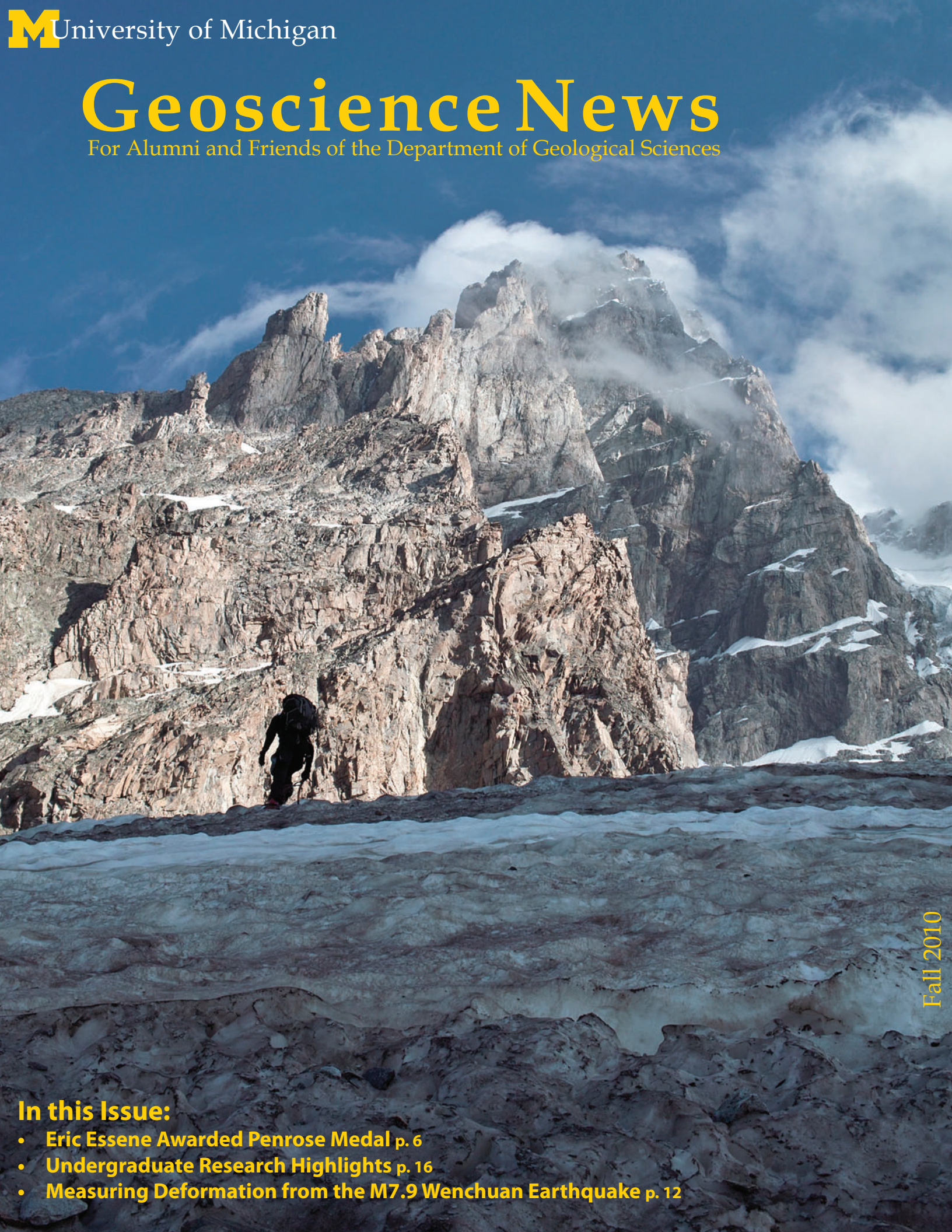
University of Michigan

Geoscience News

For Alumni and Friends of the Department of Geological Sciences



Fall 2010

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Chair's Corner

Dear Alumni and Friends,

It is with pleasure that I send my greetings only a few months into my new role as Department Chair. This change in leadership arose when we learned last May that Sam Mukasa would be taking a new job as the Dean of the College of Engineering and Physical Sciences at the University of New Hampshire, his alma mater and where he met his wife Claudia. We owe Sam a debt of gratitude for all his efforts and accomplishments as Chair over the last three years, which include the successful hiring of several outstanding young faculty. Sam spent a fruitful 20 years in our Department, and he is not so much leaving it as retiring from it, and so I'm pleased to report that he will continue his connection to our Department as an emeritus faculty member.

Another sad passage for our Department was the death of Eric Essene on May 20, 2010. Eric had an enormously positive impact on so many of us, most especially our students, during the 40 years that he was on our faculty. Last spring, the Geological Society of America awarded Eric the Penrose Medal. It is one of the highest honors bestowed by the Society and is in recognition of eminent research in geology. Eric's wife, Joyce Budai, will accept the Penrose Medal on his behalf at the annual GSA meeting in Denver on Saturday, October 30th, 2010.

The last five years have been a time of extraordinary change amongst our faculty, with 8 retirements, 3 departures, and 11 new hires. This represents a faculty turnover of nearly 40%! Our most recent retirements (in addition to Sam) include Lynn Walter, who had a highly successful career at the University of Michigan in aqueous geochemistry, and Bob Owen, who combined a research and teaching career in oceanography with extensive administrative duties in the College. Bob distinguished himself most recently as the founding Director of the Program in the Environment (PiTE) at the UM. Fortunately, we were able to convince Steve Kesler to remain one more year in our Department, so that he could continue to teach his popular course, Mineral Resources, Economics, and the Environment.

Happily, the transformation among our faculty has included several new hires in recent years, and we are pleased to welcome two new faculty members this year, Sarah Aciego and Brian Arbic. Both were hired as part of our Global Climate Change initiative in collaboration with the Department of Atmospheric, Oceanic and Space Sciences. Sarah is an isotope geochemist with a focus on glaciology, including studies of ice chronology and ice dynamics. She recently completed a PhD at the University of California, Berkeley and a post-doc at the ETH in Zurich, Switzerland. Brian is a physical oceanographer, and he uses numerical modeling to study ocean and solid earth tides, ocean energy balances, and ocean forecasts. He received his undergraduate degree in Physics from the University of Michigan (it is great to welcome him back!), and his PhD from MIT.

Other positive developments in the Department include another banner year for graduate student recruitment, with 23 new students joining the department this year. On the undergraduate front, we currently have >85 majors and minors as we begin our first year implementing our fully revised undergraduate curriculum. Our faculty members continue to be recognized for their outstanding research. Joel Blum was elected a 2010 Fellow of the Geochemical Society and was one of five UM faculty named an Arthur F. Thurnau professor, Rod Ewing was elected a Foreign Fellow of the Royal Society of Canada, Peter van Keken was elected a Fellow of the American Association for the Advancement of Science, and Youxue Zhang was appointed a 2010 LS&A Collegiate Professor. And last, but not least, the continued generosity of you, our alumni, has been of enormous help in helping the Department navigate the difficult budget cuts being implemented by the University in these economically challenging times. We are particularly grateful for the generosity of Stewart R. Wallace who left a bequest to the Department for student support that exceeds $1 million. This has allowed us to establish the Stewart R. Wallace Fellowship for graduate students and the Steward R. Wallace Scholarship for undergraduates. We send our deepest thanks to all of you for your continued support.

In closing, let me wish you a wonderful holiday season, and I look forward to hearing from you!

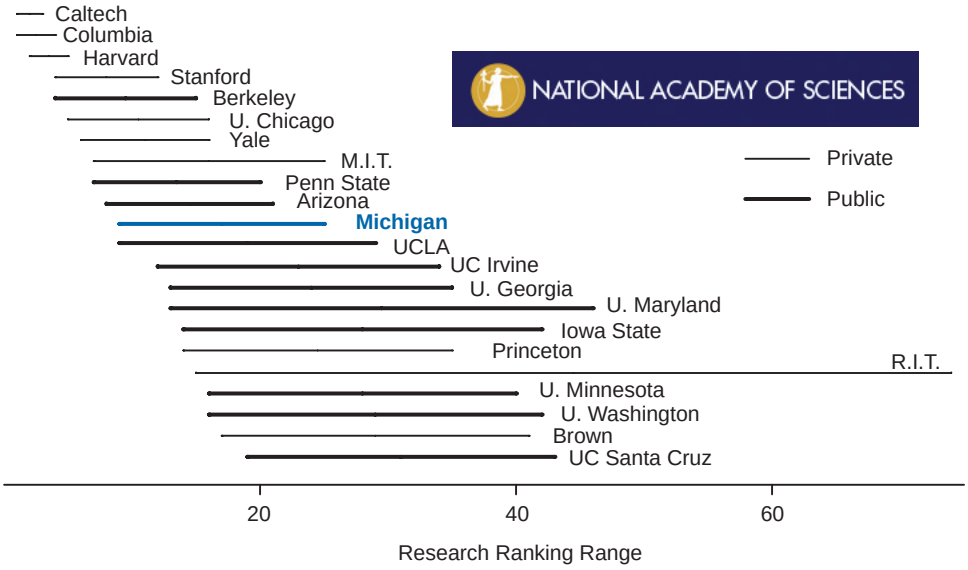
Becky Lange

DEPARTMENT RANKINGS

Both U. S. News & World Report and the National Academy of Sciences released rankings this year of graduate schools and doctoral research programs nationwide. In the U. S. News & World Report rankings, the Department was ranked 9th nationally in the Earth Sciences category, and received national rankings in several specialities, including **5th in paleontology**, **4th in geochemistry**, and **1st in geology**, one of only three specialities across campus to receive the top ranking.

The National Reserach Council of the National Academy of Sciences also released their rankings of graduate programs nationwide. The last time that the NRC ranked graduate programs was in 1995. The rankings are based on data collected from departments in 2006. Unlike previous NRC reports, departmental rankings in the most recent report were defined by a range of possible values, considering factors such as funding, publications, student outcomes, citations, and awards. Based on the range of results provided by the NRC, there are ten other programs ranked above our Department, so that one interpretation of the data presented below is that Michigan is ranked 11th in Earth Sciences/Geology. This represents a substantial increase from our 18th ranking in the last evaluation performed by the NRC in 1995. For comparison, only three public universities have a higher ranking than U-M (Berkeley, Penn State, and U. of Arizona).

These rankings have only just been released as this issue of Geoscience News heads to the printer, and we will certainly endeavor to better understand, and explain, these rankings in future issues, along with plans and strategies to continue to improve our national and international standing.



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Cover Photographs:

Boris Avdeev (PhD. Cand.) *crosses a glacier on route to collecting a sample transect on Mt. Ushba (in the background) in the Greater Caucasus of Georgia.*

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 Awards 2010

John Dorr Graduate Academic Achievement Awards

Elizabeth Ferris (PhD '09) received the Department's Dorr Graduate Award for her dissertation on *Corrosion of uranium oxide and thermodynamic properties of solid solutions in the zircon group*. Elizabeth was co-advised by Udo Becker and Rod Ewing, and is currently an adjunct professor at Pace University in New York.

Adam Rountrey (PhD '09), received the Dorr Graduate Award for his dissertation on *Life Histories of Juvenile Woolly Mammoths from Siberia: Stable Isotope and Elemental Analyses of Tooth Dentin.* Adam was advised by Dan Fisher and is currently a postdoctoral fellow at the University of Michigan.

Jen Cotton (PhD Cand.) will receive the 2010 Sedimentary Geology Division Student Research Grant Award from the Geological Society of America for submitting the most highly ranked student research proposal in the field of sedimentary geology.

Mike D'Emic (PhD Cand.) was awarded a research grant from the Charles A. & June R. P. Ross Research Fund of the Geological Society of America.

Ethan Hyland (Grad. Student) received the Raymond Moore Award from Society of Economic Paleontologists and Geologists for submitting the top ranked student research proposal in paleontology.

Tim Gallagher (incoming student) was awarded a Fulbright Fellowship to study in Sweden.

Lydia Staisch (Grad. Student) was awarded a National Science Foundation Graduate Fellowship for her proposed studies on the tectonic evolution of the northern Tibetan Plateau.

Lindsay Shuller (PhD Cand.) was awarded a first place prize of in the category of Fuel Separations and Waste Forms and was invited to present her paper at the ANS Winter Meeting. The award also included a travel stipend to the meeting and a plaque.

