

GEOSCIENCE NEWS

*for alumni and friends of the
Department of Geological Sciences
The University of Michigan, Ann Arbor, Michigan*



December 1993



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Greetings from the Chair

News from the Department since the last (Spring) newsletter includes the awarding of the Donath Medal by the Geological Society of America to Mike Gurnis in a ceremony in October in Boston. Considering that Mike won the Macelwane Medal of the AGU last year and a Packard Fellowship the year before, he has not been able to say no to the request to be editor of this issue of *Geoscience News*.

The C. C. Little Building will undergo an infrastructure renovation in 1994-1997: new windows, heating, air-conditioning, plumbing and electrical renovations are included in this plan, which will be funded by bonds issued by the State of Michigan. Unfortunately, the funding falls short for doing all floors, but the third floor (entirely) and parts of the first and fifth floors are included in the renovation. New space vacated by Biological Sciences on the third and second floors will be used for teaching laboratories, an undergraduate lounge, seminar rooms and new offices. While the renovation is going on, the Department's activities must continue in the building, so we are all going to play a game of musical chairs as one moves temporarily into new quarters while the old are being modified. That this is a source of much joy and cheerful dancing in C. C. Little's hallways is a bit of an exaggeration, but as always our faculty are facing the reality of such circumstances with dignity. The planning and design by the architectural firm in charge of the project is to be completed at the time of mailing of this newsletter; considering that they started in the summer, one can imagine the rushed state of affairs and the somewhat chaotic nature of departmental communications about what and who will be impacted.

An article about Ben van der Pluijm in this issue highlights the often overlooked fact that our research programs are still very much field-based; despite the impressive array of analytical equipment in C. C. Little's laboratories, most of our students are mapping, charting, and measuring their way through interesting field settings in order to collect well-documented materials for graduate or undergraduate study back in Ann Arbor. The Scott Turner Fund is still primarily used to support much of this fieldwork; although our federal research funding (mostly NSF) continues to increase at a healthy supra-inflationary level of some ten percent per year, grant moneys inevitably fall short of all that is needed to do a project well. Our annual expenditures of external funding in 1992/1993 exceeded \$2.5 million and show no signs of abating.

The Department is joining the University's Capital Campaign this Fall; kick-off took place during the annual meeting of the GeoAlumni Advisory Board on October 1 in Ann Arbor. A mailing of Campaign material should have reached you even before the appearance of this newsletter. We hope you find our propaganda persuasive!

Sincerely,



Rob Van der Voo
Chairman

On The Cover

A coastal view of the Parry Sound shear zone at Georgian Bay, southern Ontario. This is just one of many spectacular shear zones in the Grenville Orogen that preserve an orogenic history from *ca.* 1400 to 900 Ma. Field and strain studies using magnetic anisotropy indicate large northwest-directed, reverse displacement along this particular mid-crustal, amphibolite grade shear zone and based on Pb dating of synkinematic garnet the time of shearing is 1123 ± 3 Ma. These integrated studies of Grenville geology provide a view of the deep-crustal structure and processes in orogenic roots.

U-M Graduate Program in Top 10!

For the first time, *US News and World Report* surveyed and ranked key science departments. Michigan ranked sixth in the nation above such traditional geology heavyweights as Texas, UCLA, and Cornell. Harvard and Yale didn't even make the top ten! The ranking was based on a survey of geology department chairmen nationwide and used such criteria as reputations for scholarship, curriculum and quality of faculty and graduate students. The results can be found in the March 22, 1993 issue.

Ben van der Pluijm receives 1993 Geo-Alumni Award



Ben van der Pluijm is the second recipient of the University of Michigan's Geo-Alumni Award for Excellence in Research and Teaching. The award was presented by Geo-Alumni Advisory Board Chair John Joity, joined by Department Chair Rob Van der Voo, during the annual meeting of the Alumni Board on October 1 in recognition of outstanding accomplishments in teaching and research. Ben thanked the Board for this recognition and briefly highlighted some of the motivations that led to many of his studies. We use this opportunity to expand on this.

Ben completed a M.Sc degree in 1981 at the University of Leiden in the Netherlands in structural geology. The virtual absence of rocks in the Netherlands creates a university curriculum that exposes students to the varied geology of many regions in western Europe, which formed the basis for Ben's strong field-oriented research interest that he continues today. A particularly vibrant group of structural geologists at Leiden (and later University of Utrecht) also guided him into what has now become microstructural geology, the study of deformation features on the microscopic and submicroscopic scale. In Leiden Ben worked on cleavage formation and illite crystallinity in Carboniferous slates from the Cantabrian Mountains of northern Spain and transmission electron microscopy of calcite. Following his M.Sc., Ben continued his studies under former Leiden faculty Paul Williams who had left to become Chair at the University of New Brunswick in Canada. Ben's dissertation topic focused primarily on field observations and regional correlations in a classic area of the northcentral Newfoundland Appalachians called New World Island. His field area was previously studied by such eminent geologists as Marshall Kay and John Dewey, but detailed structural work was lacking. In spite of the large amount of existing work in the area, Ben's study presented two views that would prove to be of great significance: (1) the northern Appalachians are detached from the basement along

thrusts, which led to a reevaluation of regional subdivisions, and (2) the 'Acadian' orogeny in the area was much older than previously assumed (starting already in the earliest Silurian) and tectonically more widespread than the Ordovician Taconic orogeny. In spite of the initial objections, subsequent work by Ben and his associates and others seems to lend support to these ideas. In the course of his Ph.D. investigations Ben also published on such topics as scanning electron microscopy, paleontology, conodont color alteration, cleavage formation, and folding.

Near the end of his Ph.D. in 1984, Ben accepted the position of structural geologist at the University of Michigan, which first led him back to the Netherlands where he had to wait for a visa and work permit. During that time he married **Lies Quint**, who was completing Medical School at the University of Leiden. Lies fondly remembers those days as ones where dinner would be ready when she came home; Ben's memory is one of dishes and dusting. In the summer of 1985 Ben started at Michigan, and Lies joined him in early 1986 after she completed her degree. Since that time Ben has been building a research program in structural geology that attempts to step beyond the traditional boundaries of this discipline. The seemingly limitless opportunities at the University of Michigan offer new approaches to old problems, which has led Ben and his students to utilize essentially each laboratory facility in the Department. This large variety of research topics would not have been possible without a dynamic group of students and post-docs, and fruitful collaboration with other faculty in the Department. In his current research, three fields of interest can be identified: (1) Paleozoic deformation of eastern North America, (2) deep-orogenic architecture from study of the mid-Proterozoic Grenville, and (3) quantification of deformation fabrics.

Studies of Paleozoic terranes of Iapetus that are preserved in the northern Appalachians are underway since 1985. This includes paleomagnetic, geochemical and field study of rock units from locations in Maine, New Brunswick and Newfoundland, where he and his coworkers are mainly concentrating on Ordovician and Silurian rocks. This aspect of the research is carried out in collaboration with **Rob Van der Voo** and involves the efforts of former post-doc **Rex Johnson** (now at Traverse Group) and past M.Sc. students **Julie Gales**, **Margo Liss**, **Art Lombard** and **Reid Wellensiek**, and currently post-doc **John Stamatakos** and graduate students **Steve Potts** and **Sean Todaro**. A picture is emerging that likens the paleogeography of the Iapetus Ocean to the complexity that is found today in the western

Pacific. A second aspect of this research is the determination of deformation patterns in the cratonic cover sequence to the west of the Appalachian mountain belt (the orogenic foreland). The results show that late Paleozoic deformation is much more widespread than previously assumed (stresses are transmitted >1200 km inland) and current efforts are directed to further quantification. A related study involves Michigan Basin subsidence patterns, which appear to be directly related to Appalachian orogenic pulses at the margin. These studies formed the dissertation topics for **John Craddock** (now at Macalester College) and **Paul Howell** (now at University of Kentucky), and this research continues. Some of this work was included in the recent 1993 AAPG Hedberg Conference on "Basement and Basins of Eastern North America" at Ann Arbor that was co-convened by Ben.

