

Fall 2013

UMD

Geological

Sciences

## Geological Sciences Newsletter for Alumni &amp; Friends



## News from the Department Head - Howard Mooers



Hello, everyone! I'm back as department head after a four-year hiatus. Ron Morton retired at the end of the last academic year, and that is only one of the many changes that we are going through. This year we welcomed Dr. Christian Schardt to our faculty. Christian is our new economic geologist and he comes to us with a great deal of experience. Fortunately for us he saw our ad for a faculty position in economic geology and made the move to Duluth over the summer. You can read more about Christian on page seven.

The department has grown significantly over the past few years. Not only has the number of geology majors grown, but, as you may recall, we took over administration of the Environmental Science program in 2011. Between the two programs our department has nearly 200 majors with an additional 50+ students with minors in our programs. The addition of Environmental Science and our continuing expansion of program offerings have prompted us to forward a request to change the name of the Department. Effective fall 2014, our name will officially change to the Department of Earth and Environmental Sciences. Our degree offerings, however, will remain the same.

The graduate program continues to thrive, and when you add our current cohort of 25 graduate students to the undergraduate numbers we are bursting at the seams in terms of space in Heller Hall. Things do not appear to be slowing down, either. At the annual GSA meeting in Denver in October we had 70 students visit our information table and discuss the opportunities available at UMD. Our faculty and their research programs are attracting outstanding students.

This year we lost a friend of the department. Jack Everett, Consulting Mining Geologist, passed away August 12, 2013, at the age of 92. Although Jack was not an alumnus of our department he was a presence on campus for many decades showing up at seminars and often just to chat. Recently Jack made a substantial donation as seed money for an endowed professorship in the name of Ralph Marsden, a former UMD geology faculty member and department head. We offer our thanks and our condolences to Jack's family.

Most of you remember that in 2007 we opened a new state-of-the-art petrology lab with 15 new petrographic scopes equipped with cameras and networked for easy sharing. The lab was made possible by generous donations from many of you. Our lab, which was spearheaded by John Goodge, greatly enhanced our teaching and learning environment and became a model for new teaching labs at many other institutions. We are now beginning a campaign to raise money to equip an ore microscopy lab with similar capabilities. Although there are many analytical methods available today to determine the chemistry of samples, nothing can replace reflected light microscopy. Studying the intergrowth of ore minerals and the relative timing of crystallization is a vital step in understanding the formation conditions of a mineral deposit and helps to elucidate the nature of the ore-forming fluids and the distribution of individual metal-bearing minerals. Because our current microscopes cannot accommodate polished ore sections, our goal is to acquire ten reflected light microscopes for our students. The new ore microscopy lab will be the central focus around which economic geology and exploration geology coursework is developed, teaching students to identify ore minerals, deduce the likely formation conditions, and gain a better understanding about the genesis of individual ore types and textures. If you are interested in helping us out with a donation for this new microscopy equipment please indicate this preference with your donation.

Hope all is well with each and every one of you. All the best in the new year!

## Fall 2013 UMD Geological Sciences

### To Our Donors:

We thank the following alumni and friends who have supported our students and programs with a charitable gift in the past year. Listed below are the names of individuals and organizations who donated to the funds of the Department of Geological Sciences, and includes those donations that the University has posted to our department accounts at press time.

Roger Anderson  
Pamela & Richard Backstrom  
William Bangsund  
Catherine Barnett-Pfarr  
John W. Beck  
Anna & Aaron Beek  
Kathy & Eric Burgdorf  
Philip Carpenter  
Odin Christensen & Phyllis Lucas  
William & Jean Crain  
Donald & Mary Davidson, Jr.  
Anthony Dincau  
Marlene & Arthur Dingmann  
Sheri & Henry Djerlev  
Richard & Grethen Dunn  
Jayne Englebert  
Thomas J. Fitz, III  
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Thomas & Beth Frantes  
Christina Gallup  
Michael Gasser  
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Jeffrey Jones  
Randolph & Nancy Koski  
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Jeffrey & Genene Lynott  
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Charles & Audrey Melbye  
Marsha Miller  
Penelope Morton  
James & Elizabeth Munter  
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Dennis & Eileen Ojakangas  
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Kent Syverson  
Cathy Udem  
Catherine E. VonEuw  
Robert Wahlstrom  
James & Kathleen Welsh  
James Werler  
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Fidelity Charitable Gift Fund  
Minnesota Section SME  
Northshore Mining Company  
Resource Exploration, Inc.  
United States Steel Foundation, Inc.

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## Student Scholarships, Awards and other Notable Mentions

**Ralph & Ellen Marsden and Randy Seeling Outstanding Graduate Student Award:**  
Melanie Graupner

**Outstanding Graduate Teaching Assistant Award:** Jonathan Dyess

**Ralph & Ellen Marsden and Minnesota Section SME Outstanding Senior Award:**  
Allison Severson

**Hugh Roberts Scholarship Outstanding Junior Award:** Nathan Lentsch, Julianna McDonnell

**Minnesota Section SME Tools-Of-The-Trade Award :** Nathan Lentsch, Matthew Lundberg, Julianna McDonnell

**Harry & Margaret Walker Research Fund Award:** Adam Leu, Alex Steiner, Lisa Broderius, Jonathan Dyess, Aubrey Lee, Chelsea Nissen, Adam Thompson

**Cliff Natural Resources Scholarship:**  
Patrick Quillen

**Jill & Terry Swor Scholarship:** Nathan Lentsch (2012-13), Julianna McDonnell (2013-14)

**Estwing Geology Field Methods Award:**  
Nathan Lentsch

**Roderick Syck Outstanding Field Camp Performance Award:** Jacob Kolke

**Kenneth E. Differt Scholarship:** Emily Goranson

**UMD Peterson Memorial Scholarship:**  
Danielle Sackett

**Frantes Graduate Fellowship:** Kristofer Asp, Michael Doyle, Sarah Sauer, Virginia Batts, Courtney Targos

### FIELD CAMP SCHOLARSHIPS:

**Robert L. Heller Field Camp Scholarship:**  
Emily Goranson, Kaitlin Johnson, Jacob Kolke, Patrick Quillen

**“Rip” Rapp Field Camp Scholarship:**  
Nicholas Rogers

**Charlie Matsch Field Camp Scholarship:**  
Emily Goranson, Kaitlin Johnson, Jacob Kolke, Patrick Quillen

**Ralph & Ellen Marsden Scholarship:**  
Cameron Dahlin, Emily Goranson, Kathryn Grave, Kaitlin Johnson, Jacob Kolke, Scott Pollan, Patrick Quillen, Derek Rode

