University of Michigan

Geoscience News

For Alumni and Friends of the Department of Geological Sciences

Fall 2007

Chair's Corner

Dear Alumni and Friends,

With my appointment as Department Chair to replace **Rod Ewing** effective July 1, 2007, another changing of the guard has taken place in the Department. We owe Rod a debt of gratitude for his many accomplishments as Chair. During the last months, Rod has familiarized me with the most pressing matters so that solutions may be identified without delay. Not surprisingly, these matters focus on personnel issues, Camp Davis programs and infrastructure, laboratory space, aging equipment, budget and alumni affairs. It is a great privilege to write to you with updates about our activities of the past year and to look ahead toward the challenges we face in the coming years.

First, I am delighted to announce that three new colleagues will join us in 2008, which is quite a coup in a year when faculty hiring was highly restricted. **Nathan Sheldon**, presently on the faculty at Royal Holloway University of London and whose research focuses on terrestrial climate records, will begin his appointment on January 1, 2008. **David Lund**, an oceanographer/paleoclimatologist now a postdoctoral research fellow at Caltech, and **Greg Dick,** a geomicrobiology postdoctoral research fellow at Berkeley, will both begin their appointments in the Department on August 1, 2008. Space renovation projects are already underway to accommodate the research needs of these new colleagues.

Regrettably, we are saying farewell to four colleagues. **Carolina Lithgow-Bertelloni** and **Lars Stixrude** have accepted positions at University College London. **Dave Rea** and **Phil Meyers** retired this past spring following distinguished careers at Michigan. With Carolina's impending departure and **Steve Kesler's** desire to refocus on research, **Becky Lange** and **Todd Ehlers** have assumed the responsibilities of Associate Chair for Graduate Studies and Associate Chair for Curriculum, respectively. Please join me in thanking the outgoing associate chairs for their selfless and dedicated years of service, and the new associate chairs for accepting the challenge to help students, lead in the implementation of our academic programs, and guide our current deliberations on curricular reform.

U-M continues to feel the effects of the recent state budget crisis. Dramatic shrinkage in the state economy has left public institutions with dwindling resources – ours being no exception – and resulted in budget cuts distributed across the University. Private philanthropy has become even more important to our university during these difficult times. Thanks to your generosity, the impact of the current budget crisis on students has been substantially modulated, allowing us not only to sustain our critical programs, but expand in areas of new demands and opportunities. This would not be possible without your continuing and generous contributions.

Those of you who have visited Camp Davis in recent years recognize that the facility badly needs renovation. Some of the buildings no longer even meet code for electricity or waste water. With strained resources for infrastructure, the College of LS&A has been able to provide only a modest amount toward this renovation as seed money, with the hope that we will work with our alumni support base to raise the funds needed to complete this project. Camp Davis rejuvenation will be one of the Department's central fund-raising efforts for the next several years.

Furthermore, to sustain a vigorous and esteemed graduate program, we also need to expand endowment for graduate student fellowships. U-M President **Mary Sue Coleman** gave a passionate speech recently, pointing out how difficult it has been over the years to create sustainable funding for graduate student fellowships in departments across the University. In response, she has set aside $20 million as the President's Donors Challenge (see article on page 3) in which for every dollar contributed for graduate student fellowships between now and December 31, 2008, there will be a match of fifty percent. This matching applies to contributions at every level of giving (up to 2 million dollars for individual gifts) and provides a powerful opportunity to expand our endowments for graduate education.

In closing, the Department and I are extremely grateful for your continued generous support of our efforts to provide a high-quality academic experience for both graduate and undergraduate students. Opportunities we have afforded students in the form of fellowships, research funding, and field trips, both domestically and abroad, were all sponsored by your gifts (see stories about these trips on pages ahead). These would not have been possible without your support, which I wish to acknowledge with words of thanks.

Sincerely,

Samuel B. Mukasa

Samuel B. Mukasa

The Michigan Difference
The President's Donor Challenge: Phase II

In September 2007, University of Michigan President Mary Sue Coleman announced the President's Donor Challenge: Phase II. This fundraising effort follows on the success of the original President's Donor Challenge, which targeted fundraising for undergraduate scholarships. The new initiative aims to achieve the same success in establishing endowments to permanently fund fellowships for graduate and professional students. The University has committed $20 million in funds to this effort that will match any gifts earmarked for this challenge at a rate of one dollar for each two dollars given, up to a maximum gift of $2 million. Gifts exceeding $50,000 will establish a named endowment. The President's Donor Challenge: Phase II will continue until December 31, 2008, or until all $20 million have been matched. Gifts can be pledged to a college, school, or department, and any gifts pledged to this challenge and received over the next 5 years will qualify for a University match.

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

The President's Donor Challenge: Phase II offers an unparalled opportunity to increase the funding available within the department for graduate fellowhips. Please consider helping us attract the next generation of excellent graduate student researchers, instructors, and colleagues by contributing to this challenge.

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

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

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Middle Teton, Teton Range, Grand Teton National Park, Wyoming, from upper Garnet Canyon. (N. Niemi)

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Overlapping mud flows erupted form a mud volcano, Salyon region, Azerbaijan. (N. Niemi)

Middle:
Students examining a welded ash flow outside of Shoshone, California, on the 2007 Spring Soft Rock trip See page 15 for more on this trip. (G. A. Janevski)

Upper Right:
The water falls 12 meters over Goðafoss on the river Skjálfandafljót in north-central Iceland. See page 11 for more about the 2007 International Field Trip to Iceland. (S. Mukasa)

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Honors and Awards

Departmental Graduate and Undergraduate Awards 2007

John Dorr Graduate Academic Achievement Award

Rackham Distinguished Dissertation Award

Martin Reich (PhD '06) received the Department's Dorr Graduate Award as well as the Rackham Distinguished Dissertation Award in recognition of his outstanding contributions to the field of geochemical processes at the nanometer and atomic scales. Martin is currently an Assistant Professor in the Department of Geology at the University of Chile, Santiago.

Outstanding Graduate Student Instructor Award

Rackham Outstanding Graduate Student Instructor Award

Each year the department recognizes excellence in graduate student instruction, which has a direct impact on the quality of undergraduate education. The 2007 recipient of the Outstanding GSI Award is **Dave Whipp (PhD Candidate)**, who was also recognized by the Rackham School of Graduate Studies for his contributions to teaching.

Undergraduate Achievement Awards

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

Academic Excellence Award

Jessica Malone (BS '07)

Camp Davis Field Geologist Award

Karen Kimm (BS '06)

Alumni Undergraduate Award

Sara Worsham (BS '08)

Honor Society Returns

After an extended absence, the Iota Chapter of Sigma Gamma Epsilon, the National Earth Sciences Honor Society, has been re-established at the University of Michigan. SGE is a student-run organization that recognizes scholarship and professionalism in the Earth Sciences. The revived chapter of SGE at U-M has 10 active members, all of whom maintain at least a 3.0 GPA in their geological sciences courses. This year, the members of SGE are serving the department by offering free tutoring sessions to any undergraduate student taking Geological Science courses. Members of SGE also participated in Museum Day, where the public can bring rocks or minerals that they have found to the Museum of Paleontology for expert identification by faculty and students.

New Undergraduate Award

The Department of Geological Sciences is pleased to announce the establishment of the **Eugene and Elizabeth Singer Award for Academic Excellence in Geology**. This award will be given annually to a junior undergraduate in the Department of Geological Sciences who has demonstrated the highest level of academic achievement in the class. The award will be funded through an endowment started by **Gene Singer (BS '51).**

Eugene and Elizabeth Singer

A Gold Medal Year in Geological Sciences

Rod Ewing Awarded the Lomonosov Gold Medal

The Lomonosov Gold Medal, named after Russian scientist and polymath Mikhail Lomonosov, is the highest award of the Russian Academy of Sciences. Each year, a Russian and a non-Russian receive the award for outstanding achievements in the natural sciences and humanities.

The Lomonosov Gold Medal for 2006 was awarded to Professor Nikolay Laverov, Vice-President of the Russian Academy of Sciences, and **Professor Rod Ewing**. Both have played a significant role in fundamental research in support of the nuclear fuel cycle and nuclear waste management. Professor Ewing's research has focused on developing an understanding of radiation effects in solids and the discovery of radiation-resistant materials that can be used to safely dispose of actinides, such as plutonium. Professor Ewing is the Donald R. Peacor Collegiate Professor in the Department of Geological Sciences and also is a Professor in the Departments of Materials Science & Engineering and Nuclear Engineering & Radiological Sciences.

More than twenty of the previous recipients are Nobel laureates. Previous recipients include Hans Bethe, John Kenneth Galbraith, James Watson, Linus Pauling and Aleksandr Solzhenitsyn. The most recent award to a non-Russian in the geosciences was to Frank Press, the former president of the National Academy of Sciences, in 1997.

The Lomonosov Gold Medal was presented to Professor Ewing on March 27th in Moscow at the annual meeting of the Russian Academy of Sciences.

Rod Ewing receives a book for his collection at the 2006 Lomonosov award ceremony in Moscow.

Henry Pollack

The **2007 Nobel Peace Prize** was awarded jointly to the United Nations' Intergovernmental Panel on Climate Change (IPCC) and former Vice President Al Gore. The IPCC reports were cited by the Nobel Foundation for twenty years of publications that "created an ever-broader informed consensus about the connection between human activities and global warming." Eight U-M researchers contributed to the IPCC reports, including **Henry Pollack (Professor Emeritus, PhD '63),** who participated as an author on the 2007 IPCC report on paleoclimatology, and who's work on reconstructing paleoclimate conditions from heat flow in boreholes has led to a significant extension of continental paleoclimate records.

Henry also works with Al Gore through Gore's "Climate Project", an effort to spread the climate-change message related to Gore's Oscar-award winning "An Inconvenient Truth" through trained volunteers. Henry also works tirelessly for the University, lecturing to alumnni around the country on climate change, and leading field trips to Antarctica.

Steve Kesler at the 2007 Dorr dinner.

Steve Kesler (Professor) has been awarded the 2007 **R. A. F. Penrose Gold Medal** of the Society of Economic Geologists. The medal is highest honor bestowed by the society, and is given in recogntion of "unusally original work in the Earth Sciences", including in research, teaching, and the development of mineral resources. Steve is an internationally recognized expert on the geology, geochemistry and origin of economic mineral deposits. Steve has served as both vice-president and president of the SEG. The list of past recipients of the Penrose Gold Medal includes **Heinrich Holland**, **Brian Skinner,** and **Willam Kelly (Professor Emeritus)**.

Samuel Mukasa (Professor), Lars Stixrude (Professor), and **Ben van der Pluijm (Professor)** were elected as Fellows of the American Association for the Advancement of Science.

Chris Poulsen (Assoc. Professor) was elected as a Fellow of the Geological Society of America.

Sam Mukasa (Professor) has become the first elected Vice President of the Geochemical Society. He will prepare from this position to assume the presidency in 2009.

Udo Becker (Assoc. Professor), T**odd Ehlers (Assoc. Professor)**, and **Chris Poulsen (Assoc. Professor)** received promotions to tenure this year.

Jason Barnes (PhD Candidate) received the prestigious Rackham Predoctoral Fellowship.

David Whipp (PhD Candidate) won the American Geophysical Union Outstanding Student Paper Award in Tectonophysics at the Fall 2006 meeting. His presentation was titled: *Influence of groundwater flow on thrmochrononmeter ages and exhumation rates: Insights from the Nepalese Himalaya*.

Nadja Insel (PhD Candidate) received the Rackham International Student Fellowship.

Scott Tinker (MS '85), Director of the Bureau of Economic Geology at the University of Texas at Austin, State Geologist of Texas, and Edwin Allday Endowed Chair in Subsurface Geology in the Department of Geological Sciences, Jackson School of Geosciences, University of Texas at Austin, has been elected as the newest president of the American Association of Petroleum Geologists for 2008–2009. Scott received his MS from Michigan for work on the lithostratigraphy and biostratigraphy of the Aptian Lapena Formation under the direction of James Lee Wilson. After a successful career in the oil patch, Scott was hired to the prestigious postion of Director the Bureau of Economic Geology in Austin. Despite his extensive commitments elsewhere, Scott continues to contribute to the Department as a current member of our Alumni Advisory Board.