The mid-Proterozoic Grenville belt offers the opportunity to examine orogenic processes that are active at levels in the crust not exposed in young (Mesozoic/Tertiary) mountain belts. Ultimately such deep-crustal studies enable us to obtain a complete picture of orogenic processes. The Grenville project was initiated in 1986, with a particular emphasis on the role of major crustal fault zones in orogenic evolution. In this study, structural mapping and laboratory work are combined to examine crustal deformation processes, recently focusing on shear zones in the central, lower-grade portion of the belt, which preserves the late orogenic contractional and collapse history. Collaboration with **Eric Essene** and **Alex Halliday** enables the broad approach that is required for this study, as does the involvement of former post-doc **Klaus Mezger** (now at Max-Planck Institute), past graduate students **Kate Carlson**, **Mark Rathmell** and **Mary Ellen Tuccillo**, and current graduate students **Jay Busch** and **Jim Cureton**. These studies have documented the existence of an earlier tectono-metamorphic cycle in the Grenville (ca. 1.4 Ga) and detailed the role of syn-orogenic collapse among other topics.

Two projects on the quantification of deformation fabrics were initiated in 1989, and utilize modern rock magnetic and X-ray techniques to study deformation fabrics. A new magnetic method that was developed at Michigan enables the separation and quantification of the ferro- and paramagnetic fabrics of rocks. This work appears to resolve many outstanding problems and offers a potentially powerful technique for fabric quantification. This project is the dissertation topic of **Bernie Housen** and includes post-docs **John Stamatakos** and **Carl Richter** (who left earlier this summer for a staff-scientist position at the Ocean Drilling Program). With graduate student **Nei-Che Ho** and **Don Peacor** we recently completed the construction of a high-resolution X-ray texture goniometer using a single-crystal diffractometer. This device, of which only a handful operate in North America, measures the crystallographic orientation

of minerals in a rock and we were able to improve the resolution of this method by one order of magnitude. The resulting high resolution better approaches the inherent heterogeneity of deformed rocks. Topics involving these studies include foliation development in clays (Gulf Coast shales and Cascadia and Barbados accretionary wedge melanges) and slates (Martinsburg and Welsh slates). Some of the samples for this research were obtained from shipboard participation in the Ocean Drilling Program.

In addition to the individuals that are listed by name, these research projects have and continue to involve several enthusiastic undergraduate students. Other research projects were carried out with M.Sc. student **S.T. McWhinnie** (on thrusting and remagnetization) and Ph.D. student **Jeff Mauk** (now at University of Auckland) on the structural origin for second-stage Keweenaw copper. Support for these projects is primarily from National Science Foundation grants and the American Chemical Society-Petroleum Research Fund.

Within his specialty of Structural Geology and Tectonics, Ben has taught a sequence of courses that involve his field of expertise at the undergraduate and graduate level. One of the offerings is a core course with laboratory session for undergraduate majors in geology (Structural Geology, GS351). In this course he tries to bring some of the excitement associated with modern research in structural geology to undergraduate students, without ignoring the development of the necessary general background. Several blocks of lectures are dedicated to modern topics that are often only superficially covered in most geology textbooks. With post-doc **Andrew Schedl** (Louisiana State University) he has published some of his class notes on deformation microstructures, and produced a 30-minute video of microscopic deformation experiments for class instruction. Copies of this video are used by more than 100 universities worldwide. More recently, Ben has extended this endeavor by working on a textbook, titled "*Micro, Meso, Macro—An Introduction to Deformation and Tectonics*" in association with **Stephen Marshak** of the University of Illinois, with contributions on regional geology from others. Ben expects that the book will go into production next year. Graduate courses in tectonics (GS606 and GS515) have been co-taught with several other faculty in the Department. Advanced structural geology (GS662) has been offered in alternating years and uses various formats, ranging from lectures to laboratory sessions, and student presentations to comprehensive term papers. Topics are timely and are chosen in consultation with participating graduate students. The small class size inherent to advanced classes is perfect for the treatment of these often highly specialized topics and each time Ben looks forward to the special challenges this class offers.

For six consecutive years Ben taught mapping at Michigan's summer field camp for concentrators in geology (GS440) at everyone's favorite location in Wyoming. Many alumni may remember that camp can be very demanding, because one has to learn many new techniques in a relatively short time while exercising unwilling muscles that were dormant for most of the year. Ben modified existing projects and designed new field projects to reflect modern approaches to field mapping. In the future he hopes to return to field camp and continue his cowboy training (roping is next).

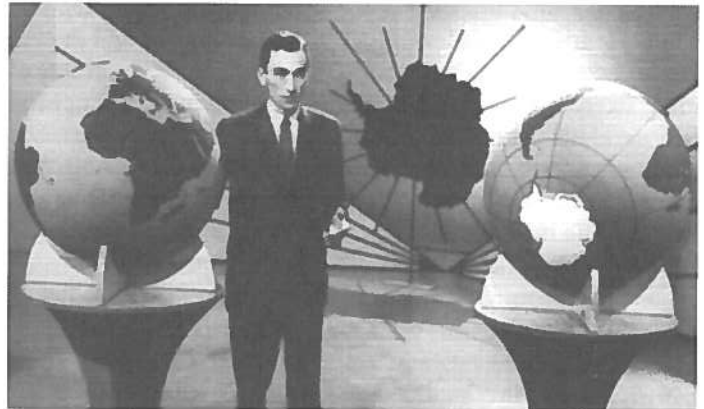
Since 1991 Ben has also been teaching courses for non-science majors. He greatly enjoys bringing the excitement of modern geology and the sciences in general (astronomy, physics) to students who at first seem turned off by 'hard science'. His enthusiasm removes at least some of these barriers and the courses are proving very successful. Most recently, Ben designed a new course with the modest title "*How the earth works: The dynamic planet*" along these same lines. An additional challenge in this course is the use of modern multimedia technology in the classroom; juggling several remote controls is one of the acts. However, old-fashioned classroom experiments that invariably go wrong continue to be a favorite with the students; remember the (empty?) beer can experiment.

Ben has served on several committees both inside the Department and outside the University. These assignments range from membership of the Department's executive committee to chairing the College of LS&A's Library Committee, to panel member of the Geological Society of America's Committee on Research Grants. Ben serves on the Editorial Boards or as Associate Editor of *Geology*, *Precambrian Research* and *Tectonophysics*. He has (co-)authored some 45 papers since 1985 and received more than \$1 million as (co-)Principal Investigator in research grants primarily from the National Science Foundation. He became Associate Professor with tenure in 1991.

Finally, in his personal life Ben finds great joy in his two boys, **Wouter** (3) and **Robbie** (1), who seem to be early football prospects according to some of the comments he receives (including a recent one from a Michigan coach). Dutch tradition, however, would require that they play soccer, so Ben feels compelled to constantly argue the beauty and future of this sport to those around him, and he has already started training session with the kids. His wife Lies continues a rewarding career at the University of Michigan, where she is an assistant professor in OB/GYN in the Medical School. Ben says that the University of Michigan has been very good to both of them and that many of his academic accomplishments are rooted in a Departmental atmosphere

that nurtures and stimulates young faculty, but Ben is reluctantly aware that he no longer fits the category 'young faculty'. Just returning from a sabbatical year that was mostly spent writing, Ben looks forward to the future with a very enthusiastic group of graduate students in Structure/Tectonics and collaborating researchers within and outside the Department, and further adventures in teaching.

Bill Kelly



To many currently in the Department, this handsome stranger would be a mystery figure, but to alumni from decades ago, he is easily recognized as Bill Kelly, soon to be Emeritus Professor of the University of Michigan. Bill was honored at a celebration of his career (rather more like a roast) organized in Summer 1993 by the Office of the Vice-President for Research, and the invitation to that event carried this picture.

