# Table of Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Note From the Chair</td>
<td>1</td>
</tr>
<tr>
<td>Faculty and Staff</td>
<td>3</td>
</tr>
<tr>
<td>The Geological Society of America</td>
<td>17</td>
</tr>
<tr>
<td>Geology Majors</td>
<td>19</td>
</tr>
<tr>
<td>Achievements of Our Geology Majors</td>
<td>23</td>
</tr>
<tr>
<td>Scholarships and Awards</td>
<td>35</td>
</tr>
<tr>
<td>The Geology Club</td>
<td>39</td>
</tr>
<tr>
<td>Senior Independent Study Projects</td>
<td>45</td>
</tr>
<tr>
<td>The Osgood Lecture</td>
<td>57</td>
</tr>
<tr>
<td>Alumni News</td>
<td>59</td>
</tr>
<tr>
<td>Special Thanks</td>
<td>63</td>
</tr>
<tr>
<td>Alumni Information Sheet</td>
<td>65</td>
</tr>
</tbody>
</table>
August 2018

Dear Alumni and Friends:

I am delighted to introduce the 2017-2018 annual report, the last from the Department of Geology at The College of Wooster. What an exciting year! We graduated a strong class of geologists, welcomed new faculty members, redesigned spaces, and overhauled our curriculum.

We have officially become the Department of Earth Sciences, a term that encompasses our two new majors in Geology and Environmental Geoscience. We are thrilled to offer additional courses in Geochemistry, Remote Sensing, and Statistics, among others. When Biology relocated to the Ruth W. Williams Hall of Life Science, we renovated our spaces to support the new curriculum. Students will now be able to work on quantitative, research-based, collaborative projects in a state-of-the-art computing lab.

Our students are active and thriving. You’ll be impressed by the diversity of research projects and the abundance of conference presentations. Some highlights include student fieldwork in Utah, Alaska, and Iceland, and lab work in our computing and Tree Ring labs. We are profoundly grateful to the outside funding agencies, the College, and our generous alumni who make these opportunities possible for our students.

Dr. Shelley Judge and I welcomed Dr. Karen Alley and Dr. Alex Crawford to the faculty this past year. They taught innovative courses on GIS, Hydrology, and Geomechanics & Numerical Modeling, and advised cutting-edge research projects in remote sensing and Arctic ice-ocean-atmosphere interactions. We happily welcome back Dr. Mark Wilson and Dr. Greg Wiles, who are returning from productive research leaves. We hope you enjoy learning more about our courses, research groups, and accomplishments.

Patrice Reeder, our administrative coordinator, continues to be the brains behind the operation. She has been extra busy coordinating the Biology move-out and Scovel renovations. We greatly appreciate her work as our majors grow in numbers and our new curriculum is implemented. Nick Wiesenberg continues as our departmental technician. In addition to his typical duties, he co-led a summer AMRE project on tree ring dating with Dr. Wiles and conducted fieldwork in Utah with Dr. Wilson and his students. We are thankful to Nick for keeping us running on a day-to-day basis.
We look forward to updates and news from you! At the end of this report is the Alumni Information Sheet with an online update link. You don’t have to wait for the next annual report to hear the latest news. You can follow GeoClub on their new Instagram account, @woogeoscience, and we regularly update the departmental blog at http://woostergeologists.scotblogs.wooster.edu/.

On behalf of the department, we extend our heartfelt thanks for your support and hope that you share our enthusiasm and optimism about our future.

Best wishes,

Dr. Meagen Pollock, Chair
Karen Alley

Karen joined the department in the Fall of 2017. Her expertise is in glaciology, and she carries out her research through remote sensing and numerical modeling techniques. During the past year, she advised two Senior I.S. students on remote sensing projects. Freya Wu ('18) completed an NSF-sponsored Research Experience for Undergraduates (REU) during the summer of 2017 at the University of Northern Iowa. As her senior I.S. project she continued investigating the use of very high-resolution air photos for classifying urban surface materials. Amineh AlBashaireh ('18) used two decades of imagery from the Landsat satellite series to investigate vegetation changes due to prolonged drought in Jordan.

Karen advised two Junior I.S. students. Joshua Charlton ('19) and Melissa Dods ('19) are both interested in using satellite imagery and historic air photos to investigate the history of glaciers in Alaska and Greenland. In addition, Karen worked with Sophomore Researcher Dyani Armijo-Sinnett ('21) in the spring, and worked with Julia Pearson ('21) during the summer of 2018 on projects focused on integrating the data processing platform Google Earth Engine into glaciological applications.

During the past year, Karen published three first-author papers, and gave invited talks at the American Geophysical Union Fall Meeting in New Orleans, Colorado College, and Byrd Polar Research Center at Ohio State University. She looks forward to adding new courses on GIS and Remote Sensing to the department curriculum during the coming academic year.

Faculty and Staff
Bent trees in Fairbanks, Alaska.
Photo by Josh Charlton ('19)

Navajo Sandstone, near St. George, Utah

Holden Arboretum
Alex Crawford

Alex joined the Geology faculty in the Fall of 2017. He advised two Senior I.S. students, Chris Menolosino ('18) and Jacob Nowell ('18). Both worked on projects that advance our ability to predict seasonal sea ice cycles in the Arctic. Chris investigated sea ice predictability in a new reconstruction of monthly sea ice extent that goes back to 1850. He found that as the amount of sea ice has declined, it has become easier to predict how much will linger through the end of summer. Jacob performed a validation study of the new version of the Simple Ocean Data Assimilation (SODA). Jacob found it was adequate to pursue further as a study tool for sea ice. He also blended his Geology and Art double-majors by using Arctic climate change as an inspiration for his art pieces and incorporating some sea ice datasets into the artwork. In the spring, Alex adopted Brandon Bell ('18) from Dr. Wilson and worked with him to refine a double-major I.S. with History that examined the intersections of seismology and cultural identity before and after the 1906 San Francisco earthquake. In the spring, three junior I.S. students worked with him. Inspired in part by the 1969 Flood in Wooster, Connor O’Keeffe ('19) started investigating extreme precipitation and flooding events in Wooster and whether they are impacted by climate change. Tommy Peterson ('19) developed a research plan to analyze the physical controls on combined sewage overflow events along the Potomac River based on data he collected last summer in Washington, D.C. Ben Sershen ('19) is building on Jacob Nowell’s project, using SODA to replicate a prior study into the impact of ocean heat transport on sea ice retreat, only with twice as much data. Alex also worked with two sophomore researchers, Anna Cooke ('20) and Adam Gellert ('21), to develop a method for identifying rain-on-snow events that are followed by re-freezing and ice formation within the snowpack. Such events can cause stress in caribou and musk ox, which have trouble breaking through solid ice to reach winter forage.
In his first year of teaching, he taught Geographic Information Systems and Hydrology, incorporating an environmental justice unit into the latter in preparation for new departmental learning goals in the 2018-2019 academic year. He published the last part of his Ph.D. research about how the mechanisms that develop summer storms in the Arctic are likely to change as the region continues to warm. He also presented at the fall meeting of the American Geophysical Union on research about how early snow cover over western Siberia leads to a cascade of influences that results in early retreat of sea ice in the distant Laptev Sea. He is looking forward to his second year with a great department!❖
Shelley Judge

During the fall semester, Shelley taught Geology of National Parks (a 100-level course to commemorate the centennial of our NPS), Structural Geology, and oversaw a student in a Teaching Apprenticeship. During the spring semester, she taught Environmental Geology, Processes and Concepts of Geology, a Tutorial in Advanced Structural Geology for several students, and oversaw a student in Teaching Apprenticeship. As usual, she also taught field camp for Ohio State during both the 2017 and 2018 summer seasons.

This past academic year, Shelley worked with four seniors on their I.S. projects. Emmett Werthmann (’18) focused on the picturesque Salina Canyon unconformity and its associated paleosol development just east of Salina, Utah. Mara Sheban (’18) investigated the distribution of and depositional environment of unusually large oncoids in the Flagstaff Formation on the San Pitch Mountains, Utah. Eduardo Luna (’18) and Peter Hurst (’18) both worked on aspects of the Green River Formation in central Utah. Eduardo undertook an investigation of the silica morphologies in the Upper Member, stratigraphically adjacent to a large tuff bed. Peter focused on quarry localities on White Hill, north of Ephraim, Utah, and his interests in preserved caddisfly cases within the Green River extended the known distribution of these fossils southward. Both Mara, Peter, and Shelley attended AAPG ACE 2018 in Salt Lake City in May, presenting their senior research at an undergraduate research symposium.

Shelley also worked with four juniors on their Junior I.S. projects, and she looks forward to continuing research with them throughout their senior year. These students include: Charley Hankla (’19), Taylor Myers (’19), Galen Schwartzberg (’19), and Michael Thomas (’19). While Galen will transition to Mark Wilson for his Senior I.S., Shelley is excited for ongoing conversations about Utah geology with
Charley and Michael, and also for Taylor’s interests in investigating food deserts and people’s associated perceptions. During the 2017-2018 academic year, several students worked with her on Sophomore Research: **Josh Charlton (‘19), Alexis Lanier (‘20), and Ric Reynolds (‘19)**. Josh helped primarily with oncoid research, Alexis worked to develop some isotope techniques for the lab, and Ric helped in the lab with petrographic research and put his GIS skills to use in making maps for Lyn Loveless and David McConnell for their upcoming book.

During the past academic year, Shelley served on a variety of committees, both on- and off-campus, and these included: Teaching Staff and Tenure; one of two Wooster Faculty Athletic Representatives (FAR) to the NCAC and the NCAA; National FAR Conference Liaison to the FARA Executive Committee, and member of the Stanford Project (focused on campus retention issues).
Meagen Pollock

In the summer of 2017, Meagen collaborated with Dr. Greg Wiles to run the inaugural Keck Gateway project, with the primary goal of engaging early-career students in authentic geoscience research. Ten students from Keck institutions, including Wooster’s own Emily Randall (’20) and Josh Charlton (’19), studied the ages of young lava flows in Utah and trees in decline in Alaska. The research group presented their results at the 2017 GSA Meeting in Seattle, Washington.

In the 2017-2018 academic year, Meagen taught Mineralogy, Petrology, and a First Year Seminar (FYS) called #EarthandUs. Her FYS focused on the representations of Earth science in social media and covered the topics of climate change, the Dakota Access Pipeline, and flat Earth. Students in her Min/Pet sequence conducted research on the decorative stone used in the recently completed Ruth W. Williams Hall of Life Science, which they found to be an alkali gabbro.

Meagen’s Senior Independent Study students covered a wide variety of topics this year. Eve Caudill (’18) investigated the morphology of submarine pillow lavas from the 8°20’N seamount chain on the East Pacific Rise. Michael Craigmile (’18) conducted a meta-analysis of climate change and glacial outburst floods. Cole Jimerson (’18), who participated in the 2017 Dominica Keck Project, examined river development and incision in tropical volcanic environments. Ben Kumpf (’18) continued his summer research from Columbia University to determine the effects of organic ligands on Gallium and Aluminum weathering in soils. In the spring, when Dr. Wilson went on research leave, Macy Conrad (’18) joined her Senior I.S. research group. She studied encrusting sclerobionts on oysters in the Type Campanian (Upper Cretaceous) of southwestern France.
During the spring semester, Meagen’s Junior Independent Study advisees prepared for their senior research. Simon Crawford-Muscat (‘19) and Ric Reynolds (‘19) investigated the geochemical and physical aspects of subglacial eruptions in Iceland. Both of them worked in Iceland in the summer of 2018, collecting samples and mapping their field sites. Olivia Hall (‘19), a double major in philosophy, examined geoethics in the context of sea level rise. Olivia Hall (‘19), a double major in philosophy, examined geoethics in the context of sea level rise. Victoria Race (‘19) and Juwan Shabazz (‘19) were part of the Junior I.S. research group, but will be working with Dr. Wiles during the 2018-2019 academic year. Victoria studied latewood blue intensity tree ring data from Columbia Bay in Prince William Sound, Alaska. Juwan will be applying dendrochronological methods to buildings from the historic Sonnenberg Village to date them and provide insights into the climate history of Wayne County.

