

GEOSCIENCE NEWS

For Alumni and Friends of the Department of Geological Sciences



FALL 2008



Dear Alumni and Friends,

I come to realize how quickly the time passes as it is again my pleasure to share with you news of the last year's events and developments. Well into my second year as Chair, I can report that the Department is doing well, and that overall, it has been an excellent year in spite of the economic hardships that have beset Michigan. Thanks largely to you we have some wiggle room when appropriations do not position us where we want to be. Let me share with you some of the highlights.

We have continued to attract and hire excellent new faculty, and have authorization to build in new areas of research. Three new colleagues have joined us since my last letter. Nathan Sheldon, who holds a PhD from the University of Oregon and has interests in terrestrial records of climate change, joined us during winter term after a three-year stint on the faculty at Royal Holloway in the UK. David Lund with a PhD from the MIT/Woods Hole Graduate Program and a postdoc from Caltech joined us during the summer. Dave's research focuses on chemical oceanography. Also, with two of our Geophysics colleagues having moved on as I stated in last year's letter, we have been able to hire Eric Hetland, a

specialist in Lithospheric Dynamics and Crustal Mechanics who recently completed a degree at MIT and postdoc at Caltech.

To foster interdisciplinary research, the President and Provost instituted a year ago the Interdisciplinary Junior Faculty Initiative, to which the Department submitted a successful proposal to diversify our research expertise in the area of Global Climate Change in collaboration with the Department of Atmospheric, Oceanic and Space Sciences (AOSS) in the College of Engineering. Shifting into this area of research reflects our increasing awareness of issues related to the changing climate and how these will have significant short- and long-term consequences for the Earth and society. Three new positions will come to us while two will end up in AOSS. For our three positions, the plan is to add specialties in coastal processes, physical oceanography, and glaciology. We are fortunate to have been successful in this endeavor, as it represents an opportunity to maintain and increase our Department's strengths during a time of overall contraction of the University. We have submitted three proposals in this year's cluster hire competitions focusing on carbon management, nanoparticles in the environment and biogeochemistry. One of our most compelling objectives is to add faculty in the fields of sedimentary basin architecture and fluid-rock reaction chemistry to bolster our expertise in sedimentology and low temperature realm of sedimentary geology. Growth in the nanotechnology arena will focus on mineralogical interactions within the environment as nanoparticles being developed in various industries are released into the natural system. We will know by the early part of next year whether our efforts for such diversification are successful.

Renovation of Camp Davis has finally been approved by the Regents and work has begun to replace half of the steel cabins with new three-season structures, allowing camp to operate over an extended period – both early and late – compared to previous years. Most of the funding needed to cover phase 1 of the overall renovation project (replacing half the cabins) has already been raised from the College and gifts from you -- our very generous alumni. In order to complete phase 1 without compromising on quality, and to begin phase 2 on a timely basis in order to maximize camp utility, we must continue to ask for your support.

Student exposure to the field has been increasing annually with this year's number and diversity of field excursions far greater than earlier years. In addition to our traditional national and international trips that take place during the summer months, field excursions are becoming a central part of our introductory-level core courses. This last year's trips include several overnight excursions associated with various undergraduate courses. Highlights of these trips are included elsewhere in this newsletter.

Despite the severe downturn in the nation's economy, the Department remains fiscally sound. Our successful treading of water so far is due in large part to the generous endowments provided by you, our alumni. With annual growth of these funds, endowments have accrued to a sustainable level. We do, however, continue to face growing challenges as the returns on these endowments decrease while our commitments to student scholarship, field excursion and activities support continue to grow. Additionally, with significant budget cuts to the whole University, the Department must now contribute to the research start-up costs for incoming faculty. These include costs for laboratory renovation and equipment acquisition whose costs typically range into the hundreds of thousands of dollars. We hope that during these difficult times, we can count on your continued support of the Department's endowment and gift funds.

Finally, I – and all other members of the Department – wish everyone a very happy holiday season and spectacularly successful New Year.

Samuel B. Mukase

The Michigan Difference

The President's Donor Challenge: Phase II

In September 2007, University of Michigan President Mary Sue Coleman announced the President's Donor Challenge: Phase II to establish endowments to permanently fund fellowships for graduate and professional students. The Department of Geological Sciences recognizes the importance of such fellowships in maintaining a vibrant and competitive graduate program. The University honored the Department faculty **and current graduate students** for 100% participation in this fund raising effort with an article in the University Alumni magazine (see picture below). The Department has also successfully sought contributions earmarked for Geological Sciences graduate fellowships from many of our corporate donors.

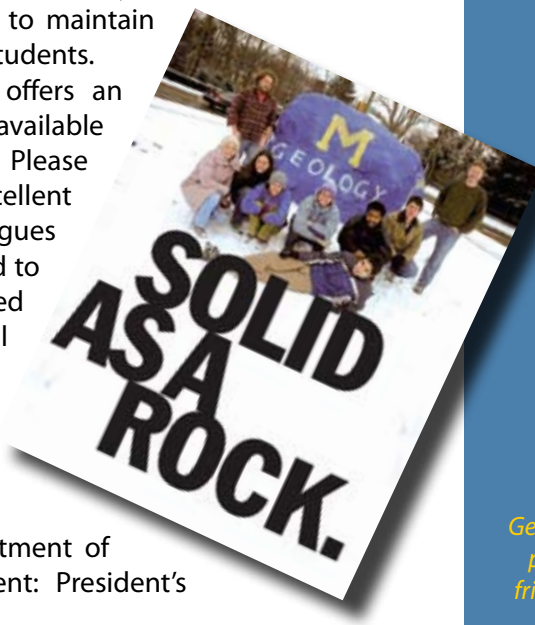
The President's Donor Challenge will match any gifts for graduate fellowships at a rate of one dollar for each two dollars given, up to a maximum gift of \$2 million. Gifts exceeding \$50,000 will establish a named endowment. The President's Donor Challenge: Phase II draws to a close at the end of 2008.

The Department of Geological Sciences has observed first hand the competitive advantage that funded graduate fellowships confer in attracting and keeping the highest quality graduate students, and, over the past 5 years has successfully funded graduate fellowships for many first-year graduate students from a combination of University, departmental, external, and alumni funds. The endowment the department has established for this purpose, however, is small, and each year requires renewed effort to find the funds necessary to maintain these fellowships and continue to attract world-class students.

The President's Donor Challenge: Phase II offers an unparalleled opportunity to increase the funding available within the department for graduate fellowships. Please consider helping us attract the next generation of excellent graduate student researchers, instructors, and colleagues by contributing to this challenge. Gifts can be pledged to a college, school, or department, and any gifts pledged to this challenge and received over the next 5 years will qualify for a University match.

You can obtain more information on the President's Donor Challenge: Phase II on the web at http://www.giving.umich.edu/where/presidents_challenge.htm.

Donations should be specified to the Department of Geological Sciences Graduate Fellowship Endowment: President's Challenge for the matching funds to be applied.



Cover Photographs:

Background: Waterfall plunging over Cretaceous carbonates, Greater Caucasus Mountains, Azerbaijan.

Left: Tents at dusk at City of Rocks National Preserve, Idaho, during the Field Geology regional field trip.

Right: Students sitting on Soda Dam along the Jemez River, New Mexico, during the Fall 2008 Mineralogy field trip.

Table of Contents

Greetings from the Chair	2	Field Excursions 2008	
President's Challenge II	3	Soft Rock Trip	17
Honors and Awards	4	Sedimentary Geology Trip	17
Faculty News	6	Bear Valley Mine	18
New Faculty Hires	11	New Mexico	19
Interdisciplinary Faculty Positions	11	Alumni News	20
Camp Davis Gazette	12	Camp Davis Alumni Getaway 2009	20
Michigan Geophysical Union	13	In Memoriam	22
Journey Across the Roof of the World	14	Recent Graduates	24
River Incision in the Sierra Nevada	16	Faculty and Staff	27

Geoscience News is compiled periodically for alumni and friends of the Department of Geological Sciences at the University of Michigan, Ann Arbor, MI 48109-1005

E-mail:

geo.alum@umich.edu

Phone:

(734) 764-1435

Web:

<http://www.geo.lsa.umich.edu/>

Newsletter Production:

K. C. Lohmann
N. A. Niemi

Honors and Awards

Departmental Graduate and Undergraduate Awards 2007



John Dorr Graduate Academic Achievement Award

Erik Kneller (PhD '07) received the Department's Dorr Graduate Award as well as the Rackham Distinguished Dissertation Award in recognition of his outstanding contributions to the field of geophysics for his research on seismic anisotropy in subduction zones. Erik was earlier recognized for his work by receiving the MARGINS student

presentation award in 2006. Erik is currently employed by ExxonMobil Upstream Research.

Outstanding Graduate Student Instructor Award

Each year the department recognizes excellence in graduate student instruction, which has a direct impact on the quality of undergraduate education. The 2008 recipient of the Outstanding GSI Award is **Lin Ma (PhD '08)**, who was recognized for his contributions toward the instruction of geohydrology.



Geoclub and SGE Awards

Geoclub continued its tradition of providing awards to outstanding students to help defray the costs of textbooks and field equipment. Eight recipients this year received a total of \$825 from Geoclub.

Book Awards

David Azzolini (BS '09)

Mary Peterson (BS '09)

Kelly Umlauf (BS '08)

Ian Winkelstern (BS '09)

Jessica Zinger (BS '09)

Field Gear Awards

Jared Halonen (BS '08)

Andrew Little (BS '08)

Nattavadee Srisutthiyakorn (BS '10)

In addition to the Geoclub awards, the department's honor society, SGE, selected **Dack Stuart (BS '08)** as Michigan's recipient of the W. A. Tarr Award.

Undergraduate Achievement Awards

The department recognizes the excellence of its undergraduates with three awards each year. The Academic Excellence award recognizes achievements in the classroom through the course of an undergraduates' education. The Alumni Undergraduate Award recipient is selected by Geoclub as an individual who has made outstanding contributions to the Department through spirit and service. The Camp Davis Field Geologist Award is given to the student with the strongest performance in the Geology 440 Field Course.



