

EPICENTERS

THE NEWSLETTER OF THE DEPARTMENT OF EARTH & PLANETARY SCIENCES



JUDD A. AND MARJORIE WEINBERG COLLEGE OF ARTS AND SCIENCES
NORTHWESTERN UNIVERSITY | 2018

Message From the Chair



*Greetings to all
friends of Earth
& Planetary
Sciences,*

Welcome to the newest edition of the EPS newsletter. I officially became chair in September and want to recognize the extraordinary

efforts of my predecessor, Brad Sageman, who served in the role for 12 years. It is remarkable to reflect on how the department has grown under his skillful leadership with respect to faculty research expertise and our undergraduate and graduate programs. He worked tirelessly to enhance our analytical capabilities and facilitated the department's move from Locy Hall to the Technological Institute on the north end of campus. On a personal level, I want to thank Brad for being such a wonderful mentor and colleague, and perhaps most importantly, a good friend. For all of this and much more, thank you Brad!

I am both proud and excited to lead a department with so many talented faculty, students and staff. We continue to be at the forefront of innovation (research and teaching) in our ongoing efforts to better understand the processes that shape Earth and other planets. I encourage you to read more about these efforts in the pages that follow. In addition to welcoming a new cohort of graduate students and the return of Rosemary Bush (PhD 2014) as a Weinberg College Advisor and an Assistant Professor of Instruction in EPS (see below), we were thrilled to host Francis Albarède this fall as the 2018 inaugural Nemmers Prize in Earth Sciences recipient (see page 3).

Importantly, we have been fortunate to receive alumni support and your gifts allow us to offer extraordinary opportunities to our students like the field course that took place this past summer through parts of Colorado and Utah (see page 9). Please keep in touch and stop by and see us if you are in the Evanston area. We hope you have a wonderful 2019!

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We Welcome Back Rosemary Bush

Rosemary Bush (PhD 2014), returned to Northwestern this year as both a Weinberg College of Arts and Sciences Academic Advisor and an Assistant Professor of Instruction in Earth and Planetary Sciences. In addition to her advising duties, Rosemary will teach courses in the areas of her expertise. The department warmly welcomes back one of its own!



Alumni Spotlight: Richard House (MS 1955)

Members of the department recently reconnected with alumnus Richard "Dick" House who completed his MS in 1955 under the direction of Arthur Howland. Dick announced his intention to establish the Doug House Endowment Fund in the department in honor of his son who passed away earlier this year. Dick was born in Johnson City, NY, and received a geology degree from Wheaton College. He applied to the graduate program at NU, but his application was rejected. However, Dick was persistent and made his way to Evanston and University Hall to plead his case. He spoke with Arthur Howland, who was chair of the department from 1945 to 1970 (that's right, 25 years), and asked that the department reconsider accepting him for graduate studies. Howland decided that anybody who

was willing to make the effort Dick made to pursue graduate work at NU deserved a chance, and he admitted Dick as his own student. Not long after completing his graduate work at NU, Dick hopped on a bus (without a cent to his name) to New Orleans, LA. That bus happened to stop directly in front of Texaco. So, he marched up to the door and explained he was a geologist and wanted a job. Sure enough, they hired him! He worked at Texaco for ~15 years before striking out on his own and developing a very successful drilling operation. The extremely generous donation of 1 million dollars will support the research and teaching mission of EPS and support graduate students for generations to come. The department is eternally grateful!

Front cover:

Melissa Chipman and Laura Larocca pose with a 4.5 meter sediment core recovered from a glacial lake in South Greenland. The 5-week expedition was part of Yarrow Axford's NSF-funded project to study South Greenland's Holocene climate history and how the region's alpine glaciers have responded to past sustained warm periods. Photo by Everett Lasher.

Francis Albarède Receives Nemmers Prize in Earth Sciences

It has been the department's privilege to host the inaugural recipient of Northwestern's Nemmers Prize in Earth Sciences, Professor Francis Albarède. Prof. Albarède has been recognized for his achievements in high-temperature geodynamic processes, planetary sciences, and marine geochemistry. An Emeritus Professor at the Ecole Normal Supérieure de Lyon in France, he has revolutionized the field of isotopic analysis through his development of multiple-collector inductively-coupled plasma mass spectrometry, which has become a standard in the field. Furthermore, he has pursued understanding of unconventional isotopic systems such as zinc and copper; he has applied geochemical techniques to varied fields such as medicine and history; and he has combined chemical and physical models to understand natural processes including, for

example, iron in ancient oceans, the history of volatiles on the Moon, and the origin of life. He is a Fellow of the American Geophysical Union, the Geochemical Society, and the European Association of Geochemistry, as well as the author of over 225 peer-reviewed papers and four books.



Albarède's public lecture. Photo by Jim Ziv.