**Lempi M. & John Pagnucco Scholarship:**  
Benjamin Katka

**Millennium Fund Scholarship:** Sarah Bauer, Paul Kamnikar

**Faculty Emeriti Scholarship:** Cameron Dahlin, Kathryn Grave, Matt Grotte, Shane Loeffler, Scott Pollan

**R.C. Bright Scholarship:** Shane Loeffler

**Randy Seeling Scholarship:** Melanie Graupner

**Donald Yardley Scholarship:** Shane Loeffler

**Richard Patelke Scholarship:** Matt Grotte

## Fall 2013 UMD Geological Sciences

### Undergraduate Student Presenters & Contributors

#### Spring 2013 UMD UROP Showcase University of Minnesota Duluth

**Buschette, M.**, "Mineralogical and Elemental Analysis of Granitic Bodies Across the Transantarctic Mountains"

**Heikkila, T.**, "Controlling Fuel Cells Using LabVIEW"

**Kryzer, R.**, "Rogen Moraine Genesis in Arrowhead Region, Minnesota"

**Muellner, E.**, "Effects of Various Lead Soil Concentrations in Plants"

**Palokangas, C.**, "Heavy Metal Pollution Sources into the St. Louis River"

**Shang, H.**, "A New Interpretation About Life Evolution Based on Entropy"

**Spano, N.**, Brown, E., Deocampo, D., "Rates of Chemical Weathering Inferred from Tasmanian Lake Sediments"

#### Geological Society of America 2013 Denver, Colorado

**Kryzer, B.**, Larson P., Mooers H., "Rogen Moraine as a Transitional Bedform in an Erosional Subglacial System"

**Spano, N.**, Brown, E., Deocampo, D., "Chemical Weathering Rates Inferred from Tasmanian Lake Sediments"

**2013**

#### The Institute on Lake Superior Geology 2013 Houghton, Michigan

**Severson, A.**, Hudak, G., Severson, A., Geertz, S., Zanko, L., Kramer, S., Bandli, B., "The Minnesota Taconite Workers Health Study: Environmental Study of Airborne Particulate Matter-2013 Update"

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### Graduate Student Presenters & Contributors

#### The Institute on Lake Superior Geology 2013 Houghton, Michigan

**Caton, C.**, "Crystallization of Chrome Spinel in the Southern Troctolite Zone of the Bald Eagle Intrusion, Duluth Complex, Northeastern MN"

**Dyess, J.**, Hansen, V., "Application of LiDAR to Resolving Regional Tectonic and Glacial Fabrics in Glaciated Terrane: An Example from an Archean Granite-Greenstone Belt in NE Minnesota"

**Doyle, M., Lee, A.**, Korman, K., Craddock, S., Walter, J., Jirsa, M., "Geologic Mapping of Neoproterozoic and Paleoproterozoic Rocks Near Ester Lake" by students of the Precambrian Research Center's 2012 field camp Precambrian Research Center Capstone Project

**Dyess, J.**, Hansen, V., "Structural and Kinematic Analysis of the Shagoawa Lake Shear Zone and Snowbank Lake Stock, Superior Province, NE Minnesota"

**Lee, A.**, Miller, J., "The Igneous Stratigraphy of the Bad Vermilion Intrusion, Mine Centre, Ontario, Canada: Which Way is Up?"

**Lee, A.**, Miller, J., "Field, Petrographic, and Geochemical Study of the Bad Vermilion Intrusion, Mine Center, Ontario, Canada"

**Leu, A.**, Miller, J., Djon, L., LaPietra, E., Martin, Z., Martinez, R., "2012 Precambrian Field Camp Mapping in the Wilder Lake Intrusion, Lake County Northeastern, Minnesota" - Precambrian Research Center Capstone Project

**Sauer, S.**, Fehrs, E., Kenny, E., Kuchma, J., Sylvester, W., Hudak, G., "Bedrock Geologic Map of the Putnam Lake Area, St. Louis County, NE Minnesota" - Precambrian Research Center Capstone Project

*Congratulations to Jonathan Dyess for winning the best poster at ILSG!*

#### Geological Society of America 2013 Denver, Colorado

**Dyess, J.**, Hansen, V., "Structural and Kinematic Analysis of the Shagoawa Lake Shear Zone and Snowbank Lake Stock, Vermilion District, NE Minnesota"

**Dyess, J.**, Hansen, V., "Application of LiDAR to Resolving Regional Tectonic and Glacial Fabrics in Glaciated Terrane: an Example from an Archean Granite-Greenstone Belt in NE Minnesota"

**Nissen, C.**, Goode, J., Fanning, C. M., "New Evidence of Proterozoic Metamorphic Events in East Antarctica from In-Situ U-Pb Age Dating of Monazite in Metamorphic Glacial Clasts, Central Transantarctic Mountains, Antarctica"

#### The International Association for Great Lakes Research 2013 Purdue University, West Lafayette, Indiana

**Votava, J.**, Johnson, T., Hecky, R., "Lake Kivu Carbonate Deposition: Abrupt, Recent Onset of Recurring Fluctuations?"

#### American Geophysical Union 2013 San Francisco, California

**Votava, J.**, "A Revised Holocene History of Lake Kivu, East Africa"

**Dyess, J.**, Hansen, V., "Structural and Kinematic Analysis of the Shagoawa Lake Shear Zone and Snowbank Lake Stock, Superior Province, Northeastern Minnesota"

## Current Faculty News

### Erik Brown

This was a busy travel year. It started in January with three weeks of fieldwork in Chilean Patagonia (absolutely gorgeous) with colleagues including Sergio Contreras, a Chilean scientist who has been a post-doctoral researcher at Large Lakes Observatory (LLO) for the past couple of years. Summer fieldwork in the Spanish Pyrenees was followed by the United Nations Food and Agriculture Organization (UN-FAO) workshop in Malawi East Africa. In case you are wondering, four transatlantic flights in four weeks sure takes a lot out of you. In Malawi, we are evaluating the effects of increased agricultural activity-conversion of forest land to agriculture, increased fertilizer use, irrigation on the lake and its fisheries.

I continue working on projects examining the climate history of southwestern North America (very relevant for water resource usage in this country), as well as on Lake Superior. A group of LLO Faculty is embarking on a new program on Lake Superior, using very cool new remote sensing technologies to allow us to make more observations (including under ice in winter!) at lower costs. As always, we are happy to have visitors!

### Christina Gallup

My research interests are in sea level change as a consequence of the ice ages and in uranium-thorium dating of fossil corals and cave deposits. Recently, my research has become more focused on how chemical and physical alteration affects the ability to date fossil corals with uranium-thorium methods. In teaching my courses, I think more about issues of global climate change and specifically global warming. Having participated in a climate change forum recently, it is clear that many people feel quite strongly about global warming and related issues and would like more information. The new report from the Intergovernmental Panel on Climate Change is quite good and I encourage getting involved and contacting your legislators about doing something to combat global warming.

