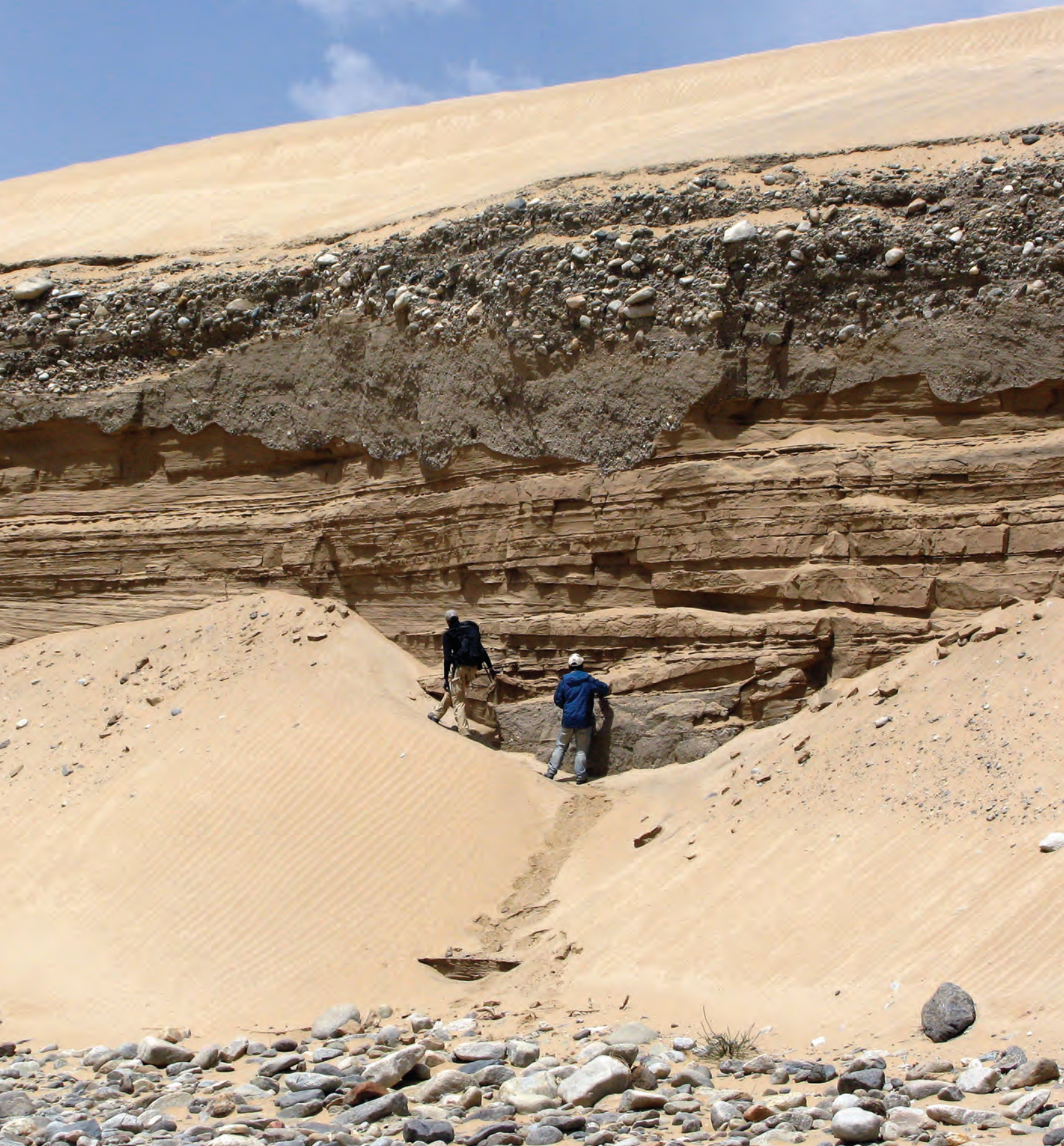


GEOSCIENCE NEWS

For Alumni and Friends of the Department of Earth & Environmental Sciences





Dear Alumni and Friends,

It is with pleasure that I send greetings in my second year as Department Chair. Perhaps the biggest news to report is the change to the name of our Department from Geological Sciences to Earth and Environmental Sciences, which took effect on September 1, 2011.

The impetus to change our name arose from our 2011 Long-Term Strategic Plan, which we were asked to write by Dean McDonald in the aftermath of an external review of our Department in 2008. Last year, while preparing that document, our faculty had numerous discussions surrounding the societal relevance of our research and teaching activities. Over the last decade, the Department's research and teaching directions have seen pronounced shifts, coinciding with national and international trends in Earth Science, toward a heightened emphasis on the societal impact of our field. Previous long-term plans guided the Department in these directions, and areas of faculty expertise are now grouped within five broad sub-disciplines, with considerable collaborations, interactions and overlaps between

them: (1) Geophysics/Tectonics of the Solid Earth, (2) Geochemistry of the Solid Earth, (3) Global Climate Change, (4) Environmental Earth Science and (5) Paleontology. Increasingly, faculty research is focused on the dynamic couplings between Earth's interior, surface topography, hydrosphere, atmosphere and biosphere. This shift toward a more integrative and interdisciplinary study of planet Earth and its co-evolution with life, combined with a stronger embrace of environmental science, led our faculty to vote to change our name.

In our 2011 Long-Term Plan, we also laid out our strategic hiring plan for new faculty. We are currently searching this year in two broad areas. The first is in *Energy/Mineral Resources*, with a focus on the origin and development of fossil energy sources, alternative energy sources, or mineral resources. The second area is in *Global Climate Change/Water Sustainability*, with an emphasis on water cycling and resource issues in relation to climate (and paleoclimate) change. In the near term, we hope to hire new faculty in two additional areas of priority: *Geochronology* and *Aqueous Geochemistry*.

Given our top hiring priority in *Energy/Mineral Resources*, we were fortunate to have Professor Scott Tinker (alumnus from our Department in 1985) give a university-wide lecture on September 26, 2011, entitled, "*A Global Perspective on the Future of Energy*". Scott Tinker is currently the Director of both the Bureau of Economic Geology and the Advanced Energy Consortium at the University of Texas, Austin. The lecture was well attended, particularly by undergraduates across the university (and I can report it received rave reviews from the students in my introductory course, Earth-120: Geology of the National Parks, as we discussed it afterward). We were especially pleased that the Associate Dean for Natural Sciences in LSA was in attendance, as well as the Directors from other units across campus, including the Graham Institute of Sustainability, the Program in the Environment, and the Energy Institute.

Another measure of how our Department is engaged in issues related to diverse energy resources is seen in the recent appointment of Professor Rod Ewing by President Obama to the Nuclear Waste Technical Review Board (NWTRB), an independent agency of the U.S. Federal Government. The NWTRB plays a critical role in advising the President and the Department of Energy on its nuclear programs, including managing and disposing of high-level radioactive waste and spent nuclear fuel. This Presidential appointment is not only a major honor for Rod, but helps to raise awareness across the campus that our Department is engaged in societally relevant issues.

Other developments in the Department include another great year for graduate student recruitment, and we now have five students with National Science Foundation Graduate Fellowships (a record high among departments in the College of LSA at the University of Michigan). On the undergraduate front, we continue to see the number of our majors and minors (>93) increase. For these students, an international field trip to Spain is planned for this upcoming spring/summer, which will be led by Professor Kacey Lohmann. Last, but not least, we are deeply grateful for the continued generosity of you, our alumni. Your gifts to the Department are of enormous help, particularly in this era of painful budget cuts during difficult economic times. We are especially pleased to announce that we received a second installment of the major gift from the Stewart R. Wallace Foundation, which I announced last year, for a total of \$1.4 million for our graduate and undergraduate students. We send our deepest thanks to all of you for your continued support.

In closing, I wish you a happy and healthy holiday season, and always look forward to hearing from you!

Becky Lange

Examining an outcrop of Cenozoic fluvial deposits in the Kunlun Mountains on the northern margin of the Tibetan Plateau.
(Photo credit: P. Yakovlev)

Thank you.