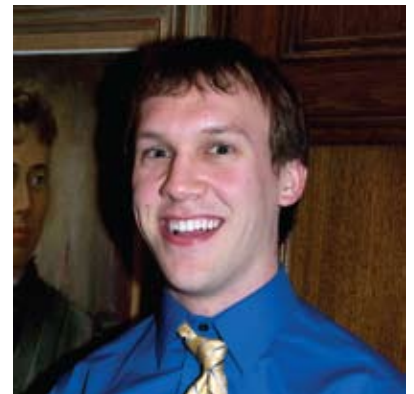
Kelly Umlauf (BS '08)

**Academic Excellence Award
Alumni Undergraduate Award**



Megan Ortega (BS '07, MS '08)

**Camp Davis Field Geologist Award
(Academic Excellence Award '07)**



Eric Portenga (BS '08)

Alumni Undergraduate Award

Andy Jacobson (PhD '01), who was cited by **Joel Blum**, received the F. W. Clarke medal for 2008 from the Geochemical Society, presented at the Goldschmidt meeting in Vancouver. Previous winners with U-M connections are **Ruth Blake (PhD '97)** who was cited by **Lynn Walter** in 2002, **Becky Lange** cited by Ian Carmichael in 1995, and **Youxue Zhang** cited by Ed Stolper in 1993. The F. W. Clarke Award is made annually at the V. M. Goldschmidt Conference to an early career scientist for an outstanding contribution to geochemistry or cosmochemistry, published either as a single paper or a series of papers on a single topic. F.W. Clarke (1847-1931) was a chemist who estimated the average composition of the Earth's crust. He is honored by continued use of the term the Clarke number, which is a measure of the enrichment or depletion of a certain trace element relative to the crustal average. Clarke has been called the *Father of Geochemistry*.

Larry Edwards (MS '86) received a major award, the Science Innovation Award, the 2008 Shackleton Medal from the European Association for Geochemistry which was presented at the Goldschmidt Conference. Larry presented a major talk to attendees on young chronometric systems at the meeting as a part of the award. The EAG Science Innovation Award is bestowed upon scientists who have recently made a particularly important and innovative breakthrough in geochemistry, considered to be of fundamental significance. This geochemical research must be highly original and contribute in a significant fashion to our understanding of the natural behavior of the Earth or our planets. In addition, such a contribution must be in the form of a widely recognized important piece of innovative scientific research published in a peer-reviewed journal. This award is named in honor of Nicholas John Shackleton. During his career, Shackleton made major fundamental contributions to our understanding of climate change and the link between CO₂ and global warming. In addition, Larry also was elected a Fellow of the American Geophysical Union for his pioneering work on U-series systematics and contributions to paleoclimatology, neotectonics and the ¹⁴C timescale.

Jeff Alt (Senior Research Scientist) was selected as one of the 2009-2010 Distinguished Lecturers in the Consortium for Ocean Leadership and US Science Support Program associated with the Integrated Ocean Drilling Program. Jeff will visit 6-7 campuses and present seminars on the things he's learned about the mineralogy, microbiology, and geochemistry of the ocean crust from his multiple (~10!) cruises on the JOIDES Resolution. Of special interest, Jeff is the fifth person selected from our department to be a Distinguished Lecturer in this series, which is a record for any institution. The previous Distinguished Lecturers have

been **Dave Rea** (2002-2003), **Kacey Lohmann** (2004-2005), **Ted Moore** (2005-2006), and **Phil Meyers** (2007-2008).

Rod Ewing was honored by being recognized as a Fellow of the Materials Research Society and the American Ceramic Society.

Megan Tuura (BS '07, MS '08) – Although Megan has ended her official career at Michigan, beginning as a goalkeeper on the winning Women's U-M Soccer Team from 2003-06 and ending with both her BS and MS in Geological Sciences, she continues her academic endeavors next year at the University of Otago in New Zealand. Megan was awarded a prestigious Fulbright Fellowship for her graduate study during which she will investigate marine mammal fossils that are 20-35 million years old. During this last summer, she completed a summer internship with BP, her first exposure to the oil business. Upon completing her graduate degrees, she hopes to continue her career as a geoscientist in the oil industry.

Chris Stephano (PhD Candidate) received the first ever Mineral Investigator Award from the Department for his role in recovering numerous mineral specimens that were stolen from the Department. During this last year, over the course of two evenings, several of our mineral display cases were burglarized with the loss of in excess of \$100,000 worth of irreplaceable specimens. Through his actions of immediately alerting local and national gem and mineral dealers and posting photos of key specimens, the alleged thief was quickly apprehended while trying to sell specimens at a local jewelry store. We honor Chris for his gumshoe talents and the ultimate recovery of these treasured specimens.

James C. Zachos (Postdoctoral Fellow '88-90), currently a professor at the University of California Santa Cruz, was elected Fellow of the American Geophysical Union for his innovative contributions to Cenozoic paleoceanography. Jim is noted for his seminal works on defining the effects and causes of rapid climate changes and extreme climates for Earth's systems. This award honors scientists with "acknowledged eminence in the geophysical sciences." Congratulations, Jim!



FACULTY NEWS

Over the past academic year **Tom Baumiller's** Invertebrate Paleontology lab was home to three graduate and four UROP (Undergraduate Research Opportunity Program) students who worked on a variety of research projects. Some of these included the effects of secondary predators on drilling predation frequencies (**Devapriya Chattopadhyay** and **Sarah Groat**), the effect of species-richness on evolutionary rates (**Alex Janevski**), paleoecology of Michigan Basin hyolithids (**Megan Tuura** and **Lan She Chan**), an examination of gastropod shell strength (**Brianna Groeneveld**), and the study of "pyrite disease" in fossils (**Kirsten Eom** together with Dr. Dan Miller of the UMMP). Results of some of this work were presented as talks and posters at GSA in Denver and at the UROP symposium and some have been written up for publication. In fact, for her paper on drilling predation on Australian brachiopods, Megan received the annual Case Award for "outstanding scholarship and attainment of research".

The activity in the lab was occasionally punctuated by field work or by museum visits which took students to places such as West Texas, Nebraska, and Ontario. However, by early summer the UROP students went home and the graduate students all took industry internships in Houston, and things got uncomfortably quiet in the lab. To escape, Baumiller sought action across the Atlantic: he went hunting for past evidence of predation on crinoids, echinoids and brachiopods in Poland, the Czech Republic and Netherlands and shared some of his findings at the International Geological Congress in Oslo.

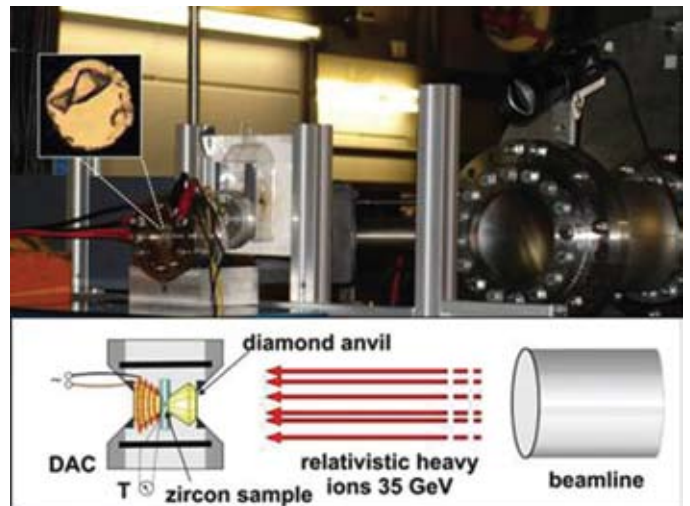
Sadly for us, Megan, when other than goatending



Alex Janevski looking for the Rustler Fm. in the Permian Basin, west Texas.

for the U-M Varsity Soccer team was a constant in the lab for the past 5 years, is leaving Ann Arbor—she has been awarded Fulbright Graduate Fellowship and you will be able to catch her teaching "Hail to the Victors" to her fellow geology graduate students at the University of Otago in Dunedin, New Zealand!

Rod Ewing's research group continues to work on a wide range of topics including radiation effects and the geochemistry of actinides. The newest activity investigates the combined effects of high pressure (up to 100 GPa) and very high-energy irradiations (tens of GeV). An international team, including **Maik Lang**, **Fuxiang Zhang** and **Jiaming Zhang** in Geological Sciences, has completed high-pressure studies of zircon in a diamond anvil cell using 35 GeV Pb ions generated by the heavy-ion synchrotron at the Gesellschaft für Schwerionenforschung (GSI) in Darmstadt, Germany. Ions at these energies create simulated fission tracks.



Photograph (top) and schematic illustration (bottom) of the irradiation experiment (GSI, Darmstadt, Germany) for exposing heated, high-pressure samples in a diamond anvil cell (DAC) to a beam of relativistic heavy ions. The very small sample (300 μm in diameter and 40 μm thick) is enclosed in the DAC (see schematic inset). The inset (upper left) is an image of a zircon crystal in the DAC. For the irradiation, the DAC is placed in air, 45 cm behind the beamline window. The schematic (not to scale) shows the details of the DAC, including the resistance-heating coil (only shown for one anvil) (Lang et al., 2008, Earth and Planetary Science Letters).