Alumni News

1930's

Donald H. Chapman (BS '28, PhD '31) writes from Durham, New Hampshire, that he retired in 1974 after 43 years of teaching at the University of New Hampshire in the Department of Earth Sciences. He received the St. Olav Medallion from King Olav of Norway in 1958 for Student Exchange work. At 89 years, he no longer has any research in progress. Activities presently include residential maintenance, gardening, occasional presentations to Service Clubs, etc., and travel. In recent years he has done some Geological sightseeing in Norway, Scotland and Orkneys, coastal Alaska (1992), and in March of this year traveled along the Palmer Peninsula of Antarctica, reaching 67 S Latitude.

1940's

Orlo Childs (PhD '45) writes from the University of Arizona that he and **George Davis** (PhD '71) planned a gala birthday event for **Laurence Gould** (MA '23, SCD '25, LLD '54) in honor of his 97th birthday on August 22. As a student (under Hobbs), a faculty member, and honored alumnus of Michigan, he is of course a legend. Contributions to the UA Foundation are going to be used to build a cabinet in the foyer of the Gould-Simpson building to house and display Larry's 32+ honorary doctoral hoods.

Orlo also writes that he was awarded an honorary Doctor of Humanities by Weber State University in Ogden, Utah. He found it something of a shock to realize that the 50-year graduates, who were being honored at the Commencement exercise, had been students of his when he taught at Weber. This year he was asked again to be a part of WSU's commencement, and this time included were the last 50-year graduates before he left Weber for other segments of his career. The impression that "senior citizens" have seems to be true, "everyone else gets older faster than we do."

Mary Webster Lamoreux (BS '45) writes from Silver Spring, MD, that her oldest grandchild is a sophomore at the University of Maryland. Time flies!

Jean Holforty Story (BS '45) is spending a good share of her retirement years as a docent at the Denver Museum of Natural History: fossils (including dinosaurs, of course), minerals, and earth sciences, primarily. Her biggest challenge is facing second graders at 10 a.m., tenth graders at 1 p.m., senior citizens at 3 p.m.—and once even a ladies garden club.

James A. Seglund (MS '49) spends the summers on Autrain Lake in Michigan and the rest of the year in south Louisiana. What a great schedule!

Richard Wyman (MS '49) writes from Boulder City, Nevada, that he retired at the end of June 1992 as Chairman of the Department of Civil and Environmental Engineering at the University of Nevada, Las Vegas. His wife, Anne, continues teaching in the Department of Geosciences at UNLV. Richard identified Stanley Jerome and Prof. Eardley in the Camp Davis pictures in the last Newsletter.

1950's

Nancy (BS '51) and **Bob Dott** (BS '50, MS '51) spent last fall on sabbatical leave in Australia and New Zealand studying Proterozoic strata and the fascinating Gondwana biota. In April, Bob received the SEPM's Twenhofel Medal. Nancy continues to "wow" school kids with rock talks and nature walks—all part of her popular offerings in Environmental Education. In October, Bob completed his five-year term on



SEPM Medalist Bob Dott and his wife Nancy at the recent Geo-Alumni Meeting

the U-M Alumni Advisory Board. He said that "this was a terrific experience."

David G. (BS '51, MS '52) and **Ann L.** (BS '51) **Hardy** write from Mesa, AZ, that in June they spent their third summer at Camp Michigania in Switzerland, hiking under the tutelage of Bob Foreman. As usual they enjoyed it immensely.

Joseph A. Wolfe (BS '50, MS '51) is retired and living in Las Cruces, New Mexico. He is still studying a little bit, and enjoying golfing, traveling, and two grandchildren.

Robert H. Edwards (BA '52, MS '54) is enjoying retirement from Rowan College in Glassboro, New Jersey. He travels, with emphasis on Hispanic America and its archaeology, and enjoys visits with his children and grandchildren.

Patrick J. Cooney (BS '54) is semi-retired to Vancouver Island (Maple Bay). He has five grandchildren, all living in Calgary—500 miles east. There are a number of U-M graduates living in Calgary, and there have been many Michigan reunions. Most of the graduates were in the oil business. Patrick has operated his independent companies since 1970.

William R. Flenniken (BS '56) is retired and living in Ottawa, Canada. "Merci beaucoup, mes amies!"

Harold R. Livingston ('58-'59) is winding up another year of travelling within the 225,000 square mile Northern Region of Alaska's DOT & PF. He is taking part in drilling foundations and borrow sources for airports and highways within the area from Cordova on the south coast, Barrow on the north coast, Canada on the east boundary, and Diomed Island on

the west. The South Central Region of DOT & PF includes the Aleutian Islands, the Anchorage area, and about one-third of the highway system between Anchorage and Fairbanks. They still only have about 90 feet of roadway per square mile in the state. Much travel has to be by airplane, dogsled, boat, and 4-wheeler. He's anticipating retirement in a couple of years and can then take up gardening and beekeeping to a greater extent. The 50 colonies being managed now are located in Fairbanks and Captain Cook Hawaii, making quite an enjoyable arrangement.

Haig F. Kasabach (BS '57, MS '59), State Geologist of New Jersey, has been appointed editor for The Association of American State Geologists.

1960's

Pedro A. Gelabert ('60) was appointed Secretary of Natural Resources on January 4, 1993, by the Governor of Puerto Rico. In this new position he will try to defuse two major crises on the island: the depletion of the dwindling water supply, and the safe handling of municipal garbage. Prior to this he has served as Director of the U.S. EPA Caribbean field office, was Chairman of the Puerto Rico Environmental Quality Board, President of Environmental Services of Puerto Rico, Inc., and Executive Director of the Puerto Rico Mining Commission. Pedro and his wife have two grown children.

Richard L. Leary (MS '61), Curator of Geology at the Illinois State Museum, writes that a little excitement enters his life once in a while. He will be an invited lecturer on board Orient Lines cruise ship Marco Polo in January 1994. The 15-day cruise begins in Buenos Aires, Argentina, visits the Malvinas/Falkland Islands, makes several stops along the Antarctic Peninsula, and ends in Punta Arenas, Chile. He will lecture on regional geology and paleobotany and will also share his experiences of travels in Patagonia and western Argentina. He enjoys the newsletter which keeps him informed of the activities of the department and fellow graduates.

Ralph M. Perhac (PhD '61) has retired after 15 years with the Electric Power Research Institute, most of that time as Director of environmental research. He left California and settled in Raleigh, North Carolina. The thing he misses most about California is seeing some of his U-M classmates who lived nearby.

Leigh W. Mintz (BS '61, MS '62) writes from Castro Valley, California, that his duties at California State University in Hayward have been expanded to include Admissions and Records, in addition to previous roles as Dean of Undergraduate and Dean of Graduate Studies. The budgetary crisis in California is making everyone do double or triple duty.

Josephine C. Moore (BA '47, MS '59, PhD '64) is Prof. Emeritus, Department of Anatomy, USD Medical School, Vermillion, South Dakota. She still lectures in the US and abroad and, when time permits, is carrying on research and publishing on the nervous system.

John A. Thoms (PhD '65) of Littleton, Colo., has been elected executive secretary of the Society of Economic Geologists for 1993.

1970's

James M. Robertson (MS '68, PhD '72) took over duties as Director of the Wisconsin Geological and Natural History Survey and State Geologist at Madison, Wisconsin, in January of this year. The strengths of the WGNHS—its programs, staff, and position in Extension—attracted him to the position. He is married and has two children; they live in Middleton, Wisconsin.

Roger L. Gilbertson (PhD '72) wrote from Argentina on July 9, their independence day. He will soon complete his fourth year in Buenos Aires with BHP Petroleum. They have made a potentially significant natural gas discovery in the Neuquen Basin; follow-up drilling will tell the story. He has made some trips to Bolivia and visited Lago Titicaca—strictly business, of course!. Due to the Bolivia work he has re-established contact with **George C. McIntosh** (PhD '83) concerning some Devonian stratigraphy and echinoderms. He also visited with **John Greene** (MS '70) for a few minutes this spring in Houston (a chance encounter). Roger really enjoys reading *Geoscience News* and wishes more 70's classmates would send notes.