I continue to enjoy my role as co-director of the Environmental Science program. Several of the students in the program have obtained internships and have been able to receive college credit through our Cooperative Education course. After completing the internships, the students write up what they did and what they learned, and the employer writes up what they did and how they performed. Students get two credits toward their electives. This is a great way to earn college credit while getting real world experience that can shape the students' future employment. We are always seeking good internship opportunities for our Geological Sciences and Environmental Science majors, so if you know of opportunities for our students, please let us know!

### John Goodge

I was hopping in early 2013 with Petrology and Tectonics, with big groups in both classes, including two lab sections in Petrology for the first time. It's good to see so many geology students, but it's a lot more work staying ahead! As things simmered down, I made a return trip to Canberra in June with graduate student Chelsea Nissen for U-Pb zircon and monazite geochronology with the SHRIMP group at Australian National University where we analyzed over 60 samples! In the meantime, Jennifer (Koester) Goldner defended her M.S. thesis after a lengthy leave at Rio Tinto. Three cheers for persistence! The rest of the summer was a blur, but culminated in attending the Goldschmidt Conference of the Geochemical Society in Florence, Italy, preceded by a driving tour of the western Alps with incredible alpine hiking. Things are coming together on analysis of glacial clasts, and we've made great progress in designing a new ice- and rock-coring drill for use in Antarctica. With luck, final drawings and operational plans will be done by December, 2013, so we can begin construction in early 2014. The RAID drill will have a winter test in sub-Arctic Canada and will eventually be shipped to Antarctica for science drilling by 2017.

## Karen Gran

The weather just turned on us here in Duluth, reminding everyone that fall is overdue. Every year I hold my breath hoping we can make it through our last field lab in geomorphology before the weather gets too chilly.

Overall, this has been a great year. I got tenure! I also had a semester leave in the spring to finish up a few lingering projects, including a project I've been working on with Michal Tal at the University of Aix-Marseille. We relocated our family to Barcelona, Spain, and I was able to travel up to Marseille to work with Michal while Rik worked with colleagues in Barcelona. The boys (now 6 and 10) loved it.

On the graduate student front, I had three students finish up and defend this year: Molly Wick got her M.S. in Water Resources Science, Grant Neitzel finished his M.S. in Geology, and Ted Fuller completed his Ph.D. in Geology. Congratulations to all of them! Meanwhile, this fall brought with it four new M.S. students, adding to the two students already here. Many of them are involved in a large collaborative project in the Minnesota River, with one working on flood impacts in Duluth.

## Vicki Hansen

Hard to believe it is newsletter time again. I hope that you all have had a wonderful year!

Our group continues to do research on Venus and Earth's Archean. Jon Dyess (Ph.D. candidate) had another successful field season extending research into the Quetico! Jon won best poster at Institute on Lake Superior Geology (ILSG), following Chris Goscinak's example in 2012. Jon also presented two posters at Geological Society of America (GSA), and has a manuscript on LiDAR in review (congrats, Jon!). Post-doc Kevin Thaisen continues to keep Dr. Ivan Lopez (Madrid) and me organized and moving forward in GIS space in our mapping about 30% of the surface of Venus. Kevin participated in an Impact Crater field workshop in Ontario (I am jealous). Chris Goscinak is wrapping up his thesis, as he continues his work at Barr. Melanie Graupner (Bergmann) completed her M.S. before heading south to Ol' Miss to teach Earth History, then west to New Mexico working for Morco Geological Services. Mel presented her thesis results at the Lunar and Planetary Science (LPSC) meeting in Houston and at the NASA Mappers' meeting in Washington, DC. Aaron Slonecker defended his thesis, and is in the process of filing his thesis with the graduate school (yeah, Aaron!). Aaron has a position with the Duluth Children's Museum; among other things, he develops new space 'field trips' for the area school kids. I received the honor of an invite to present to University of Minnesota Distinguished Faculty, using the opportunity to crystallize early Earth-Venus ideas. I also presented at LPSC, the NASA Mappers' meeting, the Goldschmidt Conference in Florence, Italy—(what a wonderful city and amazing country), and GSA125 in Denver, Colorado, and I am off to Grand Forks—University of North Dakota later this month.

## Tom Johnson

In early January I, along with graduate students Jillian Votava, Rozhan Zakaria, and Julie Halbur, and our technician, Jason Agnich, were on the Malawi Fisheries vessel Ndunduma, a trawler just a bit smaller than the Blue Heron (and not nearly as comfortable) for a six-day cruise on Lake Malawi to service two instrumented moorings that measure temperature throughout the year, every five minutes at 10 depths between the surface and the lake floor (450 m down), and have sediment traps that collect bi-weekly integrated samples of what is settling out of the water column. We use this information to better understand the chemical signals of past climate change that we derive from sediment cores that we have recovered from Lake Malawi in the past. I was an invited participant in a UN Food and Agricultural Organization workshop in Maputo, Mozambique in March dealing with the future of lake fisheries under a changing climate, and I returned to Africa a third time in June to participate in a drilling project in northern Kenya, drilling through lake beds now exposed on land, spanning the interval from 1.5 to 2 million years ago. On the local front, I directed two undergraduate students, Nick Spano from UMD and a summer intern from Oberlin College, to find volcanic glass shards from the Mt. Mazama in Lake Superior sediment cores. The Mazama eruption created Crater Lake, Oregon, around 7600 years ago, and while volcanic ash layers derived from this event are widespread throughout the western United States, its tephra had never before been found in the sediments of the Great Lakes. I think that we can find more ash layers in the Great Lakes besides just Mazama, and if so, will greatly improve our ability to precisely date Great Lakes sediment cores. Kate and I are faring well, and are just back from a joyous family event in San Marcos, California, where son Ryan finally got married!

## Jim Miller

With having a half-time faculty appointment and teaching only in the spring, I experienced a new beginning and a reluctant ending last spring. I took over teaching Earth History (Geol 2110) from Tom Johnson - MY FAVORITE COURSE EVER!! I also taught for the 7<sup>th</sup> and last time, Advanced Earth Science for Teachers (Geol 4110). Going forward, I will teach Earth History each spring and Geologic Maps (Geol 3000) and Petrology of Mafic Intrusions (Geol 5100) in alternate spring terms.

With my other hat as Director of the Precambrian Research Center (PRC), I took the lead in planning and directing the 17<sup>th</sup> Annual Minnesota Minerals Education Workshop in June, the 7<sup>th</sup> Precambrian field camp in July and August, and a professional workshop on Cu-Ni-PGE deposits in the Lake Superior region in October. Read more about these and other PRC activities elsewhere in the newsletter.