Outstanding Graduate Student Instructor Award

Rackham Outstanding Student Instructor Award

Rackham Predoctoral Fellowship

Alison Duvall (PhD cand.) was recognized by the Department and the Rackham Graduate School for her contributions to undergraduate education as a Graduate Student Instructor. Over the past three years, Alison has served as an graduate student instructor of GS440 at Camp Davis, as well as on campus, teaching Physics and Chemistry of the Earth.

In addition to receiving recognition for her teaching efforts, Alison was awarded a Rackham Predoctoral Fellowship to complete the final year of her dissertation research on the tectonic and geomorphic evolution of the northeastern margin of the Tibetan Plateau. Highlights and photos of some of this research can be found in the Fall 2008 issue of Geoscience News.

Departmental Undergraduate Awards
2010

The Department recognizes the excellence of its undergraduates with four awards each year. The Academic Excellence award recognizes achievements in the classroom through the course of an undergraduate's 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. The Eugene and Elizabeth Singer Award for Academic Excellence in Geology is awarded annually to a student of junior standing who has demonstrated the highest level of acadmic achievement in their class.

Eleanor Ferguson (BS '10)
Academic Excellence Award

Patrick Hastings, Jr. (BS '10)
Alumni Undergraduate Award

Luke Pettinga
Camp Davis Field Geologist Award

Alistair Hayden (BS '11)
Eugene and Elizabeth Singer Junior Achievement Award

Geoclub and SGE Awards

Geoclub continued its tradition of providing awards to outstanding students to help defray the costs of textbooks and field equipment. Nine recipients this year received awards from Geoclub.

Book Awards
Colleen Long (BS '10)
Ellie Ferguson (BS '10)
Marcus Re (BS '11)
Bob Schnittman (BS '10)
Sul Gi Ye Park (BS '12)
Sreya Vempatti (BS '12)

Field Gear Awards
Bailey Keeler (BS '11)
Claire He (BS '13)
Caitlin Rushlow (BS '10)

The Department's honor society, SGE, selected **Patrick Hastings, Jr. (BS '10)** as recipient of the SGE Iota Chapter W. A. Tarr Award.

Stewart R. Wallace Bequest for Student Fellowships

Stewart Raynor Wallace (MS '48, PhD '53), who passed away last year (see the Fall 2009 issue of Geoscience News), left a bequest of $1,046,250 to the Department to establish graduate and undergraduate student fellowships. Wallace was the former chief geologist for the Climax Molybdenum Company and a graduate of Dartmouth as well as the University of Michigan. Wallace was a Distinguished Member of the Society of Mining Engineers and served as president of the Society of Economic Geologists from 1992 to 1993. In 2001 he was inducted into the National Mining Hall of Fame, which describes his work as having a great impact on the molybdenum mining industry, while guiding and inspiring a whole generation of exploration geologists. The bequest will fully support one graduate student each year, as well as a variety of undergraduate scholarships.

Eric Essene Awarded Penrose Model

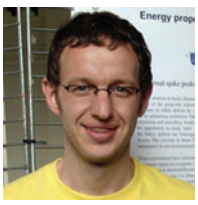
Eric Essene was awarded the 2010 Penrose Medal, the highest honor bestowed by the Geological Society of America, shortly before his death earlier this year. Eric's wife, **Joyce Budai**, will accept the Penrose Medal on his behalf at the Annual Meeting of the Geological Society of America in October and **John W. Valley (MS '77, PhD '80)** of the University of Wisconsin will give the Penrose Gold Medal Lecture in his honor.

John Bowman (PhD '78) noted in support of the nomination that "Essene's contributions have improved significantly our understanding of the geologic processes involved in the formation and evolution of the continental crust." Bruce Yardley, former head of the Department of Earth Sciences at Leeds, wrote that "Eric Essene has been one of the most influential scientists in metamorphic petrology and mineralogy in the latter part of the 20th century, both through his own work and through that of his students." Eric's role in mentoring students was not overlooked, either: " Eric… broadens their horizons, makes them think independently, and encourages them to tackle interdisciplinary problems," John Valley said.

Honors and Awards

Joel Blum (Professor), the John D. MacArthur Professor of Geological Sciences, was one of five UM faculty named an Arthur F. Thurnau professor for his outstanding contributions to undergraduate education. As department chair and director of the university's field station in Jackson, WY, Joel expanded the course offerings at Camp Davis to reflect a wider range of disciplines, developed new interdisciplinary courses, and designed group projects in which students proposed models for making the camp a self-sustaining energy system. Joel's generous mentoring of students also has had a profound impact on attracting, inspiring and retaining underrepresented populations in the sciences.

In addition to being named a Thurnau professor, Joel was elected as a 2010 Geochemical Fellow by the Geochemical Society and the European Association of Geochemistry.



Maik Lang (Asst. Res. Scientist) has been selected to receive this year's Alvin Van Valkenburg Award. The award recognizes a young scientist who has made seminal contributions to high pressure science. Maik has been at UM three years, during which time he has worked on radiation effects as part of the Ewing group's Basic Energy Science team as well as having researched the behavior of materials under extreme environments.

Rod Ewing (Professor) was elected a Foreign Fellow of the Royal Society of Canada.

Peter van Keken (Professor) was elected to the American Association for the Advancement of Science (AAAS). In addition, Peter will be traveling around the country this year as a MARGINS/GeoPRISMS Distinguished Lecturer.

Youxue Zhang (Professor) has been named the James R. O'Neil Collegiate Professor of Geological Sciences. This is one of the highest honors the College and the University can bestow upon a member of the faculty. Youxue is widely recognized for his work on kinetics and diffusion applied to a wide variety of processes within the earth sciences, and his book, "Geochemical Kinetics " has received rave reviews from the geological community.

Henry Pollack's (Professor Emeritus) second book, "A World Without Ice", has made the short list for the Royal Society Prize for Science Books.

Selena Smith (Asst. Res. Scientist) has been elected a member of the Michigan Society of Fellows.

Susan Bilek (Turner Post-doc '01-'03) was elected to the Incorporated Research Institutions for Seismology (IRIS) Board of Directors.

The Geological Society of America has a distinctly maize and blue hue to it this year. Recently elected GSA officers include President **Joaquin Ruiz (MS '80, PhD '83)**, Vice President **John Geissman (BS '73, MS '76, PhD '80)** and Councilor **Bruce Clark (Professor '68-'77)**.

George H. Davis (PhD '71) received the 2010 Career Contribution Award from the Structural Geology and Tectonics Division of the Geological Society of America.

James P. Evans (BS '81), **Joseph G. Meert (PhD '93)**, **David W. Mogk (BS '75)** and **Jaime Urrutia-Fucugauchi (Post-doc '82-'83)** were elected as Fellows of the Geological Society of America.

Transitions

Becky Lange (Professor) has been named to Chair the department, beginning in September, 2010. Joining Becky will be new Associate Chairs **Ben van der Pluijm (Professor)**, for Undergraduate Studies, and **Chris Poulsen (Assoc. Professor)**, for Graduate Studies.

Youxue Zhang (Professor) will serve as the new Director of the Central Campus EMAL facility.

Samuel Mukasa (Professor) will retire from U-M this winter. He will assume the position of the Dean of the College of Engineering and Physical Sciences at the University of New Hampshire in January 2011. In addition, **Steve Kesler (Professor)** , **Bob Owen (Professor)** and **Lynn Walter (Professor)** all enter their furlough year in 2010-2011 and will retire from full time teaching throughout 2011 and 2012.

Jim Hinchcliff (Staff) retired after nearly 30 years of rock and thin section preparation. **Brenda Paulsen (Key Administrator)** has moved on to an adminitrative position at the Duke University Medical School.

Paul Koch (MS '85, PhD '89) is the new Chair of the Alumni Advisory Board. **John Geissman** has stepped down as Chair after 7 years of service.

Outreach

Geological Sciences kicks off first High School Geoscience Camp. 22 high school students and four high school teachers participated in a pilot Summer Geoscience Camp, a collaborative effort between the Department of Geological Sciences and the IDEA Institute (ideainstitute.umich.edu). **Lauren Miller (MS '10)** coordinated the camp, undergraduates **Colleen Long (BS '10)** and **Josh Soble (BS '10)** served as instructors, and **Allison Yee** and **Elizabeth Bunin (BS '11)** were assistants. Students spent two weeks on campus in Ann Arbor and participated in a range of laboratory and classroom activities as well as field trips to sites around southeastern Michigan.

The goal was to expose students - especially those from traditionally underrepresented groups – to the depths of geologic time, the theme of global change, and the excitement and practical relevance of geoscience in the modern world. The camp also gave high school students a taste of college life – living in dorms, interacting with faculty, and exploring Ann Arbor in the evenings. Efforts are now underway to build on this pilot program and sustain a robust Summer Geoscience Camp that will draw excellent high school students to our department for years to come.

The 2010 Geoscience Camp was funded by British Petroleum, Shell Oil Company, the UM Center for Educational Outreach, and the UM IDEA Institute.

Students of the first IDEA Institute Summer Geoscience Camp pose for a picture after a fluvial systems flow rate activity on the Huron River.

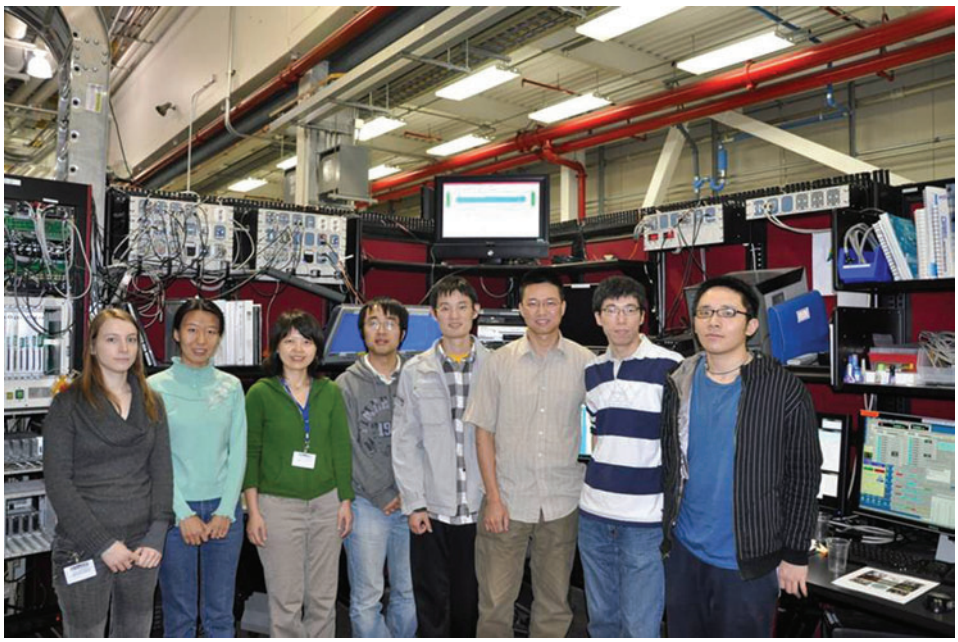
Faculty News

Jackie Li has installed a new multi-anvil apparatus with computerized control at CC Little 1003. It is capable of generating high pressures, up to 27 GPa, equivalent to a depth of ~ 700 km below the Earth's surface. The maximum temperature is about 3000 K, sufficient to melt refractory metals such as gold and platinum. The multi-anvil apparatus is used to synthesize dense phases such as diamond, coesite, stishovite, wadslyite, ringwoodite, and perovskite. It will also be used to study properties and behavior of materials under the P-T conditions of Earth and planetary interiors.

In the past two years, **Rob Van der Voo** has worked with two Honors undergraduate students. Both were engaged in paleomagnetic studies of Permian-Triassic igneous rocks from Europe, and both completed their projects, writing first an Honors thesis, followed by submission of a first-authored manuscript to Geophysical Journal International in the current calendar year. **Ada Dominguez (BS '10)** worked on dikes from the Permian Oslo Graben Norway, and **Ken Yuan (BS '09)** worked on dikes he helped collect in Ukraine in collaboration with local geoscientists and with Dr. **Mikhail Bazhenov** (U of M Visiting Scientist, 2002, 2006) from the Geological Institute of the Russian Academy of Sciences (GIRAS) in Moscow. Age dating of the Norwegian and Ukrainian dikes was done by Dr. Bart Hendriks of the Norwegian Geological Survey, in a collaborative effort with the Michigan paleomagnetism group to resolve controversial Pangea reconstructions. Senior graduate student **Matt Domeier** is also involved in this Pangea project, working on Permo-Triassic rocks from Argentina, which he collected in the fall semester of 2007 and 2008 from Mendoza, La Pampa and San Luis Provinces for paleomagnetic and geochronological studies.