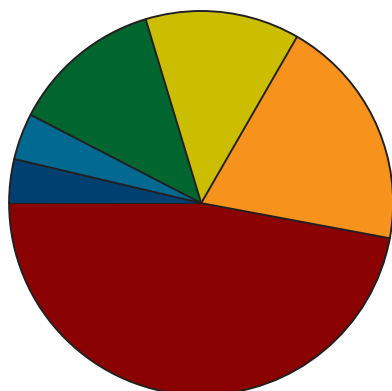
The new year of 2012 is just around the corner as the last days of 2011 are passing as quickly as they appeared. It is at this time that we can look back at the great things that our alumni have helped us accomplish and again thank you all for your continued support. Our graduate and undergraduate numbers are at all-time highs, reflecting in part the ability to provide them with help to pursue for their academic and research endeavors. Using endowment funds that have grown over the years annual giving by you, our past students and friends, we have been able to sustain a high level of financial contribution for field excursions, field camp scholarships and graduate and post-doctoral fellow support. Our success in recruiting at all levels has been enhanced because of the predictability that these funds will be sustained in coming years. We are spending your monies wisely, and through the careful investment strategies by the University, your contributions continue to grow to ensure that the financial flexibility and opportunity that our endowments provide will endure into the future.

While our past fundraising efforts have focused largely on establishing endowments to support the Department's graduate and research programs, with the increasing need by our nation to train the next generation of geological, earth and environmental scientists, we now need to attract and retain the brightest and most promising students at the undergraduate level. During this last year, the Department has grown to over 75 undergraduate majors, representing a pool of very talented students. We intend to enhance their academic experience

by increasing scholarship support and research opportunities. With this goal, we are now expanding our fundraising targets to include the establishment endowments that can provide such support. In your giving, we hope that you will consider directing some your contributions to help build these endowments to a level that will provide sustained funding for the coming decades.

Again, the Department thanks you for your generosity, both for what you have already given and what you consider for the future. Your contributions have helped build a strong and effective program at the University of Michigan.

GO BLUE!



- Graduate stipends and tuition
- Turner postdoctoral fellowship
- Field trips and Smith lectures
- Camp Davis support and scholarships
- Outreach and education activities
- Graduate student research support

How fiscal year 2011 endowment funds were spent on academic programs.

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

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Honors and Awards

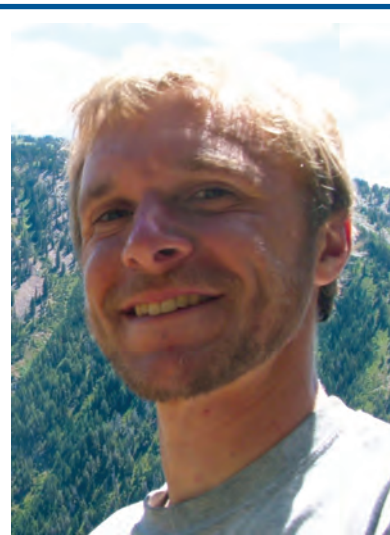
Departmental Graduate Awards 2011

Grants and Honors



John Dorr Graduate Academic Achievement Awards

Devon Renock (PhD 2011) received the Department's Dorr Graduate Award for her dissertation on *Redox Processes in Sulfide Minerals*. Devon was advised by Udo Becker and is currently an assistant professor at Dartmouth College, where he is pursuing further research into processes that occur at the mineral-water interface and which are relevant to environmental processes, contamination, and remediation.



Outstanding Graduate Student Instructor Award

Rackham Outstanding Student Instructor Award

Alex Lechler (PhD 2011) was recognized by the Department and the Rackham Graduate School for his contributions to undergraduate education as a Graduate Student Instructor. Over the past three years, Alex has served as a graduate student instructor of GS116 and GS440 at Camp Davis, as well as on campus, teaching Sedimentology, Earth Physics, the Physical World, and Computer Programming.

First-year graduate students **Tim Gallagher** and **Allyson Tessin** were awarded National Science Foundation Graduate Fellowships, and both arrive at U-M from a year spent as Fulbright Scholars.

Three U-M graduate students received GSA Graduate Research Grants, including **Meredith Dennis (MSc '12)**, in support of her MSc research on changing paleovegetation across the Eocene-Oligocene greenhouse-icehouse transition, **Meghan King (PhD candidate)** for her work on paleoclimate, and **Will Defliese (PhD candidate)** for his work on clumped-carbonate paleothermometry. Will also received the MGPV Division award for outstanding grant proposal.

Graduate students **Jennifer Cotton** and **Ethan Hyland** undertook a month-long field campaign in Argentina to compile paleoclimatic and paleoenvironmental records spanning the Late Miocene expansion of grassland ecosystems (Cotton) and the Early Eocene Climatic Optimum (Hyland). Jen was supported by an ExxonMobil Geoscience Grant, AAPG's Suzanne Takken Memorial Grant, and a SEPM Graduate Research Award. Ethan was supported by an International Research Award from U-M's Rackham Graduate School. Jen and Ethan have both also received Rackham Research Grants this year in support of other aspects of their PhD research.

Dan Horton (PhD '11) received an Outstanding Student Paper Award at the 2010 American Geophysical Union Meeting from the Paleoceanography and Paleoclimatology Section.

Stewart R. Wallace Fellowships

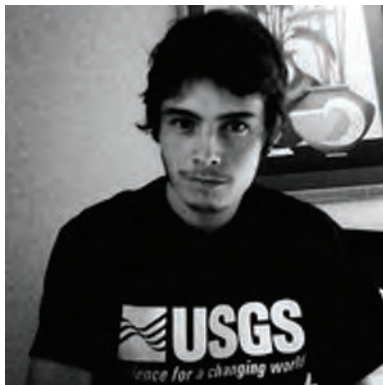
Last year we announced a bequest by **Stewart R. Wallace (MS '48, PhD '53)** of over \$1 million dollars to establish graduate and undergraduate student fellowships. One quarter of this bequest was set aside to provide undergraduate financial aid through the College of Literature Sciences and the Arts, while the remainder was endowed to the Department for graduate student support. An additional gift from the Wallace estate this year increased the graduate student endowment by almost fifty percent. Through the beginning of the 2011-2012 school year, the College of Literature, Sciences and the Arts has distributed over \$20,000 in financial aid to 19 undergraduate students study earth sciences. The additional bequest from the Wallace estate results in an endowment income generous enough to support one graduate student for an entire academic year. **Tao Wen** is the first student to be supported by this bequest.

Departmental Undergraduate Awards 2011

The Department recognizes the excellence of its undergraduates with three awards each year. The Academic Excellence award recognizes achievements in the classroom through the course of an undergraduate's education. The Camp Davis Field Geologist Award is given to the student with the strongest performance in the Geology 440 Field Course. The Eugene and Elizabeth Singer Award for Academic Excellence in Geology is awarded annually to a student of junior standing who has demonstrated the highest level of academic achievement in their class.



**Mastura Johari (BS '11) (l.)
Ka Yan Semechah Lui (BS '11) (r.)**
Academic Excellence Award



Evin Maguire
Camp Davis Field Geologist Award



Keegan Melstrom (BS '12)
Eugene and Elizabeth Singer Junior Achievement Award

Geoclub and SGE Awards

Geoclub continues its tradition of honoring students and faculty through teaching awards, the Alumni Undergraduate Award to an individual who has made outstanding contributions to the Department through spirit and service, and to undergraduates to help defray the costs of textbooks and field equipment. Nine recipients this year received awards from Geoclub.



Laura Waters
Geoclub Best GSI Award



Alistair Hayden (BS '10)
Alumni Undergraduate Award

Book Awards

- Zac Calamari (BS '12)
- Molly Blakowski (BS '12)
- Walter Afonso (BS '13)
- Meredith Dennis (BS '12)
- Izyan Dzulkifli (BS '12)
- Keegan Melstrom (BS '12)

Field Gear Awards

- Marissa Gunnarson (BS '12)
- Alistair Hayden (BS '11)

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



Steve Kesler
Geoclub Best Teacher Award

Undergraduate **Stephanie Chen** received a PitE Individual Enrichment Scholarship award that covered part of her travel to attend the annual GSA Meeting in Minneapolis, where she gave a talk describing her ongoing plant taxonomy and proxy development work with current Michigan Fellow Selena Smith.