Two sophomore researchers, Alyssa Brown (‘20) and Hannah Grachen (‘20), worked in the X-ray lab during the spring. They prepared samples of Jurassic diabase from Pennsylvania for geochemical analysis. They also prepared geochemical data for publication in an open-access database.

Meagen was a co-author with several student authors on publications in *Computers and Geosciences*, *SPUR: Scholarship and Practice of Undergraduate Research*, and *Perspectives on Undergraduate Research and Mentoring* (PURM). At the 2017 Scientific Assembly of the International Association of Volcanism and Chemistry of the Earth’s Interior (IAVCEI), she organized a session on Volcanism and Magmatism Under Water and Ice, and presented two posters.

Meagen continues her service as a Councilor for the Geosciences division of the Council on Undergraduate Research (CUR). She also served on the advisory board for Wooster’s STEM Success Initiative. In her first year as Chair of the Department, Meagen facilitated the transition to the new department name and majors. She appreciates the positive feedback from the Wooster Geology family, and is looking forward to implementing the new curriculum during the next academic year. ❖

Molten rock pours into a mold before geochemical analysis.
Gregory C. Wiles

Greg was on research leave for the 2017-2018 academic year. He split his time between The College of Wooster Tree Ring Lab and Lamont-Doherty Earth Observatory (LDEO). He continued work on an NSF-funded project measuring blue intensity parameters (BI) from tree-rings. Greg also learned a new technique from Ben Gaglioti (LDEO) that involves measuring traumatic resin ducts in tree rings (TRD). This work, funded by the National Geographic Society, will be a new step forward in understanding climate variability along the North Pacific. BI is a strong proxy for summer temperature and TRDs will give us some information about storminess and winter precipitation. These new parameters can now be measured in the Wooster Tree Ring Lab and offer new uses of our archived collections that include over 800 wood samples from Glacier Bay National Park and Preserve. These forests, which continue to be revealed in the wake of retreating ice, were originally described by John Muir and span much of the Holocene. Both BI and TRDs proxies will be useful for upcoming Senior I.S. projects by Victoria Race ('19), who aims to reconstruct mass balance of benchmark glaciers in Alaska in collaboration with the USGS, and Josh Charlton ('19), advised by Dr. Alley, who is modeling the advance of the Columbia Glacier. This past year Greg also participated with Alaskan colleagues working on the Cooper Plots. These sites in Glacier Bay are iconic plots established a hundred years ago in the wake of retreating ice and are yielding vital information on plant succession.

Greg co-directed an AMRE project with Nick Wiesenberg during the summer of 2018 that included Juwan Shabazz ('19), Alexis Lanier ('20), and Kendra Devereux ('21). The group used tree-rings to date several houses, discovered new remnant old growth forests in northeast Ohio, updated known old-growth sites and wrote reports for The Nature
Conservancy, The Holden Arboretum, Sonnenberg Village, The Wilderness Center, the Barnes Preserve, and to individual homeowners. Victoria Race ('19) and Josh Charlton ('19) provided support for this ambitious project, which was funded by the Sherman-Fairchild Foundation. Juwan will be using aspects of this work for his IS.

This past year, Greg was a co-author on several papers, including one with Clara Deck ('17), Sarah Frederick ('15), and Nick Wiesenberg on a multispecies network of tree-ring records from Kamchatka, Russia Farseast, which appeared in “Forests.”

Additionally, he published work on the mobility of Uranium across tree ring boundaries as indicators of past contamination at sites in Ohio. This work was done in collaboration with colleagues at Miami University of Ohio and appeared in the Journal of Environmental Radioactivity. Wiles and co-authors including Josh Charlton ('19) and Nick Wiesenberg submitted the results of the Keck (2017) project in Juneau, Alaska, to The Holocene; this work describes extensive sampling of Alaska yellow-cedar and how BI measurements can help understand the ecology of yellow-cedar decline.

Greg continues to serve as associate editor of Tree Ring Research, as a member of STATEMAP Advisory Council of the Ohio Geological Survey, and on the Archaeology Curriculum Committee. He is excited about the new Earth Sciences Department and looks forward to working with new colleagues and teaching Environmental Geology, Geomorphology, and Paleoclimate in the coming year. ✤

Alexis Lanier ('20) coring a tree.
Tree core on right.
Mark A. Wilson

Mark had four Senior Independent Study students in the fall semester. During Spring Break, Matthew Shearer ('18) and Luke Kosowatz ('18) traveled with him into northern Kentucky and southern Indiana to collect bryozoans and bioeroded fossils for their projects on the “Richmondian Invasion” biotic event in the Late Ordovician. Early in the summer Mark and Macy Conrad ('18) journeyed to southern France to study fossils and sediments of the Type Campanian (Upper Cretaceous). They were hosted by long-time friend Paul Taylor of the Natural History Museum in London. Mark’s fourth Senior I.S. student was Brandon Bell ('18), who was a double major with the History Department. Brandon went on a heroic solo journey to the San Francisco Bay Area to research his project on the great 1906 earthquake and how it facilitated international conversations on the developing new science of seismology. His other advisor was Margaret Ng of the History Department.

Mark spent most of his spring semester research leave writing, with some sustained intervals of travel. He did some work (and gave a presentation) in the National Museum of Natural History (Smithsonian) in April. Later in April he went on a solo trip to southwestern Utah to scout localities for an Independent Study expedition the next month. The resulting trip in May was with Ethan Kilian ('19) and Galen Schwartzberg ('19), assisted by the multi-talented and essential Nick Wiesenbarg. This Team Jurassic Utah collected rocks and fossils from the marine Carmel Formation (Middle Jurassic). Ethan is concentrating on a reassessment of the unique Carmel oyster balls, and Galen is summarizing the systematics and paleoecology of the Carmel sclerobions (hard-substrate dwelling fossils). They were very successful, making many new friends among landowners and residents of the St. George
area. Mark even gave a talk on the oyster balls of the Carmel to the Utah Friends of Paleontology.

Mark next traveled to Cardiff, Wales, to participate in the Larwood Meeting of bryozoologists. He gave a talk (on “bryoimmuration” – you heard it first here!) and presented a poster authored by Macy Conrad ('18) and her team. Afterwards he had a delightful geological and archaeological tour of Wales with Tim and Caroline Palmer, followed by work in the Natural History Museum (London) with Paul Taylor.

Estonia was Mark’s last summer trip. He returned there with Bill Ausich, a retired Ohio State University paleontologist and friend of the department. They were based in Tartu with their host Olev Vinn, doing museum work and some field projects.

Mark published three papers and five abstracts this year on topics including cave-dwelling bryozoans, Ordovician bacteria, and various sclerobionts. He again had numerous domestic and international co-authors.

Mark will teach Invertebrate Paleontology and History of Life during the coming fall semester, and History of Life and Sedimentology & Stratigraphy in the spring.

Team Jurassic Utah – Galen Schwartzberg ('19), Ethan Killian ('19), and Nick Wiesenberg.
Patrice Reeder

This year Patrice celebrated 18 years with the College. She attended several sessions for The College of Wooster Academic Administrative Coordinators. She also organized many special activities hosted by both Geology (now known as Earth Sciences), Philosophy, and The Pre-Law Advising Program. She was the Tournament Coordinator of the American Collegiate Moot Court Association Midwest Regional Tournament, and also the Scovel logistics liaison with the Department of Biology moving in to the new Ruth W. Williams Hall.

Patrice and her husband celebrated their 35th wedding anniversary by touring some of the southwestern national parks and towns. They travelled by train from Cleveland into the Grand Canyon where they stayed overnight. From there they toured Sedona, Lake Powell, Bryce Canyon, Capitol Reef, Grand Staircase Escalante, Canyonlands, Arches, and Moab, Utah. They were able to take in the beautiful countryside and landscape during their train ride from Colorado back to Ohio. Patrice also enjoys spending time with family, reading, camping, and knitting.

Nick Wiesenberg

Nick’s daily duties include maintaining the department’s equipment, conducting safety checks, and keeping consumable items stocked. Nick is a curator for the Fern Valley field station’s weather and stream-monitoring data collection and Geographic Information Systems (GIS) based image collection. He has received additional training in chemical safety and the handling of hazardous materials, in operating GIS equipment and software, and has audited geology courses to better assist students with their work. He also monitors the College’s seismic station and is in charge of archiving data and samples, as well as assisting students with equipment usage, software training and tree-ring research.
Nick was invited to join Dr. Wilson and Team Utah this May and jumped at the opportunity to provide logistics and assistance in the field. Late Jurassic invertebrate fossils were the primary focus of the trip and nearly 300 pounds of fossils were brought back to Wooster for the team’s Senior Independent Study research. Upon returning to Ohio, he joined Dr. Wiles and several Wooster students in the eight-week AMRE (Applied Methods Research Experience) project. Tree-ring dating of northeast Ohio old-growth tree sites and historic structures were used to reconstruct climate history and provide calendar dates on several old buildings in Wayne County. Nick enjoys spending his free time outdoors and is an active volunteer at Wooster Memorial Park and Vulture’s Knob.
The following attended the annual GSA Alumni Reception held September 26 in Denver, Colorado:

Brandon Bell ('18)   Cole Jimerson ('18)   Fred Siewers ('85)
Will Cary ('13)      Tricia Kelley ('75)    John Sime ('09)
Josh Charlton ('19)   Scott Kugel ('14)    Abe Springer ('87)
Macy Conrad ('18)    Eduardo Luna ('18)    Emmett Werthmann ('18)
Jessica Conroy ('03)  Katherine Marenco ('03) Nick Wiesenberger
George Davis ('64)   Ryan Murrey ('97)    Mark Wilson
Steve Emerson ('69)  Tina Niemi ('85)     Kevin Wokosin
Dori Farthing ('95)  Lisa Park Bousch ('88) Nic Young ('05)
Nick Fedorchuck ('12) Meagen Pollock
Andrew Horst ('07)   Emily Randall ('20)

The 2018 GSA Annual Meeting will take place November 4—7, 2018, in Indianapolis, Indiana. We will take a group photo at 8:00 p.m. during the Alumni Reception, on Monday, November 5. ❖
Mock GSA Presentations
# Geology Majors

## Class of 2018
- Amineh AlBashaireh, Solon, OH
- Brandon Bell, Lexington, KY
- Eve Caudill, Reston, VA
- Macy Conrad, New Holland, OH
- Michael Craigmile, Atlanta, GA
- Peter Hurst, Erie, PA
- Cole Jimerson, Toledo, OH
- Benjamin Kumpf, Pittsburgh, PA
- Eduardo Luna, San Diego, CA
- Christopher Menolasino, Hudson, OH
- Jacob Nowell, Albuquerque, NM
- Matthew Shearer, Los Alamos, CA
- Mara Sheban, Worthington, OH
- Emmett Werthmann, Ann Arbor, MI
- Feiyi Wu, Shanghai, China

