

2014
UMD

Earth & Environmental Sciences Newsletter for Alumni & Friends



Happy holidays everyone!

It has been an interesting year with many changes in the Department. As most of you already know, Charlie Matsch died this past April. With Charlie's passing we lost a great friend, colleague, mentor, and benefactor. Charlie was a gifted teacher who captivated students with his puns and stories while building a framework around geology. Charlie was extremely generous to the Department and to UMD with both his time and financial support. Acutely aware of the financial burden that summer field camp places on students, he started the Charlie Matsch Field Camp Scholarship Fund, which now gives out several thousand dollars per year. He also started the Charlie Matsch Glacial Geology and Geomorphology Research fund, which provides field support for graduate student research. Any time there was a need, Charlie stepped up to help. As a final act of generosity Charlie provided a substantial estate gift to the Department, the Tweed Museum of Art, and to the Marshall Alworth Planetarium. His legacy will live on.

I asked Dick Ojakangas to write a few words about Charlie that I think you will enjoy (page 12).

Well, we have officially changed the name of the Department, again. We are now the Department of Earth and Environmental Sciences. Over the years our teaching and research emphases have continually expanded in the areas of geophysics, geochemistry, paleoclimate, limnology, tectonics, and planetary science. With the addition of the Environmental Science program we are now expanding into environmental monitoring, mineral and energy resources, pollution, and environmental assessment. To reflect these changes and to better integrate our new programs we felt the name change was in order. We still offer the BA/BS and MS in Geological Sciences, and have added a BS in Environmental Science. This year 30 undergraduates received degrees from the Department, 15 in Geological Sciences and 15 in Environmental Science. We also had 8 graduate students finish up, 6 MS and 2 PhD.

Along with our new name came two new faces. Byron Steinman (joint position with LLO) joins our faculty as an assistant professor and expands our program in paleoclimate and paleolimnology. Byron received his AB from Harvard and PhD from the University of Pittsburgh. He recently finished a two-year postdoctoral fellowship at Penn State working with Michael Mann. Byron expands on his background and research on page 7. Antoinette Abeyta joins us this year as a pre-doctoral fellow, a program that provides University of Minnesota doctoral candidates the opportunity to teach, write their dissertation, and be mentored by senior faculty. Antoinette is a PhD student in Earth Sciences (formerly Geology and Geophysics) at the Twin Cities campus. While in residence at UMD she is teaching courses in stream restoration and methods of problem solving.

In other news, Steve Colman, Director of the LLO, retired over the summer. Steve left the USGS in 2004 and took over as LLO Director. He taught courses in glacial geology and limnology and has supervised a number of graduate students. With Steve's retirement, the helm of the LLO was passed to Dr. Robert (Bob) Sterner, UMD Department of Biology. The Swenson College of Science and Engineering also has a new Dean. Dr. Josh Hamilton took over the position with the retirement of Jim Riehl. Many of you knew Jim and will certainly get to know Josh in the future. As with any change in leadership there are new directions and initiatives and I look forward to updating you in future newsletters. Please check out the short introduction to Josh Hamilton (page 15).

This year, John Goode received the Chancellor's Award for Distinguished Research. John has developed an international reputation for excellence in Antarctic research that crosses the boundaries among tectonics, metamorphic petrology, geochemistry, and geochronology. Now he has taken the lead on the development of an innovative new drilling platform in support of multi-disciplinary Antarctic research. A summary of this new initiative and its potential impacts is on page 11. Please be sure to check this out.

As we approach the end of another year I would like to congratulate the 38 students that completed degrees this year. They are joining a special group, UMD Department of Geology/Geological Sciences/Earth and Environmental Sciences alumni. I look back on my 23 years at UMD and I see a lot of faces, and there were 40 years of history before I arrived. With that in mind, I would like to issue a special invitation to ALL of you out there. Our spring banquet and awards ceremony will be held on March 27, 2015, and we are encouraging our alumni and friends to attend. The details of the event can be found on the page two. Please consider joining us. One of the highlights is the announcement of awards and scholarships that all of you have made possible through your donations.

Thank you.

2014 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.

Richard & Pamela Backstrom
Nancy J. Beaudet
Reid & Wanda Bevis
Charles & Sharon Brenner
Tricia Bunten
Philip Carpenter
Odin Christenson & Phyllis Lucas
William & Jean Crain
Donald & Mary Davidson
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Shell Oil Company Foundation

Please join us at Greysolon Plaza's Moorish Room on Friday, March 27th for an evening to reconnect with faculty, alumni and friends, and to meet our current students!

Earth and Environmental Sciences Department 2015 Annual Banquet

Social hour starts at 5:30 pm - cash bar

Dinner served at 7:00 pm, Italian buffet with dessert

Program and award presentations begin at 7:30 pm

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

Price: \$20/person

Please RSVP by Friday, March 13, 2015

Phone: (218) 726-8385

or

E-mail: dees@d.umn.edu

2014 UMD Earth & Environmental Sciences
Undergraduate Student Presenters & Contributors

Spring 2014 UMD UROP Showcase

University of Minnesota Duluth

Johnson, K., “The Use of Terrestrial Laser Scanning to Monitor Bluff Erosion at Amity Creek, Duluth, MN”

Kryzer, R., “Rogen Moraine as a Transitional Bedform in a Subglacial Erosional System”

Geological Society of America 2014

Vancouver, British Columbia

Loeffler, S., “Temporal Relationships Between Mare Flows in Steep-Walled Lunar Pits”

Loeffler, S., Mooers, H., “Historical Record of Industrial Pollution Recovered from Abandoned Canals, Black Country, West Midlands, UK

The Institute on Lake Superior Geology 2014

Hibbing, Minnesota

Grotte, M., Hudak, G., “A Field and Petrographic Study of Neoproterozoic Variscan Pillow Lavas, Newton Belt, Vermilion District, NE Minnesota”

Grotte, M., Baumgardner, M., Brown, N., Jacobson, A., Kendall, J., Ostwald, C., Schriener, N., White, J., Peterson, D., “Bedrock Geologic Map of the Gafvert Lake Area, St. Louis County, Northeastern Minnesota”

Quillen, P., Miller, J., “Documenting the First Lava Flows of the Midcontinent Rift by Digital Mapping and Petrographic Analysis”

Graduate Student Presenters & Contributors

The Institute on Lake Superior Geology 2014

Hibbing, Minnesota

Dyess, J., Hansen, V., “Determination of Vorticity in Archean Tectonites”