Rod Ewing (Professor) was appointed by President Barack Obama to the Nuclear Waste Technical Review Board. The Board evaluates the technical validity of Department of Energy (DOE) activities related to implementing the National Waste Policy Act, and provides objective expert advice on nuclear waste management to Congress and the Secretary of Energy.

Udo Becker (Professor) and **Jie (Jacki) Li (Associate Professor)** were elected as Fellows of the Mineralogical Society America.

Joel Blum (Professor) was elected to the American Association for the Advancement of Science (AAAS).

Phil Gingerich (Professor) was named an Honorary Corresponding Member of the Palaeontologisches Gesellschaft.

Ingrid Hendy (Associate Professor) received a Marie Tharp Visiting Fellowship to the Lamont Doherty Earth Observatory at Columbia University.

Jie (Jackie) Li (Associate Professor) was selected as a 2009-2010 COMPRES Distinguished Lecturer.

Ben van der Pluijm (Professor) received the 2010 University Award for Service and Leadership. Ben has taken a leave of absence from the University of Michigan for the 2011-2012 academic year to serve at the National Science Foundation, where he is a Program Manager for the Science, Engineering and Education for Sustainability Program.

R. Lawrence Edwards (MS '86), the George and Orpha Gibson Chair of Earth Systems Science and Distinguished McKnight University Professor in the Department of Geology and Geophysics at the University of Minnesota is the recipient of the 2011 Arthur L. Day Prize and Lectureship of the National Academy of Sciences for his contributions to understanding the physics of the Earth, and a newly elected member of the National Academy of Sciences.

John Bowman (PhD '78) was elected a Fellow of the Geological Society of America.

Steven Bohlen (PhD '79) was appointed Deputy Program Director for Energy and Environmental Security in the Office of Strategic Outcomes. Steve will work to increase the mission impact of Lawrence Livermore National Labs Energy and Environmental Security programs, which support a broad range of DOE and Industrial needs in areas of climate change, energy systems analysis, smartgrid, and energy technologies across renewable, fossil, and nuclear.

Chester C. Langway Jr. (PhD '65), Professor and Chairman Emeritus in the Department of Geology, State University of New York at Buffalo, was among the nation's most influential artists, scientists, scholars, authors, and institutional leaders who were inducted into the American Academy of Arts and Sciences at a ceremony in Cambridge, Mass. on Saturday, October 1.



Chester C. Langway Jr., Professor and Chairman Emeritus in the Department of Geology, State University of New York at Buffalo, signs the American Academy of Arts and Sciences

Peter van Keken (Professor) has been appointed as the Associate Chair for Undergraduate Studies.

Tom Merline (Staff) has retired from the Department after nearly 30 years of service.

Please redirect your browser...

The Department's name change coincides with a College-wide effort to upgrade web services, so please visit our **new** Department web page at its **new** URL:

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

Remember, you can always update your address and contact information, and e-mail preferences, through the website by choosing the Alumni & Friends menu. You're also welcome to use this form to keep us up-to-date on your latest news, which we happily collect for the annual Newsletter. If you'd like to send us a photo, please e-mail us at earth.alum.addr@umich.edu.

The Department's social media pages have migrated, as well. You can now friend us on [Facebook](#) or join us on [LinkedIn](#) by searching for our new alumni group -

University of Michigan EARTH-Geoscience Alumni

FACULTY NEWS

Calls to wrangle newly discovered mammoths and mastodons are lately coming so thick and fast to **Dan Fisher's** lab that this summary shall focus on only two of this past summer's ventures. In the first, Dan and **Mike Cherney** (just starting our PhD program), along with Dan's wife, **Cindy**, and son, **Noah**, joined a crew from the Denver Museum of Nature & Science at the recently discovered high-elevation Pleistocene site near Snowmass Village, Colorado. The assemblage recovered there includes at least two mammoths, some thirty-five mastodons, and several giant bison, ground sloths, and deer. These are all older than about 40,000 years before present and thus offer insight into the ecology of Pleistocene faunas long before the extinction that swept away many of these same taxa ten thousand years ago. Among many directions in which work on this site will likely go, Dan and Mike began to focus on the circumstances of death for the mastodons in the fauna in order to understand the nature of the assemblage and its relationship to its source population. Returning from the field with tens of specimens, they set about to determine the distribution of seasons of death to help resolve whether these were isolated deaths or whether multiple individuals might have succumbed in single events. In this, they were joined by postdoc **Adam Rountrey**, while undergraduate assistants, **Zac Calamari**, **Patrick Lind**, and **Helen DeMarsh** kept other projects moving forward, Honors student **Alistair Hayden** wrapped up an Honors thesis on modeling tusk growth, and undergraduate **Chris Whalen** and recent graduate **Ethan Shirley** helped analyze CT scans of baby mammoths. An intense, coordinated push yielded the first answers just in time for the arrival of a National Geographic film team making

a documentary on Snowmass, but as for what we learned, we are sworn to secrecy until the broadcast, sometime next year!

Not long after the departure of this film team, Dan and Adam left for Siberia to meet colleagues in Moscow and Yakutsk, and another film team (this one from the BBC), before continuing to Pevek, on Russia's northeast arctic coast. Here they boarded an antiquated Russian vessel, the "Professor Molchanov", bound for Wrangel Island. Today, Wrangel Island is an isolated biological reserve where walrus, seals, muskoxen, polar bears, lemmings, and birds are the most numerous inhabitants. Among those who study mammoths, Wrangel Island is known as the home of the last-surviving woolly mammoths, which did not die out until about

3600 years ago. Dan and Adam and colleagues came to Wrangel because it had been almost ten years since anyone had done systematic fossil collecting there, and they were eager to learn more about the last mammoths and the ecological stressors that attended their eventual demise. Prospecting for fossils poses even more challenges now than it did for earlier workers. Loss of sea-ice around Wrangel Island means that the region's polar bear population is forced ashore in late summer to hunt and scavenge in both coastal and inland areas. Traveling mostly in open ATVs, exposed to every extreme of weather and topography, and sleeping in small shelters built of scrap lumber and tar paper, with doors and windows protected by boards with outward-facing nails, Dan and Adam's team had less than two weeks to work and managed to cover only a fraction of the island area. They nevertheless



The physical oceanography/ocean modeling group on August 17, 2011. The group, led by newly hired Assistant Professor Brian Arbic, examines the dynamics and energy budgets of oceanic tides, eddies, and the general circulation, using realistic numerical models, idealized numerical models, and a variety of in-situ and remotely sensed observations. The group is funded by the National Science Foundation and the Office of Naval Research.

*Left to right: **Alfredo Wetzels** (graduate student, Applied Mathematics), **Joseph Ansong** (Postdoctoral Fellow), **Aaron Skiba** (Undergraduate student, Aerospace Engineering), **Libo Zeng** (Undergraduate student, Physics), **Brian Arbic**, **David Trossman** (Postdoctoral Fellow), **Andrew Morten** (graduate student, Physics), **Patrick Timko** (Postdoctoral Fellow)*

Photo credit: Dale Austin



From left to right, **Ethan Hyland (PhD candidate)**, **Meredith Dennis (MSc student)**, **Nathan Sheldon (Asst. Professor)**, and **Selena Smith (Michigan Society Fellow)** are near the top of a butte of earliest Oligocene strata near Matador Ranch in southwestern Montana.

collected and/or sampled over sixty specimens, roughly two thirds of the number recovered in nearly two decades of earlier work. There remain some complex bureaucratic issues to resolve before analysis can begin, but the first phases of this work could not have been more successful. Visions of muskoxen grazing on the colorful autumn tundra of Wrangel Island now fill Dan and Adam's dreams ... and slowly transmute into woolly mammoths.

