Earth Sciences Newsletter 2016

The Dickin-stone-ian

Dickinsonians pass through Gates of the Arctic National Park In August 2015

by Ben Edwards

John and Susan Pohl have continued their incredible generosity to the Department of Earth Sciences in helping us educate students about the Arctic with a rafting trip down part of the Noatak River, in the western half of Gates of the Arctic National Park. Sally Belasco '16, Megan Layman '16, Kyle Fitch '18, James Fisher '18, Ben Edwards and Alyson Thibodeau joined the Pohls and three Alaskan guides for this expedition. The trip was run by a very professional crew of Alaska guides from Arctic Treks, and included transport into and out of the western Brooks Range via float planes, and 4 days going down the river. We saw many permafrost features, including pingos, and large-scale glacial terranes, including several spectacular U-shaped valleys. The effects of climate change are most prominent by not only what is coming in to the country (trees climbing the valley sides), but also what is leaving (Brooks Range glaciers). The impact on wildlife is also intriguing; salmon were in the river and smaller tributaries, which acts to concentrate bear activity. Our main day-long hike opportunity got short-circuited due to be surrounded at one point by 5 different grizzly bears. Fortunately the bears were more interested in fish and roots than us, but having to call off a fieldtrip due to bear activity was a first for the crew! At present we are less than a month away from the next Arctic adventure with the Pohls, which will involve camping on the Arctic Sea ice immediately east of Bylot Island in the Canadian Arctic. We will be studying the breakup of sea ice, surrounding land-based glaciers, and Arctic Ocean currents on this trip.

Inside this issue:

CASSA Student/Faculty Field Trip to Costa Rica January 2015

By Pete Sak

Last January Earth Science Professors Peter Sak and Ben Edwards lead ten students (Sally Belasco'16, Matthew Berman '18, Mackenze Burkhart '15, Kyle Fitch '18, Emily Kaplita '16, Sophia Larson '17, Megan Layman '16, Crystal Mortar '15, Mariah Murphy '15, Amanda Santailli '17, on a 10-day field excursion to Costa Rica. The trip allowed participants to explore a tectonically diverse region displaying all components of a subduction zone. Highlights of the trip included a lecture on earthquake tectonics by seismologist Dr. Marino Protti of OVSICORI-UNA, a volcanologic and seismologic observatory affiliated with Universidad National of Costa Rica, and the opportunity to traverse the country with stops including.

- Mt. Arenal, an active stratovolcano.
- Cherro Chato, a dormant volcano to the southeast of Arenal featuring hiking trails through rainforest and beautiful lake occupying the crater.
- Montezuma, a picturesque beach village known for its forest, waterfalls and cinder cone and breccia rock formations.
- Cabo Blanco Nature Reserve on the Nicoya Peninsula, the first area to be established as a national park of Costa Rica. Cabo Blanco is known for its exotic bird population and mixed forest.
- Quepos/ Manuel Antonio National Park, a tropical forest known for its biodiversity.

Student Reflection, Costa Rica 2015

Megan Layman '16

Words cannot describe how thankful I am for the privilege of traveling to Costa Rica through the support of the Cassa Fund. As an Environmental Earth Science major from the eastern United States, I believe it is important that students like me are able to see everything the world has to offer. Costa Rica is extremely tectonically active. Through this Cassa trip we experienced, firsthand, what active tectonic landscapes look like.

It is one thing to learn about Earth's processes in a classroom, but to go out into the world and see these things with your own eyes is a profound learning experience.

This trip has made me a better Earth scientist, and has made me extremely appreciative of the opportunities given to me at Dickinson College. Inspired by this trip, my senior research project will examine tectonics and streams of Costa Rica.

I bonded with my colleagues and professors in a way I never thought possible, and I created memories that I will carry with me for the rest of my life.

Arenal Volcano taken by Mariah Murphy ('15) It is very rare for anyone to see the top of this volcano because it is always very cloudy at the peak. We were lucky enough to have a few moments of viewing the top of the volcano as the clouds cleared. This photo is also one of my favorites because it captures the beauty of this tectonically unique area. You can see the dark paths trekking down the sides of the volcano, the paths that were created from the last lava flow that emerged from this active volcano.

Letter from the Chair

Departmental Update from the Chair

I have taken over as the department chair of Earth Sciences following Pete Sak's productive three year stint. This is my third term as chair, and boy have the administrative responsibilities grown! The biggest change is that with Jeff Niemitz's retirement, I am now the senior colleague in the department. That is scary! The first time I was chair, I hired Gale Blackmer as a one year sabbatical replacement for Noel, now she is the Director of Pennsylvania's Bureau of Topographic and Geologic Survey and the State Geologist. Time flies!

This year, two of our majors (Will Kochtitzky '16 and Juliane Bowman Brown '94) received highly competitive National Science Foundation (NSF) graduate fellowships. The fellowships—which have been directly supporting graduate students in STEM fields since 1952—provide a three-year annual stipend of $34,000, plus $12,000 for tuition and fees. Will's NSF Geosciences-Glaciology fellowship will allow him to attend the School of Earth and Climate Sciences at the University of Maine where he'll study outlet glacial dynamics using remote sensing and in-situ measurements. Juliane's NSF Environmental Engineering fellowship will allow her to pursue a doctoral degree in environmental engineering science within the Department of Civil and Environmental Engineering at the Colorado School of Mines in Golden, Colo. She will focus on the source apportionment, fate, toxicity and risk of perfluoroalkyl acids in food crops grown in urban/peri-urban agricultural communities.

My most important goals for the next three years are Ben's evaluation for promotion to Full Professor (which was successful this year; congratulations Ben!!!!) and mentoring my two new colleagues that we hired to replace Jeff. They are Jorden Hayes and Aly Thibodeau. They bring exciting new specializations and fresh ideas to the department. It is great having them around to balance the loss of Jeff's experience. Speaking of Jeff, we had two wonderful retirement events for him last year. One on campus in the spring and the other in Baltimore as part of the Geological Society of America's annual meeting last fall. It was great catching up with all the alumni that attended these events to wish Jeff well in retirement. Suzy Kairo ('83) has graciously spear headed the fund raising for the new Jeffrey Niemitz Endowed Student Research Fund which you can read about below!

Many of the exciting things happening in the department are directly related to your past support of student research and field experiences. For example, the William Vernon Research Prize in Geology and the Henry Hanson Research Prize in Geology have supported some of our senior theses such as:
- Dave Bertram's "The effects of geologic parent material on the growth of rye grass"
- Katie Mattern's "The addition of volcanic ash to soil and its effects on the growth of rye"
- Liz Plascencia's "Analysis of sediment and ash from Lago Pallarcocha, Nevado Corpuna, Peru"
- Julia Redden's "Assessing the relationship between physical weathering and precipitation using riverine chemistry budgets on Basse-Terre, Guadeloupe"
- Will Kochtitzky's "Short-term climate cycles, recent climate changes, and volcano-ice hazards: Nevado Coropuna, Arequipa, Peru". For this work, Will received departmental honors and won the William Vernon Prize for Excellence.

The Cassa Extended Field Trip Fund subsidizes fieldtrip costs for students which has allowed us to take them to Hawaii, Death Valley, Grand Canyon, Zion, Yellowstone, Glacier, Acadia, England, Scotland, Wales, and Sicily. Last year Pete and Ben were able to take 10 students to Costa Rica. Our goal is to increase the Cassa Fund to enhance the geographic diversity of our student field experiences by alternating annual cheaper domestic trips with more expensive international trips.

Letter from the Chair (cont'd)

Finally, the Potter Lectureship Fund supports bringing a distinguished Earth scientist to campus each year to interact with our students. This winter it was a delight to have our 12th Annual Potter Lecturer: Lonnie Thompson, Distinguished University Professor, School of Earth Sciences and Senior Research Scientist, Byrd Polar and Climate Research Center, The Ohio State University. His main public lecture was, "Global Climate Change: The Evidence, People and Our Options."

If you are able to contribute to any of these funds described below, please send a check payable to Dickinson College to Marcus Key, Dept. of Earth Sciences, Dickinson College, P.O. Box 1773, Carlisle, PA 17013-2896. Please indicate on the memo line which fund you would like to contribute to or contact me at 717-245-1448 if you want to discuss the department's areas of greatest need. Our goal is to build the research funds to the point where we can provide some funding to all of our seniors.

