

2015
UMD

Earth & Environmental Sciences Newsletter for Alumni & Friends



In this issue:

- Invitation to our annual spring banquet (this means you!)**
- New faculty introductions**
- Honors for John Green**
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- 50th Anniversary Celebration of the Wasatch-Uinta field camp**
- UMD in Antarctica**

I can't believe I'm saying this but I am in my 25th year at UMD. The face of the Department continues to change and our scope widens. This year we welcomed three new faculty. Latisha Brengman received her PhD from the University of Tennessee Knoxville and her research focuses on early Earth problems. One of her tools is the study of silica isotopes in banded iron formations, and she thinks Minnesota has enough BIF for a long career. Latisha will be teaching Earth history and developing courses in geochemistry and early Earth environments. Fred Davis joins us from the University of Minnesota Twin Cities following a three-year post-doctoral fellowship at the Smithsonian. Fred's interests are in the petrology and geochemistry of the mantle and the history of recycling of oceanic lithosphere. He will be teaching mineralogy and developing courses in solid earth processes.

Jacob Selander also joined our faculty for the year as a sabbatical replacement. Jacob received his PhD from the University of California Davis and his research emphasis is neotectonics. Karen Gran, John Goodge, and Vicki Hansen are on sabbatical leave this year and their teaching duties are safely in Jacob's hands. Geomorphology this fall, structural geology in the spring, and the students are lining up for his neotectonics course with a field trip to the Mojave Desert over spring break.

This year John Green was inducted into the Swenson College of Science and Engineering Academy, joining a distinguished group of alumni and friends of UMD. John taught geology at UMD from 1958 until his retirement in 1999 and has continued to contribute to the Department. Most days John can be found in his office continuing his research on the Mid-continent rift with colleagues in the Department, at the Natural Resources Research Institute, and at the Minnesota Geological Survey. Please take a moment to read the enclosed highlights of John's long career and many accomplishments.

We also said goodbye to Tom Johnson with his retirement in May. Many of you may not know, but Tom had two careers at UMD. He was a professor in the Twin Cities and moved to UMD for two years in the early 1980s before moving on to Duke University. Tom then returned as founding Director of the Large Lakes Observatory in 1994. We wish Tom and Kate all the best as they share their time between their new home in Massachusetts and their cabin on Lake Vermilion.

And now two special invitations. Please plan on attending the annual Department banquet that is scheduled for April 15. The banquet is a great social event with a program put on by the students followed by our award ceremony. The other invitation is to the 50th anniversary celebration of the Wasatch-Uinta field camp. There will be a reunion July 25-28 at the Chateau Apres in Park City, Utah, (bring your hiking boots) and an evening celebration at the 2016 Annual Meeting of the Geological Society of America in Denver in September.

Happy Holidays everyone.

2015 UMD Earth & Environmental 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 Earth & Environmental Sciences, and includes those donations that the University has posted to our department accounts at press time.

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Please join us at Greysolon Plaza's Moorish Room on Friday, April 15th for an evening to reconnect with faculty, alumni and friends, and to meet our new faculty and current students!

Earth and Environmental Sciences Department 2016 Annual Banquet

Social hour starts at 5:30 p.m. - cash bar

Dinner served at 7:00 p.m. - Italian buffet with dessert

Program and award presentations begin at 7:30 p.m.

Parking is free after 5:00 p.m. (parking ramp behind the Sheraton, handicap accessible)

Price: \$20/person

Please RSVP by Friday, April 8, 2016

Phone: (218) 726-8385

or

E-mail: dees@d.umn.edu

Undergraduate Student Presenters & Contributors

Spring 2015 UMD UROP Showcase

University of Minnesota, Duluth

Kelner, G., “The Geosourcing of a Plagioclase Sample from Mission Creek”

Geological Society of America 2015

Baltimore, Maryland

Hoover, B., Mooers, H., Larson, P., “Slope Morphology on Icelandic Fuglapúr”

The Institute on Lake Superior Geology 2015

Dryden, Ontario

Essig, E., Hudak, G., Pignotta, G., Lodge, R., “Petrographic Analysis of Felsic Tuffs Within the Neoproterozoic Soudan Member of the Ely Greenstone Formation, Northeastern Minnesota”

Lentsch, N., Miller, J., “Incorporation of Duluth Complex Maps into GIS Platform”

Graduate Student Presenters & Contributors

The Institute on Lake Superior Geology 2015

Dryden, Ontario

Doyle, M., Miller, J., “Geologic and Geochemical Attributes of the Beaver River Diabase and Greenstone Flow: Testing a Possible Intrusive-Volcanic Correlation in the 1.1 Ga Midcontinent Rift”

Sauer, S., Miller, J., “Petrologic Study of the “Chill” Zone of the Layered Series at Duluth: Testing a Possible Plutonic-Volcanic Correlation Within the Midcontinent Rift”

Asp, K., Schardt C., Spivak-Birndorf, L., “Evidence of High Temperature Ni Isotopic Fractionation During the Formation of Cu-Ni-PGE Sulfide Deposits in the Duluth Complex”

Fix, P., Diedrich, T., “Characterization of Secondary Minerals Formed on Weathered Duluth Complex Cu-Ni-PGE Deposit Rock and Implications for Controls on Metal Mobility”

American Geophysical Union 2015

San Francisco, California

Batts, V., Gran, K., “The Role of Fine Sediment in the Morphologic Evolution of Vegetated, Braided Channel Networks: Results from Flume Experiments”

Kremmin, T., Wattrus, N., “Reconstructing the Geomorphic Evolution of a Freshwater Baymouth Bar in Response to Lake Level Change Using 3D Ground-Penetrating Radar (GPR) Data”