Rod Ewing (Professor) has been elected as a Fellow of the American Geophysical Union, an honor bestowed on just 0.1% of the AGU membership. Rod joins eight other Michigan faculty in receiving this honor.

John J. Amoruso (MS '57) became the first recipient of the Michel T. Halbouty Outstanding Leadership Award, an honor bestowed by the American Association of Petroleum Geologists to recognize exemplary service and leadership in the Association.

Leadership is the best word that describes John Amoruso's personal and professional life – from his years as a student, as a US Navy officer, and then as a professional petroleum geologist. He has served at every level of leadership throughout his career. John has been president of the American Geological Institute, the American Association of Petroleum Geologists, the Huston Geological Society, and many more. In addition to the professional societies, his roles at the national level have been equally impressive, serving on National Academy of Sciences committees, and on the Board of Earth Sciences and Resources of the National Research Council. John's accomplishments derive from his willingness to volunteer, to pitch in, and to get things done. The Department continues to benefit from his endless energy and his skilled leadership. John was one of the founding members of the Department's Alumni Advisory Board that first met in 1982. This Board provides critical advice to the Department on issues such as curricular reform, corporate-academic initiatives, fundraising strategies, and perspectives on areas for future faculty growth.

John, thank you for your continuing dedication to Michigan, to geology, and to your profession. The Department and its alumni are proud to have you as a colleague and a friend.

Fisher's Lab Welcomes a New Baby!

Geological Sciences PhD Candidate Adam Rountrey has been celebrating the arrival of two babies recently. He and his wife Melanie recently welcomed their son, River Parks Rountrey – all 7 pounds, 9 ounces of him – into their family, but earlier this summer, Adam and his advisor, Dan Fisher, welcomed another baby into the scientific community, a 50-kg baby mammoth! No, Dan's and Adam's colleagues who work with ancient DNA haven't yet managed to clone one of these extinct relatives of modern elephants – not even close. This baby's arrival was by far more prosaic means, but in a way, no less remarkable. She was delivered from the melting permafrost of northwestern Siberia by the normal, seasonal cycle of surface melting and solifluction, and she then had the good fortune to be discovered by someone who cared more about her potential scientific value than about the rubles she might have brought on the commercial market.

The new baby – the 50-kg one, that is – is a complete, frozen carcass of a young female woolly mammoth. Other mammoth carcasses have been found, starting even in the early days of European exploration of the Arctic, but none have been recovered in as nearly perfect condition as this one. For this reason alone, it is something special – something that puts a real "face" on these extinct animals.

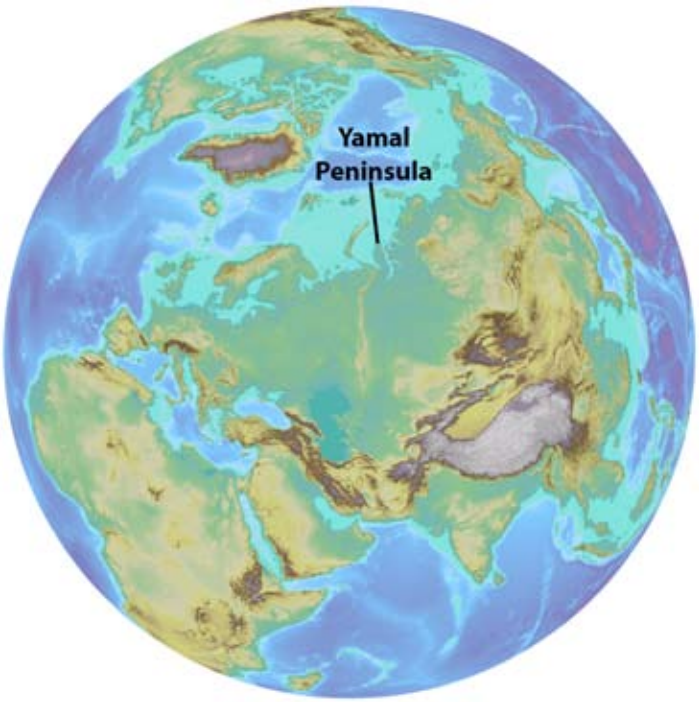
Dan's and Adam's excitement about this baby, however, goes deeper than outward appearances. Dan's research on mammoth (and mastodon) paleobiology and extinction is an effort to learn about these animals' environment, behavior, and reproductive physiology from analyses of the structure and composition of their tusks. He then aims to use this knowledge to enhance our understanding of Pleistocene environments and events, including the cause of mammoth (and mastodon) extinction. Details of the diets of these animals, and vicissitudes of their lives, are recorded in their tusks in much the way that tree rings record the growth history of a tree. As Dan started to work on Siberian material, he realized that a special focus on juvenile mammoths was both feasible and necessary if he was to understand adults. This is because the tusks of adults have often lost some material from their tips, which record the first years of their lives and mark the starting point for determining critical variables such as age at maturation, age at first reproduction, and age at death. When Adam was looking for a dissertation project, he and Dan decided that a focus on juvenile mammoths would make a great contribution, and they soon managed to arrange access to specimens – most of them just tusks – that would comprise a suitable group of samples. The new baby mammoth is in one sense just the latest addition to this sample series, but its distinctive contribution is that details of its life will also be recorded in its soft tissues, in the amount and distribution of body fat, and the compositions of many different organs and parts of its body. These represent a sort of "ground truth" against which Adam and Dan can test their tusk-based interpretations, giving their entire study an extra dimension of observational constraint.

The person Dan and Adam have most to thank for their new baby mammoth is Yuri Khudy, a Nenets reindeer herder living on the Yamal Peninsula, which protrudes into the Arctic Ocean just east of the northern end of the Ural Mountains. The Nenets are one of the small groups of indigenous peoples of the North who have done the best to keep their traditional culture and lifestyle intact.

Baby Lyuba, named after the wife of the Nenets reindeer herder who found her, is a nearly perfectly preserved woolly mammoth calf, recovered from the permafrost of northwestern Siberia. She will be worked on this year by Dan Fisher and Adam Rountrey, as part of their investigation of the early stages of life in mammoths. (D. Fisher)

They are nomadic, following their reindeer on a seasonal round of grazing and migration, and augmenting what the reindeer provide by hunting and fishing. In May of this year, as spring finally struggled out of the grip of winter, Yuri was out checking on the condition of forage for his reindeer in the area surrounding his camp. At a distance, he saw a recumbent form and thought it was a sick reindeer, or one that had already died. As he approached close enough to figure out what it was, he realized it was dead alright – but no reindeer! Its size was not remarkable – a little over a meter long and not quite a meter from the round soles of its feet to the ridge of its back – and it showed no outward sign of the tusks that characterize adult mammoths. However, from the front of its only slightly compressed face extended a perfect, curving trunk, right down to the lip-like prehensile tip.

Yuri Khudy recognized that this was an unusually well preserved baby mammoth and that it might be parlayed into a windfall of some magnitude in the cash-poor economy of the tundra. Yuri Khudy, however, also has a strong sense of community identity and pride, and he felt that a specimen of this potential importance should be identified as coming from his people, his land, rather than being lost in the nameless shadows of commercial networks. He therefore walked for three days, then arranged passage on a helicopter, before finally arriving in the nearest town where there was a small museum. There, he told officials about his find, and within a few more days, the baby mammoth had been retrieved from the tundra and transferred to the main regional natural history and



Location of the Yamal Peninsula on the Arctic coast of Siberia, where the baby mammoth was discovered by a Nenets reindeer herder.

Dan Fisher, Adam Rountrey, and Alexei Tikhonov exam the baby mammoth at the Salekhard museum, Siberia. (D. Fisher)

ethnography museum in the provincial capital, the city of Salekhard. As a gesture of thanks and recognition to Yuri, Salekhard museum officials named the baby mammoth Lyuba ("Love" in Russian), after Yuri's wife (other recognition is planned as well).

The Salekhard museum announced Yuri's discovery of Lyuba in a press release that was picked up by several European news services, but not more globally. However, Dan's European colleagues notified him immediately and within weeks of the discovery, plans were afoot to visit Salekhard and investigate the possibility of working on this new specimen. First onsite were French Arctic explorer and logistician Bernard Buigues and Russian geologist Yuri Burlakov, who made arrangements for follow-up visits later in the summer. Another authority critical to the work is Alexei Tikhonov, of the Zoological Institute of the Russian Academy of Sciences, in St. Petersburg. Alexei is head of the Russian "Mammoth Committee" and has experience working with some of the earlier discovered carcasses of baby mammoths. Dan has worked with all of these colleagues from the beginning of his involvement with Siberian mammoths. When it was time to gather in Salekhard, Dan and Adam were already in Siberia, having attended the 4th International Mammoth Conference in Yakutsk and worked for some time following the conference, sampling Yakutian mammoth tusks. Another member of this company of investigators was Stacy Gohman, a graduate student at the University of Minnesota working with UM alumnus (and former student of Dan's) David Fox. In the future, David plans to join in the field component of their NSF-funded collaborative research project.

Bernard, Yuri, Alexei, Dan, Adam, and Stacy received a warm welcome in Salekhard, conducted initial review of x-rays and external reconnaissance on the specimen, and completed the first stages of planning for a long-term investigation. Among other things, they determined from examination of x-rays of Lyuba's head that both "milk"

tusks and "permanent" tusks were present, suggesting a probable age at death (based on comparisons with African elephant development) of about four months.

The next stage of work on Lyuba will be to send her to Japan, where another collaborator, Naoki Suzuki, will conduct a high-resolution CT-scan of the complete specimen. This will document the entire carcass from the perspective of 3D variation in density of tissues. With appropriate processing of the CT data, internal structures, including some organs, should be resolvable. Following this, the baby will return to St. Petersburg, where Alexei, Dan, and other colleagues will conduct an autopsy to examine the interior of the specimen and collect samples of specific tissues for further analysis. At that time, Dan will extract tusks and molars to bring back to Ann Arbor, where Adam and he will undertake one of their most demanding sampling programs, given the small size of Lyuba's tusks.

A radiocarbon date on Lyuba is in progress, so at the moment, we can only speculate that she might be similar in geologic age to other, previously dated mammoths from the Yamal Peninsula, which would place her in the range of 30-40 ka. She has lost much of her woolly coat, some of which may even have happened since she began to be exposed by seasonal thawing of the surface layer of the permafrost. She also was evidently discovered first by an arctic fox or some other small mammal, because the end of her tail and part of one ear lobe were gnawed off when Yuri Khudy found her. She has also lost some of her original water content, giving rise to a somewhat compressed, shriveled appearance in parts of her body, but with these few exceptions, she has barely a blemish.

Woolly mammoths are one of the last of a long lineage of mammoths to evolve, and likewise the last to survive, succumbing to extinction only in the mid-Holocene, when several Arctic island populations were finally lost, well after the end-Pleistocene extinction of all mainland populations. During the Pleistocene, woolly mammoths extended from northern Europe, across Siberia, and to the Atlantic coast of North America. Although often associated with conditions of extreme cold, woolly mammoths also lived in temperate-latitude settings and were quite flexible in their habitat requirements. We have already learned a great deal about woolly mammoths and the so-called Mammoth Steppe Biome, in which they were the most conspicuous and ecologically significant species, but studies of tusks, and of spectacularly preserved specimens such as Lyuba, are bringing a new level of clarity to our understanding of these animals and their place in earth and human history.

About the author: Daniel Fisher is the Claude W. Hibbard Collegiate Professor of Paleontology in the Department of Geological Sciences, and Curator of Paleontology in the Museum of Paleontology.

