Department of Geosciences

UNIVERSITY OF MONTANA

Newsletter Spring 2014

Water & Earth

Dear Alumni and Friends,

Our Geosciences program continues to grow. We currently have about 160 majors and our classes are full to overflowing. For the past few years we have been growing at the undergraduate level at a rate of 3 percent per year. Our graduate program is doing well. Faculty achievement in scholarship and research is also extremely high. I urge you to read through the following pages where we detail undergraduate and graduate student accomplishments and faculty and staff discuss recent work and activities.

We spent much of the last year thinking about who we are as a geosciences program and planning where we want to go in the future. We are going to focus on water and solid earth science, research areas of regional and global significance. We are in the process of revising our undergraduate curriculum so that an instructional balance is achieved between our focus areas and so that we provide consistent instruction in a broad range of geoscience principles. Courses are being revised to prioritize innovative and forward-looking content, critical and scientific thinking, and marketable skills. At the graduate education level, we intend to maintain both our M.S. and Ph.D. programs and are investigating ways to ensure that we attract high quality applicants to our program as well as being price competitive in providing research and teaching assistantships to students who matriculate. Stipends for teaching assistantships provided by the University are not competitive nationally, and we have been subsidizing these with funds from our UM Foundation accounts to remain competitive. This is an area of continuing concern for us.

For us as a program, this is also a time of change and transition. I was elected Chair in March of 2013 and assumed the duties with the close of graduation in May 2013. I want to thank Johnnie Moore for three years of able guidance and leadership as Chair from 2010-13. At the end of 2013 Steve Sheriff retired. Johnnie will retire on June 30, 2014, and Bill Woessner will retire at the end of December, 2014. Their combined service to the Department represents over 100 years of unswerving commitment to geoscience education and research. George Stanley has reduced his appointment to 60 percent time starting with the 2013-14 academic year. Jim Sears and I are no longer spring chickens. Long story short, we are undergoing a generational shift within the Department. These retirements (and pending retirements over the next few years) are substantial changes that have already had and will continue to have impacts on our program for years to come in regards to curriculum and research.

With change comes opportunity. We will be conducting a national search for a hydrogeologist this fall semester, and we hope and expect that we will be authorized to search for additional new

faculty, including both a geophysicist and a geochemist, in the near future. These searches for replacement faculty present the opportunity to find the best and the brightest candidates, but they also present financial challenges in providing what we refer to as "start-up" packages to attract our top candidates to UM and to fund their initial research activities, including purchasing equipment and setting up labs. These start-up packages are provided to allow new faculty to quickly build research programs, get students involved, and become nationally competitive for externally funded grants and contracts from agencies like the National Science Foundation and the Department of Energy as well as private industry. We as a department are required to cover a substantial part of these start-up packages: an estimated $50,000 for the Hydrogeology position alone, and more than $200,000 in total for the three hires we envision currently. For us to maintain a high-profile, dynamic geosciences program it is going to take your help and investment in us to do this. You have been consistently generous in your giving to support the program, but retirements and replacement costs are taking us to a new and unparalleled level of need. I urge you to give generously and ask that you discuss with your employers about corporate donations to help us through this time of transition. The best way to help us with this challenge is to contribute to the Geosciences Department Unrestricted Fund via the UM Foundation.

The combination of our generational shift, the broader societal need for geoscientists, and a strong job market for our graduates present challenges as well as opportunities. We are a strong program with a growing student population. For a number of years with retirements, we will not be at full faculty strength as a program. What we do have is a strong and committed group of young faculty, who have done the lion's share of strategic planning during the last year and who, along with our new hires, will carry the program into the future. The next few years will be challenging for us, but with your help and support we will evolve into a stronger program committed to training the next generation of geoscientists.

Best wishes,

Jim Staub

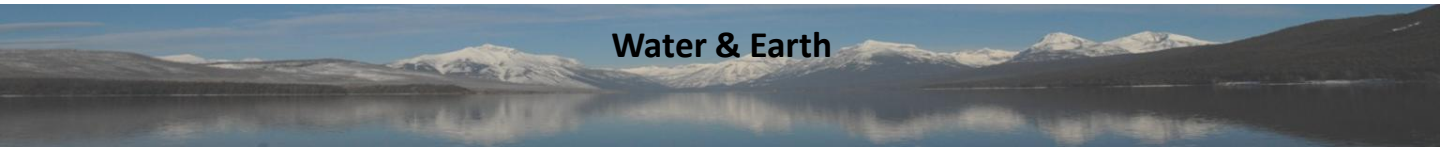
In Memorium

We were saddened to learn of Bob Weidman's passing on December 29, 2012. A native Missoulian, Bob was 89. He was a professor of Geology starting in 1951, and for 38 years he taught structural geology and served as the long-term chair of undergraduate advising. Additional Information can be found at http://missoulian.com/news/local/obituaries/robert-mcmaster-weidman/article_389dbdc4-54ec-11e2-8706-001a4bcf887a.html. His wife and family held a gathering last spring that was attended by relatives and friends.