Prof. Albarède spent the 2018 fall quarter at Northwestern where he interacted with students, faculty, and the general public. He spoke at the department's seminar series, addressed the 2018 Midwest Geobiology Symposium, presented a public lecture entitled "How Silver Became Money," and participated in a weekly seminar series with graduate students and postdoctoral researchers. Prof. Albarède will return to Northwestern for a week in the spring to attend the Nemmers Prize award reception.

What is the Nemmers Prize?

Northwestern University's Nemmers Prize recognizes scholars who have made major contributions to their field of study. Recipients of the prize receive \$200,000 and residency at Northwestern for one quarter, so that they may present lectures, participate in departmental seminars, and engage with Northwestern faculty and students. These prizes are awarded biennially in the fields of Economics and Mathematics (both established in 1994), Music Composition (established in 2004), Medical Science (established in 2015), and now Earth Sciences. The Nemmers Prizes are made possible through bequests from the late Erwin E. Nemmers, a former member of Northwestern's Kellogg School of Management, and his brother the late Frederic E. Nemmers.

In Memoriam

We are sad to share the news of the passing of two individuals who contributed greatly to the department, Northwestern University, and beyond.

Laurence Hewitt Nobles

(9/28/1927–4/1/2018)

Larry Nobles began his career at Northwestern in 1952 as a Professor of Geological Sciences, where he remained until retirement in 1990. His research was in the field of geomorphology and focused on the effects of active glaciers on landforms in Greenland and Alaska. He also assumed various administrative positions within the University at large, from Dean of the College of Arts and Sciences to Vice President for Administration and Financial Planning. Nobles' public activities included service as Trustee of the Adler Planetarium of Chicago, President of the Chicago Academy of Sciences, and Honorary Trustee of the Chicago Academy of Sciences.

Johannes Weertman

(5/11/1925–10/13/2018)

Johannes Weertman joined the Northwestern community in 1959 as a professor (and later department chair) in the Department of Materials Science. He maintained a joint position within the Department of Geological Sciences, due to his deep interest in the study of glaciology and the migration of subglacial lakes. In fact, while working at the US Naval Research Laboratory prior to his position at Northwestern, his dedication to applying geophysics to the study of glacier flow resulted in an island being named after him—Weertman Island—near the Antarctic coast. Beyond the University, he was an active member of the American Academy of Arts and Sciences and the National Academy of Engineering.



Professor Larry Hewitt Nobles



Professors Julia and Johannes Weertman

EPS HIGHLIGHTS



YARROW AXFORD: It's been an exciting year in the Quaternary Sediment Lab (QSL). Graduate student **Laura Larocca** garnered NSF support for her research on past glacier fluctuations, and led a productive field expedition to the mountains of south Greenland (photos on the cover and page 12). Graduate student **Everett Lasher** presented recent research on warm climate during Medieval Norse settlement at the Fall AGU meeting, and Graduate student **Jamie McFarlin** published a rare record of Last Interglacial climate on Greenland in *Proceedings of the National Academy of Sciences*. Undergraduates **Peter Puleo**, **Annika Hansen** and **Christine Lee** made important contributions to QSL research. Postdoc **Melissa Chipman** starts a tenure-track position at Syracuse University in January, where she will continue leading a National Geographic-funded investigation of Greenland's fire history in collaboration with Yarrow Axford. Yarrow has enjoyed another year working with this team and NU collaborators Prof. **Maggie Osburn** and Research Associate **Mitch Barklage**. Outside the lab, she is pleased to have helped obtain funding from Northwestern for a 2019 mentorship program for women postdocs and grad students in STEM.

PATRICIA BEDDOWS: The year has featured a number of happy successes and great research travel—central Mexico, Bahamas, Vancouver Island, and of course the Yucatán Peninsula. The inaugural publication of the Cave Pearl Project data-logger in February 2018 is now headed to 5000 downloads. This multi-year effort in instrument design cross tabs with teaching efforts, notably the problem-based course EARTH360 Instrumentation & Field Methods. It is a pleasure to place on the Associated Student Government Faculty Honor Roll based on nominations

from EARTH360. Thank you! Graduate student **Emiliano Monroy-Ríos** is in review with his new genetic model for the Ring of Cenotes overlying Chicxulub Crater, and another paper "On the Tectonic Stability of the Yucatán Block" is approaching submission. It is equally a pleasure to work with undergraduate students: **Katherine Haile's** senior thesis work examines the hydrogeology decoupling of the coastal Yucatán mangrove basins from the groundwater/coast, and **Abigail Lammers** is providing cloud based computational tools for environmental data. I welcome Graduate student **Karyn DeFranco**, with a vision of working along with Prof. **Andy Jacobson** on Sr and Ca isotope dynamics in the Yucatán Peninsula.