Not so Mammoth Babies

There have been several new arrivals among the faculty over the last year or so. Meet some of the newest department members:

***Finlay Howard Hamm**, born March 25, 2006, to **Ingrid Hendy (Asst. Professor)** and **Scott Hamm**.*

***Luca Becker**, born April 14, 2006, to **Michela Arnaboldi (Lecturer, PhD '06)** and **Udo Becker (Assoc. Professor)**.*

***Zoe Niemi**, born October 19, 2006, to **Marin Clark(Asst. Professor)** and **Nathan Niemi (Asst. Professor)**.*

Nano-Rocks and Mega-Molecules
Michigan Math and Science Scholars

As part of the Michigan Math and Science Scholars (MMSS) program, **Udo Becker** and his research group provided a two week geology course to engage and interest high school students in math and science. Entitled "Nano-rocks and Mega-molecules", this course provided the students with an introduction to basic geology, including rocks and minerals along with concepts of geologic time and geologic events. In addition to typical laboratory exercises, field trips were a central component of the course, with excursions to a local gravel pit, an environmental center, and a tour of the building stones of the University campus. Away field trips included spelunking in a fracture cave and fossil hunting in Ohio.

Students were also given a unique opportunity to learn about geology at the molecular scale with exploration into computer simulations of molecular interactions, nanoscience, and biomineralization. With hands-on demonstrations, students were introduced to state of the art instrumentation including the Scanning Electron Microscope and Atomic Force Microscope. Observing everyday items with these forms of microscopy gave students a better understanding of size, from the macro- to the nanoscale. A host of guest lecturers (**Rodney Ewing, Maik Lang**, and **Henry Pollack**) introduced areas of current geologic research areas that have significant and public global impact, with special emphasis on nuclear waste management, fission track dating, and climate change. The lessons on the nuclear fuel cycle and climate change were aided by the use of two issues of the journal Elements – The Nuclear Fuel Cycle, and Energy: A Geoscience Perspective. The students used the issue on Energy to guide their discussions about possible alternative energy sources for the future. Overall, this summer course was an eye opening experience for the students, who were not only introduced to basic concepts of geology but also learned how earth sciences impacts their daily lives.

The Ann Arbor Rock Walk included a stop at the Michigan Bell Tower to take a closer look at the fossiliferous limestone.

Trilobites, crinoids, and brachiopods were found while fossil collecting in Sylvania, Ohio.

Students learned about geologic time by unrolling 1000 sheets of toilet paper on Palmer Field.

Let's Look at Rocks

There is a sound to stagnant water, its shallow breaths, although I don't think I knew it – the way it buzzes like an insect – until I came back from Iceland, until everything in my life grew louder. There, the waterfalls crashed with the power of heavy traffic. The people of Iceland seem to have grown around the country's geology, the jökulhlaups and the basalt columns – split, like anywhere, down the middle. It is a loud and silent country, with all of its light and all of its water, and, if it is possible to learn anything about ourselves from rocks, it taught me how to live with ambiguity, with things meaning more than they seem, more than people say. Back now in Michigan, I realize how little of the world I'd known before. Or, rather, how I'd failed to see the dynamics of my own home, the place I've lived all my life – how I'd known neither its crowded corners nor its vast emptiness, its ability to be both at once. Maybe I would have learned this anywhere; maybe I could have only learned in Iceland, in that one place with those particular geologists. This is our trip.

Call me a pseudo-scientist, call me a convert; perhaps, before, I had only ever skimmed the surface – too afraid of math and computers to do more than glance over interesting facts or read Wikipedia articles about how a generator works. There were others on the trip who, at first, felt the same – lost somewhere in translation, just as we lost the night somewhere over the Atlantic when we flew to Keflavik. Thirteen undergraduates joined the trip as part of the Global Intercultural Experience for Undergraduates (GIEU) program. Among us, we came with varying degrees of knowledge about geology, and some of us – myself included – were a little overwhelmed at first. From GIEU to Geology, as though they sounded similar and we had somehow mixed the two up. But by the end of the trip, there were rocks in my pockets; in the hostel in Reykjavik, I woke up to a sore hip and realized I had slept on one all night. For this, a geologist gave me a high five. Another GIEU scholar sat in the hallway of the Salvation Army guesthouse the night before we left, sorting through the rocks she could and couldn't take with her. Maybe we were guest geologists, there to learn a new language.

We've inherited the seismic activity of the earth; we are more like our planet than we know, we are carved

These series of basaltic and rhyolitic dikes are found along the eastern coast of Iceland at Breiðdalsvik. The lack of significant chemical weathering at high latitudes leads to more resistant basalt dikes between less resistant rhyolite "valleys". (S. Rilling)

2007 International Field Trip to Iceland

In June 2007, Professor Sam Mukasa and Holli Frey (PhD '05) led the third departmental international field trip to Iceland (previous trips have explored Scotland and Spain). A group of 28 undergraduate and graduate students from both the Department of Geological Sciences and from across the University participated in this scientific and cultural journey. The department partnered with the University's Global Intercultural Experience for Undergraduates (GIEU) program and the International Institute. This collaboration opened the doors for a broader spectrum of students to participate in this once-in-a-lifetime opportunity, fostered the development of a cultural program for the trip that exposed students to Icelandic art, history, and mythology, an environmental program to study alternative energy sources in Iceland, as well as the opportunity to see the volcanic and glacial geology of Iceland. The entire group spent two weeks exploring the geology, geomorphology and geothermal resources of Iceland, after which the GIEU students remained for an additional week of cultural programs in Reykjavik. Participation of departmental students in this field trip was subsidized by the generous donations of an anonymous alumnus to the department field excursion fund.

Students and instructors on the Iceland trip standing on hexagonal columns of basalt caused by cooling of the lava from above. (S. Mukasa)

just like it. Maybe the geologists already knew this, the way we dig and dig and always find something new, but this June, for the first time, I left my Midwest with a vague idea of what, exactly, the Mid-Atlantic Ridge is (some fence in the ocean? A bridge to balance on?). Suddenly it was six in the morning; suddenly we had landed in Iceland, the coastline ran neatly under the plane's windows. We went first to the Blue Lagoon, where we swam in pools of silica and sulfur-rich water, the runoff from a geothermal plant. Located in the Grindavík lava fields, the water was a shocking blue (and a little green, because of algae) in a landscape of brown and deep green – rocks covered in moss. Immediately, we experienced the alternative energy that Iceland is known for: beneath the surface of the earth, magmas heat the water that is in turn harnessed by geothermal plants, generating electricity for Iceland's towns and cities. While visiting Nesjavellir – the largest geothermal plant in Iceland, located in the southern part of the country – we learned that the water is under such high pressure that it pumps itself up from the ground, bubbling up the way the Icelandic language seemed to come from somewhere deep within the diaphragm. The hot water – harnessed at a rate of nearly 1800 liters per second – is siphoned down to the cities using gravity, making the whole process a green and renewable one. Later, at Krafla Geothermal Station, we learned more about this awesome power: Krafla sits on shallow magma chambers called stars. (Imagine my, the liberal arts major, delight at this name.) It is amazing how they can harness all this water, whereas they cannot harness the wind, which never seems to stop to inhale: too unsteady, too forceful, I worried more than once my tent would collapse during the night.

Energy was a common theme throughout the trip; energy within the country, energy among ourselves. Iceland – with its ECTOS project that introduced three fuel cell buses to Reykjavik – is a zenith for experimentation with alternative energy resources. Isolating the hydrogen molecules – the most difficult, costly, and energy-draining aspect of fuel cells – can be done using geothermal energy in Iceland, whereas other parts of the world would likely rely on dirtier forms of energy. While the ECTOS project is no longer running – the three hydrogen buses dismantled for parts – we might think of Iceland as a sort of field study in the area of hydrogen economy, small as the initial project may have been. (Small is understandable, as the current cost of one fuel-cell car is around $1,000,000 USD.) In 1999, the Icelandic government announced the goal of completely converting their fuel economy to hydrogen by the year 2030. If anywhere, it seems it can be done there, with the help of their geothermal resources.

But, with cheap energy come bad habits: per capita, Iceland uses the more energy than any other nation on Earth. I left for the trip expecting to find cities full of environmentalists, a country, practically, of woodland sprites. And yes, the Icelanders love their Nature, its unparalleled beauty, the magnetism that comes from its instability. But they are a part of the West, torn as they may be between Europe and America, and they face the same problems as much of the rest of the world: how to

Students were able to walk under this waterfall at Seljalandsfoss. This waterfall is held up by a more resistant basalt flow, underlain by Pliocene and Pleistocene turbidites and subglacial till deposits. (S. Rilling)

A short hike through snow on Askja. The largest caldera was formed by multiple eruptions ~6500 years ago, with the most recent caldera, Viti, formed in 1961 . This youngest caldera is now a sulphurous hot spring. Walls of the caldera show layered, effusive flows that formed a volcanic edifice before subsequent caldera-forming explosive eruptions. The area surrounding Askja was used as a training ground for Neil Armstrong and Buzz Aldrin before the Apollo 11 flight to the Moon in 1969. Pumice from an 1875 eruption still covers the landscape. (S. Rilling)

keep energy clean, how to renew it? In Iceland's east, a new dam – the Karahnjukar Hydropower Project, all to realize one ALCOA aluminum smelter – now breaks into the otherwise empty sky of the highlands. On one hand, this has likely harmed the ecosystem; on the other, there are (at least some) jobs in a place where there used to be none. In Iceland, like many other places in the West, there is the presence of this double-edged sword.

While Iceland's small population and abundant geothermal resources put them ahead of, say, the United States, but this, I feel, is where we have to recognize the possible presence of a global community – global citizenship as opposed to national, the duality in our own lives. In places like Vik, Skaftafell, and Dverghamrar, columnar basalts – eerily standing on their own, in a field or by the sea – towered hexagonally over us: much like cells, lava flows harden in that shape because it is the most energy efficient geometrical pattern. They stand together; they fit. In this way, we as a species are also the same – we, too, are like geometry. Where else, if not from Nature, would we have gotten the idea of symmetry? A world where we cooperate to preserve what we already have instead of always searching for more is not, perhaps, so far fetched after all.

With this idea of energy always in our minds, we traveled around the perimeter of Iceland, mainly along Hringvegur (Iceland's "ring road") with a sojourn into Iceland's central highlands – a cold, uninhabited place that is, I imagine, very similar to the moon, or maybe Pluto. In all the sites we visited, we could have spent weeks looking at the rocks alone. (Still, I'm finding pebbles in my pockets.) But the trip turned out to be more than rocks. (Is it risky for me to say that, in a geologist's world?) The driver – an Icelander named Diddi (or Hreggvidur Sverrisson) – of our wonderful, big, green bus drove us to glaciers, to gorges and ice lagoons and through grey sky and blue. Diddi gave us the perspective of a native Icelander; since, years ago, he started driving tours around the country, he's noticed changes in the landscape. For example, we stopped at the tongue of a receding glacier near Stakkholtsgjá (a wonderful gorge we hiked through, with walls that were like deep breaths); the lake at the glacier's base didn't exist when Diddi first started driving his bus over Iceland's rocky roads. Even within our group of thirty, we experienced this kind of great global perspective: our guide, Magnus, was from Sweden, and others joined us from Bombay, Hungary, Hong Kong, from the two bookends of the United States – New York, LA – and everywhere in between. Here, again, we saw our differences grow into similarities – like the mafic lava fields we climbed through, we became less viscous; there were fewer connected atoms in our way.

Can I also call science a different culture? Very early on into the trip, a geologist explained to me something about the Mid-Atlantic Ridge that hadn't crossed my mind: while the ridge is slowly spreading, the world isn't getting any bigger. I stood near the ridge itself but had to learn this way of thinking, the cause and effect of science, the way it, too, involves a type of creativity in thought. In John McPhee's Control of Nature, he quotes Bjarni Sighvatsson as describing the flow Heimaey in this way: "It more felt than sounded" (quoted in McPhee 108). At the Skógar Folk Museum in Skógarsafn, Thordur Thomasson – the

museum's owner and something of a national celebrity – told us about spinning wool into yarn in the darkness of winter. "There is no light, only feeling," he said. Science, I learned, is feeling and sound and touch; climbing up the mountain and back down. (And, in our case, the occasional broken leg that comes with it.) In some ways it is a different world; in some ways it is the same.

