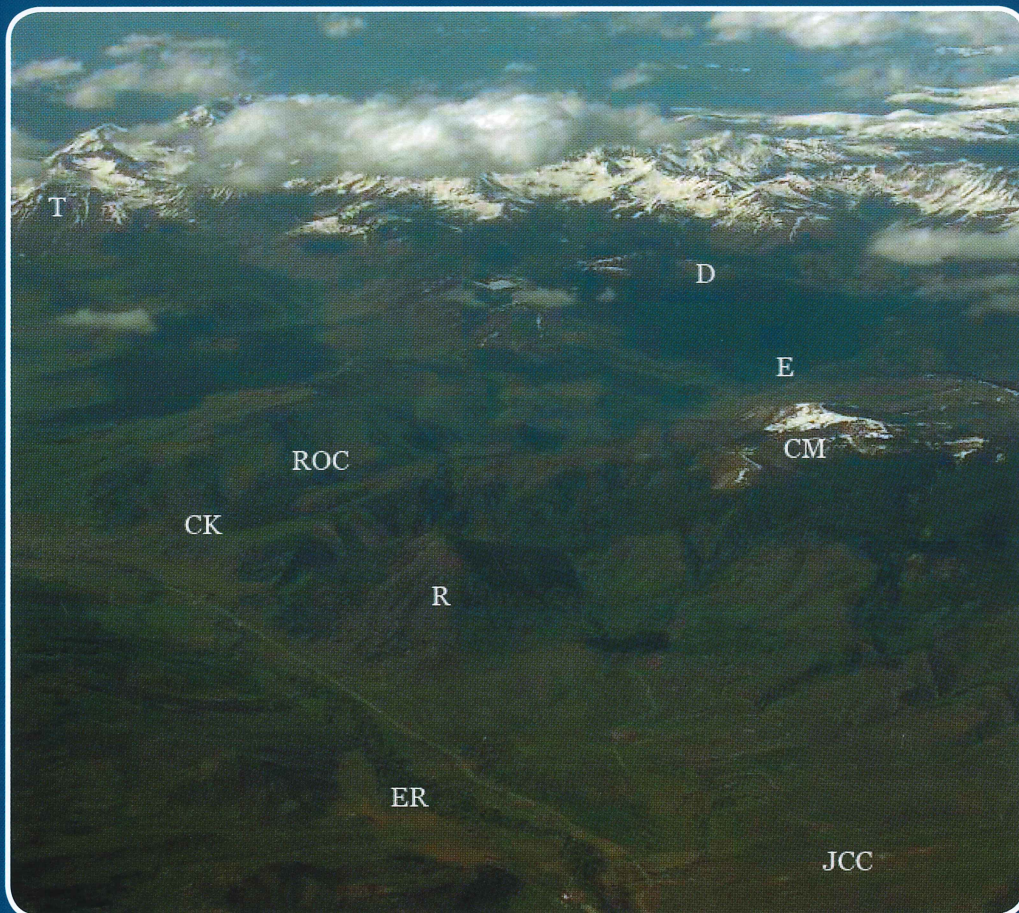


Department of  
**Geological Sciences**  
Newsletter



<http://www.uky.edu/AS/Geology/>

## Inside

- Alumni News
- Student News
- Department News

**The Round Up** — Many of you are quite familiar with the place shown above, but probably not from this vantage point. This is our geology field-camp area in central Colorado. This digital photo was taken out the window of an airplane on a Dallas-to-Portland flight on May 31, 2004, by Cindy (Palmgreen) Esterle, a 1997 graduate. Some prominent features include: JCC – Jack's Cabin Cutoff; ER – East River; R – Round Mountain; CK – Cement Creek; ROC – Ridge opposite camp; CM – Cement Mountain; E – Eccher's Gulch; D – Double Top; and T – Teocalli. The snow-covered mountains in the background are the higher Elk Mountains. If you have any good cover photos, please let us know.