Ada Dominguez is continuing in the MS program working on a newly funded project to study secular variation characteristics of the Paleozoic geomagnetic field, whereas Ken Yuan is studying the paleomagnetic record of earliest Permian sedimentary rocks of the Dunkard Formation in West Virginia, southeastern Ohio, and southwestern Pennsylvania.

Rob is on sabbatical this year, working in a charming 19th century building of the Norwegian Academy of Sciences and Letters in Oslo, as member of a team of a dozen or so scientists who are all working on aspects of geodynamics, linking surface plate motion observations and hot spots to processes in the deeper mantle. He is happily trading in his activities of the past year as associate chair for curricular and undergraduate matters, to now devoting nearly 100% of his time to research and interactions with like minded others.



Investigating core formation at the Sector 13 of the Advanced Photon Source, Argonne National Laboratory, April 2010. Dr. Elodie Tronche (VU University Amsterdam, The Netherlands), Lili Gao (U. of Illinois and Argonne National Laboratory), ***Prof. Jie (Jackie) Li (U. Michigan)****,* ***Zeyu Li (U. Michigan)****,* ***Xinyang Chen (U. Michigan)****, Dr. Bin Chen (Caltech), Dr. Zhicheng Jing (Argonne National Laboratory),* **Jiachao Liu (U. Michigan)**.

Dan Fisher's lab group continues to be awash in proboscideans, but with a greater representation of mammoths and elephants, joining the mastodons usually found there. March saw the opening of the Field Museum's exhibition (in Chicago) entitled "Mammoths and Mastodons: Titans of the Ice Age," for which Dan served as guest curator. By the close of the Chicago "run" of the exhibition, on Labor Day, over 325,000 visitors had seen it, and it is now moving to its second installation (out of ten, total), at Liberty Science Center just outside New York City. Meanwhile, Dan and **Adam Rountrey** continued work with Thure Cerling and Kevin Uno of the University of Utah, showing that modern elephants have a faithful record of diet and local climate in their tusks. In addition, **Katy Smith** completed her dissertation on tusk

form and sexual dimorphism in mastodons and elephants. By the time she defended, she had already been hired to a faculty position at Georgia Southern University, where she is now well into her first semester. Back on the home front, just before the start of final exams last April, Dan received permission to excavate at a Michigan mammoth site on a golf course near Saranac, west of Lansing. The site initially seemed like it might be wrapped up in a week or two but stretched out to consume three months … much more time than Dan has ever spent on a golf course before! The scientific importance of the site is that it shows a pattern of bone processing – clearly human-induced – that had been recognized before, but principally from older sites, where many workers were reluctant to infer human association. Museum of Paleontology staff member Scott Beld carried an especially heavy load in this excavation, but Adam and other geoscientists (graduate students **Mike Cherney**, **Emile Moacdieh** and **Katy Smith** and undergrad **Ethan Shirley**) pitched in as well, along with a number of anthropology graduate and undergraduate students. Finally, Dan returned to Siberia to investigate a new site in northern Yakutia, where the permafrost is yielding new treasures that he may be able to describe later, and then to France, where he and Adam participated in an autopsy on the newest baby mammoth, Khroma, before greeting colleagues assembled for the Vth International Conference on Mammoths and their Relatives. Southern France is hard to beat for a conference venue, but they are gradually adjusting to being back in Ann Arbor.

After a 3 year period in the Provost's Office, **Ben van der Pluijm** returned to the teaching faculty ranks this Fall. Mostly this means a return to the classroom, since the continuation of his research program was well-

Helicopter shot of the most frontal thrust near Hinton, Canadian Cordillera, showing spectacular footwall folding and a thin fault gouge layer under the folded carbonate cliff. Getting a sample was tricky, as you can imagine. (B. van der Pluijm)

supported by the university during these years. **Charlie Verdel (Post-doc)** and research scientist **Anja Schleicher** anchored a research team that has been focusing on fault rocks in a range of settings, from the US Cordillera to the Appalachians, from the San Andreas fault to the Nankai seismogenic zone. Graduate students **Sam Haines** and **Jim Hnat** completed PhDs on Cordilleran normal faults and Southern Appalachian foreland thrusts, respectively, during this period, and new graduate student **Tim O'Brien** has started his dissertation research on Northern Appalachian faults and foreland diagenesis. Ben will remain involved in a range of university activities, both at U-M and as a consultant-evaluator nationally, while increasingly directing his interests toward the lower-level undergraduate experience. His appointment left little time for geology fieldwork, but he recently returned to the Canadian Rockies to sample fault rocks at major thrusts in the Jasper area. Aided by helicopter, access to key locations was a lot easier than past hikes that would easily take a day for one sample, or were impossible to reach.

Phil Meyers reports that **Yuehan Lu (PhD '08)** started in the Fall of 2010 as an Assistant Professor in the Department of Geological Sciences at the University of Alabama, Tuscaloosa, after completing a two-year position as a Mellon Postdoctoral Fellow jointly at the College of William and Mary and the Virginia Institute of Marine Sciences. While she was in Virginia, Yuehan studied the consequences of increased land-use activities on organic matter production in Chesapeake Bay and the rivers flowing into it. She adapted the application of many of the biomarker molecule and stable isotope proxies that she had used in her dissertation research in Lake Erie to these new settings, and she added new, more site-specific proxies to her organic geochemical toolbox. She also created and taught a new upper-level course "Assessing Environmental Quality". In Alabama, she will develop new research

directions in paleoenvironemental organic geochemistry and paleoclimatology using the molecular and isotopic indicators of organic matter origins and alterations that she has learned. She will also have important teaching responsibilities at both the undergraduate and graduate levels.

Because Phil no longer has formal teaching and committee responsibilities, he has much more time for research. He continues many of the organic geochemical studies of marine and freshwater sediments that he and his students have always pursued, and he has expanded his horizons to include more parts of the world and of geologic time. Along the way, he has been able to indulge his long-standing interest in seeing interesting parts of the world. He started in 2005 to investigate histories of the Holocene evolution of the Asian monsoon system as recorded by peat sequences in China. This line of research now includes collaborations with scientists in Xi'an, Wuhan, and Nanjing, and it has expanded into new collaborations with investigators in Taiwan and Japan. Phil crosses the Pacific at least once a year to visit the field areas and to talk with local investigators. At about the same, he started to collaborate with a group in the environmental geochemistry group at Universidade Federal Fluminense in Niteroi, Brazil. This interaction has developed into a formal agreement to be a scientific advisor for a Petrobras-funded study of the organic matter production and sedimentation associated with the Cabo Frio upwelling system, which is just east of Rio de Janeiro. Phil now visits Brazil 2-3 times a year. In deeper time, he is presently working with **Tom Algeo (PhD '89)** to describe and interpret some of the icehouse-greenhouse impacts on the marine nitrogen cycle as recorded in black shale sequences and associated rocks throughout the Phanerozoic. Phil loves his life as an Emeritus Professor!

Becky Lange now has three graduate students working in her research group, after **Stephen Crabtree** defended his PhD thesis in April 2010. His thesis was focused on hydrous arc magmas in the Mexican arc; he is currently teaching part-time at Jackson Community College, while a post-doc in Becky's group studying the kinetics of degassing-induced crystallization in arc magmas. Fourth-year graduate student **Mary Catherine O'Leary** is working on the thermodynamic properties of carbonate liquids (heat capacity, density, compressibility), with the goal of incorporating carbonates into the thermodynamic models of mantle melting. Fourth-year graduate student **Xuan Guo** is making the first quantitative measurements of the density and compressibility of FeO component in magmatic liquids under reducing conditions, in a collaborative effort with colleagues at Caltech and U. New Mexico to study melt density at high pressure. Third-year graduate **Laura Waters** is working on the origin of rhyolites, and is helping to expand the experimental data set for the plagioclase-liquid hygrometer. In addition, **Sarah North**, who just finished her undergraduate degree at UM, is continuing to work with Becky on a microprobe study to calibrate the spinel-olivine oxybarometer in mafic magmas. Becky is also working with her colleague in the department, **Prof. Eric Hetland**, on modeling the thermal evolution of the lower arc crust at subduction zones. Research scientist **Yuhui Ai** continues to work with Becky's group part-time on their acoustic interferometer to measure melt compressibility.

Dave Lund has worked with four undergraduate students in the past two years, including **Rachel Sortor, Rachel Franzblau**, **Rachel Seltz**, and **Steven Davey**. In the lab, they sometimes refer to themselves as Rachel #1, #2, and #3. Attempts were made to refer to Steven as 'Rachel #4', but this wasn't well received. Rachel Sortor is continuing as a MSc student, completing her work on the Southern Ocean's role in glacial-interglacial CO_2 cycles. Rachel will present her results at her first AGU meeting this fall. Both Steven Davey and Rachel Franzblau capably assisted in sampling of deep-sea cores at the Woods Hole repository during summer break. Rachel Franzblau is starting an independent research project to round out her chemistry major. She is analyzing core material from the Caribbean which we hope will illuminate changes in the deep overturning circulation in the Atlantic Ocean. Rachel Seltz's primary interests lie in linguistics and foreign languages, yet she has been very helpful in assisting **Jamie Hoffman**, a second-year Ph.D. candidate in our group. Jamie will present at AGU this fall on her work that constrains the abyssal ocean circulation using a new tracer budget technique. Both Rachel Sortor and Jamie Hoffman are in the process of writing their first manuscripts. It remains to be seen how many revisions they will tolerate from their advisor.

After teaching this past summer at Camp Davis, Dave is focusing on research this fall in the friendly confines of C.C. Little. His main preoccupation is the enigmatic oceanic radiocarbon anomalies that occurred during the last deglaciation. These anomalies may originate from an isolated oceanic reservoir, but little evidence for such a reservoir exists. Alternatively, the carbon anomalies may be linked to a mantle source via hydrothermal activity. Such a finding would be consistent with recent collaborative work between Dave and Paul Asimow at Caltech that suggests changes in sea level may modulate decompression melting beneath mid-ocean ridges.

New Faculty

Brian Arbic

Physical Oceanography
PhD MIT/WHOI Joint Program

My research focuses on the dynamics and energy budget of oceanic motions, including tides, turbulent oceanic eddies, intense boundary currents such as the Gulf Stream, and internal gravity waves. In recent years the energy budget of the ocean has come under increasing scrutiny, in part because the mixing that results from oceanic energy dissipation is thought to exert a strong control on oceanic transports of mass and heat, and hence, on Earth's climate. While most of my research focuses on the present-day ocean, I've done some work on past oceanic conditions, especially paleotides. Numerical models, both idealized and realistic, are the main tools of my research. I occasionally use analytical (pencil-and-paper) mathematical models, and I frequently compare the results of all my models to both in-situ and remotely sensed observations of the ocean. I enjoy both small and large projects; examples of some of my larger collaborations include work with the U.S. Navy ocean forecast modeling team, and planning for a future NASA oceanography mission. I've enjoyed collaborations with scientists in disciplines outside of my own, including marine geophysics and geodynamics. I hope to continue doing some amount of interdisciplinary work in our broad-ranging department.

Sarah Aciego

Glaciochemistry and Isotope Geochemistry
PhD University of California, Berkeley

Although the applications are diverse, my research interests broadly follow a common theme: using isotopes to trace physical processes of the earth. My primary research interests fall into several categories - U–series isotopes as tracers of ice dynamics in polar regions, isotopic tracers of dust and weathering in polar and tropical climates, and stable isotopes of oxygen and hydrogen as pseudo-chronometers in polar regions.

Recent, Ongoing and Future Research Projects:

- Absolute Ice Chronology: U-series isotopic composition of ice and particulates trapped within ice can be used as a dating tool for ice cores including the EPICA Dome C and Dronning Maudland, Taylor Dome and WAIS Antarctic ice cores and the Dye3, Summit and Camp Century Greenland ice cores. Ages are used to reconstruct ice flow and paleoclimate signals. New project initiated in Alaska to look at the timescales of storage and re-charge of permafrost.
- Ice Dynamics and Chronostratigraphy: Constraining the flow models of the glacier systems using stable isotopic tracer analysis (O, H, d-excess).
- Radiogenic isotopic tracers of dust and weathering: application of Sr, Nd and Hf isotopes to tracing material from source (arid regions, permafrost, aquifers) to sink (ice sheets, oceans, rivers).
- U-series isotopes to investigate the relationship between weathering, tectonics and climate; current project in Taiwan.
- Technique development for boron isotope analysis by NTIMS on the new Triton PLUS being installed in the department. Applications to marine and terrestrial carbonate chemistry and PCO_2.