During our stay in Iceland's central highlands, we experienced something very different from anything I, at least, had ever before encountered. After spending a cold, windy night at a rocky campsite – where we could watch the rain come toward us over the mountains – we hiked through mud and snow to Öskjuvatn – the lake of the active volcano Askja – where Viti crater steams with blue-brown water. The ground – covered with old snow, bitten by rocks – sloped downward to the water, which the lava heats to about 25˚C. It was a strange and beautiful mix of light and dark, heat and cold. Steam hovered like netting over the lake. Viti – formed in Askja's eruption of 1875, and in Icelandic means "hell" – is a collapsed magma chamber; it settled in on itself like a lung, and, after almost two weeks in this volcanic country, its sulfuric smell only seemed a little too strong. On the hike back, we walked against the wind through heavy fog; the whole world had turned to a ghost. It was eerie, a little bit surreal, and the bus that waited for us was from some altogether different place, with its windshield wipers like beating hearts.

Basalt injected into a molten felsic body, evidenced by chilled margins on basalt blobs, flow alignments, and minor magma mixing. This outcrop is part of a larger "net-vein" complex at Krossanes on the coast of Iceland. (S. Mukasa)

Svartifoss cascading over basalt columns in Skaftafell National Park. (D. Dixon)

This was one of the most wonderful things about Iceland: the country is roughly the size of Indiana, but more dynamic, I feel, than the entire Midwest. (Although, in all fairness, I have never been to Indiana; perhaps the south there is radically different from the north.) In the highlands, we froze; in Skaftafell, we climbed to Skaftafellsjökull in shorts and t-shirts. There, I got a burn on my face; I hadn't thought to bring sun block to Iceland. In one part of the country, I didn't encounter a single insect; near Myvatn (aptly named Mosquito Lake), midges swarmed our tents, our hair, our bus.

The lake of Myvatn and the nearby Hverfjall crater were formed by an eruption some several thousand years ago; after hiking up the black sandy slopes of Hverfjall, we could see the lava tubes in the field below, and the soft center of the crater where visitors had written their names in the sand. We always seem to want to leave a mark somewhere; this was an anonymous sort of hand hold.

It wasn't until the end of the trip that we discussed the fact that much of Iceland's shaping geology first occurred before recorded history. How, then, do we know where, and when, and how a mudslide molded a particular area? I had accepted the information without hesitation, and while I remember learning about carbon-14 dating, it wasn't quite an active part of my vocabulary. The very idea is inspiring; we can know so much, we do know so much.

On one of the last days of the trip, during the GIEU students' stay in Reykjavik, a gentleman named Jakob Hjalmarsson speaking to our group said, "If we knew everything, we wouldn't be needed." Some of us came to Iceland knowing a lot, some of us only a little – but we were there, we were all learning. In a short story by Pam Houston, she writes, "You wonder why there is no word for the opposite of lonely." While there may be no word for it, what I felt in Iceland was the opposite of lonely; like a full lung in comparison to an empty one. In trying to distinguish the two main purposes for the trip – geology and culture – I realized how, in Iceland and for our trip, the two were so closely tied. We were travelers; we were geologists.

Let's look at rocks.

About the author: Megan Cummins is an undergraduate in LS&A. She is pursuing a degree in Creative Writing and Literature. Megan participated in the Iceland field trip through the GIEU Program.

Basins Below and Mountains Above

Exploring the Geologic History of the Basin and Range Province

Soft Rock Trip 2007

Led by several well versed members of our Department, Kacey Lohmann, Nathan Niemi, Marin Clark and Peter Knoop as well as Maribel Benito, a visiting carbonate sedimentologist from Spain, we set off to understand the detailed geologic past of the great Southwest for the annual soft rocks adventure. Traveling through Nevada, California, Utah, and Arizona, we studied the last 543 million years of Earth's history, with special emphasis on the Basin and Range Province, in roughly ten days. Thirty of us packed into vans to visit some of the best national parks including Grand Canyon, Death Valley, Capitol Reef, and Zion in addition to the best-kept secrets of the House Range, Snake Range, and even those of Beatty, Nevada. Armed with our rock hammers and hand lenses, we were ready to be wowed by the unveiling of one of the most spectacular geologic tales of all time.

After an overview of the geology in the classroom, it was time to pack our suitcases and assemble for departure. We arrived in Las Vegas for a great geologic journey with sixteen pounds of maps and not enough warm clothes. Wasting no time, we were greeted by Frenchmen Mountain just east of Las Vegas. Here we were introduced to the Bright Angel Formation, also known as the Carrara Formation, and we were able to touch the Great Unconformity. This made the perfect place to begin our adventure. From here we worked our way up through the major stratigraphic formations.

From there we traveled to see the Red Springs and Keystone Thrust both late Cretaceous in age and exemplary products of the Sevier Orogeny compressional event. Our investigations around Las Vegas continued with a visit to the gorgeous hematite stained, Jurassic eolian sand dunes of Red Rock Canyon, just west of the city. Farther west at Wheeler Wash in Pahrump, we learned the major characteristics of an alluvial fan sequence. Traveling across the southern Californian border into Chicago Valley, we were introduced to the black and white banded carbonate sequences of the upper Cambrian Nopah Formation and

The 2007 soft rock field trip at Zabriskie Point, Death Valley National Park. Manly Beacon is visible just behind the group, with the Panamint Mountains on the far skyline. (K. Lohmann)

Students demonstrating apparent dip of bedding at a bend in Titus Canyon, Death Valley National Park. (N. Niemi)

From May 1–11, 2007, Michigan faculty Marin Clark , Kacey Lohmann, and Nathan Niemi led 28 graduate and undergraduate students on a geological exploration of the southwestern United States. The group flew to Las Vegas, Nevada, and traveled by van through California, Nevada, Utah and Arizona, visiting such geologically significant National Parks as Death Valley, Great Basin, Capitol Reef, Bryce Canyon, Zion, and the Grand Canyon, with stops at both Nathan and Kacey's PhD thesis areas!

The trip was subsidized for all participants by the generous donations of our alumni, and Geoclub contributed funds from a recent industry gift to underwrite the costs for all of the undergraduates who participated.

The same group at Great Basin National Park, Nevada, three days later. What a change! Wheeler Peak is the high peak in the background. (K. Lohmann)

the slightly older Bonanza King. They are evidence for a once encroaching sea line. Not passing up the opportunity, we hiked to see the controversial cap carbonates with fantastic bioturbation and the Kingston Peak diamictite. This diamictite was supposedly emplaced by glaciers that covered the Earth during the Neoproterozoic. This outcrop led to debate over the Snowball Earth hypothesis.

The trip pushed on into the heat of Death Valley and a discussion of the Eagle Mountain Formation. Once in Death Valley, we visited Zabriskie Point, Gower Gulch, Badwater Basin, and the appropriately named Artist's Palette to see the colorful display of oxidized manganese and copper. Then, a sudden chance to see Pupfish in Salt Creek. This example of allopatric speciation aroused the curiosity of the group. Anticipation was dashed once at the site. To end our tour of Death Valley, we drove up section through Titus Canyon and its uniquely cemeted breccia wall with secondary calcite. By nightfall, we ended our tour in Beatty, Nevada and camped under the stars.

The following day we hiked up Meiklejohn Peak to the mudmounds in the Ordovician Pogonip Group, which are packed full with stromatactis. We even had the Air Force in a tizzy over our visit to a continuous GPS site, near Yucca Mountain. Emphasizing the affects of basin extension, we worked on an exposed metamorphic core complex at the Snake Range Detachment Fault. We trucked on through Tybo Canyon to the Margum Formation, a prime site for agnostid trilobite specimens. Wheeler Amphitheater in Utah delighted everyone with fossil hunting for the rare *Asaphiscus wheeleri*. We studied Horse Canyon in the House Range to understand the interplay of silicic material with carbonate factories and the rise of sea level. After hiking up the wrong ridge, we discovered that the correct ridge was off in the distance. Whoops!

Jess Masterman enjoying the view of the Colorado River, from the Toroweap Overlook, Grand Canyon National Park. (M. Clark)

At Capitol Reef, we saw formations from the Permian Kaibab limestone to the



Left: Marin Clark leading a discussion of the geomorphic evolution of the Grandstaircase-Escalante National Monument, Utah. (N. Niemi) Middle: Kacey Lohmann explaning eolian transport at Observation Point, Zion National Park, Utah. (N. Niemi) Right: Nathan Niemi describing the structural geology of the Titus Canyon area, Death Valley National Park, California. (D. Dixon)

upper Jurassic Entrada Sandstone. No geologic tour of the West would be complete without driving the Grand Staircase, where we took in the sublime beauty of the Vermillion Cliffs, the hoodoos and grottos of Bryce Canyon National Park, and the Escalante monocline. The drive took us all the way to Zion National Park. We hiked the amazing eolian dunes and witnessed extraordinary cross beds. The "grand" finale was indeed grand. We ended our trip on the north rim of the Grand Canyon at Toroweap Overlook, near Vulcan's Throne where much of the stratigraphy we had seen throughout the trip was revealed on the walls of the canyon. However, after such a strenuous trip of studying geology, the next day we drove back to Las Vegas for a well-deserved night on the town (and shower facilities).

The soft rocks tour was a window into the formation of southwestern North America. Under our hand lenses the modern North America was born. This trip was unlike those of previous years because everyone, including the professors, learned something new. The students had first-hand experience solving geologic questions. From this we learned more than we would have in the classroom. Here is to those who made this possible, and our endless thanks to Kacey Lohmann, Nathan Niemi, Marin Clark, and our wonderful Department, all dedicated to creating informed, well-rounded geologists.

Round Trip Plane Ticket to Las Vegas: $300
Hiking Boots and Hammer: $200
Learning in the Field: Priceless

About the authors: Kelly Umlauf and Sara Worsham are undergraduates pursuing degrees in Geological Sciences and Environmental Geosciences, respectively. They are the co-presidents of the Michigan chapter of Sigma Gamma Epsilon, the National Honor Society for Earth Sciences.

5 Months in the Land Down Under

They were easily the best months of my life. They didn't come without hardship though—I had to go through several difficult situations, such as fitting in and a frustrating housing situation. But for some reason, I always felt at home in Australia. I met amazing people everywhere I went and was treated very well throughout my time there—often by complete strangers. Australians are very laidback, fun people with the most amazing sense of generosity. From getting "shouted" beers at the pub to being offered accommodation by families I had only just met, the selflessness and hospitality never ceased to amaze me. I made friends there that I will most likely keep in contact with for the rest of my life and am excited to see at geology conferences throughout my career. It was truly a blessing to live in Australia for so long and meet such fantastic people. I hope that everyone will take the chance to at least visit and experience the Aussie lifestyle first-hand (and see the amazing Australian geology!).

My travels began on a cold, snowy morning in Ann Arbor, but 46 hours later I was in the beautiful, sunny city of Perth in Western Australia. I was there to do research for my Honors thesis on some rather unique brachiopods that Professor Ken McNamara had reserved for me at the Western Australian Museum. He and his family were very kind and let me live with them for most of my 3 week stay, making it really easy for me to adjust to life almost literally on the other side of the planet. They showed me some really neat sights around Perth—my favorite was seeing modern freshwater stromatolites! I also took a short bus tour along the southwestern coast where I enjoyed numerous tranquil, white sand beaches, crawled through caves with thousands of beautiful speleothems, walked 40m in the air next to the "fireproof" red tingle trees with their 26-m wide trunks, and visited an assortment of fine-quality wineries. I really enjoyed my time in Western Australia, but the fun was only just beginning as I headed for my new home in the state of Victoria in southeastern Australia.