Keep in touch and come see us, Marcus Key

Endowed Departmental Funds

NAME	DESCRIPTION
David and Cary Cassa Extended Field Trips	It is used by the Department to help subsidize student expenses for extended field trips. The trips supported will be beyond those ordinarily associated with regularly offered courses. Trips will occur either every year or every other year. Decisions about expenditure of the funds will be a joint decision of the Department faculty.
The Henry Hanson Research Prize	It is awarded to an outstanding student in support of his or her independent research project. The money will be used to help pay for expenses such as travel for field work, purchase of research equipment, software, supplies, etc. Travel to professional meetings can be supported, but only in so far as it is related to the student's research. While field work should be encouraged, support of laboratory work will also be appropriate. The award recipient will need to demonstrate initiative, curiosity, creativity, and promise in the field through a selection process which will be conducted by the Department faculty based on cumulative grade point average and a formal application submitted by each student. This application will include a complete research project proposal including an abstract, a hypothesis, an outline of their experimental design, a discussion of proposed data analysis techniques, a summary of how they plan to present their results, and a proposed budget for the project. This prize was established in honor of Professor of Geology Henry Hanson. It will normally be awarded annually in May at the year-end picnic with the moneys being available for use either over the summer or during the course of the following academic year. The selected student will be listed in the Convocation program at the beginning of the following fall semester.
Potter Lectureship	This lectureship was established by alumni, colleagues, and friends in 2004 to honor Emeritus Prof. Potter who retired in 2005 from Dickinson. It provides an opportunity for our students to meet and engage established scientists and to have discussions about their research, career paths, graduate school, and career opportunities beyond the limestone walls.
The William Vernon Research Prize	It is awarded to an outstanding rising senior Earth Sciences major in support of his or her laboratory or fieldwork or travel to present results at a recognized professional conference as part of their senior independent research project. The award recipient will be chosen through a selection process which will be conducted by the Department faculty based on cumulative grade point average and a formal application submitted by each student.

Endowed Departmental Funds (cont'd)

NAME	DESCRIPTION
The William Vernon Research Prize (cont'd)	This application will include a complete research project proposal including an abstract, a hypothesis, an outline of their experimental design, a discussion of proposed data analysis techniques, a summary of how they plan to present their results, and a proposed budget for the project. This prize was established in honor of Professor William Vernon, the founding member of the department. It will normally be awarded annually in May at the year-end picnic with the moneys being available for use either over the summer or during the course of the following academic year. The selected student will be listed in the Convocation program at the beginning of the following fall semester.

Endowed Extra-Departmental Funds

NAME	DESCRIPTION
Robert Allan Jansen Memorial Student-Faculty Research Fund	It is awarded by the College's Research and Development Committee for a student-faculty research team involving an Earth Sciences (first choice) or Environmental Sciences/Environmental Studies (second choice) sophomore or junior (or to a sophomore or junior in a closely related field of study in the sciences).
Jeffrey Niemitz Endowed Student Research Fund	It is awarded by the College's Center for Sustainability Education to a student researcher in Earth Sciences (first preference), Environmental Sciences/Environmental Studies (second preference) or a closely related field. It is preferred that the Fund shall be used to support a research project involving or closely related to the sustainable use of Earth's natural resources in disadvantaged communities around the world. The research project would ideally aim to solve an existing or potential challenge related to the use or misuse of natural resources. Additionally, educating communities about the benefits and holistic value of sustainable living should be incorporated as part of the research project. A tangible outcome (publication, presentation, etc.) from the research project is highly desired. When fully funded by existing pledges by the year 2020, the endowment will generate an annual student research grant of at least $5000. This grant will be awarded to a student to fund scientifically-based research around the world.
The Dickinson Fund	Working in line with the college's mission and core values, the Dickinson Fund supports educational access for students in need. It funds sustainability efforts. It purchases lab equipment and art supplies. It is part of why this college has such a track record of success in all fields, including its exceptional financial management and fiscal responsibility.

The Art and Science of Giving Back: Establishing the Jeffrey Niemitz Endowed Student Research Fund at Dickinson College

When I started my freshman year at Dickinson College, I took Introductory Geology to fulfill my science requirement. This decision ended up sending me on a career path I never could have imagined. I liked natural sciences but had no intention of being a scientist. I was not very good in chemistry, never had a real physics course, and was absolutely terrible at math. How could I become a scientist? As it turns out, I have been a student and practitioner of geology for over 35 years. If I could have seen into my future on the day I started my education at Dickinson College, I would not have believed that the future I was seeing was mine.

The role that Dickinson played in setting a course for my life may seem familiar to some of you. Young people who think they are inclined to subject matter such as language, political science, law or art, take science as a requirement and decide to make science part of their life. It is an amazing process of discovery and exploration that is fostered at Dickinson every day, thanks to Dickinson's commitment to the liberal arts.

My life and career as a geologist would not have been possible without the welcoming, inclusive atmosphere of the Dickinson College Geology Department and the liberal arts philosophy of Dickinson College, where even a student who hates math can learn to be a scientist! It was also largely possible because Jeff Niemitz was my academic advisor and friend. If it were not for Jeff's encouragement and compassion, I might have given up. When I was feeling defeated by quantitative geologic problems and exercises, he was there to help. When I was homesick, he and his wife, Trish, invited me into their home to be part of their family, to play with and babysit for their three very little kids. When I decided to pursue a graduate degree, Jeff navigated me through the maze of possibilities, wrote many letters of recommendation, and consoled me when I got rejection letters.

That is why I have taken the step of establishing the Jeffrey Niemitz Endowed Student Research Fund, which will honor Jeff and provide funding for student research. When Jeff retired, I wanted to recognize his dedication to a career of being a teacher and mentor. I also wanted to do something that would, in some way, repay the College for the many ways it set the stage for my life's path.

The Purpose and Goals of the Niemitz Endowment

As I explored the possibility of establishing an endowment, Jeff and I had several conversations about how an endowment in his honor could best represent his interests and values, and could benefit current and future Dickinson geology and environmental science students. I had some ideas of how I would like to see the endowment used. Jeff's passion in academics has been and remains with teaching and mentoring students. He frequently shares that his most satisfying moments and experiences have come from interacting with students on research, outside the classroom. Most recently, those interactions have been through his relationships with the Dickinson College Center for Sustainability and the Global Studies Programs, and through his involvement in projects helping under-served communities in Africa and South America. Jeff wanted the Endowment to reflect these aspects of his career.

From my perspective as both a research scientist and a scientist that applies scientific approaches to address all sorts of issues, I have a growing concern that public policy on issues of sustainability are commonly controlled by emotions and belief rather than data and logic. I wanted to see Dickinson students set a standard for taking a scientific approach to studying and finding sustainable solutions to matters of environment and resources.

Together, Jeff and I built a foundation and framework that became the Niemitz Endowment. It embodies the merging of our values: education, sustainable use of natural resources, and global outreach in underserved communities. The intent of the research funds are to enable the student to get into the field, to put their boots on the ground, and to work with a community to find a best-fit solution to their sustainability issue. Educating communities in the benefits and holistic value of sustainable living should be a key goal of funded projects.

Jeff continues to remind me that sustainability encompasses more than the physical planet and its resources. We both agree that sustainability means empowering local communities with the knowledge and means to maintain the resources for a healthy and safe quality of life that is within their economic realm, that fits within their social and cultural norms, with solutions that do not have serious detriment to the natural world that hosts them. He also reminds me that finding solutions to living with and managing the effects of climate change may be the single most important challenge for sustaining a humanistic quality of life for communities around the globe, for many decades to come. Teaching communities about how to manage or adapt to the ways changing climate may affect their natural resources is another area for potential student research that could be funded by this endowment.

An Endowment for Today…and for the Future

I'd like to close with two philosophical perspectives that students of the liberal arts should appreciate. The perspectives are two quotes that couldn't come from more distinctly different sources and mindsets. They show that no matter how different our cultures, heritage and economic backgrounds may be, we all want the best for our children and for the world.

The first quote came to me this spring. I found it on a greeting card for sale at White Sands National Monument. I have been to that magical place several times, and was visiting there most recently with my family and some friends during Spring Break. I wanted to share the magic with them. The quote on the card was from a Native American leader, Chief Seattle. He stated, "We do not inherit the earth from our parents; we borrow it from our children."

The second quote comes from the epitome of corporate America: Exxon. Some of the pre-1985 alumni may remember an Exxon advertisement jingle called "Energy for a Strong America." In that jingle, there is a phrase: "for the children of today, it will be their world someday." Environmentalists and lawyers commonly espouse the idea that the XOM of Wall Street doesn't care about sustainability and the holistic welfare of the world. The elusive corporate entity might not seem to care, but the people that make up that corporation truly do.