Student Awards

2012

Neal Auchter	AAPG Meckel Family Named Grant Billings Geophysical Society Scholarship Rocky Mountain Section SEPM Fluvial Sedimentology Award Tobacco Root Geological Society Scholarship
Whitney Bausch	Geological Society of America Graduate Student Research Grant Tobacco Root Geological Society Scholarship University of Montana Geology Club Achievement Award
Jared Bean	University of Montana Geology Club Achievement Award Montana Institute on Ecosystems Graduate Fellowship Montana Water Center Graduate Fellowship
Erika Colaiacomo	Montana Water Center Student Research Fellowship Geological Society of America Graduate Student Research Grant
Franklin Dekker	University of Montana Graduate Student and Faculty Research Conference Poster Presentation Award
Sperry DesRosier	University of Montana All Nations Louis Stokes Alliance in Minority Participation Grant, NSF
Ryan Kadlik	L. Austin Weeks Undergraduate Grant - AAPG Minority Participation Grant, NSF
Frederick Kellner	Geological Society of America Graduate Student Research Grant Montana Water Center Student Research Fellowship
Laura Good	Mortar Board Outstanding Senior Award - International Field Geosciences Joint B.S. Degree Fred Honkala Outstanding Senior Award
Lindsay Mackenzie	Geological Society of America Student Research Grant
Toby Meierbachtol	Bertha Morton Scholarship
Ashley Mulholland	Estwing Pick Award University of Montana Geosciences Alumni Scholarship



Student Awards

Abbey Nastan	Mineralogical Society of America American Mineralogist Undergraduate Award
Thomas Palin	University of Montana Geology Club Achievement Award
Zackary Rambo	Mortar Board Outstanding Senior Award - Geosciences Option Fred Honkala Outstanding Senior Award
Karin Riley	Elected to the Board of the Association for Fire Ecology
Dylan Schmeelk	Fred Honkala Outstanding Senior Award
Amy Singer	University of Montana Provost Travel Award
Andrea Stanley	Montana Institute of Ecosystems Fellowship
Brett Woelber	Montana Geological Society Research Scholarship Montana Water Center Student Research Fellowship

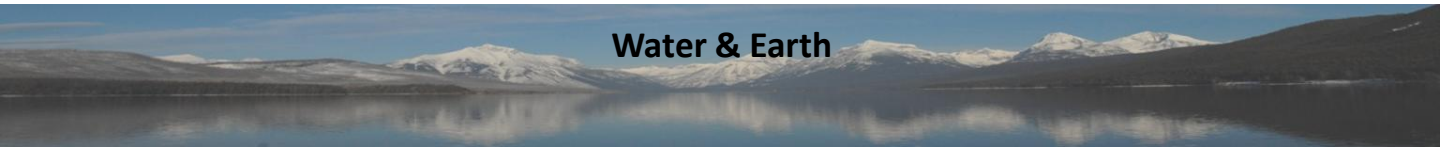
Student Awards

2013

Nicholas Bowman	The Governor's Energy Internship The Bonhomme Scholarship
Alex Brekke	Rocky Mountain Association of Geologists Scholarship Geological Society of America Graduate Student Research Grant Tobacco Root Geological Society Scholarship
Sharon Bywater-Reyes	American Water Resources Association Best Poster (1st Place) NSF - The National Center for Airborne Laser Mapping Award Bertha Morton Scholarship
Erika Colaiacomo	American Water Resources Association Best Poster (3rd Place)
Drew Cramer	Colorado Scientific Society Grant Tobacco Root Geological Society Scholarship
Elise Fitzpatrick	University of Montana Davidson Honors College Undergraduate Research Award University of Montana Davidson Honors College Study Abroad Scholarship
Zachary Hoylman	Liberal Arts and Sciences Award Robert and Eleanor Weidman Scholarship
Pamela Lavering	Norman Knapp Scholarship
Robert Livesay	University of Montana Davidson Honors College Undergraduate Research Scholarship Geological Society of America Travel Grant Fred Honkala Outstanding Senior Award Montana Water Center Fellowship Mortar Board Outstanding Senior Award – International Field Geology Joint B.S. Degree Option Tobacco Root Geological Society Scholarship
Jennifer Meidinger	Western Undergraduate Scholarship
Toby Meierbachtol	Bertha Morton Scholarship American Geophysical Union Outstanding Student Paper Award

Student Awards

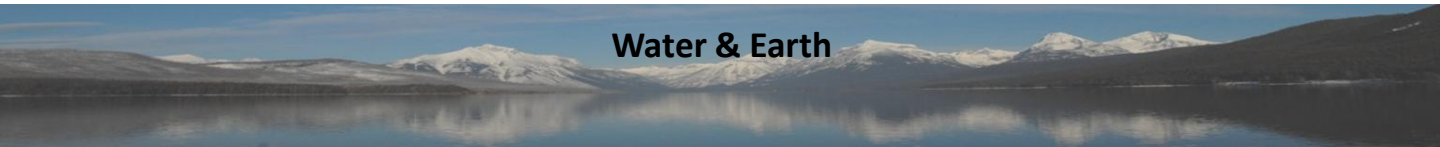
Tetsuro Nagase	Patrick McDonough Memorial Fund Scholarship
Abigail Nastan	Academic Enrichment Fund Grant Fred Honkala Outstanding Senior Award Mineralogical Society Student Award for the UK & Ireland Montana Space Grant Consortium Research Grant Mortar Board Outstanding Senior Award - Geosciences Option NSF REU - Summer Research Experience at the SETI Institute University of Montana Conference on Undergraduate Research Conference Award - Oral Presentation
Carly Osborne	Fred Honkala Outstanding Senior Award Mortar Board Outstanding Senior Award – International Field Geology Dual B.S. Degree Option
Robert Rader	Davidson Honors College Undergraduate Research Award International Research Experience for Students Fellowship
Nicholas Silverman	Bertha Morton Scholarship
Amy Singer	Evolving Earth Foundation Award Montana Geological Society Scholarship
Liane Stevens	Bertha Morton Scholarship Geological Society of America Rocky Mountain Section Student Travel Grant Geological Society of America Graduate Student Research Grant Preparing for an Academic Career in the Geosciences Workshop, On the Cutting Edge - Stipend Award
Jennifer Torres	Fred Honkala Outstanding Senior Award Mortar Board Outstanding Senior Award - Geology Option



