Issue No. 10 LEHIGH UNIVERSITY December 2016

EES NEWSLETTER

Welcome to the annual Newsletter of the Department of Earth and Environmental Sciences. 2016 marks the silver anniversary of the department. On July 1, 1991 the existing Department of Geological Sciences, all 9 faculty, were merged with 4 faculty from the Department of Biology to form the new Department of Earth and Environmental Sciences. This forward-looking formulation has allowed us to lead the subsequent transformations by many of Lehigh's peer institutions. EES faculty continue to thrive under the current organization. We are still working, however, to ensure that the admissions office and current Lehigh students understand there is a difference between Earth and Environmental Sciences, Environmental Engineering, and Environmental Studies.

It is always my pleasure to acknowledge the great faculty and students of EES and to call to your attention their achievements and honors over the last year. The EES faculty are the creative minds that help us achieve our mission through their research, teaching, and service. Together we study the earth and environment, how the solid earth, oceans, atmosphere, and life interact to shape the world in which we live. Our teaching and research is incorporated into field-based, experiential, and multidisciplinary education, which integrates observational, experimental, theoretical, and numerical approaches.Together we seek to instill in our undergraduate and graduate students the critical thinking, quantitative, and communication skills needed to succeed in life.

EES has a long record of research accomplishments tied together with leadership in education for all manner of Lehigh students. Engagement with diverse perspectives and people enhances our research and is integral to educating our students. More broadly we seek to enhance earth science literacy through academic and outreach activities so that individuals and communities can make informed decisions about land use, biodiversity, resources, hazards, and climate change. Our future research will continue to define and provide leadership in the emerging fields of earth and environmental science.

We are excited to be joined in our efforts by Assistant Professor, chemical oceanographer Dr. **Jill McDermott**, most recently from the University of Toronto and Director of Instrumentation ,**Corinne LaViolette** from Northern Arizona University. Jill greatly enhances our capability to understand fluid and volatile chemistry preserved in deep terrestrial and marine environments.

Finally, I want to thank all of you who gave generously of your time and treasure to the department this past year. Science is an expensive enterprise. It costs a great deal to educate our students and support our advanced laboratories and instruments. Endowment income and gifts make up the majority of the EES operating budget and provide the department with the resources necessary to embellish our undergraduate and graduate research opportunities, student professional travel, and our superb seminar series. We look forward to interacting with student mentors, career night panelists, and visitors to our graduate and undergraduate research symposia this year. If you live in the Lehigh Valley or expect to be back to Lehigh University for a visit, please accept my invitation to stop by the department and tour the STEPS Building. We fondly remember all our alumni and are gratified by your continued support of our activities.

EES will host a mixer in Houston, TX in association with the 100th anniversary meeting of the American Association of Petroleum Geologists. I hope to see you there.

Best wishes for a successful and gratifying new year,

David Anastasio, PhD, PG
Professor and Chair
Earth and Environmental Sciences

RECOGNITION!!!

Dr. **Anne Meltzer**, is the 2016 recipient of the *Ambassador Award* from the American Geophysical Union (AGU).

The award is given for outstanding contributions in service to the earth and space science communities in the areas of societal benefit, scientific leadership, and promotion of the talent and career pool. The award includes induction as an AGU Fellow, an honor reserved for the most exceptional contributions to ones field as judged by their peers.

Congratulations to Dr. **Peter Zeitler** on being awarded the *Dodson prize*. *The Dodson Prize in Thermochronology* is awarded by the International Standing Committee on Thermochronology.

Congratulations to **Janelle Thumma**, '16 and **Mingkai Jiang**, '16 for being selected as *Elizabeth V. Stout Award* winners for the best science thesis and dissertation at Lehigh University for their distinguished research work. These projects showcase the exceptional Earth (Janelle) and Environmental (Minkai) Sciences work being done by the EES Department.

March 2016 **Andrew Moodie** BS'14, won an NSF fellowship to fund his doctoral education at Rice University in TX

One of **Don Morris'** papers was named by *Limnology and Oceanography* as a top 10 article of the 1990's. It was republished in a special volume to commemorate the 60th anniversary of *Limnology and Oceanography*

http://onlinelibrary.wiley.com/doi/10.4319/lo.1995.40.8.1381/full

WELCOME TO EES!

In August, we welcomed Dr. **Jill M. McDermott** as an Assistant Professor to EES. Prior to joining us, she was a MAGNET postdoctoral fellow at the University of Toronto, and an alumna of the MIT-WHOI Joint Program in Chemical Oceanography (Ph.D), the University of New Hampshire (M.Sc.), and Dartmouth College (B.A.).

Her research investigates the aqueous and volatile geochemistry and biogeochemistry of seafloor hydrothermal vents and ancient terrestrial fracture waters tapped by deep mines. These systems link fundamental geologic and biological processes that sustain microbial life in the largely unexplored deep subsurface biosphere, and they represent modern analogues of environments that may have played a critical role in the origin of life on the early earth.

Jill resides in Bethlehem with her husband **Santiago Herrera** who is a Visiting Assistant Professor in the Department of Biological Sciences here at Lehigh. He will be teaching Oceanography in the Spring of 2017 for EES.

On January 30, 2017 we will have a new Director of Instrumentation, **Corinne La Violette**. You can look forward to meeting her in our next newsletter.