Dan Fisher's field season started early this past summer, as he left Ann Arbor in mid-May to return to the Yamal Peninsula in northwestern Siberia (north and a bit east of the Urals), where in May, 2007, the frozen carcass of a female woolly mammoth calf was found – with spectacularly preserved soft tissues. This was the only time of year when the nomadic Nenets reindeer herders

who found the calf would be back in the area where they had discovered her. To learn as much as possible about the preservational history of this specimen, it was essential to get their first-hand perspective. Getting there (by helicopter) was the “easy” part. For the first several days, the temperatures were about -10°C and winds, about 50 km/hr. The rolling tundra was still in the grip of winter, and aside from regular outings for fuel (dwarf willow excavated from under snow cover), water (ice chopped out of the frozen surface of lakes), and watching over the reindeer (for whom calving season was just beginning), everyone stayed relatively close to the shelter of the chum (a teepee covered by a double layer of reindeer hides). When conditions moderated slightly, the Nenets family camp was moved to within range of where the baby mammoth was found, and the site could be visited – by reindeer-drawn sled. On close questioning, Dan admits that the sled was only airborne briefly, as the galloping team (usually of 3-4, not 8) “flew” over the crusted snow, but it was the closest he can imagine to a ride with old Saint Nick. This visit to “Land’s End” (translation of “Yamal”) did indeed reveal a great deal about the geologic context of the newly discovered baby mammoth, but it was also a rich cultural experience. As it turned out, the discovery site was not where the mammoth carcass was eroding from Pleistocene sediments, but where it had been transported by spring floods associated with “ice-out” the year before. Armed with this information, Dan planned to return in August, when conditions for prospecting would be better. First though, he went to Saint-Petersburg, where with Russian, French, and Japanese colleagues he undertook a partial dissection, sample retrieval, and endoscopy of the baby mammoth, following which he had to return to the US to coordinate a series of analyses that were soon underway on her tissues. In late July and August, while graduate student **Katy Smith** went on a series of museum visits to collect measurements of mastodon and elephant tusks for her analyses of sexual dimorphism, Dan and graduate student **Adam Rountrey**, accompanied by U-M Geoscience alumnus **David Fox** (now on the faculty at University of Minnesota), returned to Siberia for a combination of tusk sampling and field work on the Taimyr Peninsula, followed by a return to Yamal. Much as they loved the raw fish that comprised the main part of their tundra diet, they were not fully prepared for U-M Accounting to abandon them there by holding up the wire transfer of funds that would have paid for their extraction by helicopter. Thanks to their Russian colleagues, they had only a few extra days to investigate the mysteries of the tundra. Their samples are still in the complicated export permit process, but the trip was a success, yielding a great deal of new information on the history and paleobiology of the woolly mammoths of Siberia.

Ted Moore had an active speaking year as one of the three Distinguished Researcher and International Leadership Lecture Series (DRILLS) of the Integrated Ocean Drilling Program (IODP). Ted gave talks on the topics of “The Warm Earth As We Know It” (a comparison of the predictions of future global warming with the patterns of change seen in the very warm Eocene); “The Sub Seafloor Ocean” (a review of what we know about the waters and microbial life that circulate beneath the sea floor); and “The Past and the Future of Scientific Ocean Drilling” (a look at the discoveries that have been made through scientific ocean drilling and the capabilities and plans for future drilling in the new drilling program). The hosts got to choose which talk or talks they would like to hear. “The Warm Earth As We Know It” was the most popular, although the other talks were given as additional lectures in several places. Ted was assigned to speak in the Asian sphere, but also skipped down to Brazil to speak to PETROBRAS and the University of Rio de Janeiro in November of last year. In late February and early March Ted spoke in Japan at Hokkaido University, the University of Tokyo, Kyushu University, and Kyoto University. In May Ted spoke in Australia at James Cook University (Townsville), the University of Queensland (Brisbane), The Australian National Museum (hosted by the University of Sydney and Macquarie University), Australian National University (Canberra), the University of Melbourne, the University of Tasmania (Hobart), The Geological Society of South Australia, the University of Adelaide (Adelaide), and the Petroleum Exploration Society (Perth). This was followed by a hop up to South Korea where Ted spoke at The University of Seoul, The Korean Institute of Geology, Mining and Minerals (Daejeon) , and the Korean Oceanography Society (Meeting in Cheju).

Phil Meyers had an enjoyably busy first year in his new status as Professor Emeritus. Shortly after his official “retirement” at the end of the 2007 academic year, he crossed the Pacific in July to meet with colleagues at Kyoto University in Japan who share his interest in reconstructing past climates from lake sediments and to give several talks. He then continued his travels to Bandung, Indonesia, where he was one of the keynote speakers in a meeting on “Active Geosphere Science” cosponsored by the Technical University of Bandung and Kyoto University. In September, he crossed the Atlantic to participate in the International Meeting on Organic Geochemistry in Torquay, England. While in the south of England, Phil and Judy explored the Cotswolds in a rented car. The combination of narrow roads and right-hand drive meant that they had near-accidents almost hourly. To help recover from this scary experience, they flew from England to Montpellier, France, where they spent a week helping a small farmer to harvest his 2007 grape crop and to consume some of his 2006 vintage.

Although no longer in the classroom, Phil still spent most of the 2007 fall term giving lectures. As a Distinguished Lecturer for both the Joint Oceanographic Institutions and the Society of Sigma Xi at the same time, he visited eleven campuses to present talks and to meet with their students and faculty. Depending on the interests of his hosts, Phil's presentations were about what can be learned about how Cretaceous black shales were deposited from Plio-Pleistocene Mediterranean sapropels, the paleoceanographic histories of the large upwelling systems of the modern oceans, or lake sediment paleoclimate records. Because of the diverse interests at many of the campuses, he would sometimes give two or even three presentations. Among the many highlights of these visits, Phil particularly enjoyed reconnecting with **Jim Silliman (PhD '98)** at Texas A&M University – Corpus Christi and talking about their common interests in environmental organic geochemistry. During the spring term, Phil visited two more campuses as Distinguished Lecturer, and he will continue in the Sigma Xi program for the 2008-2009 academic year.

Phil began 2008 by traveling to Sapporo, Japan, on New Year's Day to start a three-month position as Visiting Professor at Hokkaido University. He was invited to join the organic geochemistry group of Prof. Kimitaka Kawamura and to use some of its compound-specific isotopic analytical facilities to study peat bog records of the evolution of the Asian Monsoon System in China over the last 16 kyr. This study is an outgrowth of work that Phil has been doing with Prof. Weijian Zhou of the Chinese Academy of Science in Xi'an, China, for several years. By analyzing the hydrogen stable isotopic composition of molecular components of the waxes from both subaerial and subaqueous plants, the climate-dependent hydrologic histories of the peat bogs can be reconstructed. The results of the three-month study turned out better than anyone dreamed, and Phil and his Japanese colleagues are busily writing papers and preparing presentations.

A significant milestone recently occurred in the lives of Phil and his PhD student **Yuehan Lu** with the successful August defense of her dissertation on the sediment eutrophication history of Lake Erie. Yuehan is Phil's tenth and "ultimate" PhD student, although he continues to serve on the dissertation committees of other students. Her completion marks an end to more of Phil's academic activities and the start of Yuehan's scientific and academic career. As a great launch to her new career, Yuehan has been awarded a position as a Mellon Postdoctoral Scholar in a special two-year teacher-scholar training program in aquatic biogeochemistry that is jointly mentored by faculty at the Virginia Institute of Marine Science and the College of William and Mary.

Assistant Professor **Nathan Niemi** and his students have been busy in the field this past year. PhD candidate **Boris Avdeev** spent the spring in the Russian Greater Caucasus, undertaking geologic mapping and collecting samples for low-temperature thermochronology to place constraints on the time and rate of the tectonic evolution of this range. Nathan joined Boris in the eastern extent of the Greater Caucasus in Azerbaijan in the fall to continue this work, where they were joined by colleagues from the University of California, Davis, to initiate a new three-year study of the neotectonics of the Greater Caucasus.

Closer to home, PhD candidate **Alex Lechler** has been working to understand the paleotopographic evolution of the Basin and Range through the application of stable isotope paleoaltimetry. Niemi and Lechler spent time in the Death Valley region in the winter collecting Cenozoic lacustrine carbonates. Analyses of these rocks have led to a wide-ranging study on the distribution of oxygen isotopes in modern precipitation that should improve our ability to understand the paleoelevation implications of stable isotopes preserved in the geologic record.



U-M PhD candidate Boris Avdeev mapping vertically dipping Cretaceous volcanoclastic strata exposed on the sides of the Girdmancaj valley, Greater Caucasus mountains, Azerbaijan.

For the past few years, **Ben van der Pluijm's** research has increasingly focused on shallow fault rocks. Graduate student **Sam Haines** recently completed his PhD on exhumed faults rocks of the western US, while post-doctoral fellow **Anja Schleicher** continues to work on samples obtained from drilling of the San Andreas Fault (Earthscope's SAFOD project). Both studies include exciting Ar-dating components that constrain the timing of faulting processes. MS student **Sara Tourscher** completed a detailed elemental study on SAFOD samples, constraining

dissolution-precipitation and mass transfer in these rocks. PhD student **Jim Hnat** continues his work on curvature of the Appalachians, bookending our US mountain range projects. Ben's group also works in the Spanish Pyrenees, the Rwenzori Mountains of Uganda and on the Alpine Fault of New Zealand. Collaboration with U-M's **Marin Clark** on Tibetan faulting is in the planning stages, as is study of the Michigan Basin substructure with U-M geophysicists **Peter van Keken** and **Jeroen Ritsema**, and colleagues at Western Michigan University. Since last year Ben has been "on loan" to the Provost Office, where he works on issues related to university accreditation. A new academic world of long-term planning, learning assessment, knowledge production, co-curricular activities, among other issues now occupies much of his time. In support of Ben's continuing research goals, the university is funding post-doctoral fellow **Charlie Verdel**, who arrived this fall. Charlie will work on Cordilleran extensional structures with Ben and U-M colleague **Nathan Niemi**, particularly with the goal to date fault rock.

On the family front, Lies continues to enjoy her work in the U-M Medical School, combining a busy GYN practice with part-time administrative responsibilities, while the boys have finally eclipsed their parents in height (much to their joy!). Wouter just started at Michigan State University (Science College) and Robbie is a junior in Pioneer. Both continue their enthusiasm for sports (both real and virtual), occasionally interrupted by school work. Life is good.

Rob Van der Voo now works with two graduate students, who are both engaged in paleomagnetic studies of various parts of the world, whereas some four undergraduates have joined the team with additional projects. Former PhD student **Sasha Abrajevitch** has completed her program of studies and is now a postdoctoral fellow at Kochi University in Japan. The paleomagnetic studies Sasha carried out on rocks from Kazakhstan are all published, whereas her last chapter (on the magnetic minerals in sediments from the Bengal Fan) is in the process of being made ready for publication. Sasha's original intent was to use the iron-oxides (magnetite and hematite) and Fe-oxyhydroxides (goethite, basically) as proxies of climatic conditions in the Indian subcontinent. It was possible to distinguish hematitic from goethite-bearing strata as there was a clear signal in her results. However, there also are multiple indications that later dissolution has taken place, and moreover, it appears that magnetite (possibly originating as bacterial magnetosomes), was variably dissolved. This has made the original goal an unlikely target, but has achieved greater insight into the diagenetic processes within submarine fans and deltas. The study was funded by a Schlanger Fellowship of the Joint Oceanographic



The team in Argentina sampling some of the Mendoza wines. From left to right: Ada Dominguez, Eric Tohver, Renata Tomezoli (U-Buenos Aires), Rob Van der Voo, Matt Domeier, Sonia Rouse (Norwegian Geol. Survey) and Trond Torsvik (NGU).