Most of my 5 months was spent in the wonderful city of Melbourne (pronounced "mel-ben") where I took classes at Melbourne University. For the past 2 years Melbourne has been ranked as the world's most livable city (by the Economist Intelligence Unit) and is

Sunshine Coast, Queensland, Australia.

regarded by many Australians to be the "sporting and cultural capitol" of Australia. Indeed, from various festivals to Australian Rules Football (AFL, or "footy") there was always something going on in this beautiful city. I lived ~20-minute walk from downtown and enjoyed my days and nights strolling along the city streets. When I wasn't in class, I visited art museums, went to concerts, played sports, and never had a dull moment. One of my favorite places in the city is Museum Victoria, which has a fantastic exhibit museum accompanied by massive IMAX theaters—it also has an amazing brachiopod collection which I was fortunate enough to study. My friends who worked alongside of me in the museum often took me to see the IMAX shows after we finished our work in the collections. We had become close friends while attending a paleontology conference during my school break in March. Although I was labeled a "nerd" by my classmates, I still think that it was the best Spring Break I've ever had.

I took five geology courses at Melbourne University, which was great because I was able to see a lot of Victoria through the various field trips that were offered in my subjects. I loved Camp Davis, but nothing beats mapping on the beach! My Structural Geology trip to southeastern Victoria had me taking strikes and dips along the beach during the day, playing beach-cricket and swimming in the evening, and sitting around bonfires with my classmates at night. During my Minerals and Magmas course I climbed through lava tubes and examined other neat volcanics along the beaches of southwestern Victoria; I also went mineral-hunting in beautiful northern Victoria. I was extremely lucky to be invited on a research trip to the Flinders Ranges with the sedimentology professor, Malcolm Wallace, and his PhD students. There, we looked at NeoProterozoic reefs and had a great time camping kilometers away from the closest human being on Aboriginal land in the outback. I had a blast spotting kangaroos and wallabies while doing fieldwork, but I had even more fun oohhing and ahhhing over the gorgeous ~650 Ma stromatolites! Near the end of the trip we headed to the Murray Basin for a paleoclimate study in the Cenozoic strata exposed along the Murray River. There I saw Pliocene freshwater stromatolites that were absolutely beautiful and enjoyed South Australia's meat pies and other bakery goods. I also ate the best steak I've ever had—sorry Captain Kangaroo!

My parents came down to visit, and we shoved as much sightseeing as possible into 1.5 weeks. We saw the gorgeous Victorian coast along the Great Ocean Road, did the tourist gig in Sydney, visited the quite spectacular Jenolan Caves, attended a free John Butler concert in Melbourne's central district, and did heaps of shopping at the fantastic Queen Victoria Market. We also went to an AFL match, where I watched my newly adopted Carlton Blues get annihilated by the 2007 Grand Final winner, the Geelong Cats. I was glad that my parents were able to see how I had adapted to the laid-back Australian lifestyle and to meet my new friends (and bring me some sorely missed Reese's peanut butter cups!).

When I came across a bit of housing trouble, my friend, Daniel, invited me to live with him and his family for my last few weeks in Australia. I had a great time with them and was treated like one of the family. Daniel's father was a businessman by trade and a wine connoisseur by hobby, and each night he would treat me to a sampling of his favorite Australian wines with our family dinner. At "breakky" and morning tea, I heard many amusing stories from Daniel's mum about her latest teaching experiences. One of Daniel's sisters made time to take me to a Carlton footy practice so that I could get autographs from the players; I enjoyed hearing about the progress of another sister's wedding arrangements. It was great to be accepted and treated so well by almost complete strangers, and I am indebted to Daniel's family for their generosity.

Of all the neat things that I did and places that I went my favorite memories of Australia are those of my everyday life. Even walking to the supermarket from my house never got old. I loved hearing my friends use their Australian lingo and give everything nicknames (being an Atlanta-native, mine was "Georgia"). I enjoyed walking around Melbourne at night, especially down by the Yarra River where the beautiful city lights reflected in the still water. I loved shopping at the Victoria Market where I could get a quality 2lb steak for $5 US. Just having afternoon tea with my friends was amazingly refreshing and memorable. It was really difficult for me to leave such a neat place full of fantastic people, but I have plenty to look forward to in the good old USA. I'm keeping my fingers crossed doing PhD fieldwork in Australia…

About the author: Megan Tuura is an undergraduate in the College of Literature, Sciences and the Arts. She will graduate with a BS in Geological Sciences in December 2007, and an MS in 2008.

Gregory Dick

Geomicrobiology

PhD Scripps Institute of Oceanography

My research interests are focused on the interplay between the biosphere and the geosphere, examining how microbes drive geochemistry and how geochemistry in turn shapes microbial diversity, metabolism, and evolution. Microorganisms have dominated the history of Earth, playing an intimate role in shaping its chemical and physical properties. Microbes continue their role as agents of biogeochemistry today as they drive a wide range of processes, including the cycling of carbon, oxygen, nitrogen, sulfur, and metals. Many biogeochemical cycles are actively driven by genetically encoded molecules that are often carefully regulated to be produced only under certain environmental or physiological conditions. Thus an understanding of biogeochemical cycles that take place on global scales demands knowledge of dynamics that take place on molecular scales. As such, my research relies heavily on molecular-biological approaches that are closely coupled with geochemical approaches to achieve an integrated view of geomicrobiology.

David Lund

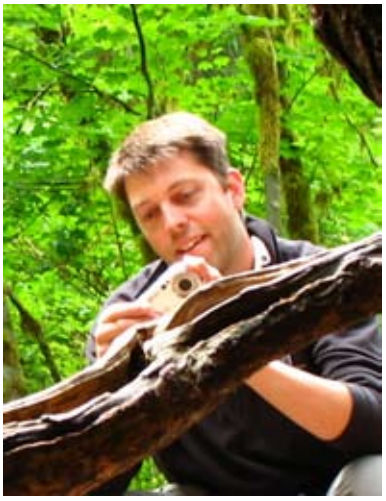
Paleoceanography, Paleoclimatology, and Biogeochemical Cycles

PhD Woods Hole Oceanographic Institute

My research focuses on the mechanisms that govern climate variability on centennial and longer time scales. In particular, I am interested in quantitative reconstruction of the ocean circulation and feedbacks between the ocean circulation and the global hydrologic cycle. I use the following analytical techniques: stable isotope geochemistry, trace and minor element geochemistry, and radiocarbon and U/Th geochronology.

Recent and ongoing research projects include:

- Gulf Stream temperature, salinity and transport during the last millennium based on benthic and planktonic foraminifera
- Holocene variability of the El Niño-Southern Oscillation using stalagmites from Borneo
- Stable isotope tracer budget constraints on deep ocean mixing during the Last Glacial Maximum
- Anthropogenic carbon dioxide uptake in the North Atlantic ocean using high resolution stable carbon isotopic records
- Reconstructing the radiocarbon content of the deep Pacific Ocean during the last deglaciation.



Nathan Sheldon

Soils, Paleosols, and Climate

PhD University of Oregon

The dominant theme of my research is the interaction between terrestrial life and its environment at Earth's surface. I examine this interaction by studying modern soils to define quantitative geochemical relationships that can be applied to paleosols. This work has four main strands.

First, I am interested in studying chemical weathering, biogeochemistry, redox, and element cycling in modern soils as analogues for paleosols, and in using that information to develop paleoclimatic/paleoenvironmental proxies. Second, I am interested in integrating stratigraphic, sedimentological, ichnological, and geochemical data to make paleoclimatic and paleoenvironmental reconstructions based on paleosols and their associated sediments, especially of important extinction events and of transitional events such as the middle Miocene climatic optimum that provide good analogues for future anthropogenic climate change. Third, I am interested in the Cenozoic development of grassland ecosystems and the role that tectonic and climatic changes played in providing selective pressure. Fourth, I am interested in the role that climatic and hydrological conditions play in controlling sedimentation and geomorphology in continental interior basins.

Camp Davis Gazette

If you've ever spent time at Camp Davis in Jackson Hole (Wyoming) you know that it is a special place. Field studies in the Rocky Mountains can be captivating and often influence student career directions forever. The University of Michigan is very fortunate to own this "western campus" and the Geological Sciences Department has been working to make the Camp Davis experience accessible to a wider group of students than ever before. In the past four years, we have more than doubled the enrollment of Geology students at Camp Davis, and have added a humanities course. The net result is that enrollment has grown from about 40 students to approximately 95 students for the summer term classes.

The traditional Introductory Geology and Advanced Field Mapping courses are still the mainstay of the camp curriculum. In 2003, an interdisciplinary course in Ecosystem Science was added to the course line-up. This course explores how geology and meteorology interact to control the occurrence of terrestrial and aquatic ecosystems, and attracts Environmental Geoscience majors as well as students from the Program in the Environment. In 2005, a course in the History and Literature of the Rockies was added, and it has provided the opportunity for Michigan students to study humanities in the American West. After a brief introduction to the area's geology and ecology, students examine human history in the west from the first inhabitants to the present, focusing on contemporary development, management, and recreational issues. At the same time, students explore human expressions of the western landscape that are captured in literature and the arts.

In the early years of Camp Davis, Surveying was taught by the Civil Engineering Department – but this course ended in 1964 with a change in degree requirements. Four years ago, we welcomed back an Engineering faculty member, Jerry Keeler, as an instructor in our interdisciplinary course in Ecosystem Science. This summer we are delighted to offer a new course titled "Weather and Climate of the Rockies". This course will be taught by Keeler and is offered by the Atmosphere, Ocean and Space Sciences Department of the School of Engineering.

It is very exciting for us that we have been able to expand the positive impact of Camp Davis to a broader group of students at the University of Michigan. This has motivated and inspired many students to continue and expand their studies in science and humanities, and has strengthened the bonds between undergraduate students, graduate student instructors and U-M faculty. The unfortunate news is that the Camp Davis facility, having been built in 1929, is inadequate to accommodate the large increase in usage. Most of the facilities have not been upgraded for over 70 years and are on the brink of failure.

A year ago we commissioned an architectural firm in Jackson Hole to conduct a study of the facility and propose plans for modernization. They developed a plan for upgrading the electrical and sewage treatment system and we worked together to create a camp master plan for the replacement of obsolete buildings and allow the extension of the camp season from summer-only use, to late spring and early fall seasons. The master plan has three phases. Phase I updates the utilities and replaces 40% of the cabins with buildings that are suitable for three-season use. Phase II replaces the remaining cabins and bathroom facilities. Phase III updates the kitchen and mess hall, replaces the caretaker's house and shop, and modernizes the classrooms.

We are pleased to report that funding has been secured from the College of LS&A and donations from our generous alumni to begin Phase I in the fall of 2008. We have initiated a fund-raising campaign with the goal of raising sufficient funds to complete Phase I this summer, and to complete Phase II over the following three years. We will use the Camp Davis Gazette of the Alumni Newsletter to keep you posted on the planning and implementation progress for the Camp Davis Renovation Project. If you valued your own field experience as a student and would like to support our effort to expose more students to studies in the Rocky Mountains, please consider donating to this effort.

Joel Blum – Camp Director

Camp Davis Alumni Getaway 2008

The Department welcomes you to participate in the 2008 Camp Davis Alumni Getaway, scheduled for some time within the last two weeks of July 2008. This event will be an opportunity for alumni and friends to visit the Camp Davis area, staying in the camp facility. Camp Davis, it is located just south of Jackson Hole, allowing easy access to Yellowstone and Grand Teton National Parks. The Camp can serve as a base for your independent excursions around this region, or as a reunion where you can reacquaint yourself with old friends and the current U-M crew. Several sight-seeing, field trips, and hiking activities will be organized to areas of the Tetons and adjacent Gros Ventre Mountains, and local outfitters will provide float trips and wildlife excursions. For additional information on dates, costs and activities, visit the Department's website http://www.geo.lsa.umich.edu/ and follow the link to Alumni Getaway 2008.

