

The View from the Chair

For the past three and a half years it has been my privilege to serve as chair of the Department of Geological Sciences. Much of what has been happening has been behind the scenes with respect to the alumni and friends of the department, and I welcome the opportunity to share with you our stories.



Ralph Taggart

The publication hiatus means this issue is quite a busy as we try to get you updated on the department. A more detailed version is on our website (geology.msu.edu) and some key stories include:

- **Transitions:** Since the last time we were in touch, we've bid farewell to a number of faculty and staff who have retired or moved on to new opportunities. If you have reason to communicate with the office or swing in for a visit, there are new faces to greet and a new design for delivering services.
- **New Faculty:** We have been fortunate to hire four new faculty members in the last few years and we will introduce you to who they are and what they are doing.
- **News from the Field and Bench:** We'll share some of the activities and achievements of our "senior" faculty.
- **Student Highlights:** Our graduate and undergraduate students have made some memorable accomplishments.
- **Wine and Sand:** A recap of the

alumni field trip that combined the ambiance of the Grand Traverse Bay area with the Quaternary Geology of the Sleeping Bear Dunes and Leelanau peninsula.

To provide a framework, it is worth looking at how the department is currently organized at various levels.

UNDERGRADUATE PROGRAMS

Three programs have characterized our undergraduate program for a number of years now. The Geological Sciences degree is equivalent to the basic geology program that would be recognizable to most of our alumni. This includes mandatory participation in field camp in Park City, Utah.

The Environmental Geosciences degree emphasizes the environmental links to the earth sciences, with a significant emphasis on hydrology, aqueous geochemistry, applied geophysics and environmental issues and policies.

Both of these degrees have a Geophysics option. Recent changes have been instituted for these degree tracks to evolve, while assuring a significant number of common experiences both early and late in the programs. We also have a Geobiology degree under consideration by the University Curriculum Committee.

Finally, we offer the Earth Science interdepartmental program that includes an option for teacher certification.

One distinctly different item is an emphasis on organized opportunities for

undergraduate research. A few years ago we organized an Undergraduate Research Committee to help connect students with faculty as research mentors, evaluate research proposals, coordinate funding, and monitor outcomes with respect to participation in the University's annual research initiatives. While the pattern of funding has varied, we have sustained a viable program by using a combination of alumni, industry, college and departmental funds. Our undergraduate students receive valuable experience as they participate in these hands-on research programs.

GRADUATE PROGRAMS

As in years past, graduate education is tightly linked to centers of faculty research within the department. New faculty have been especially active in mentoring and funding graduate students. One distinctive trend has been toward a significantly larger population of doctoral students. This increase is putting new pressures on funding, primarily as a result of longer residence times. Like it or not, we are rapidly trending toward new funding models that de-emphasize teaching assistantships and put added emphasis on a mix of research assistantships, external fellowships, and endowment-based fellowships. It is important to note that we have no intention of abandoning or marginalizing our master's programs as these represent an extremely versatile terminal degree in geological sciences.

FACULTY RESEARCH AREAS

Surficial Processes and the Environment incorporates elements from applied geophysics, hydrogeology and aqueous geochemistry. Surficial water and groundwater is a key piece of this focus in terms of quality, sustainability, pollution and other degradation.



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Ancient Life Systems is the umbrella designation for paleobiology, invertebrate and vertebrate paleontology, paleobotany, palynology and pollen analysis, and paleoecology. There is an increasing emphasis on environmental reconstruction, including paleoclimate, in search of models and principles that might be applied to future climatic change.

Geodynamics and Tectonics embraces some of the classic disciplinary areas, including tectonics, structure, volcanology, petrology and basin analysis. Several of our young faculty are creating some very productive synergy that is maintaining a high level of student interest and driving innovative research.

Geocognition and Geoscience Education investigates how people understand and interpret geological phenomena and how personal models of the natural world impact learning in geosciences. Ongoing research is pushing the boundaries in application of new qualitative and statistical approaches to assessment and analysis of student conceptions.

Like two old friends who cross paths at a meeting, there isn't time or space to touch all, but I sincerely hope this newsletter is a good start. In future issues, and on our web site, we would like to have a steady flow of alumni news. You can help by keeping the office informed as to any significant events in your life or career. We are interested in hearing from you, and I offer a standing invitation to visit whenever you find yourself in East Lansing.

Sincerely,

Ralph E. Taggart
Chair, Department of Geological Sciences
Michigan State University

Transitions

Changes come rather quickly when it comes to the students. In contrast, transitions among the faculty tend to move a bit slower. Yet no matter the pace, change is inevitable and following are recent transitions of department faculty and staff.

Ran Bachrach, Applied Geophysics, left MSU in 2004 and is now at WesternGeco/Schlumberger in Houston, Texas.

F. William Cambray, Structural Geology and Tectonics, retired in 2002. He retained an office in the department and helps out with special projects such as the 2004 alumni field trip to the Upper Peninsula

David Hindle, Structural Geology and Tectonics, is now at the Geologisches Institut at the Albert – Ludwig – Universität in Freiburg.

J. Alan Holman, Vertebrate Paleontology and Herpetology, died suddenly on August 12, 2006. His passing was a major loss to his profession and left a void in the lives of all who knew him.

Peggy and Nathaniel Ostrom, Stable Isotope Chemistry, moved their academic affiliation to the MSU Department of Zoology in 2004.

Lina Patino, Analytical Geochemistry and Volcanology, is now Program Director for the NSF-EAR Education and Human Resources Directorate in Washington. Lina still retains an adjunct appointment with the department and continues to mentor students and collaborate with our faculty.

Tom Vogel, Volcanology and Igneous Petrology, retired in June 2006. Fortunately, he continues as Emeritus Distinguished Professor with a very active research program. He is in his office and lab most days, so you stand a good chance of running into him if you drop by the department.

Gary Weissmann, Stratigraphy, Sedimentology and Hydrostratigraphy, accepted an appointment at the University of New Mexico. He holds the Albert and Mary Jane Black Chair in Hydrogeology as an Associate Professor in the Department of Earth and Planetary Sciences.

The department is fortunate to have a talented and committed support staff. These individuals are the face and voice of the department for generations of students and alumni, and following are some of the recent changes.

In 2005, **Loretta Knutson** moved to the Dean's Office in the College of Social Science after 27 years of service in geology. There is likely not a single student who didn't benefit from Loretta's encyclopedic knowledge of rules and procedures. If you are on campus, you can find her in Berkey Hall. However, ask for Loretta Winkler as her new job wasn't the only change in her life!

Michelle Torres join the staff as the Office Supervisor and also handles all financial matters.

Cathy Caswell retired last year after 26 years of service. She is still in the area and comes in occasion, including attending the annual Halloween Party.

Lori Jean Nichols has joined the staff and serves as the undergraduate secretary as well as the smiling face who greets our visitors.

With all the changes, one familiar face is **Jackie Bennett**. Jackie now functions as the graduate secretary in addition to many ancillary duties.

News From the Field and Bench

Department faculty are busy throughout the year with commitments to teaching, research and outreach. The following highlights offer a glimpse into their current initiatives. This online version contains information provided by the faculty. Enjoy!

Robert L. Anstey, Invertebrate Paleobiology and Evolution
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Joe Pachut (I.U.P.U.I.) and I started a huge N.S.F.-supported project in 1995 on speciation in the fossil record, which is still ongoing after 13 years. Our first publication received the Best Paper Award in the *Journal of Paleontology* in 2002. Our second publication appeared in 2004, and our third in 2007 in *Palaios*. The fourth and fifth publications are in press in the most recent volume of the *International Bryozoology Association*. The sixth publication has been submitted to a journal this year, and the seventh and final one is mostly already written and just needs a little revision. Beware of long-term projects! They can dominate your life.



Lance Paquette and Emily Holmquist both began M.S. programs with me in the fall of 2006, and both are now (April 2008) in the final stages of writing their theses. Lance's is on the phylogeny of 100 or so genera of rhabdomesid bryozoans, based on 317 characters. Emily's is on the paleobiogeography of Devonian bryozoans in Laurussia (North America and Europe).

Ryan Morgan started a joint B.S.-M.S. program in the winter of 2007, and complet-

ed (in one semester!) an undergraduate research project on the paleobiogeography of Mississippian bryozoans in North America, and presented a poster on his research in MSU's U.U.R.A.F. in the spring of 2007. He is now expanding his project to encompass a global analysis of Mississippian bryozoans for his M.S. thesis.

John Myers began a Ph.D. program under my direction in the fall of 2007. He is currently working on a pre-thesis project analyzing the diversity dynamics of all Paleozoic bryozoan genera. He is hoping to do field work this summer collecting Ordovician bryozoans in Morocco.

Tory McCoy, an honors undergraduate, has been working with Danita Brandt on scorpion taphonomy and describing a new ichnofossil species. On top of that, she has been working with me on the global biogeography of all Silurian bryozoans. Her project is essentially complete (and represents an update of Mike Tuckey's work in 1990), and is nearing the manuscript preparation stage.