Nathan Sheldon's lab group welcomed **Tim Gallagher**, a recipient of a prestigious NSF Graduate Fellowship, this fall after he returned to the US following the completion of a Fulbright Fellowship to Sweden. The rest of the group also had a busy year, undertaking NSF-sponsored field research on Precambrian rocks in northern Michigan and northern Minnesota, on Cenozoic paleoclimate and paleoecology in Montana, and jointly with **Greg**

Unnamed glacier in the Tanghla Mountains, 5400 m elevation, central Tibetan Plateau. (Photo credit: N. Niemi)



Dick's group on submerged sinkhole microbial mats in Lake Huron. Graduate students **Jen Cotton** and **Ethan Hyland** received a series of research grants that supported a month-long field campaign in Argentina to look at Paleogene and Neogene climatic and vegetation changes. Ethan's bid to spend the entire summer away from Ann Arbor also included fieldwork in Montana where he assisted **Meredith Dennis** with her 5th year masters fieldwork, in Wyoming, and teaching at Camp Davis. Undergraduate **Stephanie Chen** worked with Nathan and with **Selena Smith** on modern and ancient phytolith extraction, and undergraduates **Tess Nugent** and **Christie Wilkins** worked on isotope ecology of modern plants, with Christie joining Jen in field for work on carbon cycling in modern soils. Post-doc **Mike Hren** continued to develop the clumped isotope thermometry method in concert with **Kacey Lohmann's** group, and had to sort through no fewer than 6(!!!) offers of faculty positions before settling on a move to the University of Tennessee at the end of 2011.

Nathan Niemi traveled with **Lydia Staisch (PhD candidate)** and **Petr Yakovlev (Graduate Student)** to the northern margin of the Tibetan Plateau in May to undertake geologic mapping, sample collecting, and other field work as part of a collaborative research endeavor to understand

the timing of the northward growth and uplift of the Tibetan Plateau. The highstanding Tibetan Plateau (~5 km mean elevation) significantly influences regional climate, and is a large enough feature to divert the jet stream and modulate climate on hemispherical scales. When, and how, Tibet grew in both areal extent and mean elevation is an important constraint on understanding paleoclimate records from throughout eastern Asia, and better understanding feedbacks and interactions between atmospheric and solid earth processes. **Marin Clark (Asst. Prof)** is also a principal investigator on this project, which has several Michigan connections, including collaborations with University of Minnesota geochemist and paleoclimate scientist **Larry Edwards (MS '86)**, and University of Washington atmospheric scientist Gerard Roe, who grew up in Ann Arbor, as well as earth and atmospheric scientists from the universities of Arizona; California, Berkeley, Colorado at Boulder, Rochester, and Wisconsin.

During the past academic year, 2010-2011, **Rob Van der Voo** had a one-semester scholarly leave of absence (SLA), granted by the College of L.S. & A., and a one-semester sabbatical leave. The SLA was granted because Rob was invited to spend the year as a fellow of the Centre for Advanced Study (CAS) at the Academy of Sciences and Letters in Oslo, Nor-

way, and to be a member of a team of geoscientists investigating the link between deep-earth processes and surface plate tectonics. The team's leader was Professor **Trond H. Torsvik (U-M Visiting Scholar 1993-1994)**, of the Norwegian Geological Survey and the University of Oslo. About a dozen fellows were in residence at one time or another and contributed their expertise (seismologic imaging (tomography), mineral physics, plate kinematics and paleogeography, computational geodynamics, etc.). My own contributions were initially primarily related to surficial plate kinematics as based on paleomagnetic results, but evolved during the year to include more and more a paleogeographical slant.

It has been known for a couple of decades or more that two large low-shear-wave velocity provinces (LLSVP's) occupy antipodal equatorial positions in a couple of 100-km-thick patches above the core-mantle boundary. These are centered below equatorial Africa and the equatorial southwest Pacific and coincide with low-degree geoid anomaly regions. The patches are often described as thermo-chemical piles, are clearly negatively buoyant (i.e., denser than normal lower mantle), and yet likely at elevated temperatures in order to be visible as negative S-wave velocity regions. In the early 1990's it was recognized that hot spots (where hot rising plumes of mantle material cause

mid-plate volcanism at the surface) were principally located at the edges of the LLSVP's. This then led the CAS-group leader Trond H. Torsvik and his co-author K. Burke to investigate and conclude that ancient plume locations could, upon plate kinematic reconstruction, also best be thought of as originating at the LLSVP-edges. In turn, and of great importance for my own paleogeographic interests, this led to the demonstration that diamond-bearing kimberlites also to large extent did erupt at the surface in locations above the edges of the LLSVP's. Turning the argument around in our joint project (Torsvik, with RVdV and others), kimberlite occurrences have been reconstructed to their paleolatitudinal locations derived from paleomagnetic data for Paleozoic times, and then paleolongitudinally placed at appropriate edge locations of the LLSVP's. Rob gave presentations of these novel approaches to the determinations of ancient paleolongitudes (not ever done before) at the December 2010 AGU meeting in San Francisco, at the April 2011 EGU meeting in Vienna and, responding to invitations, at the May 2011 Kongsberg Conference and in June 2011 at the Federal Institute of Technology (ETH) in Zürich, Switzerland. Publications are being prepared in the coming year from these aspects in several submissions to international journals.

Rob arrived in Oslo in August 2010 with previous projects ap-



proaching initial manuscript status, resulting from a NSF-funded (“Pangea”) project to refine the paleomagnetic results for the European, North American and southern continents (South America, Africa, etc.) for Late Permian – Early Triassic times. Six of these Pangea-manuscripts were prepared by graduate students **Ada Dominguez (MSc ‘12)**, **Kenneth Yuan (MSc ‘10)**, and **Mathew Doemeier (PhD ‘11)**, with co-authorship of Rob, Trond Torsvik, and several others. Seven other manuscripts were also completed in this obviously most

productive academic year, and two or three more are planned for submission later this calendar year.

Dr. Fatim Hankard, a post-doctoral fellow in paleomagnetism working with Rob is nearing completion of her time in Ann Arbor. She has collected samples for paleomagnetism from various rock formations in eastern Canada and from the Catoctin Formation in Virginia, in order to determine paleomagnetic latitudes for Laurentia in Ediacaran time. Graduate student Ada Dominguez, meanwhile, has sampled and worked on the pa-

leomagnetism of various extrusive Paleozoic formations from Kazakhstan and Kyrgyzstan, and the Miocene of the Columbia River Basalts in Oregon, Washington and Idaho. She is assisted this Fall by two undergraduate students **Syamil Razak** and **Zach Menzo**, who are aspiring to graduate with honors upon completion of an Honors Thesis on the results from these samples. The aims of the latter projects are to attain a more accurate characterization of the secular variation in Miocene and Paleozoic times.

X-ray vision: What Synchrotron Tomography Can Reveal About Past Ecosystems

This past August, I returned to the Swiss Light Source (SLS), Paul Scherrer Institute, in Villigen, Switzerland to spend a few days doing synchrotron radiation tomographic microscopy (SRXTM) with colleagues Margaret Collinson (Royal Holloway University of London) and **Nathan Sheldon (Asst. Prof.)**. The SLS is set in a pastoral Swiss countryside, along the Aare river with the tinkling of cowbells heard from across the road and a short walk to the quaint village of Villigen. The TOMCAT beamline that we use for SRXTM is similar to a medical CT scanner in that it shoots X-rays through specimens (in this case, less than 1 cm diameter) and takes photographs over a range of angles (tomography). Synchrotron light is generated from electrons travelling very fast; at SLS, electrons are accelerated in a cement-encased ring 945 feet in circumference, kept on their circular path by magnets.



Top row, left to right: The entrance to the SLS building, and inside the SLS. Bottom row, L to R: The Bird-of-Paradise plant, *Strelitzia reginae*; a seed from the Bird-of-Paradise plant; a digital longitudinal section through this seed produced from synchrotron X-ray tomographic microscopy.

Our goal is to study fruits and seeds in an effort to understand Eocene and tropical vegetation. Part of this continued a long-term project on fruits and seeds from the Messel World Heritage Site in Germany, which is about 49 million years old (middle Eocene). The ani-

mals from this locality are famous – you may remember *Ida*, the primate that was discovered last year – but understanding the plants helps us put the animals into an ecological context. While the plants have been studied for decades and we know that a dense, lush subtropical forest once grew here, there are many plant fossils that still have not been identified, which means we cannot fully comprehend evolution of the plants involved and the biodiversity of this system. In addition, some of the fossils are quite rare and destructive sampling needs to be avoided; and yet, we need to know features inside fruits and seeds in order to identify them (think of a cranberry, blueberry, and cherry: if they were black in color and squashed flat – which is what’s happened to many of the Messel fruits during fossilization – how could you tell if they were different or not, except by cutting them open?). So far, SRXTM has been useful for identifying at least five species and we are in the process of analyzing more. The more up-to-date species list produced by these data will help undergraduate UROP student **Germain Burchfield**, who is looking at Eocene biodiversity. Our third project was to study seeds from living bananas, gingers and relatives – the order Zingiberales – to look at seed structure. This group of tropical plants dates back to the late Cretaceous, about 90 million years ago, but fossils are hard to identify when we do not have enough data about the modern relatives with which to compare them. These data will be used for comparison of two types of seeds from Messel that might belong to this group, as well as other previously described fossils. **Catherine Hu**, an undergraduate UROP student, is currently analyzing these datasets to find features that are unique to the different groups within Zingiberales.