Measuring Coseismic Surface Deformation

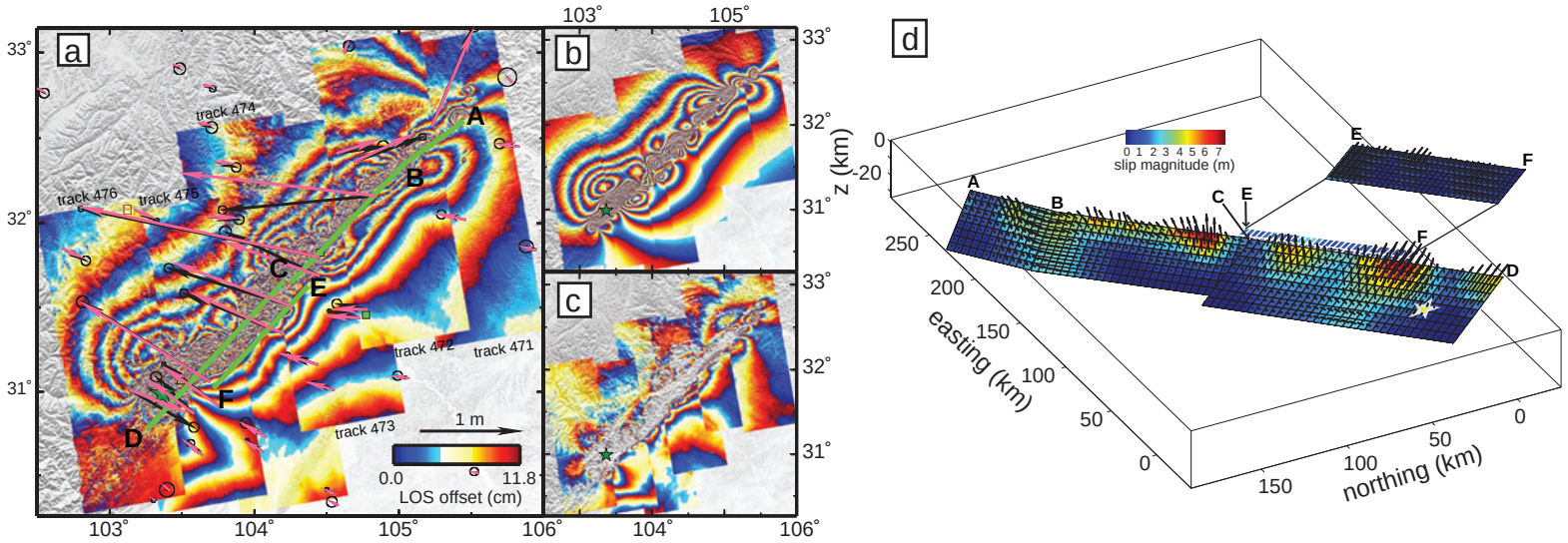
On 12 May 2008 an earthquake struck eastern Sichuan province in China, the M_w7.9 Wenchuan earthquake. The Wenchuan earthquake is remarkable for two reasons, first it is the only natural disaster to make the top ten lists of the costliest disasters and the deadliest disasters since 1980. Official government estimates are that over 69,000 people died in the Wenchuan earthquake, with another 18,000 people missing, although many international groups put the death toll at 84,000 people dead - prior to the devastating Haiti earthquake earlier this year, the Wenchuan was the 5th most deadly natural disaster in the last 20 years. The Wenchuan earthquake also resulted in an economic loss estimated at $85 billion dollars, making it the 3rd costliest natural disaster since 1980, with Hurricane Katrina (2005) topping the list at an estimated $125 billion loss, and the M_w6.7 1992 Northridge, CA, earthquake the 4th costliest disaster at $44 billion loss. Although the death toll in the recent Haiti earthquake is much larger than the Wenchuan earthquake, the estimated monetary loss of the Haiti earthquake is likely less than $14 billion.

The second reason the Wenchuan earthquake is remarkable is its tectonic significance. The earthquake occurred on the Longmenshan thrust fault system on the border between the Tibet plateau and the Sichuan basin, a fault system that was known to be accumulating strain and with documented earthquakes during the Holocene. However, despite that the fault system was active, the region was deemed to be of moderate seismic risk, mainly because the rate at which strain was accumulating was particularly low.

About a year after the Wenchuan earthquake, Gaungcai Feng, a PhD student in surveying engineering at Hong Kong Polytechnic University, came to Michigan in order to work with me on estimating coseismic fault slip during the Wenchuan earthquake. Gaungcai's PhD research is on using satellite-based radar observations to map ionospheric disturbances that began a few days prior to the Wenchaun earthquake, and lasted up to two months after the mainshock. These same radar observations are most commonly used to measure surface deformation in the form of interferometric synthetic aperture radar (InSAR) images. When InSAR is used to measure ground deformation, ionospheric anomalies are considered part of the noise processes, and while Guangcai was documenting the ionospheric disturbances during the Wenchuan earthquake, he also developed a catalogue of InSAR maps of coseismic deformation in which the ionospheric noise was minimized. Guangcai arrived at Michigan in June of 2009 ready to work on the Wenchuan earthquake, and our results were published in the Geophysical Research Letter within six months.

The geodetic data of the coseismic ground deformation during the Wenchuan earthquake was spectacular, with both InSAR observations from the ALOS/PALSAR satellite flown by the Japan Aerospace Exploration Agency, and GPS measurements from Zhang (2008). Guangcai and I found results that were broadly similar to results of other studies of the Wenchuan earthquake (as with almost all significant earthquakes, there are numerous other groups also working on the Wenchuan earthquake, with results continuing to be published). Our results indicate a rather interesting rupture process during the Wenchuan earthquake, with the earthquake fault slip dominated by thrust motion on fault planes in the upper crust dipping about 50° near the epicenter, while the fault slip was dominated by strike slip motion on steeper fault planes to the NE of the epicenter. Earthquake slip models constrained with seismological data indicate that the rupture initiated on a 30° dipping fault deeper in the crust, although the geodetic data is largely insensitive to the smaller offsets at these depths and thus we do not include the relatively little slip during this earliest phase in our model.

While developing an understanding of how the fault slipped during the Wenchuan earthquake is interesting in itself, we are far more interested in the implications of these results to this tectonic region between the Tibetan plateau and the Sichuan basin. Namely, we are now trying to understand why the coseismic slip in the Wenchuan earthquake transitioned from predominantly thrust slip to strike slip, and what the implications are for the large scale tectonics of the region. **Lorena Medina Luna**, a newly arrived graduate student at Michigan, will be working on trying to answer both of these questions over the next few years. Although we have just started this work, we are encouraged that the variations in slip rake and fault dip in the Wenchaun earthquake can be used to place constraints on the regional background stresses. Interestingly, the 2010 M_w 7.0 Haiti



(a) InSAR and GPS horizontal (black vectors; Zhang, 2008) observations of ground deformation during the 2008 Wenchuan earthquake. Also shown are the horizontal surface offsets predicted by the slip model in (d) (pink vectors), the epicenter of the Wenchuan earthquake (green star), and surface traces of the fault segments in the model (green lines. (b) Interferograms predicted by the slip model in (d). (c) Difference between the observed and simulated interferograms; decorrelated regions of the interferograms are masked. d) Coseismic slip model; yellow star is the hypocenter of the Wenchuan earthquake, and vectors show the motion of the head-wall relative to foot-wall. Figure after Feng et al. (2010).

earthquake also appears to involve a large variation of fault slip rake on fault segments with different dips, and we intend to investigate this more recent earthquake using the tools we are developing. Gaungcai and I are working on InSAR derived coseismic deformation from the Haiti earthquake (Guangcai is back in China, although we hope he will come back in a few years as a postdoctoral fellow); however, InSAR only measures deformation on land, and thus the InSAR observations on the western end of the island of Hispaniola are not as extensive as they are for the Wenchuan earthquake. In collaboration with **Profs. Ritsema** and **Ruff** we plan to develop new methods to determine coseismic slip using both geodetic and seismic measurements.

On the non-earthquake side of my research, my group is continuing to make progress on several crustal and lithospheric deformation projects, including the process of stress build-up on active faults, deformation associated with fluid movement in the crust, and longer time scale lithospheric deformation. **Ka Yan (Semechah) Lui (BS '11)** and **Samantha Moore (BS '10)**, two undergrad research assistants who have been working for me for over a year, have made significant contributions to several projects. Semechah is mainly working on mechanical models of lower crustal flow over both seismic cycle and tectonic time scales, quantifying how the apparent strength of the lower crust depends not only on the time scale of the process, but also on the mechanics of the deformation process. Samantha is currently working on the mechanics of crustal deformation during magma migration in the upper crust, but she has also assisted with models of the stress accumulation process on faults. Results from their work will be presented at this Fall's GSA and AGU meetings. **Nora Lewandowski (MS '10)** just finished up a masters thesis with **Marin Clark (Asst. Professor)** and I, on the potential role of shear stresses on the base of the lithosphere. Finally, **Becky Lange (Professor)** and I have recently begun to model the thermal evolution of the crust due to melt migration within the crust. Thermal modelling is a slightly new field for me, but has strong ties to several projects I have been working on for several years. I find that the most fulfilling aspects of the department are access to motivated students (both undergrad and grad), and the great opportunities for interdisciplinary collaboration with other faculty.

Eric Hetland is an Assistant Professor in the Department of Geological Sciences.

STUDENT SPOTLIGHT

'Fingerprinting' mercury in Arctic snow

A study by University of Michigan researchers offers new insight into what happens to mercury deposited onto Arctic snow from the atmosphere. The work also provides a new approach to tracking mercury's movement through Arctic ecosystems. Mercury is a naturally occurring element, but some 2000 tons of it enter the global environment each year from human-generated sources such as coal-burning power plants, incinerators and chlorine-producing plants.

"When released into the atmosphere in its reduced form, mercury is not very reactive. It can float around in the atmosphere as a gas for a year or more, and it's not really an environmental problem at the concentrations at which it occurs," said Joel Blum, the John D. MacArthur Professor of Geological Sciences.

But once mercury is oxidized, through a process that involves sunlight and often the element bromine, it becomes very reactive. Deposited onto land or into water, the mercury is picked up by microorganisms, which convert some of it to methylmercury, a highly toxic form that builds up in fish and the animals that eat them.

As bigger animals eat smaller ones, the methylmercury is concentrated. In wildlife, exposure to methylmercury can interfere with reproduction, growth, development and behavior and may even cause death. Effects on humans include damage to the central nervous system, heart and immune system. The developing brains of young and unborn children are especially vulnerable.

In the Arctic, mercury remains in its benign gaseous form through the dark winter, because there's no sunlight to drive oxidation and little bromine to catalyze the process. But in polar springtime, that all changes. As sea ice breaks up, water vapor rises in great clouds through the openings in the ice, bringing with it bromine from the sea water. The bromine enters the atmosphere, where it conspires with sunlight to convert mercury gas into the reactive form. The activated mercury sticks to snowflakes and ice crystals in the air and travels with them onto the surface of the snow.

This leads to what's known as a mercury depletion event. The normally steady levels of mercury in the atmosphere quickly drop to near zero, as concentrations of mercury on the surface of the snow rise to extremely high levels.

"When we first started observing these events, we didn't know how much of that mercury returned back to the atmosphere, so the high level of mercury in snow was a great concern," Blum said. "But the more we learned, the more we realized that the sunlight shining on the snow typically will cause much of the oxidized mercury to become reduced and return to the atmosphere as a gas. And it turns out that its re-release to the atmosphere has a striking "fingerprint' that we can use to study the progress of this reaction through time."

The fingerprint is the result of a natural phenomenon called isotopic fractionation, in which different isotopes (atoms with different numbers of neutrons) of mercury react to form new compounds at slightly different rates. In one type of isotopic fractionation, mass-dependent fractionation (MDF), the differing rates depend on the masses of the isotopes. In mass-independent fractionation (MIF), the behavior of the isotopes depends not on their absolute masses but on whether their masses are odd or even.

