
Indiana University College of Arts and Sciences-Graduate School

HOOSIER GEOLOGIC RECORD

Alumni Newsletter of the Department of Geological Sciences



Photo by John Day

October 1994

Printed by
Indiana University Printing Services



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GREETINGS TO ALUMNI AND FRIENDS

From Lee Suttner, Past Chair:

I owe much to the Department family of faculty, students, staff and alumni for the wonderful support and opportunities provided for me, not only during the past four years of my term as Department Chairperson, but also during the 24 years that preceded this term. Confident that this support will continue to exist and that new opportunities will arise, I leave the chair's office on the first floor and return to the fifth floor in close proximity to my colleagues and students in sedimentary geology with energy and "born-again" feelings of excitement over the prospect of devoting more time to teaching and research.

The Department has experienced success and disappointment over the past four years; my hope is that the former have far outweighed the latter. Improvements in our facilities, a resurgence of alumni support and involvement in Department activities, new curriculum initiatives, especially at the 100-level, increased enrollments, and a more prominent research profile highlight our successes. Our inability during the past year to recruit an established environmental geoscientist for our faculty certainly is a major disappointment. Regardless, John Hayes, the incoming Chairperson, has identified the development of a new environmental sciences curriculum and possible new degree program in this field as one of his major goals. We will renew immediately our search for an appropriate person to work with our current faculty in environmental science, both within and outside the Department, in meeting this goal.

John Hayes will bring to the chair's office outstanding academic wisdom, a distinguished reputation in both teaching and research, and superb organizational and communication skills. He (and the Department) will benefit from the high level of confidence and respect that the College and University administration have in him. Faculty, students, and staff will be challenged to meet his standards of excellence and productivity. All alumni should share the feeling of security I possess that four years from now the Department will have risen to a still higher level during his administration.

My sincere thanks to all of you who have helped in so many ways to give me perhaps the four most memorable years of my professional life.

Lee J. Suttner

From John Hayes, New Chair:

Dave Towell, the editor of this newsletter, has asked whether, as chairperson elect, I would write a few lines "introducing" myself. I've been on the faculty at Bloomington since January, 1970, and had a title in Geological Sciences since September of that same year, but my association with the Department has been much stronger since 1984, when my appointment was changed so that 50% of my salary came through Chemistry and 50% through Geological Sciences.

It's fair to ask how it took me so long to find a proper home as a geochemist, particularly since my interest in chemistry developed while I was growing up in Butte, Montana. We moved there in 1946, and one of my earliest memories of the town is the *blue* puddles. Right there, in parts of our yard where no grass would grow, the water standing after a rainfall must have been 0.1 M Cu^{2+} . Somewhere nearby, tailings were leaching. Each rainstorm produced some new hue from the periodic table, and mineral fragments could be found everywhere. Later we moved and lived just down the hill from the mineral museum at what was then called the Montana School of Mines. I was particularly fascinated by the fluorescent minerals and remember spending hours in the museum.

But, for some reason, it was the chemical formulas that wound up seizing my attention. I was thrilled (believe it or not) by the orderliness of electronic configurations and remember explaining to a baffled seventh-grade teacher who might never have heard about subshells that s, p, d, and f electrons were named for their sharp, principal, diffuse, and fundamental lines in emission spectra (all of that from encyclopedias, of course). The birth of a nerd!

I began graduate school in chemistry at M. I. T. in 1962, at the beginning of the exponential-growth phase of the space program. For me, geochemistry reasserted

itself in the form of cosmochemistry. Although I was thinking in terms of organic chemistry, I talked a natural-products chemist into supervising a thesis on the organic constituents of meteorites (the abundance of NASA funds was more crucial than my eloquence). That brought me into contact with the earth-sciences program just then building at the Institute. Although I didn't meet Professor Shrock, I did audit a seminar that John Winchester taught on organic geochemistry, and, from that, became aware of the work of Abelson and others working on "biogeochemistry" at the Geophysical Laboratory, in Washington, D. C.

I had sought Warren Meinschein's advice while I was working on my doctoral thesis, and he eventually arranged that I should interview for a job in chemistry at Bloomington. It turned out to be the best offer that I had, and I've been happily in Bloomington ever since I completed a postdoctoral year (after two in the Army) with Geoff Eglinton at Bristol, England.

My research is in biogeochemistry; not quite the same thing as organic geochemistry. I will die happy if, when an organic molecule falls through the ocean to the sediment-water interface, I can tell you in advance whether - and understand why - that carbon will ultimately be buried and never seen again until the sediment goes through the whole rock cycle or be remobilized and remain in the atmosphere + hydrosphere + biosphere. In fact, I believe such questions lie at the center of "environmental science," and that our department can provide the best educational home for a technical and scientific program that will supplement offerings like the curriculum in "environmental science and management" in our School of Public and Environmental Affairs. Other aspects of the classical earth sciences are similarly relevant, and I enthusiastically support the Department's search for a new faculty member working on environmental aspects of geophysics. By developing along such lines, we can continue to offer excellent opportunities to our students, and I will do my best to see that we succeed.

With sincere best wishes to you all,

John Hayes

DEPARTMENTAL NEWS

Undergraduate enrollments in the 100-level courses were up 15% over one year ago. Currently, all sections of the service course G103 are now taught in the Geology Building, indicating progress in our effort to provide more personal instruction with smaller sections. New 100-level topics courses for non-majors were taught this past year in oceanography and environmental geology. The addition of several new 100-level courses over the past three years has increased the number of faculty teaching at this level from a low of 2-3 as recently as five years ago, to 10-11 today. Our flagship course is G105 (*Earth, Our Habitable Planet*); two sections are currently offered. Enrollments are holding in the 75-115 range.

Although the past spring produced a substantial drop in students in sophomore petrology, registration is up to normal level for the feeder course this fall in mineralogy. Undergraduate major enrollment is up approximately 25% over the previous year and now numbers 73. There has not been any significant change in the undergraduate major curriculum although there is initial discussion underway now to establish a B.S.E.S., an environmental science degree. The degree requirements would be patterned after our present B.S. degree which would not be altered. The new B.S.E.S. degree would include an increased distribution of courses from appropriate departments within the College (e.g. Biology, Chemistry) as well as revisions to some of our present courses for majors.

At the graduate level, enrollments and applications remain steady. We may see a drop next year because, like other departments of the College, we have been asked to take a reduction in the number of associate instructor appointments (by two in our case). We are vulnerable because of our relatively low enrollments in upper-level undergraduate courses. A new graduate course in GIS (Geographic Information Systems) with emphasis on remote sensing is being co-taught by Haluk Cetin of the Indiana Geological Survey and Visiting Assistant Professor and Larry Onesti of the Department. Haluk completed his Ph.D. dissertation in remote sensing at Purdue University in 1993.

We are excited by the change in status of the Indiana Geologic Survey which has been transferred (effective July 1, 1993) from the Indiana Department of Natural Resources (DNR) to Indiana University where it has become a research institute. It will now report to George Walker, Vice President for Research and the University Graduate School (RUGS). Although its mission remains service-oriented to the State of Indiana, it is expected that the Survey will now work more closely with other units on campus, specifically the Department of Geological Sciences and the School of Public and Environmental Affairs (SPEA). The Survey will gain in a number of ways, including now having access to the very strong University support system and to research areas formerly denied because of its association with the DNR (e.g. water research). The University will benefit from the Survey by its very strong service profile throughout the State, by enhancing the University's image for direct service to the State beyond its educational mission.

Student computing facilities have been strongly enhanced during the past year. Three new 486 PC workstations were added to the sixth-floor student computing room, which has now been relocated to the first floor adjacent to a new Macintosh laboratory. Although the University did not fund the original proposal for installation of a public computing laboratory, the Department was given \$40,000 to establish a laboratory with 12 Macintosh Quadra computers, color printer, projection screen, and chalkboards for exclusive use by geology students and faculty. Software and technical support needed for this laboratory have been donated by the University Computing Services (UCS). These computer rooms (136-138) along with the Unix and Sun workstations in the geophysics laboratories should meet most of our current student computing needs.

The \$27,000 raised by the Advisory Board in its Classroom Technology Campaign was used as leverage in a proposal submitted to the Student Technology Fee Committee for improvements in the lecture auditorium (Room 126). The proposal has been funded by this committee with the addition of \$52,000. This is especially gratifying because the Department was competing with more than 90 other proposals for approximately \$800,000 of available funds and was placed among 12 in a special category relating to finding ways to improve the faculty's

integration of new teaching technology in the classroom.

Phase II of renovation of the biogeochemistry laboratories began in April and will be completed sometime this fall. Included is the former analytical laboratory on the third floor which could not be renovated last year for use by the biogeochemists because of insufficient funding, and a second area is the space on the fourth floor of the Survey wing, nearly adjacent to the Department's new analytical laboratory. The latter is being developed into a core examination laboratory and will include a freezer and refrigerated area for cold storage of cores and water samples. A \$250,000 grant from NSF with matching funds from the University is supporting the second phase of this renovation.

Additional improvements have been completed in the past year in the teaching/research laboratories in geophysics and petrology. Students in these laboratories now have much more functional and pleasant environments in which to work.

The Geology Library has experienced a shortfall of about \$15,000 in its budget during the past two years. The funds will have to come from cancellation of under-used serial publications and more selective purchase of monographs. The faculty has helped Lois Heiser, Geology Librarian, determine which journals are to be eliminated. Helping to offset the severity of this problem is the rapid increase in availability of many of these titles from other sources; with electronic media and new services in place, many journal articles can be made available within a few hours. In addition, the Geology Library currently has five CD-ROM stations. The success of the Hydrodata USGS Stream Flow Data (daily values) and the National Climatic Data (summary of the day) has been so great that there is difficulty at times in using that computer station for other library uses and the CD-ROMS assigned to it. Geology currently has 48 data files on CD-ROM DISCS. Important geological and geophysical journals are now moving toward or have achieved availability in the CD-ROM format.

A forthcoming issue of the *Journal of Paleontology* will include a paper co-authored by William Ausich (M.S., '76; Ph.D., '78) of Ohio State and Gary Lane of I.U. on crinoids from the Mississinewa Shale at

Huntington, Indiana. In this article, a new crinoid species named *Periechocrinites shaveri* is described in honor of Emeritus Professor **Robert Shaver** of I.U. for his many years of study of Silurian reefs and stratigraphy.

Chris Gellasch was selected to receive an Outstanding Student Paper Award from the North Central Section of the Geological Society of America for the oral presentation he made at the 1994 sesction meeting in Kalamazoo in April. He received a check for \$75.00 along with recognition of his contribution.

During the fall semester, three oil company representatives interviewed I.U. students interested in employment in the energy industry and gave group presentations on exploration, production, and/or research activities as well as employment opportunities in geology and geophysics. These representatives included **Terry Carium** of Exxon Exploration, **Mark Northam** of Mobil Oil Corporation, and **Walter Pierce** of Amoco Oil.

Interviews were conducted in the Department during the spring semester by both energy and energy-related companies as well as environmental companies. The former included interviews by **Tad Shea** of Exxon, Inc. and **Dick Gibson** (B.A., 1971) of Gibson Consulting. Environmental companies were represented by **Roy Funkhouser** (M.A., '83) of Law Environmental, **Michael Graham** (A.M., 1978; Ph.D., 1983) of Battelle Pacific Northwest Laboratories, and **Vijay Satoskar** (M.A., '65; Ph.D., '72;) of Envirosience, Inc.

Lee Suttner was honored at two ceremonies at the end of the spring semester as he neared the end of his four-year term as Chairman of the Department. At the annual "T.G.I.O." (Thank God It's Over) dinner of faculty, spouses, and friends held at the University Club, Lee was presented by the Faculty with a beautiful framed black and white photographic print of the Two Medicine River in Glacier National Park, Montana by the prominent photographer **John P. Wickersham**. The print is from Wickersham's collection of contributions to the Missouri River Photography Project. At a later reception in the "Elephant Room" (S201) of the Geological Survey, Lee was honored by staff, students, and faculty and presented with golfing certificates for greens fees and golfing merchandise, certainly a practical gift for someone who will now have

more time for one of his favorite pastimes. All of us express our sincere and deep appreciation for Lee's hard work, dedication, fairness, and success during his tenure as Chair.

We thank **David E. Risley** (B.S., 1980; M.S., 1985) for his response to our request for help in identifying some of the unidentified people in our picture (p. 31 of last year's newsletter) taken on the Sohio-sponsored sedimentary geology field trip to Sapelo Island, Georgia in the spring of 1983. David is the person standing second from the right. Standing third from the left is **Dan O'Hara** (B.S., 1980; M.S., --).



"Si...It was a very good four years." Lee Suttner at his "Hats Off to You" reception upon completion of the Chairman's job.

A highlight of the annual colloquium series in the Department was a special colloquium on November 1, 1993 to honor the memory and achievements of one of the Department's most distinguished alumni, Dr. Robert R. Shrock, who passed away on June 22, 1993 (see memorial article in 1993 issue of this newsletter). Following remarks on behalf of the family by Ms. Wendolyn Shrock, Dr. Shrock's daughter, Dr. Robert Shaver, Professor Emeritus of Geology at Indiana University, presented a colloquium entitled *Deja vu Robert R. Shrock: Silurian Sequence Stratigraphy and Eustasy, Central North American Craton*. Dr. Shaver is internationally known for his work on the Silurian of the mid-continent area -- the same rocks which were the focus of Dr. Shrock's Ph.D. dissertation research at I.U. in the late 1920's.

1993-94 Department Colloquium Series:

- Aug. 30, **Dr. Malcolm Walter**, Macquarie University, Sydney Australia: "The Paleobiology of hydrothermal Ecosystems, and the Search for Fossil Life on Mars"
- Sept. 13, **Dr. Ken Ridgeway**, Purdue University: "Mid-Cenozoic Strike Slip Basin Development, Sedimentation and Paleoclimate Along the Denali Fault System, Yukon Territory and Alaska"
- Sept. 20, **Dr. Kevin Furlong**, The Pennsylvania State University: "Geodynamic Evolution of the San Andreas System"
- Sept. 27, **Dr. Andy Fisher**, Indiana Geological Survey & Department of Geological Sciences: "Permeability and Fluid Flow in the Upper Oceanic Crust"
- Oct. 4, **Dr. Haluk Cetin**, Indiana Geological Survey: "Remote Sensing and Geographic Information Systems: An Integrated Study of Mineral Exploration in Nevada"
- Oct. 11, **Dr. James Brophy**, Indiana University: "A New View of Mid-Ocean Ridge (MOR) Magmatism"
- Oct. 18, **Dr. Bruce Marsh**, Johns Hopkins University: "Magmatic Solidification Fronts and Planetary Structure"
- Nov. 1, **Dr. Robert Shaver**, Indiana University & Indiana Geological Survey: "Deja vu Robert R. Shrock: Silurian Sequence Stratigraphy and Eustasy, Central North American Craton"
- Nov. 8, **Dr. Michael Dorais**, Indiana University: "The Temporal and Spatial Association of Silica-Undersaturated and Oversaturated Syenites, Red Hill Complex, N.H.: The Thermal Divide Dilemma"
- Nov. 15, **Dr. John Crelling**, Southern Illinois University: "Release of Nitrogen and Sulfur During Coal Combustion"
- Dec. 6, **Dr. Carlton Brett**, University of Rochester: "Sequence Stratigraphy, Taphofacies and Evolutionary Paleocology in a Middle Devonian Foreland Basin"
- Dec. 16, **Dr. Carl Enfield**, U.S. Environmental Protection Agency: "Research Needs for Groundwater Remediation"
- Jan. 24, **Dr. Duncan Sibley**, Michigan State University: "Dolomitization Kinetics: Natural and Experimental Studies"
- Jan. 31, **Dr. John Hayes**, Indiana University: "Isotopic Records of Biogeochemical Processes"
- Feb. 14, **Mr. Scott D. Davis**, U.S. Geological Survey, C.E.R.I., Memphis State University: "Triggered Earthquakes"
- Feb. 21, **Dr. Steve LoDuca**, Eastern Michigan University: "Silurian Lagerstätten I Have Known (Plus a Visit to the First Jurassic Park)"
- Mar. 7, **Dr. Fred Phillips**, New Mexico Institute of Mining and Technology: "Ice-Age Lakes and Glaciers: A History of the Hydrological Cycle"
- Mar. 21, **Dr. Arndt Schimmelmann**, Indiana University: "Santa Barbara Basin Varve and Stable Isotope Record of the Last 500 Years"
- Mar. 25, **Dr. Walter Hays**, U.S. Geological Survey, Office of Earthquakes, Volcanoes, and Engineering: "Role of Geology and Geophysics in an Environment Needing the STAPLE Approach: Social, Technical, Administrative, Policy, Legal, Economic"
- Apr. 4, **Dr. Isaac Winograd**, U.S. Geological Survey, Reston, VA: "The Roles of Intuition, Luck, and Non-Cancelling Unknowns in an Exciting Discovery: The Devils Hole Paleoclimate Record"
- Apr. 18, **Dr. David Meyer**, University of Cincinnati: "Paleocology and Taphonomy of Carbonate Facies within a Mississippian Clinofom: Fort Payne Formation of Kentucky and Tennessee"
- Apr. 25, **Dr. Haydn Murray**, Indiana University: "Clays in the Industry and the Environment"