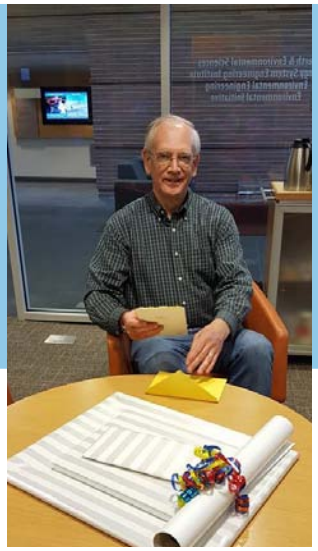
EES NEWS

THANK YOU!

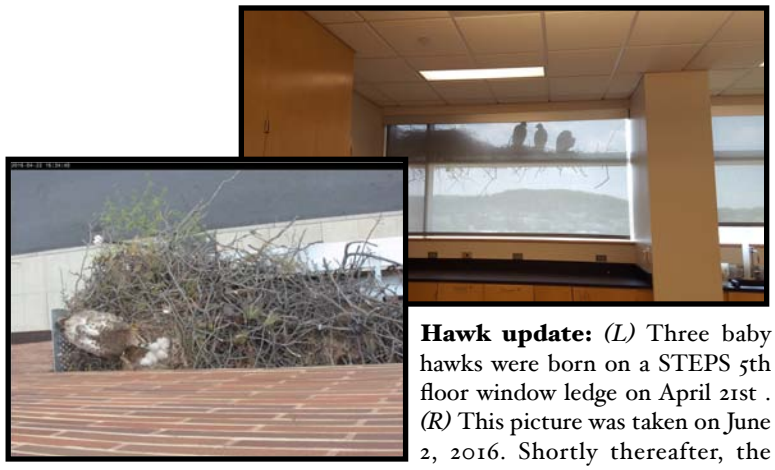
Dr. **Alan Pense**, Professor and Provost Emeritus at Lehigh, for your donation of mineral specimens.

Mrs. **Louise Valeriano,** Bethlehem, PA, widow of a Lehigh University alumnus of 1951, for your donation of a fossil and rock collection for the EES teaching laboratories.

Dr. **Jack Epstein** , United States Geological Survey, retired, for continued donations of field equipment and publications for teaching and research.



Joe Seem, EES Engineering Technician retired the end of May after 15 years of service. On May 4, 2016 we celebrated his retirement.



Hawk update: *(L)* Three baby hawks were born on a STEPS 5th floor window ledge on April 21st . *(R)* This picture was taken on June 2, 2016. Shortly thereafter, the fledglings took off from the nest and haven't returned. The hawks have been here for 2 years in a row. When they return the hawk camera will go live at:

http://hawkcam.ees.lehigh.edu/view/viewer_index.shtml?id=5367

In Memory

Gene Williams, an influential sedimentologist and long time professor at Penn State, passed away at age 90 in late March. Gene graduated from Lehigh in 1950 with a BA degree. He was a notable teacher and mentor for a generation of geologists, including me.

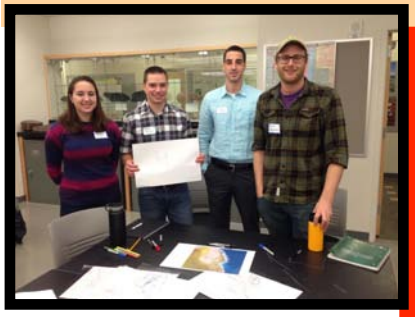
-Frank Pazzaglia

To view his obituary:
http://www.legacy.com/obituaries/centredaily/obituary.aspx?pid=179844256

Find us on Facebook!
https://www.facebook.com/LehighEES/

We've been busy…

On March 8 and November 1, 2016 EES in collaboration with civil and environmental engineering and environmental initiative hosted Career Expo's for undergraduate and graduate students with career goals related to the environment. The March event kicked off with a talk by **Jonathan Price** '72, President of the Geological Society of America, "The Origin of Carlin-Type Gold Deposits" and the November event with a talk by **Andrea Skimbo,** Lehigh Center for Career and Professional Development, "Networking for career preparation". Both talks were followed by a dinner where senior undergraduates had the opportunity to network with the speakers, professors and some of the young professionals. After dinner the young professionals from varying environmental fields (14 in March and 8 in November, 2016) were able to share their career journeys, distribute business cards and other company swag with the students. The feedback from the students was very positive and they were quite pleased with the chance to meet with these alumni and other professionals with ties to Lehigh.



L to R: Lehigh undergraduate, Nicole Etzel; Josh Barna, Bucknell; Jared Wink, University of Pittsburgh; and Gabe Epstein, Lehigh University.

Integrated Basin Analysis Short Course

October 21 to 23, 2016

ExxonMobil

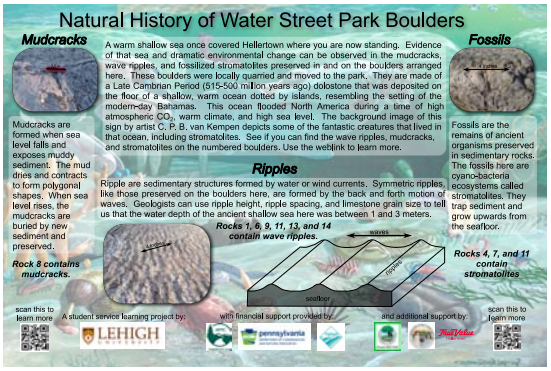
We were once again fortunate enough to have ExxonMobil's **Tom Becker,** MS '02, **Liz Lee** and **Bob Stewart** visit Lehigh and conduct a short course as well as interviews for Exxon positions. This year we had one Lehigh undergrad **Nicole Etzel** and seven graduate students **Mariah Chambers**, **Megan Clark**, **Gabe Epstein**, **Darwin Janes**, **Adrienne Scott**, **Candace Wygel** and **Edward Zajac** participate along with students from Binghamton University, Bryn Mawr College Bucknell University, Colgate University, Franklin & Marshall College, Rochester University, Temple University, Tufts University, University of Pittsburgh, Williams College and Lafayette College. There were a total of 28 participants.