I call attention to that and this quote from the jingle because of how the Niemitz Endowment is being financially enabled. I, and two other Dickinson Geology graduates who work for ExxonMobil have provided, or are committed to providing, the seed money to fund the endowment at the level of more than $100,000. This is possible because of ExxonMobil's very generous matching educational gift program. A corporation that earns money for stockholders by extracting and selling natural resources is funding a program that supports the sustainable use of those same resources. It is a beautiful irony.

Here's to the vision that the Children of Today may inherit a world that we borrowed from them and stewarded in a responsible way. I am envisioning a world where living sustainably is *status quo*, rather than the hope for tomorrow.

If any of you are in Houston, or are traveling here, please contact me. It would be my pleasure to connect with you.

Dr. Suzanne Kairo, Class of '83
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Houston, TX 77009
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Potter Lectureship Going Strong

	Name	Affliation
2005	Richard Alley	Pennsylvania State University
2006	Bruce Marsh	Johns Hopkins University
2007	Rob Thieler '87	USGS-Woods Hole
2008	Jeremy Jackson	Scripps Institution Oceanography– University of California at San Diego
2009	Mark Brandon	Yale University
2010	John Eichelberger	USGS-Reston
2011	Katie Huntington	University of Washington
2012	Frank Pazzaglia	Lehigh University
2012	David Bottjer	University of Southern California
2014	Rudy Slingerland '69	Pennsylvania State University
2015	Susan Brantley	Pennsylvania State University
2016	Lonnie Thompson	Ohio State University

Department Outreach to Area Schools

The Department, in an initiative to promote Earth Sciences in education, has invited area schools to campus to participate in labs and exercises that we feel would interest them. Below is a photo of our volcano simulation that was enjoyed by local grade schoolers of the Carlisle Area School District. I thought it was cool to watch too!

Picture Left: Man Made Eruption in all her glory!!

Picture Right: Grade Schooler looking on as the "volcano" erupts.

William Vernon Prize for Excellence in the Earth Sciences

Each year the faculty has the difficult task of deciding which graduating senior will receive the Vernon Prize for Excellence in the Earth Sciences. The prize is based on grade point average, service to the department and the college, and promise for the future.

William Kochtitzky '16, was awarded the 2016 Vernon Prize for Excellence in Geology. Will's senior theses "Short-Term climate cycles, recent climate changes, and volcano-ice hazards: Nevado Coropuna, Arequipa, Peru" was built upon the summer that Will spent working with Ben Edwards in Peru.

After graduation, Will has acquired a National Science Foundation (NSF) graduate fellowship which will allow him to attend the School of Earth and Climate Sciences at the University of Maine where he will study outlet glacial dynamics using remote sensing and in-situ measurements.

Photo Above:
Dr. Vernon and prize recipient, William Kochtitzky

2014-2015
Senior Student Research Projects

Melanie Campbell '15

Petrologic investigation of the Wissahickon Schist

Abstract: This study attempts to examine the detailed changes that occur in chemistry and mineralogy of a single in the Wissahickon Schist located on the eastern bank of the Wissahickon Creek. Field observations were not conclusive as to the diversity of minerals present. Further examination of the samples using Petrography, X-ray Diffraction (XRD), X-ray Fluorescence (XRF), and Scanning Electron Microscope-Energy Dispersive Spectrometer (SEM-EDS) showed diversity of texture, mineralogy, and rock composition. The purpose of the study is to determine whether mineralogy is controlled by the protolith, or by changes that occur during metamorphism. The outcrop shows macroscale, fourth order folds, and the texture of the samples is schistose. Microscope and X-ray Diffraction (XRD) analysis show that the mineralogy of the studied samples is dominated by quartz, followed by feldspar, muscovite, biotite, and ilmenite. Bulk chemical analysis using the XRF has results consistent with that mineralogy since most samples have greater than 75% SiO2 by weight. Mineral compositions show slight variation. Results show that on the scale of 5 meters across an outcrop, mineralogy and bulk rock compositions vary, which is consistent with protolith variations controlling mineralogy.

Spencer Lieber '15

Determining Igneous or Metamorphic Locality Source Rock from Hornblende Samples

Abstract: The purpose of this study was to verify the classification of 21 samples reported to be the amphibole species hornblende (Ca,Na)2–3(Mg,Fe,Al)5(Al,Si)8O22(OH,F)2) and to determine if samples from the same locality had the same range of composition. The samples were from the Carnegie Museum of Natural History in Pittsburgh, PA and were collected in 1 of 3 geographic locations: 1) St. Lawrence and 2) Orange Counties in New York and 3) Renfrew County, Ontario, Canada. Samples were characterized by measuring color, hardness, density, and chemical composition (measured via electron dispersion spectroscopy). Eight samples were analyzedx-ray diffraction. For the suite colors all had a base of black or grey and with hue variation from brown grey to red and black. Hardness ranged from 5-6. Density ranged from 2.9 to 3.5 g/cm3. The compositions from the EDS were classified using the "Nomenclature of Amphiboles" general classification of amphiboles (Leake et. al, 1997). All mineral compositions were determined to be varying species of amphiboles. Some of the XRD analyses were consistent with the amphibole chemical classifications and some were not. Densities of the samples did not vary systematically by location, which might be attributed to small sample size. Based on the chemical classifications all of the locations showed variations in amphibole species, but all were characteristic of their locality.

Senior Student Research Projects (cont'd)

Crystal Mortar '15

Inferring Lacustrine Paleohydrology from the Carbonate Mineralogy of the Triassic Passaic Formation Warford Member, Newark Rift Basin, eastern North America

Abstract: The advent of the breakup of the supercontinent Pangaea in middle to late Triassic time (~230-180 ma) created elongate rift basins, which became depocenters for a cyclical sedimentary record corresponding to filling and emptying of the basins via monsoonal circulation inhibited or exacerbated by orbital scale drivers of climate change. In this study we examine the mineralogy and geochemistry of calcium and calcium- magnesium carbonate minerals from a single climate-induced sedimentary cycle in the Newark Basin, the Warford Member of the Passaic Formation, (aka a van Houten precession cycle) to determine the paleohydrology of these lacustrine sediments. This sedimentary record can potentially reveal the degree of influence of climate change over one 21,000 year period of continental rifting during the Triassic Period. It is hypothesized that differences in carbonate textures indicate different modes of carbonate mineral origin and differing paleohydrologic conditions. During the presence of a playa or a shallow lake, evaporation induced carbonates should dominate. At intermediate lake depth, carbonates are more likely to be produced organically by algae or inorganically by massive lake turnover possibly due to mega-monsoonal circulation. In a deep lake, algal blooms form carbonates possibly on an annual basis. Textures and sedimentary geochemistry thus suggest distinct changes in the lake's paleohydrogeochemistry. Oxygen isotopic changes indicate that the lake remained a closed system during filling by runoff and emptying via evaporation only. Petrographic and SEM-EDS analysis revealed that there is significant dolomite and feldspar replacement of calcite due to diagenesis making specific hydrological interpretations somewhat speculative.

2015-2016
Senior Student Research Projects

David Bertram '16

The Effects Of Geologic Parent Material On The Growth Of Rye Grass

Abstract: Plants are affected in many different ways by the parent material that they grow. The purpose of this study was to understand the ways that rye plants were affected by different rock types by adding shale, diabase, limestone, sandstone and quartz (control) to peat moss in concentrations of 1:9, 3:7, and 1:1. The hypothesis of this experiment was that the plants with the higher concentrations of powdered rocks will yield larger plants at faster rates. . The results show that diabase, shale, and limestone are good for growing plant height, weight, and germination, whereas sandstone is not good, but that all soils with crushed rock added grew better than the quartz control.

William Kochtitzky '16

Short-term Climate Cycles, Recent Climate Changes, and Volcano-Ice Hazards: Nevado Coropuna, Arequipa, Peru

Abstract: The glacier body atop Nevado Coropuna Peru is the largest body of ice in the tropics. The surrounding area is home to ~100,000 people and is vital for agricultural production in southern Peru. Not only does the ice cap provide a water resource to Peruvians in the area, but it also poses a potential hazard if the volcano erupts. The location and physiography of Coropuna make it an excellent location to understand local climate over a variety of timescales in the ice and snow. Using 258 Landsat scenes, to measure snow and ice extent at Coropuna since 1980, this study has suggested a more accurate measure of glacial shrinking on Coropuna. During fieldwork in 2015, we collected nitrogen and diatom samples, made observations of millennial scale lava flows, and collected century scale lake sediment cores. In additional, this study uses photographs of ice retreat for historic comparison, and measured ice thickness at an outcrop.
An analysis of 20 Landsat images from 1980 to 2014 to measure aerial changes in the ice cap at the Nevado Coropuna volcanic complex, Peru suggests ice loss to be 0.41 km2 yr-1. Even though previous studies have reported ice loss rates of 1.4 km2/yr. Analysis of 258 Landsat scenes determined annual snow minimums using the Normalized Difference Snow Index. Field photographs estimate that a western outcrop of ice is 37 meters, and provide useful supplemental information to work by others including Peduzzi et al (2010) and Birkos (2009). While testing of N during the 2015 field season was inconclusive, preliminary diatom analysis is promising and in progress. Although some predict that Coropuna will be a non-contributor to water supply by 2025, my results suggest that this will not be the case and that the ice-cap could survive at present rates for the remainder of this century and beyond. My results have significant implications for hazard assessment and resource water planning in southern Peru, which relies heavily on glacial meltwater for year round agricultural production and domestic use.