Thomas M. Brocher (BS '75) writes from Millbrae, California, that he manages to keep busy. He has worked at the U.S. Geological Survey for almost eight years. Recently, he has been involved in a relatively new type of seismic refraction experiment, in which they record on-land marine airgun signals used for offshore reflection profiling. He has participated in these onshore-offshore experiments in Alaska, Oregon, and California. The most recent experiment, named the Bay Area Seismic Imaging eXperiment (BASIX), was conducted in San Francisco Bay in September 1991. During BASIX they mapped a mid-crustal reflection between the San Andreas and Hayward faults at about 16 km depth. They're not sure yet whether this reflector represents a decollement surface accommodating fault normal compression or the top of a slab of oceanic crust or both. Tom will be presenting the results at a special session at the 1993 GSA meeting in Boston and at the Fall AGU meeting in San Francisco. He and his wife have two small children, and they have had the pleasure of running into **Steve Bohlen** (MS '72,

PhD '79) and his family several times at the playground, zoo, and aquarium.

Robert E. Dister (BS '75) is currently an optometrist and Assistant Clinical Professor at the UC Berkeley School of Optometry, where until recently he was teaching 4th year interns. He worked as an attorney for three years after receiving a J.D. in 1980, but decided he needed to earn a less stressful and more honest living. His only connection to geology these days is using what he learned when he goes on vacation. He saw the total solar eclipse in Hawaii during July 1991 and also got a great view of the erupting Kilauea volcano at sunset, a truly spectacular sight. This was his second total eclipse, the first being in Oregon in 1979 which he viewed with old classmate Sue Brown. Bob believes that everyone should make an attempt to see at least one total solar eclipse. The next easy one to see is in the Caribbean in February 1998—mark your calendars! He's hoping to visit the Grand Tetons and Yellowstone next summer, with a side trip to Camp Davis to show his wife of five years, Darlene Fong, the site of two really great summers. He'd love to hear from any of his old classmates who might be wandering through the Bay area.

David Chapman (PhD '76), Professor of Geophysics at the University of Utah, has been appointed Associate Dean of the Graduate School at Utah.

Steve A. Catlin (BS '78) writes from Ventura, California that not a lot is new, but he will be vacationing in New Zealand for a couple of weeks in November and December.

Meridee Jones Cecil (MS '78) is taking a year off from working at the USGS (current project, study of structures associated with crustal seismicity in the Puget Sound area) to go with her family to England. Her husband is working at the Joint European Torus Laboratory during his sabbatical from the Colorado School of Mines. They will return in August of 1994.

Newly elected SEPM officer is GSA Fellow **Carlton E. Brett** (MA '75, PhD '78), University of Rochester, New York.

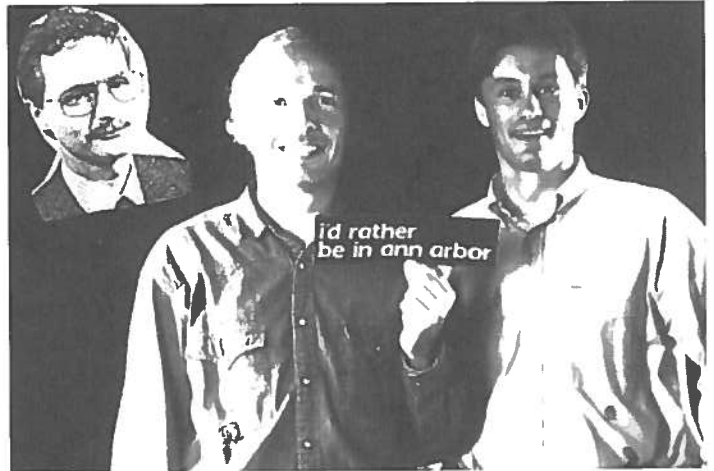
1980's

Jim Evans (BS '81) and his wife **Susanne (Janecke)** (BS '81) are expecting their first child in December. Jim is an Associate Professor at Utah State University.

Allan H. Treiman (PhD '82) tells us that after nine months with Lockheed Engineering and Science Co., he will be joining the Lunar and Planetary Institute (USRA) as a Staff

Scientist. He will be continuing work on water on Mars and begin experiments on metamorphic petrology of basalt on the Venus surface. His son Daniel will enter the fourth grade and Michael will start kindergarten in the fall.

David P. Morley (MS '83) and his wife Anne are happy to announce the birth in March of a second daughter, Kristin. They are living in Houston, Texas.



Clint Cowan (left) and Volker Vahrenkamp with a Bart Tichelaar inset—the recent Michigan graduates are at Royal Dutch Shell.

Clint Cowan (MS '85) and **Volker Vahrenkamp** (MS '83) write that there are now three graduates from Michigan at the Shell Research Lab in the Netherlands since the addition of **Bart Tichelaar** (PhD '91). They had their first Michigan Lunch exchanging their experiences with Michigan banquets and professors and viewing pictures of the 1982 hockey team. Plenty of laughs and good memories. They welcome visitors. The science atmosphere is pretty good there and Amsterdam is wild, Clint says, and Volker agrees.

Elizabeth Finkel (MS '86) joined the faculty at the U-M School of Education in September. She recently earned a doctorate from the University of Wisconsin-Madison and earlier a bachelor's in geology from George Washington University. She has been a secondary school science teacher.

Faculty, Research Staff, and Student News

After spending a few weeks at Camp Davis, **Jeff Alt**, along with post-doc **Damon Teagle**, attending the RIDGE (Ridge Interdisciplinary Global Experiments) Theoretical Institute meeting in Big Sky, Montana. Both presented abstracts at the meeting and Jeff gave a lecture at the short course. Jeff and Damon continued their "field" work logging drillcore at the DSDP core repository in La Jolla, California, and after getting a few manuscripts and other meetings out of the way, are back in the lab continuing work on hydrothermal alteration and mineralization of mid-ocean ridges and island arcs.

Catherine Badgley is continuing research on the ecology and evolution of mammalian faunas. A broad survey of ecological attributes of modern mammalian faunas in relation to climatic conditions indicates that the distribution of species by size and feeding specialization is highly correlated with climatic conditions for mammals in modern ecological communities. This strong correlation offers a means of inferring paleoclimatic conditions based on unbiased mammalian fossil assemblages; application of this method to Miocene mammalian faunas from Pakistan indicates that climatic conditions were drier and more seasonal than previously recognized. Also, this pattern in modern mammalian faunas suggests that projected changes in global climatic conditions within the next hundred years would have a strong impact on the geographic distribution of extant mammals.

Joyce Budai has returned to the realm of stable isotope research this fall with the initiation of a major investigative effort to unravel the hydrogeological and fluid history of several key Paleozoic horizons within the Michigan Basin. Joyce will be collaborating with Lynn Walter and her crack group of graduate students on two different projects. The American Chemical Society's Petroleum Research Fund is supporting an evaluation of Silurian brines and enclosing evaporites, which will be a part of **Anna Martini's** dissertation. Lynn Walter and Joyce Budai, together with Linda Abriola (Department of Civil and Environmental Engineering) have received the go ahead from the Gas Research Institute to begin a broadly based, collaborative evaluation of the Antrim Shale, an unconventional gas reservoir in the Michigan Basin. Joyce will be interacting with Anna Martini and **Jim Richards** (graduate student) on the stable isotopes of the waters, gases and fracture-lining carbonates that play a role in distribution of production patterns. On other fronts, Joyce has been busy preparing to move a large part of Michigan State University's well core collection down to Ann Arbor. The generous contributions of Amoco Production Company, Arco Oil and Gas Company, and Shell Western E & P are

gratefully acknowledged and have made this acquisition of new cores possible for our Subsurface Laboratory.