Selena Smith is a paleobotanist and a member of the Michigan Society of Fellows.

Faculty Positions Open at Assistant, Associate, or Full Professor Level

The Department of Earth and Environmental Sciences at the University of Michigan is searching for candidates in the areas of Energy/Mineral Resources and Climate Change/Water Sustainability, at the assistant, associate or full professor level, starting September 2012. This is a university-year appointment. We encourage applications from candidates with established records of research and teaching in either of these areas.

Energy/Mineral Resources: Candidates for this position should investigate processes key to the origin and development of fossil energy sources, alternative energy sources, or mineral resources. Research areas might include, but are not limited to: (i) formation of mineral or energy deposits using sedimentology, aqueous geochemistry, or high-temperature geochemistry; (ii) exploration for deposits using reflection seismology or exploration geochemistry; and (iii) research relevant to alternative energy development or carbon sequestration. Candidates may use field, and/or experimental studies, and/or modeling.

Global Climate Change/Water Sustainability: Candidates for this position should investigate water cycling and resource issues in relation to climate and paleoclimate change. Areas of expertise might include, but are not limited to: (i) hydrological cycling with emphasis on atmosphere and/or land surface processes; (ii) monitoring and modeling of surface and ground water, vapor, snow, and ice; and (iii) impacts of climate change on water availability and quality. Candidates may use field, monitoring, and/or experimental studies, geochemical or geophysical techniques including remote sensing, and/or modeling.

The successful candidate is expected to establish an independent research program and contribute to undergraduate and graduate teaching. More information about the Department and these positions can be found at: <http://www.lsa.umich.edu/earth>.

A GeoCorps Experience

Though Dinosaur National Monument is known for its renown dinosaur quarry there is a great deal more to see in the park than just fossil bones. As a GeoCorps intern it was



my job to explore the early Jurassic Nugget sandstone of the park. The goal of the project was to find any evidence of life in the form of trace fossils. By the end of the summer we had found a number of invertebrate burrows, spider and scorpion tracks, and even the occasional vertebrate footprint. After working in the Nugget formation our team searched for vertebrate remains in the Stump formation, conducted a census of the tamarisk beetle population on the Yampa River, and participated in exciting government safety seminars. It was an incredible summer job filled with dinosaurs, fossil trackways, and the occasional snake.

Keegan Melstrom is a senior in the Department of Earth and Environmental Sciences.

The Michigan Basin Geological Society (MBGS)

celebrated their 75th Anniversary on April 6th at the Michigan Geological Repository for Research and Education (MGREE) in Kalamazoo, MI. The Society was formed in 1936 by a group of exploration geologists to discuss



oil and gas drilling activities in the Michigan Basin. The group started meeting in the Saginaw area, but monthly meetings have since been held in Detroit, Jackson, Lansing, Grand Rapids and Traverse City. MBGS has run many annual field trips in and around the Michigan Basin to outcrops in Ontario, Ohio, Indiana, Illinois, Wisconsin as well as Michigan. More recent programs have covered hard rock, glacial, reservoir evaluations and environmental geology subjects. The Society offers grants for original research by graduate geology students. **Curt Lundy (BS '54, MS'58)** was one of seventeen past Presidents of MBGS present for the occasion. The MGREE facility at Western Michigan University in Kalamazoo is a premier gathering place for collected cores and drill cuttings from mineral and hydrocarbon wells drilled in Michigan. Much of the core material gathered by the University of Michigan Geological Sciences Department over the years has been relocated to Kalamazoo for research access.

A New Approach for Measuring Subglacial Water Residence Time

A number of recent articles (e.g. Bell, 2008; Parizek, 2010; Bartholomew et al., 2010), meetings (e.g. West Antarctic Ice Sheet Meeting 2010), and funded NSF proposals (NSF-OPP Antarctic Whillans Ice Stream Subglacial Access Research Drilling, WISSARD) have stressed the importance of understanding the evolution and fate of subglacial water in relation to ice-sheet mass balance. Subglacial water will be collected from the new ice core (NEEM) location in Greenland and from the WISSARD site in West Antarctica with the goal of understanding the role of subglacial water in ice-sheet stability. Surface melt water drained through the ice, basal melting and aquifer flux can all contribute to subglacial water. This subglacial water can lubricate the bed directly and/or saturate till, both of which can lead to an increase in ice velocity and ice thinning. However, the relationship between subglacial water volume changes, transport and ice-sheet velocities remains poorly understood. One way to investigate this relationship is to examine the residence time of the subglacial water as it moves through the hydrologic network. The residence time of subglacial water is uncertain - early studies indicated long residence times (~4-100 ka) beneath large ice sheets, while more recent studies of the Greenland margin indicate short residence times (seasonal) due to increased surface melt. Even shorter residence times have been suggested for alpine glaciers (hours to days). However, all of these ages are based on modeled surface and basal melt rates rather than direct measurement.

U-series isotopes have been used regularly to determine residence time of water in aquifers and rivers based on the decay of ^{238}U to ^{234}U and ^{234}U to ^{230}Th . The energetic decay of ^{238}U to ^{234}Th (with a rapid decay to



Sarah Aciego (Asst. Professor) setting up the chemistry in the carboy of filtered water for the iron co-precipitation of the uranium.

^{234}U) results in recoil of the daughter from sediments and accumulation in water; the concentration of ^{234}U (and the activity ratio $^{234}\text{U}/^{238}\text{U}$) will depend on the half life of ^{238}U and ^{234}U (350 ka), the volume of water, surface area of the bedrock or sediment, and the residence time of the water. Radon-222 is produced in the same ^{238}U decay chain, but has a much shorter half-life (days). By measuring both daughter isotopes, we should be able to determine the residence time of subglacial water.

Carli Arendt started working with Sarah Aciego in December of 2010 and together they have explored this idea for Carli's PhD thesis. They investigated the legitimacy of using the ^{234}U - ^{222}Rn excess technique to measure residence times over the summer of 2011. They chose the Athabasca glacier, part of the Columbia Icefields in Jasper National Park in Canada, as our test site for the project.



Carli Arendt (Graduate Student) setting up the tagline profile for river discharge measurements.

The Columbia Icefields have the highest accumulation rates south of the Arctic Circle, has runoff reaching the Arctic, Pacific, and Atlantic Oceans, and is a significant contributor to the Northern Hemisphere's water supply. The Athabasca Glacier is well-known to scientists and tourists alike because of its easy accessibility: the glacier extends down to within 2 kilometers of the Icefields Parkway road that connects Banff and Jasper. In normal summers, it is possible to walk to the glacier toe in 5 minutes. In order to make the field season economical and efficient they rented a primitive cabin, also a short hike off of the Icefields Parkway. However, the 2011 summer was an anomaly across the American and Canadian West and the snowpack was in excess of 6 feet at the beginning of May, which resulted in long snowshoe treks to and from the cabin and the field site.

The research group - Sarah Aceigo, Carli Arendt, and field assistant and PhD student Sarah Aarons - collected filtered water samples daily for 2 months: May, at the beginning of the summer melt season, and July, at the peak of summer melt. They measured the daily meltwater discharge using an ADV (acoustic Doppler velocimeter).



Sarah Aarons (Graduate Student) using a field radiation-counting device to measure ^{222}Rn .



Sarah and **Carli** collecting glacial meltwater samples for collaborative research on noble gases in meltwater with U-M Associate Professor Clara Castro.