Student Awards

2014

Cody Bomberger	Geology Alumni Award
Benjamin Broman	Bonhomme Scholarship Montana Baker Grant Wisconsin Society Colonial Dames XVII Century Scholarship
Douglas Brugger	NSF-EPSCoR Graduate Fellowship, Montana Institute on Ecosystems Montana University System Water Center Student Research Fellowship Geology Alumni Award
Peter Christoffersen	Geological Society of America Graduate Research Grant
Kurt Imhoff	Montana Geological Society Scholarship Northwest Scientific Association Student Grant Geological Society of America Research Grant Montana Institute on Ecosystems Fellowship
Katrina Keleher	UM Davidson Honors College Undergraduate Research Award
Pamela Lavering	2014 University of Montana Conference on Undergraduate Research Conference Award Davidson Honors College Undergraduate Research Award
April Sawyer	Montana Water Center Graduate Student Research Fellowship Geological Society of America Graduate Student Research Grant
Dorothy Spencer	Mortar Board Outstanding Senior Award - Geosciences Option Fred Honkala Outstanding Senior Award
Anna Phelps	Geology Alumni Award Geological Society of America Graduate Student Research Grant Apache Corporation Scholarship
Elyse Rector	Geology Alumni Award Tobacco Root Geological Society Award Patrick McDonough Memorial Fund Scholarship



Undergraduate Graduation

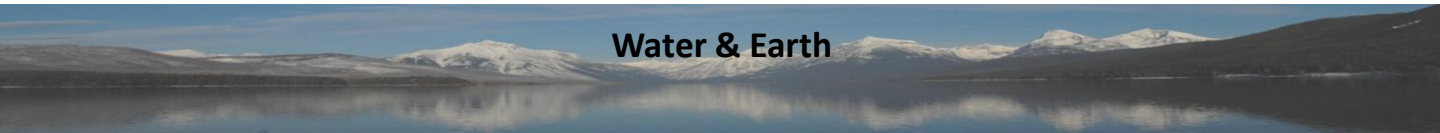
2012
Miles Anson
Sperry Desrosier
Joshua Erickson
Joseph Fairchild
John Frye
Benjamin Gardner
Matthew Gilbert
Christopher Gold
Laura Good
Jeffrey Howell
Ryan Kadlik
Jessica Leslie
Jeremy Malmberg
Timothy McNally
Constance Millsap
Ashley Mulholland
Zachary Rambo
Samantha Ross
Dylan Schmeelk
Abraham Schmidt
Matthew Seaton
John Spencer
Flora Sperberg
Dana Wilson

2013
Rebecca Annis
Todd Blythe
Tyler Dearborn
Stephen Dodd
Patrick Doyle
Elise Fitzpatrick
Eric Lavering
Robert Livesay
Jennifer Meidinger
Abigain Nastan
Carly Osborne
Robert Rader
Jennifer Torres
Michael Williamson
Margeaux Zwang

2014
Dylan Davis
Leah Diggins
Chad Dunshee
Douglas Goodman
George Grismer
Adam Hessenkemper
Kaleb Horlick
Brandon Kingsbury
Patrick Moffitt
Ashley Murray
John Orton
Dustin Rambur
Katelyn Salem
Michael Schmechel
Damien Setlich
Dorothy Spencer
Alexander Vaught
Brandon Veth
Sarah Washko
Garrett Woodson
Katrina Zigan

Senior Theses

Student	Advisor
2012	
Benjamin Gardner	Andrew Wilcox
Christopher Gold	Marc Hendrix
Ryan Kadlik	Marc Hendrix
Jeremy Malmberg	George Stanley
Abraham Schmidt	Marc Hendrix
Flora Sperberg	Nancy Hinman
2013	
Rebecca Annis	George Stanley
Elise Fitzpatrick	Julia Baldwin
Eric Lavering	Marc Hendrix
Robert Livesay	Andrew Wilcox
Jennifer Meidinger	Julia Baldwin
Katie Monaco	Marco Maneta
Abigail Nastan	Johnnie Moore
Carly Osborne	Julia Baldwin
Robert Rader	George Stanley
Jennifer Torres	James Staub
Swaid Worms	Marc Hendrix



Graduate Students
Theses and Dissertations

2012

Neal Auchter, M.S.	Evolution and Architecture of Incised Valley Fill Deposits in the Upper Cretaceous Eagle Formation, South-Central Montana (James Staub)
Jared Bean, M.S.	Multi-scale Hydrogeomorphic Influences on Bull Trout Spawning Habitat In Snowmelt-Dominated Headwater Streams (Andrew Wilcox and William Woessner)
Adam Clark, M.S.	Quantifying Glacier-Derived Summer Runoff in Northwest Montana (Joel Harper)
Victor Guevara, M.S.	Structural, Thermochronological, and Stratigraphic Constraints on the Evolution of the Clearwater Metamorphic Complex, Idaho (Julia Baldwin)
Adam Johnson, M.S.	Controls on the Spatial-Temporal Distribution of Soil Moisture Under Snow Dominated Conditions in a Naturally Vegetated, Sub-alpine Mountain Catchment (Marco Maneta)
Kevin Lielke, Ph.D.	The Climatic, Biotic and Tectonic Evolution of the Paleogene Renova Formation of Southwestern Montana (Marc Hendrix)
Karin Riley, Ph.D.	Statistical Modeling of Rare Stochastic Disturbance Events at Continental and Global Scales: Post-Fire Debris Flows and Wildland Fires (Rebecca Bendick)
Zachary Seligman, M.S.	Delay of Spring Snowmelt due to Storm-induced Changes in Snowpack, Columbia River, Headwaters, Western Montana, USA (Joel Harper)
Eleanor Spangler, M.S.	International Facies Architecture of a Regressive to Transgressive Wave-Dominated Delta in the Upper Cretaceous Eagle Formation, South-Central Montana (James Staub)
Zackary Wall, M.S.	A Structural History of the Garnet Stock and Its Relationship to Deformation Along the Lewis and Clark Line, Western Montana (James Sears)