# Department Funds

by Frank Ettensohn

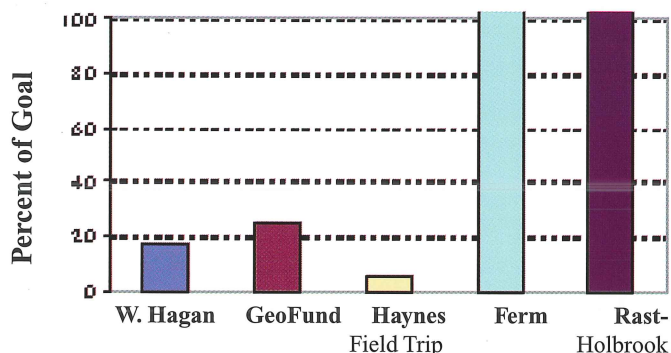
The photos on this page show students participating in some of our recent field trips to New York and the Bahamas. I think all of us can appreciate that in the geological sciences, it is much easier to learn about geology by actually experiencing it in the field, and that for most effective learning, it behooves us to get our students in the field as much as possible. We have certainly been trying to do this as much as possible, but getting students into the field continues to get more expensive, and student participation is often limited by the extracurricular expenses involved; most of our students just do not have the financial resources needed to participate in many of these trips, especially some of the more



Students with Pleistocene rhizocretions (CaCO<sub>3</sub> concretionary forms around ancient roots) at Crab Cay, San Salvador, Bahamas.

expensive trips. Although we do have a well-endowed fund to support students attending field camp, we have very little support to help students who wish to be involved in the week-long trips that we run in the spring or on longer trips associated with classes. For example, students have a difficult time finding support for our biennial trip to the Bahamas to study modern carbonate environments. Although we have a fund to support such field trip activity, it is grossly underfunded at present, and that is the purpose of this article. We would like to let you know that we have several recently endowed funds that are well-funded, but there are other funds that cannot be used because they are underfunded. The Ferm Graduate Student Support Fund and the Rast-Holbrook Fund, which supports our weekly seminar program, were recently endowed and are well-funded. Alumnus Charlie Holbrook gave us the financial start for each of those funds, and many other alumni have contributed to both of them, putting them over \$100,000, the level necessary for the endowment to produce enough interest to be useful on an annual basis. In contrast, the Brown-McFarlan Fund has only a small endowment, and most contributions are expended as received. Its use will largely be assumed by the Ferm Fund. However, we have three other funds, the Haynes Field Trip Fund, which would support the kind of field travel discussed above; the Geofund, which could support the many Departmental equipment needs and repairs; and the Hagan Scholarship Fund, which was set up to provide undergraduate scholarships. As you can see from the accompanying graph, none of these three funds is sufficiently endowed to be useful at present.

Geological Sciences Fund Status 2004



Although it is certainly up to you as to which of the funds you wish to support (see back page), I would like to encourage you to help us work on the above three funds so that we can bring their endowment to the \$100,000 level, at which point they can really be useful to us.



Students viewing overturned syncline near Lake Bomoseen, NY.

## 2004 Degrees

### BACHELOR OF SCIENCE

Michael Jonathon Caudill  
Winston Troy Cinnamon  
Sarah June Surles  
Adam Keith Smith  
Timothy Robert Nelson  
Thomas Stephen Deen  
Robin Louise Westrick (2003)  
Sarah Todd Davidson (2003)

### MASTER OF SCIENCE

Robert B. Jewell  
Shane Goodnight  
Alexander Rutledge  
Jennifer Thompson  
Kristin Toth  
Ting Li Lin

### DOCTOR OF PHILOSOPHY

William Andrews, Jr.  
Margaret Brewer  
Danita LaSage



# Faculty News

## Faculty Happenings: what's going on?

### Kieran O'Hara Associate Professor

This past summer, the Japanese Society for the Promotion of Science invited me to undertake a six-week visit including a lecture tour of several universities, using Kyoto University as a base. I visited two universities around Tokyo, taking the bullet train (Shinkansen) from Kyoto—just a 2-hour trip. I also visited Shizuoka University, where, after my talk, several of us climbed Mt. Fuji at night (see photo at right).