## Class of 2019
- Joshua Charlton, Easton, PA
- Simon Crawford-Muscat, Amherst, MA
- Melissa Dods, Parkville, MO
- Olivia Hall, Dayton, OH
- Charley Hankla, Lafayette, CO
- Ethan Killian, Springfield, VA
- Taylor Myers, Boca Raton, FL
- Connor O’Keefe, Madison, NJ
- Thomas Peterson, Clifton, VA
- Victoria Race, Strongsville, OH
- Richard Reynolds, Westerville, OH
- Galen Schwartzberg, Seattle, WA
- Benjamin Sershen, Worthington, OH
- Juwan Shabazz, Richmond Heights, OH
- Michael-Arthur Thomas, New Castle, PA

## Class of 2020
- Sarah Bonnelle-Roberts, Williamson, MI
- Matthew Conrad, Meadville, PA
- Anna Cooke, Pittsburgh, PA
- Hannah Grachen, Pittsburgh, PA
- Alexis Lanier, Navarre, OH
- Aiden “Fox” Meyer, Washington, DC
- Mason Minerva, Rochester, NY
- Emily Randall, Webster, TX
- Evan Shadbolt, Ridgewood, NJ

## Class of 2021
- Julia Pearson, Saint Paul, MN
Class of 2018

*Left to right*
Row 1: Cole Jimerson, Emmett Werthmann, Peter Hurst, Amineh AlBashaireh, Freya Wu, Brandon Bell, and Eduardo Luna
Row 2: Michael Craigmile, Macy Conrad, Mara Sheban, Matthew Shearer, and Jacob Nowell
Row 3: Ben Kumpf and Chris Menolasino (not shown: Eve Caudill)
Alina Karapandzich ('18), Melissa Dods ('19), Victoria Race ('19), and Ann Wilkinson ('18)

Kendra Devereux ('21), Alexis Lanier ('20), Greg Wiles, and Josh Charlton ('19)

Kendra Devereux ('21) and Victoria Race ('19)
Achievements and Activities of our Majors

**Amineh AlBashaireh**
Amnesty International member
Geology Club member
Graduated with Latin Honor *cum laude*
Poster presentation of research at College of Wooster Senior I.S. Research Symposium
Timken Science Library employee

**Brandon Bell**
Aileen Dunham Prize in History recipient
Dean’s list, fall semester
Geology and History double major
Geology Club member
Graduated with Latin Honor *summa cum laude*, honors on Senior I.S., and departmental honors
History Department Assistant
Karl Ver Steeg Memorial Scholarship recipient
News Editor, *The Wooster Voice*
Phi Alpha Theta member
Phi Beta Kappa member
Poster presentation of research at College of Wooster Senior I.S. Research Symposium and Geological Society of America conference
Robert W. McDowell Prize in Geology recipient
Brandon plans to seek employment or an internship over the summer related to geology or his previous experience in journalism.
Next year, he plans to take additional classes at the University of Kentucky before pursuing admission to a graduate school degree in a field related to geology or numerical modeling.

**Eve Caudill**
Alpha Gamma Phi member
College of Wooster’s Campus Manager for University Tees
Humane Society volunteer
Poster presentation of research at College of Wooster Senior I.S. Research Symposium
Received honors on Senior I.S.
SAAC member
Women’s Cross Country and Track & Field teams
After graduation Eve plans to move to Canton, Ohio. She will be pursuing experience in Marketing and Sales, with a hope of finding a ceramics studio she can apprentice at to continue her passion.
Macy Conrad
Betty Gone Wild Women’s Ultimate Frisbee Team
Campus Grounds employee
Charles B. Moke and Margaret Kate Moke Endowed Scholarship co-recipient
Endowed Faculty Scholarship recipient
Geology Club member
Graduated with honors on Senior I.S., departmental honors, and Latin Honor magna cum laude
Phi Beta Kappa member
Poster presentation of research at College of Wooster Senior I.S. Research Symposium and Geological Society of America conference
STEM Zone intern
This summer Macy will be working full-time on her family’s dairy farm in New Holland, Ohio, and part-time as a bartender at Crown Hill Golf Club in Williamsport, Ohio.
Ultimately, she hopes to take over the family farm, but has not ruled out going to grad school at some point to further her geological studies.

Michael Craigmile
Eta Pi Vice-President
Geology Club member
Men’s Ultimate Frisbee team member
Nick Amster Workshop Inc. volunteer
Poster presentation of research at College of Wooster Senior I.S. Research Symposium

Peter Hurst
Game operations employee
Geology Club President
Poster presentation of research at the AAPG Annual Convention and Exhibition in Salt Lake City, Utah
Peter works as a farm apprentice with his sister at Amber Waves Farm, Amagansett, New York.

Cole Jimerson
Dean’s list, fall semester
Department of Geology teaching assistant, fall and spring semesters
Geology Club member
Poster presentation of research at Geological Society of America conference and American Geophysical Union (AGU) convention in New Orleans, Louisiana
Published a paper in the KECK Geology Consortium Short Contribution volume titled, “River Development and Incision on Dominica, West Indies”
In the fall, Cole will be attending The University of Arkansas in Fayetteville, Arkansas, to obtain his MS in Geology. He will be conducting research on landscape evolution with Dr. Jill Marshall and will also be a graduate teaching assistant.

Ben Kumpf
Charles B. Moke Prize co-recipient
Department of Geology teaching assistant and departmental assistant
Don J. Miller Endowed Geology Scholarship recipient
Frederick W. and Ruth Perkins Cropp Endowed Geology Scholarship recipient
Geology Club member
Margaret Reed and John O. Clay Endowed Scholarship co-recipient
This summer Ben will be working with Drs. Justin Richardson and Louis Derry at The University of Massachusetts Amherst and Cornell University studying Gallium/Aluminum fractionation in weathering soils.
He is pursuing a Master of Science in Geology at the University of Victoria in British Columbia, Canada. He will be focusing on compiling site-specific geochemistry across North America to construct a historic geochemical model of Earth’s oceans.

Eduardo Luna
Department of Geology teaching assistant, spring semester
Geology Club member
Intramural sports
Received honors on Senior I.S. Woo91
WOODS member
Eduardo has an internship for the summer then plans to travel.

Chris Menolasino
Charles B. Moke Prize co-recipient
Club Soccer team
Geology Club member
Poster presentation of research at College of Wooster Senior I.S. Research Symposium
Received honors on Senior I.S.
Scot Marching Band member
Chris is taking a gap year, then plans to apply to graduate school.

Jacob Nowell
Cross country and track (pole vaulting) team member
Double major in Studio Art
Geology Club member
George Olson Prize in Art recipient
Graduated with departmental honors in Studio Art
Poster presentation of research at College of Wooster Senior I.S. Research Symposium
After graduation, Jacob plans to seek employment in geology for a few years and then look at graduate schools.

Matthew Shearer
Club Soccer team
Department of College Relations student photographer
Double major in English
Geology Club member
Poster presentation of research at College of Wooster Senior I.S. Research Symposium
Mara Sheban
Dean’s list, fall semester
Geology Club Vice President
Presented I.S. research at AAPG Annual Conference and Exhibition, in Salt Lake City
Research Help Desk Student Assistant, COW Libraries
Women’s Ultimate Frisbee Team Captain
During the summer Mara plans to work as a Teaching Assistant at Maine Media Workshops and College, in Rockport Maine.
She is planning a move to the Chicago area in the fall.

Emmett Werthmann
Frederic Kent Warner Endowed Scholarship Fund recipient
Geology Club member
Graduated with honors on Senior I.S., departmental honors, and Latin Honor magna cum laude
Member of Xi Chi Psi fraternity
Men’s Varsity Swimming and Diving Team
Received honors on Senior I.S.
During the summer Emmett plans to work as an intern at a renewable energy company in Jerusalem, Israel.

Freya Wu
Geology Department teaching assistant, spring semester
Graduated with Latin Honor cum laude
Participated in REU program about hyperspectral imagery at the University of Northern Zina
Presented I.S. research at the 2018 AAG conference in New Orleans, Louisiana
Joshua Charlton
Charles B. Moke and Margaret Kate Moke Endowed Scholarship co-recipient
Dean’s list, fall semester
Karl Ver Steeg Prize in Geology and Geography recipient
Phi Beta Kappa member
Presented Keck research (advised by Dr. Wiles) at the Geological Society of America annual meeting
Principal tubist in the Scot Symphonic Band
Principal tubist in the Wooster Symphony Orchestra
Research assistant for Dr. Judge
Resident of Sustainability House
Teaching assistant for Dr. Pollock’s First Year Seminar #EarthandUs
Teaching assistant for Hydrology lab, fall semester, and Processes and Concepts lab, spring semester
This summer Josh worked with Dr. Wiles in the Tree Ring Lab
Joshua will core trees for a few days in the Kenai Peninsula, south-central Alaska, as a field assistant to Dr. Ben Gaglioti (Lamont-Doherty Earth Observatory at Columbia University; University of Alaska Fairbanks). He will conduct I.S. research on campus at Wooster.

Simon Crawford-Muscat
Summer senior I.S. research in Iceland with Dr. Pollock

Melissa Dods
Archaeology student colloquium
Chair Team member
Community Breakfast program
Dance Company member
Dance Team captain
Geology Club member
Office of Admissions employee
This summer Melissa attended geology field camp in Spain.

Olivia Hall
COWabunga member
Dance Concert lighting designer and assistant master electrician
Delta Theta Psi member
FreeStore member
Geology Club member
Greenhouse member
Organic Farming Club member
Philosophy Roundtable member
Podcast Club member
Student assistant in Kauke
Sustainability Program House member
Theatre scene and costume shop employee
WOODS member
Wooster Quidditch team member
During the summer Olivia worked at a summer camp near her hometown

Charley Hankla
Common Grounds co-program coordinator
Geology Club member
Margaret Reed and John O. Clay Endowed Scholarship co-recipient
Geology Department assistant
Off campus study, fall semester
Shop Assistant in the Theatre and Dance Costume Shop
Senior I.S. summer research with Keck

Ethan Killian
Geology Club member
Off campus study, spring semester
Senior I.S. summer field work with Dr. Wilson in Utah

Taylor Myers
Geology Club member

Victoria Race
Geology Club member
This summer Victoria worked with Dr. Wiles in the Tree Ring Lab

Ric Reynolds
Geology Club member
Men’s varsity swim team
Men’s varsity golf team
Phi Sigma Alpha fraternity
Student Athlete Advisory Committee (SAAC)
The Lakes Golf and Country Club employee
Senior I.S. summer field research with Dr. Pollock in Iceland

Ben Sershen
Geology Club member
Senior I.S. summer research with Dr. Crawford
Summer lab assistant for Dr. Crawford
Ben travelled to Oregon and Michigan during the summer and enjoys biking, playing the guitar, computers, and music.
Galen Schwartzberg
Geology Club member
Senior I.S. summer field work with Dr. Wilson in Utah

Juwan Shabazz
Beta Kappa Phi member
Black Students Association Vice President
Field assistant for Dr. Judge in Utah
Geology Club member
Outreach and Diversity committee for the Student Government Association chair
During the summer, Juwan worked in the Tree Ring Lab with Dr. Wiles through the AMRE program.