Senior Student Research Projects (cont'd)

Will and Ben with Nevada Coropuna volcano in background

Mesozoic stratigraphy above green river

2015-2016
Senior Student Research Projects (cont'd)

Megan Layman '16

ROUGH CRUST SUBDUCTION, SPECIFIC STREAM POWER, AND SURFACE UPLIFT ALONG THE PACIFIC COAST OF COSTA RICA

Abstract: The subduction of rough seafloor at convergent plate boundaries results in differential uplift of the overriding forearc. Over 400 km trench length along the Middle America Trench, the tectonic setting ranges from strike-slip motion to subduction of seamounts and the aseismic Cocos Ridge. Rapid, near-orthogonal subduction of linear tracts of seamounts on the Cocos Plate, oriented parallel to the convergence vector result in isolated segments of the forearc experiencing the repeated effects of seamount subduction, while neighboring segments experience smooth subduction.
Abandoned alluvial terraces record fluvial histories of deposition and incision. Calibrated age constraints from weathering rind thicknesses are used to provide first-order constraints on the ages of terraces along the Pacific coast of Costa Rica. Ages and elevations of these terraces are used to calculate uplift rates within basins servicing portions of the Costa Rican forearc. Spatially variable patterns of surface uplift can be preserved as knickpoints in the longitudinal profiles of rivers. Knickpoints are migrating boundaries between downstream regions adjusting to uplift, and upstream regions that maintain the characteristics of the pre-existing state of the landscape. Assuming dynamic equilibrium, this study compares both normalized stream gradient (ksn) (dataset provided by Morell et al., 2012), and precipitation-dependent specific stream power (SSP) to the uplift rates of rivers. The morphology of the subducting Cocos Plate has a stronger influence on uplift rates than does precipitation within the Costa Rican forearc.

Katie Mattern '16

THE ADDITION OF VOLCANIC ASH TO SOIL AND ITS EFFECTS ON THE GROWTH OF RYE

Abstract: This research tests the hypothesis that using volcanic ash as a soil amendment will have a significant effect on plant growth. Experimental soils were prepared to ensure a consistent grain size range for four different volcanic ashes and commercial quartz sand. Each material was sieved to select a grain range from 63-250 μm (fine to very fine sand), and was then used in rye plant growth experiments by adding 10, 30, and 50 volume percent of each amendment to peat moss. Results showed that plants grown in 10% Grimsvötn ash (170.0 mm) were 20.3 mm taller on average ($p \leq 0.1303$) than plants grown in quartz (149.7 mm). Also, plants grown in sorted Eyjafjallajökull ash (144.0 mm) grew significantly higher ($p \leq 0.10$) than plants grown in unsorted Eyjafjallajökull ash (120.9 mm). Rye grown in 50% Grimsvötn ash, 30% Peru ash, and 50% Peru ash were found to have significantly longer roots than their corresponding quartz volume ratios. These results could be due to the vesicular texture of volcanic ash, which can hold onto water and easily weather, providing nutrients to the soil. It could also be due to greater sorting, which would increase porosity and permeability, or the composition of the volcanic ash, i.e. basalt. Although it could not be determined whether these results were solely due to the chemical or physical properties of volcanic ash, these results could support the use of volcanic ash as an inorganic "fertilizer" to help stabilize rye cover crops due to the general trend of longer root depth with the addition of ash.

Senior Student Research Projects (cont'd)

Elizabeth Plascencia '16

ANALYSIS OF SEDIMENT AND ASH FROM LAGO PALLARCOCHA, NEVADO COROPUNA, PERU

ABSTRACT: Lago Pallarcocha (15.57° S/ 72.72° W; 4,740 m a.s.l.) is a small (15 ha) alpine lake located on the western flank of the Nevado Coropuna volcanic complex in southern Peru. The lake is at least ~ 20 m deep and has a surface conductivity of 34.8 µS. The surrounding high-elevation Altiplano region has been heavily impacted by climate change in the Holocene (Kuentz, 2005). In order to fully understand the implications of recent glacial retreat and projected climate change, it is important to investigate the paleoclimate of Andean region. Limnological parameters serve as climate archives in sediments, however the least studied environments in the Andean region are tropical lake ecosystems (Michelutti et al, 2015). Currently no studies have been published that describe the lacustrine sediments of lakes adjacent to Nevado Coropuna. This study will work to investigate ecological (diatoms) and physical (grain-size distribution, mineralogy) characteristics of sediments from Lago Pallarcocha, extracted from a gravity core (21.5 cm in length) that was sampled at 0.5 cm intervals in the field. An observed ash horizon in the sediment cores was found to be chemically consistent with ash from the 1600 Volcan Huaynaputina eruption, which implies extremely low sedimentation rates (0.13 mm per yr and 0.075 mm per yr), at least for the upper section of the cores. Significant ecological and physical changes in the lake sediment records may record change in climate, which helps to further inform Anthropogenic warming. Analysis of sediment cores from this unique location (i.e. remote area, proximity to ice cap) will help contribute to the limited number of climate records in this region.

Julia Redden '16

ASSESSING THE RELATIONSHIP AMONG PHYSICAL WEATHERING AND PRECIPITATION USING RIVERINE CHEMISTRY BUDGETS, BASSE-TERRE ISLAND, GUADELOUPE

Abstract: This project will explore the relationship between mechanical weathering rates and precipitation through the analysis of stream steepness index and specific stream power. ArcGIS and Matlab will be used throughout this project to analysis images of Basse-Terre, the western island of Guadeloupe. This island's conditions are ideal for this study, as the two western side and eastern side have significantly different characteristics. The eastern side of the island has greater rainfall and thus should have higher levels of weathering. It is predicted that higher levels of precipitation will correlate with higher mechanical erosion rates. Mechanical erosion rates were recorded in nine basins across the island. These mechanical erosion rates were then plotted against specific stream power and the stream steepness index, and correlation coefficient calculated. Using the technique proposed by Ferrier et al., we found these R2 values do not show any significant difference. It was concluded that there is not greater correlation between mechanical erosion rates and steam steepness index than there is between mechanical erosion rates and specific stream power. Therefore, our hypothesis was disproven, and precipitation levels do not have an effect on mechanical erosion rates.

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(ERSC majors underlined)

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2016

- **Key, M. M.**, **Jr.**, P. N. Wyse Jackson, and S. H. Felton. 2016. Intracolony variation in colony morphology in reassembled fossil ramose stenolaemate bryozoans from the Upper Ordovician (Katian) of the Cincinnati Arch region, USA. Journal of Paleontology. 90: ?-?.
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- Smellie, J.L., **Edwards, B.R.** 2016. Glaciovolcanism on Earth and Mars: products, processes and paleoclimate implications. Cambridge University Press, ~450 p.
- Oddsson, B, Gudmundsson, MT, **Edwards, BR**, Thordarsson, T, Magnusson, E., Siggurdsson, G. 2016. Subglacial propogation and heat transfer in intermediate lava flow during the 2010 Eyjafjallajokull eruption. Bulletin of Volcanology, 34 p, 10 figs., 2 tables.
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- Miller, S.R., Krirby, E., **Sak, P.B.**, Bierman, P.R., 2015, The rivers and valleys of Pennsylvania: A 21st century view of neogene topographic rejuvenation: SlingFest: Sediment from Mountains to Seas. A celebration of research and service in honour of Rudy L. Slingerland: Pennsylvania State University.
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- **Thibodeau, A.M.,** Corsetti, F., Ritterbush, K., Yager, J., West, A.J., Yadira, I., Bottjer, D., Berelson, W., and Bergquist, B. Mercury Concentrations and isotopes as tracers of CAMP in Triassic-Jurassic strata from Muller Canyon, Nevada. Geological Society of America *Abstracts with Programs.* Vol. 47, No. 7, p.67
- Volynets, A., **Edwards, B.R.,** Melnikov, D., Yakushev, A, Griboedova, I. (2015) The 2012-13 Tolbachik fissure eruption: geochemical, petrographic and mineralogic records of storage zone processes from lava samples. IUGG meeting, Prague.