Kyoto is home to the largest number of temples in Japan, and we visited the famous Golden Pavilion. While at Kyoto University we undertook several high velocity friction experiments, and succeeded in degassing samples such that the fault zone became very weak. Fault pressurization by frictional heat may be an important earthquake mechanism. The results will be presented at AGU in San Francisco in December.

### William Thomas Professor

I became President of the Geological Society of America at the annual meeting in Denver on November 6, 2004. I completed a one-year term as Vice President. Until now, the terms of officers for GSA have extended from one annual meeting to the next (generally November to November), but the terms are being changed this year to correspond to the GSA fiscal year (July 1 to June 30). As a result, my term as President will extend from November, 2004, through June, 2006. The President presides over meetings of the GSA Council and the Executive Committee, and serves on a number of GSA committees. In addition, the President generally represents the Executive Committee at the GSA section meetings. In the next few months, GSA will be launching two new publication ventures, *Geosphere* (an electronic journal) and *GeoScience World* (an on-line journal aggregate). *GeoScience World* consists of the journals of several professional societies, including GSA, AAPG, SEPM, and Geological Society of London. *Geosphere* joins the *Bulletin* and *Geology* as the journals published exclusively by GSA. During the next year, GSA will initiate a membership drive designed to increase the membership beyond the current 17,000+.

During the current academic year, I am on sabbatical leave at the Geological Survey of Alabama, where I am continuing research on structure and stratigraphy of the Appalachian thrust belt, as well as on the terrain transfer of the Argentine Precordillera from North American Laurentia to South American Gondwana.



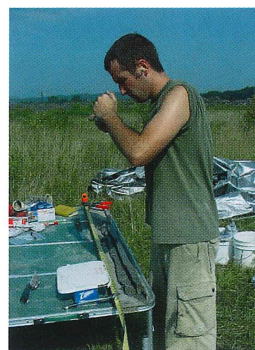
### Edward Woolery Assistant Professor

The productivity in the Seismic Lab continues at a hectic pace. New grants for research in the northern Mississippi Embayment, the lower Wabash Valley fault system, and the Seismic Network, as well as our highly motivated graduate students, fuel the efforts. A few highlights from the ongoing research include: 1) the first deep strong-motion recordings on a vertical accelerometer array in the New Madrid seismic zone (also the 1st east of the Rockies), 2) the first geophysical imaging of neotectonic deformation in the Quaternary sediment of the lower Wabash Valley, 3) the deployment of three additional seismometers and one vertical strong-motion array near the NMSZ's ambiguous northern boundary, and 4) a better understanding of the role of site effects in the ground-motion assessment of southern Indiana and Illinois. These results, as well as significant findings from last year's field campaigns, have resulted in four published, peer-reviewed journal articles, four additional journal articles now in review/revision, and five conference abstracts.

Although their support will be missed in the lab, we are proud to have graduated Ting-Li Lin to the Ph.D. program at the University of Memphis and Alex Rutledge to the M.S.C.E. program at Virginia Tech. In addition to that achievement, Alex also won first prize for his oral presentation at the Eastern Section-Seismological Society of America annual meeting in October.

### Frank Ettensohn Professor and Chair

For me, this year has seen activities in many directions, one of which was final publication of the Rast Memorial Issue as a special issue of the *Journal of Geodynamics* (2004, v. 37, nos. 3-5). The issue, titled "Tectonics of the Appalachian Belt," honored the career and many accomplishments of Professor Nick Rast, who passed away in August, 2001, and whose major interest centered on the Appalachian belt. The issue contains 16 articles on Appalachian geology by many workers who had worked with Nick over the years and was edited by myself and Alec Gates of Rutgers University.