OUTREACH

In the Spring of 2016, **Frank J. Pazzaglia** and Ph.D. candidate **Jonathan Stelling** worked with three students and their advisor **Agnelo Sequeira** from Springhouse Middle School (Parkland School District) as they helped prepare for the fossils competition in the Pennsylvania State Science Olympiad, held at Juniata University on 23 April, 2016.

*"Yesterday Springhouse Middle School competed at the PA State Science Olympiad Competition, I am delighted to report the team overall ranked 1st thereby earning a berth to compete at the Nationals on May 21st. **Meghna** & **Daniel** who represented the team in Fossils came in 2nd, this is a improvement of 4 positions from last year's team. The exposure @ Lehigh to real fossils helped Meghna & Daniel to identify fossils with confidence, with this came speed and agility to answer over 100 questions on 18 stations (2.2 mins/station) within 50 mins. The Students and I are very appreciative of the time you took with us and the knowledge you shared helping us on our journey."*

At the Nationals competition the students placed 19th out of 60 schools in the fossils category. https://www.soinc.org/sites/default/files/uploaded_files/2016_Final_Results_Div_B.PDF



Junior **Jocelin Gregorio Alcaron** is working on a service learning project where she is designing and installing an educational panel that explains the local geology at Water Street Park in Hellertown, along the Saucon Rail Trail. The project is funded by the Appalachian Mountain Club and is part of the broader Delaware and Lehigh National Heritage Corridor. This is the second educational panel that has been designed and installed by Lehigh students along the Saucon Rail Trail since 2014.

Undergraduate Symposium
Friday, May 6, 2016

Keynote speaker:

EES alumus **Molly Mulhern**, B.S. '11
M.Ed. '12 Lehigh University,
. '12 Geological Sciences,
MS, '14 University of Oregon
Consultant at FTI Consulting

"Leveraging Research Experience in Academia and Beyond"

Oral Presentations

Lorraine Carnes, "River sinuosity response to central and eastern US (CEUS) intraplate seismicity with a focus in the central Virginia and Charleston seismic zones" (*advisor Frank Pazzaglia)*

Ryan Herbert, "Light variability and mixotrophy: responses of testate amoeba communities and shell δ13C composition to a two-year peatland shading experiment" *(advisor Bob Booth)*

Erin Sowell, "Establishment and expansion of Atlantic White Cedar (Chamaecyparis thyoides (L.) B. S. P.) near its northern range limit: a paleoecological study at Saco Heath, ME" (*advisor Bob Booth)*

Mary Pettit, "Rock Magnetic Cyclostratigraphy and Paleomagnetism: A study of the Plum Point Member of the Calvert Formation, Calvert Cliffs, MD" *(advisor Ken Kodama)*

Poster Presentations

Yang "Georgiana" Gao, "Evidences of drainage network reorganization in response to active tectonics in the Betics Cordillera, Spain" (*advisors Claudio Berti, Frank Pazzaglia)*

Kaylee Kraft, "Evidence for Carbon Mobility in Deeply Subducted Basalts and Carbonated Ultramafic Rocks: Northwest Alps and Northern Apennines" *(advisor Gray Bebout)* Research funded by Ryan endowment

Cora Summerfield, "Pedogenesis and geochronology of the Bryn Mawr Formation (lateMiocene?) in Cecil County, MD, a possible analogue environment of future mid-Atlantic climates" (*advisor Frank Pazzaglia)* Research funded by Ryan endowment

Julian Traphagen and **Pond Sirorattanakul**, "S and P Traveltime Residuals for Seismic Activity in Mongolia" (*advisor Anne Melzer)*

Student Awards Ceremony

Best talk-**Lorraine Carnes** and **Ryan Herbert**

Best poster-**Yang "Georgiana" Gao**

Annual Undergraduate Awards, 2016

Students are recognized at the annual EES Undergraduate Symposium each spring

Donnel Foster Hewett Award- Ryan Herbert, BS '16
This award goes to a senior in geological sciences Who best demonstrates the potential for professional excellence.

J. Robert Munford Award -Yang "Georgianna" Gao, BS '16
This award is given to the senior major who demonstrates substantive improvement over the course of their program of study, and attains, in their senior year, a clear record of excellence.

2016 Honor's Degree recipients:

Lorraine Carnes **Ryan Herbert**

Mary Pettit **Erin Sowell**

These students had a minimum major GPA of 3.4 and an overall cumulative GPA of 3.0, completed at least four credits of EES 393 (Supervised Research in Earth and Environmental Sciences) and prepared a written honors thesis on their EES 393 research project. They had to file a written request with the EES undergraduate instruction coordinator, constitute an advisory committee of two EES faculty plus the student's research supervisor to guide the research, prepare a research proposal for the committee's approval, and give an oral presentation of research results and conclusions at a department seminar.

Undergraduate Happenings…

Eric Niziol, **Jerry Vogel** and **Grant Loescher** worked with **Kristin Carter MS '93,** of the Pennsylvania Geologic Survey Pittsburgh office, learning to use the well-logging computer program Petra. The students are busy logging wells and making picks of sandstone reservoirs in western Pennsylvania. The data are being used for more comprehensive management of Pennsylvania's hydrocarbon resources as well as meeting the requirements of identifying reservoirs for carbon sequestration.