Andrea Jimenez-Sanchez, a doctoral student at the University of Zaragoza, spent the fall semester here in 2006. We are currently working on a joint project describing a new Ordovician genus from the Iberian Ranges, and, as part of that study, a phylogenetic analysis incorporating all the pilodictyine and timanodictyine bryozoan genera.

Our paleobiology faculty group has been incredibly active recently, with lots of grad students, and I have been on all of their committees. Danita, Mike, Ralph and I have initiated a new undergraduate major at MSU in Geobiology. We think it will appeal to a broad range of students.

Danita S. Brandt, Invertebrate Paleobiology
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Danita Brandt was appointed Associate Professor in January, 2007, after joining the Department in 1991 as a part-time Academic Specialist. This change in appointment was made possible by her shift to full-time status by accepting a 50% appointment with MSU PROM/SE, a 35

million dollar Math & Science Partnership grant from the National Science Foundation to the College of Natural Science and the College of Education, to Promote Rigorous Outcomes in Math and Science Education. Danita serves as Director of Science Professional Development, charged with deepening K-12 teachers' science content knowledge by developing workshops in the natural sciences.



She continues teaching, research, and supervising graduate students. Joshua Barringer (bachelor's degree, Olivet Nazarene University, Bourbonnais, IL) defended his M.S. thesis on brachiopod/epibiont relationships, and Jayme Csonka (bachelor's, University of Cincinnati) is starting a study of Middle Cambrian trace fossils from the Flathead Sandstone of Wyoming.

Dr. Brandt's research continues to concentrate on animal/sediment relationships and arthropod taphonomy. Undergraduate honor's student and Professorial Assistant Victoria (Tory) McCoy continues work she started last year as a freshman on the taphonomy of fossil and modern scorpions. Tory presented the results of her work at the 2007 regional GSA meeting in Lawrence, Kansas, and submitted a manuscript for *Journal of Arachnology* (currently in revision). Tory received a Charles Schuchert travel grant from Yale University that supported a trip to New Haven for her and her supervisor to examine the fossil eurypterids and scorpions at the Peabody Museum and foster collaboration with researchers there. Danita's collaboration with Yale colleagues Derek Briggs and Erik Tetlie resulted in a paper on eurypterid molting (Tetlie, Brandt, and Briggs, in press). A graduate seminar on trace fossils during the Fall '07 term produced a multi-authored paper describing a new trace fossil from the Pennsylvanian Grand River Formation (Brandt, McCoy, Barringer, Csonka, Holmquist, Kraig, Morgan, Myers, Paquette, and Seitz), sub-

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supporting the department.

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mitted to the journal *Ichnos*. This paper follows another on the significance of multiple trace-fossil assemblages (Brandt, 2008), and a third paper, in preparation with co-author David Rudkin of the Royal Ontario Museum, describing an unusual trilobite trace fossil assemblage from Upper Ordovician strata of Ontario and the Cincinnati area.

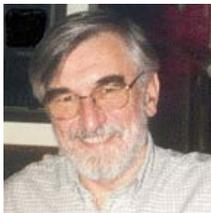
The long-awaited *Geography and Geology of Michigan* (Schaetzl, Darden, and Brandt, editors) nears completion and contains contributions from several GLG faculty, alumni, and emeriti, including George Merk, Grahame Larson, Kevin Kincare, Bill Cambray, Kaz Fujita, Michael Velbel, and Al Holman.

Danita continues outreach and engagement activities through a summer Fossil Camp for young paleontologists, in conjunction with the MSU Museum (for more information see <http://museum.msu.edu/ProgramsandPartnerships/Educational/SummerAdventure/>) and Darwin Discovery Day (<http://museum.msu.edu/Events/NaturalHistoryIDDDay/>). Danita was honored for her informal science education efforts by the Michigan Science Teachers Association (MSTA) as co-finalist for College Science Teacher of the Year ('08).

F. William Cambray, Structural Geology and Tectonics

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While Bill retired in 2001, he continues to maintain an office in the Natural Science Building. He is active in departmental affairs and was the major force behind the 2004 alumni field trip to the U.P.



Aureal T. Cross, Paleobotany, Palynology, Coal Geology

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Despite having retired in 1986 and recently turning 92, Professor Cross manages to maintain a high level of activity, garnering more medals and other awards in recognition of a long and productive career. In 2006 his career was the subject of a major review by colleague Tom Phillips of the University of Illinois (Phillips, T.L., 2006).

Biography of Aureal T. Cross: world class coal geologist, palynologist, paleobotanist, and educator.



J. Coal Geology 69:1-20). Since our last newsletter, he has received the AAPG Grover E. Murray Distinguished Educator award (2005), the Society of Organic Petrology's John Castano Honorary Membership award (2005), and the Meritorious Faculty award (2008) of the College of Natural Science Alumni Association. One of the major tasks of the past few years has been organizing the transfer of the voluminous Cross Collection to the Paleobotanical Collections of the Field Museum of Natural History in Chicago. The job is almost done and assures that the resources represented by the collections will be properly housed and curated. Aureal continues to co-author papers with Ralph Taggart and a major manuscript on the role of global climate on the origin and future of the Boreal Forest biome is presently in press with *Global and Planetary Change*.

Kazuya Fujita, Global Tectonics and Earthquake Seismology

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Greetings from the tectonophysics group. Kevin Mackey and I continue to work in eastern Russia on various problems related to seismology and tectonics.



For the last several years, we have been working with Los Alamos National Labs and MIT on crustal and upper mantle structure and with our colleagues in Yakutsk, Irkutsk and Magadan on neotectonics and plate tectonic processes in northeast Asia. As part of this process, we have been conducting several field studies to calibrate the crustal velocity model that Kevin developed ten years ago and examining the seismicity of selected, previously poorly studied, areas (e.g., Stanovoi

Range, Chukotka) and in the Seimchan basin. We are also re-examining focal mechanism and seismicity data to better constrain the tectonics of northeast Kamchatka and various parts of the Chersky Seismic Belt. A number of undergraduate students have helped in data entry, digitizing faults, and examining satellite images, in particular Maisie Nichols (B.S., 2006). Recently, we have gotten Brian Hampton involved in Russia in some of the neotectonics and basin formation work.

The Stanovoi deployment by Kevin and our colleagues in Yakutia was centered on the Stanovoi volcanic field – a region of Cenozoic volcanism located near or along the boundary between Eurasia and the Amur block. Surprisingly, no seismicity was detected within the volcanic field, but a number of events were located nearby before bears and batteries impacted the operation of the remote stations. Some of the results were analyzed by undergraduate Pam Moyer (B.S., 2007) and the results were presented at last year's Fall AGU meeting. Boris Koz'min of Yakutsk and I also started taking a harder look at events in northeast Kamchatka.

Brian and Kevin conducted a small field survey in the Seimchan basin last summer, mapping a segment of the Ulakhan fault, the presumed primary fault separating the North American plate from the Okhotsk microplate. They mapped a series of sag ponds and other structural features that allowed for the detailed location of the fault. They also looked at other sedimentological features related to the recent development of the basin.

During the summer, I finished up our contributions to the Parfenov memorial volume. My paper is a summary and extension of the focal mechanism data in the Chersky Seismic belt, including formal publication of mechanisms from Steve Riegel's M.S. thesis (1994) and collaborative work with Boris Koz'min. In addition to better documenting the change in the types of mechanisms along the belt, we have also attempted to correlate (or not) events to various faults. Kevin Mackey has a separate paper on the seismicity of eastern Chukotka summarizing the results of a small deployment there several years ago. Kevin and I also wrote a paper on the development and implementation of the Russian energy class ("K-class") sys-

tem with its developer, Tatyana Rautian; Anthony Kendall, one of Dave Hyndman's students, helped out in developing algorithms for some tricky regressions.

In slightly older news, Lepolt Linkimer (M.S., 2006) conducted an interesting study on discrimination of earthquakes and industrial explosions in northeastern Russia using amplitudes reported in the Russian analog bulletins. The results were very encouraging and we hope to get a paper written soon. I've also been working with Gary Weissman's PhD student Leslie Mikesell and David Hindle on deformation in the Livermore Valley region and worked with Elizabeth Hardesty (M.S., 2006) on strain analysis in the Andes.

Kris Huysken (Ph.D., 1996) and I have been re-examining the Aurora, Illinois, earthquake of 1909. This earthquake is the largest ($M \sim 5.1$) event close to Chicago and its epicenter has been a matter of considerable uncertainty. We examined hundreds of newspaper accounts to eliminate inflated intensity reports and to determine the actual felt area. We think the event was more likely located near LaSalle, Illinois, close to the epicenter of a magnitude 4.2 event in 2004 associated with the Peru Monocline. The felt area distributions are very similar. Norm Sleep and I have also completed a chapter for the Michigan Geography and Geology book being edited by Randy Schaetzl on Michigan earthquakes updating our 1990 paper. I'm also re-examining a few events, in particular the Calumet, Michigan, event of 1905.

As some of you may know, I have taken over teaching the structural geology course. It's been a lot of work, but I've enjoyed learning some new material and getting out on field trips. Brian Hampton and I collaborated on this year's Marquette trip and we think things went extremely well. I also continue to teach the ISP natural hazards course, plate tectonics, and solid-Earth geophysics.