The long, daily sampling season allowed them to assess potential changes in subglacial water reservoir size (and residence time) and the change in residence time as the subglacial hydrologic network formed. Discharge measurements required suiting-up in waders and spending 45 minutes in 0.5°C water with miniature icebergs floating by (**Photo 1**).

Measurement of uranium isotopic compositions require large quantities of melt water because of the low trace element concentrations, therefore water, $\sim 20\text{ L}$, was filtered. In order to minimize the total amount of material transported back to Ann Arbor, iron co-precipitation was used to concentrate the trace elements (**Photo 2**). Concurrent with the collection of water for uranium measurements, 500 mL of unfiltered water was collected in order to measure ^{222}Rn in the field using a field radiation-counting device (**Photo 3**).

Samples were also collected as part of a collaboration with faculty member Clara Castro to measure noble gases in glacial meltwater. In order to minimize the exsolution of gases from the meltwater and atmospheric exchange, samples were collected as close to the glacier toe as possible. The high discharge and turbulence of the melt required two people to work in tandem to collect a water sample isolated from atmospheric contamination (**Photo 4**).

Since coming back from the field the group has already finished processing and analyzing the samples for uranium isotopic compositions and the ^{234}U - ^{222}Rn results will be presented at the 2011 AGU meeting in San Francisco.

Sarah Aceigo is an assistant professor in the Department of Earth and Environmental Sciences.

Camp Davis Gazette

The first phase of Camp Davis renovations is now complete, and includes new three-season insulated cabins on the east side of camp. In addition, the camp infrastructure has been completely overhauled and now includes underground electric supply, new sewer and plumbing lines, and a centralized septic field. Attention has turned to providing the finishing touches on the cabins, which include steel name plaques that are being placed on the finished cabins to complete the naming process for those cabins that were generously sponsored by our alumni and friends.

The new cabins and infrastructure have been highly regarded by the faculty, students, and camp guests who have used them, and plans are now underway to continue with renovations to the infrastructure and cabins on the west side of the Camp.



Jillian Drow Memorial Fellowship Fund

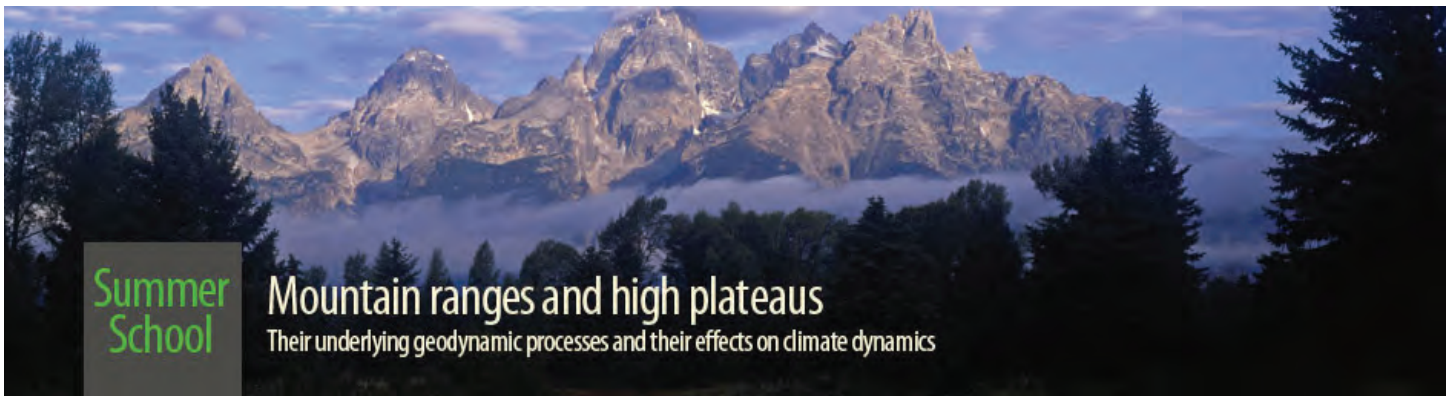
Debra and Mark Drow have generously established the **Jillian Drow Memorial Fellowship Fund** to “be used to award scholarship support for students to attend the summer program at Camp Davis Rocky Mountain Field Station.” Their daughter, Jillian Drow, was a Program in the Environment major and was a student in the GeoSci 116 Introductory Geology course at Camp Davis during the summer of 2010. Jillian died in a tragic accident while hiking in the Grand Teton National Park on a day-off from class. Jillian was a special person who brought a love of life and infectious enthusiasm to all of her activities. She was a varsity diver and mountain bike racer, and had a love for adventure. The Department of Earth and Environmental Sciences is soliciting donations from our alumni and friends for this fund. We hope to raise sufficient funds to establish an annual scholarship for students who participate in the Camp Davis program. If you would like to make a donation, please see the gift envelope included with this newsletter.



The plaque above identifies the Doris Arnold Cabin at Camp Davis, named in honor of the mother of long-time Camp supporter Jack Barnes.

Snake River near Little Greys River anticline, Snake River Canyon.





In late summer 2011, after U-M's regular summer field courses were complete, Camp Davis hosted a two-week-long summer school that brought together thirty graduate students from across the United States, Europe and China. The summer school was organized as part of the education and outreach component of a National Science Foundation Continental Dynamics grant, in which U-M faculty **Marin Clark** and **Nathan Niemi** are participants.

The purpose of the summer school was to cross-fertilize graduate students studying solid earth processes, specifically geodynamics and tectonics, with their counterparts in the atmospheric and climate sciences, and to explore ways in which geodynamics processes, particularly those that lead to high topography, effect regional and global climate, and, in turn, the feedbacks that climate change has on the evolution of topography. Instructors from the universities of California, Colorado, Michigan, Rochester, Washington, and NASA's Jet Propulsion Laboratory organized the academic content of the course, and logistical support, as well as lodging and boarding, were provided by the staff at Camp Davis.

The location and facilities at Camp Davis were highly regarded by all attendees of the course. The classroom building provided lecture space for the forty students and instructors on hand, and the computer lab and



Plateau Summer School students and faculty pose for a photograph in the Wind River Range, where the group discussed the competing effects of topographic uplift and glacial erosion in high-standing mountain ranges.

available broadband internet access afforded students the opportunity to work on atmospheric and climate dynamics models as part of the course labs and independent student research projects.

Field trips to classic localities such as the Wind River Range and Green River basin, a day-hike into Cascade Canyon in the Teton Range, followed by an evening river-side chuckwagon dinner and Snake River float trip, and an all-day excursion to Yellowstone National Park, with a stir-fry dinner on the shore of Yellowstone Lake at Gull Point were enjoyed by the students. These field trips also offered the students the opportunity to explore a wide range of geologic phenomena, and to discuss models and evidence for why the western United States is a high standing orogenic plateau, what geologic records could be tapped in order to understand the geologic and paleoclimatic history of this region, and the effects that the Basin and Range and Yellowstone Plateau have on local and regional climate.

The course was a great success, and the instructors hope to return to Camp Davis to offer the summer school again in two or three years.

Nathan Niemi is an assistant professor at U-M.



Graduate students attending the Plateau Summer School sit and listen to a student-led lecture in the shadow of the Grand Tetons on active normal faulting in the Basin and Range.

Field Trips

Mineralogy



Clockwise from upper right: The U-M mineralogy class on North Knob of the Harding pegmatite, New Mexico; fall break 2011.

At White Rock, NM, at the overlook of the Rio Grande Gorge.

Christie Wilkins (BS '12) holding a shatter cone at an impact site just outside of Santa Fe.



Geophysics

Marin Clark (Assistant Professor; red hat) and **Jeroen Ritsema (Associate Professor; yellow hat)** lead a Halloween weekend gravity survey across the Midcontinent Rift in central Michigan as part of Applied Geophysics.



Department field trips are generously supported by gifts from our alumni, and by grants from Shell and British Petroleum.

Geomorphology



Above: Landslide Destruction. Students calculate failure probabilities of a shallow landslide in Northeastern Kentucky that was activated after road construction changed the hill-slope angle; the landslide damaged or destroyed several homes in the spring of 2010.



Above: Lunch stop at Sleeping Bear Dunes. On the field trip to Sleeping Bear Dunes to examine glacial and coastal geomorphology processes the class took a lunch and swimming break on a the shore of Lake Michigan. September, 2011.