Cora Summerfield, is working on a soil geochemistry senior thesis that is investigating how terrestrial environments might respond to future climate changes, based on information extracted from paleosols.

Nicole Etzel, is working on a Triassic basin detrital zircon geochronology project. Nicole has been awarded some funding from the department and the University of Arizona to take advantage of an opportunity to travel to the University of Arizona geochronology lab in January to obtain an age spectrum from these zircons, with the goal being to better understand the provenance of sediments filling the Triassic basins.

Danika Marziller is the Lehigh University, Green Program on campus student ambassador. This program is committed to education, sustainability, and adventure.

EES Annual Spring Picnic at Lower Saucon Park

Graduate Student Happenings…

Every year our graduate students plan the **EES Graduate Symposium.** This event allows them to share their research with alumni, peers, faculty and future students in oral presentations or posters accompanied by an abstract in professional meeting format. We also host next year's prospective graduate students and nearby alumni. The 2017 symposium is scheduled for March 3, 2017., with alumni speaker **Alex Ireland**, PhD '12, ExxonMobil Biomedical Sciences. Inc.. Email Nancy Roman, nroo@lehigh.edu if you are interested in attending.

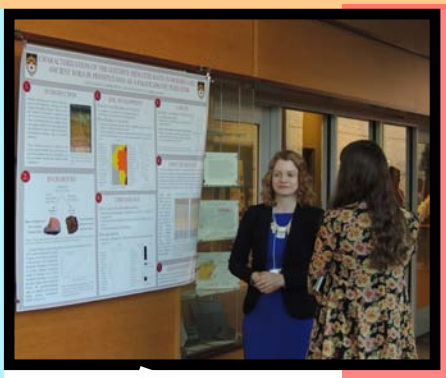
The symposium was held on March 4, 2016. It began with a talk by Lehigh alumnus **Jennifer Wollenberg**, The ELM Group, Inc., PhD '08 and MS '05, Lehigh, BS '99, Drew University, "Geochemical controls on mercury speciation and methylation in a contaminated estuary". Her talk was followed by student oral presentations and then a poster session. The day concluded with a cocktail reception, and dinner banquet. The alumni attendees included **Bob Bond**, MS '85; **James Cascione**, BS '02, 'MS '05; **Jeff "Boomer" Griesemer**, MS '80; **Don Monteverde**, MS '84; **Bob O'Neill**, MS '85; **Mike Serfes**, MS '84; and, **Pete Sudano**, MS '83.

Oral Presentations:

Mingkai Jiang
Leonard Ancuta
Zheng Gong
Christopher Bochicchio
Zhongxiong Cui
Jien Zhang
Janelle Thumma
Jonathan Stelling

Poster Presentations:

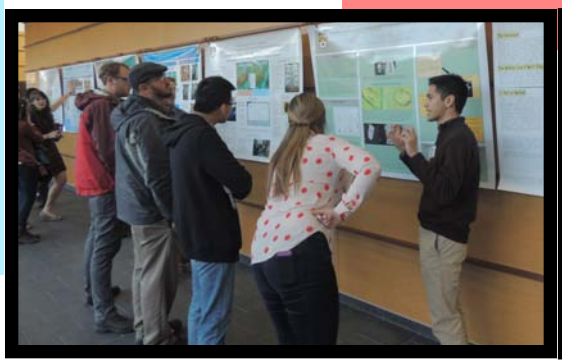
James Carrigan
Rui Cheng
Megan Clark
Elizabeth Dyer
Katie Jaeckel
Darwin Janes
Laura Markley
Bob Mason
Kalin McDannell
Matthew McGavick
Jennifer Schmidt
Lillian Soto-Cordero
Rebecca Whiteash
Zhengyu Xia



Symposium Awards:

Best talk: **Jien Zhang**
runner up: **Janelle Thumma**
Best poster: **Laura Markley**
runner up: **Jen Schmidt**
Honorable mention poster: **Katie Jaeckel**

Additional Awards:
Highest magnification award: **Megan Clark**
Mountain from a molehill award: **Darwin Janes**
Best illustration award: **Rebecca Whiteash**
Happy peat award: **Jon Stelling**
Ramblin' on down the road (or, largest excursion) award: **Zheng "Erick" Gong**
Not the most-distant-field-area award: **Bob Mason**
Mountain from a Molehill award: **Liz Dyer**



Other Graduate Student Awards!

PhD candidate **Jonathan Stelling**, was awarded the 2016 Paul B. Myers, Jr. distinguished teaching assistant award.

The graduate life office and the faculty development program together offer a teacher development program for which four of our graduate students participated this year. **Zheng Gong**, **Rui Cheng**, **Zhengyu Xia**, and **James Carrigan** each earned a certificate which demonstrates their commitment to becoming a better instructor as well as dedication to their professional development.

Welcome New Graduate Students!