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- **Key, M. M., Jr.**, M. S. Burkhart, and M. O'Leary. 2016. Eocene bryozoans preserved in chert from the Wilson Bluff Limestone, Eucla Basin, Western Australia. Pp. 55. In: A. Smith and G. Walker-Smith (eds.). Program and Abstracts of the 17th Conference of the International Bryozoology Association, Melbourne, Australia, 10-15 April 2016.
- **Key, M. M., Jr.**, P. N. Wyse Jackson, and S. H. Felton. 2016. Intracolony variation in zoarial morphology in reassembled fossil ramose stenolaemate bryozoans from the Upper Ordovician (Katian) of the Cincinnati Arch region, USA**.** Pp. 56. In: A. Smith and G. Walker-Smith (eds.). Program and Abstracts of the 17th Conference of the International Bryozoology Association, Melbourne, Australia, 10-15 April 2016.
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- Wyse Jackson, P.N., and **M. M. Key, Jr.** 2016. Epizoan and endoskeletozoan distribution across reassembled ramose stenolaemate bryozoan zoaria from the Upper Ordovician (Katian) of the Cincinnati Arch region, USA. Pp. 96. In: A. Smith and G. Walker-Smith (eds.). Program and Abstracts of the 17th Conference of the International Bryozoology Association, Melbourne, Australia, 10-15 April 2016.

Professor Marcus Key

Greetings!

With Jeff's retirement, I am now part of the rotation of faculty teaching our new Earth's Changing Climate course. I have enjoyed developing new labs and translating my research on C and O stable isotope climate proxies from bryozoan skeletons to this new introductory course. Learning about new fields in the Earth Sciences are one of the best parts of my job! I continue to teach my usual rotation of Sedimentology & Stratigraphy, Paleontology, and Energy Resources. This summer I am teaching a course entitled Meltdowns and Waves. With a colleague in East Asian Studies we are comparing how Americans and Japanese respond to disasters. In particular we are comparing Three Mile Island with the Fukushima nuclear accident and Hurricane Sandy with the Tohoku earthquake and tsunami. On the research front, I am still using extant and fossil bryozoans to test a variety of geoarcheological more conventional paleontological hypotheses. My research is increasingly international with active field projects in Greenland, Australia, and New Zealand with colleagues there as well as Ireland and Germany. My work on sourcing Colonial building and tomb stones in the Chesapeake Bay area has led to a collaboration sourcing Aboriginal artifacts in southwestern Australia. My student and I are teamed up with a geochemist and archeologist in Perth Australia.

On the home front, Maria and I celebrated 32 year of marital bliss by going to the drive through at Taco Bell. Dylan is still directing plays at the Undermain Theatre in Dallas, but is off this summer to the University of California at San Diego for a three year MFA degree in directing. "Saint" Lily is a house manager for Maggie's Place, community that provides houses of hospitality for pregnant and parenting women in need in Phoenix. Kevin is finishing his junior year studying philosophy at the University of Dallas. John and Peter are still at home balancing school with track, soccer, and computer games.

If you are coming back to Carlisle for alumni weekend 10-12 June 2016, I'll still be in Japan, so have a toast without me this year!

Sincerely,
Marcus

Professor Peter Sak

Hope this note finds you all doing well. It's been an exciting two years since the last newsletter. In the classroom, I continue to enjoy teaching Structure, Field, Geomorphology, and Earth's Disasters. Last year I had the opportunity to teach a First Year Seminar on the Politicalization of Science.
On the research front, I have been fortunate to work with a highly motivated group of students. A project focusing on the ongoing fore arc response to rapid underthrusting of the Cocos Ridge along the Middle America Trench is winding down. However, after a wonderful Cassa trip to Costa Rica in January 2015, Megan Layman ('16) was inspired to use GIS to investigate the relationship between morphology of the subducting seafloor and fluvial response across the Central American forearc. While that project winds down I have been ramping up work on a project closer to home. James Fisher ('18) has been working with me to quantify strain in the southern portions of the Susquehanna River valley in the Valley and Ridge. In an unrelated project, Julia Redden ('16), Sophia Larson, ('17) and Jess Wolfman ('17), have been studying how rates of basalt weathering vary as a function of landscape position and depth of burial within volcaniclastic debris flows from the Caribbean island of Guadeloupe.

On the home front, all is going well for Linda and Maya. Linda continues to thrive in the Math department at Bucknell and Maya, who is now 8 years old, is into numerous activities. Among her favorites are playing ice hockey, soccer and piano. I don't know where she gets all of her energy from but I wish that I could harness some of it.

Hope to see you in the near future during reunion weekend, GSA, or the next time you are in Carlisle.

Professor Ben Edwards

The last two years have been quite busy from all perspectives, and a few things have reached their culminations very recently: first, I have been working on the first monograph-style book to cover the subject of glaciovolcanism, and I am very pleased that the book should be on-sale in the UK and US (from Cambridge University Press) by the time the newsletter comes out (June). My co-author is the foremost authority of volcano-ice interactions in Antartica (John Smellie), and so I have learned a tremendous amount over the past few years while working with John to finish this project. I also was promoted to Full Professor this spring, thanks largely to efforts by my ERSC colleagues (MK and PS), many present and past Dickinson students (too many to name but I had great experiences with each one of you!), and several Dickinson colleagues and outside collaborators. I am trying not to let this make me feel old (I'm still not yet past 50 but am closing in rapidly). Mainly because I am finishing up two large administrative tasks this spring (end of term on Planning and Budget committee, my POSSE finishing 2nd year), I was elected to be on the Presidential Search Committee, so if you have any very strong thoughts about what we need in a new president please feel free to email me or phone:).

Liz Plascencia and Will Kocthtitzky pursuaded me to begin a new research avenue last spring, which has led to what hopefully will be a long-term research project at Nevada Coropuna volcano in Peru. This is the highest volcano in Peru, and has the largest area ice-mass in the tropics. Will's senior thesis focused on estimating areal extent of the ice making use of the recently released LandSat database, and Liz worked on characterizing sediments from a lake at the western end of the complex to look at potential longer term climate change recorded in the diatom communities in the sediments. This led to my first collaboration with Environmental Sciences through Kristin Strock, who is a relatively new faculty member down the hall and has expertise in analyzing lake sediments. I loved the brief bit of boat work, so I am hoping we can continue to work together in South America! We also found some convincing ice-contact lava flows, so I will be able to continue to take students to Peru over the next several years to continue this multi-proxie student of the complex. I got a second chance to go to South America in January 2016 through a National Geographic Research Grant to look at volcano-ice interactions at Villarrica volcano in Chile, which also has significant long-term potential for faculty-student research.

I have also been continuing my exploration of soils, volcanic ash and rye plants with Katie Mattern and David Bertram. They both did plant growth experiments using the Kaufman greenhouse to investigate how different soil amendments affect rates of plant growth. These experiments and the Soils course I'm teaching this fall are keeping me on my toes learning new areas of science that still revolve, at least to some degree, around my long expertise in volcanic geochemistry and mineralogy. But this is continuing to keep me thinking as broadly as possible about volcanoes.

Kim and I will be empty nesters this coming fall, so feel free to drop a line if you are coming through town to visit! Kaelan is heading to Carleton this fall to join Teagan, who will be a junior there this coming fall. Unfortunately Teka passed on this fall, so we had to get a new housemate for Sethos; thus we now have two 'pharaohs' who jointly rule our little kingdom on South Pitt Street - Sethos and Sneferu. Kim continues to get more deeply involved in life at Carlisle High School as a third year math teacher, so life is rarely dull or slow moving for us.

Professor Alyson Thibodeau

It's hard to believe my first year here at Dickinson is drawing to a close. It has been an incredible year and I feel very fortunate to be part of the Dickinson community and to have the opportunity to work with such wonderful colleagues and students. I moved to Carlisle last summer from Ontario, Canada where I was a postdoctoral fellow at the University of Toronto. Less than a week after arriving at Dickinson, I flew to Fairbanks, Alaska to take part in the departmental field trip to Gates to the Arctic National Park. It was my first time north of the Arctic Circle and an amazing introduction to Dickinson.

Teaching and creating new courses has kept me very busy over the past two semesters. Last fall, I taught one of the department's introductory courses, *Earth's Changing Climate*. This Spring I created and taught two new courses: an introductory level class on planetary habitability (*Habitable Worlds*) and an upper level seminar on isotope geochemistry. In these courses, I taught about topics as diverse as climate change, astrobiology, and isotopic fractionation -- I think I may have learned even more than the students! I am looking forward to teaching *Chemistry of Earth Systems* next fall as well as a new course, *Archaeological Geology,* in the Spring.

