary Lee Buck of Urbana, Ill; and seven grandchildren.

Cheri Chenoweth, B.S. '79, who lived in Urbana, died recently.

Alumni News is divided by decade. Those who were affiliated with the Department during part of one decade through to the next are listed according to the last degree received. Within each decade, items are listed in yearly sequence, not alphabetically.

Thirties

Charles Jacob Hoke, B.S. '37, was awarded an honorary degree of doctor of humane letters from Lyon College in Batesville, Ark., on May 24. Hoke is a retired vice president and member of the board of directors of Murphy Oil Corporation, where he worked for 30 years. For the past 22 years he has served as a consultant. In 1995 he retired as trustee of Lyon College after serving 20 years.

Forties

Elmer Glendon Moore, B.S. '41, and his wife, Dorothy, recently bought a home at The Windsor, in Savoy, Ill. Moore worked for the U.S. Geological Survey and the Department of Defense before retiring.

Ed Bushman, B.S. '41, writes that he had a "full house over Easter week, with all six of our children, spouses and six grandchildren. The visit greatly cheered my wife, Louise, who is in a hospital bed in our living room overlooking the Pacific and its range of moods."

Fifties

William L. McKenzie, B.S. '50, has retired and is living in Winter Haven, Fla.

Edwin W. Tooker, Ph.D. '52, writes that he has retired after 42 years with the U.S.G.S. His career included work on industrial mineral ore deposits and managing a scientific program at both local and national levels. "I'm now a scientist emeritus completing geologic reports on mining districts and the structural geology of the Oquirrh Mountains, in Utah," he writes. Tooker also enjoys growing camellia, conducting family genealogy and traveling.

Willy Weeks, B.S. '51 and M.S. '53, recently returned to "Urpain" to attend his 50th high school reunion. He retired in June of 1996 from the Geophysical Institute after working on field projects in the polar regions for 41 years. He and his wife have moved to Portland, where he says his "accom-

modations are extremely comfortable and Portland is an outstanding city." He has set up an office in his basement where he still does a bit of consulting, he writes. In addition, he is editing Russian papers and is "about to start on a book which I think will probably be called "More Than Anyone Wants to Know About Sea Ice." E-mail address: willy@imagina.com

Michael Sweet, M.S. '57, has become a sedimentologist/development geologist with the Gulf of Mexico group of BP Exploration, Houston. He previously was with BP Exploration in Aberdeen, Scotland.

Donald O. Rimsnider, B.S. '58 and M.S. '59, retired from Chevron in 1984 and recently moved from New Orleans to Mandeville, LA.

Do you recognize any of these people? This photo of Harold Wanless' "Geology of Illinois" field trip was taken at the Carter Oil Well (Southern Illinois) in 1941. Here's a hint: Ed Bushman is in the hat and checked shirt.

Sixties

J. Cotter Tharin, B.S. '48 and Ph.D. '60, retired in 1996 from Hope College in Holland, Mich. Tharin was first invited to establish the geology department of Hope College when he was an assistant professor at Wesleyan University in Middletown, Conn. He was chair of the department for more than 20 years. In Holland he also has been active in local affairs, serving on the city council for 12 years and the planning commission for six years. "Like most retirees, we plan to travel, play more tennis, etc.," he writes. "We will likely continue living in Holland, Mich., spending the winter months elsewhere." E-mail address: tharin@juno.com

Marion E. Bickford, M.S. '58 and Ph.D. '60, retired from Syracuse University in May, 1997, where she is now both professor emerita and research professor. So, in spite of her retirement, she continues to conduct full-time research and supervise one master's and one doctoral student. She received a "Chancellor's Citation for Academic Excellence," from Syracuse University last April. E-mail address: mebickfo@mailbox.syr.edu

GeoSciences is for alumni and largely about alumni. Please take the time to complete and return the information form at the end of this issue. Just as you like to read about classmates and other alumni, they'd like to know the latest about you. Your news is important to them and to us in the Department. Send along a recent photo, too, but let us know if you want it returned.

Seventies

Thomas W. Perkins, B.S. '72, writes that in March he won the Occidental President's award for generating the prospects which led to the discovery of more than 10 trillion cubic feet of gas in Irian Jaya, Indonesia. He is currently senior geological advisor at Occidental Petroleum ("same rank for 12 years," he writes) where he is involved in Middle East exploration. Perkins also wants to note that Dr. Ralph Langenheim played the greatest role in his training as a geologist. E-mail address: tom_perkins@oxy.com

Neil Whitehead, M.S. '76, has moved from New Mexico to Littleton, Co., where he is a consulting geologist.