Dyess, J., Hansen, V., “Structural and Kinematic Analysis of the Shagawa Lake Shear Zone: Implications for Archean Tectonic Processes in the Southern Superior Province”

Fix, P., Ginley, S., Schraeder, L., Summers, A., **Doyle, M.**, Boerboom, T., “Bedrock Geologic Map of the Brule River area, Pine Mountain Quadrangle, Cook County, Minnesota”

Leu, A., Miller, J., “Geology and Petrology of the Wilder Lake Intrusion, Duluth Complex, Northeastern Minnesota”

Mulcahy, C., Romanelli, D., Schulz, R., Moorhead, S., May, M., Jirsa, M., “Geologic Mapping of Neoproterozoic and Paleoproterozoic Rocks near Hanson Lake, NE Minnesota, by Students of the Precambrian Research Center’s 2013 Field Camp”

Sauer, S., Miller, J., Benningfield, J., Graham, J., Kozmor, S., Prue, A., “Geology of the Lake Three Troctolite, Duluth Complex—2013 Precambrian Field Camp Capstone”

Steiner, A., Miller, J., “Genesis of Sulfide Mineralization Within the Footwall Granite of the Maturi Cu-NI-PGE Deposit of the South Kawishiwi Intrusion, Duluth Complex, NE Minnesota”

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

Sauer, S., “The Petrology of the DLS “Chill” - Evidence of Venting of Hydrous Magma from the Layered Series at Duluth”

AWARDS

The Institute on Lake Superior Geology 2014

Jonathan Dyess received the Four Doug Duskin Best Student Paper Award.

Michael Doyle and Sarah Sauer received the Joe Mancuso Student Research Award.

American Geophysical Union 2014

San Francisco, California

Batts, V., Gran, K., “Physical Models in Geomorphology Education: Lessons from the Stream Table”

Bevis, M., “Fluvial Adjustment to Pleistocene Base-Level Fall Affects Sediment Budgets of Minnesota River Tributaries”

Manopkawe, P., Gran, K., “Identifying Erosional Hotspots in Duluth-Area Streams after the 2012 Flood using High-Resolution Repeat Aerial Lidar Data”

Mitchell, N., “Modeling the Hydrological Effects of Wetland Restoration in the LeSueur Watershed with Swat”

Current Faculty News

Antoinette Abeyta

I am excited to be joining the Department of Earth and Environmental Sciences as a pre-doctoral teaching fellow, where I will be teaching courses on stream restoration and computer modeling.

I grew up in New Mexico where I spent most of my childhood playing in the dirt. I never really outgrew that phase and now it constitutes a major aspect of my research. I received my B.S. in earth and environmental science at New Mexico Tech and later came to the University of Minnesota-Twin Cities to pursue a Ph.D. My research focuses on understanding the complexities of sediment and how it shapes the surface of our planet. The majority of my work has been focused on understanding the significance of clay on delta morphology through the use of physical models. It is a really exciting time to be working on deltas as it is becoming increasingly important to understand these geomorphic processes in context of a human dominated landscape.

With the many opportunities to meet new people and exchange ideas, I look forward to the upcoming year in Duluth and the many challenges that lie ahead of me.

Erik Brown

This was a year with new adventures. I stepped in to help out at UMD's Graduate Office on an interim basis, taking on new responsibilities since Tim Holst's retirement in late May. I still have managed to maintain some research activities, with field programs in East Africa and Spain in the first half of the year. Our proposed drilling program in the Basin of Mexico (just south of Mexico City) is moving forward, with the first commitment of funding now in hand. 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 has begun a new program on Lake Superior, using very cool new remote sensing technologies to allow us to make more observations at lower costs. As always, we are happy to have visitors (even Garrison Keillor has been out on the Blue Heron (http://youtu.be/_746ZjU8AjY)).

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

Much of my attention in 2014 focused on continuing development of a new system for scientific drilling in Antarctica - the Rapid Access Ice Drill. After an NSF panel review of our design and plans for construction and testing, UMD got a new award about mid-year that will carry through construction and testing in North America and Antarctic into early 2017. The drill is actually being built now in Utah and the team hopes to begin initial field tests in January, so they continue to push on a fast track toward vessel shipment to Antarctica about a year from now! It's amazing to see the progress made so far. Spring semester was a blur with Petrology and Tectonics, and then a trip to Washington State University for some isotopic work. A couple of weeks in Germany, Switzerland, Austria and even Lichtenstein provided a great opportunity for some incredible hikes in the Swiss and

(Goodge, continued from previous page)

Bavarian Alps - incredible structures! I am in my last year as science editor of *Lithosphere* and looking forward to the extra time that will allow. This fall Chelsea Nissen is finishing up her MS thesis on metamorphic petrology and geochronology of rocks from Antarctica and should be filed this fall!

Karen Gran

This has been a busy year, keeping up with a lab full of talented graduate students. I have six M.S. students right now: four working on Minnesota River-related research and two working on North Shore streams. In part, due to graduate student demand, we have started teaching two stream restoration courses at UMD. This allows students to complete a post-baccalaureate certificate degree in stream restoration science and engineering while in residence in Duluth. It's exciting to get that up and running here at UMD.

On the home front, Alex has started middle school and Peter is enjoying 2nd grade. We had a fun trip to Oregon this summer in addition to our annual trek up to the BWCA. My kids are good paddlers, and I'm really looking forward to them becoming good portagers in the years to come.

Vicki Hansen

Newsletter 2014 and time to share highlights of UMD's Planetary Tectonics! Aaron Slonecker and Chris Goscinak both filed their theses. Chris continues work with Barr; Aaron moved to Anchorage, Alaska (escaping Duluth's long winters!) as Science & Planetary Program Specialist. Jon Dyess became Dr. Dyess in September, with his first paper published in the October issue of *Geosphere* at the same time. Post-doc Kevin Thaisen continues to keep Dr. Ivan Lopez (Madrid) and me organized and moving forward in GIS space in our mapping of about 30% of the surface of Venus. M.S. student David Tovar joined the lab from Bogotá, Columbia. He brings wonderful fresh energy to the lab. David has just begun what should prove to be a fun, important, and truly terrifying project on Venus—attempting to understand how Venus might get rid of that pesky interior heat. John Swenson joins me in co-advising David. David's map area (a Texas-sized portion of Aphrodite's fracture zone, for those of you in the Venus know) is both artistically gorgeous, and geologically frightening as a result of its apparent complexity. I say 'apparent' because we're sure that with David's attention, the area's story will become both clear and logical. The poster-sized 3D-image of this 'field area' was a real hit at GSA in Vancouver, Canada.