Advising graduate students continues to consume a lot of my time. I have three students who got jobs before finishing their theses and who will hopefully finish this winter. My two second year M.S. students have been working hard on their research projects this semester and will hopefully get their writing done next semester. I've added four first-year M.S. students this year (don't ask—long story).

Finally, I've been serving as chairman of a planning committee seeking to establish the Mineral Resources Center (MRC) at UMD this year. The MRC will be an educational and research center of excellence in responsible and sustainable development of mineral resources. Currently we are holding open forums among interested faculty, local minerals industries, and other stakeholders, and have had visits to comparable centers of excellence in the U.S. and Canada. We plan to present the chancellor with recommendations for the mission, goals and objectives for the MRC this coming spring. Stay tuned.

## John Swenson

As David Byrne would say, "Same as it ever was..." Not much has changed for me in the last year. I taught my usual collection of classes—Introductory Geology, Sedimentology and Stratigraphy, Hydrogeology, and Non-renewable Resources—and conducted research on various topics, notably tributary-channel morphodynamics. As has been the case in recent years, I spent my summer working at Barr Engineering on a range of very interesting problems in the energy and minerals sectors. Sarah continues to teach a spectrum of health-related courses at Lake Superior College. Our furry children edged further into old age—in canine time increments—while fortunately maintaining good health. Unfortunately, the last year was pretty much a complete wash for gardening and growing fruit. After record snowfall in April (51 inches!), spring refused to spring, quite literally, particularly down here by the big lake. May and June were downright frigid on the shoreline and the orchard suffered accordingly. Some of my apple trees were still in bloom in early July! Consequently, my fridges and freezers are nearly devoid of the annual bounty. Here's hoping for a productive 2014.

## Nigel Wattus

The most exciting "work" related activity I did this year was the month I spent in Indonesia collecting multichannel seismic reflection data with my colleague Jim Russell from Brown University. This was my first opportunity to collect "marine" multichannel data since I was in the oil industry. This was a very different experience! Obviously we had a much smaller system than what the "big boys" (you know who you are!) use. But we were collecting our data off a catamaran raft normally used to transfer logs and water buffalo across the lake and it was being "steered" with a primitive rudder controlled by a pole! This was the latest phase of our on-going seismic investigation of Lake Towuti on the Indonesian island of Sulawesi. Our goal for the seismic work is to use it to identify the optimal sites for later drilling. This is a multinational affair involving scientists from various US, Indonesian and European universities. The primary goal of the drilling project is to recover material for Paleoclimate studies, but the cores will also be used by geologists interested in the structure and tectonics of Sulawesi as well as evolutionary biologists interested in the expansion of the lake's fish population. This is a multi-million dollar project. We recently heard that we have been awarded much of the funds we'll need for the project from the International Continental Drilling Program (ICDP). Now we have to persuade the National Science Foundation (NSF) to pony up the rest! If we are successful in our fund raising efforts we expect to start drilling on the lake sometime in 2015. Stay tuned!

This past summer Devin Hougardy, who I co-advised with Steve Colman, defended his M.S. His thesis project consisted of a seismic investigation of the sedimentary record of Lake-of-the-Woods in northern Minnesota. He collected some beautiful data

(Wattrus, continued from previous page)

and we hope to get a manuscript for publication out of it soon. He has taken a position with the Minnesota Geological Survey and hopefully he'll persuade them they need to collect more seismic data in Minnesota's lakes!

On the "home front", Jane and I are getting used to being "empty nesters." I think we both like it! My son is well into his sophomore year at Harvard and loving the Ivy League experience. He is taking full advantage of all the opportunities that come along. He spent most of the summer overseas. First in Israel and Jordan with the university orchestra (including nights spent in the desert at a Bedouin camp!). After that he headed off to Denmark to spend two months investigating the archaeology and literature of the Vikings. Tough life! My daughter Sally has also been a busy girl. She's just completed her first year teaching kindergarten at a Somali charter school in the Twin Cities. That sounds like hard work. I'll never complain to her again about having to lecture three times a week to 25 students! She is keeping her father on his toes, though, as she has just bought her first house and has lots of things on her "Daddy To Do" list!



### Meet Our Newest Faculty Member

## Christian Schardt

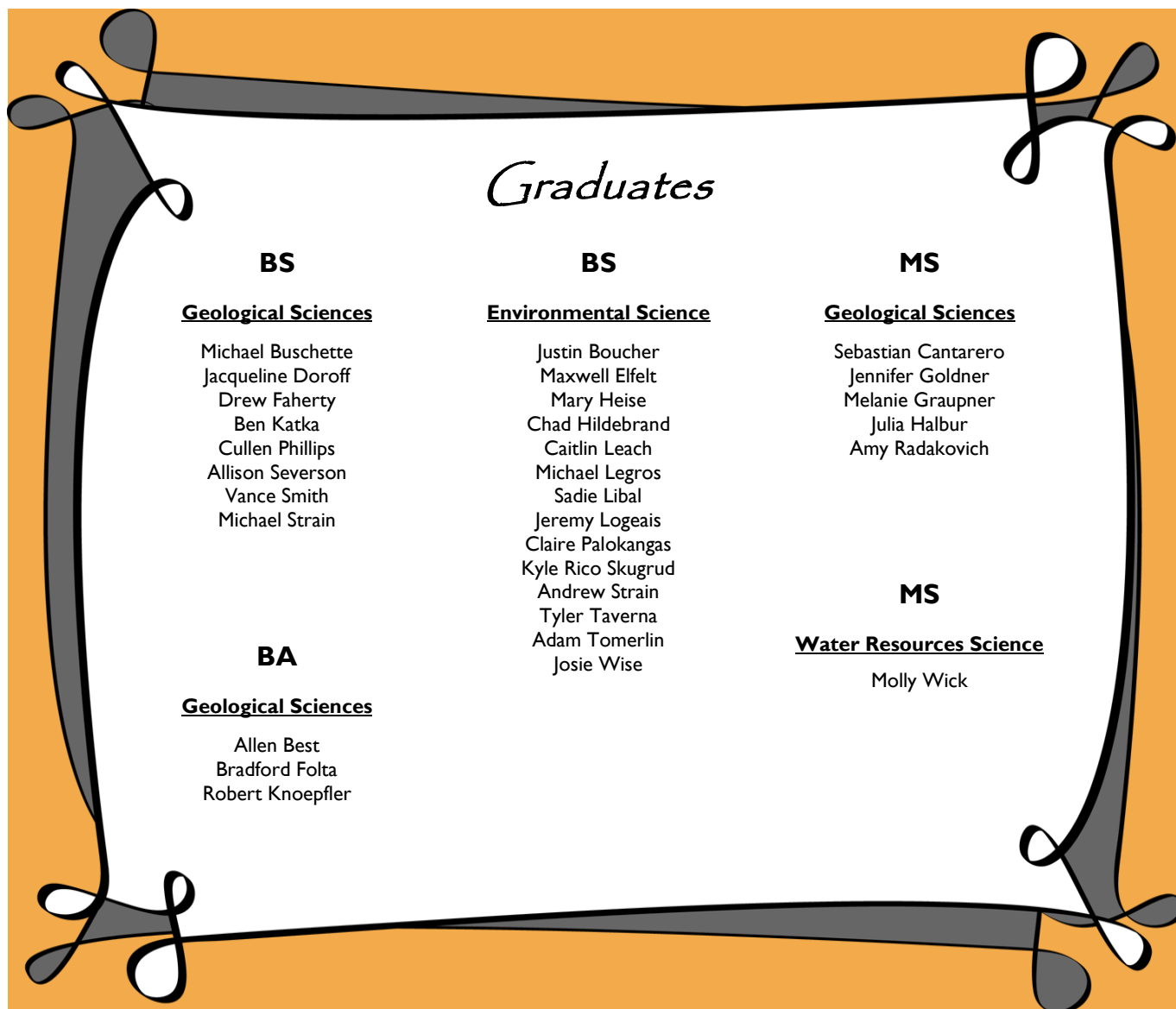
I joined the faculty of the Department of Geological Sciences this fall and I am delighted to be back in Minnesota.