Geological Society of America 2015

Baltimore, Maryland

Cappio, L., Brown, E., Stockhecke, M., Potts, R., Dommain, R., “Microfacies Analysis and High-Resolution XRF Scanning of a Laminated Pleistocene Lacustrine Sequence from East Africa”

Goldschmidt Conference (25th anniversary) 2015

Prague, Czech Republic

Asp, K., “Ni Isotope Signatures of Duluth Complex Cu-Ni-PGE Mineralization”

13th Meeting Venus Exploration Analysis Group 2015

Washington, DC

Tovar, D., Hansen, V., Swenson, J., “Detailed Structural Mapping of a Specific Region in Aphrodite Terra, Venus”

Annual Planetary Geologic Mappers Meeting 2015

Honolulu, Hawaii

Tovar, D., Hansen, V., Swenson, J., “Detailed Structural Mapping of Western Aphrodite Terra, Venus”

Workshop de Astronomía de los Andes 2015

Bogotá, Colombia

Tovar, D., Hansen, V., Swenson, J., “Mapa geológico y estructural detallado de una zona ecuatorial (15S-20S/110E-124E), ubicada en Western Aphrodite Terra, Venus”

46th Annual Lunar and Planetary Science Conference 2015

Houston, Texas

Tovar, D., Hansen, V., Swenson, J., “Preliminary Detailed Structure Map of an Equatorial Fracture Zone (15S-20S/110E-124E), Western Aphrodite Terra, Venus”

Tovar, D., Calderon, L., Robertson, K., “Geomorphologic Evolution of the Zone of Hadriaca Petera in Mars”

Tovar, D., Saavedra, F., Torres, J., “Literary Production in Science Fiction Like a Tool for Teaching Planetary Sciences in Colombia”

Faculty News

Erik Brown

The adventures never end. I am still helping out in UMD's Graduate Office on an interim basis, working to find more funds to support graduate students and to foster more interdisciplinary collaborations on campus.

I still have managed to maintain some research activities, with continuing projects in East Africa that are part of the Hominid Sites and Paleolakes Drilling Program. As the name implies, this project has recovered ancient lake sediments from sites adjacent to some of the major hominid fossil sites, targeting periods of major evolutionary change or of significant advances in stone tool technologies. Our proposed drilling program in the Basin of Mexico (just south of Mexico City) is likely to start in February 2016 (knock on wood), so I have been traveling to Mexico to coordinate discussions with drilling contractors, and work on logistics of making sure that the drilling and science crews will be safe, housed and fed.

More locally, my brother-in-law and I replaced the siding on the cabin (we did the roof last summer), so I think I can claim to be a real Minnesotan!

Christina Gallup

I taught the second half of the Wasatch-Uinta Field camp this year, which was my first time teaching field camp. It was a true learning experience and I loved every minute of it. There is no substitute for field camp. It was a pleasure to see the students think and make connections with what they learned in the classroom.

It is so good to be the Department of Earth and Environmental Sciences now. The Environmental Science major has added so much to the Department and to my experience at UMD. Several of the students in our program have obtained internships and have been able to receive college credit through our Cooperative Education course. After completing the internship, the student writes up what they did and what they learned and the employer writes up what they did and how they performed, and the student earns two credits towards their electives. This is a great way to receive college credit while getting real world experience that can shape the student's future employment. We are always seeking good internship opportunities for our Geology and Environmental Science majors, so if you know of opportunities for our students, please let us know!

John Goodge

I am on a research sabbatical in 2015-2016 and enjoying every minute! Part of the time will be in Perth, Australia at the University of Western Australia (UWA), and I will be visiting other organizations as well. A highlight of my time in Perth was a field excursion with UWA researchers to see the Pilbara craton, which hosts some of Earth's oldest rocks (~3.6 billion years old). These are about the same age as the Minnesota River Valley gneisses, but honestly the terrain, plants and animals are much more exotic in the Pilbara! My main focus while on sabbatical is to write up some lingering research results from recent Antarctic projects and continue with development of the Rapid Access Ice Drill. The new drilling system has just been completed in Utah, has been through a series of field and shop tests, and is being shipped to Antarctica this year. If all goes according to plan, my group will have it 'on the ice' for the first set of full-scale Antarctic field trials beginning in the austral summer of November, 2016. I also spent a week in Washington, DC, to participate in a planning charrette to provide input on the design of a new McMurdo Station that will serve as the main research hub for the US program in Antarctica for decades to come.

Karen Gran

It was another busy year with a full lab of graduate students. Four of them defended their MS degrees and moved on: Martin Bevis, Courtney Targos, Pichawut Manopkawe, and Nate Mitchell. Two are bound for PhD programs and the others are working. Ian Treat and Anna Baker joined the group this fall, both of them working on Minnesota River research. Ian will be looking at long-term ravine evolution, and Anna (based in the Cities) is working on a phosphorus budget in the Le Sueur River. They join Virginia Batts and Jenny Jasperson who will be finishing up their MS degrees in the next few months.

Gran (continued)

This past year we offered two new courses in stream restoration at UMD, and had five students complete both the introductory course and the capstone course. Adding these courses allows students to complete a post-baccalaureate certificate degree in stream restoration science and engineering while in residence at UMD. To better prepare to teach these courses in the future, I'm spending part of my sabbatical this year (I'm on sabbatical this year!) working in consulting on stream restoration projects. I'm enjoying my professional development time so far and look forward to working on an array of projects over the coming year.