*Bob Jewell describing  
core in the ash pond.*

In yet another direction, one of my master's advisees, Bob Jewell, defended his thesis, titled "The sedimentation, stratigraphy, and petrology of a coal-ash pond in Carroll County, Kentucky." I only mention this because Bob's work combined classic aspects of geology — sedimentology, stratigraphy, and petrology — to study the origin and development of a coal-ash pond at a power plant in Kentucky. Bob treated the ash pond like a delta deposit. He developed mechanisms for coring in the ash pond (which is no easy task!) and then used basic principles of deltaic sedimentation and stratigraphy to understand the distribution of various size fractions and components in the pond. He even made thin sections from the unconsolidated ash-pond sediments. Bob's research was supported by the Center for Applied Energy Research

*(continued on Page 6)*



# Alumni News

## **Leslie F. Berry, B.S. 1967**

Independent Prospect Generator, Wildcats, since 1990. Currently active in southeastern and western Kentucky, eastern Tennessee, southern Illinois, eastern Texas, and northeastern Arkansas.

## **John R. Cook, B.S. 2000**

I finished my M.S. in Earth Science at UCSC in 2002 with Dr. Tulaczyk. I discovered my love for teaching in grad school—so much so that I stayed on as a paid course assistant one quarter at UCSC teaching environmental geology labs and then as a TA for summer field camp in the eastern Sierra. My wife Kathy and I love our little house close to the beach in Aptos, CA. I am continuing to teach geology classes part-time at two nearby community colleges and substitute teaching all subjects in the public schools. I am currently pursuing my teaching credential. Howdy to all my old classmates!

## **Cynthia Palmgreen Esterle, B.S. 1997**

## **Jeffrey A. Esterle, B.S. 1996**

Some of you may be surprised to see the two of us reporting in the *Round Up* together. Cindy and I started dating a couple years after graduating. Our paths crossed again when Cindy's sister worked with me at the KGS while Cindy was working at the Kentucky Dept. of Environmental Protection. We stayed in Lexington for a year and then lived in Louisville for another two. We married in 2002 and moved

to Portland, Oregon in 2003. Cindy is doing environmental work as the Pretreatment Program Coordinator for the City of McMinnville (a city about 30 miles southwest of Portland). I am working for the Federal Energy Regulatory Commission, Division of Dam Safety and Inspections. We are enjoying the outdoor activities, seeing the sites, and we always use our knowledge of geology to enhance those experiences.



## **Christopher Hettinger, B.S. 1998**

I am currently in my fourth year with the Kentucky Dept. for Environmental Protection. As a Geologist II, I primarily oversee the cleanup activities related to petroleum releases. Sites vary from bulk storage facilities, power plants, railway yards, exempt UST's and AST's as well as halogenated organics from dry cleaner sites. I am also a second lieutenant in the Kentucky National Guard as a chemical officer. I will be traveling with my unit to South Korea for Annual Training this August as the NBC officer.

## **Don H. Neeley, M.S. 1982**

I am currently working as a Senior Project Manager/Geologist at Astbury Environmental Engineering

and serving on the board as Treasurer of the Professional Geologists of Indiana. My son, Owen, turned 11 last August and we went rappelling with his Boy Scout Troop at Natural Bridge State Park in April.

## **Alma Hale Paty, M.S. 1984**

I am still self-employed, with the American Coal Foundation and Vanderbilt University's Dept. of Earth & Environmental Sciences as clients. ACF is a small non-profit that provides educational materials and coal samples free to teachers. Check us out at [www.teachcoal.org](http://www.teachcoal.org). For Vanderbilt, I am assessing the Department's 100-year-old mineral, rock, coal, and fossil collections—it's Christmas everyday when I open a drawer!

## **Ken Pavona, B.S. 1968, M.S. 1971**

Currently on the "disabled list" after 27 years in the oil and gas business. Spend time reading, doing crosswords, and keeping up with exploration activity.