Tom Johnson

I started the year with a trip to Malawi in mid-January, not to work on the lake this time, but to introduce Jim Miller to the geology of the southern part of the country, and to geologists at the University of Malawi's Chancellor College and in the Malawi Geological Survey (MGS) in Zomba. The MGS provided one of their staff and a vehicle to tour old mine sites (REE and some copper) and to examine Precambrian to lower Palaeozoic gneisses and granulites of the Basement Complex. (Yes, I actually looked at some REAL ROCKS!) Mineral exploration is picking up in Malawi at present, and the country desperately needs more skilled geologists. Jim's success with developing the Precambrian Field Camp in northern Minnesota is a relevant model for Malawi to consider, and we promoted this idea to a receptive audience. I am finishing up some papers on my lakes research, and enjoying teaching my class this semester on global climate change. (Yes, Senator Inhofe, the climate is changing and we humans are the cause of it!)

I am in my final year at UMD, with plans to retire and move to western Massachusetts this coming summer. It has been a wonderful 20 years here, and I am particularly proud of the accomplishment and strength of the Large Lakes Observatory, which I started up in 1994 with tremendous support at the time from my faculty colleagues in the Geology Department. Kate and I enjoyed a memorable canoe trip in the Boundary Waters in August, with children and grandchildren. It will remind us to return to northern Minnesota every summer for more exposure to pines, loons, lakes, and Precambrian terrain.

Jim Miller

Last year's newsletter was a list of all the teaching, advising, organizing, and planning duties I had accomplished and those I expected to take on in the coming year. While I can report that I have accomplished many of those goals this past year, my professional plans going forward have dramatically moved in a different direction because of changes in my personal life. This fall, I

(Miller, continued from previous page)

became engaged to a lovely woman from Thunder Bay, Ontario. Louise and I met in August, 2013 during a geology field trip that I led on the North Shore. We plan to be married next September. Consequently, I am planning to retire from UMD after the 2015-16 academic year and move to Canada. In my semi-retirement, I plan to do some consulting for the local minerals industry, run some adult education classes, and do some teaching and advising at Lakehead University. The operative word here is “some”.

The main thing I hope to accomplish before heading north is getting my final cache of graduate students finished with their M.S. theses. Alex Steiner defended his thesis this past summer and Matt Chaffee should defend by the end of the year. That leaves three students who are out the door, working, and trying to write – Aubrey Lee, Ben Brooker, and Adam Leu; three second year students who plan to finish next summer – Paul Fix, Mike Doyle and Sarah Sauer; and my new student, Connor Mulcahy, who will finish about the time I do. If successful, I will have advised 20 M.S. students over the 12 years I have been here at UMD.

I will continue to be involved in the Precambrian Research Center, but will step away as the principal “administrative” director after the summer of 2016. The PRC has struggled financially over the past couple years due to a downturn in the minerals industry, but we expect to continue at least our field camp into the foreseeable future.

Since arriving in 2000, I have greatly enjoyed my time here at UMD, especially being able to help launch so many young careers in geology. That said, I am very much excited for this new chapter in my life and my career. This year has proven to me once again that wondrous, unexpected things are always just around the corner.

Christian Schardt

My first year at the department gave me the opportunity to acquaint myself with colleagues and UMD as an institution. Through teaching various courses, including a new Mineral Resource course for environmental majors, I got to know our student body and have become more familiar with the interests and needs. A new spring course in geochemical modeling will offer students the chance to work on real-life problems using software and techniques used throughout the industry and government to gain valuable experience. Through my initiative the department acquired three new, state-of-the art reflected light microscopes and is in the process of refurbishing existing scopes with new LED lights. This will significantly improve our ability to teach ore microscopy to students pursuing a career in the mining industry.

In my research, I have been working on metal isotopic signatures (Ni, Cu) in the Duluth complex to test potential fractionation trends and initial results look promising. The recent purchase of experimental equipment will allow us to study weathering and leaching processes of ore and rock material as well as natural waters and other materials. Various existing and future computer modeling projects are underway to investigate several mineral precipitation mechanisms. Cooperation with other colleagues, widening the network with new researchers, and acquiring research funds will be the main focus for me. The existing strong collaboration with the local mining industry and the development of further projects such as the Soudan Formation and the Vermilion district will provide great opportunities for prospective students to come study in Duluth.

John Swenson

In reviewing my newsletter snippet from last year, I realize that little has changed for me in the last year. As always, I taught a diverse suite of classes in both the Geology and Environmental Science programs—Introductory Geology, Sedimentology and Stratigraphy, Well Hydraulics, and Energy Resources. And, as usual, I divided my research efforts between ‘basic’ academic projects at UMD and slightly more ‘applied’ projects at Barr Engineering. On the academic research front, Eddie Gazzetti, a graduate student in our research group, finished assembly and testing of a unique ‘source to sink’ experiment. Eddie’s experimental apparatus consists of a laboratory-scale, net-erosional drainage basin, in which precipitation and tectonic uplift drive erosion and sediment production, coupled directly to a net-depositional basin, in which rising base level generates space to accommodate sediment. To the best of our knowledge, this device is the only one in existence that couples an erosional basin (the source) to a depositional basin (the sink). Eddie is using this system to investigate the propagation of climate-driven signals between the drainage and depositional basins; he presented some of his preliminary results at the annual GSA meeting in Vancouver. New to the research group this year is Becca Eiden, who will be conducting physical experiments on a classic provenance problem—the progressive ‘downstream mixing’ (dilution) of a marker bed by the fluvial network in both the erosional and depositional systems. Currently, Becca is refining some photo-imaging techniques that will allow her to quantify the concentration of marker bed in the sediment flux. Once Eddie wraps up his experiments, Becca will begin her ‘unroofing’ studies in the aforementioned experimental apparatus. Stepping away from the sed-strat world (quite literally), Vicki Hansen and I are co-advising David Tovar-Rodriguez on a combined mapping and modeling study to investigate the dominant heat-transfer mechanisms on Venus. Finally, on the ‘applied’ side of research, my work for Barr Engineering centered on developing mathematical models for clients in the petroleum and minerals sectors. This work is very exciting and, I believe, broadens my skills as an educator.