Vicki Hansen

Newsletter 2015 and time to share UMD Planetary Tectonics highlights! We had a wonderful group of students for the first Astrogeology course Spring 2015. Next time we'll get to include fantastic new and intriguing views of Pluto! Dr. Jon Dyess (see last year) had a second paper published (coauthors Goscinak and Hansen), "Constraints on vorticity and non-coaxial shear direction in Neoproterozoic LS-tectonites, an example from northern Minnesota, USA.", in *Precambrian Research*. We finally (!!) submitted our 1:10 million geologic map of Aphrodite Terra, Venus, to USGS for review—phew! The adjacent Niobe 1:10 million-scale map will hopefully follow soon. Together these two maps represent almost 30% of Venus' surface. MS student David Tovar is making progress in his quest to gain insight into processes responsible for formation of Aphrodite fracture zones—a challenging undertaking. I am currently (September-November) enjoying serving as a Gledden Visiting Fellow, supported by the Institute of Advance Studies, at the University of Western Australia (UWA) in Perth. The Fellowship has provided a wonderful opportunity to continue to explore connections between Venus and early Earth, building on ideas presented in a paper I published in *Lithosphere*, "Impact origins of Archean cratons". This is actually our second trip to 'Oz' this year as John and I joined Professor Tony Kemp (UWA) for field work in the incredible Pilbara Archean craton in June. The bush is truly lovely, as is Perth, though each very different! Perth is a haven for parks, bike trails, sunshine, and lovely Aussie wines. It will be hard to return to Duluth just as the days shorten and the winter cold sets in.

Jim Miller

With my retirement from UMD coming this May, this will be my last department newsletter missive. A brief history - after working for the Minnesota Geological Survey (MGS) in St. Paul since 1983, I seized an opportunity to relocate in Duluth in 2000. This allowed me to be closer not only to my rocks, the Duluth Complex (DC), but also to other DC experts. Though still employed by the MGS, I took advantage of my adjunct position in the department to periodically teach classes and advise graduate students. In 2007, after many hallway discussions at the Natural Resources Research Institute about the dire need for field training in Precambrian terranes, Dean Peterson, George Hudak and I developed a field mapping school at UMD that we called the Precambrian Research Center (PRC). The following year, my 25-year association with the MGS came to an end when I was appointed to an associate professor position that was split between teaching in the department and being administrative director of the PRC.

I just want to take this opportunity to thank all my colleagues, students, and friends who have made the past sixteen years at UMD a joy. In particular, I want to thank my PRC colleagues Dean Peterson, George Hudak, and, my girl Friday, Julie Anne Heinz. A special thanks also to Howard Mooers and Penny Morton, who have been as much friends as department colleagues, and to Mark Severson, the only other person in Duluth who speaks fluent "gabbro-ese". I especially want to thank my twenty graduate students for allowing me to do research vicariously through their talents. And lastly, I want to thank my mentor and friend over the past 30+ years, Dr. John Green. JC has been an inspiration to me as a geologist/naturalist and as a human being.

From the moment I set foot in this department as a graduate student back in the early 80's and met this accomplished and most collegial faculty (Green, Ojakangas, Matsch, Grant, Mortons...), who thought it was noble and proper to focus on the rocks in their backyard, I have wanted to be a part of this place. For the past sixteen years, and especially the past eight, I have fulfilled that dream. I hope that I have contributed a small part to the legacy of field-based studies in the Lake Superior region for which this department has been known since its creation. All the best, Eh.

Christian Schardt

2015 has been a busy year for me with teaching, research, and the involvement in the PRC field camp and the Minnesota Minerals Education Workshop. My current research continues on various projects, including metal isotopic signatures associated with Cu-Ni-PGE mineralization in the Duluth complex. Work by MS student Kris Asp has revealed promising Ni fractionation trends and results were presented at national conferences, including the premier geochemical Goldschmidt conference in Prague. A new project will focus on the characterization of mineralized and altered rock material on a microscale using advanced x-ray scanning, rock defragmentation, and microscopic techniques. To that end the Natural Resources Research Institute (NRRI) will host a new, state-of-the-art Swiss rock fragmentation test laboratory later this year. This new technology, initiated by University of Minnesota Twin Cities emeritus Professor Paul Weiblen, uses electricity to segregate individual mineral grains without the need for any mechanical grinding or crushing. This technology holds great promise for a variety of applications both within and outside of the geological sciences.

Research projects in the planning phase include a collaborative project in the Vermilion district/northern Minnesota, along with colleagues from the NRRI and the University of Wisconsin-Eau Claire. Another research plan focuses on weathering processes and metal isotopic signatures of mineralized ultramafic intrusions and laterites in the tropics.

This year we acquired two additional, state-of-the-art reflected light microscopes for both teaching and research purposes. The existing old scopes have been serviced and upgraded with new LED lights. This will significantly improve our ability to teach ore microscopy to students pursuing a career in the mining industry and conduct related research.

Byron Steinman

Hi everyone, new Assistant Professor Byron Steinman here. I know most of you don't know me (aside from the newsletter last year), but I am excited to continue my career at UMD. So here is what I do. I study paleolimnology, which basically involves using geochemical analyses of lake sediments to reconstruct past climate. During the past year I received two National Science Foundation awards to study the patterns, timing, and causes of drought in Central America and western North America. To further these studies, this past summer my undergraduate and graduate students (Cole Webster, Chris Shea, Laura Cappio) conducted field seasons in New Mexico, Arizona, Utah, Washington, British Columbia, and Alberta where we collected sediment cores from remote, mountain lakes. We've been busy processing these cores in the laboratory to better understand how drought cycles have influenced past lake levels and water availability in these regions. I've recently published several papers on a variety of topics including modern climate dynamics, paleoclimatology, and the paleoproductivity of lacustrine systems. I taught Geology and Earth Systems in the Spring semester and greatly enjoyed the experience of interacting with an enthusiastic and engaged student body. I'm looking forward to continuing my research on lake systems and past/present climate change over the next several years and expanding my student lab group at the Large Lakes Observatory and Earth and Environmental Sciences to include several new graduate and undergraduate students. My wife (Kristin) and I have enjoyed our first year in Duluth and within the UMD community and are looking forward to the future. This is a fun place to live and work, and seriously, the fishing is awesome.