Michael Thomas
APEX Fellowship
Geology Club member
Geology Department outreach volunteer
Mercury Brass Quintet
Scot Marching Band and Symphonic Band lead trumpet
Senior I.S. research in Utah with Dr. Judge
STEM Zone Intern
During the summer Michael interned at the Wayne County Auditor’s Office

Tree Ring Project funded by AMRE, Sherman-Fairchild Foundation, and NSF
Kendra Devereux (’21), Alexis Lanier (’20), Juwan Shabazz (’19), and Nick Wiesenber
Heading to GSA, Josh Charlton ('19) and Emily Randall ('20)

Mock GSA
Emily Randall ('20)
Anna Cooke
Dean’s list, fall semester
Summer lab assistant for Dr. Crawford

Hannah Grachen
Animal Friend and Stay at Home Missionary volunteer
Department of Geology teaching assistant
Farm Diversification research with Drs. Moledina and Mariola
Geology Club member
Masonic Village and Target employee
Research Assistant for Dr. Pollock
Scot Marching Band
Scot Symphonic Band
Theater Shop employee

Alexis Lanier
Dean’s list, fall semester
Department of Geology teaching assistant
Geology Club member
Scot Marching Band member
Sophomore researcher for Dr. Judge
Wooster Symphonic Band member
During the summer, Alexis worked in the Tree Ring Lab with Dr. Wiles through the AMRE program.

Aidan Meyer
Carpentry Shop employee - built and installed enough bat houses to house approximately 200 bats around campus.
Geology Club member
Peer tutor for Geology
This summer Aidan did a small biodiversity study on the golf course he works at. He uploaded the species he found and collected to iNaturalist, the same program he used to catalogue biodiversity on campus.
Emily Randall
Dean’s list, fall semester
Equestrian Club (Western Dressage Team)
Greenhouse (Food & Waste Committee)
Geology Club member
Tree Ring Lab employee
This summer Emily interned at The Whiteside Museum of Natural History in Seymour, Texas, where she participated in paleontological fieldwork, fossil preparation, exhibit development, social media projects, and public outreach.

Evan Shadbolt
GeoClub member
During the summer, Evan worked at his local pool teaching children to swim. He also worked with his aunt, Professor Patricia Kelley ('75), on bioerosion of seashells in Long Island.

***************

Dr. Mark Wilson, Galen Schwartzberg and Ethan Killian ('19s)
Julia Pearson
Geology Club member
Summer lab research assistant for Dr. Karen Alley

One of many hikes in Pee Wee Hollow and Spangler Park.
Dr. Wiles, Dr. Wilson, Nick, and Arrow.
Hydrology fieldtrip

Simon Crawford-Muscat (’19) in Iceland

Jacob Nowell (’18) in Structure class
Below are brief descriptions of the Geology scholarships and awards presented to our Geology majors during this year.

The Karl Ver Steeg Memorial Scholarship is in honor and memory of Karl Ver Steeg, who taught in the Department of Geology from 1923 until 1952. It is awarded annually to a deserving student who is majoring in Geology. This year’s recipient was Brandon Bell (’18).

The Robert W. McDowell Prize in Geology was established in 1945 by Philip C. (‘14) and Sarah Wright McDowell (‘14) in memory of their son, Robert W. McDowell (‘45), who lost his life in World War II. It is awarded annually to the geology major who has the highest general standing during the junior and senior years. This year’s recipient was Brandon Bell (’18).

The Frederic Kent Warner Endowed Scholarship Fund was established in 1986 by family and friends in memory of Fred Warner (’76). Fred, originally from Orrville, Ohio, was killed in 1985 in a helicopter crash en route to an off-shore Alabama oil rig to examine a core while working for ARCO. This scholarship is awarded annually to a Geology major. This year’s recipient was Emmett Werthmann (’18).
The Don J. Miller Memorial Fund was established in 1961 by the family and friends of Don J. Miller, of the class of 1940. In recognition of Mr. Miller’s devotion to the science of geology, the scholarship which this fund provides is awarded annually to a student who is majoring in geology. This year’s recipient was Benjamin Kumpf (‘18).

The Frederick W. and Ruth Perkins Cropp Scholarship was established in 1978 by family and friends to honor the late Mrs. Cropp, class of 1925, and the late Dr. Cropp, class of 1926, for their lifetimes of Christian service. This year’s recipient was Benjamin Kumpf (‘18).

The Charles B. Moke Prize is given in memory of Charlie Moke (‘31) who taught in the Department of Geology for 36 years. The prize consists of a field instrument or device which is awarded to the graduating senior who plans to make Geology a vocation and who, in the judgment of the Geology staff, has shown the greatest improvement during his or her college career. This year’s recipients were Benjamin Kumpf (‘18) and Christopher Menolasino (‘18).

The Margaret Reed and John O. Clay Endowed Scholarship was established in 1985 by John R. Clay, the son of Margaret (‘45) and John Clay (‘43). This scholarship is awarded annually to a student who has demonstrated academic achievement. This year’s recipients were Charley Hankla (‘19) and Benjamin Kumpf (‘18).
The Karl Ver Steeg Prize in Geology and Geography, established in 1958, honors Karl Ver Steeg who taught in the Department of Geology and Geography from 1923 until 1952. This prize is awarded annually to the Geology major who has the highest general standing at the middle of the Junior year. This year’s recipient was Josh Charlton ('19).

The Charles B. Moke and Margaret Kate Moke Endowed Scholarships were established in December of 1983 with a generous donation provided by Fritz Kate ('38), Margaret’s brother. These two scholarships are awarded annually to Geology majors who have distinguished themselves by dedication to quality in their academic work, have demonstrated self-reliance, and have a sincere interest in and a concern for other people, characteristics which were exemplified by Charlie and Margaret Moke. This year’s recipients were Joshua Charlton ('19) and Macy Conrad ('18).

The Robert A. Piscetta #31 and Wilson Sporting Good Endowed Scholarship was established in 2018 by Colleen McCauley Piscetta, a member of the class of 1989, and Wilson Sporting Goods Company to honor the memory of Robert A. Piscetta, a member of the class of 1987. While at Wooster, Rob majored in geology under the mentorship of Dr. Mark Wilson and was a standout pitcher for the Fighting Scots Baseball Team under Coach Tim Pettorini. After graduation, Rob was drafted as a pitcher by the Los Angeles Dodgers and then went on to a 19-year career with Wilson Sporting Goods, where he worked his way up from Ohio Territory Manager to Vice President. The scholarship carries the #31 because this was Rob’s favorite number which he wore while playing baseball for The College of Wooster and the Los Angeles Dodgers. Income from the fund shall be awarded each year by the Department of Financial Aid, working in conjunction with the Department of Earth Sciences, to an upper-class geology major who has demonstrated financial need. Preference shall be given to a student who has a cumulative GPA of 3.0 or higher. This scholarship will be distributed in the 2019-2020 academic year.
2017-2018 Geology Club Officers were: President, Peter Hurst; Vice President, Mara Sheban; and Treasurer, Emmett Werthmann. 2018-2019 Geology Club Officers will be President, Josh Charlton; Vice President, Ric Reynolds; Treasurer, Melissa Dods; Public Relations, Victoria Race; and Outreach, Alexis Lanier.

(left to right)
Front Row: Meagen Pollock
Second Row: Macy Conrad ('18), Aminhe AlBashaireh ('18), Fox Meyer ('20), Victoria Race ('19), Freya Wu ('18), Olivia Hall ('19), Brandon Bell ('18), Juwan Shabazz ('19), Alexis Lanier ('20), Emily Randall ('20), and Michael Thomas ('19).
Third Row: Mara Sheban ('18), Melissa Dods ('19), Dyani Armijo-Sinnett ('21), Eduardo Luna ('18), Jacob Nowell ('18), Connor O'Keefe ('19), and Simon Crawford-Muscat ('19).
Fourth Row: Emmett Werthmann ('18), Michael Craigmile ('18), Karen Alley, Peter Hurst ('18), Matt Shearer ('18), Ric Reynolds ('19), and Ben Sershen ('19).
Fifth Row: Tommy Peterson ('19), Cole Jimerson ('18), Shelley Judge, Alex Crawford, Ethan Killian ('19), Josh Charlton ('19), and Chris Menolasono ('18).
Juwan Shabazz ('19) in Structure class

Mock GSA presentations
### Geology Club Presentations

<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>August 31</td>
<td>Departmental Meeting, Annual Photo, and visit with Jesse Davenport ('11).</td>
</tr>
<tr>
<td>September 7</td>
<td><strong>Aaron Novick ('12), University of Pittsburgh</strong>, “Structuralism and Functionalism in Evolutionary Theory.”</td>
</tr>
<tr>
<td>September 14</td>
<td>“What I Did Last Summer” slideshow</td>
</tr>
<tr>
<td>September 21</td>
<td>Senior I.S. presentations</td>
</tr>
<tr>
<td></td>
<td>Macy Conrad, “Encrusting sclerobiont paleoecology and bioerosion of oysters in the type Campanian (Upper Cretaceous) of southwestern France” and Ben Kumpf, “The Effects of Low-Molecular-Weight Organic Ligands on Gallium and Aluminum Mineral Weathering and Soil Sorption.”</td>
</tr>
<tr>
<td>September 28</td>
<td>Senior I.S. presentations</td>
</tr>
<tr>
<td></td>
<td>Mara Sheban, “The interpreted depositional environment of large oncoids from the Flagstaff Formation, San Pitch Mountains, central Utah,” and Brandon Bell, “Geologists with borders: American scientific and cultural interactions with Europe and Japan after the 1906 San Francisco earthquake.”</td>
</tr>
<tr>
<td>October 5</td>
<td>Senior I.S. presentations</td>
</tr>
<tr>
<td>October 19</td>
<td>Mock GSA</td>
</tr>
<tr>
<td>October 26</td>
<td>Senior I.S. presentations</td>
</tr>
<tr>
<td></td>
<td>Amineh AlBashaireh, “Quantifying the impact of drought on vegetation through remote sensing in northwest Jordan, 1998 to 2017” and Matthew Shearer, “The Richmondian Invasion of the Late Ordovician of Cincinnati with a Focus on Trepostome Bryozoans, Or The Ekphrastic Geologist and Other Essays.”</td>
</tr>
<tr>
<td>November 2</td>
<td>Senior I.S. presentations</td>
</tr>
<tr>
<td></td>
<td>Eve Caudill, “A Morphological Study of Pillow Lavas: Generating new data on submarine pillows along the 8°20’ N Seamount Chain” and Emmett Werthmann, “Reconstructing the Cretaceous paleoenvironmental and paleoecological setting of Salina Canyon using paleosols, Servier County, Utah, U.S.A.”</td>
</tr>
<tr>
<td>November 9</td>
<td>Senior I.S. presentations</td>
</tr>
</tbody>
</table>
November 16  
*Senior I.S. presentations*

Peter Hurst, “An Analysis of Caddisfly Larval Cases from Domal Bioherms in the Upper Green River Formation, White Hill Cuesta, Ephraim, Utah” and Jacob Nowell, “Bering Strait heat inflow; locality test of the SODA reanalysis.”

November 30  
*Senior I.S. presentations*

Eduardo Luna, “Stratigraphy, depositional environment, and origin of silica at Gal Hill, Green River Formation, Sanpete County, Utah: a petrographic and geochemical study” and Chris Menolasino, “Predictability of Arctic Sea Ice 1800-2013” and Ethan Killian (Junior IS).

January 18  
Welcome Back, Photos and Retakes, Preview of Upcoming Semester, Call for Nominations.

January 25  
*Senior I.S. Seminars*

Macy Conrad, “Encrusting sclerobiont paleoecology and bioerosion of oysters in the type Campanian (Upper Cretaceous) of southwestern France” and Ben Kumpf, “The Effects of Low-Molecular-Weight Organic Ligands on Gallium and Aluminum Mineral Weathering and Soil Sorption.”

February 1  
*Senior I.S. Seminars*

Cole Jimerson, “River Development and Incision on Dominica, West Indies” and Brandon Bell, “Geologists with borders: American scientific and cultural interactions with Europe and Japan after the 1906 San Francisco earthquake.”

February 8  
*Senior I.S. Seminars*


February 15  
Welcome to the Major! Luncheon to welcome our newest Geology majors.