Institutions.

Graduate student **Jim Hnat** is continuing for the PhD degree, investigating whether vertical-axis rotations occurred in the central and southern Appalachians, by means of calcite-twinning, characterization of clays and paleomagnetic studies, co-supervised by **Ben van der Pluijm** and Rob.

Matt Domeier, collected Late Permian to Early Triassic paleomagnetic samples from Argentina's Mendoza, La Pampa and San Luis Provinces, accompanied by a large team primarily along for the outstanding wines of the region (just kidding). **Eric Tohver (PhD 2003)** from the University of Western Australia in Perth, and Trond Torsvik and Sonia Rouse from the Norwegian Geological Survey, were along to help collect samples for the essential age dating that must take place in parallel with the paleomagnetic measurements, and Rob and undergraduate **Ada Dominguez** and two Argentinian scientists from the University of Buenos Aires complemented the team. The goal of the project is to test Pangea configurations for late Paleozoic-Early Mesozoic times. Physics concentrator **Athena Eyster** is helping with the laboratory measurements and hopes to make an Honors' Thesis out of this project and the latest undergraduate addition to our team, geology concentrator **Jordan Kirshner**, will accompany Matt in the fieldwork during Fall of 2008.

Ada Dominguez has also been doing laboratory demagnetizations of samples from the 2005 collection of dikes from the Oslo area in Norway, which will lead to an Honor's thesis in the coming year, and undergraduate **Ken Yuan** has done fieldwork in July 2007 collecting dike samples in Ukraine, followed by laboratory measurements and demagnetizations during the past year with the same

end purpose in mind. Both dike swarms are thought to be of Late Permian or Early Triassic age and the anticipated paleomagnetic results hopefully will shed light on northern Europe's paleogeographic position within Pangea. Rob went to the International Geological Congress in Oslo in August 2008, where he presented results from the Kazakhstan paleomagnetic studies.

U-M Assistant Professor **Jeff Wilson** and his lab were busy collecting new fossils and studying museum collections this Spring and Summer. Wilson and PhD candidate **Iyad Zalmout** collected remains of a new dwarf dinosaur from Cretaceous rocks in southern Jordan, along with beautiful fossil palm fruits that may have been part of its diet. PhD candidates **John Whitlock** & **Mike D'Emic** were busy researching fossil sauropod dinosaur skeletons in museum collections in Argentina and southeast Asia, respectively, as part of their thesis research reconstructing the evolutionary history of sauropod dinosaurs. PhD candidate **Takehito Ikejiri** studied and measured many crocodile specimens in Florida as part of his study on their skeletal growth.



U-M paleontologist Jeff Wilson (R) and PhD candidate Iyad Zalmout (L) collect a mosasaur from latest Cretaceous rocks in central Jordan (March 2008). Photo by Monica Wilson.

To use the buzzword of the 2008 Presidential campaign, much "Change" has been happening to **Youxue Zhang** recently. All his students are gone or finishing: **Hejiu Hui** (studied viscosity of silicate melts) obtained his Ph.D. in May and is now a postdoctoral Fellow in Houston; **Yang Chen** (investigated diffusive and convective mineral dissolution in silicate melts) defended in September and is now enjoying France; and **Huaiwei Ni** (exploring water diffusion in silicate melts) plans to defend in the Fall of 2008 and then to go to Germany. Youxue plans to work hard to recruit new students. Furthermore, Youxue's two sons (Dan and Ray) went to colleges and the older son Dan will graduate from college soon. What an empty nest! His book "Geochemical Kinetics" has just been published by Princeton University Press. He planned and hoped for the book to be the "bible" of geochemical kinetics. Youxue thanks his advisors for launching him into kinetics and his many colleagues (including former and current students) who contributed in various ways to the preparation of the book.



Nathan Sheldon (Asst. Professor) and **Jen Cotton (PhD student)** at Madison Buffalo Jump State Park, Montana. Nathan and Jen were undertaking field work along with **Selena Smith (U-M Museum of Paleontology)** and **Caroline Stromberg (University of Washington)** to look for evidence of past grassland ecosystems and past climatic change.

NEW FACULTY



Eric Hetland
**Lithospheric Dynamics and
Crustal Mechanics**

PhD Massachusetts Institute of Technology

Eric Hetland's research is broadly concerned with lithospheric deformation, principally the inference of the mechanical properties of the crust and upper mantle from observations. He also works on new methods to constrain time dependent deformation from InSAR observations. The problems Dr. Hetland is concerned with cover several spatial and temporal scales, and include:

- Deformation during all phases of the earthquake cycle.
- Deformation of geothermal and volcanic systems.
- Deformation associated with fluids in the crust.
- Deformation of the lithosphere during the development and evolution of fault systems.

The most fundamental aspect of Dr. Hetland's research is developing analytic and semi-analytic models in order to gain physical intuition into mechanical systems. Additionally, he uses numeric models to explore a wider range of geometries and rheologies than analytic models allow. All of these models can be used to explore the mechanical properties of the lithosphere; however, finite element models that contain the important rheologies and honor the known structure of the lithosphere are needed to infer the mechanical properties from observations. These model-based inferences are most often non-unique, and thus instead of a single preferred model, he pursues a suite of models consistent with the observations.

DEPARTMENT AWARDED THREE FACULTY POSITIONS BY THE PROVOST

The Department of Geological Sciences is a recipient of the Provost's Interdisciplinary Junior Faculty Initiative to hire 100 new faculty members in areas that advance interdisciplinary teaching and research. The department's Global Change proposal was one of six proposals from a pool of 39 to be approved.

The Global Change proposal, spearheaded by Professors Chris Poulsen and Todd Ehlers, is a collaboration with the Department of Atmospheric, Oceanic and Space Sciences to develop a world-class research and education program dedicated to understanding the fate of our polar regions, their contribution to sea level change, and the impact of sea level change on coastal regions. "The strength of our proposal is that it has human relevance. I think President Coleman and Provost Sullivan recognized that issues of climate change and its impacts will only become more problematic in the future", Poulsen commented.

The Global Change proposal includes five new positions, three of which are funded through the Coleman IJFI. New hires will be made in the fields of glaciology, ice sheet modeling, ocean-ice sheet interactions or polar climatology, regional climate modeling, and coastal processes. The faculty search, which may take two to three years, has already begun. "We're elated, this is an opportunity for the department to expand existing programs and build department strengths in frontier fields." said Ehlers.



*Ice arch collapsing at Norsel Point, Antarctica, spring 2008.
Photo courtesy of the U. S. Antarctic Program.*

Camp Davis Gazette

U-M's Camp Davis Rocky Mountain Field Station Renovation Project



Then and now...

It didn't really sink in until I read a small headline buried in the Ann Arbor News in August that stated: "Regents Approve Camp Davis Renovation." Of course by then I had a pretty good idea that this would be the outcome, but seeing it in print had special significance. Among all of the much larger and costlier projects approved by the Regents at their summer meeting, it was the tiny Camp Davis project that was highlighted. I soon learned just how many Camp Davis alumni read the small print in the Ann Arbor News. To my delight I received numerous letters, emails and phone calls congratulating the department and applauding the project.

In the 80th year of operation, Camp Davis has received a pledge of \$0.75 million from the College of Literature, Science and the Arts to get a major Camp Davis renovation project off the ground. Much of these funds will go into planning, architecture, and infrastructure--including a modern sewage system. The Department of Geological Sciences has been challenged by the Dean to raise an additional \$0.75 million this year to complete Phase I of the project, and then an additional \$1.5 million in the coming years for Phase II.

In an effort to maintain our Rocky Mountain Field Station and improve it to better support our academic mission, the Geological Sciences Department is currently working on the first phase of a major capital improvement project. In recent years Camp Davis has experienced dramatic growth in both course offerings and student enrollments. This summer we are offering seven classes and expect an enrollment of about 150 students. The aging Camp infrastructure is no longer able to support the increased use or the extension of the season into the

colder spring and fall seasons. To support this positive growth, demolition and construction will begin this winter on new and greatly improved utility systems and student and faculty housing.

NOW WE NEED YOUR SUPPORT!

We know how much Camp Davis meant to those of you who attended, and that even if you didn't attend you appreciate the importance of field instruction in the Geological Sciences. Please consider donating to the Camp Davis Renovation Fund.

Giving Opportunities

The Camp Davis Renovations Fund is an opportunity for alumni and friends to show their support and help us continue the educational mission and facility improvements to benefit the next generation of students. Donations should be sent to the Department of Geological Sciences and designated for Camp Davis Renovations.

Special naming opportunities

Camp Davis can offer donors special naming opportunities. Many of the cabins that will be constructed in Phase I have already been funded and named for memorable faculty mentors, former Camp Davis students, and family members of loyal alumni. However, we still have a long way to go to reach our goal, and if you are interested in sponsoring a cabin or organizing a group to pitch-in and sponsor a cabin please let us know.

Joel Blum – Camp Davis Director

Fifth Annual Michigan Geophysical Union

The Michigan Geophysical Union (MGU) is an annual event for Geological Sciences and AOSS undergrad and graduate students interested in sharing their research, stimulating new ideas, and practicing presentation in a friendly environment. All students, faculty, and staff are invited to attend.

The 2008 MGU was held March at the C.C. Little Building, where 40 Geology and AOSS students presented their research in poster format. Poster presentations were judged by six faculty members from both departments.