John Swenson

As I write, I am looking out on my orchard, where the last of the late-ripening apples hang in the trees. We have yet to see a hard freeze, as a milder winter and long summer combined to allow the lake to warm nicely. In contrast to the previous two years, the warm summer allowed for development of good sugar levels in all fruit. Sarah and I had a typically busy year. Steffi (poodle) soldiered on into her thirteenth year of life, while Fozzie (labradoodle) celebrated his tenth birthday without slowing a bit—or missing a meal. I taught my typical four classes—introductory geology, sedimentology and stratigraphy, hydrogeology, and energy resources—and conducted research on a wide range of topics. I spent a chunk of time in Alberta, where, among other things, I presented a moving-boundary, morphodynamic model of non-Newtonian slurry behavior at the International Oil Sands Tailings Conference and gave a lead-off talk on process-water chemistry for oil-sands mines. I have a fantastic group of students working with me. Eddie Gazzetti is wrapping up his MS thesis on experimental studies of how autogenic processes in erosional drainage basins are transferred to and preserved in fluvio-deltaic strata; Eddie recently started a job with the US Forest Service in Juneau, Alaska. Rebecca Eiden is making great progress on her MS thesis project, which is a field-based study of paleo-hydraulics in a succession of Proterozoic fluvial rocks. Finally, Crystal Lambert, an undergraduate Geology major, is conducting a mapping project to constrain the millennial-scale rates of shoreline / bluff retreat in the far western arm of Lake Superior.

Nigel Wattrus

Earlier this year I had the opportunity to spend two weeks in Colombia collecting seismic data on Lago de Tota in the Colombian Eastern Cordillera. I took two UMD graduate students with me, Todd Kremmin and David Tovar. David is from Colombia and he was a great help to the party, explaining the details of Colombian etiquette! I have never been to Colombia before. It is an amazing place; the people are friendly and the scenery spectacular. As are many of my surveys, the objective of this project is to identify potential sites for future drilling to collect sediment samples for a paleoclimate study. Closer to home, my 2nd year MS student Todd Kremmin recently acquired a fantastic 3D set of Ground Penetrating Radar (GPR) data on Park Point. He told me after the survey that he had pushed the GPR cart a distance equivalent to that between Two Harbors and Duluth. Phew! His research has been partially supported by a grant from the AAPG, which we are very grateful for. Earlier this month we collected some vibracores from the site, which we plan to use to calibrate and date the GPR data. Todd is going to use his data to reconstruct the evolution of Minnesota Point in response to lake level change over the last several thousand years. He will be presenting some of his preliminary results at the upcoming American Geophysical Union meeting in San Francisco. This year Todd is joined by my new student Andrew Dennison, who comes to UMD from Lake Superior State in Sault St. Marie, Michigan. Andrew's thesis will center on the application of multibeam sonar data to the classification of lake floor substrate in the nearshore region. Earlier this month we spent a couple of days collecting a small (60 GB!) dataset off the Superior Entry to the Duluth harbor. That should keep Andrew busy over the snowy spring semester!

Graduates

<p>BS</p> <p><u>Geological Sciences</u></p> <p>Gerrit Bass Kenneth Bitzer Ian Dickhausen Robert Eisenrich Andrea Gadacz Jeffery Harrison Aaron Knowlton Nathan Lentsch Shane Loeffler Michael Marsh Julianna McDonnell Logan McLouth Amber Michels Stephany Rae Nelson Joseph Pearson Haitao Shang Kyle Thurk Katherine Wehrs</p>	<p>BA</p> <p><u>Geological Sciences</u></p> <p>Shayne Benjamin Ella Pelfrey Clayton Zervas</p> <p>MS</p> <p><u>Geological Sciences</u></p> <p>Angela Berthold Martin Bevis Lisa Broderius Matthew Chaffee Pichawut Manopkawe Nathaniel Mitchell Adam Thompson</p>	<p>BS</p> <p><u>Environmental Science</u></p> <p>Christopher Braeger Connor Doede Carl Dusbabek Andrew Juelich Emily Kolodge Trevor Lueders Jon Mcdannold Thomas Olson Gregory Puetz Kyle Rotegard Timothy Serre Benjamin Shandley Paul Sonday Alan Toczydlowski Nicole Torguson</p>
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Meet our New Faculty



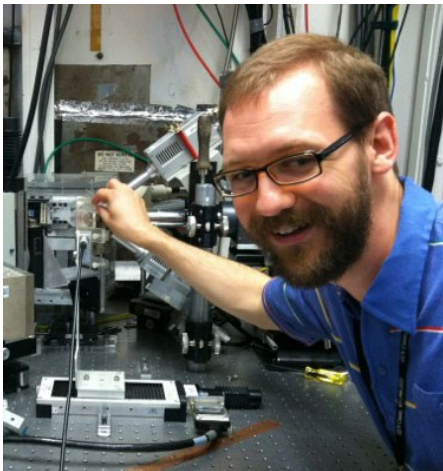
Latisha Brengman

I am thrilled to be joining the UMD community this year as a new faculty member in the Department of Earth and Environmental Sciences starting this fall.

My fascination with the world and the way it works led me to pursue a Bachelor of Arts degree at Northwestern University, where I pursued both science and music. In the fall of 2010, I entered the graduate program in the Earth and Planetary Science department at the University of Tennessee, Knoxville to pursue my passion for understanding early Earth problems. During the next five years I worked on questions relating to Precambrian chert genesis in an effort to better understand the ancient silica cycle. Upon completion of my dissertation defense, I spent the summer of 2015 in Houston, Texas on an internship with ExxonMobil, extending my research toolkit into the areas of soil development and weathering profiles.