Graduate Students
Theses and Dissertations

2013

Whitney Bausch, M.S.	Petrology, Geochemistry, and Age Extension in the Lost Trial Pass Dike Swarm, Southwest, Montana (Julia Baldwin)
Antony Berthelote, Ph.D.	Response of Groundwater to Dam Removal (William Woessner)
Frederick Kellner, M.S.	Ensemble Modeling of SWE Distribution in the Bitterroot Mountains (Joel Harper)
Hannah Shepherd, M.S.	Near the End: Reef Building Corals and Bivalves in the Late Triassic and Comparing Corals and Bivalves Before and After the End-Triassic Mass Extinction Using a Taxonomoc Database (George Stanley)
Andrea Stanley, M.S.	Hydrologic Conditions and Streamflow Change in an Evolving Semi-Arid Agricultural Watershed, Smith River, Montana (Andrew Wilcox)
Brett Woelber, M.S.	Energy Controls on Diurnal Snowmelt and Stream Recharge, Lost Horse Canyon, Bitterroot Mountains, MT (Marco Maneta)

2014

Spring Semester

Tetsuro Nagase, M.S.	Developing a Facies Model and Sequence Stratigraphic Framework for the Devonian – Mississippian Sappington Formation in Southwestern and Central Montana (Marc Hendrix)
David Reioux, M.S.	Metamorphic Evolution of Precambrian Rocks in the Southern Highland Mountains, Montana, and Implications for Proterozoic Tectonics (Julie Baldwin)

2013-2014 Graduate Students

Yelebe Amere, Ph.D., Addis Ababa University

Cody Bomberger, Ph.D., Penn State – University Park Campus

Alex Brekke, M.S., University of Idaho

Douglas Brugger, Ph.D., University of Wisconsin-Madison

Sharon Bywater-Reyes, Ph.D., The University of Wyoming

Peter Christoffersen, M.S., St. Lawrence University

Erika Colaiacomo, M.S., Colgate University

Martin Cramer, M.S., Northland College

Caitlyn Florentine, Ph.D., Montana State University – Bozeman

Joern Hauer, Ph.D., University of Potsdam

Kurt Imhoff, M.S., Oregon State University

Lindsay MacKenzie, Ph.D., University of Alberta

Jane Madison, M.S., Montana State University - Bozeman

Michael McTee, M.S., University of Montana – Missoula

Toby Meierbachtol, Ph.D., University of Montana – Missoula

Tetsuro Nagase, M.S., Southwest State University

Anna Phelps, M.S., Colorado College

Elyse Rector, M.S., Western Washington University

David Reioux, M.S., California State University – Chico

April Sawyer, M.S., University of California – Davis

Dylan Schmeelk, M.S., University of Montana – Missoula

Nicholas Silverman, Ph.D., University of Washington

Amy Singer, Ph.D., University of Illinois – Chicago

Liane Stevens, Ph.D., University of Massachusetts at Amherst

Ian Thomsen, M.S., Stanford University

Patrick Wright, Ph.D., University of Oregon

Alumni Sightings

Ben VandenBos, Zak Wall, and Kyle Durrett on the Belt Symposium V Field Trip to Glacier National Park which was led by Don Winston and Jim Sears on July 30, 2013. There were 45 participants. The three grads are working for mineral exploration companies.

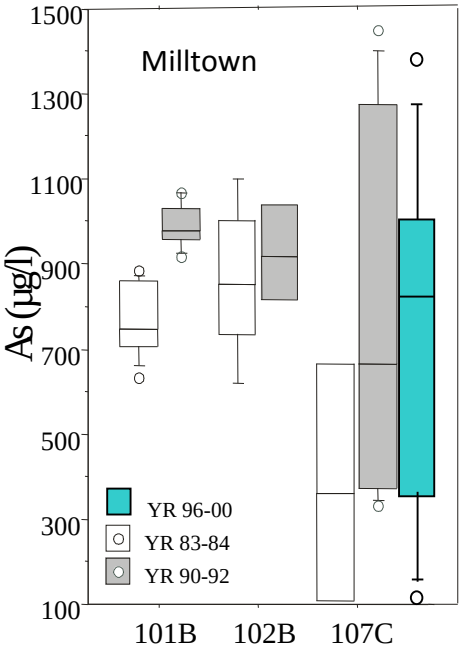
Jeff Kuhn Bill and Jean Woessner found Jeff Kuhn and his family and friends at Red Rock Lake Falls in Glacier this summer. Jeff continues his work at the Montana DEQ addressing fuel releases to soil and groundwater. He has also been successful in securing funding to evaluate new field characterization methods and remediation technologies.

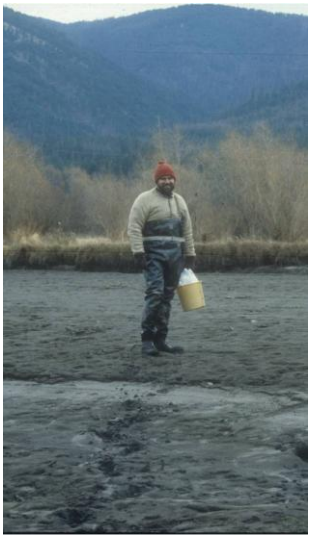
Faculty Features

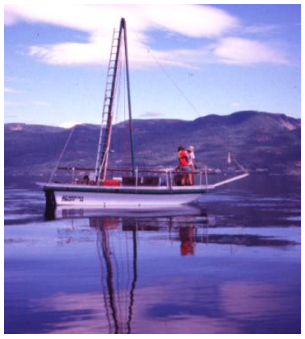
Steve Sheriff: Thirty two years ago I began my first quarter at UM; fall semester was my last. I retired from UM in December of 2013. It's fun looking back on the changes. Some of the earliest students will remember kerosene smoke on analog seismograph drums, single channel DC resistivity, one hand-written magnetic field measurement at a time, gravity measurements without GPS, paper maps, paleomagnetic experiments to measure distributed deformation, computation on a PDP-10, and curve matching instead of nonlinear regression. That was the world before Moore's law (the less famous G. Moore from Intel, not Johnnie), high power transistors, GPS, alkali vapor magnetometers, GIS, and spreadsheets. It has been a fun career with an uncharacteristic start. In the summer of 1981, months into a climbing trip, I snuck into the gym, cleaned up, and interviewed for a one-year position with Gray (then chair) and Tony Qamar; both very accomplished climbers and, like many of you, soon to be great friends. It is a small, serendipitous world and somehow I never quite made it back into the Volkswagen.