Eric Essene's graduate students continue to make excellent progress with their research. **Charlie DeWolf**, one of Eric's senior PhD students with Alex Halliday, just completed his dissertation on the geochemistry of high grade metamorphic rocks this summer and has several papers in press. Charlie is currently working as a geological consultant in Laramie, Wyoming, and is soon to be married to Mary Berman, who is an assistant professor in nursing at the University of Wyoming, and who was the nurse at Camp Davis for several years. **Jodie Hayob**, another senior PhD working with **Steve Bohlen** (PhD '79) and Eric, is completing her dissertation on deep crustal xenoliths this December. She has already taken a post as assistant professor at Mary Washington College beginning this fall. **Teri Boundy**, who is marrying **Brad Singer** (visiting Assistant Professor, '90-91) this December, is well into her dissertation on various aspects of Bergen Arc eclogites and associated rocks from western Norway with Haakon Austrheim of the University of Oslo and Eric. Haakon was a Turner lecturer this fall and attended the fall GSA with Eric. **Jay Busch** and **Jim Cureton** are working with Ben van der Pluijm and Eric on Grenville mylonites and their surroundings in Ontario. **Eleanor Dixon** is testing hornblende barometry against contact metamorphic thermobarometers in the southern Sierra Nevada with Alex Halliday and Eric. **Peter Tropper**, Eric's new PhD student from Graz, Austria, is just beginning research on blueschists and eclogites from the western Alps. **Ed Van Hees** continues his dissertation with Steve Kesler, Jim O'Neil and Eric on two Archean gold deposits.

This fall Eric has been busy with a variety of new projects, including several term projects associated with the graduate course in Metamorphic Petrology (GS 508). A field trip was run in late September to Elliot Lake, Timmins, Munro Township, Kapuskasing, Wawa and Batchewana Bay with Steve Kesler, Ed Van Hees, **Torsten Vennemann** and the students taking GS 508. Jim Cureton is evaluating cummingtonite-plagioclase-garnet barometry in a variety of high grade metamorphic rocks. Eleanor Dixon is investigating garnet granites that contain both rutile and andalusite(!). **David Minor**, a new student of Sam Mukasa from Montana State University, and **Dave Mogk** (BS '75) are examining calc-silicates from contact metamorphosed Huronian limestones. **David Stenger**, another new student working with Steve Kesler, is surveying sulfides in metabasalts in relation to the regional metamorphism around Timmins, Ontario. Peter Tropper is undertaking studies of metamorphism of komatiites from Munro Township, Ontario. The fall trip to Timmins reminds Eric of a memorable field trip to northern Ontario in the late 70's that included **Bill Kelly**, Steve Bohlen, **Phil Brown** (PhD '80), **John Geissman** (PhD '80) and **John Valley** (PhD '80), who sang rugby songs

each evening in every campground. Finally, Eric is writing a paper with Don Peacor on the pitfalls of clay mineral thermometry.

Eric, Joyce, Adam and Zachary enjoyed Halloween this fall. Adam is in kindergarten and Zach is in pre-school programs. After two years as an occupational therapist Michelle entered Medical School at the University of Minnesota this fall and is doing well with anatomy and other medical courses. Karen is a social worker for the unemployed and as an advocate for abused women in Missoula, Montana, while also continuing work as an architect. Eric and Joyce are very proud of their progeny!

Now that **Bill Farrand** is back on campus full time, he is spending a lot of time learning the ropes of running the University's Exhibit Museum, a new position that he assumed July 1st. Under his direction, the Exhibit Museum is planning several major renovations to be put in place gradually over the next few years, as funds become available. A new automation system for the Planetarium has already been installed, and an enlarged Planetarium is being planned, along with a seriously needed upgrade of exhibit and building lighting systems. Bill continues to teach glacial and non-glacial geomorphology and archaeological geology courses, for which the demand seems to be growing. His current research centers largely on geoarchaeological studies of Yarimbuzaz, a deep cave near Istanbul, Turkey, where human occupation goes back at least 300,000 years. Bill is assisted in this project by his doctoral student **Jill McMahon**, whose studies on sedimentology and diagenesis of the cave deposits were presented at the GSA meeting in Boston this year. Other activities included accompanying a U-M Alumni Association tour to the North Pole in July as a lecturer. This was a two-week cruise aboard a Russian nuclear icebreaker out of Murmansk and included three days in the Franz Josef Land Archipelago in the Barents Sea. This spectacular trip is a must for anyone seriously interested in Arctic geography, climate, and the history of Arctic exploration by heroes such as Nansen and Peary. Bill's wife, **Carola Stearns** (PhD '88), on leave from ARCO International Oil and Gas Company, is currently a visiting assistant professor, teaching the introductory physical geography course in the Department, as well as sharing in the care of recently adopted Michelle, who will be two years old in February 1994.

Dan Fisher has been working on a variety of projects lately, ranging from analysis and production of a cast of the mastodon trackway discovered last summer to his talk at the recent GSA meeting, on a test of the calcichordate theory of vertebrate origins. He also indulged (though choice of words here may be questionable) in an unusual experiment this past winter, spring, and summer. Many of you will recall that his work on late Pleistocene mastodon occurrences suggests that

many of them represent Paleoindian storage of mastodon carcass parts in shallow ponds. Small scale experiments had supported the feasibility of this strategy, but is extrapolation to the scale of a mastodon really valid? Last February, the death (from natural causes) of a 1500 lb. draft horse belonging to Gerry Smith and Catherine Badgley offered an opportunity to get significantly closer to the correct scale, and so our three latter-day Paleoindians butchered the animal using techniques based on Paleoindian treatment of mastodons and stored the carcass parts in a pond. Since then, they have been following the biogeochemical and gustatory trajectory of this specimen and have pronounced the experiment a delicious (well, at least until mid-June) success. Meanwhile, new graduate student **David Fox** is, we trust, relieved that he has not lost likely faculty advisors to this venture, and **Brian Bodenbender** took advantage of the distraction to assemble a report of his dissertation work on echinoderm crystallography that garnered a best-poster award at GSA.

Mike Foote has continued to study large-scale patterns of diversity in marine invertebrates. His recent work on Paleozoic crinoids supports previous suggestions that most of the diversity of skeletal design in crinoids evolved very early in their history. Mike has also been studying taxonomic extinction rates through the Phanerozoic, using empirical analysis and mathematical modeling. This work provides additional evidence that the risk of extinction varies enormously on very short time scales. Mike and **Lisa Churchill** are investigating the relationship between morphological diversity and extinction intensity in trilobites. Mike is testing whether trilobite families with greater variability are more resistant to extinction, and Lisa is working on ways to measure the intensity of extinction by its effects on morphological diversity rather than taxonomic diversity.

Chris Hall writes that this has been a busy past few months in the Argon geochronology lab. The spring and summer saw nearly continuous usage of the laser and resistive heater fusion systems by various investigators, such as **Sam Mukasa**, **Joe Meert** and **Jay Busch**. We have just irradiated a large quantity of samples ranging in age from the Pleistocene to the Archean, including some Apollo 11 basalts. Work on this is starting in the next few weeks. There has been a gradual improvement in equipment reliability, so our down time has been reduced dramatically. Work is nearly finished on our computer automation project, with only a small number of parts still needing fabrication. When combined with new, faster control software developed in the lab, we should have the ability for automated, unattended overnight operation of our resistively heated furnace system. The big news in the noble gas field has been the arrival of two(!) mass spectrometers for noble gas work. These had previously been used at the University of Cambridge for measurement of He, Ne and Ar isotopes. The Ne and Ar isotope machine, a VG1200S,

shows promise for high sensitivity $^{40}\text{Ar}/^{39}\text{Ar}$ studies. To this end, we have very quickly set up this machine and it is already connected to both fusion systems. So it soon may be possible to run samples on either mass spectrometer using either resistive or laser fusion systems. This should give us unprecedented flexibility, and it is a welcome hedge against equipment demons! The next major milestone will be the arrival of the VG Plasma 54 prototype in December. Chris will be deeply involved with this project, especially where it uses laser ablation sampling techniques. A promising use for laser ablation will be high spatial resolution U-Pb dating, possibly with Hf isotopes as well, of minerals rich in radiogenic lead such as zircons.