February 22  
*Senior I.S. Seminars*


March 1  
*Senior I.S. Seminars*

Matthew Shearer, “The Richmondian Invasion of the Late Ordovician of Cincinnati with a Focus on Trepostome Bryozoans, Or The Ekphrastic Geologist and Other Essays,” Chris Menolasino, “Predictability of Arctic Sea Ice 1800-2013,” and Peter Hurst, “An Analysis of Caddisfly Larval Cases from Bioherms in the Upper Green River Formation, White Hill Cuesta, Ephraim, Utah.”

March 8  
*Senior I.S. Seminars*

March 29  GeoJeopardy.
April 5   Lisa Kastor, Director of Career Planning.
April 12  Osgood Speaker – Maureen Rayno
April 26  *Junior I.S. Presentations*
              Josh Charlton, Tommy Peterson, Galen Schwartzberg, and Juwan Shabazz.
May 3    *Junior I.S. Presentations*
              Melissa Dods, Michael Thomas, Ben Sershen, and Simon Crawford-Muscat.

GeoClub Picnic

May 4    *Junior I.S. Presentations*
              Connor O’Keeffe, Olivia Hall, Ric Reynolds, Victoria Race, Charley Hankla, and Taylor Myers.

*Anna Cooke (‘20)*

*Hydrology Fieldtrip*
Geology/Philosophy Faculty Lunch

Ric Reynolds and Simon Crawford-Muscat
Amineh AlBashaireh

Quantifying the Impact of Drought on Vegetation through Remote Sensing in Northwest Jordan, 1998 to 2017

Since 1998, a period of historic drought has affected the Levant region. Due to decreased precipitation, drought can negatively impact vegetation health and density, potentially resulting in land degradation and desertification. Jordan is a semi-arid to arid country in the region that is one of the most water-scarce nations in the world, making it vulnerable to decreased vegetative cover and desertification as a result of prolonged drought. This study utilized remote sensing to quantify vegetative cover in the northwest region of Jordan from 1998 to 2017 through the Normalized Difference Vegetation Index (NDVI) employed on Landsat imagery. The study site was divided into six sub-regions based on vegetation type, and trends within the mean NDVI of the overall study region and each sub-region over time were determined for the wet and dry seasons in Jordan. Correlations between mean NDVI and annual average precipitation were found as well. Wet season NDVI was significantly correlated with precipitation in six of the seven study regions while the dry season was not significantly correlated in any region. As such, drought could only conclusively influence wet season vegetation cover. There were no significant downward trends over time in wet season mean NDVI for any region, however, signifying that the drought has not caused land degradation in Jordan as of March of 2017.

Brandon Bell

Geologists with Borders: American Scientific and Cultural Interactions with Europe and Japan after the 1906 San Francisco Earthquake

In the United States, the 1906 earthquake in San Francisco, California, is remembered as a foundational moment for seismology. The earthquake led to the widespread acceptance among American geologists that strike-slip motion – the horizontal movement of fault blocks – could not be ignored as a major type of fault motion. It is also remembered for its human impact, including the heightened discrimination and legal exclusion experienced Chinese and Japanese immigrants in the city. However, the earthquake did not occur in a vacuum. First and foremost, American scientific response to the 1906 earthquake drew upon the existing work from European and Japanese seismologists. I show this to be the case by first examining the international scientific
interactions that produced two new theories after the 1906 earthquake: (1) the Geological Society of America’s proposed fault nomenclature changes in 1913, and (2) the theory of elastic rebound. In doing so, I argue that each theory’s ability to become an international standard was dependent on how convincing it was to a nation’s scientists against that particular nation’s geological conventions. Second, I argue that the cultural divisions experienced among Chinese, Japanese, and European Americans in the city were closely linked to much broader national identities and movements of nationalism.

Examining attempts by nativists to exclude these immigrant groups, including the Gentlemen’s Agreement of 1907 and attempts to relocate Chinatown outside of downtown San Francisco, as well the immigrants’ reaction to these attempts, I argue that the earthquake strengthened the national identities of each group. Although these scientific and cultural interactions seem unrelated, the fact that they were both limited by national identities shows that nationalism continued to be relevant, even if the disaster happened on a global scale.

Eve Caudill

*A Morphological Study of Pillow Lavas: Generating new data on Submarine Pillows along the 8°20’ N Seamount Chain*

Pillow lavas are the most abundant lava structure on Earth and can be used as a stratigraphic tool to indicate the presence of water and/or ice across geologic time. However, the submarine environment in which they form has proved challenging for research and exploration, thus limiting what we know about this abundant lava structure. This study focuses on the 8°20’ N Seamount Chain, located west of the East Pacific Rise. The purpose of this study is to create a comprehensible and replicable dataset of submarine pillows to compare to subglacial pillows, in order to better understand the environment and conditions in which pillow lava forms. This investigation includes pillow measurements, mapping, structural observations, and emplacement pressure calculations of submarine pillows to compare to previously collected subglacial data. This study concludes that there is an overall pattern of decreasing emplacement pressure with increasing elevation along the 8°20’ N Seamount Chain. However, the size of pillows found along the seamounts showed no correlation to pressure or depth. Future research should include a larger data set of submarine pillows, not limited to those along seamounts, to further the investigation of the relationship between pillow size and pressure.
Macy Conrad

Encrusting sclerobiont paleoecology and bioerosion of oysters in the Type Campanian (Upper Cretaceous) of southwestern France

The Campanian Stage of the Upper Cretaceous was established by Henri Coquand in 1857 based on a sequence of richly fossiliferous shallow water carbonates in the Charente and Charente-Maritime departments of southwestern France. One of the most common macrofossils is the gryphaeid oyster *Pycnodonte vesicularis* (Lamarck, 1806), which often forms extensive shell beds. This bivalve lived primarily on soft marly substrates, forming hard substrate islands. They frequently supported sclerobiont communities comprising encrusters (diverse cheilostome and cyclostome bryozoans, foraminiferans, oysters, bivalves, sabellid and serpulid polychaetes, calcareous sponges), borers (the sponge borings *Entobia*, the worm borings *Maeandropolydora* and *Caulostrepsis*, the barnacle borings *Rogerella*, the phoronid borings *Talpina*, the predatory borings *Oichnus*), the ballistic crustacean trace *Belichnus*, and grazers (*Gnathichnus* and *Radulichnus*). Collections of *Pycnodonte vesicularis* from the Late Campanian Biron, Barbezieux and Aubeterre formations (in ascending stratigraphic order) were assembled to study the systematics and paleoecology of the sclerobionts, and describe the bioerosion ichnofauna. These chalky marls record a sequence from deeper to shallower shelf environments. *P. vesicularis* shells from the deeper-water Biron Formation are relatively large and complete, with their encrusting fauna mostly intact and on exterior surfaces, suggesting rapid burial. Shells from the overlying shallower-water and highly bioturbated Barbezieux and Aubeterre formations are typically heavily bioeroded with fragmentary encrusters, pointing to a complex history of colonization on shell exteriors and interiors. The diversity of sclerobionts increases upwards as the depositional environments shallowed, especially for the bryozoans. Part of this diversity increase may be because of the longer seafloor residence time of the shallower shells, and part may be due to the growing surficial complexity of the bioeroded shell substrates, but most of this diversity increase appears to reflect a rising biological productivity with the shallowing seas. The bioerosion ichnodiversity increases stratigraphically upwards with the shallowing paleoenvironments.

Michael Craigmile

Climate change and GLOFs: A Multi-Locational Meta-Analysis on the Peak Discharge and Flood Volume of Glacial Lake Outburst Floods

Glacial Lake Outburst Floods (GLOFs) represent a major hazard to human health and development, particularly in less developed countries. Because these floods
stem from glacial meltwater reservoirs, I hypothesize in this paper that two values for GLOF magnitude as well as GLOF frequency will increase over time, in response to anthropogenic climate warming. I tested this hypothesis by collecting data from papers from three earth science databases, resulting in six papers that were found to have relevant data from four study sites. The data were compiled into spreadsheets, and dot graphs with trend lines were created to see trends in the peak discharge, flood volume, and frequency of GLOFs from the past several decades. Additionally, the timing of these GLOFs were examined. As glaciers melt and recede, GLOFs from these glaciers were found to burst earlier in the year, and their peak discharge, flood volume, and frequency have been shown to be affected by factors controlled by climate warming. Specifically, frequency of GLOF occurrence has plummeted since the 1970’s, and particularly since the 1990’s. Peak discharge and flood volume for the floods were found to be increasing for three of the four glaciers, while one glacier showed a steep decrease for both values. I predict that a three-step process is occurring for each glacier that consists of an initial increase in these three characteristics, followed by a decrease, followed by a future increase which will occur sometime this century. The current trend of the GLOF characteristics are in response to climate warming and stabilization following the Little Ice Age.

Peter Hurst

An Analysis of Caddisfly Larval Cases from Bioherms in the Upper Green River Formation, White Hill Cuesta, Ephraim, Utah

The paleoenvironmental conditions and growth patterns of ancient caddisflies (Order Trichoptera) have been studied in the Jinju Formation, South Korea (Paik 2005) and the Green River Formation, WY (e.g., Leggitt et al. 2007). Caddisfly cases are within or on the top of stromatolite bioherms, indicating these insects were aquatic early in their life cycle. This study extends known Green River localities of caddisfly-dominated carbonate mounds southward from Leggitt et al.’s (2007) study in Lake Goshute to Lake Flagstaff, an intermontane basin of central Utah. The Green River Formation (Eocene) in central Utah is interpreted as a lacustrine unit with minor fluvial input, but shows lithologic variability between its Lower and Upper Members. This research focused on exposures of the Upper Green River in several quarries on one of the large cuestas in the Sanpete Valley.

The first objective of this research was a comparative investigation of two distinct quarries located 455 m from one another. One quarry (Quarry 3) was dominated by lime mudstone and showed no caddisflies present. Another quarry (Quarry 1), dominated by ostracodal-ooloidal packstones/grainstones with other interbedded carbonates, contained caddisfly-larval cases in discrete bioherms. The stromatolite morphologic differences and the lithologic variability played a role in caddisfly preferences and presence between the two localities. The second objective was to
characterize the caddisflies found in the stromatolite bioherms and the lithologies exposed at Quarry 1. Methods included: petrographic analysis (thin section and acetate peel) of the host rock and of the caddisfly larval cases (transverse and longitudinal views), XRD analysis, and portable field magnetic susceptibility measurements. Additional paleocurrent data was obtained.

Results were compared to other Green River caddisfly studies (e.g., Leggitt et al. 2007). In central Utah caddisfly cases typically are found in distinct layers in discrete domical stromatolites. The alteration of caddisfly-rich and -poor layers in these bioherms supports the work of Leggett et al. (2007). Observations show that these caddisfly-stromatolite mounds (ave height 25 cm) expose a unique stratigraphy. These mounds formed on a bed of much smaller (8 cm) digitate stromatolites, below which is a 6 cm silicified ooidal grainstone. Caddisfly characterization, coupled with the symbiotic presence of stromatolites, enables paleolake levels to be estimated for this margin of Lake Flagstaff. Transgressive and regressive events were documented in the lacustrine facies of Quarries 1 and 3.