Geological Sciences Award Winners

First Place - Alison Duvall

Mid-Miocene emergence of the 'Dulan-Chaka Plateau': Observations and implications for growth along the Northeastern Tibetan Plateau margin

Second Place - Katy Smith

*American mastodon (*Mammot americanum*) tusk morphology as an indicator of sex and age*

Third Place - Megan Tuura

Drill Holes in Cenozoic Brachiopods from Australia and a Test of the 'Low Nutritional Value' Hypothesis

Student Choice Award - Katy Smith

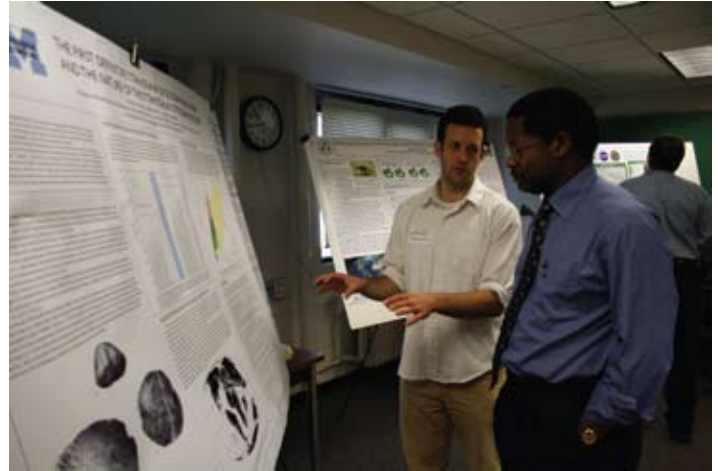


Geological Sciences MGU Award Winners (from left to right) Alison Duvall, Katy Smith, and Megan Tuura.

MGU was organized by Geological Sciences graduate students **Laura Sherman**, **Jessica Malone**, **Susan Alford**, **Sarah Rilling**, **Shih-Yu Lee**, and **Qiaona Hu**.

Faculty Judges from the Department of Geological Sciences were **Joel Blum**, **Marin Clark**, **Kacey Lohmann**, and **Larry Ruff**.

The Geological Sciences Faculty Advisor is **Chris Poulsen**.



Mike D'Emic explains his research on Titanosaurs to Sam Mukasa.



Kacey Lohmann judging posters at the 5th MGU, held in C. C. Little building.



Students from Atmospheric, Oceanic, and Space Sciences and Geological Sciences enjoy the post-MGU luncheon.

Journey Across the Roof of the World



In the fall of 2007, geological sciences PhD candidate Alison Duvall and her thesis advisor Marin Clark set off to the Tibetan plateau with the goal of sampling sediment from the headwaters of several of the world's largest rivers and their tributaries. Ordinarily crossing the entire width of Earth's highest plateau (~ 2000 km) is quite a feat. Add to that cold late-fall conditions and an aggressive sampling itinerary and you have the makings of an unforgettable geo-adventure!

The Tibetan Plateau, with elevation equal to Mt. Whitney over an area the size of the eastern United States, provides an excellent natural laboratory for investigating intracontinental deformation as well as climate-tectonics-erosion links. Such a large topographic feature acts as a major atmospheric disturbance, which is evident from environmental changes through time (e.g. intensification of the Monsoon and aridification of central Asia). Because erosion by rivers is driven both by uplifting mountains that control the steepness of a river, and the amount of water in the river from precipitation, studying erosion patterns in space and time provides clues to both how mountains grow and how climate has changed in response to mountain uplift through Tibet's past.

Marin has participated in research projects/field work focusing on the Cenozoic history of Tibet for over a decade and even lived near Lhasa for a summer during college. Alison, now in her 3rd year at Michigan, has spent several field seasons collecting samples and mapping rocks along the northern margin of the Tibetan plateau in

the Gansu and Qinghai provinces of China, but this was her first time entering the remote, sparsely-populated central part of Tibet. The goal of this trip was to sample sediment directly from river catchments in order to characterize erosion history across the plateau. More specifically, the mineral apatite was extracted from the river sand in order to estimate erosion rates over longer geologic timescales ($>10^6$ yr) by (U-Th)/He thermochronometry and erosion over shorter timescales ($10^5 - 10^6$ yr) by using the concentration of cosmogenically derived ^3He accumulated in apatite at the Earth's surface.



Marin Clark (right) and John Bershaw (University of Rochester) collecting water and sediment samples on the Tibetan Plateau. (A. Duvall)



Weather is very important when planning any field work, but up on the Tibetan plateau, it can mean the difference between a successful trip and a disaster. Flood-stage flow in spring and heavy monsoon rains in summer prohibit sampling of sand exposed along river banks and safe travel during these seasons, leaving only a brief window of time in late fall before heavy winter snow for sampling to be accomplished. With this in mind, Alison and Marin left Michigan and arrived in Beijing, China on October 20, 2007, keeping their fingers crossed for good weather and passable roads (landslides have been known to wreak havoc even this time of year). There they met up with the rest of the team: graduate student John Bershaw (SIREAL stable isotopes lab, University of Rochester, NY) Chinese colleague Chuanyou Chen (Institute of geology and geophysics, Beijing), and two Chinese drivers Xiao Liu and Xiao Wang. With so much ground to cover, there would be no time for the usual Peking duck welcoming feast. Instead, the group immediately departed on a domestic flight to the city of Xining, China. From here, it was south to Lhasa in 4-wheel drive vehicles via some of the most difficult terrain and remote landscape that Asia has to offer.

Everyone who does field geology knows that unexpected delays are inevitable, especially when working internationally. In keeping with tradition, it did not take long for team Tibet to encounter their share of unforeseen circumstances. The first glitch related to sampling difficulties. The plan was to sieve sand-sized particles

from deposits along the banks of rivers. Sometimes, however, the desirable size particles were not deposited conveniently along banks but rather closer to the middle of the river. In these cases, a wet-sieving technique was used. Ordinarily this is only a more time-consuming nuisance. It is an entirely different story when air temperatures are below freezing and parts of rivers are actually frozen! To make matters worse, it is difficult to think straight (not to mention breathe) at >5500 m elevation.

With winter approaching and no time to dwell, it was go, go, go further south toward Lhasa. Thankfully, the highest elevations and coldest conditions were left behind in the most northern reaches of the plateau. Unfortunately weather and road conditions seemed inversely correlated, as the smooth highway soon gave way to narrow and rough roads for much of the rest of the journey. Slow going isn't all bad though, especially when it means having more time to observe gorgeous landscapes and the beautiful people who live among the remote mountains and rivers. Indigenous Tibetans live together in both small villages and larger city centers across Tibet. They worship at Buddhist monasteries and herd grassland animals such as yak, sheep, and goats. Although it is often difficult to communicate, Tibetan people are very kind and happy to lend a hand. At one sampling site along a tributary to the Yangtze River, several Tibetan children helped the Chinese sieve as the Americans recorded location and notes. It was truly an international effort.

With the deadline of a departure flight fast

approaching, Marin, Alison and the rest of the team did their best to make the most of their field time – even if it meant collecting sediment late into the night or in less-than-ideal conditions (who could forget scooping up sand at a river-side garbage dump!). After a couple of other unexpected permit issues, the team finally arrived in Lhasa, both vehicles drooping from the weight of bags and bags of river sediment. Once the last hurdle of getting the samples safely back into the United States was cleared, both Marin and Alison breathed a sigh of relief and reflected. What an incredible journey...a trip across

the roof of the world in a span of two weeks is definitely one for the record books.

Alison is currently busy separating samples and selecting appropriate apatite grains for ⁴He analysis. She and Marin are encouraged by the quality of the samples and happy that all of their hard work sampling paid off. Stay tuned for the exciting results!

Alison Duvall is a PhD candidate working with Assistant Professor Marin Clark on the tectonic evolution of the Tibetan Plateau.

River Incision and Mountain Uplift in the Sierra Nevada, CA

This past summer, **Nora Lewandowski (BS '08, PhD student)**, **Joshua Soble (BS '10)**, and **Joe Murphy (BS '09)** spent the month of August participating in a field campaign to gather river incision rates of streams in Kings Canyon National Park in effort to find uplift rates of the Sierra Nevada. The ultimate goal of the work was to better constrain when the Sierra obtained their maximum elevation. The group measured several variables of stream morphology in an effort to quantify river response to uplift, which included stream width and depth, as well as statistical measurements of sediment particle size. They also collected river sand from small tributaries to the main Kings Canyon for cosmogenic nuclide exposure ages. Bombardment of the Earth's surface by cosmogenic rays results in the accumulation of nuclides in exposed rock. The concentration of nuclides is a function of time exposed at the Earth's surface, where short exposure times are related to high erosion rates and long exposure times are related to low erosion rates. As rock in the hillslopes is eroded into sand and transported out of the mountains by rivers, river sand collected in any one location records the erosion rate upstream by its concentration of cosmogenically-produced nuclides. The data from this project is being analyzed and we expect to ultimately relate river erosion rates to a response to mountain uplift.

Marin Clark (Assistant Professor) accompanied them for the first two weeks and provided invaluable

assistance in the field. "My time in the field was great, I feel it really has me prepared for Field Camp next summer," said junior Joshua Soble. Despite close encounters with bears, rattlesnakes, and poison oak, the team enjoyed the experience and every member is excited to return to the field.

Nora Lewandowski received her BS from the University of Michigan in Mathematical Biology in 2008. She is currently a PhD student in Geological Sciences.



Journeys Around the Rest of the World



Spring 2008 Soft Rock Field Trip

As the cold of Winter began to wane in Ann Arbor, the 2008 Soft Rock Field Trip began its excursion to the warmth of south Florida. This year, Kacey Lohmann and Peter Knoop guided the trip of about 16 students on a 12 day trip that ended in Key West Florida. It began with travels through Paleozoic of Indiana and Kentucky where the group examined reefal and platform limestone sequences and the diverse siliciclastic deltaic and fluvial units of the upper Mississippian and Pennsylvanian. In addition to examining outcrops of the lower Paleozoic near Knoxville Tennessee, we then traveled through the Smoky Mts., stopping at key localities to examine the structural features of the southern Appalachians and recap the depositional and deformational history of the Southeastern US. Then on through Georgia and north Florida with stops at the Pleistocene limestones of the Anastasia Fm. and Ocala Ls. Proceeding southward, we moved into the carbonate belt of south Florida where Pleistocene carbonates are exposed in cuts, as karstic remnants throughout the Everglades, and as the backbone of the Florida Keys. While on the Keys, students were able to examine the full range of modern carbonate environments, ranging from the mud-rich sediments of Florida Bay to the reef and grainstone facies of offshore at Pennekamp Park. After the traditional final banquet of shrimp and grilled grouper, the journey ended with the long trek back to Ann Arbor. This next year's trip will be traveling to the Southwest with the ultimate destination of west Texas and the Permian Reef. Hope to see you there!!