The big event in **Steve Kesler's** life recently was **Hank Jones'** completion of his PhD degree in June. Congratulations, Hank! In July, Steve and **Torsten Vennemann** visited the Tsumeb and Kombat lead-zinc-silver deposits in northern Namibia. The trip was a further test for the presence of large stable isotope haloes in limestones around chimney-manto deposits, a feature that was first noted by **Rodrigo Vazquez** in his work at Mochito, Honduras. Tsumeb is a premier mineral collecting locality and the largest chimney-manto deposit in the world, extending almost vertically for about 3000 feet through late Precambrian limestones. Much of the rest of the summer was spent looking over the shoulders of **John Christensen** who continues to evaluate the use of Rb-Sr isotopic methods to date sphalerite, focussing on the Polaris and Nanisivik deposits in the Canadian Arctic. At the end of August, Steve, Torsten, **Joe Graney** and **Ed Van Hees** attended the Gordon Conference on Hydrothermal Ore Deposits, which was organized by Steve and Bob Bodnar of VPI at the Tilton School in New Hampshire. Gordon Conferences usually deal with chemistry, and the ore deposits conference is one of the few held by geologists. The week-long conference was filled to capacity, with 135 attendees from Australia, Canada, Chile, Germany, England, Russia, South Africa, and the U.S., and was a real success. In the Fall, Steve attended the NSF panel meeting and then went along with **Eric Essene** and others to the Abitibi Belt in Ontario, where Ed Van Hees and **David Stenger** collected material for their work on greenstone gold deposits. During this trip, Ed treated the group to a fantastic feast of salmon and moose burgers....a great way to end a day in the field!

Phil Meyers reports that interesting progress has been made on a number of paleoceanographic and paleolimnologic fronts by the Organic Geochemistry Group. He returned from two months at sea on the *JOIDES Resolution* in June with samples from five Ocean Drilling Program (ODP) sites in the Iberian Abyssal Plain, as well as ideas of things to do with them. **Jim Silliman**, a PhD student who joined the group in September, is starting work to explore relationships between organic matter types and a range of postdepositional

diagenetic processes in turbidites, a common sediment type in the deepsea. Circumstantial evidence suggests that conditions at the places from which the turbiditic sediments originated markedly influence sediment geochemistry at the final site of deposition. Meanwhile, **Beth Kowalski** has discovered that a variety of relationships exist between the organic matter contents of chalk-marl cycles and other components in sediments from Deep Sea Drilling Project (DSDP) Site 552 on the Rockall Plateau west of Ireland in the North Atlantic, DSDP Site 594 on the Chatham Rise southeast of New Zealand, and ODP Site 689 on the Maude Rise north of Antarctica. In some intervals, increased delivery of non-calcareous components during glacial periods has diluted marine-produced organic matter. In others, land-derived organic matter is added to marine material during glacial periods. In yet other intervals, marine organic matter has been oxidized and has contributed to dissolution of sedimentary carbonates. **Gab Tenzer** has been expressing her interest in environmental geology by studying evidence of environmental change in the sediment records of Pyramid Lake, Nevada, and Lake George (the one in the St. Marys River between northern Michigan and Ontario, not the one between New York and Vermont). In the Lake George record, changes in organic matter contents correlate with local histories of timbering and industrialization, and they even show consequences of the Great Depression of the 1930's! A possible outcome from the information contained in the Pyramid Lake sediment record is evidence of Great Basin climate change between 1200 and 1400, the period of decline of the Anasazi civilization on the Colorado Plateau. There are hints that this evidence might be found!

While **Egon Weber** slaved over the multichannel seismic lines from Lake Baikal and **Dave Dobson** was mapping seismic sequences in the high resolution seismic data from Lake Huron, **Ted Moore** enjoyed the company of slightly over 100 Michigan alumni, their families, and friends on a vacation in the northern climes. The trip took them to Fairbanks by plane, to Anchorage (via Denali Park) by train, and then through the inland passage to Vancouver by cruise ship. To earn his keep, Ted lectured on the tectonics of Alaska, its natural resources, glaciers big and small, and the impact of climate change. Dave Rea and Ted Moore ended the summer with a brief trip to Oregon as members of the Marine Earth Systems History (MESH) Steering Committee, where together with about 14 other paleoceanographers they worked on a report to the National Science Foundation outlining the priorities and needs for paleoceanographic research.

This past summer **Jim O'Neil** and graduate student **Henry Fricke** spent a week in Copenhagen establishing a research program with University scientists there who are actively working on problems of the ill-fated Norsemen who colo-

nized Greenland in about 111 A.D. and then perished during the Little Ice Age. Jim and Henry obtained excellent specimens of teeth and bones of both Norsemen and Inuits who occupied Greenland during this period. They will attempt to reconstruct conditions of paleoclimate and paleodiet from stable isotope and chemical analyses of these materials. **Lois Roe** (MS '90) and Jim presented their new method of oxygen isotope analysis of phosphates at the GSA Meeting in Boston. This simple method will now be employed in the thesis research of **Ella Reinhard**, **Ruth Blake**, and **Andy Mughannam** who are all working on various aspects of the oxygen isotope geochemistry of phosphatic materials. **Sang-tae Kim**, new graduate student from Korea, has joined this research group and is working on stable isotope compositions of fluid inclusions in biogenic carbonates and inorganic carbonates precipitated in the laboratory. Jim will be spending January-August, 1994, in Lausanne, Switzerland, on sabbatical leave.

Bob Owen's Marine Geochemistry group has kept busy the last six months working on ongoing projects in the Atlantic, Pacific and Indian Oceans. Graduate students **Peter Knoop** and **Sean Paulsen** will both be presenting the results of their recent studies at a meeting of the International Marine Minerals Society this fall. Peter has examined bulk ferromanganese nodule compositions in the region of Clarion and Clipperton Fracture Zones in the Central Pacific. His work suggests that while a number of different accretionary processes collectively contribute to nodule compositions, the relative significance of each of these is ultimately linked to past variations in primary productivity. Sean has completed the first draft of his M.S. thesis, which involves the application of a geostatistical modeling technique to the problem of understanding sediment dispersal patterns in high latitude coastal regions of the North Atlantic. **Gerry Dickens'** investigations of Indian Ocean sediments has led to the development of a geochemical model which suggests that sedimentary manganese depletions can serve as proxy indicators of periods of low oxygen levels in intermediate depth waters. Model results are in excellent agreement with both the timing and magnitude of fluctuations of an intensified late Miocene/Pliocene oxygen minimum zone in the Indian Ocean previously inferred from faunal evidence, and they suggest that this zone extended some 2100 km further than its present limits.

Don Peacor was delighted that **Dick Merriman** and **Brin Roberts** from Great Britain were able to spend part of the summer with us, keeping the STEM hot while studying illite and chlorite crystallinity. **Bob Freed** (BS '61, MS '63, PhD '66) also was able to join us for awhile, and will be returning soon for a brand new look at Gulf Coast samples, taking advantage of our new "magic bullet" for STEM studies of smectite. **Wei-Teh Jiang** (MS '89, PhD '93) is now settled

in at Arizona State University on a post-doc appointment, after successfully defending his thesis on low-grade metamorphism in the Gaspé Peninsula. **Geijing Li** enjoyed her field trip to Australia and the South Island of New Zealand, with the help of Doug Coombs. The new preferred orientation device designed by **Nei-Che Ho** is working very nicely indeed. Nei-Che was able to go to the United Kingdom with the help of Dick Merriman, to collect samples of Welsh shales. And Don is basking in the pleasure of no longer being editor of *American Mineralogist*, even though the past four years have been rewarding and educational.

Henry Pollack and post-doc **Shaopeng Huang** continue their investigations of paleoclimate through analysis of borehole temperature profiles. This work is in close collaboration with Paul Shen at the University of Western Ontario. In addition to the study of North American data, they are laying the groundwork for a global data base that will provide a useful context to the debate about global warming and its possible causes. This work is now taking on intercontinental dimensions through a research grant to enable collaboration with European scientists, coordinated through Vladimir Cermak, Director of the Geophysical Institute of the Czech Academy of Sciences in Prague, and also involving **David Chapman** (PhD '76) of the University of Utah. Henry continues to serve as Chairman of the International Heat Flow Commission of IASPEI, and will be convening a meeting of the Commission in New Zealand in early 1994. On the teaching front, Henry and Lynn Walter offered a new course on hydrogeology in the fall term. Enrollments were strong, indicating widespread interest in the topic.