I am excited to be here at UMD to continue pursuing my passion of teaching alongside my research interests, which are linked to using geochemical tools to decipher early Earth problems relevant to nascent life. Recently, I have been working with my colleagues at the University of Tennessee and the Swedish Museum of Natural History on understanding the origin of banded iron formation (BIF). These enigmatic iron- and silicon-rich sedimentary rocks precipitated from ocean water between 3.8 and 1.8 billion years ago. Because they are formed in the ocean, BIF are unique rocks that can provide information about what the ocean was like in the distant past. Most studies today focus on the iron in BIF deposits, because it preserves information about early photosynthetic life at a time with little or no free oxygen. In my research, I am particularly interested in the other part of BIF, the silica. The silica layers in BIF, which form the white layers in the picture above, are called chert. These chert layers consist of the mineral, quartz (SiO_2), which precipitates from seawater and/or mixed hydrothermal fluids, without the aid of biology. The element silicon can be delivered to the ocean in two main ways, first, from chemical reactions during weathering and erosion on land, and second, through the alteration of volcanic rocks at modern hydrothermal vent systems. My recent projects have focused on using isotopes of the element silicon from quartz in BIF to investigate the balance of these two sources of silicon to the ocean over time. To do this, I combined bulk and in-situ analytical techniques to measure silicon isotopes combined with major, trace and rare earth element geochemistry in order to investigate longstanding questions relating to early silica cycle and how silicon sources to the ocean may have evolved throughout geologic history. With so many questions still unanswered relating the BIF genesis, I look forward to working with colleagues and students to answer early Earth problems.

Fred Davis



I am thrilled to be joining the faculty of the Department of Earth and Environmental Sciences at UMD. In 2012, I completed my PhD in the Department of Earth Sciences at the University of Minnesota Twin Cities, where I was a graduate student from 2006-2012. Returning to the great state of Minnesota feels like coming back home! I spent the intervening three years as a Peter Buck Postdoctoral Fellow at the Smithsonian Institution's National Museum of Natural History studying mantle xenoliths housed in the National Rock and Ore Collection. I grew up in rural Missouri, about 60 miles west of St. Louis, and my Bachelor of Science degree in Geological Sciences is from the University of Missouri.

My research interests are in understanding the petrology, geochemistry, and mineralogy of Earth's mantle in its present state and as it has evolved over Earth's lifespan. In addition to being the largest of Earth's layers, the mantle is also the recycling center of the solid Earth. New crust is generated by partial melting in the mantle, and old crust is subducted and remixed back into the convecting mantle beneath the lithosphere. As you can imagine, a few billion years of these recycling processes has turned the mantle into a diverse petrological reservoir. In my research, I am particularly interested in how the diversity of

rock types found in the mantle influences the processes of magma generation. I study the mantle and magma generation processes by simulating conditions in the mantle in high-pressure, high-temperature experiments and by examining natural xenoliths, pieces of mantle rock carried to the surface during volcanic eruptions.

At UMD, I plan to build an experimental petrology laboratory with piston cylinder apparatus for performing high-pressure experimental studies of magma generation in Earth's upper mantle. I hope to soon begin working with graduate and undergraduate students on experimental projects and studies of mantle xenoliths. This fall, I have been teaching Mineralogy, and we've been off to a great start. This spring I will teach Earth's Dynamic Interior, and I will be developing a new upper-level course in solid earth processes for academic year 2016-2017. After only a few short months, I am already feeling at home here at UMD. I'm looking forward to continuing to build relationships with faculty, students, and staff and to contributing to future successes in the Department of Earth and Environmental Sciences.

Jacob Selander



I'm excited to have joined the Department of Earth and Environmental Sciences this year as a visiting Assistant Professor. I moved to Duluth from California where I completed my PhD at the University of California-Davis; so far the entire community has been very welcoming and always curious if "I've had a winter". Not a true Minnesota winter yet, but I'm looking forward to trading the road bike and kayaks for my skis and snowshoes soon.

I am a structural geologist and geomorphologist, and my research focuses on combining the two to determine what young, geomorphic features at the Earth's surface we can use to interpret longer-term fault system evolution. Or, put another way, I combine 1000-100,000-year earthquake records with dirt deformed by these earthquakes to figure out fault mechanics. Most of my research to date has been in southern California with respect to how faults may (or may not) potentially link, and how this may (or may not) lead to larger earthquakes.

But this year teaching is taking a priority over research, and I have no complaints! This fall, I'm enjoying teaching Geomorphology and getting the students out in the field as much as possible, and probably having a little too much fun with the intro Oceanography class—a number of students seem intrigued that many physical properties of oceans are also at work on or around

Lake Superior! Spring semester teaching will be all about deformation, with Structural Geology and a new Neotectonics course. Should be fun, I'm very much enjoying the department and the opportunity to further develop my teaching.

50th Anniversary Celebration 1967-2016

Join us in a celebration of 50 years of nationally recognized, award winning field education.

We are putting together two great opportunities to remember the laughs (and possibly tears), return to the scene (of the crime?), reminisce, and reconnect with fellow campers.

Reunion

Chateau Apres in Park City, Utah
7/25/2016 - 7/28/2016

Featuring new field trips by local geologists, visits to old favorite field areas, and perhaps a walk or two up to watering holes on main street.