I first came to Minnesota in 1994 from Germany to complete a Master's degree at the Twin Cities campus. In 1999, I earned a geology diploma from Freiberg University in Germany before receiving my Ph.D. in geology at the Center for Ore Deposit

and Explorational Studies (CODES) from the University of Tasmania in Australia. A Post-doctoral studies at Johns Hopkins University in 2004 involved research on matter transport and ore deposit formation in hydrothermal systems. In 2007, I transferred to Aachen University in Germany to teach and continue research on physical and chemical processes connected to ore deposit formation as well as mineral resources in Oman and Asia. Exploring new opportunities, I moved to the University of Alaska-Anchorage in 2011 to broaden my teaching and investigate seafloor brine pool formation and the rare earth element potential in Alaska before coming to Duluth.

As an economic geologist with a broad interest in physical and chemical processes related to mineral deposits, metal isotopes, and fluid flow, I contribute to the traditions of economic geology in the department by teaching economic geology this semester and exploration geology next semester. I will add to the diversification of the course spectrum by offering a class in computer modeling and other topics in the future. In addition, I intend to utilize reflected (ore) microscopy and computer simulations in both teaching and research activities. To that end it is planned to acquire a set of reflected light microscopes to take advantage of existing ore material and expand the current collection. On the research front, I will continue my studies of SEDEX-style mineralization, investigate weathering and chemical changes of Cu-Ni-PGE mineralization together with the local mining industry, and spatial controls of fluid migration and matter transport. These and forthcoming activities will provide engaging and useful research projects for current and future students interested in economic geology and help prepare them for ongoing and prospective mining activities in Minnesota.

With the possibilities of the Cu-Ni-PGE ore deposits connected to the Duluth complex, and the engagement of the local mining companies, this is a great opportunity for prospective students to come to Duluth. This will contribute to the growth of the geology department and I am looking forward to a fruitful collaboration with colleagues and interesting work with our students.



## EMERITUS FACULTY NEWS

### Jim Grant

The year started off well, with our annual trips to Los Cabos and to Park City, and the maps of the Morton Gneiss continued to take shape, slowly (me) but surely (Julie Oreskovich). Then I got into surgery – first cataract surgery, which was less than successful, and still a work in progress. Meanwhile, my dentist found I had a 2cm tumor whose removal was said to be (a) essential and (b) life-changing. I was referred to THE expert at Mayo. He had the whole thing out very neatly, and used a flap from my cheek to fill the hole. Within a few days the flap died, and I've had an acrylic prosthesis, which worked better than I could have hoped for. While my mouth healed, we went off to Europe for five weeks with Christabel's sister, Niki. From England to Ireland and finally to the Cote d'Azur for a week, with a cool flat in Old Nice, which was exactly the way it should have been. Chagal and tripes a la Nicoise and Les Gorges du Loup, which I'd seen in black and white photos when I was about four years old, and is my first memory of "abroad". Lovely old hill towns, from which one can see from the Med to the snow-covered French Alps! On our return, I went back to Mayo for more surgery to close the hole. This was ten days ago, and so far so good.

All the best for 2014!



## John Green

Nothing too exciting to report for this past year; mostly more of the same activities, both geological and otherwise.

On the rocky side, along with a few invited talks and field trips and the Institute on Lake Superior Geology, and handling “funny rocks/meteorites” from the public, I ran a three-day field workshop for the Minnesota Department of Natural Resource’s County Biological Survey ecologists in the central Vermilion District (east and west of Ely) in late May. Surprisingly few bugs! And I try to keep track of, and assist where I can, Terry Boerboom’s (M.S. 1987) bedrock mapping up the North Shore in Cook County for the Minnesota Geological Survey. It was great to have my former M.S. student (1974) Klaus Schulz of the USGS be honored as an Inductee to the Swenson College of Science and Engineering’s Academy of Science and Engineering in September.

I continue to be involved as a board member of the Superior Hiking Trail Association and volunteer (rebuilding after destruction by a logging operation).

We took our usual family visit to New England in August, which included tracking down some ancestors’ gravestones in Vermont and New Hampshire. What a difference geology makes! The inscriptions on the stones made of local Paleozoic slate are as sharp and clear as ever, even though ~200 years old. When fashion turned to marble about 1840 things started to go to pot – how would they know about acid rain?

Jan continues to be deeply involved in the Hawk Ridge Bird Observatory here in Duluth, in Minnesota Audubon, and in the Minnesota Breeding Bird Atlas project.

Our oldest grandkids are now freshmen in college! One is at the College of the Atlantic in Bar Harbor, Maine, and the other is at Rensselaer Polytechnical Institute in Troy, New York. And a granddaughter is taking her junior year in high school in NE France, near where my dad fought in WWI.

## Charlie Matsch

I kept close to home this past year. Just a spring getaway to Tucson, Arizona to warm up, hiking in the foothills of the Santa Catalina Mountains, and a summer visit to my hometown, Hastings, Minnesota for a family gathering. I was close to the top in age! So far since retiring, I’ve spent major time in Arizona, Oregon, Washington, Vancouver Island in British Columbia, Texas, Florida, Utah, Nevada, and Maine. I think that’s enough for awhile. Hey, I’m keeping healthy, feeling great and I still don’t have a Lazy Boy recliner! Have a great holiday season.