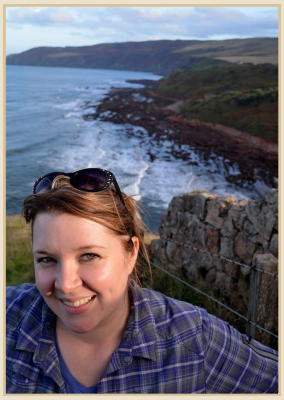
I am also building new laboratory facilities in the department. In the fall, I purchased the DMA-80, a direct mercury analyzer. It is a versatile and very user-friendly instrument that can provide data on the total mercury content of almost any type of solid or liquid sample. Currently, I am using it to analyze. Triassic and Jurassic sedimentary rocks for mercury anomalies related to episodes of massive volcanism. I have already had one student worker (Sally Belasco '16) assist me in this research and anticipate hiring several more in the fall. I am also building a low-dust laboratory space for the preparation of samples for metal isotope analysis, which I hope to have up and running by the end of the fall term.

In addition to setting up labs at Dickinson, this summer will also be busy travel-wise: In May and June, I will spend three weeks in Arizona conducting both lab- and field- work. The fieldwork includes a rare opportunity to visit ancient turquoise mines and cliff dwellings on the White Mountain Fort Apache Reservation in central Arizona with an interdisciplinary team of geologists, archaeologists, ethnologists, and tribal representatives. I will also spend a substantial amount of time collecting lead and strontium isotopic data using laboratory facilities at the University of Arizona in Tucson. Zachary Keller-Coffey ('17) will join me for a week to collect data for his senior thesis. He will be measuring the lead and strontium isotopic ratios of turquoise artifacts from an archaeological site in New Mexico's Tularosa basin. Our goal is to determine the geologic origin of the turquoise artifacts and provide information about prehispanic trade networks in the region.

I am also scheduled to go to a retreat in Bar Harbor, Maine as Dickinson's faculty representative for the Ecoleague and to spend a week at the University of Maryland at a workshop for early career geoscience faculty. When I'm not working, you can find me on running or hiking trails around central Pennsylvania. I have found a wonderful running community in Carlisle and I frequently run along the Letort stream, the paths around the Dickinson athletic field, and the Appalachian trail. I am also looking forward to spending time with my family this summer on both the west and east coasts (Seattle, Washington and Old Orchard Beach, Maine). I am especially looking forward to hanging out with my 5-year-old niece, Emily, who loves to collect rocks.

I hope to meet many alumni in the future, so please drop by and say hi!

Professor Jorden Hayes



This past January I joined Dickinson and the Earth Sciences family, adding a new geophysical perspective to the department. My research interests range dramatically in spatial scale from the genesis of continents to the weathering of crust in the life-sustaining near-surface environment known as the critical zone. I use a variety of geophysical tools and techniques (especially in the near-surface), but most readily identify as an active source seismologist. I moved to Carlisle from Laramie, Wyoming, where I finished a Ph.D. in geophysics. Prior to that, I was at Olivet Nazarene University, a liberal arts college south of Chicago, Illinois, where I earned a B.S. in geology with an engineering concentration.

My husband, Isaac, and two dogs, Trillian and Watson, joined me in the long move from the Rockies to Appalachia. Our arrival in Carlisle was met with warm welcomes from the faculty (current and emeritus) and staff, as well as ~30 inches of snow! In fact, my first official day of the semester was cancelled from the heavy snowfall! I was only too happy to immediately unpack the snowshoes, instruments of our favorite winter activity, and take an urban hike downtown and across campus. Once the snow cleared, Noel graciously took me into the field to acquaint me with the geology of Cumberland Valley from Waggoners Gap to Hammonds Rock.

This first semester I was inspired by my group of energetic and curious students in Earth's Hazards. Ben helped us simulate a volcanic eruption in front of Althouse and we were even joined by President Roseman and Dean Weissman! You can see more here: https://youtu.be/tt3ortpbXgw In the coming semester I will be teaching Earth's Changing Climate, Oceanography, and advising an independent study in Global Geophysics. In the next year I will continue to build my toolbox of near surface geophysical equipment and hope to start planning courses in environmental geophysics and global geophysics.

The majority of my summer will be spent in the field and lab continuing projects in Wyoming and starting new projects at the Susquehanna Shale Hills Critical Zone Observatory, at the Dickinson College Farm (a collaboration with Ben), and in the French territory of Guadeloupe (a collaboration with Pete). We recently acquired a Geometrics 48-channel seismic refraction array with 14-Hz vertical geophones and it will be seeing many hours of use this summer!

I feel so blessed to join this elite college rich with tradition and a department with such a strong legacy of teaching and research. I look forward to meeting more of you in the coming years. In the meantime, feel free to e-mail me at hayesjo@dickinson.edu or follow my research on Twitter: @WiggleTracers

~Jorden Hayes

Rising Junior Ivy Gilbert is learning to collect seismic refraction data at the Dickinson College Farm. Ivy

Rising senior Rob Page swinging a sledge hammer to create a seismic source at the Dickinson College Farm.

Deb Peters, Academic Department Coordinator

Hi Everyone,
It hard to believe that I have been with the Earth Sciences and the Environmental Studies departments for 4 years and almost 19 years with the college. Time sure does fly when your having fun!

White Mtns, NH—2015

The last 4 years have been a very busy time in both departments. With limited experience on the academic side of campus, I have survived two decadal reviews, four tenured track faculty hires, three retirement parties, a website migration, and Marcus' first year as the department chair. (Ha Ha!) I am very blessed to be part of such a great team of people!

I am looking forward to my reduced work schedule for the summer months and have many things planned. In addition to spending time with family (especially my two grandsons), my husband and I will be taking our annual motorcycle vacation. This year we will be traveling to Tybee Island, GA.

If you are in the area this summer, stop by the office to say "hello"!

Robert Dean, Department Technician

Hello All,
It's hard to believe that I'm closing in on 9 years here at Dickinson as the Earth Sciences (formerly Geology) Technician. In that time I've had the chance to cross paths with many great students and have enjoyed watching you all go on to do bigger and better things. The job keeps me busy and we're always finding new and interesting lines of research.

On a professional note, I had the opportunity to present a poster at the Geological Society of America meeting in Baltimore Maryland this past November. I'll be heading to Texas next month for a short course on X-Ray Diffractive Spectroscopy. We have added several new instruments here in the department as we continue to build on our surprisingly diverse collection of research tools. We purchased a new Rigaku XRD to replace the old Phillips unit. Those who had the opportunity to work with the old instrument would be amazed at the signal to noise ratio and throughput of the new XRD. Alyson Thibodeau purchased a Milestone DMA-80 Direct Mercury Analyzer with her startup and it has found a home in the Geochem lab. Jorden Hayes purchased a new Geometrics seismic refraction array as part of her startup and we've already had the chance to test it out at the college farm.

On a personal note, I continue to chase trout with almost every free moment I have. Living in the Cumberland Valley has certainly provided some amazing fly fishing opportunities and I'm so very thankful for that. I'll even get the chance to cast to some Redfish in Galveston this summer. In the last couple of years, I've gone even further down that rabbit hole and have started tying flies and building fishing rods.
I hope you all stop by sometime and say "hello"!
Cheers, Rob

Professor Noel Potter

Noel Potter remains active, if at his pace. After a couple of years of problems with his back and sciatica, he had a substantial back operation this Spring and though recovery is long, things are improving. I still get to most GSA meetings and help some with NE GSA.

Helen is still at the Pennsylvania Geological Survey. Our son, Noel Lewis will be a senior this coming year Bates College up in Maine, and continues the family tradition as a geology major. He spent this past spring semester in Svalbard, up north of Norway. Last year he asked me if I would go with him to Galena Creek in Wyoming where my favorite rock glacier is and help re-measure movement on the 150+ marks we emplaced on it in the late 1990's. He applied for and got grant money and we went last August with 2 other Bates students to help. They re-surveyed all the old marks and also with the help of UNAVCO converted all to GPS coordinates. Some of the re-surveyed marks were originally made in the 1960's. If all goes well, this coming Fall at GSA in Denver there will be a poster by two Noel Potters, the younger one first.

I am always happy to hear from Department alumni by e-mail at pottern@dickinson.edu.

Pat Braught, Retired Department Secretary

I'm sending greetings to all alums (1982 to 2005) of the Geology and Environmental Studies Departments. I hope you are living your dreams and are healthy and happy. I cannot believe it has been 11 years since I retired. My retirement years have been busy and fruitful, as our family core of 5 has expanded to 14 (including 2 daughter-in-laws, 1 son-in-law, and 6 grandchildren. Our family all live fairly close so we are able to be a part of our grandchildren's lives. Attending their school activities, sporting events, sleep-over's at Grandma and Pappy camp, or just spend time with them gives us great pleasure.