Nigel Wattrus

As I sit and write this (overdue!) note I see the snow flakes drifting by my window. That will be bad news for the students in my undergraduate geophysics class. We try and get outside to actually “do” many of the geophysical survey methods we talk about in class. This week we’re supposed to go to Esko to do a magnetic survey. Brrrrr!!!!

I have just completed my first year as the Director of Graduate Studies for our program. This has been an eye-opening experience for me and I have a new appreciation for all those faculty members who have preceded me in this role! One of our latest recruits is Todd Kremmin, who came to us from a job in the oil industry. Todd will be working with me. He has already collected a beautiful high-resolution 3D Ground Penetrating Radar (GPR) dataset on Park Point. We hope to use this data to reconstruct the evolution of the freshwater spit after the deglaciation of the region. This must be some kind of record for an incoming graduate student to already have his thesis data in hand within a month of arriving at UMD. Way to go, Todd!

Next semester, I’m not scheduled to teach and I’m busy planning several research projects which include a seismic survey in Colombia, as well as possible projects in Indonesia and Tibet. I’m also putting together new projects closer to home. These include more GPR surveying on Park Point and also possibly Long Point at the mouth of Chequamegon Bay. Some of you may know that I have a long term project running in my back yard where I have installed a vertical thermistor array to track the seasonal development of frozen ground (only in Duluth!). I’m trying to find a new graduate student to take on this project, hopefully utilizing other geophysical measurements to complement this data.

On the home front, Jane and I continue to enjoy our “empty nest-lifestyle”. Our daughter Sally is teaching 1st grade in the Twin Cities. She loves it but it is very hectic. I will never complain about teaching three courses in a semester again! Last year she bought a house which I think of as my “cabin” in the Cities. I have done many, many projects at the “cabin” over the past year! My son Sam is now a junior at Harvard. He has declared a concentration (that’s Harvard-speak for major) in Human Development and Regenerative Biology. That’s stem cell biology to you and me! This summer he had the opportunity to spend eight weeks in the research laboratory of a Noble Prize winner in Cambridge, England. Lucky guy!

Meet Our Newest Faculty Member

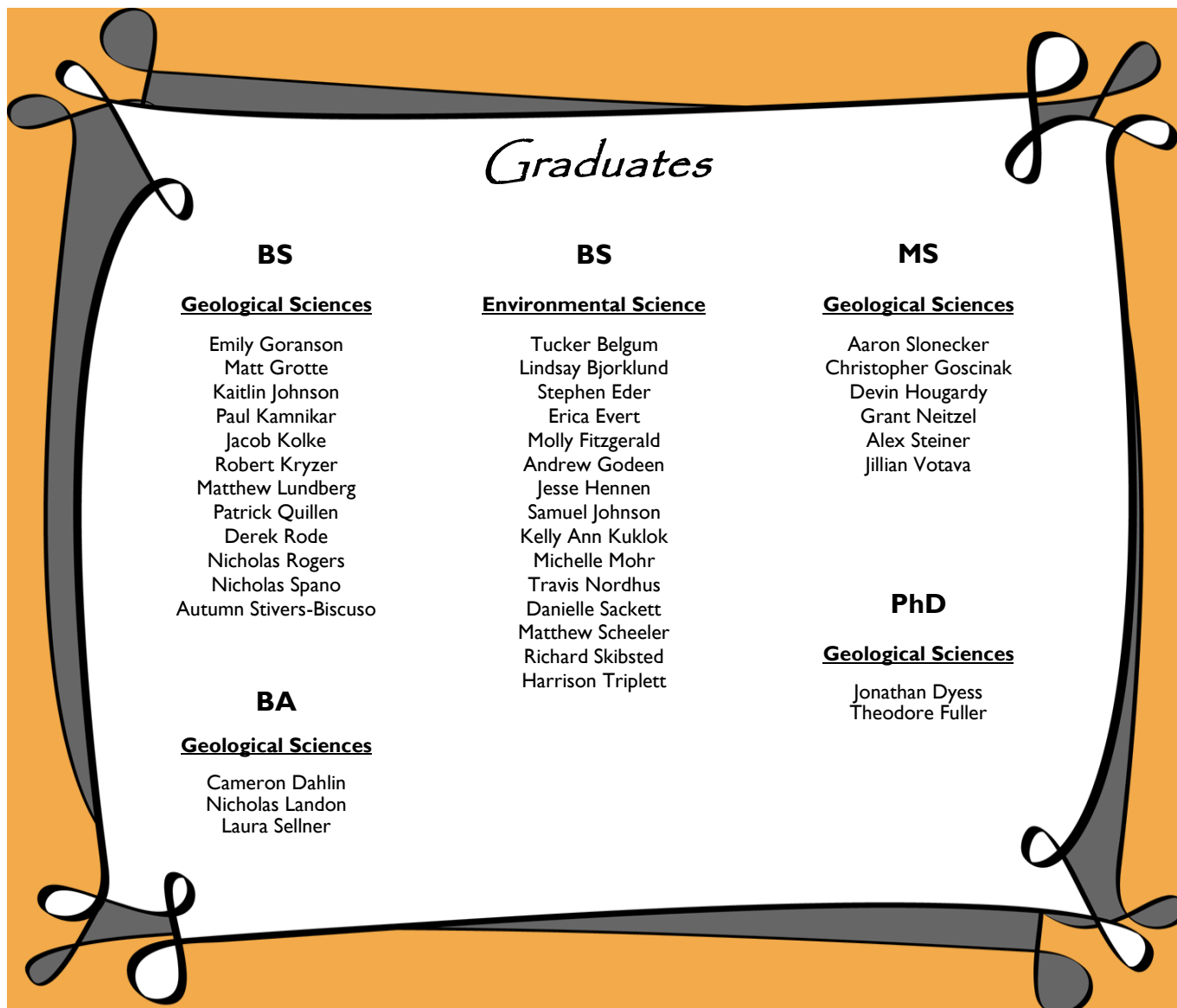
Byron Steinman



I’m excited to be the newest member of the Department of Earth and Environmental Sciences, having started as an Assistant Professor in the fall term. This past summer, my wife and I moved to Duluth from State College, Pennsylvania, where I spent two years at Penn State University as a National Science Foundation Postdoctoral Research Fellow working with Dr. Michael Mann (the global warming, Hockey Stick scientist). Prior to that, I obtained my Arts Bachelor from Harvard University and my PhD in geology from the University of Pittsburgh in the Department of Geology and Planetary Science. I grew up in the Appalachian Mountains just west of Pittsburgh, Pennsylvania, and my wife is from the Akron area of Ohio. We’re both looking forward to enjoying the great outdoor and cultural activities that Duluth has to offer.