In the work described in the Nature Geoscience paper, the researchers confirmed, through sample collection and experiments, that MIF occurs during the sunlight-driven reactions in snow, resulting in a characteristic MIF fingerprint that is absent in atmospheric mercury.

"This finding allowed us to use the MIF fingerprint to estimate how much mercury was lost from the snowpack and how much remained behind, with the potential to enter Arctic ecosystems," said U-M graduate student Laura Sherman, the paper's first author. "Our experiments showed that a significant portion of mercury deposited to snow was re-emitted. Any mercury that is not re-emitted is likely to retain the unique fingerprint, so we hope future researchers will be able to use our discovery to track mercury through Arctic ecosystems."

Sherman and Blum's coauthors on the paper are former U-M graduate student Kelsey Johnson; Gerald Keeler and James Barres of the U-M Air Quality Laboratory; and Thomas A. Douglas of the Cold Regions Research and Engineering Laboratory in Fort Wainwright, Alaska.

The research was funded by the National Science Foundation and the Office of Naval Research.

***Laura Sherman** is a PhD student pursuing research in the Arctic with **Joel Blum**.*

Uplift of the Andes

Orogenic plateaus are some of the most dramatic features on Earth. Next to Tibet, the Andean Plateau (AP) is the second largest plateau on Earth with an average elevation of ~4 km and a width of up to ~400 km. It has been known for a long time that high extensive plateaus not only influence local-to-far-field lithospheric deformation and global sediment flux, but also play a critical role in the evolution of climate, affecting atmospheric circulation and ocean currents as well as regional precipitation pattern. However, the task of correctly differentiating between tectonically and climatically driven processes and their influence on denudation and topographic evolution is complicated by variations in tectonic rates and long- and short- term climate variability. The main hypothesis I test in my dissertation is that the apparent rapid rise of the Andean Plateau in the late Miocene is an artifact of changes in South American Cenozoic climate and atmospheric circulation.

Quantifying the interaction between tectonic deformation, surface uplift, climate, and surface processes is hampered by our limited understanding of the elevation history of the AP. Despite extensive research, the timing and rates at which current Andean elevations were attained are strongly debated. Recent elevation reconstructions of the AP suggest a rise of ~2.5 km of elevation (>½ the current plateau height) during the late Miocene (~10-6 Ma). Reconstructions of rapid and recent surface uplift of the AP are mainly based on stable isotope paleoaltimetry methods that interpret changes in $\delta^{18}O$ as purely related to altitude. This interpretation is based on the assumption that the past climate was analogous to modern, despite dramatic changes in regional climate that take place when mountains form. The proposed timing is inconsistent with significant geological evidence that proposes AP growth was slow and steady since at least the Eocene (~40 Ma).

I address this issue by conducting climate modeling experiments with limited-domain, general circulation models to (1) evaluate dynamical and physical atmospheric changes associated with variations in Andean heights; (2) elucidate the dominant regional processes that drive $\delta^{18}O$ variability and, in this way, provides constraints for the interpretation of paleoclimate and paleoaltimetry from $\delta^{18}O$ archives; and (3) quantify changes in $\delta^{18}O$ associated with Andean surface uplift and regional climate change. Understanding how climate conditions and stable isotope compositions in meteoric waters change in response to the formation of the Andes allows evaluation of whether regional climate change rather than surface uplift may have caused changes in the stable isotope record. In addition, significant changes in the climate pattern (e.g. strong increase/decrease in precipitation) should have left its imprint in the geological record. If the climate change is related to surface uplift, dating the change could provide constraints on minimum paleoelevations. This study addresses some of the most prominent research challenges in the Andes and lead to a better understand the coupling of climate and landscape evolution through time.

***Nadja Insel** is a PhD student pursuing research in the Andes with **Todd Ehlers** and **Chris Poulsen**. She expects to complete her degree in the fall of 2010.*

American Sauropods

This summer was a great one, full of travel, research, and teaching. I traveled to Argentina right after commencement (and some inspiring words from the President's address), where I spent two months studying the anatomy, taxonomy, and systematics of a group of dinosaurs called titanosaur sauropods. My advisor (Jeff Wilson) and I visited natural history museum collections around Patagonia studying these giant animals in order to understand their relationships to one another and their paleobiology. We had the opportunity to study the largest terrestrial animal ever to have evolved, the 30+ meter long Argentinosaurus, as well as the smallest known sauropod fossils, tiny embryos serendipitously preserved in Late Cretaceous Patagonian sediments. During our summer we made a lot of headway towards our goal: creation of the first comprehensive 'family tree' for this set of dinosaurs.

After my 'field' research in Argentina, I headed out to Camp Davis as a graduate student instructor for the upper-level ecosystems science course. I learned a lot from working with Professors Joel Blum, Don Zak,

Mike D'Emic (PhD. cand.) *prospecting for fossils in the Cloverley Formation of the Big Horn Basin, WY, with field assistant* ***Alistair Hayden (BS '11)****.*

Tom Baumiller, and Brian Kennedy. This was the most diverse course I have taught, with field-based activities ranging from digging soil pits to mapping glacial moraines to analyzing fish gut contents in mountain streams. As always, Camp Davis was a wonderful place to spend a month in.

After driving back to Michigan with the Camp Davis students, I turned right back around and drove to the Bighorn Basin, where I spent three weeks conducting research in my field area. Based in Powell, myself and two undergraduates explored most of the northern basin for fossiliferous sites, which I plan to return to in coming years and fully excavate.

Mike D'Emic *is pursuing his PhD with* ***Jeff Wilson*** *studying sauropods.*

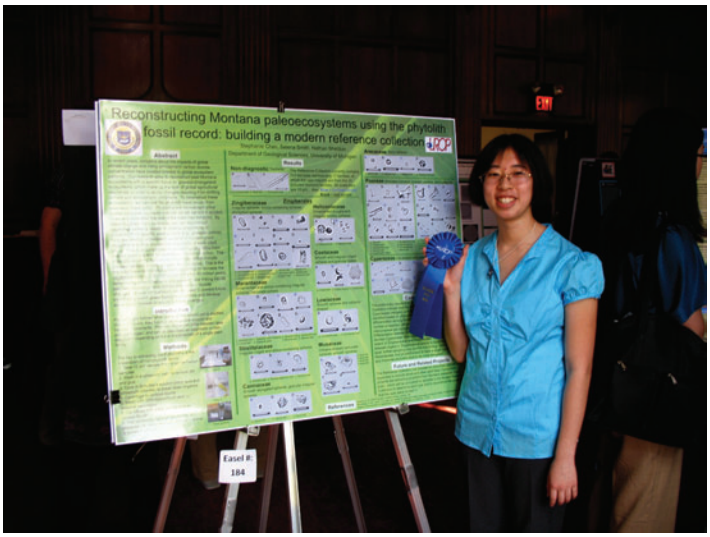
Undergraduates in Action

Stephanie Chen (BS '12)

Reconstructing Montana Paleoecosystems

For me, researching started off as finding a direction for my time at Michigan. I first began working for my sponsors, Nathan Sheldon and Selena Smith, my freshman year through the UROP program. I was charged with creating a reference collection of phytoliths (microscopic silica bodies in plants) from modern plant samples, for use in identifying fossil phytoliths. My research came to define my freshman year experience and sparked my interest in the field of Geology as a whole. But sometimes it's hard to find the link between what you learn in the classroom and what you are actually researching. I had my "hallelujah" moment one day in my "Dinosaurs and Other Failures" class. I was working on my UROP research poster, basically looking at pictures I had taken of my phytolith samples. In the middle of class, I looked up from my laptop to see a giant picture of a grass phytolith, nearly identical to the one I was looking at on my laptop, up on the front screen. The professor was talking about cutting edge research that was challenging well-established notions, such as the time frame when grasses began to evolve. It's a wonderful feeling knowing that your work is actually making a difference in our understanding of the world.

My UROP research project focused on the reconstruction of paleoecosystems through the use of phytoliths and carbon isotopes. My role was to create a reference collection of modern phytoliths and determine what phytolith shapes are characteristic of specific plant types. By knowing what shapes correspond to what plants, we can identify fossil phytoliths from paleosols and thus determine what type of vegetation was present at the time. This year, I am extending my work to look at fossil phytoliths and isotopes from a Miocene-aged field site at Madison Buffalo Jump in Montana.



Stephanie Chen (BS'12) *was awarded the Best Student Presentation award at the Spring UROP Symposium.*

Semechah Lui (BS '11)

Radiation Damage In Minerals

Trace concentrations of uranium and thorium are often found in apatite, zircon, and mica. The alpha-decay and spontaneous fission of ^{238}U, ^{235}U, and ^{232}Th dissipates a certain amount of recoil energy to the crystal structure of the mineral, displacing atoms from their stable lattice position and leaving damage zones. The two types of radiation result in different damage zone dimensions: fission tracks (FT, cylindrical zones of damage) and alpha-recoil tracks (ART, a nearly spherical zone).

While FTs are widely used in geochronology to date rocks and to infer geological processes in Earth's crust, ART-dating is less developed due to nanoscale dimensions of the tracks. ARTs are, however, important for dating younger rocks because they are about two million times more abundant than FTs. Atomic force microscopy (AFM) provides a new approach for ART dating because of its atomic-scale resolution.

In order to study general aspects of track formation and assess the utility of AFM for the routine characterization of radiation damage zones, a set of previously-annealed biotite, muscovite, and phlogopite samples have been irradiated with energetic gold ions at high and low fluences to produce radiation-induced hillocks. We have identified these features on the surfaces of biotite, muscovite, and phlogopite samples. Characterization of high-fluence samples shows a similar hillock diameter for all mica types.

To better understand the internal structure of the radiation damage, we also study the etching behavior of ion tracks. Phlogopite was etched with hydrofluoric acid in timed intervals followed by AFM characterization after each interval. After the first interval, hillocks disappear and are replaced by etch pits with the same areal density as hillocks. By measuring diameter and depth of etch pits for each etching step, we obtained more information such as horizontal etch rate and a vertical (track-) etch velocity. The morphology of the etch pit transitioned from an initial triangular shape to one that becomes circular with continued etching. Etch-pit morphology and etch velocity are both useful information indicating the energetics of track formation and the structure of the mica.

In long run, we hope to master the techniques of nanoscale characterization of naturally formed radioactive damage, so as to open larger opportunities in geological dating, making it possible to understand younger minerals in a more accurate manner.

Current Undergraduate Research Projects

Rachel Sortor (BS '10), Outgassing of oceanic CO_2 during the last deglaciation.
Rachel Franzblau (BS '11), The role of thermohaline circulation in climate variability of the last millennium.
Alistair Hayden (BS '11), 3D modeling of tusk growth in elephants, mammoths, and mastodons.
Samantha Moore (BS '10), Mechanics of crustal deformation during magma migration in the upper crust.

Recent Undergraduate Honors Theses

Alexandra Costakis (BS'10), Studying a volcanic groundwater system: Dissolved noble gases in the Galapagos Islands. (*Castro*)
Ada Dominguez (BS '10), The Permo-Triassic paleolatitude of Baltica and its significance for Pangea models. (*Van der Voo*)
Athena Eyster (BS '10), The use of multi-model ensembles of IPCC 4th Assessment Report climate simulations for projections of Bolivian precipitation and temperature. (*Poulsen*)
Eleanor Ferguson (BS '10), Effects of transient topography and drainage basin evolution on detrital thermochronometer data. (*Ehlers*)
Mary Peterson (BS'09), Elevated water concentrations in olivine-hosted melt inclusions: Insight into the source of high melt volumes in the Iceland hotspot. (*Mukasa*)
Elaina Shope (BS '10), Mercury concentrations in lichen (Hypogymnia physodes) surrounding an oil sands processing site in Alberta, Canada. (*Blum*)
Nattavadee Srisutthiyakorn (BS '10), Slip rate on the low-angle Sevier Desert detachment constrained by geodesy and pluvial shoreline deformation. (*Niemi*)
Kenneth Yuan (BS '10), Paleolatitudes of the Permo-Triassic Ukranian Shield with implications for Pangaea A and B. (*Van der Voo*)
Jessica Zinger (BS '09), Modeling calcium and strontium cycling in northern hardwood forests. (*Blum*)

U-M Undergraduate Abstracts at the 2010 Geological Society of America Meeting

Hetland, E. H. and **Lui, K. Y. S.**, Comparing geologic and geodetic inferences of viscosity: effects of non-linear viscosity and depth sensitivity.
Hastings, P. T., Jr., **Krall, L.**, Shuller, L. C., Zhang, J. M., and Ewing, R. C.Fen complex carbonatites, Telemark, Norway: mineralogy of niobium and thorium bearing minerals.
Lui, K. Y. S., Renock, D., Lang, M., **Johari, M.**, Becker, U., and Ewing, R. C., Artificially-produced heavy ion tracks in mica studied by atomic force microscopy.
Srisutthiyakorn, N., Niemi, N. A., and Hetland, E. H., Holocene to Recent slip rate variations on the Sevier Desert detachment constrained by geodesy and pluvial shoreline deformation.
Rengers, F. K., Tucker, G. E., Phillips, D. A., and **Braswell, J. J.**, Using a natural experiment to understand gully erosion rates and mechanisms.