In January, 2007, I was asked to be present at the Michigan roll-out of the Enhanced Fujita scale for tornadoes. For that event, I put together a history of the development of the original F-scale which turns out not to have been documented. I've also given a number of talks to local

emergency service groups on tornadoes and my father's early work.

I continue to be active with K-12 Earth Science teachers, serve on the Michigan Earth Science Teachers Association (MESTA) board and give talks to local schools. A few years ago, I helped write the new secondary education Earth Science standards for the state. I've also started to deploy a short-period seismometer at schools for periods of a few to ten days so the students can see the Earth in action. This past year I also participated as a content provider to two workshops for teachers.

As always, I am glad to see alumni when they visit or at AGU meetings. Hope to see some of you soon.

Michael D. Gottfried, Vertebrate Paleontology
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My primary current research project, in collaboration with colleagues at Ohio University, the University of Dar es Salaam, and Southern Utah University, involves field and laboratory work dealing with fossils from the Cretaceous and Paleogene of Tanzania. We have been exploring the 'Red Sandstone Group' in the remote Rukwa Rift Basin of southwestern Tanzania for the past several years, currently with support from the National Science Foundation. Fossil discoveries to date include mollusks, arthropods, fishes, frogs, turtles, crocodylians, dinosaurs, birds, and mammals, which combined are helping to bridge the 'African Gap' – a phrase we coined to refer to the very poor understanding of vertebrate evolution and biogeographic patterns during this critical time period in African prehistory. One particularly rewarding outcome of this project is the strong ties we've developed with our colleagues in Tanzania, which has led to a Tanzania PhD student, Sifa Ngasala, joining the MSU program under my supervision.

I have also been keeping active in two other research areas – describing the re-

cord of fossil fishes and sharks from New Zealand that date to the time of, and relate to, the initial establishment of the high-latitude circum-Antarctic current system, and continued work on the evolution and relationships of Great White Sharks and their giant fossil relatives. The white shark research has led to my involvement, both on-camera and as a consultant, in two upcoming documentary films, one for the History Channel, and one (in ultra-high definition!) for National Geographic Television's "Prehistoric Predators" series – both should air later this year or in early 2009.

One particularly rewarding experience I've had recently was getting involved as a faculty leader on MSU's signature 'Study Abroad' program to Antarctica. We took a group of 32 students there in 2007, and I will be going back again over the 2008/09 Winter Break. The scenery, geology, and wildlife are all jaw-droppingly spectacular, and the overall experience of being in the Antarctic is truly memorable. MSU is one of the few universities to offer an Antarctic experience for students, and we are now introducing an Arctic program as a counterpart, which I plan to be part of in the near future.

Since our last departmental newsletter, I have had a number of graduate students complete Masters and PhD degrees in my lab; the current group includes Sarah Kraig (who just finished a Masters on shark paleontology), Sifa Ngasala (whose PhD project involves fossil fishes from southern Africa), Summer Ostrowski (just starting a PhD on fossil fishes from East Africa and Madagascar), Megan Seitz (working on a PhD on Cenozoic mammals), and Yasemin Tulu (in the final stage of a PhD on Cretaceous sharks from Montana).

Along with research and my regular teaching, and outreach activities, I recently (2006) took on a new responsibility at MSU, assuming the position of Director of the Center for Integrative Studies – General Science, which is MSU's model for teaching science to thousands of non-science majors. I am in very good company in this role, as the two immediate past Directors of the Center – Bill Cambray (now Emeritus) and Duncan Sibley – are also faculty members in Geological Sciences, and both set a very high standard. I am grateful to both Bill and Duncan, and

to many others, for their advice and help in this new capacity.

David W. Hyndman, Hydrogeology, Applied Geophysics
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The last several years have been very productive in the Hydrogeology research lab, and have brought a shift in focus for the program. A common core



of our research is coupling state of the art computer models (many of which are developed in-house) with high resolution field data to explore the physical, chemical, and ecological processes of natural and anthropogenically altered systems. In addition to developing novel methods of characterizing the aquifers that store and transmit water supplies critical to human and ecological health, we have begun to evaluate human impacts on the water cycle through changes in climate and land use. We have also transitioned from a program that focuses on Masters students to one that is primarily Doctoral students.

These programmatic transitions began in 2002--the year of my Darcy lecture tour. The tour allowed me to travel to nearly 60 locations in 12 countries and give presentations to universities and other research groups. During this tour, I presented a summary of the results of the Schoolcraft Bioaugmentation project. This project provided the basis for several peer-reviewed publications from 2000 through 2005.

Some of the most exciting developments since the last newsletter have been associated with a research effort funded by a National Science Foundation Water Cycle grant, which provided our group with the means to model large-scale watershed scale hydrologic processes. Anthony Kendall, a PhD student in the group, developed a revolutionary code that simulates the entire terrestrial hydrologic cycle in a physical process-based manner. Nick Welty, who graduated in with his M. S. in 2005, was also involved in the first phase of this development. This code, called the Integrated Landscape Hydrology Model (ILHM), opens vast frontiers for exploring

the complex affects of anthropogenic land use and climate change on hydrologic and ecological systems. Recent work by the group and collaborators at Purdue involving simulations of the legacy of land use across the Muskegon River watershed was recently featured in a presentation by the American Museum of Natural History, with distribution to over 20 museums around the world.

A second area of exciting research has been associated with collaborative efforts between our research group and Dr. Remke van Dam, a recently-appointed applied geophysics faculty member at MSU. Through this research, our PhD student Dush Jayawickreme has developed novel methods of imaging subsurface moisture distributions and characterizing subsurface hydraulic properties. We also recently had a NSF proposal funded that will allow a team of scientists from three universities to use high resolution hydrogeophysical methods to characterize the classic MADE hydrogeology field site at an unprecedented level of detail. This has the potential to revolutionize our understanding of the role of variable subsurface properties on fluid and contaminant transport. Given the resolution of this study, it should be possible to validate or refine aspects of the fundamental equations used in all contaminant transport models. Recent publications in this area include two co-edited books, *Aquifer Characterization* (published by SEPM), and *Subsurface Hydrology: Data Integration for Properties and Processes* (published by AGU).

On a somewhat different topic, I co-authored one of the leading textbooks in the area of Natural Hazards and Disasters. The first edition, published in 2005, was selected as the Top First Edition Book of the Year by its publisher, Thomson Books. After Hurricane Katrina struck, we updated the book with new material on that topic. A second edition was just published in early 2008. I was also involved with an international team of hydrologists that visited Sri Lanka after the devastating tsunami, to examine and discuss the impacts of this event on water resources.

Grahame J. Larson, Glacial Geology, Hydrogeology

The past several years my research has taken me to Iceland where I have been studying the origin of basal ice in outlet

glaciers of Vatnajökull, the largest ice cap in Europe. My last trip there was about 10 months ago and involved sampling basal ice for isotopic analyses

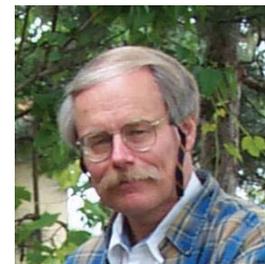


with colleges from Lehigh University and the U.S. Army Cold Regions Research and Engineering Lab. What we are trying to prove is that under certain circumstances ice can accrete to the glacier bed by glaciohydraulic supercooling. We have already demonstrated this happens at the Matanuska Glacier in south-central Alaska and now wish to apply the theory to glaciers in Iceland. We also suspect glaciohydraulic supercooling may have resulted in ice accretion to the bed of former ice sheets and may explain how sediment gets concentrated in ice near the glacier bed.

This summer I led the Alumni Geology Field Trip, along with my doctoral student, Kevin Kincare of the U.S.G.S., looking at the glacial features that have shaped Sleeping Bear Dunes and the Leelanau Peninsula. This trip is described elsewhere in this issue. It was a great pleasure to interact with alumni and friends of the Department in the field and we all had a great time.

David T. Long, Aqueous and Environmental Geochemistry
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Well it has been awhile and not sure where we left off with our story line, so I apologize if I miss something. Things are going



along in the lab, although my office is now on the first floor and is rather nice. Since 2000 I have been involved in a project in the Balkans (Training and Research in Environmental Health in the Balkans, TREHB) which is funded by NIH Fogarty. In 2003 Tom Voice (Environmental Engineering) and I became co-directors of the project. The project involves work in Croatia, Bulgaria, Romania, Serbia, Montenegro and new this year Macedo-



nia. There are two aspects to the work training and research. For training we (as well as colleagues at MSU that we ask to help) give week long workshops on topics in the broad area of environmental health. Tom and I give workshops on topics in Environmental Health, Environmental Engineering, and Environmental Science. For research we are still working on trying to identify the environmental agent responsible for Balkan Endemic Nephropathy with our current focus on the organic acid produced in the plant *Aristolochia Clematis*. It appears from the medical community this is a likely suspect but how exposure might occur is not clear and is what we are working on. We have a new student, Nichole Hardigan (MS) who is studying the geologic/geographic controls on the plant and the relationship to the disease. As part of this we are working with a surgeon (Jovan Nicholic) from Serbia who has been studying the spatial distribution of the disease.