Mary Peterson, Jeff Bartels, Kelly Umlauf, Joe Murphy and Dack Stewart after a successful shark's tooth expedition in the Miocene Phosphate District near Venice Florida.

GS 305 Sedimentary Geology Field Trip

Nearly the entire Sedimentary Geology class (GS 305) took part on a two day field excursion from Ann Arbor down through southern Indiana and Ohio. As part of the course, several day field excursions are planned to expose the students to real rock and sedimentary structures. The last trip for this term began with exposures of the Silurian Louisville Ls and Wabash Formation which are unconformably overlain by the Devonian Detroit River Formation at the Ardmore Avenue Quarry near Fort Wayne. The trip continued southward to Pipe Creek Jr Quarry where an excellent exposure of a limestone reef in the Wabash Fm is being actively quarried. Replete with fossils and a variety of depositional and diagenetic features this quarry is one of the best in the world. From here, the group continued to southern Indiana around Bloomington where the classic Mississippian-aged limestones are quarried for building stone. Outcrops of the Harrodsburg, Salem, St. Louis and Ste. Genevieve Limestones were studied. After a long and cold night camping at Starve Hollow SRA, the class began its next day with the deltaic and prodelta sequences of the Borden Group sandstones and shales. We capped the day off with extensive stops along the classic outcrops of the Ordovician Whitewater and Dillsboro Formations near Cedar Grove where the students were able to collect enough fossils to last them a lifetime. All in all, the students love learning in the field, despite the long days and cold blustery weather.



Examining Silurian Reef Rock at Pipe Creek Jr. Quarry near Gas City Indiana. From left to right: **Becky Polvis, Ian Winkelstern, Julia Giddy and Ada Dominquez.**



GeoSci 351 Field Trip

**Bear Valley Strip Mine, Valley and Ridge Province, Pennsylvania
Spring, 2008**

In late spring 2008, the GeoSci 351 class, Structural Geology, traveled to central Pennsylvania to learn basic mapping and field geology skills at the abandoned Bear Valley strip mine. Fifteen students, two graduate assistants (**Boris Avdeev** and **Jim Hnat**) and Assistant Professor **Nathan Niemi** braved the flying snow and near freezing temperatures to study these amazing outcrops. Although this marked U-M's first trip to this locality, the site is well-known to geology departments throughout the region.

Pennsylvanian plant fossils (and a purported deformed tree trunk), calcite-filled tension gashes, and textbook examples of disharmonic folding. The students completed a basic structural map on aerial photographs, and used the structural data they collected as the basis for a geologic report on the mine as part of their class work.

FIELD TRIPS



Slickenlines on the 'Whaleback', Bear Valley strip mine.

The Bear Valley strip mine is a hilltop mine abandoned in the late 1960s or early 1970s. The mine is comprised of several third-order folds, superposed on top of the regional synclinoria. Strip mining of Pennsylvanian coal has exposed the upper bedding surface of the underlying sandstone, and the students can walk over this single deformed surface throughout the mine. The strip mine wall (see photo above) offers the students a cross-section of the geology that once overlay the mapping area. This combination of exposures illustrated to many of the participants the inherent three-dimensional nature of structural geology. In addition to the large-scale structure, the strip mine is filled with many wonderful smaller scale features, including deformed concretions, imprints of



Students standing on the 'Whaleback'. Large round features are concretions. Exposures are one folded bedding plane.



Students exploring extensional faults and kinematic indicators on the upper surface of an exposed anticline.

During the 2008 fall break, the mineralogy course (GS 231) took its field trip to northern New Mexico. Twenty-one students, two graduate assistants (**Devon Renock** and **Lindsay Shuller**) and Professor **Rod Ewing** explored the geology and mineralogy of the Española Basin in north-central New Mexico. The visit began with a visit to the mineral and meteorite museums at the University of New Mexico. The base camp was at the Harding Mine, located some 70 miles north of Santa Fe in the western part of the Picuris Range with a view across the Rio Grande Rift to the west. The Harding mine is a beautifully exposed pegmatite with a unique history of production of Li, Ta and Be.



Professor Rod Ewing gives the students a geologic overview of the Abo section of the Jemez caldera.

In the early 1950s, the Harding was the leading producer of beryl in the United States. The next days included stops at a newly discovered bolide impact site in the preCambrian of the Sangre de Cristo mountains, the Tertiary deposits of the Española Basin, the upper Paleozoic section beneath the Jemez volcanics, and the Valle Grande Caldera, the largest strato-volcano in North America. The trip also included a stop at the Bradbury Science Museum

at Los Alamos, an afternoon of museums and galleries in Santa Fe, and a visit to the home and studio of Charlie Carrillo an internationally renowned New Mexico santero.



Students collecting shatter cones from an impact structure north of Santa Fe, New Mexico.



Teams Maize and Blue present their geologic maps of the Harding pegmatite for inspection.

ALUMNI NEWS

Jim Rogers (BS '52, MS '53) recently published a seminal paper on a new reservoir model for the Garfield Conglomerate pool. Although he is particularly proud of his accomplishment, he states: "it was completely ignored by my peers (those still alive)". Jim, we are proud of you.

Earl Brabb (MS '52) has published thirteen papers within the past three years, a level of accomplishment that testifies that he has not really retired, contrary to a piece of paper that says he did in 1994. Earl works gratis, almost full time in his Rocklin home as a volunteer for the USGS where he supervises three other volunteers who help digitize the age and location of thousands of Chevron microfossil localities from Baja to Washington. The Chevron collection, the largest gift of new information ever provided to California, is now housed at the California Academy of Sciences. He is currently working on a paper about a Paleocene index fossil that led to a major discovery of multiple thrust sheets in an area thought previously to have simple structure. In addition, he spends time as Chairman of a European Geophysical Union Committee to select the annual winner of the Soloviev Medal named for a Russian Seismologist. On days off, he and his wife Giselle ski, raft rivers, take hikes, ride bikes, exercise in their gym, and take advantage of the community club pool. Robin, their older daughter, is taking exams to become a battalion commander for the City of Fremont. Their younger daughter Kristin, along with grandchildren and husband Steve, have just returned from a 3-year assignment in Edinburgh where they had to travel frequently to visit Giselle's relatives in Germany and attend plays and concerts in Paris and London. It sounds like a tough life, Earl and Giselle!

Jeff Huspeni (MS '82) was appointed Vice President for African Operations for Newmont Corporation in January 2008. Jeff served as Vice President, Exploration Business Development from 2005 to 2008 and Vice President, Mineral District Exploration, from 2002 to 2005. He is currently based in Accra, Ghana. Matthew, the son of Jeff and **Mary Roberts (BS '81)**, is a senior this year at Michigan

and is only one credit away from completing a minor in Geological Sciences as part of his undergraduate degree.

Patty (Schnorr) Haynes (MS '84) was on campus this summer to visit her son, Thomas, who will be a senior at Michigan this year. She and **Fred Haynes (PhD '86)** and the rest of the family moved from Newfoundland to Houston last year. Patty did a quick walk-through of the Department and reported that things have changed both in the make up of the facilities and especially the faculty.

Scott Tinker (MS '85) has been President of the AAPG while maintaining his position as Director of the Bureau of Economic Geology in Austin. His big news this year is that Allyson is still as gorgeous and is as smart as ever. They just celebrated 25 years of marriage in July 2008. Their oldest just started college. They also have one in high school and two in elementary. Scott is thrilled with still being around to enjoy it. As he says: "Life is Good!!!"

Ralph Stearley (PhD '90) is professor of geology and chair of the Dept. of Geology and Geography at Calvin College. Together with retired colleague Davis Young, he has co-authored a 500-page book which bluntly refutes the claims of young-Earth creationism. Entitled *The Bible, Rocks and Time*, it examines historical, biblical and geological evidence which blatantly point to an Earth of great antiquity. We hope that it gets wide readership!

Deb Tjoa (MS '97), the first graduate student of Peter van Keken, is happy to announce that she and her husband have been expecting their first child. It was due on October 11th. Deb and her husband currently live in San Francisco.

Grigore Simon (PhD '98), currently with Newmont Corp. in Denver, and **John Muntean (MS '89)**, currently with the Nevada Bureau of Mines and Geology in Reno, were co-leaders with Chris Heinrich of the Gordon Conference on the *Geochemistry of Hydrothermal Ore Deposits*, which was held this July at Il Ciocco, Italy. This was the first Gordon conference on ore deposits to be held outside the U.S. and it attracted attendees since the series began in 1968.

Camp Davis Alumni Getaway 2009

The Department welcomes you to participate in the 2009 Camp Davis Alumni Getaway, scheduled for August 19th - 23rd. This event will be an opportunity for alumni and friends to visit the Camp Davis area, staying in the camp facility. Camp Davis is located just south of Jackson Hole, allowing easy access to Yellowstone and Grand Teton National Parks. The Camp can serve as a base for your independent excursions around this region, or as a reunion where you can reacquaint yourself with old friends and the current U-M crew. Several sight-seeing, field trips, and hiking activities will be organized to areas of the Tetons and adjacent Gros Ventre Mountains, and local outfitters will provide float trips and wildlife excursions. For additional information on dates, costs and activities, visit the Department's website <http://www.geo.lsa.umich.edu/> and follow the link to Alumni Getaway 2009.

Keep in touch! We're always glad to hear what you've been up to, and to get updated information on how to reach you. Address and e-mail updates, as well as news, can now be sent to us easily through the department web site. Go to <http://www.lsa.umich.edu/geo/alumni> and follow the link for Alumni News & Updates on the right hand side.

Other U-M attendees included **Artur Deditius** (current post-doctoral fellow with Rod Ewing and Steve Kesler), **Francois Robert** (post-doctoral fellow with Bill Kelly in 1988-89, now with Barrick Gold Corporation), **Martin Reich (PhD '06)**, now at University of Chile, Santiago) and our own Steve Kesler.