## Ron Morton

I’ve been retired for six months and it seems like just a few weeks! Time has flown by as I’ve spent the summer and fall working on a new book with Carl Gawboy, doing agility and lots of hiking with our Brittany Spaniel Tillie, spending time with my granddaughter who is two, taking care of 25 acres of woods and creeks plus about an acre of gardens, and then there are all those wonderful recipes to try out! Great fun so far.

Penny remains as the associate dean of the Swenson College of Science and Engineering and still very much enjoys working with students (except at dismissal time). She is no longer acting head of civil engineering (which she spent the last year doing) as they have hired a real civil engineer to manage the department.

Our daughter, Megan, continues to enjoy building pipelines with Enbridge. She was married this fall on the beach at Park Point, and it turned out to be a perfect day.

Chris has taken a job as a software engineer for Saturn Systems here in Duluth and his wife, Tracy, remains with the federal rural health program, which is based in Duluth. Thanks to the two of them we are expecting our second grandchild in April.

Finally, I would like to thank all of you who sent me e-mails upon my retirement.

Keep well and enjoy life.

## Dick Ojakangas

I am writing this while on a 20-day cruise from Boston to San Diego, via the Panama Canal. I presented eight PowerPoint lectures to spread the "geological word".

I spent January in India continuing research on 2.7 Ga glacial deposit sand and presented seven talks at different Universities. I will be there again in November, 2013--my gosh, I leave today! I will present an invited keynote paper on "Uranium: Energy of the Future?" at an International Seminar on Energy and Minerals, held in conjunction with the annual meeting of the Geological Society of India.

I taught a course for University for Seniors on "Geology of Minnesota and the Great Lakes Region," as well as attended the Institute on Lake Superior Geology (ILSG) at Houghton, Michigan.

Peaches and I traveled to Niagara Falls for her birthday. We hosted an Ojakangas family reunion, including my brother Dennis (BA 57) and his wife Eileen from California. We enjoyed a visit from Roger McLimans (MS 72) and his wife. Roger was in our first group of four graduate students. I presented "Glaciations: Present and Past" at the Mesabi Range Geological Society.

I am still slowly attacking my backlog of unfinished projects that date back to 1972, but interesting new projects keep appearing and delaying that progress. My son Greg Ojakangas (BS 82) and I (with the help of John Heine and Mark Severson, from NRRI) are continuing studies on Mesabi Range stromatolites.

Peach's 29th cookbook was just published by Rodale Press, "The Soup and Bread Cookbook". (What will I be taste-testing next?)

Keep at it, all you grads of UMD Geology!

## Rip Rapp

At 83 I think I am slowing down; fewer papers being published, I gave up biking (too many steep hills here—more time in the exercise room to compensate), foreign professional travel is becoming less interesting (went to GSA in Denver, however, to give a paper) and so forth. The website, [www.rip-rapp.com](http://www.rip-rapp.com), has been up and running for a few months. It contains the complete volume one of my autobiography, titled simply, "Rip". I am currently working on volume two with the not very creative title of "Rip 2", along with a paper on Raphael Pumpelly's pioneering excavation Annu, Turkestan in the first decade of the 20th Century. I will be back in Duluth for the usual three weeks in late June-early July, 2014. Beginning this last summer I have started flying back instead of driving—another nod to my octogenarian status. Between now and June southern Arizona provides the sunny weather to match my disposition.

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## PRECAMBRIAN RESEARCH CENTER

The Precambrian Research Center (PRC) at UMD had another successful year in 2013 – our seventh. The Precambrian field camp, the centerpiece program of the PRC, once again attracted 22 students from 14 different schools from across the U.S. Registration was full by January, and we had to turn away 12 students. I will let one of our UMD students who attended the 2012 camp, Matt Grotte, tell you more details about last summer's camp elsewhere in this newsletter. Some updates on our other programs:



*"The rocks are the final court of appeal" Francis Pettijohn*

**Professional Workshops** – This past October, the PRC hosted a weeklong workshop on Cu-Ni-PGE deposits of the Lake Superior region. The workshop included two days of invited talks on the attributes of magmatic sulfide deposits and five days of field trips, including visits to the Eagle Mine in Upper Michigan, and the Lac des Illes mine outside Thunder Bay Ontario. The workshop was attended by 67 participants, mostly from industry, and was aided by 30 instructors and field trip leaders.

## Fall 2013 UMD Geological Sciences

(PRC, continued from previous page)

**Outreach** – In June, the PRC once again served as the principal organizer for the 15<sup>th</sup> Annual Minnesota Minerals Education Workshop (MMEW) held at Winona State University. The MMEW was attended by a record 96 K-12 earth science teachers from across the state. Next year's MMEW will be held in Hibbing.

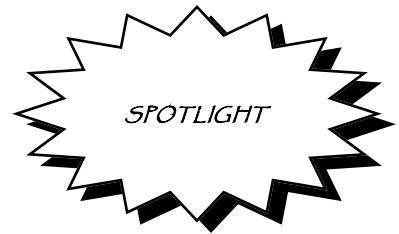
**Student Grants and Assistantships** – Although industry contributions to the PRC dropped this year, we were still able to provide Graduate Research Assistantships last spring to Aubrey Lee and Jon Dyess. Also, thanks to support from specific companies through the PRC's Industry Support of Student Research program, a number of students received GRAs and other support for their thesis research: Craig Caton (Duluth Metals), Paul Fix (Teck), and Alex Steiner (Twin Metals Minnesota).

**Student Mentoring** – The PRC continued to play a major advisory role in the new Society of Economic Geologists student chapter. During spring break, Jim Miller accompanied a group of 10 SEG-UMD students to visit the geology and mineral deposits of Arizona and New Mexico. This past fall, the PRC assisted in an SEG field trip for 12 students to the western Mesabi Range. In addition, the PRC co-sponsored three undergraduate and three graduate students to attend the Prospectors and Developers Association of Canada convention last March in Toronto.

For more info on these and other programs and on how to become a supporting member, please visit the PRC website: [www.d.umn.edu/prc](http://www.d.umn.edu/prc)



Congratulations to Steve Colman for receiving the Chancellor's Distinguished Research Award for 2012-2013.



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## Klaus J Schulz named Outstanding Alumnus



Klaus Schulz received his Master of Science degree in Geology from the University of Minnesota Duluth in 1977. He is a fellow member of the Geological Society of America and the Society of Economic Geologists, and received the Goldich Medal from the Institute of Lake Superior Geology in 2003.