May 2, **Dr. David Lambert**, Monash University, Australia: "Re-Os and Sm-Nd Isotope Geochemistry of the Stillwater Complex, Montana: Implications for the Petrogenesis of the J-M Reef"

Additional Seminars, Brownbag Talks, and Special Presentations:

- Sept. 1, **Dr. J. Robert Dodd**, Indiana University: "Anatomy of the Grainstone Shoal Facies of the Salem Limestone"
- Sept. 8, **Dr. Alan Horowitz**, Indiana University: "Lyellian Curves and the Fossil record of the Recent Bryozoan Fauna"
- Sept. 13, **Dr. Ken Ridgeway**, Purdue University: "Influence of Laramide Thrusting on Paleogene Synorogenic Conglomerates, Bighorn Range, Wyoming"
- Sept. 15, **Mr. Donald Eggert**, Indiana Geological Survey: "Shear-Wave Velocities and Soil Periods for Unconsolidated Deposits in Evansville, Indiana: Seismic Risk Mapping in an Urban Environment"
- Sept. 21, **Dr. Kevin Furlong**, The Pennsylvania State University: "Rheology of Oceanic Transforms"
- Sept. 22, **Dr. Gary Lane**, Indiana University: "Field Work in China"
- Sept. 29, **Dr. Michael Savarese**, Indiana University: "The Biology and Ecology of Freshwater Sponges, Lake Baikal, Russia: Adventures in Siberia, Both Above and Below the Water"
- Oct. 6, **Ms. Ana Carmo**, Indiana University: "Paleoclimatic Implications of Upper Cretaceous Marlstone/Limestone Rhythms in the Sergipe Basin, Brazil"
- Oct. 19, **Dr. Bruce Marsh**, Johns Hopkins University: "Solidification and Convection in Magma Chambers"
- Oct. 20, **Mr. Sujoy Ghose**, Indiana University: "Late Cenozoic Mountain Building in the Central Tien Shan of Kyrgyzstan: Implications for Tectonic Processes in an Intercontinental Thrust System"
- Oct. 20, **Dr. Abhijit Basu**, Indiana University: "Metal Pollution in the Venice Lagoon (Italy): Model, Observation, and Possible Removal Paths"
- Nov. 10, **Ms. Carla Whittington**, Indiana University: "The Interpretation of a Soil Profile, Bloomington, Indiana"
- Nov. 12, **Dr. John Crelling**, Southern Illinois University: "Three Hot Microscopes"
- Nov. 17, **Mr. Lindsey Leighton**, Indiana University: "Palaeoecological Significance of Campanian Foraminifera in the Western North Atlantic"
- Dec. 1, **Ms. Matt Warner**, Indiana University: "Sedimentology of the Franciscan Complex in Santa Barbara County, California"
- Dec. 8, **Mr. Glenn Bear**, Indiana University: "Remote Sensing and Geographic Information Systems: Application to Meander Migration on the Wabash River - The River Movie"
- Dec. 8, **Mr. Jason McCuiston**, Indiana University: "Undergraduate Honors Research in Clay Mineralogy"
- Dec. 17, **Dr. Carl Enfield**, U.S. Environmental Protection Agency: "Resistive Tomography in a Physical Model Aquifer"
- Jan. 12, **Mr. Glenn Bear**, Indiana University: "Maximizing Quantitative Subsurface Information from Satellite-Derived Gravity Data"
- Jan. 19, **Dr. Clifford Ambers**, Indiana University: "A Structural Petrologic Argument for Deep Burial Cementation in the Salem Limestone and Other Comments on the Petrographic Character of Stylolite-Related Cements"
- Jan. 26, **Dr. Enrique Merino**, Indiana University: "Shapes, Replacements, and Other Textures: The Neglected Power of the Eye, and How it Could Do for Soil Science, Geochemistry, Sedimentology, Geohydrology, Geomagnetism, etc."
- Feb. 9, **Mr. Rob Mellors**, Indiana University: "Travels in Kyrgyzstans"
- Feb. 16, **Dr. Alan Horowitz**, Indiana University: "Evaluating Devonian Bryozoan Extinctions and Originations"
- Feb. 23, **Mr. Eugenio Santos**, Indiana University: "Geochemical Characterization of Oils of the Potiguare Basin, Brazil"
- Mar. 2, **Mr. Charles Zuppann**, "Top Ten Reasons Why the Ste. Genevieve Limestone is Difficult to Interpret"
- Mar. 9, **Dr. John Droste**, Indiana University: "You Gotta Have Luck to be Successful with the Mansfield"
- Mar. 23, **Mr. John Guthrie**, Indiana University: "Chemostratigraphic and Sequence Stratigraphic

GEOLOGIC FIELD STATION

- Correlation of the Upper Ordovician Maquoketa Group, Illinois Basin"
- Mar. 30, **Mr. Nathan Way**, Indiana University: "Tectonic Controls on Alluvial Systems in a Distal Foreland Setting: The Cloverly/Lakota Formations (Cretaceous) in Wyoming, South Dakota and Montana"
- Mar. 31, **Mr. Roy Funkhouser**, Law Environmental, Inc.: "Assessing Extent of Environmental Contamination"
- Apr. 5, **Dr. Isaac Winograd**, U.S. Geological Survey, Reston, VA: "Research on Age and Isotopic Composition of Cave Dripstones that Calls into Question Control of Quaternary Climatic Cycles by Milankovitch Parameters"
- Apr. 6, **Dr. Michael Savarese**, Indiana University: "Theoretical and Biomechanical Analysis of Archaeocyathan Functional Morphology: "The Little Sponge That Could...."
- Apr. 13, **Paleoecology Seminar**, Indiana University: "Crinoid Ossicles as Sedimentary Particles: "Velveeta" in Abundance, But "Swiss" in Hydrodynamic Behavior"
- Apr. 20, **Mr. Chris Gellasch**, Indiana University: "Depositional History of the Upper Dakota Formation and Graneros Shale (Cretaceous), Central Kansas"
- Apr. 22, **Dr. Marion H. O'Leary**, University of Nebraska: "Carbon Isotope Fractionation in Plants: the Next Generation"
- May 4, **Ms. Barbara Ziegler** (aka Barbara Grehl), Indiana University: "Application of Fluid Flow Transport Design Theory to Sponge Functional Morphology: A Quantitative Analysis"
- May 10, **Mr. Dana Strength**, Indiana University (Undergraduate Honors): "Concentrations of Major Elements in Limestone/Marlstone Couplets as an Indicator of Cretaceous Environmental Conditions in the Sergipe-Alagvas Basin, Brazil"
- May 13, **Ms. Jennifer Klug**, Indiana University (Undergraduate Honors): "Factors Influencing Spatial Variability of Hydraulic Conductivity in Saturated Alluvium"

The forty-fifth summer at the Geologic Field Station in the Tobacco Root Mountains was characterized by an expanded enrollment in both options of G429. Both students and faculty were challenged not only by the geology of Southwest Montana and adjacent areas, but also by probably the worst weather in at least thirty years. Unseasonably cold, rainy, and cloudy conditions prevailed for the entire summer.

In spite of the generally poor to fair field conditions, the 1993 Field Station program met its goals. Enrollments in G429 continued to increase. Options I and II both included 61 students. For Option I, this represented a single-year increase of 25% and 86% over two years. Option II was up 36% over 1993 and 118% over the two-year period. Consequently, overall for both options the total two-year increase in enrollment in G429 stands at 88%. Admissions for 1994 indicate that each option should enroll an optimum 65-67 students. There even have been short waiting lists for applicants.

Abhijit Basu again taught our introductory courses, G111-G112. Enrollment in these courses was up to 14 (from 10 in 1992), marking a significant increase. The one-week Alumni College taught by **Gary Lane** (I.U.) and **Tom Straw** (Western Michigan) served 14 participants in 1993, one less than in 1992. As was the case with the courses earlier in the summer, the late August Alumni College was not blessed with the best of weather, but a great time was had by all. Enrollment has grown substantially for 1994 with a final total of 21. Six persons remain on a waiting list in case of cancellations. Bob Shaver's wife, Sue, is enrolled and we are pleased that he is going to serve as an additional (volunteer) instructor to assist Gary and Tom.

New additions made possible by donations to the Field Station include a small library/reading area in the lodge and the basketball (half) court. Both were very popular in 1993. The reading area with numerous journal articles is located along the south wall of the lodge just west of the central entrance. A series of shelves for reading materials extends from the south wall about one-fourth of the way into the lodge, partially separating the eating/study area from the fireplace and west half of the

building. The backside of the shelves sports a nice, large, permanent blackboard facing toward the dining/study area. The study/reading desks installed along the south wall proved especially popular and will be extended along the entire length of the wall.

The basketball court is located west of the volleyball court and is a sufficiently large concrete pad that one can launch NBA 3-point attempts at the goal located on its west end. Too bad last summer's students couldn't appreciate the monumental improvement over our old basketball "court" with its dirt depression which alternately went from being filled with thick dust to mud! Dribbling wasn't that great, either, on the surrounding grass.

On a less happy note, for the first time in the history of the Field Station, a student suffered a serious rattlesnake bite and we experienced major vehicle damage in an accident involving two vehicles in the caravan returning to Bloomington following the conclusion of Option II. Fortunately, there were no serious injuries related to the vehicle accident, which was caused by inattentive driving on the part of someone attempting to pass our vehicles. After a three-day hospital stay, the student bitten by the snake was able to resume her work in G429, but at a slightly restricted pace.

Looking into the future, we have two significant projects to consider. First, the underground gasoline storage tank must be replaced by 1999, at an expected cost of \$10-15,000. We are hopeful that support for this will come from the general University budget as opposed to our Field Station budget. Secondly, we must improve the sleeping quarters for the students. In the first step, we could install electrical baseboard heating in the smaller dormitories, now mostly occupied by the women students. But we must also improve the two large men's dormitories and provide the men with more privacy than they now possess. One solution would be to partition the two larger dorms into smaller rooms. If we did this, space would be lost and we would have to construct a new dormitory on the lower campus to accommodate an equivalent number of male students. Planning and fund raising for these projects might be linked to the 50th anniversary of the Station which will be celebrated in 1999.

INDIANA GEOLOGICAL SURVEY

On July 1, 1993 the Indiana Geological Survey's status as a division of the Indiana Department of Natural Resources came to an end and a new era began in which the Survey will function as a research and service-oriented institute of Indiana University. The event was commemorated by a ceremony at the Survey on June 18. At the ceremony, **George Walker**, IU Vice President for Research and the University Graduate School, and **Patrick Ralston**, Director of the Indiana Department of Natural Resources, spoke optimistically of the opportunities for new and continued cooperation between the Survey and the DNR, and between the Survey and other institutes and departments of IU. The Survey, which traces its roots back to **David Dale Owen's** 1837 appointment as Indiana's first State Geologist, had been a division of Indiana state government since 1869, and has been located on the IU Bloomington campus since 1947.

The Survey hosted or sponsored four conferences during the fall of 1993. The Indiana Arc Info Users Group conducted a conference at the Survey in September. During October, the Survey hosted a weekend workshop highlighting recent research findings concerning seismic hazards in Indiana, and co-sponsored a conference on opportunities for the use of limestone in coal desulfurization at the Indiana Government Center in Indianapolis. During November, the Survey was also the site of a three-day symposium on the economic resources of the lower Pennsylvanian rocks of the Illinois Basin.

Computerization at the Survey has advanced with the addition of several pieces of equipment, including a scanner that will accept items up to 36 inches in width, disks that provide the Survey and Department staffs with about 11 gigabytes of network storage space, and photographic imaging hardware and software.

After 25 years of service as a geologist and section head with the Survey, **Curt Alt** retired in December of 1993. A gathering was held in Curt's honor at which he was presented a laser printer for his computer by his colleagues. Curt served as head of the Coal, Industrial Minerals, and Mineral Resources Sections of the Survey. Among his many contributions to the Survey's mission of service through applied geologic research was Curt's key

role in the discovery and mapping of Silurian reefs in northern Indiana. Rocks quarried from these reefs are a source of high-purity limestone and dolomite. Curt's efforts earned him the Indiana Mineral Aggregates Association's 1994 "Aggie" award for service to the aggregate industry in Indiana.

Don Carr, Principal Geologist, for Industrial Minerals, is senior editor of the sixth edition of *Industrial Minerals and Rocks*, which was published during the spring of 1994 by the Society for Mining, Metallurgy, and Exploration. Don is also co-author of a chapter on limestone and dolomite. **Haydn Murray**, of the Department of Geological Sciences, is associate editor and author or co-author of six chapters on clay minerals. Other contributors to the 1200-page volume include **Nelson Shaffer**, geologist and acting head of the Mineral Resources Section of the Survey, who is author of a chapter on biotechnical materials, and **Karan Keith**, doctoral student, who is co-author of a chapter on clay uses.

Denver Harper, of the Environmental Geology Section, was presented the 1993 Innovation Award by the Indiana Society of Mining and Reclamation at the society's annual meeting in December at Vincennes University. The annual award is presented to an individual who has made a significant contribution to the development or implementation of innovative methods for the reclamation of coal-mined lands. Harper's work involved demonstration of a reclamation method, known as direct revegetation, at an abandoned mine site near Dugger in southwestern Indiana.

Three new geologists have been added to the staff. **Haluk Cetin**, geologist in the Energy Resources Section, joined the Survey staff in March of 1993. Before that, he was a research and teaching assistant with the Purdue University Department of Earth and Atmospheric Sciences. Haluk also teaches in the IU Department of Geological Sciences and in the School of Public and Environmental Affairs. His work with the Survey has involved coal availability and the potential for high quality coal resources in southwestern Indiana.

John Noel began working for the Survey's Environmental Geology Section in May of 1993. He is working on water well computerization projects in Lake and

Porter Counties. Before joining the Survey, John was a geophysicist with Texaco in New Orleans.

Andy Fisher, a hydrogeologist, holds a joint appointment with the Survey and the Department of Geological Sciences. He came to IU in September 1993 from Texas A&M where he was a research scientist. He is currently working on a Survey study of the hydrogeology of the Crane Naval Surface Warfare Center in Martin County. During the coming summer Andy will spend two months on a mobile drilling platform/research ship near Barbados collecting data on how changes in fluid pressure along a major active fault allow tectonic plates to slide past each other.

New employees haven't been the only personal changes around the Survey lately. Baby news was highlighted this year by the February 20 birth of **Quintin Charles Thompson**, who made proud parents out of **Todd Thompson**, geologist with the Energy Resources Section, and **Linda Pride Thompson**, IU alumna and geologist with the Indiana Department of Environmental Management.