As a paleoclimatologist and paleolimnologist, my research is primarily focused on reconstructing how climate has changed through time in various regions around the world including the Americas (North, South, and Central) and Asia. Simply put, I use coring devices to collect lake mud, take it back to the lab, chop it up, then measure changes in its chemistry to determine how high or low the lake level was at the time the mud was deposited. Since lake level is controlled by climate (precipitation, temperature, evaporation) we can use these records to determine how wet or dry it was in the past, in some cases as far back as 10,000 years before present (or more). Another large component of my work involves synthesizing results from quantitative models of lake responses to climate change with lake sediment records to determine exactly how wet or dry it must have been in the past. More recently I’ve been using global climate model simulations to provide insight into the configurations of the ocean-atmosphere system that produced the climate conditions inferred from the lake sediment records. I have several proposals in the works that should fund a wide range of paleoenvironmental research projects and provide support for several Masters and PhD students in the coming years. Currently, I’m having a great time teaching Geological Limnology, and I’m scheduled to teach Introductory Geology and Field Limnology next Spring. In the future, I will teach Advances in Paleoclimatology. So look me up if you’re interested in further study in the fields of paleolimnology or paleoclimatology as either a graduate or undergraduate student.

The past several months have been professionally inspiring, and I’m looking forward to building stronger bonds with the faculty, students and staff in the UMD community and contributing to the growth and prestige of the Department of Earth and Environmental Sciences.



EMERITUS FACULTY NEWS

Jim Grant

Greetings from Lake Nebagamon! After a flurry of medical problems at the end of 2013, this year is focused on recovery. I went to Los Cabos in a wheel chair, walked rather than skied in Park City, and we made it to China and did everything we had hoped to do. We “did” Beijing, hiked a bit of the Great Wall, took a bullet train to Xi’an and loess and terracotta warriors, cruised the Li River through the fantastic karst topography, and cruised the Three Gorges en route to Shanghai. We were impressed by traffic, new high-rises and a burgeoning middle class and very upscale shops that would all be right at home in LA. The people were relaxed, friendly and polite, and we communicated with a smile and “Ni hao”. There is another culture out there, in which their long history is part of their everyday life.

(Grant, continued from previous page)

The wonderful event of the year for us was our 50th wedding anniversary, which we celebrated in August with old friends, including Christabel's sister Niki, my first cousin from South Africa (one of the bridesmaids) and a colleague from Caltech (also at our wedding in Dublin) and two of Christabel's cousins (of the family she was staying with in Pasadena when we first met).

The progress with my maps of the Minnesota Valley has been limited, but I am trying to get them done by the end of the year. Wish me luck. All the best for the New Year!

John Green

The year was "low-lighted" by the sudden loss of my long-time office mate, Charlie Matsch, in April. I'm missing his amazing sparkles of memory, old puns, stories of Hastings, St. John's Academy, Maine, Antarctica, Mali and elsewhere, and much more. We're all richer for our time with him.

Well, fifteen years into retirement and I find my geological/professional activities continue to decrease. I still led several field trips for various groups in the area, and collaborate with Terry Boerboom in his continuing detailed bedrock quadrangle mapping up the North Shore for the MGS. I've been recommending sites of special geological interest in NE Minnesota to the DNR for potential Scientific and Natural Areas. I get all sorts of calls from people with funny rocks, which are usually interesting but not extraterrestrial. Thanks to Bryan Bandli at our SEM Analytical Lab, they get some good data. And I continue to keep an Environmental Geology perspective on Cu/Ni mining proposals.

Though I'm off the Board now, I still volunteer for the Superior Hiking Trail Association in trail maintenance and building (the latest through the SE part of Jay Cooke State Park).

My interest in family history continues, and in family trips to New England I've been having fun searching out ancestor grave-stones in Salem, Massachusetts and very back-country New Hampshire, Vermont, and New York. Geology is very important in this business; slate was available and easy to carve in the 1700s and early 1800s, but then marble became fashionable but has not stood the test of time and acid rain. Granite became fashionable around 1900, and of course has stood up very well. But the old slate inscriptions are still sharp as ever. Sandstone not so much.

Ron Morton

Early November and it snowed four inches last night and is now in the low 20's! Though that is the dismal case it does make it appropriate for me to mention my new book with Carl Gawboy titled "Talking Sky: Ojibwe Constellations as a Reflection of Life on the Land." Appropriate because one of their four seasonal constellations is called the Wintermaker. Since publication of the book Carl and I have been traveling around the state giving presentations at libraries, museums, and art centers.

I have to admit that I have not been in the department at all this semester. I have just been too busy and time goes way too fast. I have been doing a lot of hiking on the newest parts of the Superior Hiking Trail, gardening (we had our best garden ever), cooking, writing a new book, and spending time with my three-year-old granddaughter (we go to the zoo, depot, and aquarium a lot) and my new six-month-old granddaughter (Cora May).

Penny remains as Associate Dean of the Swenson College of Science and Engineering and will finish her academic career in this capacity as she has given up her position in the department. Other than dealing with students and faculty she plays bridge, Ma-Jong, is in a couple of book groups, goes to the opera and hockey games whenever she can, and loves to garden. This fall we both discovered the fun of women's volleyball.

Chris and Megan are doing great and my 90-year-old dad spent the summer here in his little cabin. He will be back for a month in December.

Dick Ojakangas

I took another trip to India, the fifth in four years, to attend an International Seminar on Sedimentary Processes and Metallogeny Through Time. I presented a keynote address on “Graywackes and Turbidites: Recent to Archean” and also “Archean (2.7 Ga) Glaciomarine Sedimentation, Western Dharwar Craton”.

The first paper on these Archean glaciomarine deposits that three Indian colleagues and I have been studying finally came out in Current Science in April. This is only the 2nd documented example of Archean glacial deposits on Earth, the first being in South Africa.

I taught an eight-week course (two hours/week) on “Geology Potpourri “ to the University for Seniors. Topics included the development of geologic thought; Earth’s present and past glaciations; world’s oil and global warming; population and resources; uranium as an energy source; volcanism, earthquakes, and tsunamis; whales and whaling; construction of the Panama Canal. Fun! (Those old people really want to learn!) I also taught a one-day short course on “Geology of Minnesota and the Great Lakes Region” at the Grand Marais Folk School.