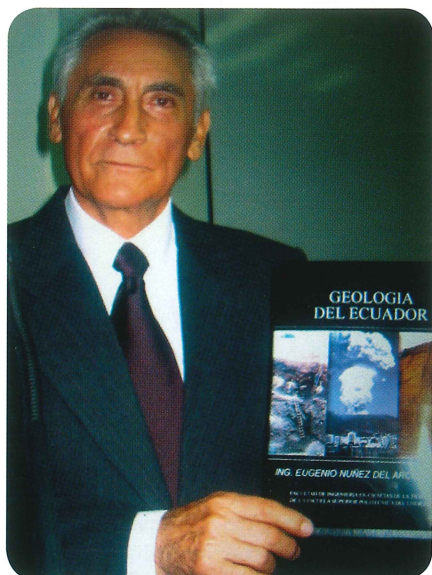
## **James David Wilson, B.S. 1981**

Just recently retired from Kentucky state government office (formerly Dept. of Surface Mining). Staying busy and doing well.

**Continued  
success to all!**



# Catching Up...



## Eugenio Núñez del Arco, M.S. 1979

Since I left the Department with my Master's degree in 1979, I have become a part of the professorial staff of the Escuela Superior Politécnica del Litoral (ESPOL) at Guayaquil, Ecuador, where I teach field geology, structural geology, and Ecuadorian geology. Under the auspices of ESPOL, I have also participated in several geological research projects. One of these projects was a six-year project, which began in 1980 and involved the mapping of the Ecuadorian coast in collaboration with the French group ORSTOM. The main activity of the project was the regional geological mapping of the southern Ecuadorian fore-arc, with special emphasis on the stratigraphy and tectonics of the Manaba and Progreso basins. This project generated 45 geologic maps at a 1:50,000 scale and five publications in Ecuadorian and Peruvian geological congresses.

From 1988 to 1991, I developed government activities as Vice Minister of Mines (Subsecretario de Minas), which was a very interesting experience.

From 1992–1995, I was involved with the project Minero Aguas Calientes to further develop a mineral prospect across 5000 hectares of land in the Mollopongo Range, 65-km south of Guayaquil. The prospect is located on ESPOL property, where interesting gold veins occur, and is called "Mina Escuela Internacional," used by our institute for the teaching of practical mining techniques.

In 2000, through ESPOL and the Ecuadorian government, I was involved

in another mining project, entitled "Tierra Brea de la Península de Santa Elena," during which I evaluated a tar-sand deposit northwest of Guayaquil. In addition, the deposit was characterized and improved for use on peninsula roads.

For the last three years (2001–2003), I have spent my time on faculty organization, curriculum development, and post-graduate programs. In addition, I have spent time writing my experiences and developed two textbooks, *A Geology of Ecuador* (see picture), and a notebook called *Tectonics*. I was pleased to be able to send a copy of my book, *A Geology of Ecuador*, to your library.

In a personal sense, I remember with special fondness the unforgettable time that I spent at your Department, and I especially remember my professors, W. Dennen, V. Nelson, T. Roberts, W. Brown, L. Campbell, W. MacQuown, W. Blackburn, J. Thraillkill, I. Fisher, and B. Moore. Please give my greetings to them; they prepared me well.

## Mark Kulp, Ph.D. 2000

I am currently an Assistant Professor and Director of the Coastal Research Laboratory within the Department of Geology and Geophysics and the Pontchartrain Institute for Environmental Sciences at the University of New Orleans. My primary research focus is on the sedimentary framework of the Mississippi River delta system. Current investigations by my students and me include the relationship between marsh health and substrate subsidence, Quaternary Gulf Coast stratigraphy, patterns and processes of late Quaternary subsidence, barrier island and tidal-inlet evolution in response to coastal erosion and interior wetland loss, and Louisiana coastal restoration plans. Although petroleum geology continues to be important to Louisiana society, coastal geology has taken on an unprecedented importance with recognition of the far-reaching effects of shoreline change