Laura Kaminski (BS '00), after graduating from U-M in Environmental Geology and working for several years in the environmental field, returned to undertake advanced studies through the Ross Business School and the School of Natural Resources and the Environment. In April of this year, she completed her MS in Resource Policy and a MBA in Nonprofit Management and Organizational Behavior through the University of Michigan's Erb Institute for Global Sustainable Enterprise MBA/MS program. Currently, she is working as a Senior Program Specialist at the Great Lakes Commission in Ann Arbor.

Steve Peters (PhD '01) and his wife Sarah Whitney are the proud parents of a new son, Nathaniel (Nate) Clayton Whitney Peters (whew!) who was born on 2 May 2008. Sarah has returned to work fulltime, while Steve is on parental leave during the Fall. Although Nate doesn't seem to like the idea of sleeping much, at least he makes up for it with lots of smiles and laughs.



Steve Peters (PhD '01) and son Nate.

Mark Wenzel (MS '02) recently completed his Ph.D from Berkeley on Martian mantle dynamics and on the mineral physics of magnetite. He was also awarded a 2006-2007 AGU Congressional Science Fellowship for which he worked in the office of Senator Christopher Dodd on energy, environmental, and agricultural issues. He is now employed by the California Environmental Protection Agency where he is working on California's policies related

to climate change.

Dan Core (PhD '04) welcomes his new son, Liam Elliott Belfield Core, who arrived on July 31 at 11:08pm. He weighed in at 8 lbs 9 ozs and was 21 inches long. The young boy and his mother, Sarah, are doing really well. The family is now living in Ohio where Dan is a principal in Fathom Geophysics.



Dan Core (PhD '04) and son Liam.

Jesse Araiza Ortega (BS '06) married **Megan Emily Tuura (BS '07, MS '08)** on October 4th, 2008. They met on the 2005 Michigan Geology Soft Rock Trip to the Florida Keys. Jesse is now working as a scuba instructor in St. Thomas. Megan is finishing her Masters degree in the Michigan Geology Department and will be joining Jesse in the Virgin Islands. Next February they will move to Dunedin, New Zealand. Megan received a Fulbright Scholarship and will be studying at the University of Otago in Dunedin, New Zealand.



Jesse Ortega (BS '06) and **Megan Tuura (BS '07, MS '08)**

I N M E M O R I A M

J. Stewart Lowther (PhD '57) Professor Emeritus of Geology at the University of Puget Sound, passed away unexpectedly in Tacoma on March 25, 2008, due to complications after a fall. Cora "Nettie" Penberthy, his wife of 26 years, pre-deceased him in 2006. Born in Cochrane, Ontario, Stewart left high school during his junior year to enlist in the Royal Canadian Air Force where he was a navigator during WWII. He subsequently earned his bachelors and masters degrees at McGill University (1949, 1950) before attending the University of Michigan where he received his PhD in paleobotany in 1957. Professor Lowther came to the College of Puget Sound in 1956, joining what was then a two-person Geology Department, and taught there for the next 48 years. At the time of his retirement from full-time teaching in 2004 he was the university's longest serving faculty member. Stewart was a warm-hearted teacher with an amazing breadth of knowledge who touched and changed the lives of literally thousands of students and colleagues over the course of his career. Among his many talents, Stewart was also a professional photographer and a pilot. He was a president of the Washington Chapter of the Professional Photographers of America and the official aerial photographer for the USGS during the 1980 eruption of Mt. St. Helens. His aerial close-ups of that event are unsurpassed. In recent years Stewart devoted his energy to electron microscopy, studying rock microtextures and helping students and colleagues with their projects. Always the teacher and field geologist, Stewart had in January co-lead a University of Puget Sound Geology Department field-trip to the Big Island of Hawaii. It was during this trip that Stewart fell and broke several bones. The development of a hospital infection and a subsequent fall led to complications and his death in March. While Stewart's research interests started with the study of conifers while at the Museum of Paleontology, his interests shifted from Paleobotany to igneous petrology while at UPS. He will always be remembered for his dedication to both the students and to the field of geology.

Waldemere "Wally" Bejnar (BS '45, MS '47) died peacefully at his home in Socorro, NM on Friday, 9 February 2007. Having been born in Hamtramck, the Polish suburb of Detroit, Wally attended the Polish National Alliance Academy in Pennsylvania, a school where all of the classes were taught in Polish. He subsequently attended the University of Michigan where he completed his BS degree in

the Department of Geology. After extended service in the Navy during WWII, Wally continued his education earning a MS degree from U-M and a PhD from the University of Arizona. Wally's career and life were diverse. He taught geology and mineralogy at New Mexico Tech and later opened a hydrology consulting firm which took him throughout the World. In 1965, he helped establish the new Earth Sciences Division at New Mexico Highlands University in Las Vegas, NM where he taught for 14 years until his retirement. Despite his retirement, he continued to maintain an active role in geology for his remaining years, opening a lapidary shop and providing science lectures at local schools. Wally's breadth of interests and seemingly endless energy exemplified his life and is marked by all of the contributions that he has made to the sciences, society and the academic world. (Excerpted from the Mountain Mail, Socorro, NM)

Joseph Anthony Mandarino (PhD '58) passed on September 18, 2007 in Toronto. Joe was born in Chicago and received his BS and MS degrees from Michigan Technology University before coming to Ann Arbor where he earned his PhD in mineralogy. Joe's professional career was largely centered around his curatorial positions at the Royal Ontario Museum in Toronto. Beginning as an Associate Curator of Mineralogy in 1959, he continued to excel in his position with advancement to Curator and ultimately to the position where he took charge of the Department of Mineralogy until 1980. Following several years of research and teaching, from 1990 to 1992, he became Acting Associate Director of the Museum. In 1994, he retired from his position as curator and took on the role as Curator Emeritus until his death. His works started with the optical and stress properties of synthetic rubies and evolved into an acclaimed career at the Royal Ontario Museum. Joe was really a gem in every respect. (Excerpted from The Canadian Mineralogist, 2007)

Kenneth L. Doe (BS '54) passed away following a long illness on January 21, 2008 in Lincoln, NE. Kenneth was born in Manistee, MI, and received his BS in geology from the University of Michigan. He was an Army veteran of World War II, and worked for many years as a Geologist for the U.S. Department of Agriculture Soil Conservation Service in Lincoln. Kenneth retired from the USDA in 1983.

DONALD FRAZIER ESCHMAN

Born in Granville, Ohio, October 22, 1923, Donald Eschman attended Denison University, where his father was professor of music. After an interruption for service in the U. S. Navy, he graduated from Dennison in 1947. Moving to Harvard University, he studied geomorphology under the distinguished Kirk Bryan, obtaining his Ph.D. in 1953 based on an interpretation of the glacial history of the Michigan River Basin in North Park, Colorado.

Before arriving at the University of Michigan, Professor Eschman was an instructor at Tufts University (1951-53) and did mapping in Massachusetts for the U. S. Geological Survey (1948, 1952-54). He was appointed as Instructor in the Department of Geology at Michigan in 1953, and advanced to full Professor in 1964. He served as Interim Chair or Chair for a total of 12 years, and was the director of the University's Program in Environmental Studies from 1971 to 1976.

Professor Eschman's teaching responsibilities included introductory physical geology, geomorphology, environmental and engineering geology on campus, as well as field mapping at Michigan's Camp Davis near Jackson, Wyoming. He also taught in Michigan's Extension Service. He was a dedicated teacher who readily established rapport with students. Also, Professor Eschman served the southern Michigan community through public lectures and consulting services for companies and utilities, and as a member of the Board of Directors of the Cranbrook Institute of Science. Professor Eschman's professional memberships included the Geological Society of America, the American Quaternary Association, the Michigan Academy of Sciences, and Sigma Xi.

Professor Eschman published widely on the Ice Age deposits and history of Michigan on both professional and popular levels. A major achievement was the publication of *The Geology of Michigan* co-authored with the late Professor John A. Dorr in 1970. This tome is still the most complete source of information on the bedrock and glacial history of the State.

In 1985 Professor Eschman suffered a cerebral aneurysm, effectively ending his professional career, but he was still able to enjoy life for another two decades. His last few years were spent in Glacier Hills Retirement Community, where he died on November 15, 2008. His ashes were buried in the courtyard of St. Andrews Episcopal Church in Ann Arbor, where Donald Eschman was an active member. He is survived by his wife, Dorothy, four children, and five grandchildren.

*William R. Farrand
Professor Emeritus
Geological Sciences*

JAMES LEE WILSON

An internationally recognized expert on the geology of carbonate sedimentary rocks, James Lee Wilson passed away on February 13, 2008 at his home in New Braunfels, Texas.

Dr. Wilson was born in Waxahachie, Texas on December 1, 1920, and was raised in San Antonio and Houston, Texas. After graduating high school in Houston, he attended Rice University and then the University of Texas – Austin, where he earned B.A. (1942) and M.A. (1944) degrees in Geology. While doing field work in Montana in 1944, he met and fell in love with Della Moore, and they were married shortly thereafter. After serving in Italy at the end of WWII, Professor Wilson returned home, and he, his wife and new baby boy moved to New Haven, Connecticut, where in 1949 he received his Ph.D. in Paleontology from Yale University.

Dr. Wilson's early geologic field studies for the Carter and Shell Oil companies made him a recognized authority on carbonate petrology, and later academic research at University of Texas – Austin, Rice University, and University of Michigan brought him international acclaim. Dr. Wilson served as an associate professor at the University of Texas, Austin from 1949 to 1952. From 1952 to 1966 he was a research geologist for The Shell Development Company in Houston. During this time he worked in The Hague, Netherlands doing a research assignment in the Middle East. In 1966 he returned to the occupation he loved most, teaching. He accepted a Professorship of Geology at Rice University, and while on the faculty there, held the Harry Carothers Weiss Chair of Geology and served as Chairman of the Geology Department, along with teaching and mentoring many graduate students. His 1975 book "Carbonate Facies in Geologic History" has remained one of the standard texts on stratigraphy of carbonate rocks, and has been translated into several languages, including Chinese and Russian. Dr. Wilson won high awards from several of professional societies, including the prestigious Sidney Powers Award presented by the American Association of Petroleum Geologists.