Exposure is an important aspect of environmental health and we even have a recent paper on this topic published in the Croatia Journal of Medicine. Other TREHB projects have included understanding the geochemistry of processes used to neutralize acid water from uranium mining wastes (Marina Nikolova, Ph.D. University of Mining and Geology, Sofia), nitrate in rural groundwater (Nedialka Niagolova, researcher National Center of Radiobiology, Sofia), uranium in kidney stones (Vladimir Nestic, MD, Institute of Occupational and Public Health, Belgrade), and groundwater geochemistry in endemic areas Serbia (Dusanka Kitic, faculty University of Nis). We are currently working with Rodica Stanescu (Poltechnic University, Bucharest) and her PhD student, Constantine Bobrica on environmental stability lead wastes contained in cement monoliths and we are finishing up work on the cause of slightly elevated uranium in groundwater in rural Bulgaria. This latter project is possibly an interesting scenario of the geochemistry of a carbonate aquifer being altered because of agriculture causing the dissolution of the limestone, liberation of uranium and uranium transport via phosphate and carbonate complexes.

As part of our experiences with the TREHB project Tom and I are exploring the possibilities of giving similar workshops in universities in Peru, Senegal,

and Ukraine. We are also working with universities in the Balkans and Senegal to help them design curricula for graduate programs in environmental science and engineering. We are also part of a team exploring collaborative teaching and research relationships with Zhejiang University in China.

Tom and I have been working with Terry Marsh (Microbiology) and on studying the relationship of microbial community structure to the complexity of DOC species and of the biogeochemistry of water in lakes. A basis for the work is the DOC speciation technique developed by Shawn McElmurry. Shawn recently received his PhD degree in Environmental Engineering and I was co-adviser with Tom. Shaw is now has a tenure track position at Wayne State University. Speaking of speciation another jointly advised Ph.D. student, Lisveth Flores del Pino finished her work on methods of As speciation and is now Dean at Universidad Nacional Agraria La Molina, Peru. We worked with Ivan Havezov (National Academy of Science, Bulgaria) on this and the four of us were recently awarded a U.S. patent for method. As a result of Shawn's work Tracy Repp (Dual PhD Environmental Engineering and Environmental Geosciences) will be starting to look at DOC-U complexes.

Our work on the MDEQ inland lakes sediments project continues. Sharon Yohn (Ph.D) who helped start the program is now co-director of the Raystown Field Station of Juniata College. Joel Fett (M.S.) who also was there at the beginning state (he did his thesis on Cu cycling and remediation of "bad" Torch Lake in the U.P.) is at Tertra Tech in Detroit. Portions of Sharon's and Joel's work have become some of the lectures that I give in the workshops in the Balkans as they nicely show how we can assess the build up of contaminants in the environment and the Torch Lake work is a nice case study of remediation. In terms of case studies in the workshops on remediation as well as lectures on oxidation-reduction and microbes, I use the work of Jen McGuire (PhD) on the Wurthsmith Project. Jen went to Texas A&M, but after getting tenure decided to become the director of the environmental studies program at St. Thomas College in St Paul.

Matt Parson's (Ph.D.) took over as lead for the inland lakes program and has focused

on Hg. He is currently finishing up his work and this year is head of our ICP-MS clean lab facility. As part of his Hg work, Matt is helping to put together the work that we started on the Deer Lake (heavy Hg contamination) in the UP. Joel had done a lot of work on this in terms of trying to study Hg isotopes. Unfortunately our ICPMS was not sensitive enough for this but we did gain some insights into Hg cycling as well as the effect of changing lake levels on 210Pb dates. Speaking of isotopes Merideth Benedict (MS, now EPA) finished up her work on using Pb isotopes to study the sources for Pb in the lake sediments. As part of her work she began to think about the use of the isotopes to assess environmental recovery. Ryan Vannier (Ph.D.) who has taken the MDEQ program reins from Matt has recently taken this idea further and with Meredith's data has attempted to estimate rates of environmental recovery. He presented this work at this year's GSA meeting in Houston and was awarded best student paper in his session. He is working up the paper on this.

Our Muskegon River Watershed project is winding down. Nate Saladin (MS, now Mac Tec) finished his work on examining groundwater surface water interactions using through geochemistry. Meredith Fitzpatrick (Lindeman) is finishing up her work landuse and the biogeochemistry of the rivers. She carried the flag for us at Goldschmidt (05). Speaking of watersheds, Karen Wayland (PhD) finished up her work on the biogeochemistry of rivers in the Grand Traverse Bay watershed. She is legislative director for the Natural Resources Defense Council and has an adjunct professorship at George Town College.

Dean Bass (Ph.D.) is also finishing up his work on phosphorus dynamics in the Kalamazoo River Watershed and has also carried the flag for us at Goldschmidt (07). Dean has explored the use of mixed linear statistical models to see through the effects of seasonality on the relationship of P-species to land use. Phani Mantha (Environmental Engineering) is helping on this project and we have just published a paper in WRR on the Red Cedar. Speaking of Goldschmidt flag bearers, Colleen Mclean (PhD, Goldschmidt 06) is finishing up her portion of the work on the Muskegon project. In addition to analyzing the chemistry of fish livers, she



is working on the use of sediment cores to interpret the environmental history of Muskegon Lake. As part of that study we used for the first time a piston corer to obtain longer cores. In addition to geochemical variables she is also looking at diatom communities to help understand processes. She is getting us into the study of environmental dynamics with terms like tipping points (conditions necessary for a system to collapse), regime shifts (when a system changes state), and resiliency (the ability of a system to recover from perturbations).

Because of Colleen's work we are adding a new dimension to the MDEQ study and this new dimension will be come part of Ryan's Ph.D. We are working with Catherine Yansa (Geography) on developing ideas of how we can further use the information gained from the cores to study environmental processes. We are also bringing back our collaborations with Bryan Pijanowski (Purdue) and Jan Stevenson (Zoology) on this. The idea is that as perturbations influence the environment, the flow of mass and energy across landscapes change, the biological process across the landscape change and the processes within the lakes change. All of these changes might be recognized in the sediment cores through changes in proxies (e.g., Pb, Ca, pollen, diatoms). As a kick off for this we presented a paper at GSA on assessing the response of watershed to large scale logging. We were able to identify in the cores the period of logging, the response, and evidence for a regime shift. Very cool, but it gets cooler. In the process of working up the paper I noticed some patterns that I could not explain and on a whim plotted these patterns against paleo-global temperatures, they matched. Stay tuned on this one. Our work on Cr contamination in the Cannelton wetlands has finished with the graduation of Matt Harold (MS, now Calvin College Teacher Program) and Hilary Thacker (MS). This work is also part of lectures on metal cycling, oxidation-reduction-microbes, and remediation for the TREHB project.

I continue to do work with Berry Lyons (OSU) and Mark Hines (Lowell) and we have just completed another paper (in press Applied Geochemistry) on the acid saline waters in south Australia. I have

been fortunate to be asked by Berry and Russ Harmon to participate in the study of the geochemistry surface waters in central Panama. Our first paper is about ready to come out (in press Applied Geochemistry). Speaking of applied geochemistry I stepped down as treasurer of IAGC after 10 years, but still help convene the IAGC sponsored session on trace metals at GSA. We think now that this might be the longest running theme session at GSA. I am honored to have been awarded a GSA Fellowship this year thanks to the nomination by Berry.

GLG 201, 319, 421, and 821 continue to go well. A new course that I am involved (with Tom) in is ESP 801 which is Physical, Chemical, and Biological Processes in the Environment an Advanced Introduction to Environmental Science. This is the first course of a four course sequence for the new PhD specialty program in Environmental Science and Policy.

Well that is it for now. Jean is doing well teaching horticulture at Lansing Community College. Jonathan is a junior (gasp) studying physics at the University of Michigan. He is part of a research group working on the CERN Large Hadron Collider. Work on this project started in 1993, with many, many scientists and countries involved and lots of money. It is really cool, but I asked "So Jonathan, what happens if when they push the switch and the beam comes on and after a few wizzes around the track they answer the question?" He looked at me and said "Well dad, it is more complicated than that." Physicists!

Duncan F. Sibley, Geocognition, Sedimentary Petrology
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This short tale began, like so many important events in our department, at the Peanut Barrel, with Vogel, Cambray and me sipping beers and deep into nonsensical discussion. We drink more coffee rather than beer these days with the hope that we can make sense for a good 20 minutes when fueled with caffeine. Beer makes the whole conversation iffy.



It was a fine and uncommon day that led us across the street. Bill doesn't come around much anymore as he has what he seems to think are better places to be. Tom is usually at the gym because he still believes that staying in shape is moral obligation. But this day, the three of us wandered into the bar and ordered a pitcher.

We moved through the usual list of topics- dolomite, silicic magmas, pull part basins, then moved on to a few other topics we've discussed for 30 years. Some of you know or can guess what we talked about but I'm not saying. A slip of the tongue, or pen, could unleash a barrage of half-truths that would make Bill Clinton seem like George Washington. Then again, there are stories about George. Never mind. Back to the tale. We finally came around to how things were different in the old days but we all agreed on one thing that's not so different. The students still don't know anything. We teach and teach and they never learn!