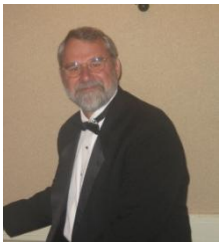
Summer 2013 saw the completion of archaeological excavations for the Grant-Kohrs National Historic Site project which started with my radar and magnetic investigations during the summer of 2012. Summer 2013 was slow on the public service side for state and federal agencies, but I expect that to pick up soon. Consequently, I had to entertain myself by exploring summits and ranges I'd not taken time for in the past. I'm waiting to hear about an NSF proposal in the review mill. With luck that will fund some archaeological geophysics in SW Alaska this summer (with enough slack time to ski an Aleutian volcano). I expect to be around and active on the scholarship/research side of things for several years collaborating with colleagues in archaeology and the minerals and energy fields.

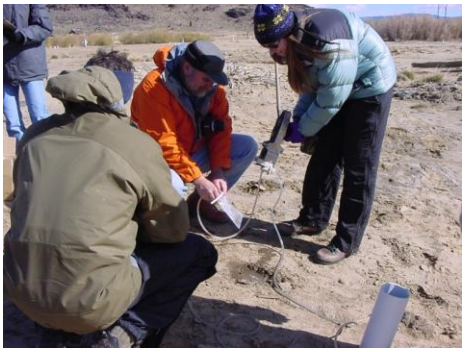
Johnnie Moore: At the beginning of the academic year, I completed my three-year stint as chair of the department and moved back to professor status. I continue to teach courses in global change and western U.S. water resources. My research concentrates on using the historical climate record to compare direct human modifications on river flow to those caused by long-term climate variability and change. I also continue to work on metals-contamination geochemistry and stratigraphy for fun and no profit. This is the end of my 37th year at UM, and I plan on retiring at the end of June. I look forward to concentrating on my research in western water resources and working with colleagues in Montana and California to help solve future problems in water resources.

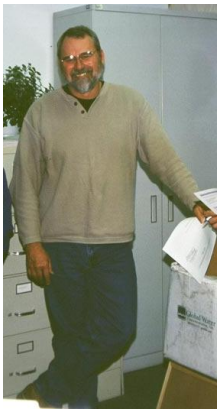








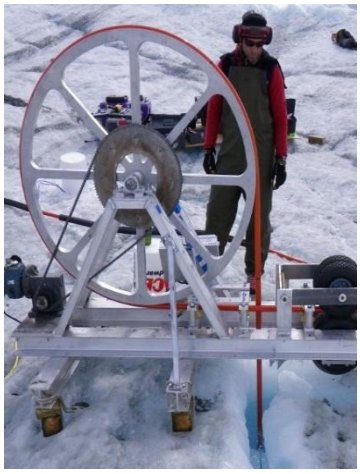




Julie Baldwin: During the 2012-13 academic year, I was selected as a Distinguished Lecturer for the Mineralogical Society of America. I traveled to ten different schools giving research talks and speaking with students and faculty at a wide range of institutions from Newfoundland to northern California. It was a fantastic experience and an enjoyable opportunity to spread my enthusiasm for the mineral sciences. Our department's new SEM arrived in September 2013 and has provided a huge boost to our research capabilities in the department. In May, I taught two weeks of our field course in Dillon followed by field work in the southern Ruby Range with M.S. student Drew Cramer and undergraduate IFG student Brennus Voarino. In July, I headed into the backcountry of the Bitterroot Range in search of the perfect garnet-bearing rocks for my core complex project. Then in August, I traveled to the Clearwater area of northern Idaho for a week of field work with a new M.S. student, Peter Christoffersen, to look at an Eocene shear zone for a new microstructural study. All in all it was a productive summer for field work, and we're now back in the lab busily analyzing all the great rocks we found.

Rebecca Bendick: Rebecca spent the 2012-13 academic year on sabbatical in Tübingen, Germany, working with Dr. Todd Ehlers on numerical simulations of extreme mountain-building events. She and her family also enjoyed the pretzels, beer, and nice cars! Grad students in the group, Dylan Schmeelk and Yelebe Birhanu, made great progress in observing tectonic deformation in their study areas in SW Montana and Ethiopia, respectively. The group also welcomed Ph.D. student Cody Bomberger who is working on both collection and modeling of deformation clustering. Rebecca published new papers on the final results from her now-complete experiment in the Pamir region of Central Asia, on results for the scaling of landslides and debris flows, and on the mechanical architecture of continents.

Joel Harper: I'm writing this while sitting on an airplane crossing the Atlantic. Appropriate, since this is my ninth crossing in four months. Some people have a cabin by a lake, others have a condo by the beach, whereas I have seat 12B on a fleet of Airbus-330s. It turns out that trips to Greenland involve two Atlantic crossings both going and returning: over once to reach Denmark, and then back over again to reach western Greenland. Most of my scientific attention during the past year was devoted to assessment of the risks associated with underground nuclear waste storage. I'm working with an international team of scientists to investigate how groundwater conditions might change during the next ice age at potential storage sites in Sweden



and Finland. The nuclear waste to be stored there needs to be safely sequestered for one million years; but an ice sheet will likely advance over the sites during that time interval. We are using Greenland as a present-day laboratory for examining some basic processes for how ice sheets influence groundwater flow. I just completed a 210 page report on the results from four years of this research. I'm not sure if I should be embarrassed or proud that it was a lot more work than my dissertation was. I've also had three M.S. students complete their degrees in the last year, all working on various aspects of snow and ice in Montana.