In 1979 Dr. Wilson left Rice to join the faculty in the Department of Geological Sciences at the University of Michigan, where he served with distinction until his retirement in 1986 having become a Distinguished Professor. Although "retired," Dr. Wilson stayed very active, doing extensive consulting geology in both the US and Mexico. During his 21-year residence in New Braunfels, he and Dell took great pride and joy in helping the homeowners association on Patio Dr. caring for the beauty of their street.

We mourn the loss of our colleague, and extend our heartfelt condolences to Dell, his wife of 64 years, and his family.

*Samuel B. Mukasa,
Chair, Department of Geological Sciences*



Recent Doctoral Dissertations

Alexandra Abrajevitch	Magnetic Memory of Rocks: the Kazakhstan Orocline and Climatic Record of the Indian Monsoon
Jason Barnes	Deformation and Erosion of the Central Andean Fold-thrust Belt and Plateau
Subhashis Biswas	Interactions of Mineral Surfaces and Adsorbates: A Computational Modeling Approach
John Paul Brandenburg	Thermochemical Convection with Plates: Linking Tectonics to the Geochemical Evolution of Earth's Mantle
Yang Chen	Geochemistry of Northeast China Cenozoic Basalts and Experimental Study on Crystal Dissolution
Nico De Koker	Liquid State Physics of the MgO-SiO ₂ System at Deep Mantle Pressures
Matthew Densmore	Quantifying Long-Term Glacial Denudation with Low-Temperature Thermochronology
Samuel Haines	Transformations in Clay-Rich Fault Rocks: Constraining Fault Zone Processes and the Kinematic Evolution of Regions
Franciszek Hasiuk	Response of the Elemental Chemistry of Carbonate Phases to Secular Change in Ocean Chemistry
Hejiu Hui	Viscosity of Silicate Melts
Shih-Yu Lee	Orbital Control and Climate Feedbacks on Ice Age Cycles During Plio-Pleistocene
Yuehan Lu	Geolipid and Stable Isotope Records of Eutrophication History in Lake Erie over the Last Century
Lin Ma	Noble Gases Dissolved in Groundwaters of the Michigan Basin: Implications for Paleoclimatology, Hydrogeology, Tectonics and Mantle Geochemistry
Matthew Manon	Heat Capacity of High Pressure Minerals and Phase Equilibria of Cretan Blueschists



Devil's Kitchen syncline, Sam Emigdio Mountains, California

Huaiwei Ni	Water Diffusion in Calc-alkaline Silicate Melts
Ni Sun	Magma in Earth's Lower Mantle: First Principle Molecular Dynamics Simulations of Silicate Liquids
David Whipp	Quantitative Thermochronology and Interpretation of Exhumation in the Central Nepalese Himalaya
Wenbo Xu	The Geotherm, Composition and Structure of the Upper Mantle and Transition Zone
Wenjun Yong	Thermodynamic Studies of Minerals Under Mantle Conditions
Iyad Zalmout	Late Eocene Sea Cows (Mammalia, Sirenia) from Wadi Al Hitan in the Fayum Basin, Egypt

Recent Masters Dissertations

Brady Foreman	A Multi-proxy $\delta^{18}\text{O}$ Record of Paleohydrologic Conditions Across a Late Cretaceous Foreland Basin (Montana, USA): Implications for Meteoric Precipitation Patterns
Kelsey Johnson	Investigation of the Deposition and Emission of Mercury in Arctic Snow during an Atmospheric Mercury Depletion Event
Karla Knudson	Using an Unconventional Climate Record to Link Glacimarine Sediments to Turbidite Frequency in the Nitinat Fan, British Columbia
Tawny Seaton	Dorsostable Lumbar Region in Hominoidea: Homology or Homoplasy?
Megan E. Ortega	Stratigraphy and paleoecology of the Devonian Arkona Formation of Ontario, Canada, with Special Emphasis on its Hyolithid Fauna
Xin Wan	Joint Seismic and Mineral Physics Modeling of the Upper Mantle Beneath Western North America
Xin Wang	Present-Day Three Dimensional Temperature Distribution From a Mantle Flow Model

Recent Bachelors Degree Candidates

Alexander Balter	<i>Earth Sciences BS</i>
Alison Beehr	<i>Geological Sciences BS</i>
Erik Berglund	<i>Geological Sciences BS</i>
Lauren Brown	<i>Geological Sciences BS</i>
Melissa Burns	<i>Minor - Earth Sciences BS</i>
Sarah Carr	<i>Minor - Oceanography BSE</i>
Hoi Lam Cheung	<i>Minor - Earth Sciences BA</i>
Amanda Cross	<i>Minor - Environmental Geology BS</i>
Royce Ebenal	<i>Oceanography BS</i>
Tegan Gifford	<i>Minor - Earth Sciences BS</i>
Jared Halonen	<i>Geological Sciences BS and Oceanography BS</i>
Stephanie Houh	<i>Minor - Earth Sciences BA</i>
Daniel LaLonde	<i>Earth Sciences BS</i>
Lauren LaRocca	<i>Minor - Earth Sciences BS</i>
Andrew Little	<i>Geological Sciences BS</i>
Carly Manz	<i>Minor - Paleontology BS</i>
Kathryn Marcos	<i>Minor - Environmental Geology BS</i>
Anna Moser	<i>Minor - Earth Sciences BA</i>
Jacquelyn Negri	<i>Geological Sciences BS</i>
Daniel Perez	<i>Geological Sciences BS</i>
Keng Yang Phua	<i>Minor - Earth Sciences BS</i>
Eric Portenga	<i>Geological Sciences BS</i>
Derek Raisanen	<i>Geological Sciences BS</i>
Andrew Staniszewski	<i>Minor - Earth Sciences BA</i>
Sarah Striker	<i>Minor - Paleontology BA</i>
Dack Stuart	<i>Oceanography BS</i>
Megan Tuura	<i>Geological Sciences BS</i>
Kelly Umlauf	<i>Geological Sciences BS</i>
William Werner	<i>Earth Sciences BA</i>
Sara Worsham	<i>Environmental Geosciences BS</i>
Jennifer Wurtzel	<i>Earth System Science</i>
Robert Young IV	<i>Geological Sciences BS</i>



Students at Lamoille Lake, Ruby Mountains, Nevada



Aletsch glacier, Switzerland

Chair: Samuel B. Mukasa

Faculty: T. Baumiller, U. Becker, J. D. Blum, R. Burnham, M. A. Carroll, M. C. Castro, M. K. Clark, G. Dick, T. A. Ehlers, E. J. Essene, R. C. Ewing, D. C. Fisher, P. D. Gingerich, I. Hendy, E. Hetland, G. Keeler, S. E. Kesler, R. A. Lange, K. C. Lohmann, D. Lund, S. B. Mukasa, N. A. Niemi, R. M. Owen, C. Poulsen, J. Ritsema, L. J. Ruff, N. Sheldon, G. R. Smith, B. A. van der Pluijm, R. Van der Voo, P. van Keken, L. M. Walter, J. Wilson, Y. Zhang

Visiting Faculty, Research Scientists and Post-doctoral Scholars: Y. Ai, J. C. Alt, C. Badgley, B. Bergquist, H. Cureton, F. Davila, A. Deditius, J. Finarelli, J. D. Gleason, H. Hill, C. M. Hall, S. Huang, M. Lang, J. Lian, J. M. Pares, V. Pointeau, O. Pueyo Archuela, R. C. Rouse, M. Schaller, A. Schleicher, S. Stackhouse, R. Thiede, S. Utsunomiya, H. Wang, J. W. Wang, F. Zhang, J. Zhang

Lecturers and Adjunct Faculty: M. Arnaboldi, J. W. Geissman, W. M. McElhinny, W. B. Simmons, K. Webber

Emeritus Faculty: C. B. Beck, P. L. Cloke, W. R. Farrand, W. C. Kelly, P. A. Meyers, T. C. Moore, J. R. O'Neil, S. I. Outcalt, D. R. Peacor, H.N. Pollack, D. K. Rea, G. R. Smith, J. C. G. Walker, B. H. Wilkinson

Support Staff: A. Andronikov, B. Apsitis, D. Austin, D. Dault, C. Henderson, J. Hinchcliff, A. Hudon, T. Huston, M. Johnson, S. Jones, N. Kingsbury, C. Lambert, J. Magiera, C. Malvica, T. Merline, M. Messina, J. Taylor, W. Wilcox, S. Wilkin, L. Wingate, Z. Xu

Alumni Advisory Board: John Geissman (Chair), Larry Davis, Steve Glass, Steve Henry, George Ireland, Chad McCabe, Cary Mrozowski, Chris Palenik, Scott Tinker, William Zempolich.

Alumni Capital Campaign Committee: John Greene, Larry Davis and Steve Henry (co-chairs), In addition to the Alumni Advisory Board members -- Curt Lundy, Ed Poindexter, and Fred Metzger.

The Regents of the University: Julia D. Darlow, Ann Arbor; Laurence B. Deitch, Bingham Farms; Olivia P. Maynard, Goodrich; Rebecca McGowan, Ann Arbor; Andrea F. Newman, Ann Arbor; Andrew C. Richner, Grosse Pointe Park; S. Martin Taylor, Grosse Pointe Farms; Katherine E. White, Ann Arbor; Mary Sue Coleman (*ex officio*).

©© The University of Michigan, as an equal opportunity/affirmative action employer, complies with all applicable federal and state laws regarding nondiscrimination and affirmative action, including Title IX of the Education Amendments of 1972 and Section 504 of the Rehabilitation Act of 1973. The University of Michigan is committed to a policy of nondiscrimination and equal opportunity for all persons regardless of race, sex, color, religion, creed, national origin or ancestry, age, marital status, sexual orientation, gender identity, gender expression, disability, or Vietnam-era veteran status in employment, educational programs and activities, and admissions. Inquiries or complaints may be addressed to the Senior Director for Institutional Equity and Title IX/Section 504 Coordinator, Office of Institutional Equity, 2072 Administrative Services Building, Ann Arbor, Michigan 48109-1432, 734-763-0235, TTY 734-647-1388. For other University of Michigan information call 734-764-1817.



Angel Terrace, Yellowstone National Park

Department of Geological Sciences
The University of Michigan
1100 North University Avenue, Room 2534
Ann Arbor, MI 48109-1005

Address Service Requested