Cole Jimerson

River Development and Incision on Dominica, West Indies

Volcanic landscapes such as that of Dominica offer ideal environments for understanding landscape evolution as they have a clear starting time of formation and similar lithology throughout. However, it remains undiscovered how rivers on volcanic Caribbean islands respond following explosive eruptions that fill the valleys with pyroclastic flows. Ignimbrite deposits on Dominica ~200 ka and younger reveal insights into the pace of fluvial incision during the Late Pleistocene. Incision into ignimbrite deposits between ~18 – 25 ka is occurring at high rates of 4.67 – 6.26 mm/yr and is reduced exponentially every 20 ka until ~ 80 through ~203 ka, where incision decreases much slower at 0.61 - 0.78 mm/yr and 0.38 – 0.7 mm/yr respectively. Changes in resistance to channel incision between volcanic deposits recognized from longitudinal profiles and normalized channel gradients suggests that older ignimbrite deposits have been fully incised since deposition. The negative power-law relationship of incision rates with ignimbrite deposit ages, known as the ‘Sadler’ effect, demonstrates that fluvial incision rates are primarily determined by aggradation and incisional processes during time hiatuses in volcanic activity across Dominica. Correlations of geomorphic characteristics of watersheds with incision rates demonstrate that enhanced climatic and topographic variables drive incision indirectly through landsliding and channel steepening.
Luke Kosowatz

*Bioerosion patterns during the Richmondian Invasion in the Ordovician of the Cincinnatian region of northern Kentucky and southeastern Indiana*

The Richmondian Invasion was a major event of invasive animals that occurred in the Cincinnatian region of Southern Ohio, northern Kentucky, and southwestern Indiana during the Ordovician period. This was made possible by the Taconic Orogeny that produced the Appalachian Mountains, with seaways opening between the Cincinnati region and northern regions of the Laurentide Midcontinent as a result of the tectonic activity. These seaways enabled organisms endemic to northern shallow marine environments to move into the similar environment of the Cincinnati region, resulting in much different fossil records before and after the invasion boundary. The Richmondian Invasion is believed to precede the Ordovician Bioerosion Revolution, which saw a drastic increase in the number of ichnogenera preserved within the Upper Ordovician rock of the region. It is the purpose of this study to analyze both pre-invasion and post-invasion bioerosion to determine if the fossil records on either side of the invasion boundary show evidence of significant changes in regards to bioerosion patterns, with an emphasis on *Trypanites* due to large quantities of the ichnogenus preserved with before and after the invasion boundary. Both pre-invasion and post-invasion samples were collected from the two rock formation each (Pre-invasion; Bellevue and Corryville Formations, Post invasion: Waynesville and Lower Whitewater Formations). Hand sample and acetate peel analysis was used to determine the diameters of *Trypanites* boring per formation, as well as to determine if *Trypanites* borings were created before or after their host organism had died, or created before or after their host had filled with calcite cement (in terms of bioeroded bryozoans). Pre-invasion and post invasion *Trypanites* borings were also analyzed for the presence of preserved ‘ghosts’.

Ben Kumpf

*The Effects of Low-Molecular-Weight Organic Ligands on Gallium and Aluminum Mineral Weathering and Soil Sorption*

Aluminum (Al) is a significant component of primary and secondary aluminosilicate minerals, which serve as the scaffolding of a soil. Minerals such as kaolinite and feldspars are only two examples of Al-bearing solids commonly found in the Critical Zone. As the third most abundant element in the Earth’s crust, Al plays a crucial role in biogeochemical cycling. Its presence within soils is essential for soil formation; however, a slight change in acidity can cause detrimental effects to life. Aluminum toxicity is defined as when excess Al has been introduced to plant tissues from a minor change in acidity leading to growth stagnation and mortality by inhibiting root growth mechanisms.
Previous research has found the production of low-molecular-weight organic ligands from plants and decaying organisms has provided a natural mitigation for soil acidity. Since Al toxicity varies for different species, the transport and uptake of Al within the Critical Zone has become of recent interest. Using the paradigm to classify the uptake and mobilization of metals by using a stable isotope ratio, such as $^{65}\text{Cu}/^{63}\text{Cu}$, $^{65}\text{Ca}/^{63}\text{Ca}$, and $^{7}\text{Li}/^{5}\text{Li}$ has proven extremely useful in recent years (Wiederhold et al., 2015). Unfortunately, a consequence of using this method applied to Al is its lack of multiple stable isotopes existing in nature. Consequently, another method is required to classify Al movement and uptake within the Zone (Derry and Richardson, 2016). Previous research has highlighted the observation in which Gallium (Ga) tends to substitute for Al in solid minerals phases. Moreover, historical data shows the proportion in which Ga substitutes to Al which is approximately 0.1 mM/M Ga/Al, as reported by Shiller and Frilot (1996). Although they behave similarly in the solid phase, Shiller and Frilot’s study noted the deviation in Ga/Al concerning stream waters in California. A proposed mechanism of fractionation of this ratio is the effect of complexation and sorption of low-molecular-weight organic ligands fractionating the Ga/Al ratio. Low-molecular-weight organic ligands produced by biota in soils may play an essential role in the sorption and potentially fractionation of Ga/Al ratio in stream waters (Shiller and Frilot, 1996). To further validate Ga/Al as a geochemical tracer for Al, we conducted two batch reactor experiments and a column leaching experiment examining several gaps in the knowledge in the geochemical signature of the Ga/Al ratio in aquatic systems. As a means to gain insight as to why Ga/Al is fractionated when weathered from bulk rock samples with a known Ga/Al of ~ 0.1 mM/M, two different organic acid treatments, and a control were used. Varying the material, a Luquillo soil, quartz diorite, and kaolinite were treated with low-molecular-weight organic ligands to test the hypothesis put forth by Shiller and Frilot, 1996 stating that the Ga/Al was influenced by low- molecular-weight organic ligands. Our first objective in this study was to evaluate the effect of low- molecular-weight organic ligands in the mobilization of Al, Fe$^{3+}$, and $^{71,69}\text{Ga}$ within a highly weathered Al-rich soil. Secondly, we sought to evaluate the effect of pH, ligand, and material type to evaluate the leaching behavior of Ga with respect to Al and Fe from primary and secondary mineral sources within soils. Lastly, we wanted to determine how these Al, Fe$^{3+}$, and $^{71,69}\text{Ga}$ sorb to different minerals to understand their transport during the weathering process. Obtained results show the effect of low- molecular-weight organic ligands is pronounced effect regarding Al and Ga dissolution. Generally, materials treated with citrate caused the Ga/Al to decrease with increasing pH, whereas the catechol and control treatments tended to increase the Ga/Al ratio with increasing pH. The relationship complexed Ga, and Al suggests the effect of organic low-molecular-weight organic ligands varies with the type of material, stability of the metal complex, and decreases with increasing pH.
Eduardo Luna

Stratigraphy, depositional environment, and origin of silica at Gal Hill, Green River Formation, Sanpete County, Utah: a petrographic and geochemical study

Cherts occur alongside carbonate rocks in many different depositional contexts, however their exact modes of formation are not always understood. This study collected and examined chert, carbonate, stromatolite, and tuff samples from Gal Hill, an outcrop of the lacustrine carbonate Green River Formation in Central Utah, and constructed a stratigraphic column of the locality in order to determine depositional environment, a timeline for chert formation, and a relationship between dolomitization and volcanic eruptions at the Gal Hill locality through the use of x-ray diffraction and petrographic analysis. Cherts at Gal Hill were classified either as N-chert, which referred to nodular chert, or B-chert, which designated chert that precipitates along bedding planes in the case of silicified stromatolites. The strata of Gal Hill are dominated by a thinly laminated calcimudstone, leading to the interpretation of its depositional environment as a mudflat. The most prominent bed at Gal Hill is a 4-foot thick tuff bed from 11 to 15 feet in the stratigraphic column. Tuffs at Gal Hill were found to be generally porphyritic with euhedral biotite and plagioclase phenocrysts in a crushed glass matrix. Carbonate samples were found to contain high amounts of the clay mineral illite. This study concludes that silica at Gal Hill was sourced from a combination of smectite-illite transformations and volcanic ash weathering. N-chert and B-chert were both found to often contain a mixture of microcrystalline quartz and mud. The silica mineral chalcedony was also found to occur in some Gal Hill chert samples. The presence of chalcedony indicates that silica at Gal Hill precipitated from solution and not from a gel. Silica at Gal Hill was also found to have precipitated while the carbonate sediment was still soft. Based on the presence of carbonate “ghosts” in many chert samples, much of the silica at Gal Hill was found to have formed through the replacement of original carbonate sediment. Evidence for a relationship between volcanic ash and dolomitization was inconclusive.

Chris Menolasino

Predictability of Arctic Sea Ice 1800-2013

Sea ice extent in the Arctic has been declining rapidly in recent years and, many people are looking to the newly open waters for new shipping routes and resources. For the Arctic to be viable for both resources and transportation, predictions on sea ice extent are necessary. Since the launch of passive microwave satellites in 1978 we have had access to accurate images of sea ice extent, but to improve predictions, we need to gather more data. In this study, we look back to times of observational data before satellites in
a new data set from the University of Alaska Fairbanks and this study is one of the first to investigate the predictability of sea ice extent dating back to the 1800s. By looking at previous years, we can see how much the system in the Arctic has changed and that global warming is the driving factor for recent variability in sea ice extent. The effects of global warming have completely overtaken the natural climate variability in the Arctic. This warming has resulted in better correlations from sea ice extent for the months preceding September and may be able to provide us with better predictions than before.

Jacob Nowell

Locality Test of the Simple Ocean Data Assimilation (SODA) in the Bering Strait

Observations of sea ice show that sea ice volume, extent and concentration are all decreasing and that the rate of decline is steeper in recent decades versus earlier ones. However, variations in year to year sea ice extent makes yearly forecasts difficult, limiting human activity in the Arctic. One major influence on sea ice concentration in the Chukchi Sea is the flow of heat through the Bering Strait (R~ 0.8 in April to June) which has been found using the A3 mooring in the Bering Strait. We find that in May through August the SODA reanalysis correlates well with the A3 mooring (R~ 0.4 - 0.6) and better when detrended (R~ 0.5 - 0.7). As data from the A3 mooring is more limited than data in SODA, we ask if SODA is a viable method for predicting sea ice extent in the Chukchi Sea.

Matthew Shearer

The Richmondian Invasion of the Late Ordovician of Cincinnati with a Focus on Trepostome Bryozoans, Or The Ekphrastic Geologist and Other Essays

The Late Ordovician was a time of great faunal turnover in the Cincinnati basin of North America. In this period of a few million years, known as the Richmondian Invasion, invasive taxa were transported into the basin from multiple sources which include other regions of Laurentia, the Iapetus ocean and Baltica. Among them were a multitude of brachiopods and corals but bryozoans are some of the most prolific in the fossil record. According to some of the experts on the invasion, the incredible amount of bryozoans has obstructed their study of the carbonate ramp in the region. It is the aim of this study to begin to unravel the mystery of the bryozoans of the Richmondian Invasion so they can be better understood in the context of this large scale biotic influx.
Mara Sheban

*The interpreted depositional environment of large oncoids from the Flagstaff Formation, San Pitch Mountains, central Utah*

Sevier and Laramide orogenesis produced regional highlands and intermontane basins, including Lake Flagstaff (Paleocene) in central Utah. Lake Flagstaff deposits are exposed on the Wasatch Plateau and San Pitch Mountains. Among the deposits from Lake Flagstaff, the Flagstaff Formation is dominantly interpreted as a lacustrine limestone with fluvial influence, and it is divided into three members. Along its Wasatch Plateau depocenter, the members include the Ferron Mountain Member, the Cove Mountain Member, and the Musinia Peak Member. However, these members are not easily distinguishable in the San Pitch Mountains, which is the focus of this study. The study locality (Radio Tower) is located 3.6 km W of Sterling, UT. Research objectives include use of the physical characteristics of the oncoids, including size, shape, and contents of the nuclei, to interpret the depositional environment and hydrodynamic behavior. Additional data obtained included petrographic (thin section, acetate peel, and XRD) analysis, specifically analyzing oncid nuclei and cortices. Oncoids from Radio Tower are small (<100mm) to large (100-400mm), with some samples as large as 30 cm x 41 cm. They are generally ellipsoidal in shape, and their nuclei are simpler, containing primarily terrigenous sediment. The nuclei and the host rock contains more spar, supporting an agitated, higher energy environment.