The Survey also had a wedding. **Tammy Watson**, Norm Hester's secretary, became **Tammy Watson-Fleck** on April 16. The wedding was followed by a trip to San Diego.

Finally, **Nelson Shaffer's** collection of gorilla toys, puzzles, stuffed animals, posters, and other miscellaneous objects now numbers more than 300 items--most of which have found a suitable habitat within the confines of Nelson's office.

FACULTY NEWS

A banquet was held in tribute to Professor **Haydn H. Murray** upon his retirement this spring. **Donald Hattin** wrote the following summary of this occasion.

Haydn H. Murray

On April 22, 1994, more than 220 family members, Geology faculty members, business associates, alumni and friends assembled for a banquet to honor **Haydn H. Murray** upon his retirement from Indiana

University. The banquet; which was sponsored by Oil Dri Corporation of America, the Spinks Clay Company, and the Thiele Kaolin Company; was held in the Hoosier Room of Memorial Stadium. Haydn's mother, **Mrs. Herbert Murray**, was an honored guest, and **Don Hattin** served as master of ceremonies. Each banquet guest received a printed encomium that outlines the events of Haydn's career from early days on an Illinois farm and service in the South Pacific during WWII, through college and graduate school years at the University of Illinois, to his first years (1951-1957) as a faculty member at I.U. The encomium continues with a summary of Haydn's years with Georgia Kaolin Company, return to I.U. in 1973 to serve as departmental chairman, presidency of three professional societies, service as trustee on the boards of two philanthropic and two professional foundations, receipt of numerous awards including the Hal Williams Harding Award from the American Institute of Mining Engineers and receipt (1993) of a Distinguished Service Award from Indiana University.

The formal program included comments, thanks, and words of praise from Haydn's brother, **Winston**; from **Wayne Bundy**, Haydn's first doctoral student, **Jessica Elzea Kogel**, a doctoral student from Haydn's second period of service at I.U.; Education Professor **Marianne Mitchell**, who served with Haydn as Co-Faculty Representative to the NCAA and Big Ten Conference; and **Clarence Doninger**, Director of Intercollegiate Athletics at I.U.

The next speaker was **Lee J. Suttner**, who presented Haydn with a gift from faculty and staff members, and a check for \$15,400 that was contributed by alumni, friends, and family toward the establishment of the Applied Clay Mineralogy Professorship. This chair, which is now nearly 50% funded, was announced in the banquet invitations that were mailed to approximately 300 of Haydn's friends.

The master of ceremonies introduced Haydn by commenting on Murray's wonderful memory for detail, great appreciation of those who help him in any way, compassion for his students and incredible good luck. Haydn then concluded the evening's program by extending words of thanks to all of those who have had an effect on his career, singling out for special tribute his mother, **Ardis**.

Those who wish to contribute to the Applied Clay Mineralogy Professorship should write their checks payable to the Indiana University Foundation; label "for Applied Clay Mineralogy Professorship"; and send to **Sarah Burton**, Department of Geological Sciences, Indiana University, Bloomington, Indiana 47405.



Haydn H. Murray's retirement party. "Way to go!"

Jim Brophy continues his research on calc-alkaline differentiation mechanisms in subduction zone volcanism. He's starting research in mid-ocean ridge volcanism in the evaluation of differentiation mechanisms and general magmatic processes beneath spreading centers. Jim recently had two papers accepted for his initial work and is pursuing funding in this area which could result in a major shift in the direction of his research. Jim also is

working with **Ed Ripley** on a series of experiments to determine the solubility of Cu in basaltic liquids. "Ed provides the ideas...I carry out the experiments. A nice symbiotic relationship," he says.

Jim has a current NSF grant with **Mike Dorais** to study hornblende gabbro cumulates from the Medicine Lake Volcano (an evaluation of competing mechanisms of calc-alkaline fractional crystallization mechanisms). He has a second grant from the Joint Oceanographic Institutes/U.S. Science Support Program (JOI/USSP) for mineralogic and experimental studies of Ocean Drilling Program Leg 142 igneous rocks. Jim also has a proposal pending with NSF for textural and compositional studies of plagioclase phenocrysts from the East Pacific Rise; an assessment of temporal and spatial variations in magmatic processes beneath a fast-spreading ridge system.

Jim has **Matt Paige** undertaking a doctoral study of the evolution of igneous layering in the Guadalupe Complex, Sierra Nevada foothills, California and **Carla Whittington** is working on masters research with petrologic investigations of pyroxene-rich high-alumina basalts from Kanaga Island, Aleutian Islands, Alaska.

On the personal side, **Jim** and **Evelyn** are the proud parents of a second daughter, **Jennifer Erin Brophy**, born on June 16, 1993. An enlarged family has compelled the Brophys to sell their old house and build a new one, next to the Towells and across the street from the Meads, thus enlarging the geology contingent in the east-side neighborhood of Edgewood Hills.

Michael Hamburger spent the past year on sabbatical leave at the Institut de Geodynamique, associated with the University of Nice in southern France. He and Jennifer are living in Sophia Antipolis, a new techno-center (the Silicon Valley of France!) up in the hills west of Nice. He's working with Professor Jean Virieux, concentrating on a study of seismic velocity tomography in the Garm region of Tadjikistan. The family is enjoying the fruits of the region--sea, mountains, and great food & wine, and he's trying to learn a little Alpine geology in the process.

During the summer of 1993, Michael organized a major, multi-national field experiment applying the Global Positioning System for high-precision measurements of regional crustal deformation in the Tien Shan Mountains of Kyrgyzstan and Kazakhstan, former Soviet Union republics. The experiment involved some 50 participants from ten institutions in four countries, and successfully collected

satellite data from 86 sites over an area twice the size of Indiana! There were four IU participants -- Michael and graduate students, Sujoy Ghose, Rob Mellors, and Xiaodan Song. It was a great adventure for all!

Michael has started an interesting new project with IU graduate student Emmanuel Ramos, looking at seismicity associated with the cataclysmic eruption of Mt. Pinatubo and its aftermath. Mike had a two-week visit to the Philippines this past spring to witness in person not one, but two volcanic crises. Not only Pinatubo, but now Taal volcano is getting ready to blow again. Taal is much closer to Manila, and is situated in a caldera with about 50,000 residents still living within it. Very nerve-racking situation, to say the least! Emmanuel is spending the year back at his home institution (the Philippine Institute of Volcanology and Seismology), and he has just been promoted to the post of vice director. Pretty impressive for a graduate student!

Don Hattin attended the annual meeting of the Eastern Section, American Association of Petroleum Geologists held in Williamsburg, Virginia in September 1993. At the annual banquet, Don received the Section's Outstanding Educator Award for "outstanding teaching of geology students at Indiana University". **Gerald H. Johnson** (B.S., '60; M.A., '62; Ph.D., '65), who is now Professor of Geology at College of William and Mary, hosted Marge and Don during their visit and took Don and **Larry Woodfork** (B.S., 1964; M.A., 1965) on a field trip to study a spectacular exposure of the Pliocene Yorktown Formation.

Don had an interesting experience in April. **Robert W. Kirby** (B.S., '59) who earned a master's degree in engineering after leaving I.U. and works as a structural engineer in California, walked into Don's office. Don had not seen him in 39 years. An hour earlier, during an historical geology lecture, Don had showed a slide that included a clear view of, you guessed it, **Bob Kirby!**

Norman Hester was named Vice President of the Association of American State Geologists in January 1994.

Gary Lane has recently received NSF funding for a two-year grant with **Johnny Waters** (M.A., '76) and **Chris Maples** (Ph.D., '85; M.S., '85) They will return to China for field work sometime in 1995. Gary also plans

a museum trip to England to study late Devonian crinoids from the Pilton beds of the type Devonian. He will officially retire in December 1994 but plans to continue various research projects. He just finished two papers, one on Silurian crinoids from Huntington, Indiana with Bill Ausich (Ph.D., '78; M.S., '76) and one on Upper Carboniferous crinoids from the Tien Shan Mountains of Xinjiang Autonomous Region in the Peoples Republic of China. The latter fossils occur in a peculiar volcanoclastic debris flow.

Gary continues to enjoy teaching at the Alumni College at the Montana Field Station in late August, and he now has taught an Honors Division class on natural history of southern Indiana completely in an outdoor setting.

Enrique Merino is starting work on the genesis of bedded cherts and banded iron formations with **Richard Murray** of Boston University and **Yifeng Wang** (Ph.D., 1993) of Georgia Tech. The latter is on a post-doctoral appointment working on EPA-funded environmental geochemistry research. Enrique is trying to finish a glut of work in progress from the last four years. He traveled to China this June to lecture at Beijing and Changchun, to Spain in July not to lecture, and to Edinburgh in August to lecture at a Goldschmidt Conference in geochemistry.

Two post-doctoral fellows are working with Enrique at I.U., Prof. Yutian Wang of Changchun University (on laterization) and Prof. Ildefonso Armenteros of the University of Salamanca, Spain (sedimentary geochemistry). Enrique says "my wife and I spend our time, most of it, shuttling our children from place to place. Time is going; life is short."

Haydn Murray formally retired at the end of the 1993-1994 academic year, but will remain very active. He is most appreciative for the retirement dinner held April 22 (see above) and particularly for the efforts of **Kim Schulte** in its organization. Haydn will continue to supervise the graduate students who have not yet completed their theses. Current students include **Karan Keith**, **Jean Hemzaeck Laukant**, **Jason McCuistion**, **Clayton Millard**, **Xujia Weng**, and **Huitang Zhou**. Laukant has a fellowship from Oil-Dri Corporation of America and McCuistion has the Grassmann Fellowship. Among former students whose addresses were not reported in this newsletter last year; **David Burke** (B.S., '75; M.S., '85) heads up the environmental group at Oil-Dri Corporation of America in

Ochlocknee, Georgia; and **Roland Merkl** (M.S., '85; Ph.D., '89) is working for an environmental company in Munich, Germany. Roland is now married and he and his wife soon expect to be parents.

Haydn has established a new fund at the I.U. Foundation to establish an endowed professorship (Applied Clay Mineralogy Professorship). The amount required for funding is \$500,000 and \$200,000 has already been contributed. Haydn hopes this professorship will be fully funded by 1997 and will enable I.U. to maintain its outstanding program in applied clay mineralogy.

Haydn and **Juanita** plan to stay in Bloomington, and he will still be at the Department and doing consulting work around the world.

Greg Olyphant is busy with three research grants. A study of the chemistry and movement of septic tank adsorption field effluent in the Dunes Area, Lake and Porter Counties, Indiana is funded by the US-EPA. **Denver Harper** and **Ed Hartke** of the Indiana Geological Survey (IGS) are collaborators. Doctoral student, **Chris Carlson** is undertaking doctoral research on this project which involves intensive monitoring of water chemistry and movement in the vadose zone and shallow water table beneath dry wells in the town of Beverly Shores.

In another project, funded by USGS-NEHRP, **Greg**, along with **Gordon Fraser** and **Todd Thompson** (Ph.D., '87; M.A., '84) of the Indiana Geological Survey are analyzing the potential geomorphic response of the Wabash River to neotectonic deformation along the Wabash Valley fault system. Finally, the USGS and NOAA-Sea grant for the study of contemporary and historical eolian transport in a coastal dune environment along the south shore of Lake Michigan, Indiana has been completed. **Steve Bennett**, who is completing his Ph.D. thesis on this subject, has accepted an offer to join the faculty of the Department of Geology at Western Illinois University beginning this fall.

Vishnu Ranganathan has been studying how the high salinity of interstitial waters in the Illinois Basin constrains groundwater flow velocities and hopes to expand this project with the involvement of **Andy Fisher**, a former ODP staff hydrogeologist, who is currently a visiting scientist in the Department. Former student **Mark Williams** (M.S., '93) reports that he is enjoying the work at Battelle Pacific Northwest Laboratories, and that he has

been involved in some hydrogeologic work at the Yucca Mountain site. How are those custom-tailored white plastic lead-lined suits, Mark? Can you eat your lunch without taking them off?

Last August, Vishnu and wife, Peg, had a very enjoyable vacation in Vermont where they hiked some nice trails, tested some Irish pubs, and mutton pies (quite good). He recommends Vermont.

Ed Ripley has been invited to contribute a chapter on the Duluth Complex to *Layering in Igneous Rocks*, a new edition of this title dedicated to Wager and Brown and their first book on layering in igneous rocks. Ed has initiated collaborative work with Jim Brophy doing experimental studies of copper solubility in mafic melts. They are using Jim's 1 atm, fO_2 -controlled, gas-mixing furnace. Synthetic basalts are the starting materials. Research in northeastern Minnesota continues with a number of projects involving our students, or in collaboration with members of the Minnesota Natural Resources Research Institute. **Insung Lee** has completed his doctoral dissertation on petrologic and geochemical studies of the Spruce-Road Cu-Ni deposit, Duluth Complex; **Nur Iskandar Taib** continues his Ph.D. study of evaluation of multiple magma inputs and sulfide genesis at the Babbitt Cu-Ni-PGE prospect, Duluth Complex; and **Young-Rok Park** is doing doctoral research on oxygen and hydrogen isotopic studies of hydrothermal alteration and crustal contamination of the North Shore Volcanic Group and related hypabyssal intrusives, Minnesota.

Ed currently has three grants: an NSF-funded study of metal sources and mechanisms of enrichment for Cu-Ni-PGE mineralization in Fe-Ti-rich gabbroic rocks, Duluth Complex; an I.U. Mid-Career and Senior Faculty Fellowship for experimental studies of copper solubility in mafic magmas; and a grant from Martin Marietta to do analysis of $^{18}O/^{16}O$ ratios in granitic rocks.

Insung Lee (Ph.D., 1994) will assume responsibilities as director of the stable isotope facility at the Korean Basic Science Center on June 1, 1994.

Al Rudman was on sabbatical leave during the fall semester 1993. In June, he visited Korea, China, and Hawaii, presenting papers at national universities and research institutes in Seoul, Taejon, Gwanju, Beijing and Changchun. In Korea, Al was hosted by Byung Doo Kwon (Ph.D., 1977). After a month at SOEST (Hawaii) as a

research associate, he joined Dr. Carl Kisslinger, Director of CIRES at Boulder, Colorado, as a visiting research scientist working on the analyses of velocity variations observed in Central Asia.

Graduate students working under Al now include **Glenn Bear** who is undertaking a doctoral study on gravity and magnetic interpretations of the mid-continent and **Lori Bear** who is doing a masters study on the role of earthquake source mechanism in P_0/S_0 wave train generation.

Bob Shaver has three scientific articles in the hands of symposium organizers and editors, approved for publication but not yet published. He gave two featured addresses during 1993-1994, one in November on the occasion of the Departmental memorial colloquium for **Robert Shrock** (A.B., '25; M.A., '26; Ph.D., '28) and the other in January honoring the retirement of **Jack Sunderman** at IUPU, Fort Wayne. Bob also addressed the Indiana Geological Survey seminar in November. He is in the final year of his three-year appointment as an associate editor of the *GSA Bulletin*.

In the summer of 1993, **Bob** and **Sue Shaver** traveled with the Indiana University Alumni Association group to China. They visited numerous cities; took a four-day cruise on the Yangtze River; stayed in new "palatial hotels" (Hilton, Sheraton, Holiday Inn, and Beijing Palace); and flew first-rate airplanes. Bob says that the trip was a wonderful experience/adventure, generating both depressive and optimistic thoughts about China's future. He wrote his usual humorous/factual/cynical/spoofy travel book, about 100 pages and 115 colored plates: *Me and Sue and the Great Chinese Phoenix. Great Chinese Phoenix. Phoenix*. They braved a Pacific typhoon atop Victoria Peak in Hong Kong, thus adding one more sought-after adventure to Bob's life. He says he only has a severe earthquake and volcanic eruption to complete his agenda.