Dave Rea's activities over the past several months have been as notable for what they did not include (no cruises during the summer for the first time in 6 years) as for what they did include (a chance to write some long-promised manuscripts). Dave still has not learned to say no to those who want him to serve on committees, so is now a member of 1. the Departmental Executive Committee, 2. the MESH (Marine aspects of Earth System History, a new NSF initiative) Steering Committee, and 3. Chair of the American Geophysical Union's new Global Environmental Change Committee. He anticipates that the work load will decline from 1 through 3 but is not sure. Other efforts that occupied Dave's time this fall included organizing the post cruise meeting for North Pacific ODP drilling Leg 145 when 30 scientists from 10 countries including Russia met in Ann Arbor for three days to present the science they had done on the samples and data collected during that cruise. Dave's student **Steve Hovan** finished his Ph.D. in the spring and took a one-semester teaching position at Indiana University of Pennsylvania. Steve plans to move to the Department of Geology at Florida State in January. **Hilde Snockx** is finishing up her work that resulted from her participation in ODP Leg 145 during 1992 and is re-focusing

her efforts full time on her thesis problem in the eastern Equatorial Pacific. **Dave Dobson** intends to finish his MS effort on the seismic profiles and sedimentary packages of Lake Huron and Georgian Bay this December. In January Dave heads for Barbados where he will join the *JOIDES Resolution* for Leg 154, a 2-month deep-sea drilling cruise to the Ceara Rise, a few hundred km east of the mouth of the Amazon.



Nazli Nomanbhoy, Yuichiro Tanioka, and Leonid Zimakov.

This has been a busy year around the “Seismo Lab.” Professor **Kenji Satake** and three graduate students presented papers at a special meeting on tsunamis this summer in Japan. Michigan continues to be a world leader in tsunami research! **Jean Johnson** is using tsunami waves to study all the great earthquakes in the Alaska region. This year was also busy due to the number of large earthquakes that occurred. In particular, **Yuichiro Tanioka** has worked on seismic wave and tsunami studies of four events from 1993; they occurred in the Shumagin Islands (Alaska), Kamchatka, Hokkaido, and Guam. The last two events were quite large and unfortunately rather destructive. Yuichiro was part of a team that surveyed some of the tsunami damage associated with the Hokkaido, Japan, earthquake. The Guam earthquake presents us with a curious scientific dilemma; Yuichiro must eventually decide if this unusually large earthquake is an interplate or intraplate event—good luck! **Nazli Nomanbhoy** is continuing to work with **Larry Ruff** to understand the global occurrence of doublet earthquakes. We may never be able to predict when such events occur, but perhaps we can understand why they do when they do. Now that the basic phenomenon of remote earthquake triggering has been proven “beyond a shadow of a doubt” for the case of the 1992 Landers, California, earthquake, **Leonid Zimakov** has been working with Larry Ruff to see if other examples of remote triggering are present in the seismicity catalogs for the western United States. For all of

those “westerners” out there, we’ll keep you posted on any disturbing results. Everyone will be glad to know that the old Ann Arbor seismographic station is operating again as a three-component digital system. The signals are telemetered into the lab where they are recorded both by analog drums and a Macintosh-based digital system. We have used several of the digital records for recent large earthquakes in our waveform inversion studies; and we recently recorded another magnitude=3 event in Ohio — there is still some seismicity in the midwest! We are always happy to see our old friends visit the newly remodeled Seismo Lab; **Chris Lynnes** (MS ’84, PhD ’88) and **Bart Tichelaar** (PhD ’91) dropped by for visits this past year. We welcome any and all of you to visit.

This Fall, **Ben van der Pluijm** returned from a sabbatical leave during which he spent most of his time working on a structure/tectonics textbook (“Micro-Meso-Macro” or “M3”) and some traveling. Meanwhile, several important changes occurred during that year, both personnel- and research-wise. Post-doctoral fellow **Carl Richter** left the group to become staff scientist at the Ocean Drilling Program located in College Station (when not battling the high seas). Before he left, Carl and Ben put the finishing touches on a new and powerful magnetic susceptibility method, low-temperature AMS, which resolves many long-standing problems with magnetic fabric analysis. **Paul Howell** completed his dissertation on the relationship between Michigan Basin subsidence and Appalachian tectonic activity just in time to prepare for his new faculty position at the University of Kentucky. **Mark Rathmell** finished his MSc thesis with **Eric Essene** and Ben on thermometry of the lowest-grade portion of the Grenville in Ontario, and currently travels the country. Lastly, **Nei-Che Ho** just completed his MSc using a newly designed X-ray texture goniometer, which measures crystallographic preferred fabrics of rocks, in a collaborative project with **Don Peacor**; he is continuing his research on shale and slate fabrics as a dissertation topic. In spite of this large number of permutations, a considerable group remains in the Structure/Tectonic crowd. **Steve Potts** (PhD) and **Sean Todaro** (MSc) continue their work on Maine and Newfoundland paleogeography, respectively, in the Appalachian project of **Rob Van der Voo** and Ben. Last year, they were joined by post-doctoral fellow **John Stamatakos** whose interests bridge paleomagnetism and structural geology. Studies of deep-crustal orogenic architecture continue in the Grenville, primarily by the efforts of **Jay Busch** (PhD) and **Jim Cureton** (MSc). Their work is part of an integrated structure, petrology, geochronology project that involves **Eric Essene**, **Alex Halliday**, **Chris Hall** and **Klaus Mezger**. This summer, Klaus (MPI Mainz) crossed the Atlantic merely to help us collect the right samples for geochronologic work. **Bernie Housen** (PhD) continues to work on magnetic fabrics in such widely different rocks as high-grade shear zones and barely consolidated ODP cores. A few weeks ago he was invited to

participate in a second ODP cruise (Barbados), which goes to show that structural geology is everywhere. Was it ever any different?

Lynn Walter and her research group had an active summer and fall, divided evenly between field and laboratory work. **Walter**, **Tim Lyons** (pot-doctoral fellow), **Ruth Blake** and **Anna Martini** (graduate students) had a final marathon field research session on pore water sulfur/carbon systematics for three weeks in the Florida Keys. There was seldom a lull in the analytical action or the power boat rides. **Vicky Hover** (graduate student) stayed at home but got samples of recent foraminifera hand picked by the carbonatrix to examine for STEM/AEM syndepositional changes. **Lynn** and **Joyce Budai** are launching two new research ventures; a salt-bromide budget for Michigan Basin salts and brines as well as water/gas production controls within the Antrim Shale. **Anna Martini** and **Jim Richards** (graduate student) have been involved in continued sampling and analyses of Antrim Shale formation waters with the support of Shell Oil. **Linda Abriola** from Civil and Environmental Engineering is interacting with the Antrim project to provide some much needed hydrologic modeling expertise. Finally, **Lynn**, **Ruth**, and **Ted Huston** have been conducting hydrothermal feldspar and quartz dissolution/precipitation experiments with surprising success (reactions really do go faster at 200°C).