Mariah Chambers, Brigham Young University, Provo, UT, BS Geology '15. Research focus: seismology. *(advisor, Anne Meltzer)* University fellow

Gabe Epstein, University of British Columbia, BS Geology '13. Research focus: metamorphic petrology and subduction zone fluid cycling. With field areas in the Western Alps. *(advisor, Gray Bebout)* Research assistant

Kaylee Kraft, Lehigh University, BS Earth and Environmental Science '16. Research focus: stable isotope study on phytoliths, microporous minerals and the Dora Maira whiteschist. *(advisor, Gray Bebout)*

Anne Meylani Magdalena Sirait, Universitas Indonesia, Indonesia, BS Physics '05, MS Geophysics/Physics '09. Research focus: Ecuador aftershock data and hopes to conduct seismology research in Indonesia. *(advisor, Anne Meltzer)* Fulbright fellow

Adrienne Scott, University of Washington, Seattle, BS Earth and Space Sciences: Geology, minor in Oceanography '15. Research focus: kinematic history uplift in the Spanish Sierra Nevadas. *(advisor, Dave Anastasio)* Teaching assistant

Candace Wygel, Skidmore College, BA Geosciences and English '16. Research focus: volcanology and environmental hydrogeology. *(advisor, Dork Sahagian)* Teaching assistant

Edward Zajac, Weber State College, BS Geological Sciences '16. Research focus: fluids and deformation. *(advisor, Dave Anastasio)* Kravis fellow

Mariah Chambers *(advisor, Anne Meltzer)*, **Gabe Epstein** *(advisor, Gray Bebout)* and **Anne Meylani Magdalena Sirait** *(advisor, Anne Meltzer)* passed their PhD qualifying exam.

Zhengyu Xia *(advisor, Zicheng Yu)* and **James Carrigan,** MS '14 *(advisor, Dave Anastasio)* passed their PhD general exam and dissertation proposal defense.

James Carrigan, **Megan Clark**, **Katie Jaeckel** and **Darwin Janes** all received summer research fellowships.

PhD Candidate Bob Mason leading a 5X10 first year program about Lehigh's Forest

Some Professional Activities of EES Graduate Students

James Carrigan received an international doctoral travel grant for global opportunities (DTG-GO) from the Office of International Affairs (OIA) to support his research in Southern Spain. James also received a Geological Society of America (GSA) grant. *(advisor, Dave Anastasio)*

Rui Cheng attended Extreme Science and Engineering Discovery Environment , High Performance Computing (XSEDE HPC) Summer Boot Camp from Jun 14 to 17 at Lehigh. This workshop was about parallel computing and Lehigh was a satellite site. *(advisor, Benjamin Felzer)*

Megan Clark received the Teaching Assistant Award Honorable Mention, Lehigh University, 2016. In December she gave a talk, at AGU, San Francisco, CA. *(advisor, Dork Sahagian)* Research funded by Palmer endowment. Travel funded by EES.

Elizabeth Dyer presented a poster at the Eastern Snow Conference, Columbus, OH, June 2016. *(advisor, Joan Ramage)*

Gabe Epstein presented posters at the Geological Society of America (GSA) cordillera section meeting in April and the December American Geophysical Union (AGU) meeting, San Francisco, CA. *(advisor, Gray Bebout)*

Katie Jaeckel presented a poster at Northeast Geological Society of America (GSA) in Albany, NY in March. In April she attended a week-long ExxonMobil Guadalupe Field School in TX and Mexico. She also attended a Institute for Study of the Continents (INSTOC) symposium at Cornell University with her Tectonic Processes class in October and in December she presented a poster at American Geophysical Union (AGU), San Francisco, CA on field work and isotopic studies from time spent in Italy and the Swiss Alps over the summer. *(advisor, Gray Bebout)* Research funded by Palmer endowment. Travel funded by EES.

Darwin Janes was awarded a department scholarship to attend the Lehigh Microscopy School which is sponsored by the Department of Materials Science and Engineering and the Center for Advanced Materials and Nanotechnology at Lehigh University every June. *(advisor, Peter Zeitler)* Research funded by Palmer endowment.

Bob Mason participated in a Community Forestry Short Course through Penn State Extension in March. In September he led a 5x10 (first year experience) program about Lehigh's experimental forest. *(advisor, Bob Booth)* Research funded by Fuller endowment.

Kalin McDannell attended an invited workshop at UCLA to learn about their SIMS (Secondary Ionization Mass spectrometer) laboratory and to initiate some work on U-Pb dating of apatite in Proterozoic rocks of the Canadian Shield. After a second trip to UCLA, this work was then presented at the 15th International Meeting on Thermochronology in Maresias, Brazil in September. *(advisor, Peter Zeitler)*

Matt McGavick gave a talk at the 2016 Geological Society of America (GSA) National meeting in Denver, CO. *(advisor, Frank Pazzaglia)* Research funded by Palmer endowment. Travel funded by EES.

Adrienne Scott attended the New York State Geological Association (NYGSA) Field Conference, Hudson Highlands, Rockland County, NY. *(advisor, Dave Anastasio)* Travel funded by EES

Anne Meylani Magdalena Sirait did a poster presentation at Institute for Study of the Continents (INSTOC) Symposium, Cornell University, Ithaca, NY. *(advisor, Anne Meltzer)*

Lillian Soto-Cordero gave an oral presentation at the Geological Society of America (GSA) meeting in Denver, CO. *(advisor, Anne Meltzer)* Travel funded by EES.

Jonathan Stelling participated as a conference attendee and symposium presenter, at Southern Connection Congress, Punta Arena, Chile in January and at the American Geophysical Union (AGU) Fall Meeting, San Francisco, CA in December. He also attended a 2 day workshop LI-COR 640xt (training workshop) in October. *(advisor, Zicheng Yu)* Research funded by Farny endowment.

Zhengyu Xia attended the Urbino Summer School of Paleoclimatology in Urbino, Italy this summer and presented a poster. *(advisor, Zicheng Yu)* Research funded by Farny endowment. Travel funded by EES.