Camp Davis in a 2006 aerial photo taken for the U. S. Department of Agriculture

Old metal cabins

Architectural rendition of the proposed Phase I redevelopment of Camp Davis.

Alumni News

1940

Jack St. John (BS '42, MS '47) retired from Chevron in 1982 after considerable travel to foreign areas, particularly Copenhagen, Denmark for 6 months, 1 week on and 1 week off. He now resides at Morningside retirement home in Fullerton, California. He appreciates his geological education because most of this current investments are in energy and gold.

Jean K. Story (BS '45) is now 82 years old, and has retired to an "old folks" place in Denver, Colorado. She doesn't enjoy growing old, but she and her knees can't fool anyone anymore.

1950

John M. Sweet (BA '48, BS '49, MS '50) is living in Green Valley, Arizona and Boulder, Colorado, and has been working on a new book about the exploration for, and discovery of, oil in Arctic Alaska. The book, tentatively titled *Discovery at Prudhoe Bay* is in the final stages of publication, and should be on bookshelves later this fall.

John Sweet (l) with Walter J. Hickel (2nd Governor of Alaska), and ARCO executives Roland F. Champion and H. C. Jamison, in the 1960s.

Earl Brabb (MS '52) is a geologist emeritus with the U. S. Geological Survey, but even in retirement in Rocklin, California, keeps busy with a project compiling the stratigraphic column for a new geologic map of the San Francisco Bay region. He and wife **Giselle** took the vacation of a lifetime in Tahiti last year, visiting the Society Islands, and enjoying the cultural and natural highlights of this region of the world. They also took the opportunity to visit daughter **Kristin**, son-in-law **Steve Gunn** and grandchildren **Sabrina** (13) and **Skyler** (11) while the Gunn family is temporarily residing in Edinburgh, Scotland.

1960

John Harold Poletti (BS '63) retired from the accounting profession, where he was a C.P.A. since 1968. He has lived on Orcas Island in San Juan County, northwestern Washington State, for the past decade. He enjoys spending his free time skiing, hiking, kayaking and boating, when not catching ferry boats to the mainland. He still keeps in touch with **Ben Gallo (PhD '77)** and **Walter Henes (MS '60)**, who were roommates and working on their graduate degrees when he attended the university.

1970

George Davis (PhD '71) stepped down as Executive Vice President and Provost of the University of Arizona on June 30, 2007. He had held this position for seven years. He will return to the faculty in the Department of Geological Sciences to resume his work in geology, in geoarcheology at Mt. Lykaion in Greece, and to enjoying the research, writing, and photography that accompanies these endeavors.

Gordon D. Wood (MS '73) is the Knowledge Management Coordinator for Geoscience and Engineering, ExxonMobil, offshore West Africa. He retired as Production Consultant at British Petroleum in 2000, and is currently living in Katy, Texas.

Donna Jurdy (PhD '74), Professor of Geophysics at Northwestern University, in Evanston, Illinois, attended a Workshop on Teaching Geophysics in the 21st century, sponsored by Cutting Edge. It was held at Camp Davis in August. The attendees very much enjoyed the scenic setting and were especially enthusiastic about the wonderful meals provided by **Chris Malvica**, the Camp Manager.

Wendy (Gordon) Sheridan (BS '76, MS '79) is currently teaching geology, astronomy, and meteorology at Ottawa Township High School, Illinois. Ottawa is right on I-80, southwest of Chicago, and she invites the Camp Davis caravan to pitch their tents in her backyard one of these years on their cross-country journey.

Howard Jay Scherzer (MS '77) is moving further and further away from the field of geology; he is now the sole proprietor of a textile agency that represents some of the top fabric makers of Europe. If anyone needs a custom made shirt, let him know! He still travels extensively, having just returned from a month in the Alps, where he puts his knowledge to work, scrambling up and down the moraines and outcrops. Howard is also still guiding tourists around NYC by bicycle.

1980

David Blake (MS '80, PhD '83) is working for NASA in San Francisco developing the Chemistry and Mineralogy (CheMin) instrument for the Mars Science Laboratory (MSL) project, slated to launch in fall 2009, funding permitting. The CheMin instrument passed Critical Design

Review, and Dave was able to spend 3 weeks field testing the instrument in Spitsbergen, Norway (*for more information on this test, see http://astrobiology.arc.nasa.gov/news/expandnews.cfm?id=10580 - eds.*) Dave and wife **Carole** have recently purchased a home in Oahu, Hawaii, and he is hoping to pursue an adjunct position at the University of Hawaii in order to spend some time at their new home.

David Blake testing the CheMin (Chemistry and Mineralogy) instrument for the Mars Science Laboratory (MSL) project on Spitsbergen Island, Norway.

Don Sprague (MS '80) recently received a new job assignment in Houston, placing him in charge of ExxonMobil's exploration activities in the deepwater Gulf of Mexico. His wife **Donna** stays involved in many volunteer activities, and managing transportation for their daughters' social lives. **Leah** is a runner, and competes in cross-country and track at the junior high level. **Caroline** is on the high school dance team, and also enjoys math classes and horseback riding.

Annette Marie Olivarez Lyle (BS '83, MS '86, PhD '89) and **Mitchell W. Lyle (BS '83)** have moved from Boise State to Texas A&M University, as of November 1, 2006. Mitch has a position as Professor, and Annette as Research Associate Professor, in the Oceanography Department of the College of Geosciences. They are enjoying the excitement of a rapidly growing College at their new location. The beauty of Idaho and their past proximity to Camp Davis are missed; however, they are looking forward to returning to the area, and seeing all of the Michigan folk, next summer at the Camp Davis Alumni Getaway!

John Muntean (MS '89) After graduating from U-M, John moved to Nevada to explore for gold, got married (**Donna**), had 2 kids (**Kylie**, 11, and **John**, 9), earned a PhD from Stanford, returned to Nevada and the mining industry, and in 2005 took a tenure-track position as Research Economic Geologist with the Nevada Bureau of Mines and Geology at the University of Nevada, Reno. His position with the Bureau is his "dream job" – bridging the gap between academia and exploration through applied research. He works with amazing 3D data sets from the mines, and he has graduate students, but does not have to teach classes. The transition has not been without bumps, mainly because it's difficult to say no to opportunities. He is still learning how to pace himself in academia. Recently John got to work with **Steve Kesler** again on the Pueblo Viejo gold deposit in the Dominican Republic, which was the subject of his MS thesis at U-M. That experience reminded him of his U-M days as if they were yesterday. Work aside, he is having a blast with his kids; taking guitar lessons with his son, helping coach little league baseball, and gotten back into model railroading and train photography. Needless to say he does not get much sleep!

Greg Arehart (PhD '92) has recently been promoted to full professor at the University of Nevada, Reno, and continues to mentor undergraduate and graduate students. He is teaching topics from introductory geology to mineral deposits to hydrothermal and isotope geochemistry. Fortunately, he still seems able to convince the editors of various journals that the work his group is doing is worth publishing and the funding sources that the research is worth supporting. His students are working on geochemistry of Carlin-type gold deposits, porphyry molybdenum deposits, and epithermal veins, as well as regional sulfur isotope geochemistry as an indicator of crustal architecture. The stable isotope laboratory continues to prosper, with a number of visiting researchers over the past several years. One of his recent innovations is to develop a new method for silicate oxygen isotope analysis that obviates the need for fluorinating agents. His family is doing well, with **Emerson** about to finish his undergraduate degree and **Julia** continuing her massage and art work. Greg and Julia recently returned to flying (which was how they met), and bought a used airplane; Emerson is now learning to fly to continue the family tradition. They would look forward to visits to Reno by any of their Michigan friends.

Peter Wilf (Michigan Society Fellow '99-'02) was recently awarded tenure at Penn State in the Geosciences, and also a Packard Fellowship. He is continuing paleobotanical work on the Paleogene of Patagonia and the Western USA. As of 2006, **Rebecca** and Peter are proud to have a daughter, **Eva Tmima Wilf**. We miss our friends in Ann Arbor, please stay in touch!

Andrea Cicero (MS '00) left ConocoPhillips in Houston in June 2006 to work across the street at British Petroleum. She reports that times are good in the oil industry, and that young, experienced geologists are in demand. She still works on Permian assets, particularly in the Delaware Basin of west Texas. Her travels recently have been limited, but she spent the holidays last year in Munich, Salzburg, and Innsbruck, and took a spring cruise in the Mediterranean, visiting Croatia, Turkey, and the Greek islands.

William Eric Jones (BS '00) is employed as a Science and Math teacher at Weston Preparatory Academy in Detroit, Michigan. In February 2007, William, wife **Maura**, and daughter **Phebe** welcomed a new addition to the family, daughter **Samantha**.

John Fortuna (MS '02) worked at R&M Environmental in Oakland, California after first graduating from U-M. The work entailed on-site investigation and cleanup projects, principally at closed Navy facilities and other DOD facilities in the SF Bay area and throughout California.

In 1999, he met his future wife **Cecilia (CC)** through friends. At the time, CC was in Corporate Sales and Marketing for an historic San Francisco luxury hotel. During the course of May 2002 we were married in a small beach town in Mexico, moved to Redding, bought our first home, and started new jobs. Busy times! As a Project Geologist for SHN Consulting in Redding, one of my favorite projects dealt with acid mine drainage from the former Golinsky Mine, located on Lake Shasta near the famous Iron Mountain Mine. This project required transportation of all equipment and supplies by boat across the lake, and packing it in by foot to the remote mine site - including flumes and bags of concrete. It was a lot of work, but great views of the surrounding lake and mountains.

In 2004, CC and I returned to the SF Bay area and I have been working with Geosyntec Consultants in Oakland ever since. I am currently a Senior Hydrogeologist, and I work on projects involving site investigation and remediation, water quality and supply, and hydrogeologic studies. CC is the Executive Assistant to a Senior VP of a major investment banking firm in San Francisco. We currently live in Pacifica, CA with our 5-yr old dog Sophie. In our spare time we like to go on coastal hikes with Sophie; I also enjoying surfing regularly and CC is a longtime devotee of Bikram Yoga.

Tamara L. Gipprich (BS '02) received her MS in Geophysics in 2005 from the Colorado School of Mines, then moved to the DC area to join the Central Intelligence Agency and the fight against terrorism. She encourages those in the geosciences to consider employment in government. In her experience, there are far too few geological experts who are needed for important missions. She is currently planning a wedding with her fiance, **Kevin Volquarts**, for August 2008.

John Solum (PhD '05) and **Marie Harrison Solum (BS '01)** have moved to Houston. After working as a geologist for a nationwide environmental consulting company for five years, Marie obtained her teaching certificate and began working as an 8th grade earth science teacher in suburban Houston in the fall of 2007. John began working for Shell in 2007, following a stint on the faculty at Sam Houston State University.

Tanya Chantal Shavalia (BS '05) is currently working on her PhD at the University of Edinburgh on the dynamics of the 2004 subglacial eruption at Grimsvötn volcano, Iceland.

Holli Frey (PhD '05) and **Matt Mannon (PhD candidate)** were married August 2007 in Pennsylvania.

Helen Eaves (BS '07) is adjusting to life as a Naval Officer. She spent the first two months after graduation driving to San Diego (with stops at the Grand Canyon, Painted Desert, and Bandelier National Monument) and attending Legal Officer School and Strike School in San Diego. After graduating from Strike School, she headed to Bahrain enroute to join her ship. Bahrain was the hottest and most humid place Helen has ever been, and the charm of Bahrain wasn't aided by the sandstorm awaiting her arrival. From Bahrain, she flew to the Seychelles. The Seychelles are a beautiful island with the friendliest people you'll ever meet. Helen will become the Strike officer after serving for about a month aboard the ship. She will be in charge of the division dealing with Tomahawks and Harpoon missiles. Her main goal is to get her surface warfare officer pin. Her collateral duty (i.e. side job) will be public affairs officer. It's been a little overwhelming trying to figure out everything she's supposed to be doing in such a short period of time.