Twelve Ojakangases invaded Finland for two weeks in July-August, touring and attending two family reunions.

In October I attended the GSA annual meeting in Vancouver and presented the Indian glacial research. Greg Ojakangas (B.S. 1982) gave a paper entitled “Heliomorphic Growth of Biwabik (1.85 Ga) Stromatolites, Minnesota: Consequences of Strong Dependence of Growth Rate on Solar Irradiance”. Susanna Ojakangas Elliott (B.S.1991) is now a middle school Science/Earth Science teacher in the Twin Cities. Cookbook writer Peaches is thinking about cookbook #30.

Have a GREAT 2015!

Rip Rapp

My big news is my move back to Duluth from Tucson in September to a 4th floor apartment on Park Point with a great view of the bay and harbor. I have converted the master bedroom to a den and library so I have no excuse not to be productive. With my paper on geologist Raphael Pumpelly’s pioneering excavation Annu, Turkestan in the first decade of the 20th Century now in press, I have turned my attention to an invited paper for the European Mineralogical Union’s series Notes in Mineralogy. The paper is titled Gems and Man: A Brief History. Work also continues on the second volume of my autobiography.

PRECAMBRIAN RESEARCH CENTER

The Precambrian Research Center at UMD sponsored another successful Precambrian field camp in 2014, our 8th, but financial difficulties have put our programs at a crossroads going forward. First, the good news: the field camp was fully subscribed again this year with 24 students from 16 different schools from across the US. Over the past eight years, the PRC Precambrian Field Camp has educated 157 students, from 69 different colleges, 27 different states and 4 different countries. These students have been trained in field skills best-suited to geologic mapping in complex, glaciated Precambrian shield terrains. We are pleased to know that this experience has compelled many of our graduates to pursue graduate studies (many at UMD) that include a strong field component, or has given them skills that have helped them gain positions with minerals exploration companies. Most importantly, we are gratified to hear that most of our students come out of camp with a newfound confidence in their geological abilities.



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

Now, the bad news: as explained in the 2013 PRC annual report (<http://www.d.umn.edu/prc/annualreports/index.html>), the tight economic times experienced by the minerals industry over that past couple years has resulted in a substantial reduction in support for the PRC by our long-time industry sponsors. This loss of support has compelled us to cut back on several PRC education programs, support of student research, and staffing. What we plan to preserve and sustain, as we make these cut-backs, is the Precambrian Field Camp, our centerpiece program. To do this, we are proposing to restructure the way we fund the field camp. Starting this coming year, we plan to charge students the full cost of the camp, which over the past four years has averaged about \$5,400/student. Rather than subsidize the cost up front (last year we charged \$3,600/student), we will offset the higher cost by asking our industry and individual sponsors to contribute to a field camp scholarship fund that will be divided equally among all accepted students. We hope to be able to give each student between \$1,000 and \$1,500 in scholarship support. If you are interested in contributing to this fund, please contact Jim Miller (mille066@umn.edu).

John Goodge

Principal Investigator

UMD's \$8.75 Million Drilling Project to Unlock Secrets in Ice



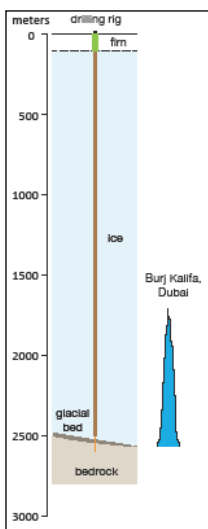
A new drilling project will take place in East Antarctica, the planet's coldest and harshest climate. The surface terrain there looks like the ocean, with swells of white snow and blue ice. John Goodge and his team will spend three months during each of five years, taking ice and rock core samples more than two miles below the ice cap of Antarctica. The project goals are to drill through the entire ice sheet and into bedrock below, in search of Antarctica's ancient continental crust and clues to the Earth's atmosphere as it existed a million or more years ago.



The team isn't after the ice itself, but will use ice to obtain samples of ancient atmospheric gas, volcanic ash and sediment. As snow falls, pockets of air mix with the snow. As this snow compresses into ice, the air pockets inside become trapped as gas bubbles, and each year's snowfall adds another layer. Many thousand of years of falling snow has created the biggest mass of freshwater ice in the world. Thin ash layers and logging of boreholes can help to date the ice and confirm its old age.

TIMELINE: 2014-2020

The project has a long timeline. A mobile drilling system named RAID, for Rapid Access Ice Drill, is now being constructed and tested in Utah. It's faster technology than the long ice-coring approaches previously used. The system will be transported by truck and then cargo ship from California, so that field drilling trials in Antarctica can start in December of 2016. In the meantime, aircraft equipped with sensitive gravity, magnetic and laser instruments will fly over the area in a grid pattern to help locate the deepest ice and image the bedrock below. By December 2017 five tractors will begin traversing over snow and ice pulling the drilling system across the East Antarctic ice sheet by way of the South Pole. Then, in December, January and February, at five sites each for the following five years, the rig will bore through ice all the way to the buried bedrock below. The rig can be operated by a crew of only three drillers. During the nine months between drilling, cores samples will be examined back at UMD and other labs in the U.S.



Samples of this kind have never been obtained previously, and to sample this portion of our planet is similar in many regards to probing our deepest oceans or other planets in our solar system. In fact, the value of the samples is so high that sampling protocols will be modeled on planetary recovery missions.

Penetration depth of the RAID drilling system compared to the Burj Khalifa tower in Dubai.



Rotary drilling rig that is being modified for the RAID system.

Alumni News

Dott, Eric, MS 86, works as an environmental consultant on a variety of assessments, investigative and cleanup projects for the public and private sectors. Industrial site and redevelopment and contaminated sediment projects continue to be a big focus. Their son and daughter are now teenagers, keeping Eric and his wife, Deborah, on their toes!

Everett, Kerry, BS 75, is self employed (KEA Associates) and working on mining and geology projects in Minnesota, Wisconsin, Michigan and Canada.