In May 1994 Bob attended his 50th graduation reunion at Monmouth College and was inducted into a heritage society at the school. In attending his first-ever college reunion, Bob also stated, "I want to show a snooty coed I dated only once - and she wouldn't park with me on a first date - how wrong she was to treat me so shabbily." In August, Bob will be assisting **Gary Lane** and **Tom Straw** in the one-week Alumni College at the Geologic Field Station in Montana. In addition, Bob will

be conducting a one-week course in January 1995 on "Fossil Life and the Dynamic Earth and Its Bases" to the local Elder Hostel group that meets at Clifty Falls State Park near Madison, Indiana. A field trip is demanded in January, believe it or not!

Lee Suttner is looking forward to a more typical faculty member's life when he finishes his four-year term as Department Chairman in July. He is especially excited about being able to devote more time to his foreland basin research in Wyoming and South Dakota with graduate students **Nathan Way**, **Pat O'Malley**, and **Craig Rankin**, all of whom joined him in the field in May. This project focuses on structural controls on the location and migration of Early Cretaceous trunk rivers. Recent results of this work appear in two separate publications which are in press. Lee also expects that his freedom from Departmental administrative responsibilities will permit him to devote more time to development of a field environmental course at the Geologic Field Station and to planning for enhancement of facilities at the Station.

Lee's wife, **Ginny**, is principal at St. Charles School in Bloomington. His son, **Jim**, has returned to I.U. to seek a second bachelor's degree -- this time in accounting. Daughters **Lisa** and **Lori** have started a pre-school program and day-care center through St. Charles Church and **Jennifer**, her husband, and two-year old son have recently relocated to Kalamazoo, Michigan.

Dave Towell has been elected Secretary of the Bloomington Faculty Council for 1994-95. He will serve on the Agenda Committee which meets weekly, including every other week with the Bloomington Vice-President and Chancellor **Kenneth Gros Louis**. Dave will chair the BFC Student Affairs Committee as well as the system-wide University Faculty Council's Student Affairs Committee. Major activities of these committees continues to involve revisions of the *Code of Student Ethics*.

Dave bit his lip and gave up following the Hoosiers on the NCAA trail this spring break with a trip to Puerto Rico with **Lindsay**, son **Garrett**, daughter-in-law **Cheri**, and granddaughter **Jessica**. The main purpose was for all of them to see **Lindsay's** step-grandmother. However, there also was opportunity to see volcanic rocks, snorkel coral reefs, and test the beaches of Puerto Rico and two of the U.S. Virgin Islands (St. Thomas and St. John).

Robert Wintsch continues his very exciting collaboration with **Mick Kunk** at the USGS in Reston, where $^{40}\text{Ar}/^{39}\text{Ar}$ age dating is involved with many of their research projects. Bob has two graduate students working on hardrock projects. **Julie Boyd** is close to finishing her masters's thesis - an $^{40}\text{Ar}/^{39}\text{Ar}$ study of amphiboles in the Bronson Hill terrane of central New England. She found a 100 ma age gradient in these rocks, showing that the tectonic evolution of the rocks from southern New Hampshire to Long Island Sound were affected by different metamorphic-tectonic events. **Brad Hellickson** should finish his masters thesis this summer, a project on the structure, petrology, and ages of micas in a ductile mylonite zone near New Haven, Connecticut.

Two undergrads at IU are also doing projects under Bob's direction. **Jenny Becker** has just completed dating hornblendes and muscovites from the Potomac terrane in northern Virginia, and along with some petrology, has identified a metamorphic orogeny older than Taconic. **Priya Ganguli** is dating phenocrysts in some basalt dikes in North Carolina.

Bob says he is kept far too busy. Graduate Studies Chairman and teaching take up the time that **Timmy** leaves, and single parenting is pretty time consuming. He did find six weeks to go to the University of Tokyo to study blue schists. It was great fun, but he lost 20 pounds that he didn't have to lose. Says he "ate 'til he was full", but two bites of raw squid and he was full!

At the editor's request, **Gary Pavlis** has provided us with his recollection of a series of events that occurred during the summer of 1992 in Central Asia. Not only did this experience create major difficulties with the seismological research of our geophysics group at I.U., but it also generated considerable adventure, intrigue, and even some potential personal danger. Gary's personal account follows.

How I Got Deported from Kazakhstan
by *Gary Pavlis*

For the past five years the geophysics group at IU has been involved in a multiuniversity effort in deploying and operating seismic arrays and networks in the (former)

Soviet Union. (The "former" is appropriate as when this project began the former modifier was not appropriate.) This project is part of an even larger program administered by a nonprofit consortium of 70+ universities called the Incorporated Research Institutions for Seismology (IRIS). IRIS's Joint Seismic Program, with which our project is connected, was born in 1986-87 from a remarkable episode in US-Soviet relations now commonly called the "NRDC Project". Under the sponsorship of the National Resources Defense Council (NRDC), a group of scientific and technical people for the U.S. were allowed to operate state-of-the-art seismographic monitoring equipment in Kazakhstan near the Soviet test site at Semipalitinsk. This project culminated with the so-called Joint Verification Experiment where nuclear explosions were detonated at both Nevada and Semipalitinsk. This was nothing unusual, but what was unusual was that on-site observers from each side were allowed to independently measure explosive yields and make seismological measurements for independent calibrations of explosive yields at each test site. During this momentous project, important bridges with the Soviet seismological community were established. The NRDC was a nonprofit group that could not continue to support any future projects. At this point, IRIS stepped in and through federal support from ARPA and AFOSR has headed efforts for continued operation of seismic equipment in the (former) Soviet Union ever since.

IU became a part of this project in 1989. IRIS sent a letter to all its members soliciting interested parties who might want to become part of this new cooperative program. At that time Mike Hamburger and I had been involved for a couple of years with a joint project with the group in Garm, Tadjikistan. As a result, we sent a letter expressing our interest in being a part of this project. As a result we became part of a working group that was dubbed the Kyrghyza Seismic Array Committee (KSAC), which was made up of the following universities: University of California, San Diego; University of Colorado; Indiana University; Rensselaer Polytechnic Institute; and the University of South Carolina. Later, Lamont-Doherty Geological Observatory of Columbia University was assimilated into our working group, although they had actually been part of a parallel arm of the program working in the Caucasus since 1990. The rest, as they say, is history.

There are a number of interesting stories I could tell related to this project, but with little doubt the most dramatic of these is the story of the summer of 1992 when the group I was with was ejected from Kazakhstan by the KGB. In fact, Dave Towell asked me specifically to tell this story for this newsletter as he thought it was entertaining and this group of readers might find it interesting. I intended to write this last summer, but I apologize for not doing so as at that time we were frantically preparing for deploying a new seismic array in Turkmenistan and I could not find time to write this.

Anyway, I first need to set the stage for this event. One year earlier, the group of scientists that were responsible for defining the U.S.-Soviet exchange program under which we were operating met in Borovoye, Kazakhstan. Borovoye is a remarkable place seismologically, and as a result the seismic observatory where our meeting was held did not exist officially one year beforehand. The reason is that Borovoye has very low seismic noise levels, and is in a "sweet spot" for sources at the Nevada Test Site. The Soviets were able to routinely detect and identify sources as small as magnitude 4 at NTS because of the low noise levels at the site and the fact that for some unknown reason, seismic waves from sources at NTS were focused (?) and amplified by a factor of about 3 to 5 compared to the worldwide average. However, under perestroika we were allowed to visit there in 1991, and were encouraged by the director of the Moscow institute that operated the Borovoye Observatory (Vitaly Adushkin) to consider deploying a seismic array at Borovoye in 1992. Plans for this then went forward. However, world events we all know very well changed everything in 1991; the coup attempt in the summer of 1991 (Another story I could tell since we were in Bishkek, Kyrghystan, at that time.) and the eventual breakup of the Soviet Union the following winter. This is important for understanding this story, as in the summer of 1992 we arrived in the semi-independent, new country of Kazakhstan with a host who was a Russian to deploy a new seismic array at Borovoye. The rest of this story is most appropriately told from the lightly edited report I sent to other people in our group following my return to the U.S. at the conclusion of the frustrating event.

July 23: Frank Vernon is in Moscow on route to Kyrghystan for upgrades to the Kyrghystan network. He

stops at IDG to check on the status of the Borovoye array equipment with Vitaly Adushkin. He discovers all the equipment was finally accounted for. However, \$5000 that was to have been transferred to IDG to help pay experimental support costs for the Borovoye array could not be accounted for. Adushkin claimed he could not ship the equipment to Borovoye until he had at least part of this money. Frank Vernon contacts the US and arranges to have Gary Pavlis bring in \$3000 in cash to pay for these shipping charges and to have paperwork started to discover what happened to the missing \$5000.

July 24: Frank Vernon again meets with Vitaly Adushkin. He gives Vitaly Adushkin \$700 to cover expenses he had already incurred so Adushkin can proceed with arrangements to ship the equipment to Borovoye.

July 30: Borovoye array installation team of James Batti, David Guo, Bingjun Zheng, and Gary Pavlis arrive in Moscow. Pavlis met with Adushkin at IDG during the afternoon to deliver money (\$3000) arranged by Vernon on July 23. \$1000 was exchanged for rubles to pay for some expenses already incurred. The balance they wanted to keep in dollars until it was needed as the inflation rate there is now so bad they believed holding for as little as two weeks represented a significant loss.

July 30-31: US and Russian installation teams travel on night flight from Moscow to Kokchetav. The flight leaves at about 10 pm, and arrives in Kokchetav at about 4 am, and then it is another 70 km (1 1/2 hours) to Borovoye. Team arrives at about sunrise. Everyone sleeps until early afternoon. At 3:00 pm we have an organizational meeting with Valantine Lampyey, Head of Borovoye Expedition; Vladmir Oochenikov; and Vitaly Adushkin. We discuss organizational plans and decide to hold meetings of entire team each day at 8:00 pm to have each day's activities clearly planned in advance.

August 1-3: Array station locations are laid out. Equipment shipment arrived on the 3rd, and was unpacked and organized.

August 4: We begin installation of geophone arrays and vault construction for broadband sensors. Adushkin and Lampyey travel to Kokchetav to register our presence with the local authorities. During the late afternoon (about

4 pm) we are advised that we must come immediately to "meet with authorities of the Kazakh government". Unfortunately, we had no idea what was about to happen so no one brought a notebook. Consequently, the following is based on Pavlis' recollection of the incident approximately 3 weeks later.

At this meeting were two members of the KGB from Kokchetav, and a third man in a military uniform with Ovier (the people who handle visas in the CIS). They first gave us a short lecture with the following points:

(1) We were told that we had "not followed the proper procedures in being registered". They referred to some vague "new registration procedure" that they claimed we had not followed. They announced that Lampyey had "been already been punished". Apparently this consisted of a 5000 R fine.

(2) One interesting remark I'll never forget was given to us by the translator as approximately this: "Perhaps people in Russia are allowed to break laws at will, but here in Kazakhstan we do not allow people to break the laws of the territory."

(3) They asked to "see our passports and visas".

(4) We were given a piece of paper and told if we did not sign this we would have to "leave this territory immediately". This paper was a one page "protocol" of which we never received a copy. Some things I recall that it said were: (1) We recognized that we had violated the laws of entry of foreigners to the Republic of Kazakhstan; and (2) the explanation we gave for this "breaking of the rules" was that "we were not aware of new rules for registration of foreigners".

(5) Our passports were returned, but we were told our visas would be held by Ovier "until this matter could be resolved". If we had to leave they would be returned to us at the airport. After this meeting, Vitaly Adushkin made clear to us that this was a very serious problem, and that he was planning on traveling to Alma Ata to try to straighten the situation out. Pavlis decides to contact the US Embassy and Adushkin agrees this is a necessary step. In the evening, Pavlis called Frank Vernon in Bishkek and

told him what had happened. He agreed to pursue the problem from his side by going to the Embassy in Bishkek the next day, and to also try to contact the embassy in Alma Ata directly.

August 5: Morning: Pavlis tries to contact the US Embassy in Alma Ata, but the numbers he has are outdated. He has to wait until the US Embassy in Moscow opens to obtain the new numbers. Frank Vernon and Steve Roecker are tied up in a meeting at the Kirghiz Institute of Seismology in the morning, but finally reach the US Embassy in Bishkek at 11 am. In the afternoon, Pavlis and Vernon both connect with Susan Thornton at the US Embassy in Alma Ata. Pavlis had a horrible phone connection and was only able to present the basic facts to her. Vernon called later and was able to tell her further information about the situation. She began work on trying to uncover the nature of the problem. Later in the afternoon, Pavlis again reached Susan Thornton who reported the following: (1) She had contacted the Institute of Seismology and the people at the Kazakh Academy of Sciences including the President of the Academy. (2) According to her information we had followed the correct visa application procedure. (3) Kokchetav and Borovoye were now open cities so that did not explain why the KGB had gotten involved.

August 6: We proceed with sensor installation. In mid-afternoon, Adushkin comes to the field and asks us to again contact the US Embassy to make sure they recognized how urgent this problem was becoming. He stated they were getting threats from the KGB that we could be deported at any moment. This was troubling since he also said the local Ovier office confirmed that we had indeed followed the proper procedure for our visa applications. We tried to call Susan Thornton but found she would not return until about 5 pm. We called her again at that time, and she was very surprised that we were getting these kinds of signals. She had gone to the Ministry of Foreign Affairs and been told that there seemed to be some miscommunication and that people there informed her that our visas were supposed to be returned.

August 7: During our regular meeting, Lampyey advises me that on Monday they were expecting a group of people from the "Ministry of Material Values of Kazakhstan" who would want to talk to us about the project.

This meeting never materialized due to events of the next day.

August 8 (Note this was a Saturday, which is not a normal workday in Russia or Kazakhstan.): In the morning (Bishkek), Frank Vernon called the US Embassy in Alma Ata, and spoke again with Susan Thornton. She stated that the Kazakh Foreign Ministry said that the installation team in Borovoye should get their visas back, and everything would be ok. She explained that the problem was that the Russian consulate in San Francisco did not communicate with Kazakhstan that the group's visas were granted for Kokchetav and that was the reason for the initial problem. In addition to the above, Susan Thornton also passes along a tidbit of information from the KGB to Frank Vernon. She was told by the KGB that everything would be OK for us since what we planned on recording was going to happen this week. At present we still do not know "what we planned on recording" was, but this is one window we have into the motivation of the KGB in this incident.

In Borovoye, a group of KGB agents come to the Expedition. They never met with the US group. We first notice them when we returned from working in the morning for lunch. We noticed some unfamiliar cars and recognized the one KGB man who had been the head of the group who confiscated our visas on the 4th. Later the afternoon of this day, Lampyey delivered a document these people had brought. The following is a translation of that document:

Protocol on Breaking the Rules
of Entrance of Foreigners
8 August, 1992

Chief of expedition number 4 of IDG, Russian Academy of Sciences, Lampyey, V. K., broke the rules of entrance and living (my notes say leaving but I think this is an error) on the territory of Republic of Kazakhstan, and also permission for providing geophysical works on the territory of the Borovoye Observatory by foreigners was not received, and about this on 4th August, 1992, he was warned by employees of the VISA Department of the Department of Domestic Affairs and the Department of National Security (KGB) of the Kokchetav District.

After receiving this warning on breaking the rules of the living of foreigners, Lampyey, V. K., did not receive the permission for foreigners to live and to provide geophysical works. This permission must be received from the Ministry of Foreign Affairs and the Academy of Sciences of Kazakhstan. Because he did not receive this permission, he is responsible according to the law.

According to the following statement (I think this may be a minor translation error. It makes more sense if you replace the previous phrase by, "Because of the previous statements".) Lampyey, V. K., was suggested: (1) to organize the departure of the foreigners immediately from the Republic of Kazakhstan, and (2) to stop providing geophysical works by foreigners on the territory of the observatory at Borovoye. Immediately dismantle equipment installed by them.