The paleomagnetic laboratory of **Rob Van der Voo** has a new name: combined with **Ben van der Pluijm**'s structural geology laboratory, the lab is now part of "PaSTeL," the Paleomagnetic, Structure and Tectonics Laboratories. The name change is appropriate because the research activities of the two laboratories are often overlapping and they have, moreover, been rejuvenated with new equipment, such as a cryogenic magnetometer delivered this summer, a thermal demagnetizer about to be delivered, a magnetic anisotropy bridge and a new alternating field demagnetizer last year. Postdoctoral fellow **John Stamatakos**, who is in charge of the running of the paleomagnetic side of PaSTeL, continues working on tectonic and structural analysis of curved mountain belts (oroclines) and remagnetizations induced during the deformation. He and **Rob**, in collaboration with Spanish scientists, are studying one such orocline in Cantabria, Spain; this work has been funded by NSF recently. Visiting scientist **Trond Torsvik** from the Geological Survey of Norway is working on the magnetostratigraphy and paleopole positions of Siberia and northern Norway. Paleontology Graduate Student **Will Clyde** has been using PaSTeL to measure the magnetic stratigraphy of Eocene fossiliferous beds in Wyoming. **Weixin Xu** is exploring the effects of chemical change due to hydrothermal alteration on magnetic oxides in ocean-floor basalts and the Precambrian Stillwater Complex. Electron microscopy techniques are used to examine the carriers of magnetization. The work of postdoctoral fellow **Joe**

Meert on the Precambrian of East Africa continues with NSF funding, now that he has defended his PhD thesis in November 1993. **Steve Potts** and **Sean Todaro** are continuing their work on Ordovician and Silurian rocks from the northern Appalachians in Maine and New foundland and are determining paleolatitudes of some of the displaced terranes in the belt. New graduate student **Liz Meyers** is starting a project involving magnetic and fabric analysis of Pennsylvania rocks deformed during the Alleghenian orogeny. **Rob** spent two months in the field this past year, tearing himself away from chairmanly duties without remorse; in February, he visited remote parts of Guangxi in southern China, collecting with **Dave Rowley** and **Shangyou Nie** of the University of Chicago in late Paleozoic-early Mesozoic volcanics and carbonates, whereas in August he and **Joe Meert** sampled more Precambrian rocks in Kenya.

Youxue Zhang spent most of the summer setting up the new experimental petrology laboratory shared with Professor **Rebecca Lange**. In May, 1993, we celebrated the completion of the renovation of the experimental petrology laboratory. **Youxue** set up a piston-cylinder and several one atmosphere furnaces and carried out some experiments. The sample preparation lab has also been put together and is functional now. The next major task is to set up the multi-anvil apparatus (several major pieces have not arrived yet). In the summer **Youxue** also traveled to Caltech to carry out experimental simulations of volcanic eruptions. He enjoyed the company of many old friends there. **Liping Wang** (now a second year graduate student) started an experimental project on the dehydration of natural pyrope garnet crystals. Two new graduate students arrived to join the igneous and experimental petrology group, **Robert Cooper** and **Fred Ochs**.

A Russian View of American Science

In August of 1991 Leonid Zimakov came to the University of Michigan with his wife Tatiana, who has a research fellowship in the Population Studies Center. Since then, Leonid has been in our department as a postdoctoral fellow with funding from the USGS. He writes about science in America and his research work.

Now that I have been in the department for two years, I feel I am able to appraise how the Geology Department compares with the Earth Physics Institute where I worked in Moscow. I want to emphasize this above all, since what impressed me most about the department was not all the modern technology available but the democratic atmosphere among the department members. Here I can address students, professors and even the dean as my equal, and I don't sense any distance between students and professors during scholarly discussions. I find both strange and amusing the fact that in twelve years of working, first at the Seismology Committee of the USSR Academy of Sciences, and then at the Earth Physics Institute, I never had an opportunity to speak with my director—we were so far removed from one another on the hierarchical ladder. Unfortunately, until the beginning of perestroika in the USSR, politics and ideology played a dominating role in Soviet society, and although scientists were not politicized to as great an extent, still bureaucracy played an important role in the Academy of Sciences, as it did in society at large. Very often scientists were evaluated not on the basis of their academic achievements, but according to the positions they held at the Institute. I was very fortunate in that my academic advisor, Professor A. Nikolaev, was not only a highly qualified specialist, but also a democratically-minded person; it is most likely for that reason that he has many colleagues and friends among scientists in the US. Here in Ann Arbor I find myself once again working with democratically-minded individuals.

The state-of-the-art computers and on-line systems at Michigan's seismology laboratory permit research to be conducted with a minimum of time wasted in compiling data. Using the computers, I generally need no more than several minutes to obtain any sort of seismological information, and the seismological catalogs and various software programs available on CD-ROM simplify the search for data. Using the network, a seismologist can obtain information and data from practically any university, as well as from various on-line centers (IRIS and USGS, for example). There are several powerful SUN workstations that allow large quantities of data to be processed.

I think I am not mistaken in saying that in Russia

scholars waste 50% or more of their work time simply locating and preparing data. Once in Ann Arbor I needed a detailed map of Japan and the Kurile Islands. Getting the map took all of twenty minutes: ten minutes to walk to the Map Library and another ten to order and photocopy it. In Moscow the same task would have required a minimum of twenty days to complete. Reducing the time spent on such non-productive activities and having access to the technological resources available here has enabled me to devote my time exclusively to scientific research, and I would describe the ratio of time I spend on non-productive versus productive tasks as 5% versus 95%.

When Professor Nikolaev visited the U-M seismology laboratory in May of this year, I asked him what he liked best about the department. He answered, "That professors can combine their research with teaching. Having professors give lectures and be in close contact with students is an education not only for the students, but for the teachers as well." I agree with him fully. As of now in Russia these two activities have been kept separate; in the main scholars have had to choose between scientific research and teaching as primary activities. Very few scholars were able to combine both types of work. Thanks to the seminars Larry Ruff and Kenji Satake conducted, and to our discussions of various seismological problems, here I do not concentrate solely on my own narrow area of specialization; I am able to enrich and increase my own scholarly potential. The learning process goes on continuously, which is wonderful.

These, in my opinion, are the main differences between the seismology lab and the Earth Physics Institute in Moscow (and also, for the most part, between the sciences in Russia and the US as a whole). At the moment I am working with Larry Ruff on a very interesting problem: the remote triggering of seismicity. This problem has become especially relevant after magnitude 7.3 Landers earthquake of June 28, 1992, triggered a remarkably sudden and widespread increase in earthquake activity across much of the western United States. Before that, many scientists were skeptical about the existence of this phenomenon, but now this point of view is changing. We have obtained rather interesting results, which I will be presenting in San Francisco in December at the AGU Fall Meeting. I would like to get as much done as possible while I am here in the department, although I do not know how much longer I will be able to stay and work here. For that reason I would like to take advantage of the opportunity now to express my thanks to everyone in the department for your warm welcome and for the friendship you have shown me and my family.

GSA Gives Student Awards

Two of the Geological Society of America grants with “outstanding mention” went to Michigan graduate students **Eleanor Dixon** and **Nei-Che Ho**. Others who received grants were **Jay Busch**, **Jim Cureton**, and **Sean Todaro**.

Michigan Bookshelf

Darwin Spearing (MA '64, PhD '69) is the author of *Roadside Geology of Texas*, Roadside Geology series, 1993. Darwin is also co-author of the *Roadside Geology of Wyoming*, both published by the Mountain Press.

In Memoriam

Fred B. Kniffen (AB '22), Louisiana State University Boyd professor emeritus of geography and anthropology and a noted cultural geographer, died in May. He was 93. He still worked at his office a few hours each day. The LSU Geography and Anthropology Department established a distinguished professorship to honor him. He is survived by his wife of 63 years, Virginia; four children, five grandchildren and five great-grandchildren.



Judith Barbara Moody (BS '64, MS '67), economic and engineering geologist, professor, and president of J.B. Moody and Associates, Athens, Ohio. Among her awards and achievements are the Mineralogical Association of Canada's Howley Award, the YWCA Women of Achievement Award for Central Ohio, A Woman of the Year Award from the American Women in Science Central Ohio Chapter, and the Harriet Parker Award for Science and Technology. She was president and a founding member of the Association for Women Geoscientists and member of several science organizations, including AGI's women geoscientists committee. Her research included mineral stability studies, mechanisms of geochemical processes, plate-tectonic cyclicality, applied geoengineering problems such as high-level nuclear waste, and radar and asbestos environmental problems. She died March 23 from injuries sustained in an automobile accident in Athens, Ohio.

Degrees Granted

Ph.D.

Steve Hovan, “Cenozoic History of Atmospheric Circulation Intensity and Climatic Variability Recorded by Eolian Deposition in the Pelagic Ocean”

Wei-Teh Jiang, “Diagenesis and Very Low-Grade Metamorphism of Pelitic Rocks from the Gaspé Peninsula”

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