Teaching Energy and Sustainability in the Field

Field-based courses have had a tremendous infl uence on my education and career by providing invaluable experience in making first-hand observations and grappling with complex scientific problems. As hard as we try as college instructors to make the classroom environment more interactive, there is no substitute for the impressions formed by students when they see the complexities of natural processes unfold in front of them. Field courses also require students to focus on a single topic for weeks at a time, free from the distractions of campus life and our "wired" society, resulting in more engaged learning. And finally, interaction with practitioners in the "real world" provides a perspective that cannot readily be obtained from academicians.

Last summer my colleague Rod Ewing and I taught a field course, and the experience was so rewarding that we thought it was worth sharing with the Elements readership. For many years we have taught courses in geology and ecosystem science at the University of Michigan Camp Davis Rocky Mountain Field Station (UM-RMFS) in Jackson Hole, Wyoming, USA. As we drove past energy-related sites, they piqued student interest, but we never had time to visit them or discuss the science of energy production in detail. In response to student interest, we developed the course Sustainable and Fossil Energy: Options and Consequences, which is devoted entirely to the study of energy systems. The premise is that students cannot fully understand and form opinions about the pros and cons of various energy options until they have seen the fuel cycles for themselves. We base the course curriculum around visits to energy facilities in Wyoming and Idaho, discussions with individuals working at these facilities, and experiments with energy usage and renewable energy systems at our field station.

Last summer we followed fuel cycles from the mining of raw materials all the way to the production of energy. We began with fossil fuels and a tour of one of the largest coal mines in North America, where we learned about coal extraction and postmining land remediation. We witnessed the vast railway system that brings coal from Wyoming to power plants across the country, and a railcar with 100 tons of coal became our standard unit of energy for comparison with other energy sources. This was followed by a visit to a coal-fired power plant, where students learned about the combustion process, turbine design and operation, the water needs of power generation, and the technologies used to control emissions of sulfur dioxide, mercury, and other pollutants. We also traveled through several oil and gas fields and visited an operating oil refinery as well as a former refinery site where we learned about groundwater and soil remediation.

Next we explored the nuclear fuel cycle, beginning with a visit to an in situ–leaching uranium mine. Of particular interest were the vast well-fields and the chemical processing of leachate into uranium oxide or "yellowcake." A uranium mine ghost town provided the perfect setting to discuss the volatile economics of uranium. We visited the Idaho National Laboratory to learn about nuclear reactors and toured the first reactor ever to generate electricity (EBR-1) as well as an operating advanced test reactor. A highlight of this visit was peering into the water pool and observing the "blue glow" of the Cherenkov radiation caused by the spent fuel rods. The students were amazed to be standing less than 25 feet above spent nuclear fuel, and this experience had a profound effect on many of the students' views of nuclear energy.

The second half of the course explored renewable energy resources. We surveyed and installed a micro–hydroelectric generator at the field station and studied the relationships between head, fl ow rate, and power generation. The light powered by this generator was a beacon reminding the class of the renewability of hydroelectric power. Next we visited a major power station on the Snake River, where we learned the intricacies of syncing turbines to the grid and discussed the challenges imposed by dramatic seasonal fl uctuations in river discharge. This was followed by a visit to a small run-of-the-river hydroelectric plant that was recently certified as "low-impact" because it has only minimal impact on the stream ecology. The juxtaposition of these highly contrasting hydroelectric projects

Joel Blum (Professor), Rod Ewing (Professor) *and the summer 2010 Sustainable and Fossil Energy class in front of the wind turbine set up at Camp Davis.*

made the students stop and consider the differences between high- and low-impact installations.

The town of Jackson (Wyoming) provided an ideal setting for sparking a debate among the students over what it really means to be "carbon neutral." Jackson has admirably initiated a plan to make the public works department carbon neutral by purchasing all its power from the low-impact hydroelectric plant that we visited, and the town pays a "green premium" for this energy. The town has also installed gridconnected photovoltaic systems on public buildings and at its wastewater treatment plant, and has constructed energy-efficient buildings. A visit to these facilities and discussions with town officials about the energy-sustainability project was a highlight for many students interested in sustainable systems.

The final alternate-energy visit was to the wind farms that are rapidly being built in eastern Wyoming thanks to recent tax incentives. We visited an operating wind farm and a facility being installed on the former site of an oil refinery. We had the opportunity to peer up into the vertical support of a wind turbine and were all impressed by its immense size. The students were able to form their own opinions about the noise associated with turbines and their impact on the aesthetics of western landscapes. We met with local experts and discussed the ecological and economic impacts of wind power, and the need to balance the variable output of wind generators on the grid.

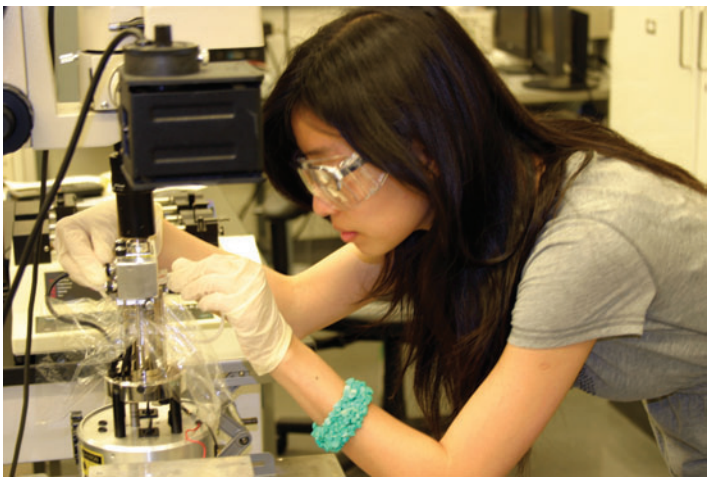
As a culminating exercise, the students researched and reported on an alternate energy plan for UM-RMFS. Students monitored energy usage across the facility through a 24-hour cycle. They collected and analyzed data on energy production from an on-site solar photovoltaic array, a micro–hydroelectric turbine, and weather stations that provided windspeed data. They also surveyed various parts of the property to assess the feasibility of hydroelectric power on two different rivers and to evaluate the potential of pumped storage. Finally, students were challenged to use all that they had seen and learned during the course to develop recommendations for an energy plan for the State of Wyoming. Judging from student reactions to this course, I am confident that it transformed many of their views on energy issues and technology. Classes such as this can be expensive, and we are grateful for support from the Graham Environmental Sustainability Institute and the Provost's Office at the University of Michigan. When financially possible I urge educators to consider using field courses to maximize student–faculty interaction, allow students to interact with experts, and enhance student understanding. Needless to say, this is not the type of experience one can gain in the classroom, nor is it what most educators think of when they discuss the trend toward distance learning!

Joel Blum, Thurnau Professor and Camp Davis Director

Staff Spotlight

Anne Hudon stands out because of her passion for students, for her department, and the University of Michigan. Her passion and skills have made a lasting and positive change on the Department of Geological Sciences. Anne began working in geological sciences in January 2004 and is now the graduate program coordinator and an irreplaceable member of the team. In her role, Anne manages the various elements of the department's graduate program. This includes recruiting graduate students at conferences, managing every aspect of graduate admissions, arranging fellowship offers, Graduate Student Instructor appointments, health insurance, as well as ensuring all requirements are met on time for degree completion. Anne also manages the department's LSA-hosted web page, coordinates course scheduling and course guide material, and organizes company visits.

Anne's passion emerges from her love of the university, her compassion for the students, faculty, and staff of geological sciences, and the enjoyment she receives from the variety of responsibilities involved her role. The most fulfilling element of the job for Anne is the opportunity to watch the students grow and develop though the program and be successful in their field.



Joanna Hu (PhD. cand.) *operating the Atomic Force Microscope (Nano III) to analyze the phase transformation of* $CaCO_3$ *precipitating on organic templates (self-assembled monolayers) at the Lawrence Berkeley National Laboratory. Joanna spent the summer working on the* CO_2 *sequestration project in Jim De Yoreo's group, and presented the results at the Gordon Conference in New Lodon, NH. At U-M, Joanna is pursuing her dissertation research with* **Udo Becker** *and* **Rod Ewing**.

Soft Rock Trip 2010

The 2010 Soft Rock Trip, "The Geological Evolution of the Southwestern United States", headed out for a sixteen day excursion of spectacular geology. **Kacey Lohmann** and **Nathan Niemi** led this year's trip with a total of 34 people, including undergraduate and graduate students as well as a postdoctoral fellow. The trip began in Las Vegas where the group rented vans and headed northeast into Utah to examine the structural and sedimentological evolution of the Colorado Plateau region. Traveling towards the east, numerous stops included the classic Hurricane bounding fault zone and the spectacular siliciclastic stratigraphic sequences of Zion National Park, Bryce Canyon National Park, and Capital Reef National Park. To keep Lohmann excited, the group also measured a section through the Carmel Formation representing a regressive coastal sequence replete with oolitic limestones and evaporates. Unseasonably cold weather pushed the group along faster than they had originally planned, so they headed south to New Mexico where they explored the Wingate and Gallup Sandstones. In a combined cultural and geologic excursion to Chaco Canyon Cultural Site, they examined the shoreface environments of the Mesaverde Formation during a long day hike.

Kacey Lohmann *discussing aeolian deposition of the Navajo Formation at Zion National Park.*

Nathan Niemi *discussing emplacement of ignimbrites at an outcrop of the Bishop Tuff in Owens River gorge.*

Walking along the Pacific Coast during a stop to study the Coast Range ophiolite.

After two breakfasts of heuvos rancheros and one dinner at Virgie's in Gallup, NM, students got their fill of excellent Mexican cuisine in preparation for the return to Arizona to visit the Petrified Forest and Grand Canyon National parks. From the South Rim, the whole group descended into the Grand Canyon on a long, 14 mile hike, to examine the entire stratigraphic section down to the Precambrian-Cambrian unconformity with excellent exposures of the transgressive shoreface facies in the Tapeats Sandstone. Ostensibly to "take up the rear" and ensure the safe return of all the students, Lohmann even made it up the trail, though not in record time.

From the Grand Canyon, the group looped back to Las Vegas to pick up Nathan Niemi. After a chilly evening in the Spring Mountains, just below the fresh snow line, the group headed to the northwest, traversing the treacherous yet spectacular road through Titus Canyon onto the floor of Death Valley, and then into the remote and beautiful Panamint Valley.

The group continued further west, to the Owens Valley, and camped in the shadow of the Sierra Nevada, and Mt. Whitney, the highest peak in the continental United States. After two days studying the active tectonics of the region, as well as recent and active volcanic activity in the Long Valley caldera, late season snow thwarted the planned trip over Sonora Pass, and instead everyone headed south to cross the southern Sierra Nevada, and studying across-arc variations in igneous petrology.

The group headed back north to the central Sierra Nevada and Sequoia and Kings Canyon National Parks. The students were able to see some of the largest trees in the world before exploring a limestone cave in a metamorphic pendant.

From the Sierra Nevada, the group traveled west to the Pacific Coast near San Luis Obispo to see the Coast Range ophiolite. Incredible exposures of deformed cherts, turbidites, and oceanic crust were explored in along the beach, below spectacular marine terraces uplifted by active tectonism along the North America-Pacific plate boundary.

The students gratefully thank **Shell Oil Company** for providing funding that made this trip possible. Additional support was provided by the Field Excursion Endowment established by an anonymous donor.