Protocol was declared on 8 August, 1992, at 16:30. Protocol received at village Borovoye by V. K. Lampyey. Although the document does not state this, Lampyey stated the KGB informed him verbally that they wanted us gone in 48 hours or a "criminal announcement" would be made against Lampyey. Lampyey said he tried to explain to them that this was not possible because of the equipment we had installed, but my understanding was that they did not really buy this. I tried to call the US Embassy in Alma Ata, but they were not open as it was Saturday. I did not have their 24 hour number at this time.

Earlier in the afternoon, the group of KGB men who delivered the above "Protocol" letter had parked themselves on the beach about 30 meters from the guest house in which we were living. They proceeded to consume a large quantity of vodka and get roaring drunk. They built a fire on the beach inside the expedition. When people at the expedition told them this was against their rules, I was told they were informed with a few expletives that they were KGB and could do what they wanted. They were observed skinny dipping in the lake and making threats about the lousy American spies. At this point, we decided it was time to lay low, and we all decided to lock ourselves in our rooms until this situation died down and/or they all passed out. This was the only time during this incident when our group felt physically threatened.

August 9: From Bishkek, Frank Vernon contacts US Embassy in Alma Ata at 7:30 am, and finally reaches someone at 8:15 am. He fills in Susan Thornton on events of August 8, and she agrees to contact the Ministry of Foreign Affairs and the KGB. Frank Vernon contacts Vitaly Adushkin through Marina Glushko. Their impression at this time is that Adushkin's primary aim is to retain control of the Borovoye Expedition, and is less concerned about the US team and the planned experiment.

In the afternoon, Susan Thornton calls Frank Vernon in Bishkek. She stated the following points:
(1) There was no official 48-hour departure notice.
(2) Adushkin admits he had no permission for the Borovoye experiment from the Ministry of Foreign Affairs or the Kazakh Academy of Sciences. His agreement was with the Committee of Extreme Situations headed by Makaevski who is the assistant representative of the Council of Ministers and has no association with the Kazakh Academy of Sciences.

August 10: In the morning, Frank Vernon (from Bishkek) calls the US Embassy in Alma Ata. Susan Thornton states that she had talked to the Ministry of Foreign Affairs and they said that everything was cleared for our group to start working again. In the future she advised us that we should advise the Ministry of Foreign Affairs before we arrive, and/or contact OVIER upon our arrival in Kokchetav. We were advised to also inform the Kazakh Academy of Sciences as well.

The crew in Borovoye sits with orders from Lampyey that we are not to do any work until this situation is resolved. At noon, Pavlis reaches Susan Thornton at US Embassy in Alma Ata. At this point she thought the situation was getting back under control and made these points: (1) She had met with the Foreign Ministry that morning and they had said it was OK for us to continue the project. (2) She expressed optimism that we would be able to continue the project soon. (3) She did note that the error in failing to register us within the required time period by Adushkin and Lampyey was part of the problem and cautioned us to make certain this did not happen again in the future. (4) She said that she had been told that our visas should be returned to us soon. (5) The 48-hour departure was viewed as a "misunderstanding" by the Kazakh Foreign Ministry. (6) She

understood it was OK for us to continue work and to call her if any new problems arose.

In early afternoon, Mr. Sajandikov (unsure of spelling), Deputy President of the Department of National Values, and a group of people from the Kokchetav and Schoochinsk KGB visit the expedition and meet with Lampyey. Vladimir Oochenikov returned from Alma Ata the previous night and passes on the following information:

(1) A new problem that has surfaced is that IDG has been accused of selling tapes of classified data to the US for \$50,000.

(2) It is now admitted that a major problem was that Adushkin did not secure permission from the Kazakh Academy of Sciences. The claim we heard at this point was that "they had suggested that people from the Kazakh Academy participate, but they had refused".

(3) The main agency Adushkin apparently went to for permission for this experiment was the State Committee on Extreme Situations and the Ministry of Science and New Technologies.

(4) Adushkin was meeting that day with the Prime Minister of Kazakhstan and the Minister of Science and New Technologies to try to resolve the problem. Results were considered unpredictable, but we were advised that a final answer would be obtained by Thursday.

(5) We were told that one problem never mentioned before was that the Kokchetav KGB had no warning we were coming and this made them hostile at the beginning. However, Vladimir claimed they had notified the KGB in Schoochinsk about our coming to Borovoye, and that the real fault lay with the Schoochinsk KGB for failure to communicate this to their superiors in Kokchetav.

(6) We were advised that IDG will probably lose control of the expedition facilities at Borovoye. The previous agreement required them to pay some fee to the Kazakhs for rental of the property, but IDG retained complete control of the facilities and relative independence. Oochenikov expected that control of the facility would probably now pass to the Municipal Department of Borovoye. They will need to pay a higher rent than before for certain, and

Vladimir had major fears they could completely lose any control of the facilities.

Somewhat later that afternoon we met with Lampyey. He noted these items: (1) The "deadline" (the one that wasn't supposed to exist according to Alma Ata) had been extended from 48 to 96 hours. (2) We were advised that we could not do any work until the situation was resolved and (in the best case) Adushkin returned with documents to present to the KGB that would give us permission to proceed. (3) We were told that "for our own safety" we should not leave the compound of the expedition without being escorted by someone from the expedition.

At 3:30 pm, Susan Thornton phoned the following to us: (1) Adushkin had passed on to her word to tell us to "stop installing equipment". She also noted he had referred to some "new nuances" that indicated some things were going on behind the scenes that none of us knew about. What those "new nuances" were remain a mystery. (2) She suggested Lampyey should go to Ovier and try to get our visas back as everyone indicated this should no longer be an issue.

Frank Vernon contacts Vitaly Adushkin by telephone from Bishkek. He states that he had been working with Gaylm Abilsiitov, Minister of Science and New Technology, and Makievski, Minister of Extreme Situations. In July Abilsiitov had given Adushkin a paper stating he had permission to run the experiment at Borovoye. He also requests we not contact the Kazakh Academy of Sciences because "they are not interested in the project". His reason for this is that he had sent Djamil Sultanov to Alma Ata two months before the project started and he had met with the President of the Kazakh Academy of Sciences. The President did not sign the proposal for joint works with IDG and then decided to kick out IDG from Borovoye.

August 11: From Bishkek, Frank Vernon calls Susan Thornton in Alma Ata. She reports that Abilsiitov is indeed the "Minister of Science and New Technology". Apparently Abilsiitov was in Moscow for a very long time and had worked with people there like Velikov and Adushkin. He supposedly was very upset that he had not been appointed as President of the Academy of Sciences

of Kazakhstan. It seems that to placate Abilsiitov, the new, parallel "Ministry of Science and New Technology" was created for him. This suggests that one aspect of this incident is that we were caught in the middle of this internal struggle in the Kazakh government.

At 3:30 pm Susan Thornton calls Frank Vernon. She had talked to the Ministry of Foreign Affairs who say that the visa issue is settled and there is no problem with our group being in Kazakhstan. The embassy had not been able to obtain permission for Pavlis to come to the meeting planned for the 12th in Alma Ata. She continues that the overall problem now is that permission for the project has not been granted by the Kazakh Academy of Sciences or the Ministry of Science and New Technology. The project cannot continue until this issue is resolved. The embassy called Abilsiitov who was extremely unhappy with Adushkin for causing this trouble. He had evidently been called by the Ministry of Foreign Affairs, the KGB, and the US Embassy about this issue and did not like this kind of attention.

At 10:30 pm, Julie (Adushkin's daughter) called Vitaly Adushkin. She passed on the result of that conversation as follows: (1) After his negotiations that day he concluded the array project was dead for this year. (2) He was going to try to return to Borovoye the following day.

August 12: In Borovoye, the group begins making serious plans to pack up all the equipment and ship it back to Moscow. I made two calls to the US Embassy and spoke with Frank and Susan Thornton. All my notes show is despair and a final remark "experiment is a bust for certain". Frank Vernon, Steve Roecker, and Marina Glushko travel by car (4 hours) to Alma Ata. They arrive approximately 10:30 am at the US Embassy. Susan Thornton was at the airport, so they try to find Vitaly Adushkin at his hotel, but he is not there. Our group returns to the embassy and meets with Susan Thornton and Gulzhahan Shamshatova. They reiterate that Abilsiitov does not want to talk to them. The embassy had not arranged any meetings for us yet, and when they tried it turned out that all the people were in a meeting at the Academy of Sciences.

At 5:30 pm, our group meets with the director of the Kazakh Institute of Seismology. They discussed the history of the JSP program beginning with the NRDC project and ending with Borovoye. The director had only rudimentary knowledge of our work in Kazakhstan. His organization had never seen the NRDC data, and was not aware of any specifics of the Borovoye experiment. The director related what he knew about the situation. He said that Djamil Sultanov had come to him during June with a proposal which stated that IDG had a project with Americans to work at BRV, and that there was no description of the experiment and there was no proposal for joint cooperation. He gave the following history of Borovoye starting with its nationalization for Kazakhstan in December 1991. Adushkin was given permission to operate Borovoye for one year with the condition that he come up with an agreement to work with the Kazakh Academy of Sciences and Kazakh Institute of Seismology in the future. Adushkin has not yet made that proposal. He also did not release any data from Talgar and Borovoye to the Kazakh Institute of Seismology and instead tried to transport all the archives to Moscow. That is why the Kazakh Academy of Sciences and Kazakh Institute of Seismology tried to assume control of Borovoye in June. The decision about the future of Borovoye would be made by the Kazakh government before August 27 and the director was sure that the Kazakh Academy of Sciences would become responsible for the operation of Borovoye.

Roecker and Vernon described the interests of IRIS in Kazakhstan and their own research interests with the planned experiment and other data collected by the Kazakh Institute of Seismology. They expressed strong interest in our research and experimental program and a desire to become participants in the future in any experiments involving Kazakh territory. They were not opposed to participation of third parties in any project (e.g. IDG or IPE) on Kazakh territory, but made it clear that all future agreements must be made directly between the US and Kazakhs and not through Moscow intermediaries. They concluded by describing their current plans which included reopening NRDC stations KKL, BAY, and KSU. In addition, they have plans to open a station in Kurchatov City.

Immediately after this meeting, our group returned to the hotel, where they were contacted by Vitaly Adushkin. They met with him, and noted the following from this meeting: Adushkin began by saying that we should postpone our experiment until next year. He then gave his version of the history and current status of the project. He had an agreement with the Committee on Extreme Situations in the beginning of July and he justified this experiment by saying the array experiment could be coupled with data from the Kirghistan array, GPS results, and other experiments to improve capabilities for earthquake prediction. He also described other earthquake prediction related geophysical measurements at Borovoye. The chairmen of this committee (Makievski) gave permission for the array experiment. The following week he notified IRIS and Vernon that the experiment could proceed as planned. Our team then headed to Borovoye shortly afterwards to start the installation. One week after arrival the KGB showed up.

The local KGB supposedly had information that the project will damage the Ministry of Defense and Adushkin said that this information came from the KGB in Russia and originated from Kovalenko's organization. Adushkin tried to contact the local KGB in Kokchetav, but they avoided him. All his attempts to contact the KGB, including Alma Ata, were unsuccessful. When the problem started, Adushkin said that he had come down to Alma Ata to try to contact Makievski, but Makievski avoided him. He believed Makievski was ordered not to talk to him. On the issue of visa procedures, he said he had gone to the Kazakh Embassy in Moscow in July to find out what the procedures were for getting visa's for Americans to go to Kokchetav. They told him that there was the same procedures as normal and that Kokchetav was an open region.

Borovoye was once a classified seismic station, but this is no longer the case. No classified research is presently being conducted at Borovoye. When asked why the Kazakh Academy of Sciences and the Kazakh Institute of Seismology were not involved in this work, Adushkin argued that the Institute of Seismology did not do work on seismic verification. All such work had previously been done by IPE at Talgar and by IDG at Borovoye. He said that he gave a seminar at the Institute of Seismology, but "nobody was interested in the work" and he could not find a single partner to work with there. Furthermore, the Institute of Seismology had no experience with digital

instruments, and was only interested in earthquake prediction. He did not want us to talk to the Kazakh Academy of Sciences for fear we might sign some paper that could be used as leverage against him for giving them control of Borovoye. Adushkin's earlier meetings with the Kazakh Academy of Sciences led him to believe they wanted to obtain control of Borovoye to use it as a vacation resort for the Academy of Sciences.

Adushkin showed our group the document signed by Makievski giving us permission to operate the array experiment from July to October 1992. Marina Glushko (programmer and translator from our group who is a native ex-Soviet citizen) verified that this was indeed an official document with the proper official Soviet bureaucratic markings.

August 13-14: The team in Borovoye begins removing seismic sensors installed previously, and packing up all equipment for shipment back to Moscow and the U.S. In Alma Ata, our group talks to the director of the Kazakh Institute of Seismology. He announces that the Vice President of the Kazakh Academy of Sciences saw no reason to meet with us unless we had specific proposals to sign. He also said there was no reason to discuss Borovoye further until the situation was resolved. They proceed to the US Embassy and meet with Susan Thornton and Gulzhahan Shamshotova. They agreed that Makeivski had the proper authority to sign the documents that Adushkin had in his possession. They also reiterated that the whole Kokchetav region is open so there should never have been any reason for us to be harassed. Our group proceeds to the Ministry of Foreign Affairs. They meet with the head of Passport and Visas named Kazbek Beysebayev. We were surprised to hear that our group had not yet had their visas returned, and that he would call the Kokchetav Ovier office and ask them to return the visas of our group. After lunch our group returns to Bishkek.

August 14: We meet in Borovoye with Vitaly Adushkin. His daughter, Julia, had been our translator earlier, but she had left for Moscow on the night of August 12. For this conversation, the translator was a young woman with little experience whom we found made some serious translation errors. With that caveat, here is the text directly from my notes of what Vitaly Adushkin

said to us:

"In spite of permission to work here, at the level of Head Makievsky (Minister of Extreme Situations). Retired after some event by KGB." (Note: Notes above show this as an example of a translation error.) "He tried to settle this question with the Cabinet of Ministries. This failed and they didn't allow this work. They can decide the question only in 2 or 3 months. This in practice means next year at best. He met Frank Vernon and Steve Roecker. They discussed the situation. They reached a decision that we should pull out the equipment and send it back to the US. Two months ago he thought the situation was OK, but obviously this was wrong. 'The power of the KGB is strong. They asked and talked with them in vain.' He sees major problems with the KGB. They were afraid this work would create 'economic disaster'. "He argued for the science aspects of this project, but they were not interested in listening to this. They gave two main reasons for closing down the experiment and sending us away: (1) We would make disorder (i.e. we would receive secret information by some unspecified means). (2) We would promote 'economic disorder'."

August 15-17: The group in Borovoye prepares to leave. We finally got our visas back on the 16th, and departed on Aeroflot the evening of the 17th back to Moscow. We had the wonderful experience of sitting on the ground for 45 minutes while airport officials argued with three drunken Kazakhs before they finally managed to boot them off the plane. Finally, when we landed in Moscow we had the "thrill" of hearing an explosion and seeing a loud flash on the right side of the airplane caused by a compressor stall. We land successfully, with no problems.

With the benefit of almost two years having past, we have learned something. We will, no doubt, never fully be certain what brought this incident on, but some things are now very clear:

(1) Ultimately this was driven by a power struggle between the emerging new government in Alma Ata, Kazakhstan, and Moscow. We got caught in the middle.

(2) A series of bad luck to stupid mistakes led to the KGB

going nonlinear. First, the regional office in Kokchetav was probably genuinely stunned to find out we were in Borovoye when Adushkin and Oochenikov first registered us. It did not help at all that they were one day late in doing this either. This could be blamed on a late visa application that led to the unfortunate fact that word of our arrival did not reach the regional office of the KGB before we arrived. Second, we continue to hear rumors that some military installations are present in this region. Something mildly sensitive may, indeed, have been going on that we will never know about. Finally, there may have been some local political forces who wanted to see the Russians out of the Borovoye expedition compound.

(3) Adushkin had no real friends in Alma Ata, but plenty of enemies. It is clear that when the KGB asked certain key people in Alma Ata about us, they were at best greeted with a "we know nothing".