Evening Celebration

2016 National Meeting of the Geological Society of America in Denver, Colorado
9/25/2016 - 9/28/2016 (exact date, time & location TBD)

Please visit the link below for more information.

www.fieldcamp.org/anniversary



Faculty Emeriti News

Jim Grant

Greetings from Lake Nebagamon. We made our annual pilgrimage to Los Cabos in January, ending with a spectacular day trip out of La Paz. This included a National Geographic site, (snorkeling with sea lions in abundance, such that the water I swallowed was definitely not pure H₂O!), visiting blue-footed boobies, and snorkeling with whale-sharks, which are gentle and awesome! Then off to Park City to ski.

Spring arrived with the long-awaited birth of a son to Serguei and Amy, bringing joy to the world! In June the whole family went off to see where Christabel and I grew up, half in Scotland and half in Ireland, with big family gatherings in Inverness and Dublin. The trip went really well, and included visiting both our homes (featuring warm welcomes by current owners who have both homes looking wonderful), haggis pakoras in Cawdor Inn (see Macbeth), helping with gathering of sheep for shearing and of eggs for breakfast on a working farm, and surfing in the Atlantic south of Galway (no, not me). Back home, the summer and fall were great, except that we had to make up for lost time on the lake and in the garden (Christabel now has a new hexagonal flower bed.) Glad to say my Minnesota River Valley maps are in review stage and I'll be happy to see them in print, only about 50 years late.

Wishing you all a Happy Christmas and all the best for the New Year.

John Green

Retirement continues to agree with me, and although my geological activities are winding down, I still come in to the Department two or three times a week for geology business. Thanks to the Powers That Be (mainly our intrepid Department Head Howie M.), I still have an office – across the hall from my former one, once shared with Charlie Matsch – which involved a lot of beneficial downsizing (tossing lots of books and files).

I've led a few local field trips, and again did a geological report/evaluation for a North Shore landowner as a fundraiser for a local nonprofit. I continue to help advise Terry Boerboom, Minnesota Geological Survey, for his bedrock quadrangle mapping on the North Shore, and the Minnesota DNR's Natural Heritage Program on potential Scientific and Natural Areas with geological significance. And, check out citizens' "meteorites" and other interesting items.

In early September our Swenson College of Science and Engineering saw fit to honor me by induction into their Academy, which also involved giving a public lecture. I called it "James Hutton, G. K. Gilbert, and my Fifty Years with the Midcontinent Rift System".

These activities were interrupted to some degree during the spring by colon surgery, which successfully removed the trouble, and I've been feeling fine since recovery.

Our only significant travel during the year was a three-week family trip to Maine in August. Highlights for me included a visit to our grandson Peter's Maine School of Science and Mathematics, a top-notch charter school in the Northeast corner of the state, and searching out some of Jan's old family gravestones along the coast in the greater Bath-Portland area. Our other grandchildren are Kitt, a junior at the College of the Atlantic, Sam, a sophomore at Rensselaer Technical Institute, Annie, a freshman at University of Wisconsin-Madison, and Edie, junior at Thetford Academy, Vermont.

Jan is in no way retired, and along with some "downsizing" at home, she has been keeping very active, especially with the Hawk Ridge Bird Observatory (she actually did retire from their Board), Minnesota Audubon's Board, and the Minnesota Breeding Bird Atlas Project; the latter two often involve trips to the Twin Cities and opportunities to visit with old friends there.

Tom Johnson

Ah, what does one do in retirement? Play the stock market? Well, you see what happened there this past summer. Move to Florida? Not Kate and me. We moved to Shelburne Falls, Massachusetts, a pretty little New England town in the foothills of the Berkshires. Kate spent several years in this area as a young adult and wanted to return, and I was all up for a more tempered climate, even if the move "south" was a mere 5° of latitude. Shelburne Falls is a town of perhaps 2,000 people that straddles the Deerfield River, a beautiful trout stream that is perhaps 100 yards across. The town has three great restaurants, three thriving book stores, old movies shown once a month in the old town hall with popcorn costing just a buck, and the weekly farmer's market on the town green. Pretty nice! I go into the geology department at University of Massachusetts Amherst a couple times a week, and I am finishing up a couple of papers with former students of UMD. Kate and I are biking more now than we ever have before, on beautiful country roads. Kate has an office in a building in town where she is working on a book of photographs that she took shortly before leaving Duluth, and renewing old friendships from her earlier years, including some with whom we go kayaking on a regular basis. So life is good! We will certainly make it back to Minnesota on a regular basis, and look forward to many visits with our friends at UMD.

Ron Morton

My grandson, four-month-old Otto Benton, just went for a nap, so I have some time to write this. Otto is our third grandchild, Megan and Tyler's first, and since I am retired I get to babysit a lot. I also continue to have a great time with my two granddaughters, Vyla and Cora.

"Talking Sky," the book I wrote with Carl Gawboy on Ojibwe constellations, remains quite popular, and we travel around the state and elsewhere giving presentations on it. My latest book, written with naturalist Judy Gibbs, is titled "Jay Cooke to Two Harbors: A Walking Guide to the Superior Hiking Trail", and will be available late March or early April of next year.

Penny continues as the Associate Dean of the Swenson College of Science and Engineering, as well as still being in charge of USGS National Association of Geoscience Teachers field camp fellowships. Though she does not get a lot of vacation time, we did get back to Big Sky and Yellowstone during the winter, Seattle and Hood Canal in the summer, and Cripple Creek, Mesa Verde, and Arches in the fall.

Other than that our gardens get larger, the trees around the house thinner (I think Penny hates trees), and the model train set up in the back of the garage seems to grow exponentially (it is where my dad spends a lot of time when he stays in his cabin during the summer).

So that's the news from the Northwoods where the wolves do howl (the Department of Agriculture took eight out of the gravel pit not far from our house this spring), and the deer have all moved into Duluth!