Kathleen Harper: My new challenge this past year was teaching an online version of intro geology! In addition, I taught the course from Canada where Joel and I spent the spring semester. It was really interesting to see the contrasts between teaching a face-to-face large-enrollment lecture class vs. a relatively small class with communication only by computer. The most rewarding part of the course was the discussions. Students were required to participate, and it was interesting and revealing to see responses from everyone in the class, rather than the vocal minority I usually hear from in the large lecture. I really enjoyed the experience and hope to do future online courses. When I was not responding to student emails, I enjoyed being in the Canadian Rockies – such fascinating and highly visible geology! Joel would surely say that I was way too interested in the rocks that were scratching up my ski edges.

Nancy Hinman: I continue to study geochemistry in all its forms. I was able to conduct field work in China with graduate student, Lindsay MacKenzie, and research faculty member, Michael Hofmann. There they sampled the world-famous Chengjiang biota under a warm December sun – see photo, very windy day! In June I returned to the Helmholtz Zentrum in Munich to continue my collaboration on a first-ever study of the complexity of dissolved organic matter in Yellowstone hot springs. Later, on that same trip, I presented a keynote address at the 14th Conference on Water-Rock Interaction in Avignon, France. The hosting association, International Association for Geochemistry and Cosmochemistry, honored me with two awards, Friend of Water-Rock Interaction and a Certificate of Recognition. I can be found in the Provost's Office where I continue to serve as Interim Associate Provost.

Marco Maneta: We had a lot of activity in our lab during the summer of 2013. Adam Johnson and Brett Woelber completed their Master degrees. Nick Silverman made major progress in his Ph.D. research including his first publication in a scientific journal and the completion of his comprehensive examination. We also had a new Ph.D. student join our lab, Doug Brugger. He will be working on the impacts of farming activity and irrigation on streamflow and water resources in Montana. The activity from our lab and the models we have developed in the past are resulting in new international, national, and regional collaboration with research groups in Spain, California, and within the University of Montana to understand the interactions between the hydrologic and the ecologic system. Research we are currently focusing on includes the effects of water shortage on land use change and agricultural activity and the role of vegetation dynamics on the reproportioning of the regional water balance in Mediterranean and mountain environments. Besides work this summer, I have enjoyed sailing Flathead Lake and the Atlantic in southern Spain/Portugal.

Jim Sears: I had another full summer of field work in 2013 with the Geology Field Course in Dillon, followed by some mapping projects in the Rocky Mountains, the AAPG professional field course "Folds, Faults, and Fractures in Thrusted Terranes" along the Rocky Mountain Front, field trips through Glacier Park and the Blackfoot Canyon with Don Winston for the Belt Symposium V, a field trip to SW Montana for the Tobacco Root Geological Society, and field work in the Black Mountains of the Arizona desert. In November of 2013, *GSA Today* published my paper, "Late Oligocene-Early Miocene Grand Canyon: A Canadian Connection?" This idea proposes that the Miocene Colorado River may have turned north near Las Vegas to flow through Nevada, Utah, Idaho, and Montana on its way to the Labrador Sea before being re-routed to the Gulf of California. The Yellowstone hotspot cut off the river in Idaho, and Pleistocene glaciation destroyed the river basin in Canada, deflecting Montana's drainage into the modern Missouri. Read all about it!

George Stanley: I was again active in working with research collections, studying fossils, investigating coral reefs and sedimentary rocks, publishing with students, taking field trips, and attending meetings. During a 2011-2012 sabbatical, I attended meetings and was a Whitely Fellow at Friday Harbor Marine Lab at the University of Washington, Seattle. As a recipient of a grant from the Japanese Society for Promotion of Science, I spent September and October, 2013, in Kumamoto, Japan, doing collaborative research with Tetsuji Onoue, a Faculty Affiliate in our department. In June I was a keynote speaker in Wuhan, China, for the World Summit on Mass Extinction and extreme Climate Change and took part in an IGCP field trip across Yunnan and

Quizhou provinces to examine the ecosystem collapse and rebuilding following the end-Permian extinction. One of my students was an NSF Research Experience for Undergraduates recipient and another was a Summer Geocorps America Intern in Denali Park, Alaska. A doctoral student, Amy Singer, is conducting field studies of an amazing Carboniferous fossil deposit in central Montana called the Bear Gulch Limestone. Finally I was honored as a Fellow of the Japanese Society for Promotion of Science in Washington, D.C., where I spoke about my research experiences in Japan.

Jim Staub: After several seasons looking at the Telegraph Creek, Eagle, and Claggett formations in the Billings area, we have expanded to the northwest to outcrops in Big Coulee and Hailstone domes and are utilizing subsurface data to correlate between Billings and the Ryegate area. We are looking for evidence of forced regression and valley incision identified by Neal Auchter (M.S. 2012) in the Billings 'rimrocks.' This work is being done by Alex Brekke, a second year M.S. student. Elyse Rector, a first year M.S. student, is looking at some of the green sands in outcrop and core in the Eagle Formation for her thesis.