This saga continues. We are still striving to install a seismic array in this region. A group from LDEO will be testing the waters again this summer by installing several portable seismic recorders. This time I'm staying away and letting others be on the front line. Wish them and us luck for the future.

FACULTY RESEARCH GRANTS

[grants in effect August 1, 1993 to current date]

- A. BASU (NASA) - "Petrologic evolution of lunar and meteorite parent body regolith."
- S. BRASELL (PACKARD FDN) - "Molecular organic geochemical research studies of climatic variations over geological time."
- S. BRASELL (AM CHEM-PRF) "Combined organic and isotopic assessment of Cretaceous paleoenvironments."
- S. BRASELL (NSF) "Temporal variations in molecular records of sea surface temperatures and plankton productivity: assessment of high resolution signals in sediment trap particulates."
- J. BROPHY (NSF) - "A petrologic and ion-probe study of hornblende gabbro cumulates from Medicine Lake volcano: an evolution of competing mechanisms of calc-alkaline fractionation."

- J. BROPHY** (TEXAS A&M) - "Mineralogic and experimental studies of Leg 142 igneous rocks."
- E. CoBABE** (NSF) "Molecular and isotopic composition of lipids in bivalve shells: records of biosynthetic origins and paleoenvironmental change."
- J.R. DODD** (MARATHON OIL) - "Carbonate stratigraphy project".
- J. DUNNING** (NSF) - "Environmental weakening of geologic materials."
- A. FISHER** (TEXAS A&M) "Ocean crustal hydrogeology: the influence of bathymetry, sediment thickness, and permeability structure on off-axis energy and mass fluxes."
- M. HAMBURGER** (NAT RES COUN)"Support for hosting in U.S. collaborative researcher, Vitaly I. Khalturin, scientist from the Newly Independent States of the former Soviet Union
- M. HAMBURGER** (NAT RES COUN) "Support for hosting in U.S. collaborative researcher, Tatyana Rautian, scientist from the Newly Independent States of the former Soviet Union
- M. HAMBURGER** (NASA) - "Application of global positioning system measurements to continental collision in the Pamir-Tien Shan Region, USSR."
- M. HAMBURGER** (NSF) - "Application of global positioning system measurements to continental collision in the Pamir-Tien Shan Region, USSR."
- M. HAMBURGER** (NASA) - "Seismicity and crustal structure in an active collisional orogen, Soviet Central Asia."
- M. HAMBURGER** (Dept. Interior) - "Collaborative research: multidisciplinary study of geodynamics in an active collisional orogen, Soviet Central Asia."
- M. HAMBURGER** (NSF) - " Analysis of seismic data from Pinatubo Volcano, Philippines."
- M. HAMBURGER** (NSF) - "Analysis of seismic data from Pinatubo Volcano, Philippines (off-campus research)."
- J. HAYES** (UNIV.CALIF.-DAVIS) - "Midwestern Regional Center of the National Institute for Global Environment Change: studies of the biogeochemical cycle of carbon relationships between pCO₂ and the 13C sedimentary organic matter."
- J. HAYES** (PETROBRAS) - "Cooperative agreement for research in biogeochemistry and petroleum geochemistry."
- J. HAYES** (NSF) - "Modernization of Biogeochemical Laboratories.
- N. KROTHER** (U.S. ARMY) "8 Groundwater GIS using computer guided data collection."
- N. KROTHER** (WESTINGHOUSE) "Spectrofluorophotometer analysis of fluorescent dyes injected into groundwater wells in local landfills."
- G. LANE** (NSF) "Paleobiogeography of Late Devonian and Carboniferous echinoderms from the Peoples Republic of China."
- G. LANE** (NSF) - "Echinoderm rebound and diversification after the Late Devonian extinction: evidence from Asian carboniferous and Eurasian Famennian Echinoderm faunas."
- E. MERINO** (NSF) - "Self-organization origin of fibrous texture and twisting of agate quartz: dynamic crystallization model."
- H. MURRAY** (UNION FNDN) "Industrial Minerals Research."
- G. OLYPHANT** (NOAA) University of Illinois, "Contemporary and historical eolian sand transport in a coastal dune environment, South Shore, Lake Michigan, Indiana."
- G. PAVLIS** (U.S. AIR FORCE) Broadband signal enhancement of seismic array data: application to long-period surface waves and high frequency wavefields."
- G. PAVLIS** (IRIS) - "Joint US-USSR Program: Kirghizia seismic network and small aperture seismic array studies".
- G. PAVLIS** (NSF) - "Appraisal of relative earthquake location errors."
- L. PRATT** (INTEVEP) - "INTEVEP, S.A. and Indiana University agreement for training."
- L. PRATT** (NSF) - "U.S.-Nigeria cooperative study of Cretaceous black shales in the Benue Trough Nigeria."
- L. PRATT** (NSF) - "Biogeochemistry of lipid biomarkers in modern and fossil bivalve shells."
- L. PRATT** (NSF) "A stratigraphic and geochemical transect across northern South America for assessment of paleoceanographic events in the Caribbean gateway during the middle Cretaceous."
- L. PRATT** (MARAVEN) - "Cooperative research, organic geochemical and isotopic study of

stratigraphy in the La Luna formation."

- L. PRATT** (Various Petroleum Grants) "Sedimentary organic geochemistry research."
V. RANGANATHAN (NSF) - "Basin dewatering near salt domes in the U.S. Gulf Coast."
E. RIPLEY (MARTIN MARIETTA) "Martin Marietta Energy Systems."
E. RIPLEY (NSF) - "Mechanisms of platinum-group element enrichment and the nature of the hydrothermal system at the Babbitt Deposit, Duluth Complex, Minnesota."
M. SAVARESE (AM CHEM) - "Paleobiological and paleoenvironmental context of coralomorph-bearing Lower Cambrian reefs, South Australia."
M. SAVARESE (AM CHEM) "A paleoecological field test of the functional interpretation of archaeocyathan paleobiology using lower Cambrian reefal carbonates from South Australia."
A. SCHIMMELMANN (U.CAL-SAN DIEGO) "Abrupt climatic changes during the late Quaternary monitored with annual to biennial resolution in the Santa Barbara basin."
L.J. SUTTNER (NSF) - "Regional chronostratigraphic and sequence stratigraphic analysis of a central cordilleran foreland basin."
R. P. WINTSCH (NSF) - "Thermochronology and thermobarometry in lithotectonic zones in eastern New England."
R.P.WINTSCH ET AL.(NSF) - "Acquisition of an electron probe microanalyzer."

DEPARTMENT OF GEOLOGICAL SCIENCES FACULTY AND STAFF

Professors: Abhijit Basu, Simon Brassell, James Brophy, J. Robert Dodd, Jeremy Dunning, Michael Hamburger, Donald Hattin, John Hayes (Chairman), Norman Hester, Noel Krothe, N.Gary Lane, Enrique Merino, Greg Olyphant, Larry Onesti, Gary Pavlis, Lisa Pratt, Vishnu Ranganathan, Edward Ripley, Albert Rudman, Michael Savarese, Lee Suttner, David Towell, Robert Wintsch

Part-Time Professors: Donald Carr (Survey), Henk Haitjema (SPEA), Peter Ortoleva (Chemistry), Carl Rexroad (Survey), Jeff White (SPEA)

Professors Emeritus: Robert Blakely, John Droste, Judson Mead, Haydn Murray, Robert Shaver, Charles Vitaliano

Research Scientists: Michael Dorais, Bruce Douglas, Andy Fisher, Alan Horowitz, Arndt Schimmelmenn

Post Doctoral: Emily CoBabe, Julie Kennedy

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Support Staff:

Sarah Burton, Financial/Admin. Asst,
Chair's Office

Patty Byrum, Administrative Secretary,
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Ruth Droppo, Research Secretary, Third Floor

Jon Fong, Technician, Hayes Labs

Gary Hinton, Resident Manager, Field Station

Mary Iverson, Student Records, First Floor

Kari Lancaster, Cartography Specialist

Charles Miller, Machinist, retired 1/94

Julie Primack, Technician, Hayes Labs

Debbie Pryor, Senior Secretary, Business Office

Jean Reese, Research Secretary, Third Floor

Kim Schulte, Administrative Secretary,

Geological Field Station

Brian Snow, Computer Systems Manager

Kim Sowder, Drafting Technician

Terry Stigall, Electronics Technician

Steve Studley, Mass Spec. Mgr.

James Tolen, Draftsman

Rodney Ward, Faculty Secretary, Fourth Floor

STUDENT AWARDS AND GRANTS

Undergraduate

Senior Faculty Awards-

Jennifer Klug, Richland, MI

Dana Strength, Valparaiso, IN

Junior Scholarship Award-
Margaret Streepey, Georgetown, IN
 N. Gary Lane Award (Beginning major)-
Sarah Blackerby, Bloomington, IN
 Minority Achiever's Program Scholarship-
Amanda Hopkins, Valparaiso, IN
 Junior Professional Development Awards
 (Society membership and journal)-
Priya Ganguli, Terre Haute, IN
Christopher Osburn, Santa Claus, IN
 Chevron Oil Company Scholarship in Geopysics-
Claire Elkington, West Chicago, IL
 Phi Beta Kappa-
Jennifer Klug, Richland, MI
Dana Strength, Valparaiso, IN
 Honors Division Undergraduate Research Award-
Margaret Streepey, Georgetown, IN
 William Tarr Award (Sigma Gamma Epsilon)
Jennifer Klug, Richland, MI

Field Station Scholarships (I.U. students)

Charles Deiss Field Station Scholarship-
Priya Ganguli, Terre Haute, IN
 Field Station Scholarships-
John Burton, Bloomington, IN
Darren Chertkoff, Bloomington, IN
Deborah Clair, Indianapolis, IN
Claire Elkington, West Chicago, IL
Colin Hudson, Indianapolis, IN
Aaron Schmoll, Porter, IN
Margaret Streepey, Georgetown, IN

Graduate

Estwing Award and Outstanding Academic Achievement-
Christopher Carlson, Evanston, IL
 Department of Geological Sciences Outstanding
 Academic Achievement Award-
John Guthrie, Madison, IN
 Outstanding Associate Instructors (Non-major courses)-
Matthew Noriega, McLean, VA
Patrick O'Malley, Montevideo, MN
 Outstanding Associate Instructor (Major courses)-
Christopher Gellasch, Sterling Heights, MI
 Cumings Award-
Victoria Ferguson, Indianapolis, IN

University Graduate School Fellowship-
Matthew Warner, Columbus, OH
 Chevron Oil Company Fellowship in Geophysics-
Stanley Radzevicius, Crosby, MN
 Shell Oil Company Fellowship-
Lindsey Leighton, Lee, MA
 Grassmann Fellowship-
Jason McCuiston, Springfield, OH
 Geochemistry Fellowship-
Volker Bruechert, Burgkirchen, Germany
 Oil-Dri Fellowship-
Jean Hemzacek Laukant, Villa Park, IL
 Brazilian Government Fellowship-
Ana Maria Carmo, Salvador Bahia, Brazil
 Petrobras Fellowship-
Eugenio Santosneto, Rio de Janeiro, Brazil
 John B. Patton Awards-
Penny Alano, Providence, KY
Jennifer Lewis, Landisville, PA
Clayton Millard, Geneseo, NY
 Sigma Xi Initiates-
Matthew Cohn, Chicago, IL
Lindsey Leighton, Lee, MA
Patrick O'Malley, Montevideo, MN
Craig Rankin, Avella, PA
Lisa Rhoades, Evansville, IN
Donna Surge, Deer Park, NY

DEGREES AWARDED

B.S. (1993)

Alano, Penny
Budak, Jamie
Dintaman, Christopher
McCuiston, Jason

A.B. (1993)

Kaderabak, Michael
Mastrine, Jason
Robinson, Rebecca
Smith, Shawn
South, Stephen

M.S.

Averill, Matthew - Research paper: Nitrogen Isotope Variations of Groundwater Discharging from a Conduit Type Karst Spring in South Central Indiana. (6/93)

Bian, Liangqiao - Isotopic Biogeochemistry of Individual Compounds in a Modern Coastal Marine Sediment (Kattegat, Denmark, and Sweden). (4/94)

Eckert, Timothy - Weather-related Changes of Water Well Levels and Soil Moisture in Glacial and Glacio-lacustrine Sediments, Cannelburg, Indiana. (10/93)

Fitch, James - A Karst Groundwater Study to Delineate the Quarry Spring Basin Groundwaters near the Lemon Lane Landfill, West-Central Bloomington, Indiana. (2/94)

Fluegge, Arnim - Molecular-Isotopic Derivation of Maps of Sea-Surface Temperature and Oceanic pCO_2 in the Eastern Equatorial Pacific. (5/94)

Frye, Eric - Hydrogeologic Assessment of the Viking Mine, Daviess County, Indiana for Coal Combustion Waste Disposal. (2/94)

Johnson, Timothy - Oxygen Isotope Analysis of Quartz, Kaolin, Smectite, and Silver Phosphate by CO_2 -Laser Microprobe. (3/94)

Lee, Insung - Petrologic and Geochemical Studies of the Spruce Road Cu-Ni Deposit, Duluth Complex, Minnesota (5/94)

Smith, Michael - Multivariate Analysis of Temporal Trends in Groundwater Chemistry and Coal Waste Moisture Content at a Site Expressing Acid Mine Drainage in Southwestern Indiana. (6/93)

Zheng, Bingjun - Evidence for Precursory Seismicity Changes Preceding Moderate and Large Earthquakes in the Garm Region, Central Asia. (11/93)

Ph.D.

Ambers, Clifford - The Nature and Origin of Very Well Crystallized Kaolinite. (12/93)

Bayless, E. Randall - Acid-Generating Salts and their Relationship to the Chemistry of Ground Water and Storm Runoff at a Pyrite Coal Refuse Deposit in Southwestern Indiana. (4/94)

Schult, Mark - Paleoecology and Paleoenvironment of an Early Permian Vertebrate Trace Fossil Fauna, Las Cruces, New Mexico. (3/94)

Wang, Yifeng - Genesis of Repetitive and Non-repetitive Textures in Diagenetic Weathering and Igneous Processes: Feedbacks, Boundary Conditions, Self-Organization, and Reaction-Transport Models. (10/93)



Can you identify this hard-working geologist? We can!

STAFF NEWS

Charles Miller retired from his official duties in the Department on January 15, 1994. Charles has provided over forty years of service to the Department and to the Indiana Geological Survey. A reception was held in his honor in S201 (The Elephant Room) on January 14. Steve Miller, his wife Jane and their son Cormack

attended the reception where Cormack was especially adept with helping to open the gifts. Pieces of luggage to accommodate Charles' interest in travel were among the gifts. Even though he has retired from his official duties, Charles is our first Honorary Staff member; he is seen often in the machine shop where he continues to work on a few projects for faculty.

During the past few months, other members of the staff have been recognized for their long-time service to the Department and Indiana University. **Mary Iverson, Jim Tolen, and Alan Horowitz** have all reached the 30-year mark. The Department recognizes their contributions, each in a critical area, and appreciates their efforts which continue on a daily basis.

ADVISORY BOARD

The Advisory Board met in Bloomington on February 18-19, 1994. President **Mike Graham** welcomed attendees and introduced two new members, **Dick McCammon** and **Dan Sullivan**. Other Board members in attendance included **George Nevers** (vice president), **Stan Anderson, Steve Young, Dan Tudor, Dick Gibson, Bob Blakely, Steve Graham, Tom Straw, Frank Pruett, Bob Boyer, Mal Boyce, and Jud Mead**. Members unable to attend included **Marcia Engle, Chris Smith, and Ann Petricca**.