Dick Ojakangas

Keeping busy in my retirement, seemingly busier than before retirement! However, it's all fun, telling interested people about those old rocks! I taught an eight-week course two hours a week entitled "Geotravels" to the University for Seniors (Antarctica, Caribbean/Central America, Mediterranean, Hawaii, Volcanic Islands of South Pacific, Australia/Indonesia, India, Africa.) I also did a session on Geology of Isle Royale in a course on Isle Royale. Every one of those seniors WANTS to learn, if only between naps, so it is quite a contrast to big GEOLOGY 1110 classes of the old days.

I presented "Archean Glaciation in India" to the Mesabi Range Geological Society and gave two presentations at Sugarloaf: "The BIG PICTURE: Continental Drift" and "Plate Tectonic Theory North Shore Geology (and More!)". I presented "Minnesota's Geologic History: Ancient to Recent" at the Duluth Public Library's Author Day, and also presented "History of Mines" at a NIH/EPA conference on Elongated Mineral Fibers at the Environmental Protection Agency in Duluth; I left early for the ER and ended up having stomach surgery. John Green and I are now "Bowel Buddies". I am currently on intravenous antibiotics, trying to whip chronic Lyme disease. Dang ticks!

Rip Rapp

At 85 my options are slowly declining and everything seems to move at a slower pace. Nevertheless my publications in archaeological geology creep out on schedule. My long history of research abroad (largely in the Eastern Mediterranean and China) is coming to an end. And foreign conferences I also hope to curtail. I did go to a scientific conference in Barcelona, Spain because I was on the Board of Directors, on the Organizing Committee, and chaired two sessions, so attendance was mandatory. Next year may be my last at the GSA annual meeting. My goal is to bow out slowly and gracefully so no one knows I am gone...

Blast from the past...

Dave Darby joined the UMD Geology faculty in 1968 after being lured out of the jungles of Peru where he worked for Mobil Oil. Dave retired in 1991 and to my knowledge has not appeared in our annual newsletter since. So why should he be the only one that doesn't have to write an annual paragraph? We will fix that right now.

Here is a note from Dave and Pat. If you want to say hello, their email is dpdarb5@gmail.com



When Pat and I retired we sold nearly everything and bought a 40-foot sailboat. We went out into the Caribbean and worked our way south, stopping for three months at some island during each hurricane season. After five-and-a-half years we stocked up on cheap scotch and Cuban cigars in Venezuela and started home. Off the U.S. coast we ran into a three-day gale. The wind gauge was pegged at 60 knots, the rain was horizontal and the waves were 30 feet. We were strapped into our bunks or into the cockpit for 24 hours a day; there were some scary moments but that was our only bad experience during those years. When it was over the Coast Guard sent a helicopter out 90 miles to see if all was well and it was. We sold the boat, bought a camper, and started looking for a place to live. All those friends in Duluth were a very strong temptation, but the weather won. We drove 22,500 miles around the U.S. and finally settled in Santa Fe, New Mexico. Four years later we moved to Florida where we see our two sons and families more often. We went, illegally, to Cuba a few years ago and had a fine time. We later dinged around China and Vietnam for a month, travelling 2,600 miles by slow trains. We learned many inscrutable things, e.g., there are no stop signs in China and traffic is as bad as here. Our next outing is to an island off western Panama for a week of snorkeling. I have had both hips and both shoulders replaced...all done very well. I bike six miles a day before breakfast and pump a bit of iron twice a week. Pat and I are enjoying ourselves.

Student Scholarships, Awards and other Notable Mentions

Outstanding Graduate Teaching Assistant Award: Eddie Gazzetti

Outstanding Graduate Student, Ralph & Ellen Marsden and Randy Seeling: Alex Steiner, Jonathan Dyess

Outstanding Senior Award-Geology, SME and Ralph & Ellen Marsden: Kate Wehrs

Outstanding Senior Award-Environmental Science, Barr Engineering: Alan Toczydlowski

Outstanding Junior Award-Geology, Hugh Roberts Scholarship: Ann Hunt

Outstanding Junior Award-Environmental Science, Barr Engineering: Jamie Dobosenski

Minnesota Section SME Tools-Of-The-Trade Award: Stephen Hanson, Dallas Jacobs

Harry & Margaret Walker Research Fund Scholarship: Todd Kremmin, David Tovar

Jill & Terry Swor Scholarship: Jamie Dobosenski, Crystal Lambert, Eric Pierre, Ryan Puzel

Estwing Geology Field Methods Award: Espree Essig

Kenneth E. Differt Scholarship: Espree Essig

UMD Peterson Memorial Scholarship: Gina McClanahan

Cliffs Natural Resources Scholarship: Espree Essig

Frantes Graduate Fellowship: Matthew Matko, Christopher Shea

Roderick Syck Outstanding Field Camp Performance Award: Nathan Lentsch

FIELD CAMP SCHOLARSHIPS:

Robert L. Heller Field Camp Scholarship: Crystal Lambert, Stephany Nelson, Ella Pelfrey

"Rip" Rapp Field Camp Scholarship: Joseph Pearson, Jordan Vargas

Steven & Karen Brand Geological Sciences Field Camp Scholarship: Nathan Lentsch

Ralph & Ellen Marsden Scholarship: Aaron Knowlton, Ella Pelfrey

Lempi M. & John Pagnucco Scholarship: Emily Vanlonden, Thomas Voigt, Katherine Wehrs

New Millennium Geological Sciences Fund Scholarship: Gerrit Bass, Kristin Elmer, Espree Essig, Amanda Huber, Dallas Jacobs, Jessica Joyal, Ryan Puzel, David Rostvold, Lauren Sable, Tyler Sager, Emily Vanlonden