CRAIG BINA continues his collaboration on subduction dynamics with colleagues at Charles University in Prague, Czech Republic, some results of which were presented at the 15th International Workshop on Modelling of Mantle and Lithosphere Dynamics in Putten, The Netherlands, and at the European Geosciences Union General Assembly in Vienna, Austria. He also continues his research collaboration on metastable minerals with colleagues at the University of Hawai'i at Mānoa, some results of which (featuring silicon in five-fold coordination) were published in *Geophysical Research Letters*, and he renewed his appointment as an Affiliate Graduate Faculty Member there. In August he was an invited speaker in Yokohama, Japan, at the 2nd Asia-Pacific Workshop on Lithosphere and Mantle Dynamics. He continues to co-advise graduate students, largely with Prof. **Steve Jacobsen**, and to serve on the editorial board of *Progress in Earth and Planetary Sciences* for the Japan Geoscience Union.

NEAL BLAIR's Carbon-Biogeochemistry Laboratory has focused on being a part of the National Science Foundation's (NSF's) Intensively Managed Landscape - Critical Zone Observatory (IML-CZO). The "Critical Zone" is the part of the Earth's surface, soils, water, atmosphere and ecosystems critical for our survival. The lab group's part of the project is to determine how agricultural activities influence the export of carbon from land to streams and rivers. They also study the fate of carbon trapped by reservoirs, now recognized to be globally important in terms of carbon-sequestration and methane emission. The group is also attempting to determine if land use, such as agriculture, is a net source or sink of carbon to the atmosphere.

ROSEMARY BUSH has returned to Northwestern in a dual role as both an Assistant Professor of Instruction in Earth and Planetary Sciences and a College Advisor in the Weinberg College of Arts and Sciences. She will teach courses in the areas of paleobotany and environmental science. Rosemary is also continuing her paleobotanical research and is currently conducting research at the Chicago Botanic Garden. She is a co-author on a publication that will come out in January in *Geochemica et Cosmochimica Acta*, with three further papers in various stages of preparation and revision.

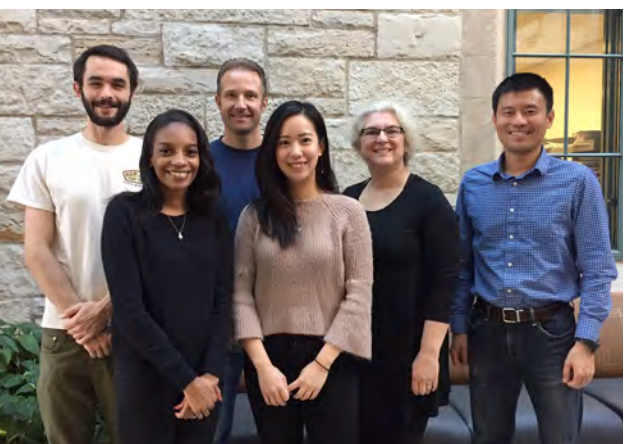
DANIEL HORTON's Climate Change Research Group (CCRG) had an exciting year of academic milestones and research endeavors. The group began work on a collaborative NSF-funded project using the Array of Things sensor network and numerical models to better understand Chicagoland's neighborhood-scale extreme meteorological and air pollution events; work that will become the focus of the CCRG's newest addition, Graduate Student **Anastasia Montgomery**. Ongoing air pollution research led by Ubben postdoc **Jordan Schnell**, has begun looking at the interaction of atmospheric chemistry, vehicle transport, and energy generation to elucidate the air quality benefits and consequences of an electric vehicle transition. Graduate student **Yuxi Suo** earned her Master's degree while investigating the influence of anthropogenic climate change on air pollution events by studying their underlying meteorological conditions. In addition, two graduating seniors completed their honors theses under Dan's direction—**Katie Braun (BA 2018)** investigated Lake Michigan wetland carbon erosion and **Chris Callahan (BA ENV SCI 2018)** researched the effects of climate change on Beijing's hazardous winter air pollution events. For their efforts, both graduates garnered Most Outstanding Thesis honors. Lastly, Graduate student **Howard Chen** published his first CCRG manuscript, detailing his novel usage of climate models in the search for life on other planets, in *Astrophysical Journal Letters*.

MATTHEW HURTGEN and the sedimentary geochemistry research group continue to reconstruct ocean chemistry through time to better understand the relationship among carbon cycle disruption, environmental change and extinction events. Graduate student **Jiuyuan Wang**, co-advised by Profs. **Andy Jacobson** and **Brad Sageman**, is measuring

the Ca and Sr isotope composition of Neoproterozoic post glacial (Marinoan) cap carbonates to better resolve the balance between global weathering and carbonate burial rates and their relationship to environmental changes that followed Snowball Earth events and preceded the Ediacaran diversification of life. Graduate student **Nilou Sarvian**, co-advised by Prof. **Andy Jacobson**, is exploring Neoproterozoic carbon cycle dynamics and global-scale glaciation using the Ca and Sr isotope composition of rocks deposited prior to the Sturtian Snowball Earth event. Former graduate student **Brian Kristall (PhD 2016)** published a paper presenting an expanded Early Cretaceous sulfur isotope record to identify the mechanisms responsible for driving the chemical evolution of the Early Cretaceous ocean.