Jien Zhang attended the 101th Ecological Society of America (ESA) annual meeting in Fort Lauderdale, FL from Aug 13-16th. *(advisor, Benjamin Felzer)*

Congratulations 2016 Graduates

Doctor of Philosphy

Michael Clifford

“Late Holocene drought, fire, and vegetation in northeastern North America inferred from peatland archives.” Michael is now living in Las Vegas, NV and is a Assistant Research Professor, Ecology at the Desert Research Institute.

Nathan Hopkins

"Magnetic Till Fabric: Applications of anisotropy of magnetic susceptibility (AMS) to subglacial deformation of till and ice” Nate and his wife Brittany moved to Minot, ND summer of 2016 where he is an Assistant Professor, Geoscience at Minot State University.

Mingkai Jiang

"On the history and evidence of the colwell index in quantifying environmental predictability, and its applications in characterizing precipitation predictability in the conterminous United States"precipitation predictability in the conterminous United States” Mingkai is a Postdoctoral Research Fellow in Ecosystem Function and Integration at the Hawkesbury Institute for the Environment, Western Sydney University, Australia.

Master of Science

Zheng Gong

"Rock Magnetic Cyclostratigraphy of the Doushantuo Formation, South China and Its Implications for the duration of the Shuram-Wonoka Excursion”

Janelle Thumma

"Assessing the timing of intercontinental uplift of the Gobi Altai, Mongolia using low-temperature themochronolgy"

James Carrigan

"Fault-related fold kinematics using terrestrial syntectonic strata, Sant Lloren\c{c} de Mournys, Pyrenees Mountains, NE Spain."

Bachelor of Science

Kristina Abens
Alexandra Beatson
Lorraine Carnes
Ali Famili
Yang Gao
Ryan Herbert
Kaylee Kraft
Dylan Morgenweck
Eric Niziol
Mary Pettit
Erin Sowell

Bachelor of Arts

Natalie Bates
Eugene Vivino

Grounded in Tradition. Always Looking Forward.

Since Lehigh's first days in 1866, the study of earth sciences has played a key role in many Lehigh students' educations. Whether the department was focused on mining, geology, water issues, the composition of other planets, or climate change, its faculty have led the way in their respective disciplines.

The department originally had a strong connection to Lehigh's engineering mission. In the early years, the department was viewed as an adjunct to the discipline, providing engineering students with the necessary background in geological sciences and its application to material science, and civil engineering, especially geotechnicial problems and water resources. Geology became a standalone department in 1899 and would take on new life in 1907-08 when Benjamin Leroy Miller became head. Under his leadership, new and expanded courses were offered, both at the undergraduate and graduate levels. In 1939, Miller retired and Bradford Willard became head, a position he held until 1959.

In the 1960s as the department of geology expanded its reach, educating students in other fields and developing classes for professional geologists and the advancement of geology as an independent discipline. Today, the department of earth and environmental sciences is comprised of faculty with national and international reputations in their respective fields. Hugh R. Gault, who had joined the faculty in 1945, became head in 1959, followed by J. Donald Ryan in 1961. The research of Charles Sclar was directly related to the National Aeronautics and Space Administration (NASA) space missions, when in 1969 he was selected by NASA to join a select group of investigators to analyze lunar samples after the Apollo XI moon shot. It was part of a worldwide effort involving more than 100 scientists and engineers. The mineral "sclarite" $Zn_7(CO_3)_2(OH)_{10}$ was named after Sclar. The impact of Professor's Willard, Ryan, and Sclar continues to this day, with the funds they each endowed for undergraduates.

Some departmental faculty have played important roles in the development of the College of Arts and Sciences as well. In 1971, the department was renamed the department of geological sciences under then chair, Bobb Carson. Carson, who specialized in sedimentation, particularly physical and hydrogeologic properties of marine sediments, would guide the department as it was reconfigured to the department of earth and environmental sciences in 1991. He became dean of the College of Arts and Sciences in 1997 and would go on to in that capacity until his retirement in 2003.

With Carson becoming dean, Peter Zeitler assumed the chair's role in 1997, which he held until 2002. He would serve a second term from 2004 to 2007. In 2006 he was awarded the College of Arts and Sciences Iacocca Professorship. The academic honor is awarded for excellence in research, teaching, and service to a faculty member with a demonstrated ability to support and enhance the mission of the Iacocca Institute to develop global leadership. His research interests have included developing techniques in geochronology, with a focus on noble-gas methods and thermochronology and their application to tectonics. Zeitler was named a fellow of the American Geophysical Union (AGU) in 2013 and won the Dodson prize from the International Standing Committee on Thermochronolgy in 2016.

In 2002, Anne Meltzer was named chair. In 2004, she would go on to become dean of the College of Arts and Sciences when Carson retired. An observational seismologist, she served as chair of the Board of Directors (twice) of the Independent Research Institutions for Seismology (IRIS), a consortium of over 120 US academic institutions and over 120 foreign affiliates, dedicated to the operation of scientific facilities for the acquisition, management, and distribution of open seismic data. In this role, Meltzer worked closely with the geoscience community in a successful effort to secure funding from the National Science Foundation for EarthScope, a major new initiative to establish observational facilities to measure deformation of the earth in real-time at continental scales, to better understand the structure, evolution, and dynamics of the North American continent She also helped establish a new initiative within IRIS to support international development efforts to build technical infrastructure, and human capacity to improve earthquake monitoring, research, and education in developing countries. In 2013 Melzer became the first to hold the Francis J. Trembly endowed chair in earth and environmental sciences. Meltzer is the 2016 recipient of the ambassador award from American Geophysical Union (AGU). Under her leadership Lehigh built the STEPS building, the department's current home.