Bill, being the wise one, as evidenced by his beard and accent he refuses to lose, wondered, "maybe we don't know how to teach."

"You mean", I said, "after all these years, we're the ones who haven't learned?"

"That's a bunch of crap", said Vogel. Still subtle after all these years.

Well a second pitcher, a few more slurred words on the topic and we each headed home to wives pleased to see us stumble in the door.

Somehow the idea that I've been teaching for more than thirty years and haven't a clue about how to do it any better than when I first started struck me as an interesting proposition. I began reading up on the topic and found that everyone who has studied how people learn pretty much agrees that pouring facts into someone's head is about as effective as dowsing for water. Sure, it works sometimes but there's no cause and effect relationship going on.

I studied up on the topic of learning enough to convince a few folks in the MSU administration that it might be worth figuring out how are students learn with the idea that if we understood that,

maybe we could teach better. With tuition skyrocketing and the State giving us less and less each year, the idea that we might figure out how to teach better struck a cord. They gave me a little money and a long rope.

The money paid for the start of the Center for Research on College Science Teaching and Learning. I'm the director, which means I'm always looking for more money to keep us going. Fortunately, the National Science Foundation is concerned about the collective scientific illiteracy of the American public and is willing to support our effort to stem the tide. There are about a dozen faculty associate with the Center, a few graduate students and four post docs working on aspects of how students learning biology, geology and chemistry.

So maybe you're smarter than we led you to believe with cryptic comments in the margins like- "no way", "you really believe this", and "why don't you just tear this up and start over". Maybe Bill was right. Maybe we don't know how to teach. Still, don't ask for a refund on your tuition. It could have been the beer.

Michael A. Velbel, Mineral/Water Interactions

Email: Velbel@msu.edu

Weathering and other aqueous alterations of Mars- and meteorite-relevant silicates (olivine and pyroxene) continue to dominate my overall research



program the past several years, with support from NASA's Mars Fundamental Research Program. Case studies of terrestrial weathering of chain-silicates have been published or accepted for publication, along with a review paper, and several papers about olivine weathering are in advanced stages of preparation. A review paper on watershed solute mass-balance was recently published, and I continue to run a field trip to the southern Blue Ridge. The trip (and the associated course) are now in Fall semester – this makes it much easier to get the trip in early in the term without worrying about snow! Other travel has included maritime Canada, the Columbia River basalts, multiple trips to New Mexico and Arizona, and one each

to Hawai'i and Japan, with plenty of stops to examine weathered volcanic rocks.

An unexpected research highlight of the past few years was my involvement in the mineralogy-petrology subteam of the Preliminary Examination Team for samples returned from comet 81P/Wild 2 by NASA's Stardust mission. The samples were returned to Earth in January 2006, and were the ideal motivational opportunity to learn to use MSU's new 200kV transmission electron microscope (TEM). I spent my most recent sabbatical leave here at MSU immersed in the application of TEM to primitive solar-system materials, including the Stardust samples and my longer-running project on carbonaceous chondrites.

Thomas A. Vogel, Igneous Petrology

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After a 43 year career teaching and research (5 at Rutgers, 38 at MSU) in 2006 I decided to retire from teaching. Many of you came to a great party in October of that year in which much roasting occurred – a lot of fun was had by all. It was great to see "old" students and friends, and share exaggerated stories about the "good old days".



My retirement life is not much different than my previous life except I have no classes, committees or university obligations (and no salary). The main thrust of many projects that I am working on is still the origin of continental crust. We have been studying silicic volcanism in many oceanic arcs to address this problem.

Our long-time effort in Central America continues with many different colleagues from Costa Rica, including Lina Patino who still keeps an active interest in this research. Although our field projects in the Philippines are over, we continue to analyze the data we collected from these projects. I have started a new project in the Taupo Volcanic Belt in New Zealand (>10,000 km³ of silicic volcanics) with a former graduate student (Chad Derring) and colleagues at Canterbury University. November of last year and this past February was spent in New Zealand working on this project (a great place to be in the winter!).

Bob Ehrlich (many of you old alumni will remember him as a faculty member at MSU from the stone age) and I have started working together again on applying type of principal component analyses to solving mixing and unmixing problems in igneous petrology. Many graduate students at MSU have used this technique and we recently published a review article showing how this tool can be used to solve a variety of problems.

Retirement is great. Research is fun, and there is more time to play.

Warren W. Wood, Geochemistry and Hydrogeology

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After 40 years as a groundwater hydrologist with the U. S. Geological Survey I returned to MSU for fall semester 2003 as the Visiting John



Hannah Professor for Integrative Studies, seconded to the Geoscience Department. Each fall in this capacity I offer a sophomore level honors class in Integrative Studies with an emphasis on environment and natural hazards.

At MSU I have continued my research in groundwater hydrology with projects on the sabkhat of the United Arab Emirates (evaluating free convection in the aquifer system with Remke van Dam and David Hyndman) and Saudi Arabia (minerals resource evaluation). I am working with Dave Hyndman and Duncan Sibley on a regional limestone aquifer system that is currently undergoing dolomitization. In this system it is possible to measure relevant fluid and rock parameters during the regional scale dolomitization process and not just the solid phase in the geologic record. Hopefully this will provide some insight into the "dolomite problem". I continue work with my colleagues at the U. S. Geological Survey on refining the concept of "Solute Stress Testing" for evaluating geochemical parameters of fractured rock systems. I am just concluding research on eolian dust transport of natural hexavalent chromium over tens of thousand or square kilometers. This soluble dust is then recharged to the groundwater system where values in excess of 1 mg/L are commonly observed.



Szymanski Named GSA Congressional Science Fellow

Dave Szymanski, PhD Geological Sciences 2007, was selected as a 2008-2009 Geological Society of America Congressional Science Fellow. Dave was among 200 applicants for the coveted fellowship, and his success is a tribute to the fine research and academic record he has compiled and the breadth of his interests and abilities. Dave is working in the office of Senator Jon Tester from Montana.

Dave received his Ph.D. working under Tom Vogel and with research focusing on the chemical evolution of silicic magmas in Costa Rica. Dave had previously received a B.A. in Geology from the University of St. Thomas in 1996 and a M.S. in Structural Geology from MSU. He also has a second masters from MSU in Forensic Chemistry. Since 2005, Dave has served as the Laboratory Manager for the department's ICPMS analytical facility.

News From the Field and Bench Continued from Page 3.

Chromium in this system originates by weathering of chromium rich olivine and pyroxene from an ophiolite sequence. Working with a student from Oxford we are finishing research on high resolution optical stimulated luminescence dating of a lunette adjacent to a saline lake on the Southern High Plains of Texas where we were able to quantitatively estimate rainfall between 1500 and 2000 years ago. This will provide some aid to archeologists working on pre-historic Indian migrations in the area as well as providing another continental record of paleo climate change. In a different academic area of geology I have recently documented tectonic uplift in the range of 3 mm/y in coastal UAE and Saudi Arabia in what appears to be a foreland bulge of the Zagros Mountains in Iran. Sort of coming from left field for a groundwater hydrologist! (Actually, it came from contemplating why coastal aquifers are transgressing into the Gulf while sea level is rising, one would think that they should be regressing!)

I have recently served on the National Research Council panel "Advancing Desalination Technology" of National Academy of Science and our report should be out when you read this. I continue as Scientist Emeritus with the U. S. Geological Survey and work with the Darcy Lecture program of the National Groundwater Association. I am Visiting Professor at

Oxford University where I have been the Christiansen Fellow at St. Catherines College. Each spring term for the last 10 years I have given lectures and advised graduate students in the Centre for the Environment, School of Geography at Oxford. I continue to lecture internationally with some recent stops this past year at King Fahd University of Petroleum and Minerals, and Saudi ARAMCO (Saudi Arabia), Flinders University (Australia) and Oxford University (England). In April this year I was the keynote speaker for the 2nd International Forum on Salinity in Adelaide, Australia. In 2006 Tom Vogel and I organized a departmental spring break field trip for faculty, students, and alums to the sabkhat of the UAE and ophiolite sequence in northern Oman. Great fun for all! Anneliese and I have supported an endowed program for graduate students that is extremely satisfying and I encourage you to consider similar support of the department. I will be at GSA this year and look forward to chatting with anyone wishing to stop by on "Alumni Night" or any other time. Go Green!

Our Newest Alumni

Congratulations and welcome these recent graduates to the family of geology alumni.

Fall 2007

Michael Hotchkiss, BS Earth Sci.
Marilyn Maticc, BS Env. Geosci.
Justin Vanderberg, BS Env. Geosci.
Paulo Hidalgo, MS Geological Sci.
Justin Johnson, MS Geological Sci.
David Szymanski, PhD Geological Sci.