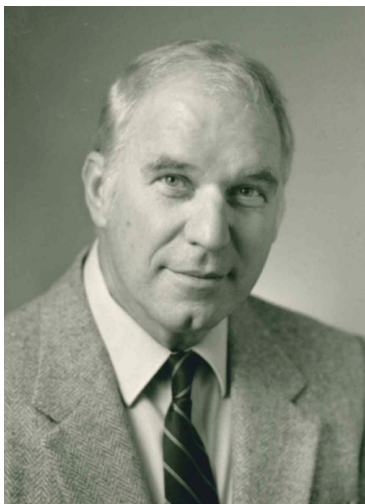
Hamilton, Jacqueline, BS 91, started a new job with the Minnesota Geological Survey (U of M) just over a year ago as their GIS Info Tech Specialist. She received her masters in GIS at the U of M in 2007, and in 2010 gave birth to her now three-year-old daughter. She married college friend Mick Hamilton in 2002, and the family lives in the Twin Cities with their Siberian husky, Mesabi, and stray cat, Nala.

Theriault, Stephanie, MS 11, congratulations to Stephanie and Matt Chaffee on their marriage on September 27, 2014.

In Memorium: CHARLES LEO MATSCH by Richard Ojakangas

Charlie passed away unexpectedly on Friday, April 18, 2014 at the age of 83. He was attending the annual UMD Geological Sciences Banquet and Awards Ceremony when he fell and sustained a severe head injury.

Charlie was born into a loving family, the seventh child of ten, to Mildred and Louis Matsch on June 22, 1930, in Hastings, Minnesota. In 1951, three years after graduating from high school, he enlisted in the United States Air Force for a four-year tour of duty during the Korean War. For a portion of that time he was stationed on a remote volcanic island in the Aleutians, where he was told by another airman that the island was sitting on a thin pedestal of volcanic rock, and that with eruptions and earthquakes, the island could topple over and fall into the sea. Charlie recounted that this discussion, while he thought the information was likely erroneous, spurred his interest in geology.



In 1956, he enrolled at the University of Maine and in 1959 graduated with a major in geology; he was a member of Phi Beta Kappa. He earned his M.S. degree in geology at the University of Minnesota in 1962, and then worked as a petroleum geologist in Midland, Texas. He returned to the University of Minnesota where he established himself as a distinguished teacher. While there, he teamed up with George (Rip) Rapp to produce one of the earliest TV courses in Introductory Geology known as “The Rip and Charlie Show”. He then went to the University of Wisconsin-Madison where he completed his Ph.D.; his dissertation focused on the Pleistocene geology of southwestern Minnesota.

In 1970 he joined the Geology Department at UMD, where he taught until his retirement in 2001. He had the reputation of being an outstanding teacher and mentor to undergraduate and graduate students. He also taught at the Wasatch-Unita Geology Field Camp at Park City, Utah, for several summers. In 1981 he received the University of Minnesota’s Horace T. Morse Award for Contributions to Undergraduate Education, the University’s highest award for teaching.

(continued on next page)

(Matsch, continued from previous page)

Charlie wrote a classic paperback book entitled **North America and the Great Ice Age** (1976), co-authored **Minnesota's Geology** (R.W. Ojakangas and C.L. Matsch, 1982), and co-authored an annotated bibliography on **Glacial Marine Sediments and Sedimentation** (J. T. Andrews and C. L. Matsch, 1983) as well as numerous papers and abstracts.

His research involved deposits of both Pleistocene and ancient glaciations, including the Neoproterozoic Mineral Fork Tillite of the Wasatch Range in Utah and the Permo-Carboniferous Whiteout Conglomerate of West Antarctica.

Charlie was a member of the U.S. Antarctic Research Program (USARP), Ellsworth Mountains Expedition, 1979-1980. The Ellsworth Range, the highest range in Antarctica, is 224 miles long and 30 miles wide; the northern half is the Sentinel Range and the southern half is the Heritage Range. Both contain exposures of the glaciogenic Permo-Carboniferous Whiteout Conglomerate, the primary research objective of Charlie and mine. The remainder of this obituary provides some details of this Antarctic project, largely extracted from my personal journal.

As Antarctic researchers well know, any carefully planned research schedule is commonly altered by weather conditions and flight problems. We left Minnesota on November 4, 1979, and arrived in Christ Church, New Zealand, USARP's home base, on November 7th. The next ten days had to be spent in New Zealand. The upside of this delay was that we were able to visit the Alps and view Mt. Cook and the Tasman Glacier, but the downside was that this meant less time in Antarctica. FINALLY on November 17th, we boarded a N.Z.A.F. C-130 for the eight-hour flight to McMurdo, the American base in Antarctica. Unfortunately, more delays and even a rumor that the Ellsworth Expedition might be cancelled! On December 2nd, we made the five-hour flight to our base camp in the Ellsworth Mountains, Camp Macalester on the Minnesota Glacier. The Ellsworth Mountains consist of two ranges, the southern Heritage Range and the northern Sentinel Range. A total of 35 scientists from several countries were in the group, plus 25 U.S. Navy and civilian support personnel. Three Navy helicopters and numerous heavy duty Ski-doo's were our means of transportation.

We studied the Whiteout Conglomerate at the Meyer Hills in the Heritage Range via short helicopter flights from the base camp. (Interpretation: the glacial deposits formed on land, as indicated by several striated boulder pavements between tills.) On December 11th we flew 100 miles north to set up a four-person tent camp (Camp UMD) in the Sentinel Range. The other two were student assistants from Macalester College, John Craddock and Pat Gould. We had two excellent weeks of fieldwork on the Whiteout in this area. (Interpretation: Glaciomarine, as indicated by dropstone units.) Matsch Ridge, a 1.5 mile long ridge (elevation 1,830 m) on the flank of Mt. Ulmer was named for Charlie in 1982 by the Advisory Committee on Antarctic Names (US-ACAN).

Charlie was the gourmet chef for our evening meals at Camp UMD, preparing dishes such as Shrimp Dijon to go along with our usual "Surf and Turf" fare of lobster tails and rib eye steaks. (Tonight will it be three lobsters each, or three steaks each?) In order to eat our food before it quickly cooled, we ate standing around the camp stove that was sitting on two rock boxes--the four of us each had our own quarter of the fry pan.

Every morning at 8:00 a.m. we radioed the base camp to verify that we were OK and hadn't fallen into a crevasse. Charlie relished that job so he could chat with someone else. He would go on and on, describing the weather and what he had prepared for dinner the previous evening, until base camp curtly replied, "Over and out!"

Charlie brought a beautiful Lake Superior agate to Antarctica to "plant" in the ice at the South Pole. Not managing to get there himself, he gave it to someone else to seed the continent. If it is ever rediscovered, it will reset the record for the southernmost discovery of a Lake Superior agate, a record now held by Kansas.