Since its dedication in 2011, STEPS has been integral in building collaboration among science, technology, the environment, policy, and society to address major environmental issues. In the past five years, many developments have taken place and many new faculty are working with the growing number of students enrolling in the sciences who are interested in helping to solve today's global challenges. It is home to 80 faculty, research scientists, staff, and graduate students and hosts 50 research and state-of-the-art teaching labs, 10 classrooms, computer labs, seminar rooms, and a large auditorium STEPS provides the stimulating environment needed to foster teaching opportunities and breakthroughs in research. In addition to EES, STEPS is the home of environmental engineering and environmental policy faculty plus the energy systems engineering institute and the environmental initiative (EI). The EI is an interdisciplinary program of academics, research, and outreach whose overall mission is to advance humanity's understanding and awareness of our role in and interaction with our natural environment through research, teaching, and outreach.

(continued on next page...)

EARTH & ENVIRONMENT

1865
-1866
Lehigh Opens

1873
-1874
Geology department was established

1881
-1902
- Edward H Williams appointed professor of mining and geology
- Edward H Williams established a course that lead to the BS degree in geology

1881
Benjamin Frazier named mining and geology chair

1903
Williams Hall was dedicated on Sept. 25, 1903

1930
-1939
Benjamin L. Miller, chair, geology department

1939
-1959
Bradford Willard, chair, geology department

1959
-1961
Richard Gault chair, geology department

1961
-1976
J. Donald Ryan, chair, geology department / department of geological sciences

1971
Department of geological sciences formed

1976
-1985
Charles B. Sclar, chair, department of geological sciences

Now celebrating its 25th anniversary as the department of earth and environmental sciences, EES faculty continue to lead their respective disciplines and impact the lives of future alumni. The department's Field Camp, now in its 42nd year, has educated more than 2,000 students not only from Lehigh University, but from many top colleges and universities across the country. Frank Pazzaglia, who served as chair when STEPS was built was field camp's director from 1995 to 2015. He was the Geological Society of America (GSA) winner of the Kirk Bryan award. Pazzaglia took over from the field camp founder Ed Evenson who was the originator and camp director for first 30 years. In 2016 Claudio Berti was hired as an EES professor of practice and the field camp director.

AL SCIENCES TIMELINE

Bobb Carson

1983 -1985
Associate dean, CAS

1985 -1991
Chair, geological sciences

1994 -1997
Chair, EES

1997 -2003
Dean, CAS

Anne Meltzer

2002 -2004
Chair, EES department

2004 -2011
Dean, CAS

2007 -2013
Frank Pazzaglia, chair, EES department

2013 -PRESENT
David Anastasio, chair, EES department

1991
Earth & environmental sciences department established

1991 -1994
Kenneth Kodama, chair, EES department

1996 -1999
Kenneth Kodama, Associate dean, CAS

1997 -2002
Peter Zeitler, chair, EES department

2004
Environmental Initiative formed

2004 -2007
Peter Zeitler, chair, EES department

2010
Moved into STEPS Bldg.

The department has benefited from faculty who lead their respective fields. Current chair David Anastasio, Ken Kodama, Frank Pazzaglia, and Ed Evenson are fellows of the Geological Society of America (GSA). Kodama, who served as chair from 1991 to 1994, is also a fellow of the American Association for the Advancement of Science and was the recipient of the Woodard Medal. Peter Zeitler and Anne Meltzer are fellows of American Geophysical Union (AGU). Many alumni have contributed in various ways to the department's growth and well-being. As new faculty join its ranks, the department is sure to continue leaving lasting impressions on future Lehigh students.

David Anastasio's 2016 was a very rewarding year. He started several new projects, both at Lehigh and in the field. With collaborators Bodzin, Popjoy, and Hammond from Lehigh's College of Education and Holland from Political Science, they are building teaching resources for a brand new high school called Building 21 in Allentown, PA. The project is funded by the National Science Foundation and graduate student James Carrigan is one of the research assistants. Also new, with longtime collaborator Josep Parés, Centro Nacional de Investigación sobre la Evolución Humana (CENIEH), he was funded by the National Geographic Society to begin a new project into hominin migration from east Africa to Europe through southern Iberia. Here they are developing astrochronologies in ancient lake sediments and will involve Lehigh undergraduates in the research. For his doctoral thesis, Carrigan is studying tectonic forcing of divide migration in the Betic Cordillera having completed his MS work on Pyrenean growth strata. New graduate student Adrienne Scott, is beginning work on brittle deformation associated with the Sierra Nevada core complex in the Betics. He was the external examiner of the PhD dissertation of Idaira Santos Betancor, University of Granada, Spain, Mudd diapirs and folds in the South Caspian Basin: geometry and syn-sedimentary evolution of structures with Petroleum interest. Among his 2016 publications is Rajhida Sharif 's (BS 2015) undergraduate thesis, Using A Web GIS Plate Tectonics Simulation to Promote Geospatial Thinking. Rajhida will finish her MA in Science Education at the American Museum of Natural History this year.