Aaron Wood (PhD candidate) and wife **Rachel** were married in August 2007.

Faculty News

Joel Blum's Michigan research group had an ad hoc beer-house reunion at the Geochemical Society Goldschmidt Conference in Cologne, Germany. Current graduate students **Gretchen Gehrke** and **Kelsey Johnson** were in attendance and both gave presentations on their research. Current Turner Research Fellow **Bridget Bergquist** presented her research (which recently appeared in Science) and will be starting as a professor at the University of Toronto in January. Current Research Faculty member **Jamie Gleason** was in attendance and gave several presentations on his work. Group members who have moved on to new positions and were in attendance include **Abir Biswas** (now a research fellow at University of Arizona), **Carmen Nezat** (now a professor at Eastern Washington University), **Bjorn Klaue** (now a Director of Technical Support at Thermo-Niton Inc.), and both **Kate Keller** and **Chris Smith** who are now with Shell Oil Company. Finally, the first graduate of the Blum group at Michigan, **Andy Jacobson**, was there and is now a professor at Northwestern University. Andy was recently awarded the coveted Packard Foundation Fellowship for his work in environmental geochemistry. We wish that **Steve Peters**, **Brian Kennedy**, **Amanda Dasch**, **Andrea Klaue**, and **Andy Lammers** could have been there for the reunion to be complete.

Youxue Zhang (Professor) had a busy summer. He spent almost three months in Peking University as a *Jiangzuo* Professor (similar to guest professor). Over the last couple of years, he set up a shock-tube experimental facility at Peking University to investigate gas-driven eruptions. The facility is currently applied to investigate the mechanism of coal outbursts. Such outbursts are the sudden ejection of coal and gas (methane and/or carbon dioxide) in underground coal mines. It happens frequently, killing hundreds of miners a year. A recent coal mine accident is Utah that killed six miners was probably due to such an outburst, instead of an earthquake. Youxue hypothesizes that such outbursts are an unrecognized type of gas-driven eruptions, and is hence investigated using the eruption apparatus. In addition to the trip to China, in the summer Youxue (together with two of his students **Hejiu Hui** and **Huaiwei Ni**) also attended the Goldschmidt Conference in Germany.

Youxue's three students are near graduation. Hejiu Hui is becoming Mr. Viscosity; he obtained the first viscosity data for hydrous melts at high-viscosity region, and constructed a new and general viscosity model that is applicable to all natural silicate melts (dry to hydrous, rhyolitic to peridotitic, and peralkaline to peraluminous melts) from high to low temperature. **Yang Chen** investigated geochemistry of recent basalts from Northeast China and is broadening to experimentally study the kinetics of mineral dissolution and xenolith digestion. Huaiwei Ni works to be Mr. Diffusion; he does not like gaps in our knowledge and is working to fill in data gaps and build models to understand water diffusion in various silicate melts as a function of temperature, pressure and water content so that bubble growth and degassing in these melts can be quantitatively modeled.

Jerry Smith has been studying drainage evolution of western rivers by documenting stream captures and spillovers, using divergence of DNA sequences in western fish populations. The method applies the DNA 'molecular clock' hypothesis, based on the constant average rate of DNA mutation substitutions in neutral genes. The breakthrough has involved calibration of the fish clocks with evolutionary stages established from the study of fossil fish in the Museum of Paleontology. Natural variations in rates of molecular change were discovered to be caused by environmental temperature and metabolic rate (for which body size is the proxy), enabling reduction in the effects of rate variability in application of the fish 'molecular clock' (recently published by Smith and colleagues in Evolution). Evidence supporting the 5.5 Ma age of Grand Canyon, which followed assembly of the Colorado River from pre-existing rivers on the Colorado Plateau and in the Great Basin is being published by Smith, **Jon Spencer** of the University of Arizona, and **Tom Dowling** of Arizona State University in two papers to appear soon in a GSA special volume on the Colorado River and Great Basin. Fish paleontology and genetics are combining to become a useful tool in geomorphology.

Dan Fisher and his students, **Adam Rountrey** and **Katy Smith**, continue their explorations of mammoth and mastodon paleobiology. Over the summer, Katy kept things rolling in Ann Arbor as she began the analysis of an interesting assemblage of thirteen tusks, all representing female mastodons, from a site in northwestern Indiana. Through her efforts and those of three UROP students last year, most of these tusks have now made the transition from bags of fragments to assembled specimens, ready for analysis. Now the real work begins! Meanwhile, Dan and Adam successfully analyzed a diminutive (ca. 7-cm-long) tusk from a baby mammoth carcass found in 2004, wrapping up the work just in time to host a film crew for the Discovery Channel, to complete a documentary (for release this winter) on the specimen. They then headed off to central Siberia to attend the 4th International Mammoth Conference, in Yakutsk, followed by additional time in and around Yakutsk, sampling mammoth tusks for a collaborative research program with **David Fox** (former

U-M geosciences graduate student and now Assoc. Prof. at Univ. of Minnesota). As David was getting married this summer (Congratulations!) he sent his current graduate student Stacy Gohman to assist in this enterprise, so there were multiple U-M (broadly speaking) representatives at work. As usual, their samples are still making their slow way through a byzantine bureaucracy for export permits, but all indications are favorable that the fruits of their labors will arrive back in Ann Arbor before long. Dan, Adam, and Stacy finally concluded their summer in Siberia with a visit to Salekhard, in northwest Siberia, where the Ural Mountains appear to dive into the Arctic Ocean. Here, they worked with the newest discovery of a baby mammoth carcass, the best-preserved of any specimen yet reported. It is a female calf, about four months old at death, found just this spring by a Nenets reindeer herder on the Yamal Peninsula. For more on this discovery, see the article, "Fisher's lab welcomes a new baby" on page 7 of this newsletter.

Rob Van der Voo's three graduate students are engaged in paleomagnetic and rock-magnetic studies of various parts of the world, and three undergraduates have joined the team with additional projects. Senior PhD student **Sasha Abrajevitch** is turning into a certified oceanographer. She is carrying out a study of sediments from the Bengal Fan, which are derived from source areas in the Himalayan foothills, and which contain iron-oxides (magnetite and hematite) and Fe-oxyhydroxides (goethite, basically) in ratios that are thought to reflect climatic conditions in the Indian subcontinent. To distinguish hematitic from goethite-bearing strata in order to deduce the monsoonal variations in the Himalayan foothills turns out to be a real challenge, as one might expect, but there is a clear signal in her preliminary results. This study is funded by a Schlanger Fellowhip of the Joint Oceanographic Institutions. In parallel, she continues to work on the Paleozoic paleomagnetism of Kazakhstan (see the accompanying illustration), in a collaborative project with **Drs. Misha Bazhenov and Natasha Levashova**, who have been Visiting Scientists in the Department two years ago, supported by a grant from NSF. Graduate student **Jim Hnat** is continuing for the PhD degree, currently investigating whether vertical-axis rotations occurred in the Tennessee Appalachians, by means of calcite-twinning and paleomagnetic studies, co-supervised by **Ben van der Pluijm** and Rob. The latest addition to our graduate student team is **Matt Domeier**, who will collect Early Triassic paleomagnetic samples from Argentina's Mendoza Province. The ultimate goal of this project is to test Pangea configurations for latest Permian and Early Triassic times.

With former postdoctoral fellow **Belén Oliva Urcia**, undergraduate student **Alison Beehr** has been investigating the latest Carboniferous – earliest Permian sedimentary strata of the Dunkard Formation in eastern Ohio and West Virginia, which are of interest because they contain a record of an unusually rare normal-polarity interval during the long Kiaman reversed Chron. Undergraduate student **Ada Dominguez** has been doing laboratory demagnetizations of samples from the 2005 collection of dikes from the Oslo area in Norway, and undergraduate **Ken Yuan** has done fieldwork in July 2007 collecting dike samples in Ukraine. Both dike swarms are thought to be of Late Permian or Early Triassic age and the anticipated paleomagnetic results hopefully will shed light on northern Europe's paleogeographic position within Pangea. Rob himself is planning to join the collecting efforts in Argentina in November and December this Fall.

Becky Lange's research continues along two main fronts: (1) thermodynamic properties of silicate liquids and (2) the eruptive history of the Mexican volcanic arc. Ex-graduate students **Holli Frey (PhD '05)**, **Qiong Liu (PhD '05)**, and **Steven Ownby (PhD '07)** have obtained a variety of positions. Holli Frey is an assistant professor at Union College in New York, Qiong Liu is a post-doctoral fellow in the Mineral Physics Group at Stony Brook University in New York, and Steven Ownby has recently taken a position with Shell Oil in Houston, Texas. Two new graduate students arrived this Fall: **Xuan Guo** and **Mary Catherine O'Leary**; they will join **Stephen Crabtree** as the three students in Becky's research group. **Jacob Hector** also has joined the group as a lab manager for the year; he graduated with his undergraduate degree in Geological Sciences from the department last year. Becky has recently taken on the departmental job of Associate Chair for Graduate Affairs.

Jeff Alt traveled to Tokyo in June with post-doctoral researcher **Roz Coggon** to attend the post-cruise meeting for ocean drilling Expeditions 309 and 312, which cored a complete section of upper ocean crust into plutonic rocks (http://www.physorg.com/news64763909.html). They met up with some old friends there, including **Damon Teagle**, former U-M post-doctoral researcer and research scientist. Besides science, the meeting included a field trip to Mt. Fuji and surroundings. In August, Jeff combined a family vacation in England with attendance at Roz Coggon's wedding at a former country estate near Southampton. Roz is finishing up various projects started while at Michigan and is beginning a new position at Imperial College in London. Jeff welcomes new grad student **Susan Alford**, from UC Davis, who will be working on hydrothermal and microbiological effects on carbon and sulfur in altered oceanic crust.

Transitions

Lars Stixrude and **Carolina Lithgow-Bertolloni** have accepted positions at University College, London, and will be leaving Ann Arbor after ten productive years on the Geological Sciences faculty at the University of Michigan.

Shanan Peters (Michigan Fellow '03-'07) accepted a tenure-track faculty position at the University of Wisconsin, Madison.

John Finarelli arrived as a Michigan Fellow from the University of Chicago in the summer of 2007. John's fields of interest are the fossil record and evolution of mammals.

Bridget Bergquist (Turner Post-doc '05-'08) accepted a tenure track position at the University of Toronto.

Heather Hill has arrived as a Turner Post-doc from South Florida University. Her research intersts are in climate, with emphasis on modeling Heinrich events.

Rasmus Thiede arrived in January 2007 as a post-doctoral researcher with Todd Ehlers. Rasmus completed his PhD work at Universität Potsdam on the tectonics of the northwest Himalaya.

Abir Biswas (PhD '07) is now a researcher at the University of Arizona, in Tucson.

Michela Arnaboldi (PhD '07) is a lecturer in the Department of Geological Sciences at the University of Michigan.

Carmen Nezat (PhD '07) accepted a tenure-track faculty position at Eastern Washington University, in Cheney, Washington.

Frannie Skomurski (PhD '07) is beginning a postdoctoral fellowship at Pacific Northwest National Laboratory, in Richland, Washington.

Martin Reich (PhD '06) is an assistant professor in the Department of Geology at the University of Chile in Santiago.

Jeffrey Rahl (Turner Post-doc '05-'06) accepted a tenure-track faculty position at Washington and Lee University in Lexington, Virginia.

Timothy Cosma (PhD '07) and **Erik Kneller (PhD '07)** accepted positions with ExxonMobil in Houston.

Amanda Dasch (PhD '06) and **Kate Keller (PhD '06)** accepted positions with Shell International Exploration and Production.

Kathryn Szramek (PhD '06) acceoted an adjunct faculty position at Washington and Lee University in Lexington, Virginia.

Maodu Yan (PhD '06) is currently a postdoctoral researcher at the University of California, Santa Cruz.