STEVE JACOBSEN's group studies Earth and planetary materials in extreme environments. In 2018, Graduate student **Michelle Wenz** held an internship at the Gemological Institute of America examining superdeep diamonds from the lower mantle. Graduate student **Fei Wang** published a paper in *G-cubed* on predicting seismic signatures of water in the mantle transition zone. Graduate student **Hannah Bausch** attended the pulsed-power workshop at Sandia National Lab to develop shockwave experiments relevant to exoplanetary interiors. NSF-postdoc **Alisha Clark**, who studies the physical properties of silicate melts, accepted a faculty position at University of Colorado Boulder. NSF-postdoc **Lily Thompson** is conducting experiments on hydrous Mg-silicates at the Advanced Photon Source. Among recent graduates, **Joshua Townsend (PhD 2016)** accepted a research position at Sandia National Lab, and **John Lazarz (PhD 2018)** started a postdoc at Los Alamos. Jacobsen is editor of *Geophysical Research Letters* and serves on the National Academy of Sciences CORES committee for NSF-EAR to identify funding priorities for the coming decade.

ANDY JACOBSON congratulates **Grace Andrews (PhD 2018)**, who defended her dissertation and began a postdoc position at Southampton University, and he welcomes graduate student **Karyn DeFranco**, who will be co-advised with Prof. **Patricia Beddows**. Other members of the Jacobson group include Research Associate **Meagan Ankney**, Postdoc **Ben Linzmeier**, graduate students **Gabby Kitch**, **Annie Nelson**, **Nilou Sarvian**, and **Jiuyuan Wang**, and undergraduate student **Tia Chung-Swanson**. In collaboration with Profs. **Matt Hurtgen** and **Brad Sageman**, several students are using a combination of B, Ca, and stable Sr isotopes to quantify "deep time" ocean acidification events. Time periods of interest include the Neoproterozoic (Sarvian and Wang), OAE 1a (Wang), OAE 2 (Kitch), the K-Pg (Linzmeier), and the PETM (Kitch). Other students are focusing on the Ca and stable Sr isotope geochemistry of chemical weathering. Field sites include Iceland (Nelson) and the Yucatán Peninsula (DeFranco). Jacobson continues to serve as associate editor for *Geochimica et Cosmochimica Acta*, while also directing Northwestern's Environmental Sciences Program.



The Planetary Physics and Chemistry group led by Professor **SETH A. JACOBSON** grew in size dramatically during its inaugural year, with graduate students **Jackson Barnes** and **Gabriel Nathan** in their first year. Jackson has begun his research studying the origin of planetesimals—the building blocks of planets, many of which are leftover in the main asteroid and Kuiper belts as asteroids and comets. Gabriel has begun investigating the effects of core formation on the mantle chemistry of small terrestrial planets like Mars and the Moon, which for these purposes can be thought of as a planet in its own right. Four undergraduate students from the group presented their work at national meetings and are preparing them for publication. **Nathan Hung** presented his work on understanding the role giant impacts play on planetary dynamics, **Claudia Sandine** presented her work examining the fate of the planetary debris generated by those same impacts, **Jeremy Brooks** looked at how near miss events effect the dynamics of planetary moons like our own, and REU student **Alexandra Detweiler** tested whether certain oft-used initial conditions in planetary simulations are physically plausible.

DONNA JURDY's research focuses on tectonic and volcanic activity on terrestrial planets, Venus and Mars, and also the outer satellites. This year she's actively involved with a student group in a NASA competition to design and fabricate a Mars Habitat (photo on page 8). The Northwestern group placed 5th, top among university entries, now proceeding to the next phase of the competition with tons of concrete being poured for a wall! Working with the SPREE project, she and **Michael Campbell (BA 2018)** used seismic reflection data for velocities and structural information for the North American Mid-Continent Rift. With the Association for Women Geoscientists (AWG), she continues to chair their Professional Excellence Award, an award she initially proposed. Currently underway: her campaign to build an endowment for the AWG's Chrysalis Scholarship for women graduate students finishing degrees. Regularly serving on national fellowship panels, she has successfully advised numerous department students and others on their fellowship applications.

As Professor Emeritus, **EMILE OKAL** pursues his research on tsunamis and the quantification of earthquakes with his continuing graduate students, **Amir Salaree** and **Nooshin Saloor**. He is also involved in worldwide efforts for the preservation of historical seismological archives. This year, he took research trips to France, French Polynesia, the Netherlands and Greece, and gave invited lectures in Chile and Singapore. He also taught a 24-hour tsunami course in Tunis in November, and lectured in Paris, Korea, Oman, Kazakhstan and Kyrgyzstan.