Lee Suttner gave the Chair's report on the status of the Department, **Gordon Fraser** spoke on the new relationship between the Department and the Indiana Geological Survey (now a research institute of the University), and **John Hayes** outlined his vision of the future of geological sciences at I.U.. **Susan Green**, Director of Development of the College of Arts and Sciences, discussed fund-raising efforts, noting that in 1993 donors to the Department increased approximately 50% whereas the overall increase in the College was just 2.5%. **Dean Morton Lowengrub** discussed the current challenges faced by the College and how these will have an impact on the Department. Even with the 7% budget increase for the University, there will be a budget shortfall of several million dollars in the College. We have already seen one effect of this with a reduction of two associate instructor positions in our teaching budget.

Standing committees reported on 1993 activities and met to discuss future plans. The Board also met with the Student Advisory Committee (SAC) to consider and respond to student perspectives. The Educational Planning Committee's report centered largely on a current proposal to develop a new environmental field course, whether or not it should be taught at the Geologic Field Station, and if so, how it would be integrated into the current offerings of our traditional field course, G429.

The Development Committee discussed the identification of the Department's short-term needs and additional approaches to fund-raising, including the use of telefunding. Alumni receptions sponsored by Board members remain popular (see below). The Committee, Board, and Department are especially pleased and appreciative of the contributions and pledges from alumni of over \$27,000 to upgrade the large lecture room in the Geology Building. All Advisory Board members, as well as eight Houston volunteers, participated in the campaign. However, **Dan Tudor, George Nevers, and Stan Anderson** spent many hours planning and coordinating the first formal fund-raising attempt by the Advisory Board. The Department is deeply grateful.

The Industrial Liaison Committee is developing a network of contacts within the environmental research and services sector as a resource for students seeking employment in this field. In another area, efforts have been successful in obtaining some research equipment from excess industrial inventory, namely, chemical analytical equipment from Chevron Research and Technology Company. This is very much appreciated. Collaborative programs between the Department and industry are also under study. One example is a memorandum of understanding between Battelle Pacific Northwest Laboratories and Indiana University primarily intended to initiate and facilitate collaboration in teaching and research at the Geologic Field Station, though it also opens up opportunities for the Department as well. From this and a meeting between representatives of I.U. and Battelle in December 1993, plans have been made to begin during 1994 the development of an environmental option for course G429.

Standing committee memberships for this year will be Educational Planning Committee: **Steve Young**

(Chair), **Steve Graham**, **Jud Mead**, **Frank Pruett**, **Chris Smith**, and **Tom Straw**; Development Committee: **Stan Anderson** (Chair), **Bob Boyer**, **Marcia Engle**, **Dick Gibson**, **George Nevers**, **Dan Sullivan**, and **Dan Tudor**; and Industrial Liaison Committee: **Mal Boyce** (Chair), **Bob Blakely**, **Dick McCammon**, and **Ann Petricca**.

In addition to meeting with administrators, faculty, and students during the two-day session, Board members also attended the popular pot-luck dinner with faculty, their spouses and friends at the University Club on Friday evening.

ALUMNI RECEPTIONS

The Department and Advisory Board hosted five alumni receptions during the past year. Board members **Stan Anderson**, **George Nevers**, and **Dan Tudor** sponsored the September 23, 1993, Houston social attended by about 60 alumni, spouses, and friends. **Lee Suttner**, **Haydn Murray**, and **Susan Green** attended from Bloomington as well as Advisory Board members **Mal Boyce**, **Bob Boyer**, **Marcia Engle**, and **Steve Young**. A Denver reception was sponsored by **Dick Gibson** on October 14, 1993. Twelve alumni attended. Two additional alumni gatherings in the Indiana area were organized and coordinated by **Dan Sullivan** and **Frank Pruett**. A post IU-Kentucky basketball game reception was held in Indianapolis in December and attended by about 25 people. In January 1994, approximately 100 people attended a reception and open house in the Geology Building.

On October 25, 1993, the Department hosted the traditional alumni reception at the Geological Society of America meeting, this past year held in Boston, Massachusetts. There was a good turnout, and a number of people won door prizes consisting of various pieces of I.U. paraphernalia. Winners included **Tom Hanley** (M.A., '68; Ph.D., '75), **Tony Hoch** (B.S., '88), **Joe Reese Nur Iskandar Taib** (B.S., '83; M.S., '89), **Andy Campbell** (B.S., '77), **Caschia Jones** (current student) and **Andrea Koziol** (Visiting Assistant Professor, 1990-91).

* * *

Again this year we are including personal profiles on a number of the Advisory Board members.

Malcolm W. Boyce:

Mal received his B.A. degree from Colgate University following which he obtained the M.A. degree from I.U. in 1956. His long and distinguished career with Chevron began in 1956. From then until 1968 he was in domestic exploration assigned in West Texas, Houston, and Oklahoma City. From 1968-1971 he was with Chevron, San Francisco as an exploration geologist for Africa. He served as North Sea Exploration Manager for Chevron Oil Company of the Netherlands from 1971-1976 and as Exploration Manager for Europe of Chevron Overseas from 1976-1984. Since 1984, Mal has been Vice President Exploration, Chevron Overseas, San Ramon, California. He is active in AAPG. Mal is a staunch Forty-Niners and Giants fan, enjoys bluegrass music, and is an avid gardener. He and his wife Sylvia have two sons, Alan, 34, a trader with Bankers Trust, and Mark, 31, who is in real estate in Indianapolis and currently earning a master's degree at Cambridge University, England.

Robert E. Boyer:

Bob earned his B.A. degree from Colgate University in 1951, his M.A. degree from I.U. in 1954, and the Ph.D. degree from the University of Michigan in 1959. From 1971-1980 he served as Chairman of the Department of Geological Sciences and Director of the Geology Foundation at the University of Texas at Austin. From 1980-1994 he has been Dean of the College of Natural Sciences as well as Director of the College of Natural Sciences Foundation. Since 1978 he has been President of Earth Enterprises, Inc. and from 1985, Senior Partner of The 3B Company. Bob and his wife, Elizabeth Bakos Boyer, have two children, Janice Boyer Buller and Gary K. Boyer.

Richard B. McCammon:

Dick received the B.S. degree from the Massachusetts Institute of Technology in 1955, his M.S. degree from the University of Michigan in 1956, and the Ph.D. degree from I.U. in 1959. He is Chief, Branch of Resource Analysis of the U.S. Geological Survey in Reston, Virginia. Recently he has served as President of the International Association for Mathematical Geology (1989-

1992). He currently is editor of *Nonrenewable Resources*, Oxford University Press (1992-present) as well as editor of *Studies in Mathematical Geology*, Monograph Series, Oxford University Press (1987-present). Dick stays in shape with his major outside interest in playing squash.

W. Thomas Straw:

Tom has received three I.U. degrees in geology, the B.S. in 1958, the A.M. in 1960, and the Ph.D. in 1968. He served with Humble Oil and Refining Company, Inc. from 1960-1965. Tom has been a faculty member at Western Michigan University in Kalamazoo since 1968, serving as departmental chair from 1972-1974 and from 1989-present. He spent sabbatical leaves with the Montana Bureau of Mines and Geology (1978-1979) and the U.S. Army Corps of Engineers (1985-1986). Tom's research interests have focused on wetlands hydrology. Glacial geology of southwestern Michigan is a hobby. Tom says he especially enjoyed the three years he returned to earn his Ph.D. degree and the 12 summers he worked in G429 at the Field Station as well as the many personal associations related to those years. He also tells us that he and his wife, Odessa, have especially enjoyed the recent summers being involved ("too much fun to call it work") with the Alumni College at the Field Station. Tom and Odessa have three daughters (Karen, Teresa, and Elizabeth) and six grandchildren.

Daniel M. Sullivan:

received his B.S. degree in geology from I.U. in 1950 and worked many years for the Indiana Geological Survey from which he retired as Petroleum Section Head. He has been active in the AAPG as a member and delegate and served on the Committee on Statistics of Drilling. He also was District Chair of the Committee on Reserves of the American Petroleum Institute, Dan is a member and past president of the Indiana-Kentucky Geological Society. Dan describes himself as "an I.U. football analyst and a former I.U. basketball analyst (retired because the field is too crowded)". He travels to basketball tournament sites *with* Lee Suttner and to football bowl sites *without* Lee Suttner. Dan is active in volunteer work at Opportunity House and in fund raising. He says he very much enjoys the opportunity as an Advisory Board member to contact with the Department as well as with fellow alumni both past and more recent. He would be delighted to hear from any of those whose trail has crossed his over the years. His address is 1610 Maplecrest Dr., Bloomington, Indiana

47408 (812-332-7419). He and his wife, Nora, have one son, Matt.

Steven W. Young:

Steve graduated from Albion College (Michigan) with the A.B. degree in 1970 and moved on to I.U. where he received the M.A. degree in 1974 and the Ph.D. degree in 1975. He is a geological associate with Exxon Exploration Company, Houston, Texas. Steve spent five years in uranium exploration in the Pacific Northwest, Gulf Coast, and Great Basin; more than seven years in petroleum production in South Texas; and five-plus years in petroleum exploration of Angola, Eastern Europe, the Soviet Union, and the Permian Basin. He served as Visiting Assistant Professor at the University of Minnesota, Duluth and has been active in the Corpus Christi Geological Society, being an editor and contributor to *Oil Fields of South Texas II*. Steve enjoys fishing and volunteer work (church, fire department, soccer refereeing, and youth football, soccer, and basketball coaching). He and his wife, Gretta, have two sons, Scott (18) and Andy (13).

ALUMNI NEWS

Althoff, William F. - B.S. (1967)

semi-retired from state service in New Jersey in 1988 (in groundwater contamination investigation). He has been consulting part-time, enjoying a quick-growing family and writing articles and books on naval and polar aviation. He returned from Greenland in mid-April of 93 -- his third Arctic trip. He also visited Russia in 1992 to interview polar scientists.

Bhattacharya, Nityananda - Ph.D.(1960)

had a challenging assignment in Saudi Arabia during 1981-1987 in establishing a mineralogical-geochemical laboratory, working on a research and development problem on sand dune stabilization in the Rub-al-Khali desert, and also taking care of the management of the Division of Geology and Minerals, Research Institute, University of Petroleum and Minerals, Dhahran. He has now settled down in Gurgaon which is very near the New Delhi airport where he devotes his time to community development.

Bork, Kennard B. - M.A.(1964)Ph.D.(1967)
received the Denison University 1993 Teaching Excellence Award at the school's annual academic honors convocation. This award honors a faculty member who is a model of commitment to teaching and who has a strong record of dedication to students both in and outside the classroom. The recipient must demonstrate a vibrant interest in the learning process and the ability to be creative in the classroom. He has recently authored a book *Cracking Rocks and Defending Democracy: The Life and Times of Kirtley Fletcher Mather*. Mather was a geologist, teacher and social activist. **Professor Bork's** book traces his life from birth, through early years as a student, and his career as a geologist, then as a teacher. It includes Mather's tenure at Denison University, where **Dr. Bork** is an Alumni Professor of Geology.

Brown, James R. - B.S.(1983)
earned an M.S. degree in environmental engineering at Virginia Polytechnic Institute and State University. He is currently a senior environmental scientist with the U.S. Environmental Protection Agency in Washington, D.C. Jim is responsible for developing groundwater monitoring and data analysis regulations and guidance manuals. He and his wife, Nancy, a lawyer with the EPA, were married in April 1993.

Canfield, Timothy J. - B.S.(1984)
has been employed with Infilco-Degremont, Inc., Richmond, Virginia since 1986. IDI is a leading manufacturer of municipal and industrial equipment systems and processes for water and waste water treatment. He is a project engineer covering applications in the western United States, Indiana, Canada, and Mexico. Tim states, "more importantly", he married the former Jeanne Mashburn, a realtor with the local Prudential affiliate, in 1989 and they became the proud parents of Zachary Boone in January 1993.

Clements, Brooke Philip - B.S. (1982)
is currently regional manager of Exploration for EXMIN Corporation, a Bloomington, Indiana, based mineral exploration company.

Clements, Ed - B.S.(1983) M.S.(1992)
is currently employed with Fairmount Minerals, Ltd. as the Manager of Environmental, Geological and Real Estate

Services in Bridgman, Michigan. He resides in St. Joseph, Michigan, having recently moved from Indianapolis where he was employed with AMAX Coal Industries.

Danikolas, Chris T. - B.S.(1986)
has become a shareholder in the midwest law firm of Howard & Howard. Chris received a J.D., cum laude, from Thomas M. Cooley Law School in 1990 and specializes in environmental law. He works in the Bloomfield Hills, Michigan office of the firm which also has offices in Lansing, Kalamazoo and Peoria, Illinois.

DuBois, Jeanette Bauman - M.A. (1978)
took a new career path with a position at the environmental firm, Woodward-Clyde, in Denver in 1992 after taking a voluntary severance package that year from Mobil Exploration and Production in Bakersfield, California. She and her husband, Dean, also a former Mobil geologist, now live in Englewood, Colorado.

Duncan, Mack S. - Ph.D.(1976)
is now Laboratory Manager/Senior Geologist at J.M. Huber Corporation, Clay at Huber, Georgia near Macon. He is responsible for testing and evaluating kaolin reserves for Huber's East Georgia and South Carolina operations which include mines and beneficiating plants. We were pleased to meet Mack's wife Julie and his two daughters Laramie and Laura when they stopped by for a visit in the Department this past summer.

Ericksen, George E. - M.A. (1949)
was honored at three separate ceremonies during July 1993 by the three principal geological and mining societies of Peru for his contributions to geology and mining in that country from 1948 to the present. Societies included (1) Sociedad Geologica del Peru, (2) Sociedad Nacional de Minería y Petróleo, and (3) Colegio de Ingenieros del Peru. Previously, George was presented the first Herbert Thomas Award at the Chilean Geological Congress in August 1991. This award is in recognition of his investigations related to Chilean mineral deposits and for his participation in the planning and organization of the first Geological Survey of Chile and the first School of Geology. He also was elected a corresponding member of the Chilean Academy of Sciences. Finally, in recognition of his scientific investigations which led to the 1976

discovery of lithium-rich brines in Bolivian salars, the Medal for Meritorious Service to Mining in Bolivia was awarded to George by the Ministry of Mining and Metallurgy at La Paz in January 1992.

Frey, Robert W. - Ph.D.(1969)

(deceased) of the University of Georgia, Athens was awarded the 1993 Raymond C. Moore Medal for his significant record of outstanding contributions to paleontology.

Garza, Cpt. Justine - B.A. (1985)

is serving with the 318th Press Camp HQ, a U.S. Army Reserve Unit based in Chicago.

Goldschmidt, Bruno - M.A.T.(1968)

retired in June 1992 after more than 34 years in public education, teaching earth science, chemistry, IPS, and general/physical science. He and his wife, Eileen, live in Stratford, Connecticut and are enjoying their leisure time by traveling (by motor home) around the U.S., particularly the Southwest during the winter months.

Greim, Jon E. - B.S.(1971)

is now President and CEO of Almet, Inc. of Fort Wayne, Indiana. Almet is a structural steel and miscellaneous metals fabricator which specializes in heavy industrial and commercial construction, including high-rise buildings. Almet also designs, manufactures and markets portable and stationary asphalt plants worldwide under the trade name AlMix. Jon has just completed his second term as President of the Indiana Fabricators Assoc.; started his second term as President of the Three Rivers Gem & Mineral Society, Fort Wayne; second term as Board Member and Treasurer of the Boys and Girls Club of Fort Wayne; Vice President of the Spencerville Lions Club; serves as a Board Member of the Northside Optimist Club, Fort Wayne; and is a member on the President's National Advisory Committee of the American Institute of Steel Construction (AISC).

Hall, Robert D. - Ph.D. (1973)

is now Chairman of the Department of Geology, Indiana University- Purdue University, Indianapolis.

Hanley, Tom - M.A. (1968);Ph.D.(1975)

and his wife, Judy report that having a daughter of 16 at

home and two grandchildren keeps them hopping. Not unexpectedly, they say "grandparenting is great". Tom attended the Boston GSA meeting, attended short courses, and went on a field trip led by Chris Hepburn of Boston College. While at Chestnut Hill, "despite Judy's urging", he did NOT vandalize the BC locker room in retaliation for the Eagles' victory over Tom's undergraduate alma mater, Notre Dame, this preventing the latter from winning another national championship.