Stratigraphy

Above: Students in Earth's Surface and Sediments (GeoSci 305) measure and describe Silurian strata at Glen Helen Nature Preserve near Yellow Springs, Ohio, to compare with regional thickness variations in Silurian strata in central Ohio.

Left: Students explore a well-preserved Silurian-aged reef deposit at Oakes Quarry Park near Fairborn, Ohio.

ALUMNI NEWS

Joe Murphy (BS '09) wrote after receiving the last version of the Alumni Newsletter. He currently serving in the Army in Afghanistan with 10th Mountain Division. He arrived in October 2010 and expects to be stationed there for a year. When he's not in Afghanistan, Joe has relocated to Sacket's Harbor, NY, and hopes to get back into geology or environmental engineering after leaving the Army.



Joe Murphy (BS '09) (on the right) and **Oliver Nakad (BS Political Science, '09)** preparing to watch the 2010 Michigan-Ohio State game at Kandahar Airfield, Afghanistan.

Elizabeth Ferris (PhD '09) was awarded one of 10 National Science Foundation Earth Science Postdoctoral Fellowships for 2010. She spent last winter in Washington, D.C. working on nuclear power-related policy at the National Academy of Sciences, and began her postdoctoral fellowship at the Columbia Lamont-Doherty Earth Observatory this fall, working with Terry Plank and Dave Walker on diffusion of water in clinopyroxene.

Jared Halonen (BS '08) was 1 of 12 individuals selected from over one hundred applicants to enroll in Basic Officer Training to become a commissioned officer in the National Oceanographic and Atmospheric Administration Corps. Jared is currently completing his training on the U.S. Coast Guard Cutter Eagle. After training, Jared will be assigned as an officer to one of the eighteen NOAA research vessels, a perfect career for a dual-degree student in geology and oceanography, who's hobbies are sailing and scuba diving.



After getting her degree in Geology at U-M, **Jackie Negri (BS '07)** moved to Golden, CO to work as a summer intern for the USGS. There, she worked on field mapping, soil collection, and lab determination of soil properties in landslide vs. debris flow response in Colorado and areas of Oregon.

For the past 3.5 years she has been living in Vail, CO working as an EMT in the Emergency Dept. at Vail Valley Medical Center. Throughout the year she helps medical patients that come through the ER. In the winter she also attends to the numerous orthopedic injuries that come off the mountain, and in the summer cares for the cycling and mountain biking injured patients. Since moving to Vail in 2007 she has finally completed her prerequisite courses to apply to medical school. After taking the MCAT this June, this fall she will be applying to medical school to hopefully start another educational journey Fall 2012.

Although she is pursuing a different scientific field, it is the basic scientific techniques she learned in her geology classes and research, and the passion she discovered and still has for geology that is driving her to succeed in her next adventure.

Al Fagerstrom (PhD '60) writes that he has published his last paper (in *Facies*, 2010), at the age of 81, and decided to pursue other interests.

Zachary Weiss (BS '11) was selected by Teach for America to teach high school science for the next two years in Dallas, Texas.

Jason Anderson (BS '96) writes that since graduating from Michigan, his life has been quite busy. He completed a PhD at McGill University in Montreal, studying an obscure group of limbless Paleozoic aged amphibians. Upon completion of his PhD, he accepted a two year postdoctoral fellowship at the University of Toronto, and then a position teaching veterinary anatomy at a new college at Western University of Health Sciences in Pomona, California.

In the fall of 2005, Jason began his current position in the new Faculty of Veterinary Medicine at the University of Calgary. This has been an excellent fit for Jason, both for the richness of the fossils and numerous students interested in studying them, and the proximity to the mountains. It is difficult to realize that over 5 years has already passed! In the past year alone my first two PhD students have defended, and I just received tenure.

Jason passes along his best wishes to his classmates and professors back in Ann Arbor!

John Fortuna (MS '02) wrote from Australia that he is back in the mining business. He misses exploration work, but is now helping to transition mid- to advanced stage exploration projects forward to the mine stage. He's recently had the opportunity to work on gold mining projects on Woodlark Island, Papua New Guinea and on the Wafi-Golpu gold-copper deposits, also in Papua New Guinea. John's work includes conducting hydraulic testing for pit dewatering design, evaluating water supply options for ore processing, river diversion studies and reducing surface water infiltration during future underground mining activities.

He already has 5 trips planned to Papua New Guinea in the next 6 months.

Jeff Huspeni (MS '81) was highlighted in a recent issue of Mining News Premium for his move to Australia as the vice president of the Asia Pacific region for Newmont Mining. Jeff oversees six gold mining operations in the Asia Pacific region in Australia, New Zealand, and Indonesia, and foresees growth in that sector to surpass the 2million ounce mark annually in the near future.

C o r p o r a t e C o n n e c t i o n s

BP Sponsors Safety Course

Tina Nielson (MS '03) arranged for BP to sponsor a field safety course for undergraduate and graduate students in the Department of Earth and Environmental Sciences. In April, a dozen students participated in 2 full days of field safety training, covering topics in driving safety, field safety, and basic wilderness emergency care, ranging from basic blisters to dealing with hypothermia and trauma. The course was presented by Remote Emergency Care, and provided invaluable training for students' whose research takes them to remote and inaccessible parts of the globe, as well as for those students who take on the responsibility of graduate teaching at Camp Davis Rocky Mountain Field Station each summer.

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

Matt Densmore (PhD '08; Shell) gave a lecture on the Marcellus shale. Matt and his wife, Maris (also with Shell), spent time on campus over the summer, participating in the Department's outreach program in geosciences to high school students.

Tina Nielson (MS '03) presented a technical lecture to students on "The value of core: an example from deep water Gulf of Mexico" while visiting campus to conduct interviews. Her colleague, David Manaker also provide a presentation entitled "Salt – It's not just for food: A primer on salt tectonics".

Steve Ownby (PhD '07), Katie Keller (PhD '06), and Nick Olds (BS '07) represented Shell during campus interviews this fall.



Scott Tinker (MS '85), Director of the Bureau of Economic Geology and the State Geologist of Texas, presented a University-wide lecture entitled "A Global Perspective on the Future of Energy" at the Rackham Amphitheatre on September 26. The lecture was well attended by students, faculty and administrators from across the University and underscored the central role that the earth sciences will play in providing energy for a growing and technologically advanced society.

Recent Bachelors Degree Candidates

Concentration Majors

Zachary Calamari	<i>Geological Sciences BS</i>
Alexandra Costakis	<i>Environmental Geosciences BS</i>
Steven Davey	<i>Earth System Science</i>
Sean Dubois	<i>Earth System Science</i>
Alistair Hayden	<i>Geological Sciences BS</i>
Mastura Johari	<i>Geological Sciences BS</i>
Ka Yan Semechah Lui	<i>Geological Sciences BS</i>
Kimberly McCraw	<i>Environmental Geosciences BS</i>
Samantha Moore	<i>Earth System Science</i>
Sarah North	<i>Geological Sciences BS</i>
Simon Sia	<i>Geological Sciences BS</i>
Holly Simon	<i>Environmental Geosciences BS</i>
Sindhuja Sunder	<i>Environmental Geosciences BS</i>
Zachary Weiss	<i>Environmental Geosciences BS</i>
Sara Wyczalek	<i>Geological Sciences BS</i>

Concentration Minors

Gavin Chensue	<i>Minor -Oceanography</i>
Patrick Duffy	<i>Minor -Earth Sciences</i>
Rachel Franzblau	<i>Minor -Oceanography</i>
Michael Howe	<i>Minor -Earth Sciences</i>
Lindsay Krall	<i>Minor -Environ Geol</i>
Joshua Levin	<i>Minor -Earth Sciences</i>
William Moyer	<i>Minor -Environment Geology</i>
Ethan Shirley	<i>Minor -Paleontology</i>
Sarah Timmins	<i>Minor -Oceanography</i>
Molly Wagner	<i>Minor -Oceanography</i>
Allison Yee	<i>Minor -Earth Sciences</i>

Recent Masters Dissertations

Michael Cherney	Two New Species of the Turtle Genus <i>Cordichelys</i> (Pleurodira, Podocnemididae) from the Fayum Depression, Egypt and Comments on the Genus <i>Stereogenys</i>
Michael D'Emic	The End of the Sauropod Dinosaur Hiatus in North America