Photos by Peter Knoop.

Examining a fossil log at Petrified Forest National Park.

On top of an uplifted marine terrace along the central California coast.

In Memoriam

Eric J. Essene (Professor Emeritus) died of kidney cancer May 20 in Ann Arbor. He was 71. Essene, known to his friends and students simply as Eric, was born in Berkeley, Calif., on April 26, 1939. He received his bachelor of science in geology from the Massachusetts Institute of Technology in 1961 and his doctorate from the University of California, Berkeley, in 1967. He was a National Science Foundation post-doctoral fellow at Cambridge University in 1967-68 and a research fellow at Australian National University, Canberra from 1968-70. He joined U-M as an assistant professor in 1970.

Although Essene was primarily a metamorphic petrologist, he pioneered interdisciplinary research, with interests spanning the fields of mineralogy, geochemistry and general petrology. The basic theme of his research was the application of chemical thermodynamics to the understanding of the Earth's crust and mantle. "Eric made insightful and seminal contributions to understanding the pressure-temperature conditions at which ancient mountain belts formed and constraints on the speed with which rocks are transported to the surface," according to Samuel Mukasa, who is the Eric J. Essene Collegiate Professor and Chair of Geological Sciences. "A number of his peers consider Eric to be the most influential petrologist of his generation."

"His research contributed to the development and critical evaluation of thermodynamic methods — geothermobarometers — used to measure temperatures and pressures in ancient mountain belts, and other thermodynamic methods — geospeedometers — used to place constraints on the speed with which rocks are exhumed from great depths by tectonic processes," Mukasa says. This research led him to fieldwork on four continents. In particular, over a period of 40 years, Essene and his students made seminal contributions to the history of the 1 billion-year-old Grenville Mountain Belt, which is represented today by deeply eroded crystalline rocks from its former root zone that are exposed in the Adirondack Mountains, N.Y., and extending northeast to Labrador.

In terms of total literature citations of his research, Essene numbers among the top 100 geoscientists in the world. Essene received numerous awards and honors, including the Bowen Medal in 1991 by the American Geophysical Union; the first Sokol Award in 1993 for excellence in graduate education of the sciences from U-M; the William C. Kelly Collegiate Professorship of Geological Sciences in 1997; and the Penrose Medal, the top prize awarded by the Geological Society of America to individuals who significantly advance the study of geosciences, in 2010. He was elected a fellow of the Mineralogical Society of America in 1981, and a fellow of the American Geophysical Union in 1991.

Essene contributed numerous articles, essays and book chapters on a variety of subjects and in countless numbers of scientific publications. Another of Essene's enduring legacies is his direction and co-direction of more than 100 master's and doctoral students, many of whom have gone on to stellar careers in the geosciences and are themselves training the next generation of geoscientists.
Eric is survived by his wife, Joyce Budai, and sons Adam Essene and Zachary Essene, all of Ann Arbor; his sister, Karen of Honolulu, Hawaii; former wife, Gail Jones of Sanibel Island, Fla., and daughters Ren Essene of Washington, D.C., and Missoula, Mont., and Dr. Michelle Essene Haroldson of Excelsior, Minn.; and two grandchildren.

Donald Earl Hillier (BS '59) passed away on April 20, 2009 of leukemia. He was born in Dertoit in 1936. He worked for the U. S. Geological Survey for his entire career and retired in 1992. After starting his career with Geologic Division, he transferred to Water Resources Division as a hydrologist. Over the years he became an expert in writing, reviewing, and editing all aspects of scientific reports, from first draft through printing.

Don travelled frequently, teaching scientists how to review and write reports, as well as doing hydrologic fieldwork in Louisiana, South Dakota, and other places in the United States. He received the U. S. Department of the Interior awards for Meritorious Service and Distinguished Service.

After retirement in Denver, Don moved to Ellensburg, WA, and then to Seattle, to be close to his daughters. He was an active volunteer with food banks and his church after retirement and enjoyed stamp collecting, gardening, bird watching, and playing casino games.
Surviving Don are his wife of 50 years **Barbara Mills Hillier (BS '59)**, two daughters and two granddaughters.

Fred Mauk (MS '72, PhD '77) passed away on October 8, 2010 at UT Southwest Medical Center. Fred was a seismologist and assistant professor at the University of Michigan from 1977-1980, during which time he spearheaded the effort for an Ohio and Michigan regional seismic network.

Ricardo D. Presnell (MS '83), 51, died in a snow avalanche while skiing in the backcountry near Solitude, Utah, on Wednesday, January 27, 2010. He was born October 17, 1958, to Dr. Walter and Clarice Presnell in Boston, Massachusetts, and is survived by his twin brother, Craig Presnell, and wife, Caroline Kroko. Ricardo graduated from Hotchkiss Prep School in 1976, earned a B.A. degree in geology from Middlebury College in 1981, and worked briefly for Sohio Petroleum in Denver. He continued his education at the University of Michigan, where he earned a master's degree in structural geology in 1983, which provided him a solid foundation to spend the next three years as a structural geologist with Sohio in the Overthrust Belt of the western United States. In 1986, he joined Kennecott Exploration as an exploration geologist responsible for drilling out the Barneys Canyon gold deposit near the world-class Bingham porphyry Cu-Mo-Au deposit. Kennecott funded his doctoral work on the deposit (Geology of the Barneys Canyon Gold Deposit, Ph.D., 1992) at the University of Utah. Following his Ph.D., Ricardo continued working for Kennecott and its parent company Rio Tinto. From 1992 to 1994, he explored for porphyry copper deposits in the southwestern United States and northern Mexico, and for gold in Central America. From 1996 to 1998 he was responsible for regional exploration for gold and copper in Alaska and the Yukon, and from 1999 to 2006 he was principal geologist for Kennecott's New Opportunities Group, with a focus on copper and uranium. From 2006 to 2008 he was principal geologist for Rio Tinto's project generation group, responsible for world-wide area selection of copper deposits. In 2009, Ricardo joined Full Metal Minerals and Underworld Resources as chief geologist. With Underworld, he was part of the team that discovered the million-ounce Golden Saddle deposit in the Yukon, which led to a takeover of Underworld by Kinross at a price of about $140 million. Ricardo was an active member of the Society of Economic Geologists and a regular visitor to Michigan, especially during early stages of exploration at Kennecott's Eagle deposit in the Upper Peninsula, and lectured in economic geology classes on several occasions. In addition to his professional accomplishments, Ricardo was an outdoor enthusiast, music lover and general social catalyst for a continuously widening circle of friends in Salt Lake and around the world. Contributions from many of them, along with information on a scholarship fund set up in his memory can be found at http://arizonageology.blogspot.com/2010/01/ricardo-presnell.html.

Anne Fenton Wyman (MS '49) passed away on June 23, 2009, in Boulder City, Nevada. She was the first woman to graduate in geology from Case Western Reserve University (CWRU) in 1947. At CRWU, Anne met her future husband **Richard Wyman (MS '49)**. After graduating from CWRU, she attended the University of Michigan, Ann Arbor. Richard and Anne married in 1947, and attended field camp together in Wyoming (summer of 1948).

The Wymans left Ann Arbor the following year and traveled to Peru where Dick worked as a geologist at the Cerro de Pasco mine. Anne taught classes for English speaking children. Anne and Dick eventually moved to Boulder City, Nevada, and Dick was employed at the Nevada Test Site. Anne searched for a teaching position and met Herb Wells at "Nevada Southern", a new, fledgling "university" in Las Vegas, soon to become UNLV.

Anne's first assignment at UNLV was to create an undergraduate geology curriculum at the bachelor's level. Using the course offerings of the best geology departments in the United States, Anne created a comparable curriculum. UNLV is in an ideal location for geology field work, and research in the surrounding environment became the main thrust of the B.S. program. Anne authored and presented two programs, (B.S. and B.A.) to the University Curriculum Committee of the Regents, and they were approved. The B.S. degree celebrated its first graduate in 1970, and this program continues to thrive. Anne excelled in teaching and was the first recipient of the Spanos Award as the outstanding teacher at UNLV in 1980. Anne served six years in the UNLV Faculty Senate and two years as the Chair of the Geoscience Department.

In addition to teaching, Anne also inaugurated and built the mineralogy collection, an extensive collection of mineral specimens used by students and faculty and established the Anne Fenton Wyman Scholarship, for students who excel in the study of mineralogy.

Anne retired in 1994, after 28 years in the Geosciences Department. During her tenure, the Geoscience faculty grew from one (herself) to twelve, with the addition of a Master of Science program and twelve graduate assistants.

Dorothy Eschman, wife of former faculty member **Don Eschman**, passed away on September 27th at the age of 87. Additional information will be provided in a future issue of Geoscience News.

In Memoriam

Pearl E. Graves (Camp Davis Nurse) died on Friday, August 6, 2010, at the age of 81. She was born in New Jersey on August 20, 1928. Pearl graduated from Duke University Nursing School in 1955. Following graduation she moved to Ann Arbor and began her career as a registered nurse at the University of Michigan Hospital and the University of Michigan Student Health Services. She retired from the University in 1991 after 36 years of service. After her retirement, Pearl for many years enjoyed working at the University of Michigan's Camp Davis, a geological camp in Jackson, Wyoming. Throughout her life Pearl was an avid fan of many sports and teams, but none more than her beloved Wolverines. Pearl was a season ticket holder of multiple University of Michigan teams and attended football, basketball, gymnastics and baseball games to name a few. She was active in and a board member of the Pittsfield Senior Center. Both with her senior group and throughout her life Pearl enjoyed traveling and taking trips eventually visiting all seven continents.

Paul LeRoy Cloke (Professor), 81, passed away July 11, 2010, in Prescott, Ariz. He was born Feb. 6, 1929, in Orono, Maine, to Paul and Ruth (Gaines) Cloke. Paul attended Orono High School and later Harvard and MIT. During his early career, he worked for the United States Geological Survey and the Anaconda Mining Company in Butte, Montana. While in Butte, he married the love of his life, Edith, in 1955. He joined the Department of Geological Sciences at the University of Michigan in 1957, where he taught and carried on research in geochemistry and mineral deposits. While at the university, Paul worked in honors advising, earning an award for his service in 1978. In 1985, he took early retirement and went to work for Battelle Memorial Institute in Columbus, Ohio. He also worked for SAIC in Las Vegas, until retirement. After retirement, he did consulting work for Science Applications International Corporation (SAIC) at the Yucca Mountain nuclear waste site. Paul published numerous papers over his career and worked with scientists in other countries, translating scientific papers into English and into other languages.

Paul was active well into his 70's and enjoyed many outdoor activities, including skiing, bicycling and hiking. He was a member of the Ann Arbor Ballet, the Ann Arbor Orchestra and the Prescott Orchestra. He played violin on many other occasions and learned to play the organ late in life. Paul was predeceased by his parents; brother, Donald Cloke; and infant daughter, Carol Cloke. He is survived by his wife, Edith Cloke; daughter, Nancy (B.J.) Thelen; son, Steven Cloke; three grandchildren, Benjamin Thelen, Katherine Thelen and Mimi Cloke; and several cousins, nieces and nephews.

Alumni News

After getting her BS in Geology at the University of Michigan, **Tracy Kolb (BS '03)** moved to Sarasota, Florida and worked at Mote Marine Laboratory, where she dabbled in all things aquatic. She especially liked working with fish, so she followed up her internship with an MS in Fisheries and Wildlife at Michigan State University.

She currently lives and works in Charlevoix, Michigan as a fisheries biologist for the state of Michigan, coordinating a statewide program that collects information on sport-fishery harvest and effort in all the Great Lakes. When not working, she splits her time between the beach, her canoe, and her garden. She is currently refining her recipe for the perfect sweet tea.

After getting his degree at U-M, **Doug Boyer (BS '02)** worked as a fossil preparator in the University of Michigan Museum of Paleontology until the beginning of 2003. He attended graduate school from 2003-09 at Stony Brook University's Department of Anatomical Sciences on Long Island. Having served as a postdoctoral associate at Stony Brook for the past year, he is now moving to Brooklyn, with his fiancée Ashley Gosselin-Ildari. Doug will start as assistant professor in Anthropology at Brooklyn College of the City University of New York. Ashley will continue to work on her PhD thesis through the Stony Brook University Anthropology program.

Doug continues to run but has no plans to ascend Cream Puff Mountain near Camp Davis, Wyoming at more than a brisk hiking pace.