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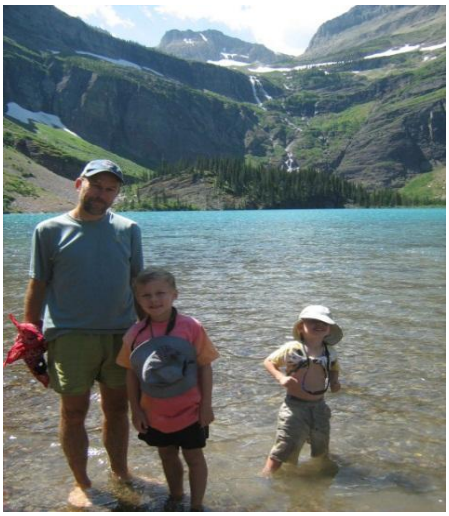
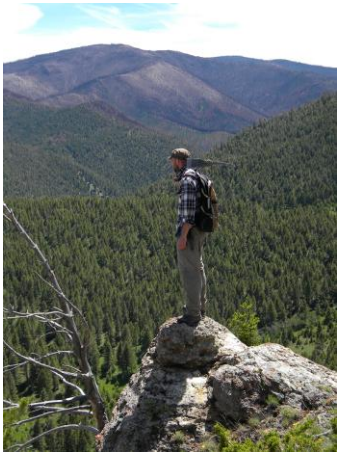
Andrew Wilcox: My students continue to investigate issues surrounding river flow, sediment transport, and channel morphology. Current projects include research on feedbacks between river morphodynamics and riparian vegetation (with Ph.D. student Sharon Bywater-Reyes and Postdoc Rebecca Manners) and on climate change effects on the hydrology and geomorphology of the Bitterroot River basin (with Marco Maneta and Postdoc Phairot Chantanatavet). I have also been wrapping up research and writing papers on a number of earlier projects ranging from studies of glacial lake outburst floods in Alaska, to hydrogeomorphic effects on bull trout habitat, to geomorphic effects of dam removal (Milltown on the Clark Fork and Condit Dam on the White Salmon River, WA). Explorations of the mountains, rivers, and trails of western Montana with my family have provided balance.



Bill Woessner: Good Day Mate! Sunrise at Uluru. I am still teaching my groundwater classes, and in 2012 and 2013 I taught a week of the department's senior field geology course (hydro component). I was fortunate to receive a one-semester sabbatical in the spring of 2013 during which I worked with my colleagues at the University of Wisconsin to update my modeling skills, and for two months I was a visiting professor at the National Groundwater Research Training Center at Flinders University in Adelaide, Australia. I had a productive time interacting with graduate students and faculty at the center and at the Department of the Environment. I have wound down my graduate students. Tony Berthelote finished his Ph.D. on dam removal and groundwater impacts, and Jared Bean (co-advised with Andrew Wilcox) completed his M.S. evaluating how geomorphic and hydrologic factors impact bull trout spawning in tributaries of the Middle and North Fork of the Flathead River. Jean is doing well and was able to spend two weeks with me in Australia. She retired from over thirty years of teaching four- and five- year olds last spring. I plan to retire at the end of the 2014 fall semester. I hope you are all well.

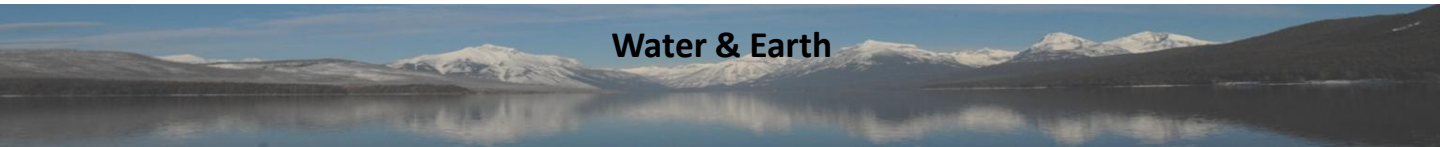
Heather Almquist: Over the past several years, I have focused on innovations in K-12 geoscience and geospatial education to better prepare young students for their future education and careers. Specifically, I am introducing K-12 teachers and students to Google Earth (GE) as an entry-level geospatial analysis tool to support inquiry-based, real-world investigations. Together with a small team of K-12 education specialists, I have developed a GE-based curriculum on volcanoes, earth-quakes, and plate tectonics for middle school classrooms, which is currently in use by over 250 educators worldwide. Another project developed a framework for conducting collaborative, GE-based geographic investigations to support inquiry-based learning (www.spatialsci.com/goowi). In a new project (GEODE: Google Earth for Onsite and Distance Education), I am training pre-service, K-12, geoscience teachers in the use of GE as a powerful teaching tool.

Carrine Blank: Our UM patent for growing algae and cyanobacteria on chitin--ground up waste crab and lobster shell--has been issued and efforts to develop commercial applications continue. We are also working on various wastewater treatment applications and studying lipid (oil) production in algae grown on chitin. For my evolutionary work, I have published several papers confirming a freshwater origin for cyanobacteria and showing that algae also likely originated in freshwater environments (discussing the implications for the biogeochemical evolution of early Earth). Finally, we have been developing web-based algorithms and a microbial ontology database to automate the extraction of character data from the published literature and facilitate large-studies of the evolution of microbial traits through deep time across the microbial tree of life.



Michael Hofmann: Over the past year I was very fortunate to go on a geologic time travel and to work on research projects spanning large parts of the geologic time scale. I got involved in exciting research in China trying to unravel depositional processes that are associated with the preservation of some of the oldest fossils on this planet. For this collaborative research (together with Nancy Hinman and her Ph.D. student Lindsay MacKenzie) I had the opportunity to travel to Yunnan province in China twice in the last year to look at these Cambrian deposits first hand. I continued to work on slightly younger rocks and spent a lot of time conducting field work in central and southwestern Montana together with Marc Hendrix and his student, Tetsuro Nagase, looking at Devonian and Mississippian sedimentary rocks. These deposits serve as an analog for the rocks of the Bakken petroleum system in the Williston Basin. Moving up the time scale, I continue to work on a series of Cretaceous deposits in Montana (together with Jim Staub and students) and Utah. I also continued to work with archaeologists in Yellowstone National Park to unravel the history of human population and migration in the area since the retreat of the glacial ice sheets 10,000 years ago.