Larianna Dunn	A New Chronostratigraphic Age Model for the Last Two Thousand Years in Santa Barbara Basin, California
Carl Henderson	Protocols and Pitfalls of Electron Microprobe Analysis of Apatite
Adam Herrington	Terminating the Last Interglacial: The Role of Ice Sheet-Climate Feedbacks in a GCM Asynchronously Coupled to an Ice Sheet Model
Jamie Hoffman	Refining the Stable Isotope Budget for Antarctic Bottom Water: New Foraminiferal Data from the Abyssal Southwestern Atlantic
Karen Wang	Calibration for IR Absorbance Measurements of OH in Apatite
Kenneth Yuan	Paleomagnetism of the Dunkard Formation with Implications for Field Stratigraphy

Recent Doctoral Dissertations

Boris Avdeev	Cenozoic Tectonics of the Greater Caucasus and the Arabia-Eurasia Collision
Matthew D'Emic	The Early Evolution of Titanosauriform Sauropod Dinosaurs
Alison Duvall	The Evolution of the Tibetan Plateau: Insights from the Deformation and Erosion History of Northern Tibet and the Surrounding Region
Gretchen Gehrke	Mercury Cycling in the Marine Environment: Insights from Hg Stable Isotopes
Daniel Horton	Climate Dynamics of the Late Paleozoic Ice Age
Qiaona Hu	Polymorph and Morphology of CaCO ₃ Controlled by Varying Additives and Templates
Yong Keun Hwang	Teleseismic Body Wave Attenuation and Diffraction
Nadja Insel	South American Climate Dynamics and Evolution of the Andes
Gregory Janevski	Causes and consequences of extinction and survival in fossil marine invertebrates with a special focus on the Crinoidea (Phylum Echinodermata)
Alex Lechler	Isotopic and Sedimentologic Constraints on the Cenozoic Paleotopographic and Paleogeographic Evolution of the Western US
John Whitlock	Paleoecology and Systematics of Diplodocoid Sauropods
Yang Zhang	Studies of Earth's Mantle using Seismic Traveltimes and Amplitudes

IN MEMORIAM

John (Jack) Barnes, 81, passed away on July 5, 2011. Born in Ann Arbor, Michigan, in 1929, he attended the University of Michigan and earned his B.S. in Geology in 1953, and his M.S. in 1957. Barnes's M.S. thesis was titled "A Regional Study of the Denver-Julesburg Basin." He worked for Carter Oil and Exxon in oil and gas exploration and production in the Michigan and Illinois Basins and then formed his own Mid-States Consulting Corporation in 1959. Barnes later returned to academics as a Professor at the University of Southern Indiana from 1969-1989, where he helped develop a new Earth Sciences program and was active in issues related to energy and the environment. In retirement he was an active environmentalist, artist, poet, philosopher and naturalist. Barnes was particularly passionate about the University of Michigan's Camp Davis Field Station in Wyoming and strongly believed in the importance of field experiences as part of a college education. He was a generous supporter and an important catalyst in the recent renovation of the Camp Davis facility. Barnes is survived by his sons William, David and James; former wife Catherine Meik; and four grandchildren.



called Ecosystem Science in the Rockies, and taught it annually at the University of Michigan's Camp Davis Field Station in Wyoming. During his 20-year career as a faculty member, Keeler mentored and served as principal adviser to more than 40 master's and doctoral students, published more than 100 papers and taught a variety of environmental, atmospheric and climate change courses. Keeler is survived by his wife of 27 years, Joanne; and his children Ryan, Kevin and Meghan.

William "Bill" Farrand (PhD '60; Professor Emeritus of Geology, Curator of the Museum of Anthropology and Director of the Exhibit Museum of Natural History) died at the University of Michigan Hospital on Tuesday March 22, 2011 while recovering from spine surgery at the age of 79.



Bill was born in Columbus, Ohio on April 27, 1931, the son of Harvey A. and Esther E. (Bowman) Farrand. He earned BS (1955) and MS (1956) degrees in geology from The Ohio State University, and a Ph.D. in geology from The University of Michigan in 1960. After completing his PhD, he took a position as a research associate at Lamont-Doherty Geological Observatory, and was later appointed an assistant professor at Columbia University. He also held a visiting professorship at L'Université de Strasbourg.

In 1965, Bill returned to the University of Michigan as a faculty member in the Department of Geology. He served as Curator of the Museum of Anthropology, beginning in 1975, and as the Director of the Exhibit Museum of Natural History from 1993-2000.

Although his training was in the field of glaciology, and was known for his work on the glacial geology and geological history of the Great Lakes, Bill's great impact was in pioneering the field of geoarcheology. He specialized in interpreting the sedimentary record of archeological sites in the eastern Mediterranean, and understanding how paleoclimate affected early human history.

Bill is survived by his sister, Lois Sensenbrenner of Powell Ohio, his wife, Carola Stearns, Ph.D.; his son, Frederic Farrand of Saline, husband of Patti Farrand; and daughters, Anne Farrand and Michelle Stearns, both of Ann Arbor; and his grandchildren, Allison and Spencer Farrand of Saline. Per Bill's request, donation in his memory can be made to the William R. Farrand Public Lecture Fund c/o Nora Webber, The Exhibit Museum of Natural History, 1109 Geddes Ave, Ann Arbor 48109-1079.

Gerald (Jerry) Keeler, 51, passed away April 12, 2011 after a long battle with cancer. An environmental researcher and teacher who had global impact, Keeler was a professor of environmental health sciences whose work focused on the sources and fate of trace elements and other pollutants. Keeler received his B.S. from Boston College in physics in 1982. He continued his studies at U-M, receiving his M.S. in 1983 and his PhD in 1987, both in atmospheric sciences. He returned to Boston in 1987 as a research associate at the Harvard School of Public Health. In 1990 Keeler returned to U-M as an assistant professor in the Department of Environmental Health Sciences. An enthusiastic teacher and rigorous scientist, he was promoted to professor in 2003, with appointments in environmental health, atmospheric sciences and geological sciences. Keeler served on many dissertation committees in the Department of Geological Sciences and collaborated with its faculty. Keeler was passionate about undergraduate teaching—especially in the field. In 2003 he co-developed a course integrating geology, ecology and meteorology



Back Cover: Dinosaur National Monument, Utah. A common field trip stop for Camp Davis courses, undergraduate Keegan Melstrom (BS '12) worked in the Monument this past summer as a GeoCorps intern (see page 11). (Photo credit: K. Melstrom)



Thrust fault in the Kunlun Mountains, northern margin of the Tibetan Plateau, placing Mesozoic marine sediments over early Cenozoic terrestrial redbeds. (Photo credit: L. Staisch)

Chair: Rebecca A. Lange

Faculty: S. Aciego, B. Arbib, J. Bassis, T. Baumiller, U. Becker, J. D. Blum, R. Burnham, G. A. Burton, M. A. Carroll, M. C. Castro, M. K. Clark, G. Dick, R. C. Ewing, D. C. Fisher, P. D. Gingerich, I. Hendy, E. Hetland, R. A. Lange, J. Li, K. C. Lohmann, D. C. Lund, N. A. Niemi, R. M. Owen, C. Poulsen, J. Ritsema, L. J. Ruff, N. Sheldon, A. Steiner, B. A. van der Pluijm, R. Van der Voo, P. van Keken, J. Wilson, D. Zak, Y. Zhang.

Visiting Faculty, Research Scientists and Post-doctoral Scholars: Y. Ai, J. C. Alt, J. Ansong, C. Badgley, L. Bai, Y. Chen, B. Chen, J. Demers, T. Ehlers, Z. El-Isa, T. Flanner, E. Fitz-Diaz, J. D. Gleason, C. M. Hall, F. Hankard, L. Hayden, S. Huang, M. Hren, M. Lang, M. Li, W. Li, A. G. Nelson, Z. Rak, D. Reed, D. Renock, A. Rountrey, A. Schleicher, C. Sheik, S. Smith, C. Stefano, P. Timko, D. Trossman, M. Tsui, J. W. Wang, B. Yanites, I. Zalmout, F. Zhang, J. Zhang.

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

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

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