and land loss that are affecting the socio-economic welfare of the state. Consequently, there are numerous efforts underway by state and federal agencies to develop a better understanding of delta-plain evolution, the mechanisms driving high rates of shoreline change and wetland loss, and to formulate long- and short-term plans for living within such a dynamic environment. UNO personnel are contributing significantly to these efforts and it has been quite fun, informative, and very challenging for "Kajun Kulp" to be part of a team that is so involved with the interface between society and nature. I fondly recall my graduate student days at UK and often think of the sights, sounds, and friends I made in the Department and Bluegrass. Especially compelling memories include spur-of-the-moment Friday trips to local outcrops, regional field trips with Drs. Howell and Moecher, and being a field camp teaching assistant for Dr. Ettensohn. I hear that the Department has made quite a lot of progress in recent years with the acquisition of new instrumentation, new funding, and the addition of several faculty positions. I am anxious to see the Department in Spring 2005 when I am scheduled to give a seminar lecture and I encourage the alumni to continue to support the Department's growth with their generosity.



Dr. Mark Kulp (top) and Dr. Duncan FitzGerald (Boston University) vibracoring from the UNO R/V Greenhead in Terrebonne Bay of southern Louisiana.



# Scholarly Activity in the Far East

by Edward Woolery  
Assistant Professor

During the past summer the engineering geophysics group took time off from our ongoing field campaigns in the central United States to make a scholarly visit to the Far East. The initial leg of the trip landed Dr. Zhenming Wang (Adjunct, Kentucky Geological Survey) and me in the south-central Chinese city of Wuhan for the International Conference on Environmental and Engineering Geophysics (ICEEG) where we had been invited to co-chair a special session focused on high-resolution seismic reflection and refraction methods in engineering practice.



*The nearly completed "Three Gorges Dam" is the largest dam in the world without rival. At approximately one-mile across and standing 575-ft. high, the completed structure will create a 350-mile-long reservoir; it will permanently change the ecologic and cultural aspects of central China.*

Following the ICEEG, we traveled farther west along the Yangtze River to the site of the Three Gorges Dam, the largest structure of its kind in the world. Although I have worked on several dam projects during my prior eight-year engineering career, the nearly completed Three Gorges structure is the most spectacular feat of civil and geological engineering I have ever witnessed. The finished dam will stretch ~1 mile across the valley, stand 575-ft high, and produce a reservoir of more than 350 miles in length—truly astonishing! Subsequent to the dam visit, we continued our boat journey upstream for three days to look at the environmental and engineering impacts of the rising reservoir waters (e.g., landslides, lost cultural sites, relocated cities, 2 million displaced people, etc.).

*A common occurrence in the remote upstream areas is farms and dwellings located on the toes of old landslides. The rising reservoir waters are exacerbating these hazards. ►*



The final leg of the in-country journey was a flight back to Beijing where I presented a lecture at the Chinese Seismological Bureau's Institute of Crustal Dynamics summarizing the neotectonics and anomalous near-surface stress in the central United States. I also participated in a follow-up intercommunications program with Zhenming on the broader implications of seismic hazard assessments. An enormous amount of sightseeing and feasting was done in the off hours!

The travels and meetings were very productive, and have led to a cooperative agreement between UK and two branches of China's Institute of Seismology for the coming year. The arrangement will have Chinese researchers coming to Lexington in the Spring Semester 2005 and our delegation returning to China for two summer months of 2005. Earthquake ground-motion simulation, utilizing earthquake data recorded both in the central United States and Gansu Province, China, and fault detection in urban environments using high-resolution seismic techniques are the two specific areas of collaborative research that will be pursued. In addition, this experience is an excellent example of collaboration between our Department and the Kentucky Geological Survey.

# More Faculty Happenings

Ettensohn (cont. from Page 3)

at the University with the idea of trying to map the distribution of various size fractions for the purpose of recycling various size fractions of the ash. Bob is one of the first to attempt this kind of analysis, but his research is typical of the growing need for integrating traditional geologic principles with more recent needs for recycling and environmental remediation.