For the last three years, **ABRAHAM LERMAN's** research has continued to be in the field of the biogeochemical cycles of the past and present and in planetary science. In the field of terrestrial geochemistry, Abe Lerman and Fred Mackenzie, continuing their long-time collaboration, completed two articles, "Carbonate Minerals and the CO₂-Carbonic Acid System" for *Encyclopedia of Geochemistry* and "Global Biogeochemical Cycling" for *Oxford Research Encyclopedia of Environmental Science*. In the field of planetary science, Abe presented on behalf of co-authors **Ashley E. Gilliam (PhD 2016)**, and Prof. Jared Wunsch, "Explicit and Asymptotic Solutions of Simultaneous 1st-order and Riccati Equations for a Gas Reaction System" at the 2017 European Conference on Applied Mathematics and Informatics in Cambridge, UK. He also chaired one session at that conference.

MAGGIE OSBURN: The Osburn Isotope Geobiology Laboratory continued to grow in number and expand into new field areas in 2018. Its primary research areas are deep subsurface geobiology, lipid biomarkers as climate proxies, and microbial dark matter. Maggie's team, including graduate student **Caitlin Casar**, continued their work at the Deep Mine Microbial Observatory including two field trips this year. Graduate student **Jamie McFarlin** had her

Photos, top to bottom, left to right:

John Lazarz's 2018 PhD defense, with Brad Sageman, Steve Jacobsen, and Craig Bina

Earthquake Detective Team—Jordan Nelson, JaCoya Thompson, Boris Rösler, Vivian Tang, Suzan van der Lee, Kevin Chao

Axford Lab Group (photo by Eileen Molony)—Peter Puleo, Melissa Chipman, Karalyn Berman (BA 2018), Yarrow Axford, Laura Larocca, Everett Lasher

Matt Jones' 2018 PhD defense, with Brad Sageman

first paper published in *PNAS* and is preparing to defend early next year. Jamie was also awarded the departmental Scott award. Three of the group's senior undergraduates walked at graduation in June, and **Hannah Dion-Kirschner (BA 2018)** and **Jordan Todes (BA 2018)** shared the Schlanger award. The summer and fall featured lots of field work with trips to Lava Beds National Monument (photo on page 12) with new graduate student **Matt Selensky**, to hypersaline lakes in British Columbia on a newly funded Exobiology project, and to Mammoth Cave National Park. In October the lab group hosted the Midwest Geobiology Symposium. The group also welcomed new postdoc **Lily Momper** in November.

BRAD SAGEMAN completed 12 years as department chair at the end of August 2018 and celebrated in the field, where he was leading his advanced stratigraphy field course in Colorado and Utah (photos on page 9). He plans to spend time in Australia and England during his 2019 sabbatical. Brad serves as advisor to graduate students **Luca Podrecca**, **Jiuyuan Wang**, and **Matt Jones**. Luca completed an M.S. at Rutgers (2018) and will work on chemo- and sequence stratigraphy of the Cretaceous Western Interior. Jiuyuan completed an M.S. at Penn State (2014) and is co-advised by Profs. **Andy Jacobson** and **Matt Hurtgen** on Ca and Sr isotopic analysis of major biogeochemical events in the Neoproterozoic, Permo-Triassic, and mid-Cretaceous. **Matt Jones (PhD 2018)** just successfully defended an excellent thesis on the integrated chemostratigraphy of Cretaceous strata spanning core and outcrop material from lacustrine deposits, epicontinental marine sites, and ODP cores; he is starting a post doctoral fellowship at University of Michigan, Ann Arbor in January.

SETH STEIN: Graduate students **Reece Elling** and **Molly Gallahue**, Research Associate **Mitch Barklage**, visiting scholar **Carol Stein**, collaborators and I are studying the structure and evolution of North America's Midcontinent rift, to learn more about this huge feature and what it tells us about how continents break apart to form new oceans. Graduate students **Edward Brooks**, **Leah Salditch**, and **James Neely**, undergraduate **Madeline Lucas**, Statistics professor Bruce Spencer, collaborators and I are exploring a broad range of issues in earthquake seismology including how well hazard maps forecast the shaking from natural and human-induced earthquakes, why large earthquakes occur in temporal clusters, and what controls the magnitudes of earthquakes in different tectonic settings. We seek to better understand the basic science and use the results to help society mitigate the resulting hazards.