Klaus is a research geologist in the Eastern Mineral and Environmental Resources Science Center of the U.S. Geological Survey (USGS) in Reston, Virginia. He joined the USGS in 1982 and served as chief of the Branch of Eastern Mineral Resources from 1989 to 1996. His primary research area is the geology of Precambrian terranes, particularly in the Lake Superior Region. He has gained worldwide recognition in metal resource estimation and authored or co-authored more than 80 publications. He has presented more than 100 technical presentations and invited lectures at national and international conferences. Klaus has also served as the U.S. representative to the International Union of Geological Sciences Sub-commission on Precambrian Stratigraphy and the IUGS-UNESCO Deposit Modeling Program Steering Committee. Prior to joining, Klaus was associate professor of geology at Washington University, St. Louis, and a National Research Council research associate at NASA.

## Alumni News

Hinkel, Jon, BS 86, joined the Duluth office of MSA Professional Services as a senior project hydrogeologist. He will be involved with environmental property assessments, leaking underground storage tank projects and environmental compliance projects.

Jahn, William, BS 99, has opened his own business, Lake Superior Coins.

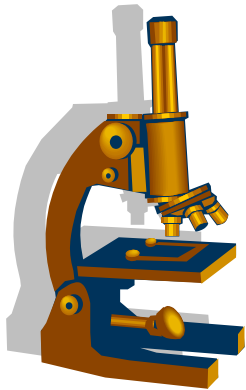
Ross Sellner, Linda, BA 96, is the newly elected three-year term President of the Duluth Public Utilities Commission. Her daughter (Laura) is following in her footsteps, and is currently studying Geology at UMD.

Swintz, Robert, BS 79, is currently in the real estate business in Jackson Hole, Wyoming. He is still involved with rocks, however. Check out his local club at [www.geologistsofjacksonhole.org](http://www.geologistsofjacksonhole.org).

Theriault, Stephanie, MS 11, and Matthew Chaffee (MS pending) are engaged and plan to tie the knot on September 27, 2014. Steph is a geochemist for Barr Engineering in the Twin Cities, and Matt is a Quality Control Coordinator at Tiller Corporation in Maple Grove, Minnesota. Congratulations, Steph and Matt!

Wartman, Emily (Dunn), MS 11, is currently working at Leggette, Brashears & Graham, Inc., an environmental consulting company in Superior, Wisconsin.

Wartman, Jakob, MS 11, is currently working at Cliffs Natural Resources, Inc., in Eveleth, Minnesota.



### *PLEASE CONTRIBUTE TOWARD OUR PROPOSED ORE MICROSCOPY LAB*

*Our goal is to raise \$100,000.*

*If you would like to contribute towards this goal,  
please note this on your contribution.*



#### **In Memory of Jack V. Everett, Friend and Benefactor**

Jack Everett, Consulting Mining Geologist, passed away August 12, 2013, at the age of 92. Jack graduated from Michigan State University in 1947 with a B.S. degree in Geology. His long career began on the Cuyuna Iron Range where he was instrumental in the discovery of several iron/manganese deposits. Jack then moved on to exploration and development of iron ore deposits in the US, Canada, Panama, and Brazil as Chief Geologist and Exploration Manager for W.S. Moore Company here in Duluth. Jack's prospecting took him around the world and he was instrumental in the discovery and development of iron ore, copper/nickel, and gold deposits including the El Chanate Gold Project in Sonora, Mexico. Jack also brought his versatile set of skills to bear on problems outside of exploration and mining such as geotechnical and hydrological applications, which included the tunnel projects on the North Shore of Lake Superior.



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## *Duluth's Flash Flood*

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by Karen Gran



Photo by Kris Hiller



Photo by Kris Hiller

Last June, Duluth experienced an extreme flash flood event. Recent work by the U.S. Geological Survey (USGS) has determined that discharges exceeded a “500-year” event magnitude on many area streams. Although the flood led to much infrastructure damage, it has also caused some rather profound changes in stream channels as well, with rivers experiencing land sliding, bank erosion, deposition of massive new gravel bars, and even small scale avulsions.

One of the hardest hit areas was Jay Cooke State Park. Last fall, we were able to take several UMD classes out to Jay Cooke to reconstruct what happened when a levee breached on Forbay Lake. Forbay Lake is fed by a diversion channel from Thomson Reservoir. It acts as a holding pond for a Minnesota Power plant. On the night of June 19<sup>th</sup>, the levee breached, causing a massive flood wave to wash over the landscape. Intense scour stripped off soil leaving exposed roots dangling above red clay tills. Tree trunks were scoured several meters high, with debris wrapped around their trunks. The flood waters then channelized, incising a slot canyon through glacial tills. Downstream, the flood waters backed up behind Highway 210, overtopped the road, and eventually breached the road, too.



Photo by Eric Vehe

We took students from Geomorphology, Sedimentology and Stratigraphy, and Fluvial Geomorphology classes out to the site in October 2012 to reconstruct what happened. Students from two classes then worked on independent research projects on site designed to document in detail what happened. They did a great job reconstructing the event including area covered by the flood wave, patterns of flow, depths of incision, size of the temporary impoundment behind the road, locations of knickpoints and newly created terraces, and magnitudes of erosion and deposition throughout. A partnership with science education students at University of Wisconsin-Superior, will result in public outreach materials for the park to use, based upon the findings from University of Minnesota Duluth students.

If you are in the Duluth area, take a walk up some of our rivers and see for yourself what happened. Or stop by Jay Cooke State Park and see if you can tell what happened there.



Photo by Derek Montgomery



Photo by Kris Hiller

## GEOLOGY CLUB NEWS

The Geology Club started out the semester with two pizza meetings to welcome new members and to decide the activities the club will be engaging in. We started out by helping with the Homecoming Campus Clean-up by picking up litter around campus. On October 12<sup>th</sup> we hosted a group of 7<sup>th</sup> grade girl scouts, talking to them about the local geology. Currently we are working on bringing back "Dinner with a Professor" where students in the club are encouraged to have dinner with their professor(s). The aim of this is to get to know our mentors better, get an insight into what brought them to UMD, and learn a little bit about life.

The first weekend in November, the Geology Club upheld its strong reputation of community education and member participation through engaging in the first ever, SCSE hosted, Bulldog Science Day. This event invited students ranging in age from middle school to high school to experience what SCSE has to offer via small departmental presentations and a large Q/A session held in the Kirby Ballroom. The geology department, in particular, led an interactive tour using the three dimensional floor maps located in Heller Hall. Students adorned red/blue glasses while seniors Bob Kryzer, Matt Grotte, and Nicholas Spano explained the plate tectonic theory and described large scale features represented on our planet. Meanwhile, senior Patrick Quillen supervised students experiencing the many wonders one can see through the polarized light microscopes. Another senior, Shane Loeffler, gave tours of the known universe through projections in the MWAH Planetarium. The success of this event was due to the overall enthusiasm, dedication, and passion towards science shown through these Geological Sciences Department soon-to-be graduates.