Since leaving Ann Arbor, **Emily Johnson (BS '03)** obtained her PhD at the University of Oregon where she studied volatiles in basaltic arc magmas. It was at Oregon that she met her husband, a geologist and native of Wyoming, Reed Burgette. In 2009 she and Reed got married with the Tetons in the background and several University of Michigan geology friends in attendance. Emily now lives in Hobart, Tasmania where she is a Research Fellow at the University of Tasmania. She and Reed spend their spare time traveling, enjoying rocks, playing ultimate Frisbee, searching for Tasmanian Devils and bouncing marsupials, and talking on Skype to their friends and family.

Mark Nabong is currently living in Chicago with his fiancée, Kristianne Kostler. In the general up-and-down-hill spiral that has been Mark's life since leaving the geology department, he has worked as a cab driver, junk mail salesman, refugee and asylee advocate, and finally a domestic violence attorney (he is against it, for the record). He still misses evolutionary biology and paleontology incredibly and apologizes for all the outstanding IOUs he left behind in Ann Arbor.

Laura Holladay (BS '01) is still in Ann Arbor! I may not frequent the halls of CC Little anymore, but you can usually find me in downtown Ann Arbor, where I now work as the Education Director for the Ecology Center and Energy Works Michigan. I'm having a blast teaching Michigan youth about environmental issues, and I love keeping in touch with many of the fantastic friends that I made over the years in the Dept of Geological Sciences and at Camp Davis -- you know who you are, and I love you all dearly!

Devapriya Chattopadhyay (PhD '09) returned back to India, where he joined a research and teaching institute close to Kolkata. The department has 11 faculty members, and he is enjoying the change in scenery.

Peter Kaplan briefly post-docced at UC Davis, then attempted to start over in Chicago. However, Michigan got the best of him and he did four more years of hard time in Ann Arbor: music publishing, political organizing, ESL training, corporate analytics, teaching, and hot (HOT) yoga.

Just last year he finally got the chance to try Chicago again, and grabbed it. He now resides there (Logan Square) with his bearded dragon Toast, perfecting his masala chai recipe and hosting visitors whenever possible.

Bart W. Tichelaar (PhD '91) recently moved from Houston, Texas, to Cairo, Egypt. Bart works in a large exploration project in the Mediterranean where he is leading a team of geoscientists responsible for making prognoses of pore pressure and formation strength for HPHT (high pressure high temperature) well design.

He learned to speak the well engineering language and, to quote the well engineering manager in Sheel Egypt: 'Bart is the only geologist who can make operational decisions". This is a great compliment for a geophysicist!

After getting her Masters, **Kate Griffin-Young (MS '02)** taught geology to high school kids in Zermatt, Switzerland before settling in Colorado where she volunteered at the Denver Museum of Nature and Science developing a fossil database before finally getting a "real" job as a water rights consulting engineer. Kate provided expert reports in a number of water rights cases and testified in court as the lead expert witness in a landmark water rights case that is currently on appeal to the Colorado Supreme Court. She now works as the lead geothermal energy analyst at the National Renewable Energy Laboratory in Golden, Colorado.

Kate met her husband Randy Young while playing ice hockey, and they married on a beach in Mexico a few years back. She just gave birth to very premature, but otherwise healthy twin boys, Connor and Liam, in February.

Forest Gahn (PhD '03) attended the University of Michigan as a PhD student under the direction of Tom Baumiller. In 2003, while Tom was on sabbatical in Poland, he was offered a temporary position at Brigham Young University–Idaho. Near the end of the eight-month appointment in Idaho, he was offered a full-time position at BYUI. However, he was simultaneously offered a two-year post-doctoral fellowship at the Smithsonian. He decided to forego the permanent position for the post-doc, but ended up being able to "have my cake and eat it too": BYUI decided to grant him the position anyway with two-years unpaid leave. Basically, he received a post-doc and a job at the same time, but without a PhD. Before beginning the post-doc, he finished his PhD (from Washington, D.C.) in early 2004. In 2006 he returned to the BYU-Idaho Department of Geology. Currently he teaches 36 credit hours per semester for three consecutive 14-week semesters. It's a very heavy teaching load, but he really enjoys teaching. He also dedicates as much time as possible to his research. In fact, he continues to work with Tom. During January of 2010 they traveled to Palau together to work on crinoid predator-prey interactions.

Melroy Borges (MS '01) left the bracing Michigan weather for sunny Miami, where he dodged Katrina, Wilma and spring breakers. He reconnected with the Deccan Trap lavas that he literally grew up on, and made them the subject of his PhD thesis at Florida International University.

After a brief post-doc stint, he began working for Corning Incorporated in Corning, New York, where he studies man-made glass rather than volcanic glass, man-made ceramics rather than igneous rocks, and has to think of the bottom line rather than the geologic time line. He runs the SEM lab at the Defect Understanding group where, armed with a microscope, SEM and phase diagrams, he attempts to understand defects.

He wishes there was more to do in Corning with one's free time. But he does manage to bike, kayak and visit the wonderful waterfalls, rivers and lakes in the Finger Lakes region. Work and trips to Ithaca, Syracuse, and New York City keep him busy, but sometimes at night, when the moon is on high, he can still hear the rocks calling….

Recent Bachelors Degree Candidates

	Concentration Majors
Emanuel Alvarez	*Oceanography BS*
John Braswell	*Earth Sciences BA*
Alexandra Costakis	*Environmental Geosciences BS*
Christine Doman	*Environmental Geosciences BS*
Ada Dominguez	*Geological Sciences BS & Oceanography BS*
Athena Eyster	*Earth Sciences BS*
Jonathan Farrugia	*Environmental Geosciences BS*
Eleanor Ferguson	*Earth System Science*
Julia Giddy	*Earth Sciences BS*
Patrick Hastings Jr	*Geological Sciences BS*
Adena Kass	*Oceanography BS*
Omar Khan	*Earth Sciences BS*
Jordan Kirshner	*Geological Sciences BS*
Colleen Long	*Geological Sciences BS*
Erin Lower	*Environmental Geosciences BS*
Megan McPherson	*Earth Sciences BS*
Brian Mulvihill	*Geological Sciences BS*
Lorraine Negron	*Earth Sciences BS*
Madeline O'Campo	*Earth Sciences BS*
Sean O'Donnell	*Geological Sciences BS*
Joseph Rhoades	*Environmental Geosciences BS*
Caitlin Rushlow	*Geological Sciences BS*
Robert Schnittman	*Earth Sciences BS*
Elaina Shope	*Environmental Geosciences BS*
Joshua Soble	*Geological Sciences BS*
Rachel Sortor	*Environmental Geosciences BS*
Nattavadee Srisutthiyakorn	*Geological Sciences BS*
Jonathon Syrek	*Geological Sciences BS*
Michael Thomas	*Earth Sciences BS*
Robin Weber	*Earth Sciences BS*
Cameron Webley	*Earth Sciences BS*
Ian Winkelstern	*Geological Sciences BS*
Christian Youngs	*Earth Sciences BS*
Kenneth Yuan	*Earth Sciences BS*

Concentration Minors

Elyse Boelens	*Minor -Earth Sciences Gener BA*
Eric Chow	*Minor -Paleontology BS*
Sarah Cook	*Minor -Earth Sciences Gener BA*
Dylan Imre	*Minor -Earth Sciences Gener BA*
Greta Jankoviak	*Minor -Earth Sciences Gener BS*
Sean Lewandoski	*Minor -Earth Sciences Gener BS*
Amber Morykwas	*Minor -Oceanography BS*
Sarah Peterson	*Minor -Environment Geology BS*
Bradley Sisson	*Minor -Environment Geology BS*
Bhavya Sridhar	*Minor -Environment Geology BS*
Devon Vaughn	*Minor -Earth Sc Gen BSE ESS*

Recent Masters Dissertations

Jennifer Cotton	High Resolution Isotopic Record of C4 Photosynthesis of a Miocene Grassland
Karen Gutierrez	Paleoenvironmental Reconstruction of Jurassic Dinosaur Habitats of the Vega Formation, Asturias, Spain
Nora Lewandowski	Basal Tractions and the Implications for Plate Motion and Orogen Growth
Lauren Miller	Using Phytoliths to Create a High-Resolution Deep Time Record of Ecological Change: A Case Study from the Eocene of Montana
Stephanie Olen	Limits to Reconstructing Paleotopography from Thermochronometer Data
Hannah Smith	Starting Plumes in a Compressible Mantle

Recent Doctoral Dissertations

Stephen Crabtree	The Effect of Degassing of H_2O on Crystallization and Oxidation in Subduction-Zone Magmas: Implications for the Origin of Andesite in Continental Arcs
Takehito Ikejiri	The Role of Neurocentral Junctions for Growth of Crocodilian Vertebrae
Maria Marcano	Interpretative Challenges and Opportunities in Oxygen and Strontium Isotope Compositions of Bivalve Shells
John Naliboff	Dependence of the Stress Field on Plate-Mantle Coupling and Lithospheric Structure
William Newsome	Experimental Investigation of Mass Transport and Stirring in Isolated Thermal Plumes
Devon Renock	Redox Processes in Sulfide Minerals
Lindsay Shuller	Atomistic modeling of the solid-state chemistry of actinide materials
Kathlyn Smith	Life Histories of Female American Mastodons (Mammut Americanum): Evidence from Tusk Morphology, Stable Isotope Records, and Growth Increments
Christopher Smith	Isotopic Geochemistry of Mercury in Active and Fossil Hydrothermal Systems
Christopher Stefano	Volatiles, Major Oxide, Trace Element and Isotope Geochemistry in the Snake River Plain and Columbia River Flood Basalts: Implications for the Evolution of a Continental Hotspot
John Whitlock	Paleoecology and Systematics of Diplodocoid Sauropods

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Corporate Connections

*BP Field Camp Scholar **John Mclain Pray** on the regional field trip as part of GS 440, Field Geology, taught at Camp Davis.*

Students studying Cambrian carbonates in Death Valley National Park during the Shell Oil Company-sponsored soft rock trip in May 2010.

2010 Industry Internships

Alison Duvall (PhD. cand.)	British Petroleum
Laura Waters (PhD. cand.)	British Petroleum
Jing Zhou (PhD. cand.)	Shell
Qiaona Hu (PhD. cand.)	Molecular Foundry
Yang Zhang (PhD. cand.)	MicroSeismic

Alumni have been coming and going throughout the department during the past year, and it's always great to see what exciting things our graduates are up to.

Franek Hasiuk (PhD '08; ExxonMobil) was back in the Stable Isotope Lab, running samples related to his continuing research on carbonate diagenesis.

J. P. Brandenburg (MS '05, PhD '08) gave a lecture on reservoir research at Shell to faculty and graduate students.

Andrea Cicero (MS '00) and **Tina Nielsen (MS '03)** conducted on-campus interviews for BP, and were able to join the Alumni Advisory Board for a football tailgate and an after game barbeque at **Kacey Lohmann's** house.

Steve Ownby (PhD '07) and **Katie Keller (PhD '06)** represented Shell during campus interviews this fall and presented a talk to the students on job oppotunities in the petroleum industry.

In addition, the Alumni Advisory Board met in Ann Arbor over the last week in September. The Department's AAB continues to be unique on campus for its breadth of industry representation. Returning to Ann Arbor for the meeting were **Aboud Afifi (PhD '90; *Saudi Aramco*), Matthew Cabell (BS '80; *Seneca Resources*), Larry Davis (MS '79; *MAP*), Steve Henry (BS '73, MS '78, PhD '81; *Innovative Exploration Services*), Bob Klein (MS '93, PhD '96; *Samson*), Eva Moldovanyi (MS '82; *ConocoPhillips*), Cary Mrozowski (BS '73, MS '75; *Chevron Global Upstream*), Chris Palenik (MS '01, PhD '04; *Microtrace*), Grigore Simon (PhD '98; *Newmont Mining*), and Bill Zempolich (MS '85; *Eni Petroleum*).**

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Back Cover: A massive colony of Jurassic sea lilies, attached to a fossil log, on display at the Urwelt-Museum Hauff. The slab is 60' long by 20' high, and took 18 years to prepare. These sea lilies led a "pseudoplanktonic" existence by attaching to driftwood. Wood-eating behavior of shipworms in modern seas has likely eliminated this unique niche of the geologic past. (*A. Janevski*)

Chair: Rebecca A. Lange

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

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