Spring 2008

Ashley Branoff, BS Earth Sci.
Samuel Genson, BS Earth Sci.
Rory Hunter, BS Geological Sci.
Robert Kelly, BS Env. Geosci.
Joshua Larsen, BS Env. Geosci.
Casey Miller, BS Env. Geosci.
Pamela Moyer, BS Geological Sci.
Amy Ring, BS Earth Sci.
Christopher Rousseau, BS Earth Sci.
Sarah Skrbina, BS Earth Sci.
Joshua Barringer, MS Geological Sci.

Summer 2008

Michael Ackerson, BS Geological Sci.
Robert Brown, BS Geological Sci.
Ryan Danescu, BS Env. Geosci.
Emily Davidson, BS Earth Sci.
Tori Holmes, BS Earth Sci.
Matt Malkowski, BS Env. Geosci.
Ryan Morgon, BS Earth Sci.
Michael Morse, BS Geological Sci.
Joshua Townshend, BS Geological Sci.
Elizabeth Woodward, BS Env. Geosci.
Angela Donatelle, MS Geological Sci.
Emily Holmquist, MS Geological Sci.
Sarah Kraig, MS Geological Sci.
Lance Paquette, MS Geological Sci.

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Meet the New Faculty

The department has recruited four new faculty. Following is a brief biography and description of their research thrusts - in their own words...

Brian Hampton, *Sedimentology/Stratigraphy, Tectonics*

Hello MSU-Geoscience alumni, I hope this finds you well in 2008! I am one of the newer faculty additions to the Department of Geosciences and began at MSU in January 2007 after receiving my Ph.D. from Purdue University. My research is focused on the stratigraphic and structural evolution of sedimentary basins in convergent margin settings. I am also interested in studying the response of modern basin landscapes to uplift in actively deforming mountain belts. Simply stated, I apply the skill sets of sedimentology, sedimentary petrology, structure, provenance, and geochronology to address tectonic-scale questions related to the evolution of mountain belts and sedimentary basins. Most of my active projects are focused in the North American Cordillera (in southern Alaska). I have also spent some time working on Cenozoic basin development in the central Andes of Bolivia and Argentina.

Since arriving at MSU, I have kept busy with research, teaching (Sedimentology/Stratigraphy and Basin Analysis) and field work. I lead two annual fieldtrips each spring to central Indiana and the southern Appalachians as part of the Sed/Strat and Basin Analysis course. If any of you are around campus and interested in attending, you are more than welcome to join in on these trips! In addition to course fieldtrips I

also had a chance to get out to Death Valley/Owens Valley with Tom Vogel, Duncan Sibley, and some of the MSU grads and undergrads during the annual Geology Club spring break fieldtrip. Bill Cambray, Kaz Fujita, and some of the MSU undergrads were nice enough to get me up to speed on some of the classic Michigan geology in the Upper Peninsula as part of the Structure field trip last fall. I also have Kevin Mackey to thank for showing me around the Seimchan basin and Ulakhan fault in Far East Russia this past summer. We are hoping to get a project up and running in this region in the next few years.

This past summer Jennifer Deloge (MS student) and Mike Ackerson (undergrad) spend three weeks mapping, measuring section, and collecting samples in the Chulitna terrane in the southern Alaska Range. Jen is doing a stratigraphic and provenance study of Triassic red-bed units in this region and was awarded funds from the Geological Society of America to do her field and lab work. She will be presenting some of her findings at the upcoming GSA Annual Meeting in Houston this fall. Jen is currently in New Orleans this summer doing an internship with Chevron and is hoping to defend her MS thesis sometime this semester. Mike also received an award from the College of Natural Sciences to carry out some research on the geochemistry of Triassic basalt units in the



Brian Hampton



Julie Libarkin



Tyrone Rooney



Remke van Dam

Chulitna terrane. He presented some preliminary results of his study at the University Undergraduate Research and Arts Forum (UURAF) at MSU. Mike graduated from MSU this summer and will be starting his graduate studies in geology at the University of North Carolina at Chapel Hill in the fall semester.

This next fall, Matt Malkowski will be joining the Basin Analysis Group at MSU. Matt graduated in the spring with his B.S. degree in geology from MSU and will be headed to the Talkeetna Mountains this summer to do some well-needed stratigraphy and structural mapping along the Talkeetna fault. Matt and I had the chance to go out to the USGS SHRIMP-RG lab at Stanford University this past April to run some preliminary U-Pb detrital zircon samples from the Alaska Range and Talkeetna Mountains. Matt will be building on these data with his upcoming project. Matt has been helpful in finalizing the set up our heavy mineral separation lab at MSU this summer.

Any time you are around campus or in the department please feel free to stop by my office or the lab. I have had a chance to meet a few of the MSU alumni and always look forward to hearing where our recent graduates have landed and what everyone has been

up to.

Julie Libarkin, *Geocognition and Geoscience Education*

I am very excited to have an opportunity to discuss my work here at MSU. My husband (Michael Moore, in Physics & Astronomy), my son (Brian, three) and I moved here from Ohio in Fall 2006. I was the first scientist hired under a new initiative to build a research presence in college level science education, with a joint appointment between Geological Sciences and the Division of Science and Mathematics Education, as well as affiliation with the Center for Research in College Science Teaching and Learning. The last two years have been dynamic, as we have settled into a new home, developed new courses, learned our way around campus, and built our research programs. I have also been lucky enough to receive two awards since arriving at MSU. In October 2007, I received the Shea Award from the National Association of Geoscience Teachers "for exceptional contributions in the form of writing and/or editing of Earth Science materials (broadly construed) that are of interest to the general public and/or teachers of Earth Science." In May 2008, I was honored by MSU's College of Natural Science with the Lorena V. Blinn Endowed Teaching Award. This teaching award is given to a teacher in Natural Science that

shows special care in regards to teaching students, and was specifically awarded for my efforts in a large, general education course, ISP 203A: Global Change.

My traditional geosciences research focuses on development of high elevation plateaus. Recent work includes co-authorship on a Tectonophysics paper focusing on the link between geoid anomalies and the structure of Colorado Plateau paleolithosphere, as well as a review article in *Science*. This article, led by C. Garzione of University of Rochester, is the culmination of a collaborative project funded through NSF-Tectonics, and looks at the relationship between paleoelevations documented in Bolivia and mechanisms responsible for Andean uplift. Although I began my career in tectonics and remain active in the field, I have branched off into a new domain: geocognition.

Geocognition is a term that I have adopted as a clearer description of my work than the more common term “geoscience education”. Geoscience education research is simply one small area of geocognition, focusing specifically on geology in teaching and learning environments. Geocognition more broadly relates to how people perceive, understand and interpret natural phenomena; in essence, the interaction between cognitive processes and geology.

Our work is by its very nature collaborative. Active collaborations and funded projects exist with faculty from the Lyman-Briggs College, the Dept. of Psychology in the College of Social Sciences, the College of Natural Sciences' Division of Science and Mathematics Education and Department of Statistics. I also collaborate with scholars at institutions across the country, including colleagues at Western Michigan University, University of Northern Colorado, TERC (a science and mathematics education non-profit), Mississippi State University, and University of Akron. Internationally, I have an active collaboration with researchers at CETL at University of Plymouth, and am developing a working relationship with Thai scholars.

Since its inception in 2006, the Geocognition Research Lab (GRL) has become a home for students, visitors, and faculty.

Led by Dr. Julie Libarkin, the lab now hosts a research associate (Scott Clark), two PhD students (Juli Moore and Sheldon Turner), a visiting PhD student from Thailand (Suttida Rakkapoa), and several undergraduate researchers (currently Sarah Jordan and Samuel Rossman). The lab has also hosted several national and international visitors, including colleagues from University of Plymouth in the UK. Supported by several grants from the National Science Foundation, we are exploring tools for concept inventory development and dissemination, the characteristics of working memory in geoscientists, student understanding of plate tectonics and climate change, and mechanisms for development of student reasoning.

The National Science Foundation has funded four projects, either directly to the GRL, or through collaborators, that span a wide range of geocognition topics. The Geoscience Concept Inventory (GCI) is an assessment tool designed by Libarkin and colleagues under a prior NSF grant. A new grant awarded in Sept. 2007 will work towards community development of GCI questions, validation of these questions by the GRL research team, and dissemination and online testing through a new GCI WebCenter. This WebCenter takes advantage of existing LON-CAPA technology supported by MSU.

A new project to unravel the nature of geoscience expertise will soon be funded through NSF's REESE program. This project is a collaboration between Western Michigan University and MSU geoscientists, a geographer, and a cognitive psychologist. We will be investigating novice and expert behavior and cognition in the field, as well as performance on standard and geoscience-specific cognitive tests. The GRL will lead the laboratory component of this study, investigating working memory function and characteristics.

The GRL is also working as an external evaluator on two projects. A project to investigate the efficacy of ConcepTest questions, led by faculty at University of Akron, was funded in Sept. 2007. The GRL will be evaluating developed questions, will conduct statistical analyses of student performance on questions, and will compare this

performance with performance on a subset of GCI questions. In a second project, an NSF award to TERC supports development of a climate change curriculum for 12th grade students. The GRL, in collaboration with Mississippi State University, will develop assessment instruments for investigation of students pre- and post-instruction conceptions about climate change over time.