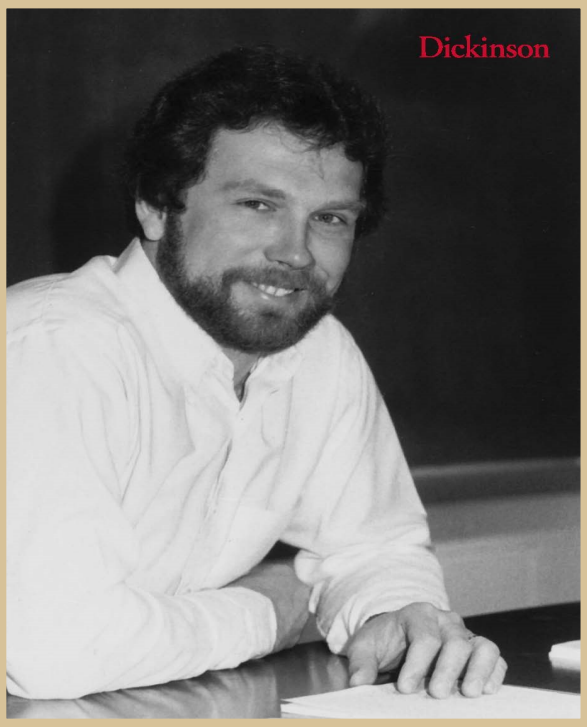
I am keeping active with walking, water aerobics, hiking, and bike spinning classes in the winter and biking outdoors in the spring, summer, and fall. I'm also involved in volunteer work with my church and the downtown Carlisle Theatre. Gary and I have enjoyed travelling the last 11 years. We have toured the Pacific Northwest coast, most of the National Parks, Alaska, the Yukon, Europe plus a yearly family ski vacation. I finally got to see some parts of the world that I asked students (studying abroad) to send postcards for my bulletin board.

Gary and I recently celebrated our 50th wedding anniversary (yes, I was married very, very, young!!). We will be visiting western Canada in June to celebrate this milestone. So as the saying goes, "I don't know how I had time to work".

If anyone would like to drop me a line, I would love hearing from you. My email address is braughtp@comcast.net

Warm regards, Pat Braught

End of an Era as Jeff Niemitz Retires



Last year Jeff Niemitz retired from the department after 38 years of service to Dickinson College. All who had Jeff as a student know what a vibrant and influential role he has played in his years at the college.

We celebrated Jeff's illustrious career with an on campus event and an off campus event.

The on campus event was held at the Alumni Commons patio on Saturday, April 25, 2015. Jeff and Trish were there as well as department colleagues, alumni, current students, family and friends.

The off campus event was held at the Geological Society of America's Annual Meeting on Sunday, November 1st at the Pratt Street Ale House in Baltimore.

Campus Reception—April 25, 2015

Dr. William Vernon's 90th Birthday Celebration

On November 1, 2015, the founding member of the Geology Department, Dr. William Vernon celebrated his 90th birthday.

His wife, Susan organized a campus party to celebrate with other retirees, faculty, family and many friends.

In addition, a private celebration of cake and fellowship was held in his honor during a departmental meeting days prior.

A note from Dr. V:

Many thanks to the Department for the birthday party and to those of you who wrote to me. The years faded away, and it was instant yesterday. Seeing the department grow from nothing to its present size has been an amazing lifetime experience for me.

Best wishes to all, Dr. V.

Field Trip Time
By Wm. V. Vernon

Field trip time is upon us once more,
And here we are waiting at the door
For buses to arrive and start the trip,
While in our hands the hammers we grip.

Across the valley the buses roar,
Filled with geologists, all hard core.
Up to the mountain to make a stop,
And then a rush to the first outcrop.

Hammers will pound on every rock,
For hidden secrets there to unlock.
All together an awesome sound,
But exotic treasures are there to be found.

Rolled-up trilobites with beady eyes,
Crinkled brachiopods of enormous size,
And graphic marks of graptolites
Scattered around on the bentonites.

On to the quarry, up on the hill,
With many more fossils our bag to fill.
Look! Fossil mudcracks on the quarry floor;
Who could ask for anything more!

Gather around and listen to the spiel
Of once upon a time, given with zeal,
When ancient seas teeming with creatures
Covered this land and left these features.

Climb on the bus, then off the bus,
And you just know it's worth all this fuss,
To take a trip through the Paleozoic,
That excites us all, even the most stoic.

Then back to the campus, our day is finished,
And hardly a spirit has been diminished.
We'll wait and yearn for another excursion
To the distant past for all its diversion!

CLASS OF 1968

Thomas F. Hoffman

After more than 40 years in the energy industry, I retired in June of 2015 -- and just in the nick of time it might seem! Still, it was a great career that took me to several locations, including Washington DC, where I testified before Congress, met a President (Clinton), and lived the life of a K Street lobbyist until I finally had to return to the real world. I've just concluded a 10 year stint as a member of the Board of Visitors for the Geosciences Department at the University of Wisconsin at Madison. It's been interesting to watch the evolution of academic training in the geosciences over that time and to help advise the Department as they struggled to keep curriculum relevant to the geoscience job market. Both my wife and I are in good health and plan to continue living in Pittsburgh. Over the past few years, I've stayed in touch with Geo grad Mike Conrad and managed to have lunch with him once while passing through Carlisle. Though the industry end of geology (fossil energy, economic minerals) might be struggling at the moment, current geo majors shouldn't hesitate to consider a career path in industry. These earth materials will continue to have value and earth scientists will continue to be valued members of industry teams.

Best wishes to all current student and faculty members of the Department.

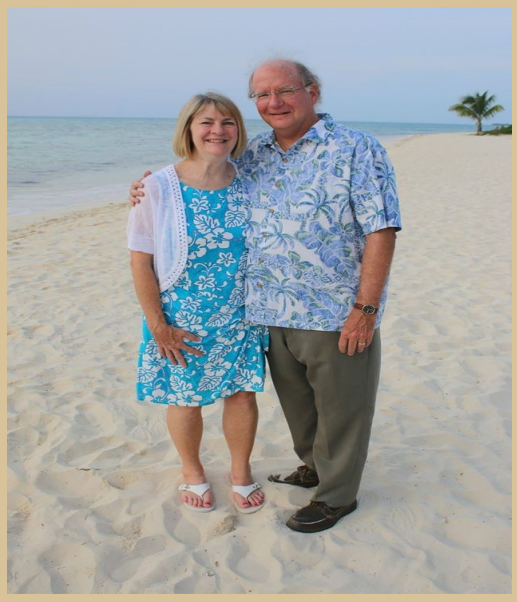
Tom Hoffman

CLASS OF 1969

Rudy Slingerland

After teaching Geology at Penn State University for 38 years, I have finally thrown in the towel as of July 2015. It's not such a big deal actually. Before I was a geologist, I was a SeaBee in Viet Nam, and before that I was a Dickinsonian studying for the law (although that ended Fall of my Freshman year with my first geology course from Bill Vernon). And before Dickinson, I was a farm boy. So this recent sea-change feels just like the others.

CLASS OF 1971



Herb Black

Currently I am working full-time as a geologist for the Office of Natural Resources Revenue in Denver, in the Valuation group. I am the geothermal specialist, which is what I studied at Colorado University for my M.S. Part-time, I practice optometry on some Saturdays to keep things interesting. I am a new grandfather, with our new grandson Cyrus, who lives in Newport, Oregon with my son Andrew and daughter in law Laura. Andrew secured a post doc with OSU marine sciences and Laura is an ER nurse there. My daughter Jen is in her second year of her OB-GYN residency at U. of Rochester, and is enjoying working 80 hours a week!

My wife Kerry continues to teach special ed in Denver. My liberal arts education at Dickinson has served me very well with all my varying career areas.

CLASS OF 1971

H. Scott Laird

Scott is happily and busily retired from URS Corporation (now AECOM) after a 43 year geological career. Life is now taken up with family and volunteer work through the church. Our daughter Ellen Laird (2002), who is Program Assistant in the Dickinson Bologna program, and her Bolognese husband, have a son, Liam Gioia, who turned 1 year old in February (2016). When not in Italy visiting, Marty and Scott find Skype sessions are a blessing. Our 3 daughters are pursuing their own lives and careers far from Wayne, PA. While good health thrives, we plan to stay in our Wayne home so kids can stay when they visit us.