Emmett Werthmann

*Reconstructing the Cretaceous palaeoenvironmental and palaeoecological setting of Salina Canyon using paleosols, Sevier County, Utah, U.S.A.*

A paleosol located within the Jurassic-Paleogene unconformity of Salina Canyon, Utah provides the opportunity to better understand the Cretaceous environment once present in central Utah. This paper presents data collected from this paleosol and discusses its significance. Trace fossils from burrowing insects, root traces from vegetation, variant mottling, and nodule horizons provide a snapshot of this paleoenvironment. Through an analysis of this data, we propose the development of two paleosols (Paleosol 1 and Paleosol 2) with varying levels of soil development. The first is composed of A and B horizons, developed from Jurassic sediments of the Twist Gulch Formation. This paleosol is dominated by high levels of bioturbation in the form of Adhesive Menisicate Burrows (AMB) from insects similar in morphology to Naktoemasis bowni, proposed by Smith et al. (2008). Paleosol 2 also contains A and B horizons which accumulated over Paleosol 1. Paleosol 2 shows the preservation of drab-haloed root traces, the more limited presence of AMBs, and a carbonate nodule horizon. Through the
division of these distinct horizons at Salina Canyon paleosol, we believe a previously unidentified portion of the Paleogene Flagstaff Formation exists directly above the paleosols. The existence of the Salina Canyon paleosol provides information at an unconformity that spans just over 100 Million years and the entirety of the Cretaceous Period. Using the interpretations of the environment which formed paleosols 1 and 2, we believe that they were developed during the Early Cretaceous.

Feiyi (Freya) Wu

*Urban Surface Material Mapping Using Very High Resolution Hyperspectral Imagery and Ther*

Impervious surfaces, including rooftops, pathways and parking lots, are surfaces through which water cannot permeate and are recognized as significant features of urban environments. This project aims to classify impervious urban materials at the University of Northern Iowa (UNI), Iowa, USA, by using very high resolution Airborne Imaging Spectrometer for Applications (AISA) hyperspectral imagery and Forward-Looking Infra Red (FLIR) Phoenix imagery. The classification divided impervious surface materials into six main classes: roof concrete, road concrete, shingle, metal, EPDM (which is a rubber material widely used in low-slope roofing throughout the USA and worldwide; EPDM Roofing Association, 2017) and clay. In order to analyze AISA data, the Quick Atmospheric Correction (QUAC) was applied using Environment for Visualizing Images (ENVI) software to eliminate atmospheric attenuation. Image-to-image registration was used to match the hyperspectral image with a reference image. ENVI’s Maximum Likelihood was used to classify the imagery. The overall accuracy using only hyperspectral imagery was 59%. The addition of a thermal band eliminated most inaccuracy caused by shadows and raised the overall classification accuracy to 73%. Some complex real life variables, such as 1) cars, 2) isolated misclassified pixels (noise), as well as 3) discrepancies between classification based on UNI building survey and materials exposed to air in real life caused by lack of site visit prevented the classification algorithm from obtaining a higher accuracy. In addition, radiance values for classes were calculated in order to relate to the Urban Heat Island (UHI) effect. Unlike expectation, that EPDM should have the highest radiance due to its dark color, results showed that road concrete and vegetation have the highest radiances, meaning they have highest temperatures and contributed to the UHI effect most on the UNI campus. The phenomenon may be explained by air conditioning inside the buildings that cools building rooftops down. Air conditioners need be turned off when taking the thermal image to obtain more reliable radiance values to relate to UHI effect.
Tree Ring Lab project supported by AMRE, Sherman-Fairchild Foundation, and NSF. Victoria Race, ('19), Kendra Devereux ('21), Alexis Lanier ('20), Josh Charlton ('19), and Juwan Shabazz ('19).
The Richard G. Osgood, Jr. Memorial Lectureship in Geology was endowed in 1981 by his three sons in memory of their father, a paleontologist with an international reputation who taught at Wooster from 1967 until 1981. Funds from this endowment are used to bring a well-known scientist interested in paleontology and/or stratigraphy to the campus each year to lecture and meet with students.

Dr. Maureen Raymo received a bachelor of science degree from Brown University and a master’s and Ph.D. from Columbia University. She is currently the Bruce C. Heezen Lamont Research Professor and director of Lamont-Doherty Core Repository of the Lamont-Doherty Earth Observatory, at Columbia University.

She is a paleoceanographer/marine geologist who studies the history and causes of climate change in the Earth’s past. She has done pioneering work on ice ages, the geologic temperature record, and climate, examining and theorizing about global cooling and warming and transitions in ice age cycles.

Dr. Raymo’s publication list is prolific and includes several occurrences of the prestigious journals Nature and Science. According to Google Scholar, Dr. Raymo is the 4th highest cited researcher in Sea Level, 5th highest cited researcher in Paleoceanography, and 6th highest cited researcher in Marine Geology and Earth Science. Her work has been widely publicized. Her research on beef’s effect on climate was featured in a recent press release titled, “Want to Save the World? Start by Eating Less Beef.” Dr. Raymo was featured in the video “This is Not Cool” through the Yale Forum on Climate Change and the Media.

In 2016, she was elected to the National Academy of Sciences. In 2014, Dr. Raymo was the first woman, after 183 years, to win the Wollaston Medal for geology, the highest award of the Geological Society of London. She was described in her nomination as “…one of the foremost and influential figures in the last 30 years…She’s been an important role model to women scientists—you can get to the top.”  ❖
<table>
<thead>
<tr>
<th>Year</th>
<th>Lecturer</th>
<th>Institution</th>
</tr>
</thead>
<tbody>
<tr>
<td>1982</td>
<td>John Pojeta, Jr.</td>
<td>United States Geological Survey</td>
</tr>
<tr>
<td>1983</td>
<td>J. William Schopf</td>
<td>The University of California, Los Angeles</td>
</tr>
<tr>
<td>1984</td>
<td>David Jablonski</td>
<td>The University of Chicago</td>
</tr>
<tr>
<td>1985</td>
<td><strong>Walter Manger (’66)</strong></td>
<td>The University of Arkansas</td>
</tr>
<tr>
<td>1986</td>
<td>Susan Kidwell</td>
<td>The University of Chicago</td>
</tr>
<tr>
<td>1987</td>
<td>Niles Eldredge</td>
<td>The American Museum of Natural History</td>
</tr>
<tr>
<td>1988</td>
<td>Steven Stanley</td>
<td>Johns Hopkins University</td>
</tr>
<tr>
<td>1989</td>
<td>Paul Taylor</td>
<td>The Natural History Museum, London</td>
</tr>
<tr>
<td>1990</td>
<td>Erle Kauffman</td>
<td>The University of Colorado</td>
</tr>
<tr>
<td>1991</td>
<td>Rodney M. Feldmann</td>
<td>Kent State University</td>
</tr>
<tr>
<td>1992</td>
<td><strong>Molly F. Miller (’69)</strong></td>
<td>Vanderbilt University</td>
</tr>
<tr>
<td>1993</td>
<td><strong>John Van Wagoner (’72)</strong></td>
<td>Exxon Production Research Company</td>
</tr>
<tr>
<td>1994</td>
<td>Adrienne Zihlman</td>
<td>The University of California, Santa Cruz</td>
</tr>
<tr>
<td>1995</td>
<td>Martin Lockley</td>
<td>The University of Colorado at Denver</td>
</tr>
<tr>
<td>1996</td>
<td>Timothy J. Palmer</td>
<td>The University of Wales, Aberystwyth</td>
</tr>
<tr>
<td>1997</td>
<td>Jeffrey F. Mount</td>
<td>The University of California, Davis</td>
</tr>
<tr>
<td>1998</td>
<td>Mary Droser</td>
<td>The University of California, Riverside</td>
</tr>
<tr>
<td>1999</td>
<td>Bruce Latimer</td>
<td>The Cleveland Museum of Natural History</td>
</tr>
<tr>
<td>2000</td>
<td>Paul C. Mayewski</td>
<td>The University of New Hampshire</td>
</tr>
<tr>
<td>2001</td>
<td>Carlton E. Brett</td>
<td>The University of Cincinnati</td>
</tr>
<tr>
<td>2002</td>
<td>Douglas H. Erwin</td>
<td>The Smithsonian Institution</td>
</tr>
<tr>
<td>2003</td>
<td>Mark A. Norell</td>
<td>The American Museum of Natural History</td>
</tr>
<tr>
<td>2004</td>
<td>Lonnie Thompson</td>
<td>The Ohio State University</td>
</tr>
<tr>
<td>2005</td>
<td><strong>Patricia H. Kelley (’75)</strong></td>
<td>University of North Carolina at Wilmington</td>
</tr>
<tr>
<td>2006</td>
<td>Orrin H. Pilkey</td>
<td>Duke University</td>
</tr>
<tr>
<td>2007</td>
<td>Richard Alley</td>
<td>Pennsylvania State University</td>
</tr>
<tr>
<td>2008</td>
<td>Paul Olsen</td>
<td>Columbia University</td>
</tr>
<tr>
<td>2009</td>
<td>David A. Burney</td>
<td>National Tropical Botanical Garden, Hawaii</td>
</tr>
<tr>
<td>2010</td>
<td>James W. Hagadorn</td>
<td>Amherst College</td>
</tr>
<tr>
<td>2011</td>
<td>M. Susan Lozier</td>
<td>Duke University</td>
</tr>
<tr>
<td>2012</td>
<td><strong>George Davis (’64)</strong></td>
<td>University of Arizona</td>
</tr>
<tr>
<td>2013</td>
<td>Michael D. Mann</td>
<td>The Pennsylvania State University</td>
</tr>
<tr>
<td>2014</td>
<td><strong>Jessica Conroy (’03)</strong></td>
<td>University of Illinois, Champaign-Urbana</td>
</tr>
<tr>
<td>2015</td>
<td>Scott White</td>
<td>University of South Carolina</td>
</tr>
<tr>
<td>2016</td>
<td>Patrick O’Connor</td>
<td>Ohio University</td>
</tr>
<tr>
<td>2017</td>
<td>Rob Thieler</td>
<td>USGS Coastal and Marine Geology Program</td>
</tr>
<tr>
<td>2018</td>
<td>Maureen Raymo</td>
<td>Lamont-Doherty Core Repository Director</td>
</tr>
</tbody>
</table>

Our 2019 Osgood Lecturer will be Dr. Alycia L. Stigall, Department of Geological Sciences, OHIO Center for Ecology and Evolutionary Studies, Ohio University.
Ann (Strouse) Fox (’52) – “Since graduating from Wooster 66 years ago, I’ve spent 10 years in 4 U.S. states interspersed among 26 years in Libya, Pakistan, The Netherlands, and Scotland as a geologist and accompanying spouse. For 30 years in Athens, Ohio, I am active co-principal of a small gas and oil business in West Virginia. One of my 4 children is a petroleum geologist and engineer. Geology at Wooster opened up a busy and interesting life for me and sparked a major interest in US and world affairs, government and politics.” ❖