SUZAN VAN DER LEE's seismology group welcomed new graduate student **Igor Eufrazio**, who returned to Northwestern after a summer internship in 2016. Three others in her group, graduate students **Vivian Tang**, **Boris Rösler**, and **JaCoya Thompson**, worked on challenges in data-driven science with other IDEAS trainees. They are requesting everyone's help with identifying dynamically triggered events in on-line data via "Earthquake Detective", a zooniverse citizen science project. Boris and Vivian presented their related research at the Fall AGU meeting, where JaCoya presented her research on tidal signals from Midwestern seismometers, and Suzan began her new position of president-elect of the Seismology section. Boris created a new data product, surface wave radiation patterns, hosted on the IRIS web site. Vivian and **Kevin Chao**, a Northwestern data scholar, gratefully rededicated the alumni GPU computer to the mining of . . . small earthquakes. The group, including graduate student **Trevor Bollmann** and alumnus **Michael Witek (PhD 2017)**, published four articles in *Journal of Geophysical Research*. Research Associate **Mitchell Barklage** worked with a summer intern to deliver a geo-activities backpack for use by visitors to the Ryerson Conservation Area, helped teach the IDEAS visualization short course, and taught a new course on applied geophysics.



Photos, top to bottom, left to right:

Osburn Lab Group—Andy Masterson, Grace Schellinger, Caitlin Casar, Jamie McFarlin, Jordan Todes (BA 2018), Maggie Osburn

Aqueous Geochemistry Lab Group—Jiuyuan Wang, Francis Albarède, Andy Jacobson, Meagan Ankney, Annie Nelson, Nilou Sarvian, Gabby Kitch, Karyn DeFranco, Ben Linzmeier

Cave diving field work—Patricia Beddows, Emiliano Monroy-Ríos

Group photo—Brad Sageman, Andy Jacobson, Matt Hurtgen, Ben Linzmeier, Grace Schellinger, Nilou Sarvian, Annie Nelson, Gabby Kitch

2018 DEGREES & STUDENT AWARDS

Doctoral Degrees Conferred

John Lazarz (May)
Effect of Water on Thermoelasticity of Majoritic Garnet: Implications for the Seismic Structure at the Top of the Lower Mantle

Matt Jones (November)
Stratigraphic and Geochemical Investigations of Late Cretaceous Oceanic Anoxic Events and Greenhouse Sea Level Trends

Bachelor Degrees Conferred

Karalyn Berman (June)
Katherine Braun (June)
Michael Campbell (June)
Luis Cartagena (March)
Hannah Dion-Kirschner (December)
Lucero Flores (June)
John Hayes (June)
Ava Polzin (December)
Caroline Schuette (June)
Clark Skillman (June)
Negatwa Tewodros (March)
Jordan Todes (June)

Department Student Awards*

Everett Lasher and
Emiliano Monroy-Ríos
Marion Sloss Award for Outstanding Graduate Teaching Assistant

Matt Jones and
Jamie McFarlin
Horace A. Scott Award for Excellence in Graduate Research

Hannah Dion-Kirschner and
Jordan Todes
Seymour Schlanger Undergraduate Earth Science Award

Amir Salaree
Graduate Service Award

John Hayes
Undergraduate Service Award

Peter Puleo
Junior Year Research Excellence Award

The Elmer Herbaly Scholarship and Seagar Fellowship are given to undergraduate students to assist with engagement in Earth & Planetary Sciences.

Outside Awards & Honors

Eddie Brooks, AGU's 2018 Natural Hazards Grad Research Award

Caitlin Casar, NASA Earth & Space Science Fellowship

Laura Larocca, NSF DDRI Grant

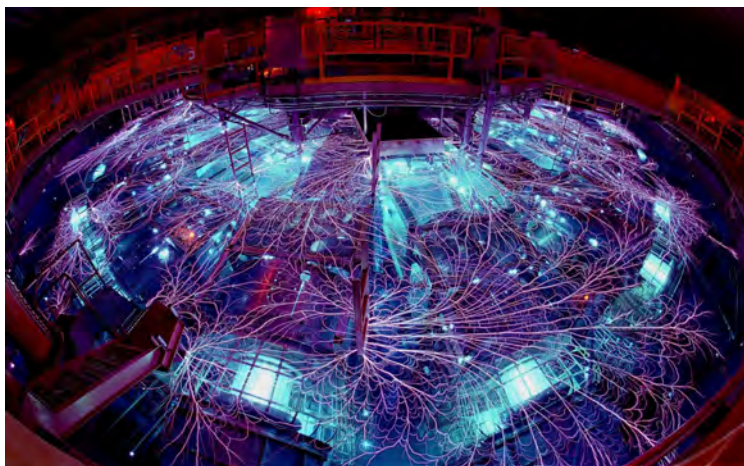
Boris Rösler, Vivian Tang, and JaCoya Thompson, 2018 IDEAS NSF Fellowship