CLASS OF 1971

Molly Flower Eppig

Retired since 2012. Still enjoy traveling to various places where I can collect sand samples [thanks, PH] and/or rock samples [thanks, Boss]. Member of New Hampshire Geological Society for many years, as is Tanya Bryce Coffin ['77?] where we hop-nob with some interesting characters. I'd be up for another trip to Alaska or the Florida Keys, if we could get a group together.

CLASS OF 1972

Heath E. Warren (Ted)

I retired from the Naval Air Systems Command, Naval Air Warfare Center at Patuxent River, Md. in May 2014. I am still an instructor at the Johns Hopkins University Whiting School of Engineering, teaching Systems Design and Integration for the Master of Science in Systems Engineering program. I am building and restoring boats as my retirement "occupation."

CLASS OF 1974

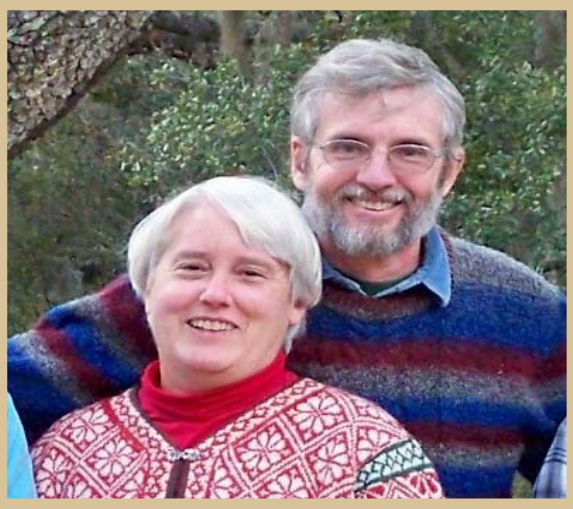
Geoff Coe

Since I left IT work behind in 2009, I've had my own photography business here in SW Florida, selling nature photography through outdoor art festivals and other events, and on my website, www.wildimagesfla.com. I'm a regular attendee at the annual Alumni Reunion Weekends, and look forward to seeing folks there.

CLASS of 1975

Sara H. Baldwin Heller

After 22 years out of the workforce to raise children, it feels great to be teaching again! Oran and I moved to a small farm in the country where I can keep my horses. I continue to enjoy doing alcohol ink artwork, see my website at http://1-sara-baldwin.pixels.com/. And I still enjoy playing the cello!

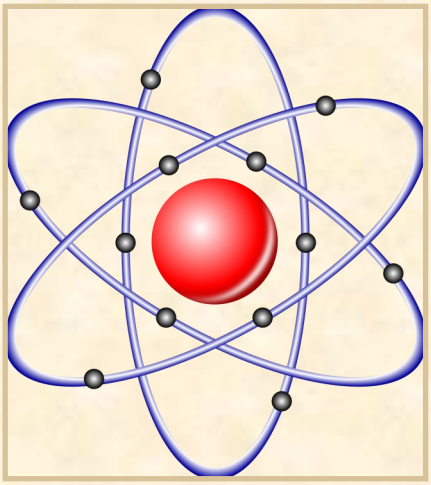


CLASS OF 1978

Wayne K. Geller

First of all a big "hello" to all my former professors and fellow Geology majors. My career in Patient Safety (Medical Director) at AstraZeneca officially ended in December 2014. The next three months I spent adjusting to a new daily routine which consists of: taking non-credit (for fun) courses at the University of Delaware Osher Lifelong Learning Institute, continuing to do things around the house and with my family, working out at the fitness center almost daily including swimming regularly (I weigh ~30 pounds less now than I was 15 years ago), and now being a part-time consultant whose expertise is in Patient Safety (Pharmaceuticals). My wife Beverly and I still enjoy travelling and exploring Lancaster and Chester counties (we live near Kennett Square where the aroma of mushroom compost permeates everything). I'm an avid gardener and my love of mineralogy has changed little over the past 38 years (thanks Dr. Vernon) except I am more focused on microscopic crystalline minerals these days than larger specimens (due to their availability and limited storage space). I still admire structural geology, especially when visible from a moving car and often slow down to observe remarkable structures (thanks Noel). My oldest child Hannah is completing her freshman year at Penn State main campus where she is studying Communications with an emphasis on film and my youngest son David will be finishing up his sophomore year in high school with an eye towards business. I often reminisce about 3 of the best years of my life spent at Dickinson (I transferred in as a sophomore) where I learned a lot about geology and chemistry, and started to become the person that I am today.

Thank you all for playing a major role in my life's transformation.



CLASS OF 1982

Betsy M. Suppes Strachan

I continue to work with non-profits who accept in-kind gifts of oil, gas and mineral interests that need geologic and economic analysis. Having experienced multiple industry downturns (code for low oil and gas prices) my Forgedale Consulting strategy has become, “when prices are down, see more people.” I have given talks about mineral interests and appraisals to accounting firms, real estate offices, Rotary, Colorado School of Mines Foundation, the BNY Mellon Wealth Management Conference, Emerging Philanthropy groups to name a few. Thank heaven I am an extrovert, or business would be non-existent. A recent interview with Mark Ruffalo in the fall Dickinson Magazine, "Not for Shale" which was riddled with inaccuracies prompted me to write a response which was printed in the winter edition.

My 8th grade son, Conrad, is nearing Eagle Scout. He was the troop high salesman ($1,650 worth of popcorn and we are still eating our way through his sales) and is ever the self-starter (when he wants to be.) Sammy, also a Boy Scout, plays "Taps" for military funerals with the local VFW. A picture of Sammy playing trumpet for Memorial Day services has gone viral. My husband, Greg, will hike segments of the Appalachian Trail, however, his appreciation for striations on glaciated outcrops is limited.

CLASS OF 1998

John T. Pusey

I recently had an article published in the Nov/Dec 2014 issue of Geostrata, titled "Sinkhole Investigation and Grouting". This article is essentially a case history that discusses methodologies used to investigate for sinkholes in areas underlain by Limestone. In the article I also discuss the grouting technique I developed called Hybrid Mobility Grouting. Since the publication, I wrote a technical specification for use of this grouting technique on the same project. I excited that this method has proved to be quite effective for remediation of sinkholes.

CLASS OF 2001

Kylene McLucas Arwood

My husband, children, and I recently moved to Pennsylvania from Tennessee. I homeschool my two sons and raise Shetland sheep.

CLASS OF 2002

Megan Gerseny

After accidentally falling into the Oil & Gas industry four years ago, I have decided, conveniently in the middle of a major downturn, that I don't really want this to be my life-long career. So I am quitting my job in August and going to Nicaragua for 3 month to volunteer with an eco-tourism outfit where I will take tourists on hikes up volcanoes. Pretty handy I know stuff about volcanoes, ey? After some more Central American traveling I will end up abiding in San Diego. Know anyone who needs a scientist in San Diego next year?!

CLASS OF 2010

Alyssa Davidson Chaplin

I'm enjoying my third year living in Colorado with my husband, Jake. It's wonderful to be close to the mountains and explore new rocks!

I teach high school Earth Science to 9th graders and am looking forward to sharing work on educational technology at ISTE this summer.

CLASS OF 2013

Marc W. Baumann

Since our last newsletter was issued, I have moved from Hummelstown, Pa to Morristown, NJ.I left BL Companies in May 2015 to join Matrix New World Engineering, P.C., located in Florham Park, New Jersey. For over 25 years, Matrix has offered the private and public sectors engineering, environmental, and surveying services while taking the lead in programs including construction management, geotechnical and civil engineering design, investigations, environmental assessments, and remediation. I am in a similar role as a Staff Scientist at Matrix. I am responsible for technical report writing, task management, and performing field work investigations at highly contaminated sites in the Newark, NJ area, including a few Superfund sites! I have taken a bigger role in business development, and am enjoying the mix of the technical side, as well as the business side of environmental consulting.

On a personal note, the move was initiated by the desire to take the next step in my relationship with my girlfriend Ashley Fields (Dickinson '13). We moved to Morristown in June 2015, and have since been engaged (Prof. Key can stop asking now!!)! No date has been chosen yet, but I will keep everyone posted!

I hope all is well and Go Devils!

DICKINSON COLLEGE

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We're on the web:
http://www.dickinson.edu/academics/programs/earth-sciences/

WE WANT YOU!!!

- Has your Dickinson education landed you the perfect career?
- Are you excited to tell people about projects you are currently working on?
- Are you involved in cutting edge work?

If you answered "yes" to any of these questions, the Earth Sciences department would love to have you back to campus to speak with our current majors.
If you would like to share your wisdom, knowledge and experiences with our students, please contact Alyson Thibodeau at thibodea@dickinson.edu