Tyrone Rooney, *Petrology and Igneous Geochemistry*

A key driving force behind my research program lies in developing a more complete understanding of large-scale mantle dynamics. Specifically, I investigate the origin and composition of chemical reservoirs associated with basalt magmatism. Much of my previous research has focused on the fate of the lithosphere during continental rifting and the progression towards sea floor spreading in the great rift valley of East Africa. This amazing locale has magnificent geology but also is a wonderful place simply to visit and experience.

I am the newest member of the department, having arrived in fall 2007. I received my B.Sc. in Geology from University College Dublin in 1999. I then relocated to Penn State University where I earned an M.S. in hydrogeology in 2002 and my doctorate in Igneous Petrology & Geochemistry in 2006. After six years in PSU's 'Happy Valley' I moved to San Diego State University where I undertook my post doctoral work.

Looking forward, I will continue my research in East Africa and a new Ph.D. student (Adise Shoge) from Ethiopia has started work this Fall term. My research group will be tackling exciting questions related to the mechanism for Ethiopian Plateau uplift, which has profound influence on regional climate during a key period of hominid evolution. I have also undertaken a wide scale study of the Panamanian Arc from the Costa Rican border to the Canal Zone. This region marks the final closure of the Isthmus of Panama, finally cutting off oceanic circulation between the Pacific and Atlantic Oceans. A portion of this work is currently being undertaken by a very talented Ph.D. student, Paulo Hildago, who is documenting the magmat-

ic history of the active Baru volcano.

In addition to my Ph.D. students, I also have three undergraduate students working on serious research projects. Allison Pluda is working on xenoliths from Ethiopia, Christian Briggs is continuing a project on rocks from South Mountain, VA, and Val Finlayson is working on felsic dikes associated with the Elliot Lake uranium deposit.

Remke van Dam, *Applied Geophysics*

My research interests are in the application and improvement of near-surface geophysical methods for hydrological and engineering problems, sedimentology and stratigraphy, issues of environmental change, and characterization of soils. Below follows a short description of some of the projects that I have worked on since my arrival at Michigan State University.

Expected changes in global climate and land use will affect important processes from evapotranspiration and groundwater recharge, to carbon storage and biogeochemical cycling. The nature of dynamic interactions between vegetation and soil moisture remain largely unresolved due to our inability to accurately quantify hydrologic and climatic fluxes at relevant scales. We are exploring electrical resistivity imaging (ERI) as a method to monitor and quantify the effects of land cover and seasonal variability on soil moisture and groundwater recharge. For this analysis we permanently equipped a forest-grassland ecotone three miles south of MSU campus with a suite of hydrogeophysical equipment. Our observations from this ecotone demonstrate for the first time that ERI can be used to accurately quantify differences in root zone moisture contents beneath different vegetation types, which bridges critical gaps between estimates derived from remote-sensing and point-measurement methods.

People involved in this project are Ph.D. student Dushmantha Jayawickreme, Dr. David Hyndman and several current and past undergraduate students in the department. Funding for this project has been provided by NSF-EAR-0233648 (to Hyndman), the Center for Water Sciences

at MSU, and MSU start-up funds to acquire the geophysical equipment. The project has resulted in several conference abstracts, two publications in review and preparation, three separate proposals currently under review, and new collaborations with Kellogg Biological Station, MSU Department of Geography, and the Universities of Calgary and Kansas.

We have recently started a project into the high-resolution dynamic characterization of transport pathways in heterogeneous aquifers. This NSF-funded project, concentrated at the MADE site in Mississippi, will combine geophysical methods and direct-push technology for the detailed characterization of and 4D imaging of fluid flow in heterogeneous fluvial deposits. The novel equipment suite that we will use integrates a typical ground-penetrating radar (GPR) system with a high accuracy rotary laser positioning system (RLPS) for real-time 3D data fusion. The RLPS consists of 2 rotating laser distance finders that continuously track the location of the moving GPR antennas. The collection procedures ($1/4$ grid spacing in both inline and cross-line directions) allow to develop “full-resolution” 3D cubes. After processing (3D-migration) and visualization in Petrel (academic software license donated to MSU by Schlumberger) we will use geostatistical methods to identify correlation structures. Also we will perform time-lapse measurements to image tracer migration. People involved in this project are Dr. David Hyndman, two new PhD students (start August 2008), and collaborators at the Universities of Alabama and Kansas.

The GPR and laser-positioning equipment was acquired using start-up funds and will be used in several different projects. In addition to the NSF-funded project mentioned above, we will use this technology in archaeological research (collaboration with Bill Lovis and Jodie O’Gorman, Department of Anthropology), and root-zone moisture dynamics research (collaboration with Steve Hamilton, Kellogg Biological Station).

Other projects that the Applied Geophysics research group is involved in include:

- A comprehensive study of sediments

in the East Jordan (Michigan) River basin, using hydrological measurements and modeling, and geophysical characterization of delta deposition (Funding: “Friends of the Jordan”, 2007-2010).

- Research to understand natural variability in soil magnetism and mineralogy, in collaboration with Colorado School of Mines, University of British Columbia, and New Mexico Tech. This research focuses on characterization of soil magnetic properties at UXO cleanup sites to reduce detrimental effect of these soils on geophysical sensors. Data from these sites and other soils from different climatic zones and parent materials are used to develop models for prediction of soil magnetization. (Funding: Strategic Environmental Research and Development Program, 2004-2008).

- Studies of glacial features in Michigan. Graduate student Bob Aylsworth has been using a range of electrical resistivity methods to characterize the extent, orientation, and dimensions of large glaciotectonic deformation structures in the Ludington Ridge. As part of a graduate seminar in the Geography Department led by Randy Schaeztl electrical resistivity methods were used to study patterned ground as an indicator of permafrost conditions in the Saginaw Lowlands.

- During a recent trip to the United Arab Emirates we studied density driven flow using electrical and electromagnetic methods. This project, supported by Dr. Warren Wood and with participation by David Hyndman and Craig Simmons from Flinders University, Australia, was the first to document such features in natural field settings.

Annual Awards Convocation

The department awarded \$45,500 in awards this year to make degrees accessible to students and recognize accomplishment. These awards provide a value-added component to the student experience while providing stability to the department by helping attract and retain excellent students. Awards included scholarships, fellowships, grants and other support provided during the academic year. None of these awards were funded by the university or public funds, rather the primary funding source for these awards was alumni and friends. The convocation, attended by students, faculty, family and friends, recognized graduate and undergraduate students.



Summer Ostrowski is presented the Pringle Endowed Fellowship by Ralph Taggart.

ENDOWMENTS

Dr. Aureal T. Cross Endowed Graduate Fellowship - provides grants for individual summer research in Paleobiology.

Jayne Csonka, MS Geo. Sci.

T. T. Fujita Outstanding Earth Science Future Teacher Award - awarded to an outstanding Earth Science major who is completing the teacher education courses at MSU and will be entering the internship year.

Tori Holmes, BS Earth Sciences

Wayne B. & Marian R. Henderson Scholarship - based on academic performance, financial need and potential for academic and professional success, this was established by Marian Henderson in recognition of her husband's work to spread understanding of the geological sciences.

Allison Pluda, BS Env. Sciences

Neal Research and Scholarship - furthers the mission of the study of geology by funding graduate student travels.

Dush Jayawickreme, PhD Geo. Sci.

Anna Losiak, PhD Geo. Sci.

Lucile Drake Pringle and Gordon H. Pringle Endowed Fellowship - established by Gordon Pringle in memory of his wife, and later re-named in honor of Lucile and Gordon.

Jayne Csonka, MS Geo. Sci.

Brian Hewitt, BS Earth Science

Paulo Hidalgo, PhD Geo. Sci.

Meredith Lindeman Fitzpatrick, PhD

Env. Geosciences

Anna Losiak, PhD Geo. Sci.

Juli Moore, PhD Geo. Sci.

John Myers, PhD Geo. Sci.

Summer Ostrowski, PhD Geo. Sci.

Daniel Snyder, MS Geo. Sci.

Colleen McLean, PhD Env. Geosci.

Matt Parsons, PhD Env. Geosciences

Ryan Vannier, PhD Env. Geosciences

Dr. Graham Ryder Memorial Fund - provides a thesis or dissertation fellowship.

Anthony Kendall, PhD Env. Geosci.

Bennett T. Sandefur Memorial Scholarship - established in memory of Dr. Sandefur, a faculty member and coordinator for the Continuing Education Program in the College.

Joshua Larsen, BS Env. Geosci.

Warren W. and Anneliese C. Wood Research Fellowship - provides support for graduate fellowships in the area of groundwater related research.

Matt Malkowski, BS Env. Geosciences

John T. Wilband Memorial Scholarship - recipients of this award all attended field camp in summer 2008.

Michael Ackerson, BS Geo. Sci.

Robert Brown, BS Geo. Sci.

Michael Morse, BS Geo. Sci.

Gregory Pansey, BS Geo. Sci.

Joshua Townshend, BS Geo. Sci.

CORPORATE, CLUB and SOCIETY AWARDS

Chevron Corporation Scholarship - provides support of students for field camp.