Faculty Emeriti Scholarship: Brittany Hoover, Joseph Pearson

R.C. Bright Scholarship: Gary Kelner

Richard Patelteke Scholarship: Ryan Puzel, Jordan Vargas

GEOLOGY CLUB NEWS

The Geology Club has had an exciting and productive 2015 calendar year. During Spring semester club members partnered with the SEG Club for a fun and educational trip to the southwestern United States. In Arizona, the group was able to visit the Bagdad Mine to view the process of copper extraction. Most of the students are familiar with the geologic terrains of Minnesota and the field trip provided the opportunity to visit multiple states with plentiful geologic diversity. The Geology Club had a successful fundraiser bagging groceries at Cub Foods, and also coordinated the annual Earth and Environmental Sciences Spring Banquet at the Greysolon Plaza Ballroom. Along with trips and fundraisers, the Geology Club provided opportunities for students to make connections with their professors by arranging "Dinner with the Professor" outings. In the spring Jim Miller, John Goodge, and Christian Schardt were able to accompany club members, and in the fall Christian Schardt, Jacob Selander, and Latisha Brengman enjoyed this unique and fun program. The club has had one fundraiser this term selling vinyl stickers, and anticipates an "adopt-a-rock" sale, the proceeds of which will go toward providing supplies for club members looking to attend field camp next summer.

by Crystal Lambert

SOCIETY OF ECONOMIC GEOLGISTS



In 2014 and 2015 the UMD student chapter of SEG (Society of Economic Geologists), currently in its 5th year, provided opportunities for members to gain firsthand experience in economic geology and related fields, which included two trips across the continental United States.

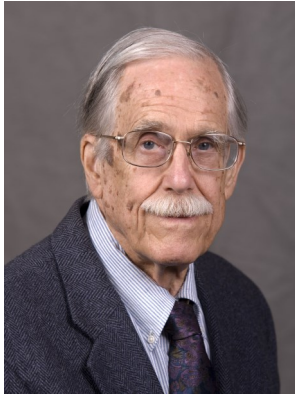
In November we took a trip to the Eagle Mine in the Upper Peninsula of Michigan just a little over a month since production had begun. We were one of the few tour groups that were able to go underground and also tour the Humboldt Mill. The tour was very exciting as we were able to explore the operation deep underground and have a firsthand look at the ore processing in action. The Eagle Mine, owned, developed, and operated by Lundin Mining Corporation, demonstrated to us how a proper, environmentally-aware copper-nickel sulfide mining operation looks and operates.

Over spring break, we climbed aboard the turtle-top and drove to New Mexico and ultimately arrived at our destination about 100 miles north

of Phoenix in Bagdad, Arizona. The Bagdad mine, owned and operated by Freeport-McMoRan, is a porphyry copper deposit containing both sulfide and oxide mineralization. Our visit consisted of a very extensive tour of the entire operation and all the main facilities.

Both trips were unforgettable learning experiences. They allowed us to see various geologic formations across over 2,000 miles of North America in addition to seeing active mining operations, acquiring premium samples, enjoying fresh air accompanied by epic landscapes, sleeping under the stars, and sharing stories next to camp fires.

by Espree Essig



JOHN C. GREEN
**SWENSON COLLEGE ACADEMY OF
SCIENCE & ENGINEERING INDUCTEE**

The Academy was established in 2002 to highlight the achievements of Swenson College of Science and Engineering alumni, faculty, and friends. This year John Green became the 11th inductee of the Department of Earth and Environmental Sciences.

John graduated from Dartmouth College and received his PhD in Geology from Harvard University. He joined the UMD faculty in 1958 and specialized in studying the rocks of the Midcontinent Rift. John has enjoyed many honors and was awarded the Goldich Medal in 2000 by the Institute on Lake Superior Geology for contributing to the understanding of Lake Superior area's geology. "A famous British scientist once said, 'The best geologist is the one who has seen the most geology', and thanks to my time at UMD, I've had the opportunity to see a lot". *John Green*

Over his career John emerged as a leader in the geological community studying the rocks of the Midcontinent Rift. Because of his expertise he was appointed a member of the international Basaltic Volcanism Study Project team sponsored by the Lunar and Planetary Institute and the National Science Foundation, and he was awarded a Senior Research Associateship by the National Academy of Science National Research Council at the Lunar and Planetary Institute in Houston. John has a distinguished record of publication of research articles, geologic maps, reports, and field trip guides. He and his wife, Jan, share a deep love of nature, natural history (especially birds), and politics, and both have become well-known advocates for preserving special geological and ecological sites on the North Shore as Scientific and Natural Areas as well as for the Duluth Natural Areas Program. John and Jan were recently featured in an article entitled "A Green Legacy" in the *Minnesota Conservation Volunteer* that highlights their innumerable contributions to Minnesota's natural history and conservation of our natural resources. If you have not seen the article I strongly encourage you to take a look:

https://webapps8.dnr.state.mn.us/volunteer_index/past_issues/article_pdf?id=8150

As lead-PI, John Goode continues to move forward with his project to build a new deep ice drill for research in Antarctica, called the Rapid Access Ice Drill (RAID). RAID has been under construction since August of 2014 and some of the main components were tested this past winter in Utah. Hard work by the principal contractor kept the fabrication and testing on schedule, and as this newsletter goes to print the RAID drilling system is on its way to a naval port in California where it will be loaded on a vessel bound for Antarctica. The photos here show some of the main modules that house the drilling system, including the drilling rig itself, supply of drilling pipe and augers, and diesel generators. Once in Antarctica, the modules will be put into winter storage in February until they are deployed a year from now for the first testing in Antarctic ice.



John Goode—Principal Investigator

**RAID
Update**



2015 UMD Earth & Environmental Sciences

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Name

Contact information

Degree earned and graduation year

A short paragraph with your news