Lixin Jin (PhD '07) has accepted a position as a posdoctoral fellow at Penn State University.

Frederick (Zeb) Page (PhD '05) accepted a tenure-track position at Oberlin College in Ohio.

Holli Frey (PhD '05) accepted a tenure-track position at Union College in Schenectady, New York.

Phil Meyers (Professor Emeritus) retired on May 31, 2007. One of our famed oceanographers, Phil's research focused on the full spectrum of geochemical records derived from organic matter to reconstruct the histories of lake and marine systems. Phil began his career at Michigan in 1972 and contributed to U-M for over 35 years. We will miss both the vigor that he instilled in this area of research, as well as his dedication to the Department's spirit.

Dave Rea (Professor Emeritus) retired on May 31, 2007. When the wind blows and the dust flies, Dave always took notice. As a marine geologist, he was instrumental in providing one of the most complete records of eolian transported sediment into the ocean basins, relating them to global paleoclimate records. His work on ocean plate spreading rates remains one of the cornerstones for understanding the tectonic evolution of the Pacific ocean. We will miss his energy and his intellectual contributions to our oceanography program and to the Department.

In Memoriam

Lloyd William Staples (MS '30; Professor Emeritus of Geology at the University of Oregon) was instrumental in re-establishing the geology department. Including establishing the Center for Volcanology. He died September 19, 2001 in Eugene, Oregon.

Victor Brown Monnett (PhD '47) received his PhD from the University of Michigan for his research on the Marshall Formation. Victor most recently lived in Stillwater, Oklahoma and died on April 2, 2006.

John White Keeler (BS '50, MS '51), whose thesis research investigated gold deposits of the Precambrian Shield in Ontario and Quebec, died January 18, 2006. John most recently lived in Lafayette, Louisiana.

Gates Willard (MS '53), a Manhasset resident for 49 years, was born in Providence, RI on Feb. 1, 1930 and grew up in Harrisburg and Bethlehem, PA. He graduated from Deerfield Academy, and received his MS from the University of Michigan for his research on the origin and age of Lead-Zinc ore deposits in east Tennessee. He was an exploration geologist for New Jersey Zinc out of the Platteville, WI office, and for Stanolind Oil in Tyler, Texas. Wishing to do something "more important" he returned to the Northeast to take education courses at Queens College, Columbia and Adelphi. Afterwards, he started teaching science in the Manhasset Junior High School in 1957. Gates became assistant to the principal and later principal of the Munsey Park Elementary School in Manhasset until his retirement in 1983. Gates Willard passed away on April 5, 2006 after a long siege with Lewy Body Disease.

Gordon L. Kinney (BS '56) died August 10, 2006 in Collins, Missouri. Gordon was born in Detroit and lived near Washington, D.C. until his retirement, at which time he moved to Missouri where he owned a small farm. He is survived by his wife, three children, four grandchildren and a host of extended family members.

Laura Nymberg Ullrich (MS '79) died April 11, 2007 in Houston, Texas after a long battle against colon cancer. Laura was born on October 31, 1954 in Detroit, MI. Laura received her BS in Geology in 1977 from Notre Dame, where she was part of the first freshman class of women admitted to the university. She received her MS in Geophysics from the University of Michigan, after which time she worked in the petroleum industry for Conoco, and as a geophysical consultant. Even while undergoing treatments, she continued to dedicate herself to her profession. Laura will be interred in a cemetery at Notre Dame.

Shelby Boardman (MS '69, PhD '71; Charles L. Denison Professor of Geology at Carleton College) passed away in January 2007. Shelby, born in Ohio, graduated from Miami University with his BA after which time he joined the University of Michigan. His research in the global occurrence of Bismuth earned him a MS degree in 1969. He shifted his research focus to examine mineral deposits near Salida, Colorado and received his PhD in 1971. Shelby immediately began his academic career at Carleton College where he served in many roles, from Assistant Professor to Dean of the College. In 1994 he assumed the position of Associate Dean to be rapidly advanced to Acting Dean in 1997. He served in the role of chief academic officer, the Dean of the College from 2002 through 2005. After a year of sabbatical in 2006, Shelly returned to continue his first love, teaching.

As the President of Carleton College reflected, "He was most proud of his accomplishments as a teacher enlightening generations of Carleton students on the intricacies and wonders of geological science. His commitment to education, his generosity of spirit, and his powerful intellect were on best display in the field with his students. With a rock in his hands and surrounded by eager students, he was a wizard. Shelby was a vital part of the Carleton fabric for over thirty years."

He is survived by his wife, **Jean**; their sons and daughters-in-law **Steven**, **David**, **Karen**, and **Michelle**; and their three grandchildren, **Grant**, **Samuel**, and **Abe**.

Wind River Mountains, Wyoming

Recent Doctoral Dissertations

Abir Biswas	Source Apportionment of Mercury to the Atmosphere from Wildfires and Other Sources in the Western USA
Timothy Cosma	Dynamics of the Cordilleran Ice Sheet
Erik Kneller	Geodynamic Insights into Patterns of Shear Wave Anisotropy in Subduction Zones
Jin Lixin	Mg- and Ca- Carbonate Versus Silicate Dissolution Rates in Mid-Latitude, glaciated Soil Profiles: Implications for Riverine Weathering Fluxes and Global Geochemical Budgets
Steven Ownby	The Detailed Eruptive Histories of Contrasting Volcanic Fields in Western Mexico: Implications for the Origin and Evolution of Continental Crust
Martin Reich	Nanoscale and Atomistic Processes in Minerals
Frannie Skomurski	The Corrosion of Uranium Dioxide: An Atomic-Scale Investigation
Andrea Stancin	Downcore Analysis of Eolian and Hydrothermal Components in North and South Pacific Pelagic Clays
Maodu Yan	Paleomagnetic Insights of the Neogene Evolution of the Guide, Jiuxi Basins, NE Tibetan Plateau

Recent Masters Dissertations

Thomas Eiting	Miocene Salmon (Oncorhynchus) from Western North America: Gill Raker Evolution Correlated with Plankton Productivity in the Eastern Pacific
Cheryl Peyser	Controls on Permo-Carboniferous Precipitation over Tropical Pangea: A GCM Sensitivity Study
Adam Rountrey	Carbon and Nitrogen Isotope Analyses of a Juvenile Woolly Mammoth Tusk: Evidence of Weaning
Aaron Wood	Mammal-bearing Fluvial Conglomerates in the Paleocene-Eocene Boundary Interval (Willwood Formation, Bighorn Basin, Wyoming) and Quantification of Down-Slope Contamination
Sara Tourscher	Elemental Geochemistry, Mineralogy and Mass Transfer in Fault Segments of the San Andreas Fault Observatory at Depth (SAFOD) Drill Hole

Recent Bachelors Degree Candidates

Wareem Anani	*Minor Earth Sciences BS*
Sarah Bradbury	*Oceanography BS*
Jennifer Burnham	*Oceanography BS*
Stuart Campbell	*Minor - Earth Sciences BA*
Mary Carnagie	*Geological Sciences BS*
Michael Coelho	*Minor - Earth Sciences BS*
Bonnie Easley-Appleyard	*Minor - Oceanography BS*
Helen Eaves	*Oceanography BS*
Michelle Falardeau	*Geological Sciences BS*
Daniel Gold	*Environmental Geosciences BS*
Jacob Hector	*Geological Sciences BS*
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Rachael Kilbourn	*Minor - Earth Sciences BA*
Aaron Kohan	*Minor - Earth Sciences BA*
Michael Konieczka	*Minor - Earth Sciences BS*
Sean Lenhard	*Minor - Earth Sciences BS*
Jessica Malone	*Environmental Geosciences BS*
Avani Naik	*Geological Sciences BS*
Jacquelyn Negri	*Geological Sciences BS*
Leslie Nemazi	*Geological Sciences BS*
Sean O'Brien	*Minor - Oceanography BS*
Nicholas Olds	*Geological Sciences BS*
Suzanne Panetta	*Earth Sciences BA*
Nicholas Posavetz	*Minor - Earth Sciences BS*
David Reed	*Minor - Oceanography BSE*
Katherine Slivensky	*Minor - Paleontology BS*

Undergraduate Research Opportunity Fellows 2007

Chelsea Snodgrass	*Topography and Climate Variability Across the Coast Mountains B.C.*
John Butler	*Detrital Thermochronology, Erosion, and Climate History of the Swiss Alps*
Erin Bachynski	*Paleoclimate and erosion modeling of the Andes Mountains, South America*
Chris Spath	*Computer program development for the simulation of orogen topographic and thermal evolution*
Emily Potter	*Working on Bothwell mastodon tusks*
Megan Rourk	*Working on molding/casting mastodon skeletons*
Kevin Thomas	*Working on Bothwell mastodon tusks*
Joseph Yonkoski	*Working on Bothwell mastodon tusks*
Joshua Soble	*Analysis of Martian channels through comparison with terrestrial river channels*
Elizabeth Koury	*Sea foof through time: the history and evolutionary implications of predation*
Ibrahim Kakwan	*Pyrite oxidation and the preservation of fossils--keeping the past alive*
Nick Krupansky	*Pyrite oxidation and the preservation of fossils--keeping the past alive*
Sara Worsham	*Hydrogeochemistry of a forested watershed*

Summer Migration

In a counterflow to the northward passage of birds, students from Geological Sciences seem to be migrating southward at greater rates each summer. This year, almost half a dozen U-M graduate students accepted internships in the petroleum industry, joining a growing number of recent graduates who have found permanent employment there.

Jim Hnat and **Matt Densmore** were interns for Shell Oil this summer. Both have accepted job offers from Shell, and will soon join **Brett Peppard (MS '02), John Solum (PhD '05)**, **Mary Davis (PhD '05)**, **Steve Ownby (PhD '05)**, **Kate Keller (PhD '06)**, **Amanda Dasch (PhD '06)**, and **J. P. Brandenberg (PhD '08)** as recent Shell hires.

Franek Hasiuk and **David Whipp** took internships with ExxonMobil in Houston during 2007. Franek has accepted a position with Exxon Upstream Research. **Tim Cosma (PhD '07)** and **Erik Kneller (PhD '07)** are other recent ExxonMobil hires.

Sam Haines was employed over the summer by ConocoPhillips Company, and enjoyed arranging a field trip in Wyoming for company employees.

U-M Faculty Lead Field Trips for Shell

Kacey Lohmann discussing the Pass Peak Formation with Shell geologists during a recent field trip in Wyoming. (N. Niemi)

In September, U-M faculty **Kacey Lohmann** and **Nathan Niemi**, along with graduate students **Franek Hasiuk**, **Jim Hnat**, and **Sarah Rilling** led four days of field trips for Shell geoscientists who were attending a conference in Jackson Hole, Wyoming. The field trip route was centered around Camp Davis, and included an overview of the Paleozoic, Mesozoic, and Cenozoic stratigraphy, as well as a discussion of the Mesozoic-age deformation manifest in the Idaho-Wyoming thrust belt, early Cenozoic Laramide deformation, and late Cenozoic Basin and Range extension. Highlights were the opporunity to see the Bear River shale, an important source rock for petroleum resources in the region, and the Mississippian Madison Formation, one of the well-known reservoir rocks. Discussion of the timing of faulting in the Idaho-Wyoming thrust belt was facilitated by a journal article recently submitted by **Ben van der Pluijm (Professor)** and **John Solum (PhD '05)**(now a Shell employee) on fault gouge dating of thrust sheets along the Snake and Hoback Rivers. The group also saw **Steve Glass' (MS '78)**(now a Shell employee) thesis area.

The field trip was run twice for groups of approximately 30 Shell scientists, and each group was treated to a barbeque dinner, cooked by **Chris Malvica**, and bonfire at Camp Davis one evening during the trip. The trip attendees greatly enjoyed the crisp fall weather at camp, and the spectacular sunset views of Mts. Ann and Arbor.

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