Pat Maas, B.S. '77, continues to work as senior processing geophysicist for Western Geophysical,

a part of Western Atlas International. She analyzes, processes and supervises processing of geophysical seismic data for oil exploration. "For the last year, I have been dedicated to reprocessing seismic data of various vintages from the Jenein area in extreme southern Tunisia. This particular data area is extremely difficult to deal with for several reasons, the main one being that it is thick surface sand desert with shifting dunes that can range anywhere from 15 to 70 meters in height. It is absolutely essential to use refraction statics in situations such as this to obtain any reasonable sort of resolution from the data."

"When I'm not busy with my career (ha!!), I'm usually chasing after my twin daughters, Amy and Allison, who are now six years old. My husband, Larry, a geology graduate of Texas A&M, is a database administrator for Schlumberger. Email address: patricia.maas@wg.waii.com

Eighties

Alison Hodge Lecouris, B.S. '83, is working as the oracle database administrator for the Illinois State Geological Survey, where she has been a computer programmer for 10 years. She has two "adorable" children, seven-year-old Jeff and three-year-old Jon.

Patrice A. Hauck, B.S. '83, is an attorney and sales rep for Merchants' Market, in Cole Bay, Netherlands Antilles. She writes that she's been enjoying "adventure, debauchery, cash flow ... last but certainly not least, sailing!"

Grant Olson, B.S. '81 and DVM '87, works at the Door County Veterinary Associates as a farm animal veterinarian. "I went to Alaska recently and saw all those glacial geological formations in real life that I thought Hilt Johnson was just fabricating in class." Olson also wonders, "Where in the heck is Steve Greb???"

Alan Singleton, B.S. '88 and J.D. '91, is an attorney at Webber and Thies, P.C., in Urbana. He and his wife have two children, Heather (two years old) and Jacob, who was just born February 10.

Nineties

Brian Phillips, Ph.D. '90, and his wife, Katherine, had a baby July 2. His name is Thomas Calvin Phillips and he weighed 6 pounds at birth. Brian writes, "true to these times, I am in charge of changing baby, feeding mom, and assorted household maintenance. We will be staying close to home for a few weeks but hope to introduce Thomas to everyone in the coming weeks, months, and years."

Scott Wilkerson, Ph.D '91, and his wife, Beth, had a baby boy August 3. His name is Zachary Marvin Wilkerson. Scott writes that "Zach was 22 inches long at birth and weighed in at 8 lbs 8.5 oz. Mom and baby are doing fine." Scott is on the faculty at DePauw University and is an adjunct professor in the University of Illinois Geology Department.

Fredrick D. Siewers, Ph.D. '95, and his wife, Helen, had a baby girl Anna Katherine, in December 1996. Fred teaches at Rock Valley College in Rockford, Ill.

Tim Paulsen, Ph.D. '96, will embark soon on a research expedition to Antarctica. He is currently a post-doctoral student at the Byrd Polar Research Institute.

Theresa L. Croak, B.S. '96, is currently modeling nuclear waste glass dissolution at Argonne National Laboratory. She plans to return to the University of Illinois this fall and complete her master's degree in environmental engineering. Croak specializes in environmental systems and will be teaching CE292 (an engineering design and optimization course) for the 97/98 academic year. She urges other former students to "write about their current whereabouts."

Anne M. Estandarte, B.S. '96, is living in Orland Park, Ill., and working for Sidley & Austin law firm in Chicago as a legal assistant for the Insurance, Product Liability and Malpractice Law Group. "I primarily work for one client on all their asbestos cases across the US," she writes. She also notes that on Nov. 1, 1997, she and Earl J. Bonovich (ENG '96 UIUC) will be married.

REMINDER

You can send your update for the Alumni News via e-mail:

geology@uiuc.edu

Let's Keep In Touch

Please take a few minutes to let us and your classmates know what you've been doing: promotions, publications, election to office, marriage, parenthood, moving, awards. We'd all like to hear from you. Send your news to the Department of Geology, 245 Natural History Building, 1301 West Green Street, Urbana, Illinois, 61801; fax 217-244-4996; e-mail **geology@uiuc.edu**.

Name _____ Response date _____

Home address _____ Office address _____
(indicate if changed)

Home phone _____ Office phone _____

E-mail _____

Degrees from Illinois (with year) _____ Degrees from other universities _____

Present employer and brief job description _____

Other news you would like to share _____

Your comments on the alumni newsletter _____

Place
Stamp
Here

Editor, *GeoSciences*
Department of Geology
University of Illinois at Urbana-Champaign
245 Natural History Building
1301 West Green Street
Urbana, IL 61801-2999

The University of Illinois
at Urbana-Champaign
is an affirmative action and
equal opportunity institution.

GeoSciences is printed on recycled paper.