On January 17th, we flew back to McMurdo, and on the 20th, left for the U.S. via New Zealand, Pago Pago, and Hawaii, where Charlie forgot his two cameras on a seat in the airport. Charlie summarized his Antarctic sojourn with the following words: "These were three of the best months of my life!"

A Celebration of Life was held to honor Charlie on May 8th in the Tweed Museum of Art on the UMD campus. A total of 250 friends, colleagues, and former students came to this event, testifying to the great regard that so many people have for Charlie!

SOCIETY OF ECONOMIC GEOLOGISTS

The UMD student chapter of the Society for Mining, Metallurgy and Exploration (SME) is an organization that offers a wide variety of benefits to its members. At each monthly meeting, members are presented with new opportunities for volunteering, potential job placement/internships and scholarships before an industry professional presents to the group. As a chapter we strive to bring in professionals with different backgrounds in the mining industry to ensure our members have a well-rounded view of mining and mining related issues. To further strengthen our members' grasp of the mining industry, UMD SME tours mines and processing plants in the area. Elections for UMD SME officer positions for the 2015/16 academic year will take place at the January meeting. Being an officer looks great on your resume and can help develop leadership and communication skills.

UMD SME is pleased to announce that for the third consecutive year we will be attending the SME National Conference in February, 2015. This year the conference will be in Denver, Colorado and hundreds of companies will be present. The national conference is an excellent opportunity for students to network with industry professionals and students from across the world, secure jobs/internships and learn about technological advancements in the industry. If you are interested in SME membership, becoming an officer for the 2015/16 academic year or the national conference, please contact Robert Wallant at walla386@d.umn.edu.

by Robert Wallant

GEOLOGY CLUB NEWS

The year started off well with the club's participation in the UMD Involvement Fair. Several new members signed up and were welcomed into the club at our first pizza meeting. A goal for the club this year is to get all members more involved in volunteering, which started off great at the MEA Campus Preview. Ryan Puzel, Kelsey Schenck, Aaron Knowlton, and Kate Wehrs, along with other members and faculty, helped high school students from across the state gain some insight into the department, as well as some knowledge on geology and jobs related to the field. James Lestos, Mady David, Shane Loeffler, Jeremy Hurley, and Sebastian Szymutko represented the club by helping out with Bulldog Science Day, showing more prospective students around the department teaching them about thin sections and hand samples, and taking a closer look at the floor maps.

The club is currently in the process of contacting local schools to set up volunteer opportunities to continue to spread our knowledge. We will be performing hands on demonstrations for multiple grade levels. We plan on starting these demonstrations during the spring semester. Also, club officers are once again working to set up the "Dinner with a Professor" program the club is known for. This is a great opportunity for students to get to know their professors outside of the classroom. So far the response has been wonderful from both the faculty and students. Finally, the club is planning to introduce a networking opportunity for members by bringing in professors and local geologists to our meetings to explain what their job entails and what graduates are able to do after graduation. We are looking forward to an incredible school year and expanding our knowledge in the field we love!

by Aaron Knowlton & Kate Wehrs



Dr. Josh Hamilton has joined the University of Minnesota Duluth (UMD) as the new Dean of the Swenson College of Science and Engineering and faculty member in the UMD Department of Biology.

Hamilton comes to UMD from the Marine Biological Laboratory (MBL) in Woods Hole, Massachusetts where he served from 2008-2013 as the Chief Academic and Scientific Officer. In this role he oversaw their five year-round research centers and programs, the summer visiting research and education program, and all other MBL education, research, and outreach programs. He received his Ph.D. in toxicology and M.S. in genetics from Cornell University and his B.S. in biology from Bridgewater State College in Massachusetts. He was a faculty member at the Dartmouth Medical School from 1990-2008, senior scientist with the Marine Biological Laboratory from 2008 to present, and held an adjunct professor appointment at Brown University from 2010 to present.



Congratulations to Dr. John Goodge, recipient of the Chancellor's Award for Distinguished Research!



Student Scholarships, Awards and other Notable Mentions

Outstanding Graduate Teaching Assistant

Award: Angela Berthold

Outstanding Senior Award-Geology

Ralph & Ellen Marsden: Jacob Kolke

Minnesota Section SME: Nathan Lentsch

Outstanding Senior Award-Environmental

Science, Barr Engineering: Tucker Belgium

Outstanding Junior Award-Geology, Hugh

Roberts Scholarship: Katherine Wehrs

Outstanding Junior Award-Environmental

Science, Barr Engineering: Jaden Materi

Minnesota Section SME Tools-Of-The-

Trade Award : Crystal Lambert, Katherine Wehrs

Harry & Margaret Walker Research Fund

Scholarship: Michael Doyle, Chelsea Nissen, Sarah Sauer

Cliff Natural Resources Scholarship

Award: Eric Pierre

Jill & Terry Swor Scholarship: Nathan Lentsch,

Shane Loeffler, Jaden Materi, Julianna McDonnell

Estwing Geology Field Methods Award:

Esprea Essig

Kenneth E. Differt Scholarship:

Katherine Wehrs

UMD Peterson Memorial Scholarship:

Jamie Dobosenski

Frantes Graduate Fellowship: David Tovar

FIELD CAMP SCHOLARSHIPS:

Roderick Syck Outstanding Field Camp

Performance Award: Julianna McDonnell

Robert L. Heller Field Camp Scholarship:

Michael Marsh, Jordan Vargas

“Rip” Rapp Field Camp Scholarship:

Andrea Gadacz

Charlie Matsch Field Camp Scholarship:

Kelsey Schenck, Laura Sellner

Steven & Karen Brand Geological Sciences

Field Camp Scholarship: Julianna McDonnell

Ralph & Ellen Marsden Scholarship:

Andrea Gadacz, Jeffery Harrison

Lempi M. & John Pagnucco Scholarship:

Amber Michels, Clayton Zervas

Roderick Syck Field Camp Scholarship:

Logan McLouth

New Millennium Geological Sciences Fund

Scholarship: Ian Dickhusen, Matthew

Lundberg, Nicholas Spano, Kyle Thurk

Faculty Emeriti Scholarship:

Shayne Benjamin, Ian Dickhausen, Jordan Vargas

R.C. Bright Scholarship: Amber Michels

Donald Yardley Scholarship: Logan McLouth

Richard Patelke Scholarship:

Michael Doyle, Jonathan Dyess, Paul Fix, Matthew Grotte, Adam Leu, Patrick Quillen, Sarah Sauer, Alex Steiner

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Name

Contact information

Degree earned and graduation year

A short paragraph with your news