Former undergraduate Mike Caudill is in the final stages of finishing a brochure for the Heritage Museum of the Texas Hill Country on a dinosaur trackway located at the museum. The study was supported by alumnus Mitch Rutledge of Austin, Texas, and will explain the origin of and characterize the tracks found in Early Cretaceous carbonate tidal-flat deposits of the Glen Rose Formation at the museum.

Finally, the highlight of the year for me was spending three weeks in Italy to attend the 32nd International Geological Congress in Florence. At the meeting I presented a paper on indicators of Ordovician paleoclimate and paleogeography, based on current research in the Lexington Limestone. However, for two weeks prior to the meeting, I went on a field trip to examine volcanoes, eruption styles, and volcanic hazards in and around Naples, and the plate tectonic setting.

Of course, we visited Vesuvius and saw its devastating effects on Pompeii and Heraculaneum. The frightening aspect about the whole trip was the fact that Vesuvius and other volcanoes in the region are



*Vesuvius looming above Pompeii, which was destroyed by an eruption in 61 A.D.*

still active and present an unbelievable hazard for the six million people living in and around Naples. Much of what geologists in the area are doing involves assessing eruption risks and developing ways to evacuate all the people.



*Plaster casts of people buried by volcanic ash in the 61 A.D. eruption at Pompeii.*



# A Passage to India

by Alan Fryar

Associate Professor

From May 10 to June 16, I accompanied my Ph.D. student Abhijit Mukherjee to Kolkata (formerly Calcutta), India, for a month of field work and coincidental cultural immersion. Abhijit came to UK with the intent of studying arsenic contamination of ground water in the area surrounding Kolkata (West Bengal state). The scope of this problem has gradually emerged over the past two decades: an estimated 50 million residents of the Bengal basin in eastern India and Bangladesh face health risks from ingesting arsenic. The arsenic is natural in origin: it appears to be slowly released from sediments transported down the valleys of the Ganges and other rivers draining the Himalayas. Because arsenic contamination is widespread in shallow ground water, and water treatment is not always feasible, especially in rural areas, Abhijit and I are studying the quality and sustainability of deep ground water. We are using data from the network of water-supply wells operated by the West Bengal Public Health Engineering Directorate to develop models of ground-water flow and chemical evolution at the regional scale. This work is being underwritten by the UK Vice-President for Research, the NSF-EPSCoR program, and the Geological Society of America.



◀ Abhijit and a local boy sampling river water from a beached boat in Mayapur.

Traveling to and from Kolkata was an adventure in itself, taking more than 40 hours each way. We flew to India via Hong Kong and Singapore, then returned via Bangkok and Hong Kong. During layovers, I toured Singapore's waterfront and Bangkok's spectacular Grand Palace (think of "The King and I") and "Reclining Buddha Monastery." In West Bengal, Abhijit and his family were wonderful hosts and guides. We visited museums, mosques, and Hindu temples; I even attended a Hindu wedding. Kolkata is the 12th largest metropolis in the world (population 15 million) and was the capital of British India during the 19th and early 20th centuries. The region is culturally vibrant, but it faces significant environmental challenges: in addition to issues of water resources and population growth, the Bengal basin is seismically active and susceptible to monsoonal flooding. I missed the earthquakes and the monsoon, but the weather still took some getting used to: it was often above 100°F and very humid during the day. Fortunately, my sleeping quarters were usually air-conditioned.