Amir Salaree, AGU Data Visualization & Storytelling Award

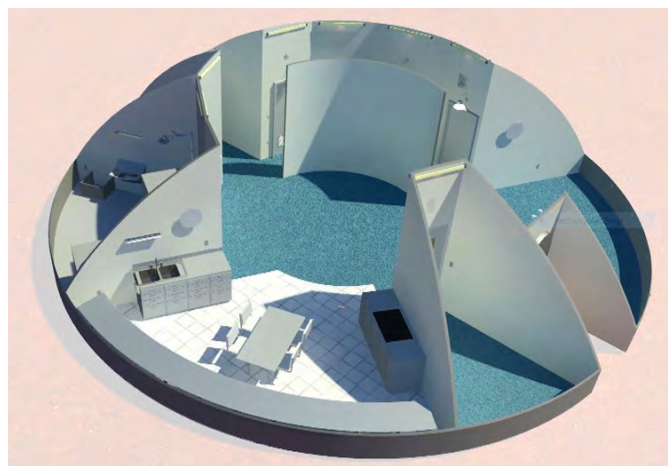
Nooshin Saloor, 2017 AGU Outstanding Student Paper Award

Niloufar Sarvian, 2018-19 ISEN Cluster Fellow

**Department awards made possible by the generous support of our alumni.*



NSF-Postdoc Alisha Clark and Professor Steve Jacobsen were awarded three shots on the Z machine at Sandia National Laboratory. The Z Machine compresses about 20-million amps of electric current into a short pulse lasting only several nanoseconds, creating conditions sufficient for nuclear fusion. Clark and Jacobsen will harness this energy to create a shockwave on the scale of colliding planets to investigate how water could have been incorporated into the early Earth during its formation. - PHOTO BY SANDIA LABS



Professors Donna Jurdy and Seth Stein consulted with Team Northwestern in the 3D-Printed Habitat Centennial Challenge sponsored by NASA and Bradley University. Team Northwestern's Martian habitat placed 5th in the competition, top among university entries. The team has continued on to the next phase of the competition, producing 3D-printed materials and interior designs, with Professor Rosemary Bush adding her botanical expertise for living on Mars.

EARTH 331 FIELD COURSE

EARTH 331 is the field component of a two-quarter course series covering Sedimentary Geology. The class embarked on a 3.5 week-long field trip to Colorado/Utah in late August. This year, the class was taught by outgoing Chair Brad Sageman and incoming Chair Matt Hurtgen (pictured below right with Research Lab Manager Grace Schellinger). The 5 graduate students and 5 undergraduates (pictured below left) worked hard and had the experience of a lifetime.





Don Argus (PhD 1990), a Principal Scientist at the NASA/Caltech Jet Propulsion Laboratory, has been elected a Fellow of both the Geological Society of America and the American Geophysical Union, and won JPL's Ed Stone Award for Outstanding Research Publication. Don developed a new and important interpretation of the implications of the data for western US tectonics, namely Great Basin extension, Sierra Nevada block motion, motion within the Los Angeles Basin, and motions across the California Coast Ranges. He has addressed the coupling between hydrosphere and lithosphere in California and in metropolitan Los Angeles, by relating vertical GPS motions to seasonal water load changes. Don has also been a leader in using space geodetic data to refine models of global glacial isostatic adjustment (GIA).

Heather Bedle (PhD 2009) is an Assistant Professor at the University of Oklahoma where her research focuses on understanding the subsurface through seismic interpretation.

Martin Lee Collin (BA 1963) studied under L.L. Sloss, W.C. Krumbein, T.H.A. Witten, & L. Nobles during the dramatic era when the paradigm of Earth's structural genesis segued from 'uniformitarianism' toward the concepts of continental drift, plate tectonics, and subduction. He



received his MSc in Soils & Agronomy and PhD in Environmental Land-use Planning from West Virginia University. Between 1968 and 1974, as the Natural Environment Planner for the State of Maryland's Baltimore Regional Planning Council, he coordinated the Baltimore Harbor's renovation, with noted landscape architect Ian McHarg, the Rouse Corp., the EPA, and the Maryland Port Authority. From 1978 until 2000, he managed national land-use planning as affecting groundwater quality for Israel's Hydrological Service. He subsequently received his certification from Cambridge University in 2000, and has since taught and edited English for business & governmental personnel and classes in Israel. He has sung in choirs, barbershop, and Celtic & Nordic folk music ensembles over the past 45 years, and has written 1,663 haiku since 1972.

Carl Ebeling (PhD 2012) is a Senior Development Engineer for the USGS' Albuquerque Seismological Laboratory. He works on Project IDA, which operates about one-third of the ~150 stations of the Global Seismograph Network (GSN), and is responsible for the operation and maintenance of seismic stations. When time allows—usually on his own time—Carl continues to work on a very-high resolution microseism wavefield study using data from IDA stations. Carl will be meeting up with **Donna Jurdy** and **Paul Stoddard (PhD 1989)** at the Holiday Bowl to cheer on the 'Cats!