Harvey, Richard D. -

B.S.(1957);M.A.(1961);Ph.D.(1964)

has retired as Senior Research Geologist in the Coal Section at the Illinois State Geological Survey after more than 33 years of service. Recently he received emeritus status from the Survey's governing Board of Natural Resources and Conservation in recognition of his distinguished service and noteworthy contributions to the success of the Survey's research and service programs. He was named the 1993 recipient of the R.A. Glenn Award given by the Committee on Coal and Coke of the American Society for Testing materials (ASTM). He continues to serve as Chairman of the ASTM Subcommittee on the Classification of Coal, a post he has held since 1985. He is past officer and proceedings editor of the Society for Organic Petrology, a member of the International Committee for Coal Petrology and the Fuel Division of the American Chemical Society, and a Fellow of the Geological Society of America. Dr. Harvey and his wife, Doris, who reside in Urbana, have three children.

Henry, Gary E. - M.A.(1958)

reports that he has now completed 30 years as an independent exploration geologist working out of Wichita Falls, Texas where he generates and sells oil and gas prospects. He initially worked there four years for Texaco.

Holbrook, John - Ph.D.(1992)

is Assistant Professor of Geology at Southeastern Missouri State University in Cape Girardeau, Missouri

Jontz, Jim - B.S. (1973)

a former congressman, Jim is currently running as the Democratic candidate for the U.S. Senate from Indiana.

Knudtson, Lee G. - M.A.(1966)

was appointed Senior Vice President - Exploration of Plains Petroleum Company on September 1, 1993. For the previous 11 years Lee served in a number of senior management positions with Houston-based Quintana Petroleum Corporation and its affiliates, completing his work there as President of Quintana Exploration Corporation where he coordinated the company's domestic and international exploration programs. Prior to joining Quintana in 1981, he worked for two major oil companies over a 20-year period.

Kwolek, Jim - M.S.(1985)

has transferred to the International Division of Exxon and has been working in such far corners of the world as Bolivia, Chad (several trips), and Kamchatka (Russia). His nickname, "Jungle Jim", which he earned in the Bahamas, now seems more appropriate than ever according to Don Hattin.

Lambert, Michael W. - M.A.(1979)

received his Ph.D. degree in geology from the University of Kansas in October 1992. Since then, he has been an Office of Naval Research post-doctoral fellow in the Seafloor Sciences Branch of the Naval Research Laboratory, Stennis Space Center, Mississippi. This past winter, in looking forward to a possible research cruise off Key West, Florida, Mike noted that "life is tough, but I am prepared to make this sacrifice for my country."

Manka, Matthew - B.S. (1989)

is employed as a staff geologist with Soil Exploration Service of Indianapolis. Upon graduating from I.U. Matt was employed initially by Groundwater Technology of Indianapolis, where he worked for 2 1/2 years as field geologist. Following this, Matt worked for one year as geologist for Roy F. Weston, Inc. of Louisville, KY. His work for the Westonfirm involved work on a technical assistance team for the E.P.A.

Mathews, David L. - B.S.(1959);M.A.(1960)

reports that he continues to enjoy retirement in Palmer, Alaska, perhaps in part because during the summer of 1993 he managed to lop 20 strokes off his golf score. David says visitors are always welcome. Maybe we should have Lee Suttner visit since Lee is always looking for a quick way to improve his golf game!

Matt, Diane - B.A.(1973)

is now Executive Director of Associated Landscape Contractors of Colorado, a non-profit trade association for landscape construction, maintenance, and irrigation contractors in Denver, Colorado. Diane completed an M.Sc. degree in Pleistocene geology at the University of Calgary in Alberta in 1975 and spent that summer as a crew person running Grand Canyon river trips. Since then she has lived in Denver.

Mound, Mike - M.S.(1961); Ph.D.(1963)

is now International Director of Marketing of QCX On-Line Systems for FLS Automation A/S, Copenhagen, Denmark, and has been living in Copenhagen since January 1994. FLS is the world leader in construction of cement and bauxite plants. QCX is the acronym for "quality control via computer and XRF". Mike is involved in the commercial applications of XRF (x-ray fluorescence), XRD (x-ray dif-fraction), and PGNAA (prompt gamma neutron activation analysis) for the detection, monitoring, and control of chemistry of rock materials such as limestone, shale, iron ore, silica sand, kaolinite, gibbsite, boehmite, and metalliferous ores. Mike will return to the U.S. in mid-1995, and has been elected Conference Chairman for the AAPG Energy Minerals Division Meetings to be held in San Diego in 1996.

Nellist, Bill - M.S. (1986)

married Catherine Cooper on July 3, 1993 in Annapolis, Maryland. They both like to cook. Bill is working with a computer mapping system at the Defense Mapping Agency.

Risley, David E. - B.S.(1980); M.S.(1986)

spent nine years working as a geophysicist for the Minerals Management Service, DOI, in Anchorage, Alaska where he was primarily involved in basin analysis and hydrocarbon potential studies for the Bering Sea and Gulf of Alaska regions. In the fall of 1992 he resigned and relocated to southcentral Turkey, where he currently resides with his wife and two daughters. David is presently teaching geology classes for the University of Maryland, European Division, in Incirlik. He says that Turkey is a wonderful place to be for a geologist, from the "fairy chimneys" of Cappadocia, to the Lake Van region, and to Mt. Ararat and other volcanoes along the

Iranian border. Unfortunately, travel, especially to the east, is severely hampered by ongoing violence between the Turks and the Kurdish people. David enjoys, among other things, collecting handmade Turkish nomadic and tribal carpets, visiting the many ancient Roman and pre-Roman ruins, and studying the sedimentology and tectonics of the local Adana Basin. "Visitors are always welcome to our door!"

Roy, William R. - B.S.(1977);M.A.(1981), has been promoted from Associate Geochemist to Geochemist at the Illinois State Geological Survey. Since 1986, Bill also has held a joint appointment as Assistant Professor of Soil Chemistry in the Department of Agronomy at the University of Illinois, Urbana. He also has been on the Graduate Faculty at the University since 1988. In January 1994 he was named a Distinguished Achievement Award winner at the Survey and cited for his research in pesticide contamination and the chemical fate and transport of agricultural chemicals in porous earth materials.

Shorb, William - B.S.(1980) spent seven years as a seismic interpreter with Exxon, mapping the Gulf of Mexico. He currently is a senior organization development specialist in Exxon Exploration Co.'s Human Resources Department. Bill has two children who like climbing on things, including rocks. He still does cartooning, which some of those who took geobiology from Bob Dodd may remember.

Sponable, Cecelia Armstrong - B.S.(1988) has worked at Applied Earth Sciences, Inc. in Houston, Texas since June 1991 as a hydrogeologist. AES is an environmental consulting firm with offices in Texas, New Mexico, Louisiana, Florida, Georgia, and Tennessee. Since June 1993 she has been a team leader for four major clients. Cecelia married **Dennis Sponable** (M.S.'89) in September 1991.

Taylor, Randy - M.S.(1986) has been employed as a geologist in the Geodesy and Geophysics Department of the Defense Mapping Agency at the Aerospace Center in St. Louis since 1988.

Taylor, S. Ross - Ph.D.(1954) was awarded the prestigious V. M. Goldschmidt Award for 1993. Ross, of the Department of Nuclear Physics, Australian National University, Canberra, was honored at the Geochemical Society Awards Luncheon at the 1994 GSA Annual Meeting held in Boston, Massachusetts. The Award Committee cited Taylor's highly productive 35-year career marked by his pervasive and seminal contributions to our understanding of crustal evolution on the Earth and Moon, his pioneering analytical and theoretical work in trace element geochemistry, his definitive trace element studies of lunar samples, meteorites, tektites and upper and lower crustal rocks, and his syntheses of lunar and planetary science and solar system evolution. The award was presented by former I.U. faculty member **Brian H. Mason** of the Smithsonian Institution.

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The deaths of the following alumni have been reported to us since the last Alumni Newsletter.

Bradfield, Herbert H. - Ph.D.(1933)
of Shiner, Texas (March 25, 1992)

Cameron, Donald K. - M.A. (1954)
of Franklin, Tennessee is survived by his wife, Barbara, a son, Donald III of Los Angeles, California, a daughter, Mrs. Douglas Sheppard and granddaughter Kelsey of New York City and also his mother, Mrs. Rachael Cameron of Portland, Maine. Mr. Cameron was employed by Chevron Oil Corporation from 1954 to 1992 in various exploration capacities in New Orleans, Louisiana, Jackson, Mississippi and San Ramon, California. He was on assignment with ARAMCO in Dhahran, Saudi Arabia from 1969-1978 and in Croydon, England from 1978-1980. At the time of his retirement from Chevron in 1992, he was Manager of Stratigraphic Sciences for Chevron Overseas Petroleum, Inc. in San Ramon. (February 2, 1994)

Devening, Donald C. - B.S.(1952); M.A.(1953)
(May 5, 1993)

Finegan, Michael - M.A. (1974)
died of cancer on December 19, 1993 in Oak Hills, Ohio where he had been a teacher of earth science at Oak Hills High School. Mike was a Vietnam veteran and while there received the Bronze Star Medal and a letter of Commendation from the Republic of Vietnam Armed Forces. His obituary published in the December 22, 1993, edition of The Cincinnati Enquirer noted his belief that "every student had talent and something to contribute to society." He was a member of the Clifton United Methodist Church and is survived by his wife Evelyn, his

father, Clive, and stepmother, Barbara Finegan of Brownsburg, Indiana; a sister, Kathleen Limbach of Woodstock, NY; and a brother, Mark Finegan of Noblesville, Indiana.

Stanley, James T. - B.A.(1950)
of Atlanta, Georgia (May 4, 1993)

Thomas, William A. - B.A.(1923);M.A.(1924)
(April 10, 1991)

Weir, Robert H. - B.S. (1981)
of Wilmington, Delaware passed away after a four-year bout with cancer. He is survived by his wife, Merry Hope McLoy; his parents, Robert Sr. and Dorothy, of Pitman, New Jersey (who have recently relocated to the Nashville, Indiana area); and two sisters, Mary Weir Anderson of Los Angeles, California and Rebecca Weir Roesher of Pitman. A sister preceded him in death. At I.U., Bob was a member of Phi Beta Kappa and Sigma Xi as well as a Metz Scholar. He was awarded a National Science Foundation Fellowship to Penn State where he obtained an M.S. degree in geochemistry. He was subsequently employed by the U.S. Geological Survey, Chevron Oil Company, and Dames & Moore Environmental. (January 22, 1994)

Williams, Frank H. - B.A.(1942)
(September 13, 1993)

We extend our deepest sympathy to the families and friends of the deceased.

* * * *

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scholarships, graduate research, summer field training), and the Geologic Field Station Maintenance Fund (improvements to physical facilities).

ACKNOWLEDGMENTS

This newsletter was compiled, written, and edited by David Towell with major assistance from Sarah Burton and Kim Schulte. Help from Lee Suttner and Barb Hill is also appreciated. The College of Arts and Sciences Alumni office contributed partially to offsetting the printing expenses as well as mailing costs. The Alumni mailroom handled distribution. We appreciate their assistance.

We urge you to send us prints, photos, or slides that would interest our readers. Please be sure to label with your name and address so that they can be returned and also provide a complete caption. We can't promise to include all submissions, but we can promise to return yours.



A Spring picnic at Bloomington's Cascades Park around 1948. Can you identify those with J. J. Galloway,

Bill Wayne, Press McGrain, Ralph Esarey, and Bob Stewart?

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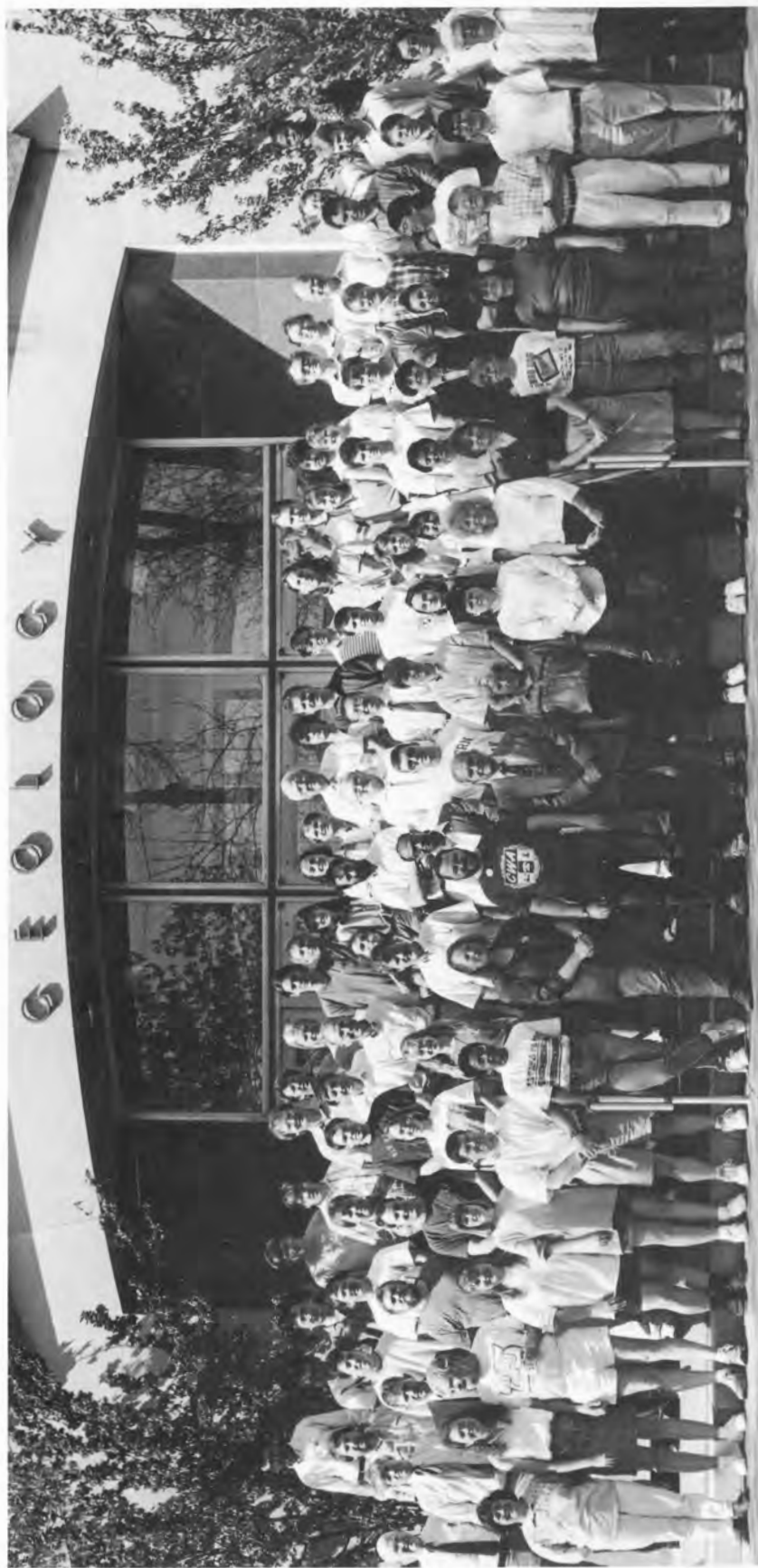
Please mail this sheet to:

John M. Hayes, Chairperson
Department of Geological Sciences
Indiana University
1005 East 10th Street
Bloomington, IN 47405



ADVISORY BOARD MEETING, February 18, 1994

(left to right) Robert Blakely, Frank Pruett, Dick McCammon, Stan Anderson, George Nevers, Dan Tudor, Mal Boyce, Jud Mead, Lee Suttner, Dan Sullivan, Dick Gibson, Mike Graham, Steve Graham, Tom Straw, Sarah Burton, Steve Young, Bob Boyer and Susan Green



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