Alisa Wade: Over the past year, I collaborated with the Rocky Mountain Research Station, completing a technical report on best practices for modeling wildlife habitat connectivity, and along with Geosciences faculty Co-PI Andrew Wilcox, I completed a study on glacial lake outburst flood dynamics at Bear Glacier, Alaska, for the National Park Service. Additionally, I wrapped-up my post-doctoral work with the publication of the journal article *Steelhead Vulnerability to Climate Change in the Pacific North-west*. Currently, I am working with Lolo National Forest and Region 1 USFS scientists to assess the vulnerability of freshwater systems on the Lolo Forest to scenarios of climatic change. I consider both geophysical and ecological controls on system responses to changes in stream temperature and hydrologic regimes. My research is primarily model based (I rely most heavily on Geographic Information Systems, remote sensing, and statistics) so I spend my days in front of a computer. To make up for this, I spend as many hours as possible during the summer biking, rafting, running, hiking, and swimming the trails and rivers around these glorious parts.



Staff

Aaron Deskins: A couple years have passed since our last newsletter and a lot has happened. I'm excited to report that our virtualized computing center in addition to our general computer lab continues to leverage the capabilities for research, student research, learning, and cloud-based classroom desktops. I have added additional storage racks for data growth. We added three new wireless access points, three steps closer to achieving a dense wireless system in the Clapp building. The wired network remains a bottleneck for large data transmission, however, thanks to the efforts of numerous administrators, faculty, and staff, we received an NSF Cyber-infrastructure grant close to $500,000. Dr. Rebecca Bendick was selected as a Co-PI for the grant. Once implemented, we will have high-speed bandwidth to our desktops 10 times faster than current speeds. On the home front all is well. One child finishing up middle school and another is in grade school. Skiing, biking, stand up paddle boarding, and climbing keep me grounded!

Christine Foster: I am still happy to be here supporting students, staff, and faculty! There is always enough going on in the department to keep me interested and busy. I look forward to each new year and helping to navigate whatever challenges come our way.

Heiko Langner: I am still directing the Environmental Biogeochemistry Lab–overseeing quite a few instruments including the ICP, ICP-Mass spectrometer, elemental analyzer, several mercury analyzers, an ailing particle size analyzer, and a lot of auxiliary lab equipment. We just acquired a brand new Dionex Ion Chromatograph. Lab clients come from several departments at UM and off-campus. We worked closely with a couple local startup companies that sprouted after the recent price hike in rare earth metals. I was also able to spend some time in the field, locating point sources of mercury in the Flint Creek drainage. We continued to sample heavy metals in osprey chicks in the Clark Fork River Basin during the summer. Our nest cams enjoy continued publicity with sometimes thousands of viewers checking in every day and following the big and small events on the nests (cas.umt.edu/geosciences/osprey). But all good things must come to an end at some point. Starting later this year, I will be managing the Analytical Core Lab at King Abdullah University of Science and Technology in Saudi Arabia. This will be a great adventure for Ute, our two high school kids, and me while our oldest daughter will start her third year at MSU in Bozeman.

Kallie Moore: Over 150 people visited the UMPC and the Geosciences Department for the 2013 National Fossil Day celebration in October. After returning from an educational Mountain-Plains Museums Association (MPMA) conference, I started a project concentrating on digitization. I'm working to update all of our policies and procedures as well as incorporate digitization into the daily functioning of the UMPC. The collections also continues to support research on and off campus. In 2013, four manuscripts were published using UMPC specimens for a total of 215 publications referring to the collection since 1937. There were 240 new catalog numbers assigned to specimens ranging from Cenozoic mammals from Nebraska to thin sections of Triassic corals from Japan.

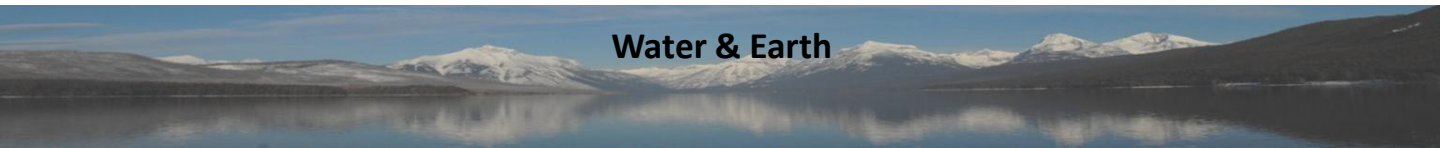
Matt Young: A lab rat's work is never done. This past year I have been very busy with the ICP-AES, working with local students, students from Montana Tech, and private industry clients. Project Osprey continues to grow and attract nationwide attention, and I always appreciate time in the field with the birds. We had the good fortune to expand the project briefly into the Missouri River watershed south of Great Falls with an extraordinary high school student who plans to attend UM. I am currently working on a project to track selenium in the Clark Fork drainage and assess the relationship between selenium and mercury. In the picture, I am holding a Brahmini Kite in the backwaters of Kerala, India. Spending January traveling across India with two of my dearest friends was the best decision I ever made.

Help Us Provide the Best Possible Geosciences Education

Geosciences Student Research Fund (Advancing Geosciences in the 21st Century): This fund provides scholarships to deserving Geoscience students in need of resources to complete their proposed research.

Geosciences Department Unrestricted Funds: This fund allows us the maximum flexibility in spending in support of operations, equipment purchases, and assisting students.

Geosciences Department Restricted Funds: Donors who want to restrict funds to a particular purpose can donate to this fund and designate how their donation should be used.



Don Winston Excellence in Field Geology Fund: This fund is used to support field-based learning and research.

Robert and Eleanor Weidman Scholarship: Established in 1994 in support of junior and senior undergraduates in Geosciences. Funds are used for student fees, tuition, enrollment in a summer field course, and field-based independent study.

Michael Lee Wilson Memorial Scholarship: Established in 1990 by Michael's family as a merit-based scholarship for the support of Geosciences graduate students.

Patrick J. McDonough Memorial Fund: Established in 1979 by Patrick's friends and colleagues to honor his dedication to the responsible development of energy resources in Montana. The fund is used for student research in the development and utilization of resources.