The field work itself was the greatest adventure of all. We hired a driver (the intrepid Murali Singh and his trusty Tata Sumo [like a Land Rover]) for three weeks of trips north and south of Kolkata, over an area about 200 miles



*Water buffaloes pulling a cart along National Highway 34 in Murshidabad district, north of Kolkata.*

long by 40 miles wide. I suspect the network of rural roads, some of which are paved, is like that of the USA 60 years ago. To my amazement, we were always able to track down needed supplies, nothing broke, and I never got sick (the polio and hepatitis A shots, typhoid vaccine, anti-malarial tablets, and eating only peeled or cooked food probably helped). We sampled 25 wells and three sites along the Ganges, typically in front of an audience of curious villagers. Away from the urban sprawl, the countryside was placid and green with rice, cane, jute, palms, mangoes, and bananas. It reminded me vaguely of childhood trips to south Florida. Despite a very modest standard of living, people were incredibly hospitable. They usually brought us tea; sometimes we were offered cold drinks, fruit, sweets, cigarettes, or dinner. I ate a variety of things I'd never seen in Indian restaurants here; most of them were quite good.

Our interim results indicate that, unfortunately, some deep public wells are contaminated with arsenic. Moreover, because storms often result in power outages that can last hours to days in rural areas, deep wells that are uncontaminated are not always in service. We found high iron and low dissolved oxygen concentrations that are consistent with results of studies in Bangladesh; arsenic appears to be liberated as iron oxides dissolve under anoxic conditions. Inferring ground-water flow paths and accompanying trends in water quality is complicated because of the heterogeneous delta-plain sediments. I presented our preliminary findings at a symposium at Jadavpur University in Kolkata in June, and Abhijit gave an updated presentation at the GSA Annual Meeting in Denver (where he received one of the very student research grants awarded by the GSA Hydrogeology Division). We plan to host one of our colleagues from the Public Health Engineering Directorate for a 10-day visit to UK in December 2004, and Abhijit will return to West Bengal for a final round of field work in summer 2005.

*Abhijit estimating the concentration of ferrous iron in the Canning municipal well by a colorimetric technique. ▶*





# Recent Contributors

## **Brown-McFarlan Fund**

Les Berry  
Frank R. Ettensohn  
Kenneth E. Neavel  
Alma Hale Paty  
(in honor of W. R. Brown)  
Ken Pavona  
(in honor of W. R. Brown)  
Jim Rankin  
(in honor of W. R. Brown)  
William A. Thomas

Gerald Markowitz  
Harry L. Mathis  
Rodney V. Metcalf  
Richard E. Phillips  
David M. Richers  
Mark Warrell  
Ralph O. Wilson II

## **Rast-Holbrook Fund**

Martha M. Brock  
Sue Rimmer  
Charles Holbrook

## **Geology Support Fund**

Continental Resources Inc.  
Kathleen A. Frankie  
Clay B. Lyon  
James W. Thornton, Jr.  
Page B. Vingralek

## **Geology Museum Fund**

Christopher Hettinger

## **Pirtle Scholarship Fund**

Daniel J. Acquaviva

## **Geology Development Fund**

Dennis R. Bell, Jr.  
Norman Kelly Breeding  
W. H. Dennen  
Jeff & Cindy Esterle  
Russell J. Ford

## **J. C. Ferm Fund**

Charles Holbrook

# Department Funds

With major budget cuts this year and more to come next year, these funds are more important than ever. They enable us to support students in ways we could not otherwise afford. (see article on Page 2)

## **Brown-McFarlan**

Supports student research and travel to present papers and the annual McFarlan Lecture

## **J. C. Ferm Fund**

Graduate student support for field-related research

## **The GEO Fund**

Will support long-term Departmental needs

## **Geology Development Fund**

Supports Department programs in teaching and research through improvement of equipment and facilities

## **Geology Support Fund**

Supports Department seminar program

## **Glenn Rice Memorial Fund**

Supports senior thesis research

## **Haynes Field-Trip Support Fund**

Supports student travel on field trips

## **Rast-Holbrook Fund**

Supports Department seminars and speakers

## **Hudnall Scholarship Fund**

Supports participation in summer field course

## **Pirtle Scholarship Fund**

Supports an undergraduate scholarship for outstanding junior student and graduate fellowships

## **Wallace Hagan Scholarship Fund**

Will support undergraduate scholarships

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