Peter Ilhardt (BA 2013) received an M.S. in Geosciences from Penn State University, which he followed with a Post-

Master's Research Associate position at Pacific Northwest National Laboratory (DOE) in Richland, WA. Peter is now a Research Technologist at Penn State in the Department of Plant Sciences.

Rachel Inderhees (BA 2017) is pursuing a Master's degree in Computer Science at DePaul, starting in January. She wants to learn how to build software that can be used to process seismic data and map earthquakes, as well as learn more about developing embedded software that can be used to increase the efficiency of solar panels and batteries.

Alberto M. López Venegas (PhD 2006) is an Associate Professor at the Department of Geology from the University of Puerto Rico - Mayagüez Campus. His research focuses on determining crustal deformation of the Puerto Rico - Virgin Islands block and has been recently devoting time on tsunami hazard analysis of the Caribbean region through UNESCO's Working Group 2 of the ICG/CARIBE-EWS.

Xiaoting Lou (PhD 2013) welcomed Eli, a new baby boy (below) on May 28, 2018.





Allegra C. Mayer (BA 2013) is a graduate student in Environmental Science, Policy, and Management at UC Berkeley. She is studying soil from the Luquillo Experimental Forest in Puerto Rico to explore drivers of soil carbon turnover in tropical forests. She is also continuing work on understanding how compost application to California grassland affects soil carbon cycling. Allegra's first paper, published this year in *Science Advances*, discusses the potential for agricultural land management to contribute to lower global temperature.

David Rice (BA 2016) published his first paper in *MNRAS* titled "Survival of Non-Coplanar, Closely-Packed Planetary Systems after a Close Encounter."

Andrea Salus (BA 2013) has been busy with work and travel. She passed her Professional Engineer licensing exam and will soon be starting a Masters of Integrated Water Resource Management program through the University of Queensland and Griffith University.



Andrea Salus cleaning pumps.

Paul Stoddard (PhD 1989) ran as the democratic candidate for Illinois State Representative of the 70th District. Although he did not win, he placed very well in a historically Republican district. He continues on the DeKalb County Board, as he has for 11 years, and, with such an encouraging showing, has not ruled out running again. Paul will be meeting up with **Donna Jurdy** and **Carl Ebeling (PhD 2012)** at the Holiday Bowl to cheer on the 'Cats!

Since 2012, **Michael A. Velbel (BA1978)** has studied meteorites from Mars and the asteroid belt as a Smithsonian Senior Fellow, and later Research Associate, at the Division of Meteorites, Department of Mineral Sciences, National Museum of Natural History, Smithsonian Institution. Also since 2012, he has been a member of the Michigan Space Grant Consortium Executive Board. He remains on the faculty of Michigan State University, where he previously served six years (1999–2005) as Chairman of the Department of Geological Sciences. He served as President of The Clay Minerals Society (2013–2014) and, more recently, as Acting Editor in Chief of its journal, *Clays and Clay Minerals* (2014–2016).

Emily Wolin (PhD 2016) and **Maung Thein (PhD 1966)** had a chance meeting in February at the GeoMyanmar conference in Yangon. The two fellow Northwestern alums, awarded PhDs exactly 50 years apart, were excited to learn that they were both working on seismic hazard and disaster risk reduction



in Myanmar. Maung is the founding president of the Myanmar Geosciences Society. He worked on sed strat and geochemistry with Sloss and Krumbein and has since done a tremendous amount of work on a variety of problems in Myanmar, including producing some of the first seismic hazard maps of the country. Emily is a Research Geophysicist for the U.S. Geological Survey, Earthquake Science Center.

Yun-Yuan Chang (PhD 2014) has a new tenure-track research position at the Institute of Earth Sciences, Academia Sinica, in Taiwan.

Hao Zhang (Former Postdoc) welcomed Yueuang, a new baby boy (at right) on January 4, 2018.



Hello all,
I just completed two years of work as an Agricultural Extensionist in rural Paraguay with the Peace Corps. I worked one-on-one with members of a local women's committee to improve home garden production. I met some incredible Paraguayans and learned Spanish and Guarani along the way.

Cheers,
Dana Johnson (BA 2016)



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We appreciate photo contributions from alumni, faculty, students, and all members of the EPS community.

OUT & ABOUT IN 2018



Part of Yarrow Axford's research group poses with their polar bear guard at one of Laura Larocca's study sites in south Greenland.



Seth Stein, Carol Stein, Chris Scotese, Mitchell Barklage, Reece Elling and other attendees at the Earthscope Midcontinent Rift Synthesis Workshop at Northwestern in July.

How Can I Contribute?

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Maggie Osburn led a team of scientists into Silver Cave at Lava Beds National Monument for the BRAILLE project.