Robert Sponseller (’58) – “I am well at 90, and continue to work on the family farm (purchased by grandparents in 1899) as owner and maintenance man. Thanks to Wooster’s liberal education, I have been a geologist with the PA survey, aerospace (Rockwell BSB Bomber), industrial sales rep (NE U.S.), mechanical draftsman/designer; and vocational ed. instructor. Life has been good; retired in 1996, and I stay busy on my farm. Son, Dan, wants to be the 4th generation owner. Attending Wooster College was the best decision that I ever made. Thanks so much.” ❖

David Moore (’61) – “My wife Marta (Keller, ’65) and I have lived on a farm in Colorado for 18 years where we happily care for chickens and llamas. Earlier this month (June 2018) I led a geologic tour for the Sierra Club of an area being considered by an oil company for oil and gas drilling. It’s pristine land and drilling there is a concern for conservationists. In May I completed a geologic map of Pagosa Springs, CO, area to be published in 2018 by the USGS in Denver.” ❖

Dave Lazor (’66) – “Barbara (Stevens, ’66) and I have 10 acres of woods near Mt. Rainier where we are visited frequently by deer, elk, and an occasional bear. Barb continues to sew, including making quilts for veterans. I recently injured a knee and had to stop playing senior softball.” ❖

Bruce Elijah (’72) – “Retired after 44 years of exploration and development project work including sample collection, core acquisition, with lab and petrophysical evaluation of 16-24 source beds on 4 separate continents. Over the course of my career I have drilled wells on 6 continents and mentored more than 25 geologists in field work, mapping skills, and prospecting. I have worked onshore and offshore in all the oceans and have been pleased to work on exploration teams that have found over 500MMBO and 3TCF gas. I have enjoyed the travel and the people I have met along the way.” ❖

James Clough (’75) – “After 34½ years as a geologist for the State of Alaska Division of Geological & Geophysical Surveys, I retired in July 2015. It was a rewarding and fun-filled career doing carbonate sedimentology and conducting oil & gas, coal and other energy-related research, lots of time spent in mountain ranges throughout Alaska! I was also, and continue to be, involved in Arctic tectonic studies with colleagues in the U.S., Canada, Norway, Sweden, and Russia. I am currently an Affiliate Professor in the Petroleum Development Lab at the University of Alaska, Fairbanks, where I mentor graduate students and help on research projects. I am also involved in geological consulting through my LLC since December of 2015. I welcome any Wooster classmates
visiting Alaska (or not) to get in touch with me to share stories from back in the day and to catch up on life since Wooster. Cheers!” ❖

**Patricia (Hagelin) Kelley (’75)** – “I continue to enjoy retirement. My research continues to keep me busy, and I’m also on the Board of Directors of the Association for Women Geoscientists. I am still a Distinguished Lecturer for the Paleontological Society and lectured at 10 institutions this past year, including a week lecturing and conducting workshops at University of Tokyo. I love helping with my grandchildren and spent a lot of time in Seattle this past year, where both of our children coincidentally relocated last summer.” ❖

**Karen Havholm (’76)** – “Still enjoying running the undergraduate research program at UW-Eau Claire. I am enjoying being involved in various projects at the national level through the Council on Undergraduate Research. My daughter is completing a Ph.D…..in Geology.” ❖

**Curtis Freeman (’78)** – “The minerals exploration business is in high gear again, due primarily to demand for metals of all sorts. Alaska remains under-explored and the lure of the North country that brought me here from Wooster is still strong!” ❖

**Rob Wheatcroft (’81)** – “Currently advising my last graduate student, who is working on a study of sediment and carbon accumulation in Oregon estuaries following the 1700 CE magnitude 9.0 subduction zone earthquake.” ❖

In May of this year **Mike Kozar (’83)** stopped in to visit us. ❖

**Jim Willard (’83)** stopped in for a visit and left a note that he still has fond memories of field work in the Bird Spring Formation in Nevada during the summer of 1982 with **Eric Tissue (’83)** and Dr. Wilson. ❖

**Ben LeVan (’84)** recently earned his doctorate in Human Resource Development and is currently serving as a professor of management and leadership at Charleston Southern University. He was awarded the Esworthy Malcolm S. Knowles Dissertation of the Year Award by the Academy of Human Resource Development and has published an article entitled “Perceived Accuracy and Utility of Performance Appraisal in Small versus Large Firms” in *The Journal of Applied Management and Entrepreneurship.* ❖

**Laura Campbell (’97)** also has her culinary degree from the Culinary Institute of America. She is a culinary instructor at a Cleveland nonprofit where she teaches about food and cooking as it relates to evolution. ❖

**Nathan Wilds (’97)** – “We moved to Wooster! My wife, Sarah (’97 – Communications Sciences and Disorders), recently accepted a promotion through her job that is based in Wooster. I am able continue my work (telecommute) as a data analyst for the University of Illinois.” ❖
Anne (Krawiec) Hamlin ('06) – “We welcomed our first child, Anderson Reed Hamlin, into the world on January 27, 2018!”

Caitlin Fetters ('09) – “I recently received a promotion at the University of Illinois at Chicago. My new position will include advising undergraduate students majoring in Biological Sciences, Neuroscience, and Integrated Health Studies.”

Jesse Davenport ('11) visited the first meeting of GeoClub and shared his experiences of life after graduation. Information can be found here http://woostergeologists.scotblogs.wooster.edu/2017/08/31/jesse-davenport-11-returns-to-geoclub/

Stephanie Jarvis ('11) is currently a Ph.D. student at University of Colorado, Boulder.

Andrew Collins ('12) has been working a temporary position as a Physical Science Technician at Kenai Fjords National Parks. His position ends in October 2018.

Richa Ekka ('13) is working as an Environmental Advisor at Laing O’Rourke in Melbourne, Australia. She visited campus in July.

Jonah Novek ('13) is a Hydrogeologist at Wisconsin Department of Natural Resources.

Lauren Vargo ('13) – “I’m currently in New Zealand working on my Ph.D. - quantifying changes in New Zealand glaciers since ~1980 using aerial photos, and then using glacier models to investigate the drivers of these recent changes (precipitation or temperature? anthropogenic warming or climate oscillations?). Between doing heaps of field work, including aerial surveys from small planes and glacier mass balance surveys, I’m just trying to keep getting work done!”

Congratulations, Lauren Vargo on having a paper accepted to the Journal of Glaciology and on winning the RHT Bates Postgraduate Scholarship from the Royal Society of New Zealand. So proud of your work in understanding how glacier fluctuations respond to climate change. Thank you to the Royal Society for supporting science, technology and humanities.

Oscar Mmari ('14) is now a Production Geoscientist at Shell and pursuing his MSc in Petroleum Geoscience at Imperial College London.

Zach Downes ('15) – “For most of 2018 I have been on an exploratory drilling project. We’re mapping a lithium-bearing pegmatite unit to determine the profitability of mining it.”

Sarah Frederick ('15) received her M.A. in geography from The University of Arizona and is moving to Seattle where she will be working as a Physical Scientist for the EPA.

Julia Franceschi ('16) – “Starting in January I am going to Parks Law Enforcement Academy in Washington to pursue a career as a National Park Law Enforcement Ranger.”
Madeline Happ ('16) is a Group Lead Instructor at Elements Wilderness Program in Salt Lake City, Utah.

Mae Kemsley ('16) works at ECS Mid-Atlantic as an Assistant Staff Geotechnical Project Manager.

Brittany Nicholson ('16) graduated with an M.S. in Environmental Analysis and Decision Making and is working as an Environmental Policy Specialist at Houston Wilderness.

Etienne Fang ('17) is currently an Environmental Protection Specialist for the Department of Energy & Environment (DOEE).

Congratulations to Annette Hilton ('17)! Her first publication from her I.S. research was accepted by the journal Remote Sensing, she is also preparing to apply for a Ph.D. in environmental geology for the fall of 2019.

Andrew Wayrynen ('17) is working as a Copyeditor and Quality Reviewer at Opportunity Education.

рожрозмір

We are saddened by the deaths of the following alumni and friends:

Don W. Byerly ('55), 4/25/18
August H. Wells ('54), 12/5/17
Richard Liebe ('66) 10/18/16
Rob Piscetta ('87), 8/27/17
(see p. 37 for information on the Piscetta scholarship)
If you would like to give a gift to the Geology Department, feel free to send your gift directly to the Department or to the College Development Office. It is very helpful to us if you designate how you would like your gift to be used, or if you would like it placed in a specific fund. Gifts that are not specifically designated will go in the general Geology Department annual budget to be used for the day-to-day operations of the department.

Thank you to the following individuals for their generous gifts to support the Department of Geology: Ann Marie Horton, Ann Gaither, Margaret Manger, David Morse ('67), John Raker, The National Christian, and Molly Miller.

The James R. Baroffio Fund for Geologic Research helps defray expenses for analytical work (i.e., major element, trace element, isotopic, and geochronologic studies) for Seniors I.S. engaged in Independent Study. We thank Jim and Ginny Robertson ('69) for designating gifts to this account.

F.W. Cropp III Endowed Fund for Independent Field Work in Geology helps defray expenses for field work done by Geology majors for their Senior Independent Study Theses. We thank Betty and Ted Doty, Jim and Ginny Robertson ('69), and Jay Henthorne, Jr. for designating gifts to this account.

The George H. Davis Endowed Research Fund helps support creativity and fieldwork carried out by geology majors engaged in Senior Independent Study (travel, field, lab, or other research related expenses) when the I.S. includes geologic mapping and/or field-based structural geology as core components.

The W. R. “Ted” Danner Fund for Student Geological Fieldwork helps defray field expenses for students and faculty engaged in geological fieldwork, whether in courses or in Independent Study. We thank Mr. and Mrs. Thomas Berg, and Donald Holt and Roxanne Baumgartner for designating their gifts to this account.

Karl Ver Steeg/C.B. Moke Fund for Geologic Research helps defray field expenses for students and faculty engaged in Senior Independent Study.

Stanley M. Totten Geology Student Research Fund supports The College of Wooster Geology majors and their research related to their major.

The Sherman A. and Florence M. Wengerd Department of Geology Endowed Fund is used to purchase equipment and supplies for undergraduate teaching and research in the areas of sedimentology and stratigraphy. The fund also supports faculty travel in preparation for Senior Independent Study projects in any geological field. We thank Mark and Gloria Wilson ('78's) for designating their gift to this account.
ALUMNI INFORMATION SHEET

Name: ____________________________________________________________

Other Name (if applicable): __________________________________________

Class Year: ____________ I.S. Advisor: __________________________________

If your home contact information has changed, please update below.

Home Address: __________________________________________________________

____________________________________________________________________

Telephone: ______________________ E-mail: ____________________________

Please complete if advanced degrees have been earned.

Advanced Degree: __________________________ Year: _____________________

Institution: ______________________________

Advanced Degree: __________________________ Year: _____________________

Institution: ______________________________

Please update below, if needed.

Occupation: _________________________________________________________

Position Title: _______________________________________________________

Business Name and Address: _____________________________________________

____________________________________________________________________

____________________________________________________________________

Telephone: ______________________ E-mail: ____________________________

News you would like us to share in the Annual Report (please use back if necessary).

Thank you for responding to this request. You may complete this form at https://tinyurl.com/2018-2019-GeologyAlumniUpdate, or send to us via U.S. Mail, fax (330-263-2249), or by e-mail to preeder@wooster.edu
Scovel Hall, originally built in 1902 and renovated in 1983-1984, is the home of the Departments of Geology, Philosophy, and The Pre-Law Advising Program. It bears the name of Dr. Sylvester F. Scovel, the third president of The College of Wooster.

http://www.wooster.edu/academics/areas/geology
http://woostergeologists.scotblogs.wooster.edu/

Don’t forget to “friend” us on Facebook.