*by Bob Kryzer, Scott Pollan, and Kate Wehrs*

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## ENVIRONMENTAL SCIENCE CLUB NEWS

### **What has the Environmental Science Club been up to?**

To start off the 2013 school year, we continue to clean up trash along a large portion of the lake walk, and we coordinated with the City of Duluth to help plant trees along a new walking/biking trail. Last year, the Environmental Science Club toured the Keetac Mine in Keewatin, Minnesota. We started off inside the office talking with the staff from US Steel, after which we were escorted around the mining operation to see how they extracted, separated, and processed the iron ore before shipping it out. The club also toured the Great Lakes Aquarium and had a special "behind the scenes" tour that the general public wouldn't normally receive. The club arranged for two speakers to present seminars last year; Kevin Wilson from Blue Water Capital Advisors, LLC on hydraulic fracking, and a graduate student from the Biology Department working with Senior Research Associate Ron Moen from Natural Resources Research Institute presenting their most recent findings on the moose population in Minnesota. This year the Environmental Science Club is focused on volunteering and gaining more recognition by the student body at the University of Minnesota Duluth. The Club is also becoming involved with educating K-12 schools in the Duluth area on environmental education.

*by Matt Scheeler*

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## SOCIETY OF ECONOMIC GEOLOGISTS

The Society of Economic Geologists Student Chapter at UMD had a very eventful and fun year. The highlights were our two annual field trips.

During Spring Break a week-long field trip was jointly run by UMD and New Mexico Tech SEG chapters. The trip was a major success and a great experience. It started with a grueling drive out to Santa Fe, New Mexico, where the students met up with Professor Jim Miller and spent the rest of the week touring various stops in Arizona and New Mexico. Some highlights included the Valles Caldera, Jerome VMS deposit, Bagdad copper mine, Grand Canyon, and Shiprock, among others. We also had the opportunity to meet some interesting local residents who were interested to learn why students from Minnesota were wandering around the desert. This trip was a great way for students to see an area new to most of us and learn about geology different from what we are accustomed to here in Minnesota.

This most recent October, a weekend trip was taken to tour the Western Mesabi Range in conjunction with the University of Wisconsin Eau Claire. Mine visits were made to several taconite mines including Keetac, Hibtac, Essar, Magnetation, and an aggregate quarry in Grand Rapids.

The Student Chapter hopes to continue its success by planning more exciting trips for the upcoming year.

*by Patrick Quillen, SEG Student Chapter President*

## Precambrian Field Camp 2013

This summer I had the opportunity to attend the University of Minnesota Duluth's Precambrian Research Center Field Camp (PRC). The six hellish weeks we spent traipsing around the boreal forests of Northeastern Minnesota were some of the greatest times I've had. Late nights, followed by early mornings, leading into longer days, may not have been bearable without the dedicated efforts put forth by the PRC staff. The first two weeks of field camp were spent in the Duluth area learning the basics of wilderness safety and proper mapping techniques. We performed geophysical surveys of the basal midcontinent rift near Esko, mapped portions of the Duluth Complex at Spirit Mountain, as well as had projects at Thomson Dam and the North Shore/Beaver Bay Complex. Before you knew it, we were already packing up and moving camp to the Vermilion Community College in Ely. Our time at Vermilion Community College went by in a blink of an eye. Up on the Mesabi Range, we learned how to log core and got the opportunity to visit a taconite plant and mine [United Taconite and Thunderbird Mine]. While in Ely, we had a few days of inclement weather, which we took to our advantage to tour the Soudan Mine and further hone our core-logging skills. Other than capstones, my favorite mapping exercise was the Nickel Lake Macrodiike Project where we saw some impressive massive sulfide mineralization. Once we returned to Duluth from our capstone mapping projects, we frenziedly compiled our data and produced some fine-looking maps. Thanks to everyone who makes it possible for PRC camp to exist, and thank you to those who provide financial support to the students.

by *Matte Grotte*

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## Wasatch-Uinta Field Camp 2013



### Chalk Creek "Top of the World"

**Sarah Bauer, Cameron Dahlin, Emily Goranson, Kathryn Grave, Kaitlin Johnson, Paul Kamnikar, Ben Katka, Shane Loeffler, Scott Pollan, Patrick Quillen, Derek Rode, Jacob Kolke and Nicholas Rogers, with Professor Karen Gran and Teaching Assistant Allison Severson.**

The hype and anticipation couldn't have been higher. After all, the Wasatch-Uinta field camp represents the culmination of our undergraduate education. All year we had heard stories about how amazing field camp is, and the 2013 Wasatch-Uinta field camp did not disappoint. No matter how much advice we were given, I don't think anything could have properly prepared us for our experience.

This year 13 UMD and 66 total students made up the class. Almost all UMD students left one week early, and hiked Glacier and Yellowstone National Parks to provide a bit of "calm before the storm." Karen Gran was kind enough to again provide her expert knowledge of geomorphology for the first three weeks of the course, and recent UMD graduate and 2012 field camp attendee, Allison Severson, lent her services as a Teaching Assistant for all six weeks. Chances are if you are reading this as a previous attendee of the Wasatch-Uinta field camp, things are much as they were in the past. In talking to Mark Elliott of the Minnesota Pollution Control Agency when I got back, we reminisced about many of the same field sites he mapped when he attended in the late 80's. Chalk Creek, Deer Creek, Bonanza, Alta, and Jupiter Ridge among others, were all places that at first had us scratching our heads questioning what we learned the last four years, but by the end of camp it is safe to say that we now all consider ourselves "expert" field geologists. Park City and Utah in general were amazing places to spend six weeks of our summer. Special trips included a tour of the San Rafael Swell by the legendary Tim Demko, a relaxing trip to the Grand Tetons, and a visit to the Newmont Mining operations in Northern Nevada.

As it probably seems every year, field camp is not without its fair share of unexpected "excitement." Leaving the Swell this year, the UW-Madison trailer flipped over and was critically wounded to the point of un-repair. Thank goodness no one was injured, but it was definitely exciting to say the least. The trailer was sent off with a field camp salute and brief "memorial service." On the 4<sup>th</sup> of July we woke up to a thunder storm, and shortly after breakfast the call was made to cancel that day of Bonanza, much to the disappointment of the students (or not). Within a few hours of that decision, like it was meant to be, the skies cleared up and the sun shone bright. The day was spent watching the parade down main street, relaxing, watching fireworks and celebrating America's independence (and not being in the field).

Thank you to everyone who helps make field camp possible, including those who support the scholarship funds. We all truly appreciate it. For the rest of our lives my classmates and I will carry with us the lessons learned, knowledge gained and fun times had at the Wasatch-Uinta field camp 2013.

by *Patrick Quillen*



## Fall 2013 UMD Geological Sciences

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