Michael Ackerson, BS Geo. Sci.

Waheed Al-Basrawi, BS Geo. Sci.

Robert Brown, BS Geo. Sci.

Valerie Finlayson, BS Geo. Sci.

Michael Morse, BS Geo. Sci.

Gregory Pansey, BS Geo. Sci.

Joshua Townshend, BS Geo. Sci.

Shell Oil Company Fellowship - supports travel costs of students attending scientific meetings or conducting field work.

Robert Aylsworth, MS Geo. Sci.

Jayne Csonka, MS Geo. Sci.

Paulo Hidalgo, MS Geo. Sci.

Dush Jayawickreme, PhD Geo. Sci.

Anthony Kendall, PhD Env. Geosci.

Sarah Kraig, MS Geo. Sci.

Anna Losaik, PhD Geo. Sci.

Christopher May, MS Geo. Sci.

Colleen McLean, PhD Env. Geosci.

Summer Ostrowski, PhD Geo. Sci.
Matt Parsons, PhD Env. Geosciences
Yasemin Tulu, MS Geo. Sci.
Ryan Vannier, PhD Env. Geosciences

Estwing Award - recognizes outstanding contributions to the department.

Larissa Gulich, BS Earth Science

Martha Nowicki, BS Env. Geosciences

Central Michigan Lapidary and Mineral Society Scholarship - based on academic performance, financial need and the potential for academic and professional success.

Chelsea Mack, BS Geo. Sci.

GEOLOGICAL SCIENCES ENDOWMENTS

Excellence in Masters Research - recognizes an outstanding masters' thesis.

Paulo Hidalgo, MS Geo. Sci.

Excellence in Teaching - recognizes a graduate teaching assistant.

Ryan Vannier, PhD Env. Geosciences

Outstanding Senior - recognizes exemplary academic achievement

Joshua Larsen, BS Env. Geosciences

FACULTY AWARDS

College of Natural Science Alumni Association 2008 Meritorious Faculty Award

Aureal Cross

Michigan Science Teachers Association College Professor of the Year, 2008 Finalist

Danita Brandt

Center for Integrative Studies in General Science Lorena Blinn Endowed Teaching Award

Julie Libarkin

Departmental Developments

By Ralph Taggart

Back when most of our alumni were on campus, MSU was a state supported institution where the annual appropriation from the Legislature paid most of the bills. Today, MSU is best described as “state assisted” as state appropriations cover only 32% of the budget. State funding will never return to the levels of the past, so we rely primarily on tuition and fees and external funding. Our success is not achieved in a vacuum. It is only accomplished through the remarkable relationship we have with you.

We are careful stewards of our funding, and our ability to meet commitments while ensuring stability is key. The department operates on a budget of \$1.4 million, with nearly all going toward salaries. There isn't much left after the obligations of operating graduate and undergraduate courses have been met. Faculty research is supported by research grants, largely from Federal and State sources.

One key element of our academic stability is what I call the “value added” component of the student experience. This year, more than \$45,000 went directly to benefit students in the form of scholarships and fellowships, travel to meetings, field camp, and field research. Add to that equipment, lecture series, field vehicles for field trips, and a host of other items that help build lifelong skills and experience.

Only through gifts to the department are we able to ensure the stability of the program with these “value added” features. While this includes gifts from our valued corporate partners, the majority comes from alumni donations in the form of endowments. These long-term gifts support scholarships, fellowships and other specific purposes by establishing interest-bearing accounts where the principle remains intact while the interest accomplishes the goal of the individual endowment. The generosity of our alumni directly influences the quality of the student experience as well as of the

critical infrastructure of the department (such as the Trow ICPMS facility). We would not be able to realize the totality of our mission without your generosity!

The support from alumni is more critical now than ever before. We are currently working to fund the Tom A. Vogel Endowed Fund in Geology of the Solid Earth. Once completely funded, this endowment will support a senior solid-earth faculty position in perpetuity and allow us to strengthen core teaching and research capabilities in the basic geology curriculum. We would also like to build endowments to fund graduate fellowships in order to make us more competitive in recruiting the best students.

I encourage you to get involved and help impact the future of geological sciences. One-time gifts, long-term pledges, or gifts through estate planning all can ensure our stability and continue to provide the unique environment that is the MSU geology experience.

If you would like to join this continuing effort on the part of our alumni family, contact me (phone 517-355-4626 or e-mail taggart@msu.edu) or Suzette Hittner in the College of Natural Science (phone 517-353-9855 or email hittner@msu.edu). When it comes to alumni giving, we can find the most effective way for your gift to accomplish goals that are meaningful to you and will have a life-long impact on future generations of geology students.



Warren Wood (2nd from left) and Tom Vogel (2nd from right) led a group of faculty, students and alumni to the UAE.



Dave Long, Matt Parsons, David Stringer, and Ryan Vannier, after finishing work on Bird Lake.



Students assisting Remke van Dam with research at the Sandhill site include (l-r) Dush Jayawickreme, Pamela Moyer, Matt Mal-kowski, Bob Aylsworth, and Michael Morse.

The Department of Geological Sciences newsletter is published annually by the College of Natural Science for alumni and friends of the Department. Copyright 2008 Michigan State University. MSU is an affirmative-action, equal-opportunity employer.

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A GEOLOGICAL WEEKEND ON THE LEELANAU PENINSULA

Wine and Sand

While the title of this piece might well serve for a European film set on the Riviera, this story is about a group of MSU geology alumni frolicking on our own Riviera in northwest Michigan.

In 2004, the department teamed up with the College of Natural Science to run an alumni field trip to the U.P., led by Bill Cambray. The goal was three-fold: fellowship with alumni “old and new”, the chance to get updated on some interesting geology and the chance for the department to highlight the impact and needs with respect to alumni giving. The trip was a great success and it was time to plan another.

This year, we traveled to the Sleeping Bear Dunes National Lakeshore and the scenic Leelanau peninsula to explore the late Quaternary geology of the area. The science side of the trip was spearheaded by Grahame Larson and Kevin Kincare - a doctoral student working at the USGS. Kevin put together a fine guidebook and demonstrated an encyclopedic grasp of some pretty daunting geology.

Given the fine wineries in the area, it was shaping up to be a great weekend of wine and sand, with a liberal quantity of gravel, boulders, and just a pinch of loess! Approximately 35 alumni, friends and spouses signed up for the trip. We stayed at Crystal Mountain Resort outside Thompsonville, so we certainly weren't roughing it!

Normally, the area would have been pretty much saturated with end-of-the-season tourists, but thanks to \$4 per gallon gas, we were pretty much on our own at each stop. With perfect weather, an outstanding setting and the best of company, we could hardly have asked for a better weekend. Graduate and undergraduate



Grahame Larson orients the group at an overview at Sleeping Bear Dunes. Holding the map are Todd Wallbom (left) and Kevin Kincare (right). Additional photos from the alumni event are on the website at <http://gft.cns.msu.edu>.

alumni across the academic generations shared memories and traded accounts both past and present.

We are not sure what we will be doing for our next alumni fieldtrip, but once we do know, we will certainly let you know as quickly as we can. Based on our past two trips, it should certainly be another memorable weekend.

SPARTAN GEOLOGY – THE INTERNATIONAL DIMENSION

While most of what we do is centered in the United States and the mid-continent region, Spartan geologists and their students have boots on the ground on all the continents of the world. Key: (1) **Brian Hampton** - Alaskan stratigraphy, sedimentology, and neotectonics; (2) **Tom Vogel and Tyrone Rooney** - Colombian volcanology and igneous petrology; (3) **Grahame Larson**: glacial geology of Iceland; (4) **Grahame Larson**: Study Abroad, the Geology of Southern England; (5) **Dave Long**: geomedical studies of Balkan Endemic Nephropathy in Bulgaria, Croatia, and Serbia, teaching workshops on Environmental Science and Engineering in Serbia, Bulgaria, Montenegro, and Macedonia, and teaching and research on cement waste isolation in Romania; (6) **Warren Wood, Dave Hyndman, and Remke van Dam**:

hydrology and landforms, United Arab Emirates; (7) **Mike Gottfried**: vertebrate paleontology, Tanzania; (8) **Kaz Fujita and Kevin Mackey**: seismic networking and analysis, Siberia; (9) **Tyrone Rooney**: tectonic history of the East African Rift Zone, Ethiopia; (10) **Mike Gottfried**: vertebrate paleontology of Madagascar; (11) **Tom Vogel**: volcanology and igneous petrology, New Zealand; (12) **Mike Gottfried**: fossil fishes, New Zealand; (13) **Mike Gottfried**: Study Abroad, Antarctic Peninsula; (14) **Tyrone Rooney**: volcanology and igneous petrology of Panama; (15) **Julie Libarkin**: cosmic nuclides and the paleoaltimetry of the Bolivian Altiplano; (16) **Dave Long**: development of advanced degree programs in Environmental Science and Engineering in Peru; (17) **Dave Long**: teaching and promoting future research collaborations, Senegal; and (18) **Dave Long**: joint research on nutrient cycling in the Lake Taihu Basin, China. World base map © Nations Online Project.