Gray Bebout recently welcomed two new graduate students into his program: Gabe Epstein (Ph.D.), who will work on volatiles cycling recorded in ancient metamorphic rocks in the European Alps and occurring now in New Zealand (North Island); and Kaylee Kraft (M.S.), who will investigate biogeochemically processed nitrogen in plant phytoliths and in Mars-analogue mineral samples. Katie Jaeckel (M.S.) continues her research on the extents of deformation-enhanced release of carbon during deep subduction, based on field study in NW Italy. Two newly acquired NSF grants support study of fluids along ancient subduction interfaces and mass-balancing of volatiles at the Hikurangi subduction margin, New Zealand. The work on volatiles cycling at paleo-subduction interfaces is funded by a large, multi-institution PIRE grant (Partnerships for International Research and Education). Bebout continues to collaborate with researchers at the Institute for Planetary Materials, a research laboratory affiliated with Okayama University and located in Misasa, Tottori prefecture, Japan. Among the 2016 publications by Bebout's group is a paper in American Mineralogist (first author Kris Lazzeri, former EES M.S. student) documenting the incorporation of nitrogen and carbon in microporous silicon-rich phases that could exist at/near the Mars surface.

Claudio Berti had an exciting and busy 2016. In his first full year at Lehigh he focused on enhancing the success of field camp and developing new courses and course material for both introductory and upper level classes. Students in his courses now benefit from augmented reality technology to visualize and understand 3D data as it applies to topography and watershed evolution. field camp had a very successful summer with a highly competitive class selected nationwide from over 90 applications. The camp traveled out west in its classic itinerant style but explored new locations and new challenging projects. The summer was also filled with travel and research from the hot valleys of southern Spain, where he and Dave Anastasio are working to constrain processes responsible for river network evolution, to the cold peaks of Greenland, where he worked with Ken Kodama in support of his magnetic field paleo intensity project.

Bob Booth obtained NSF funding in 2016 to bring forward a global testate amoebae paleoecological database, as part of a large, collaborative effort to expand and develop an integrated database of paleoecological and paleoenvironmental information (neotomadb.org). He also continued working on an NSF-funded project focused on understanding why and how peatlands form in kettle basins, and the sensitivity of these ecosystems to climate variability. Bob obtained a Faculty Grant for International Connections from Lehigh's Office of International Affairs to pursue a new collaboration focused on obtaining paleoenvironmental records from high-elevation peatlands in Colombia, and he looks forward to fieldwork for this new project in January. Watch his blog (amongthestatelytrees.wordpress.com) for updates in late January! His lab was a busy place this year, with a visiting professor from South China Normal University, Dr. Jun Ouyang, learning paleoecological techniques and contributing to ongoing projects focused on drought variability. Graduate student Bob Mason has been studying the causes of recent oak decline in the Northeast and numerous undergraduates worked on independent research projects, including honor's theses by Ryan Herbert '16 and Erin Sowell '16. Bob continues teaching a rotation of popular courses, including ecology, conservation and biodiversity, and wetland ecology.

Ed Evenson had a busy 2016. In February he traveled to the University of Kansas to deliver a department seminar and several lectures to their glacial group. With his most recent student (Nathan Hopkins, LU Ph.D. '15 – now an Assistant Professor at Minot State University) he published a paper in BOREAS on the Baltic Ice stream in southern Sweden and with another past student (Sarah Kopczynski, LU Ph.D. '08– now at the Cold Regions Research and Engineering Laboratory) he published a paper in Quaternary Science Reviews on the Late Wisconsinan deglaciation of the Anchorage Lowland. With support from a past grad student (Tom Pasquini, LU MS '76), ExxonMobil and the Swedish government, Ed continued his AMS investigations of till kinematics in Alaska and Sweden. In May Ed and Laura spent 10 days in the spectacular glaciated Alps of Italy and Switzerland – Ed called it "research" but Laura knew better! Ed and Laura continue to summer at their second residence in Mackay, Idaho and invite any of you who are in the area to drop in for a visit – ask anybody in Mackay how to get to the house.

Benjamin Felzer's research group saw two successful Ph.D. defenses in 2016. Mingkai Jiang defended his Ph.D., "On the History and Evidence of the Colwell Index in Quantifying Environmental Predictability, and Its Applications in Characterizing Precipitation Predictability in the Conterminous United States" in the spring and Jien Zhang defended his Ph.D., "Detection and effects of climate extremes on hydrology and ecosystems: case studies in California and the Great Plains, USA" in the fall. Both have gone onto highly prestigious postdocs; Mingkai to work with Belinda Medlyn at the Hawkesbury Institute for the Environment at West Sydney University in Australia and Jien to work with Monica Turner at University of Wisconsin. The work from these theses produced three peer-review published papers in 2016, one in Hydrological Processes and two in the Journal of Climate. His other student, Rui Cheng, will be completing her M.S. at the end of this academic year. Ben's 5-year NSF Macrosystems Biology project is now ending, but the NSF Interdisciplinary Behavioral and Social Science project still has another two years remaining. He gave a talk entitled "Does a large carbon sink imply a healthy forest" at the Ecological Society of America meeting this summer and recently talked to the Pennsylvania Earth Science Teachers Association about what scientists are currently studying about climate. Mingkai also presented a poster at the American Meteorological Society meeting in January and gave a talk to Lehigh's CEE Department in April. He has been co-advising three undergraduates (Casey Urban, Malcolm Scobell, and Miles Necker) in their research with CEE professor Tara Troy. Their research was presented at the EI-STEPS Mixer and Symposium in the Fall. I have also taken on a new course, EES 250, Terrestrial Ecosystems, formerly taught by Zicheng Yu, to replace my rotation of EES 80.

Ken Kodama In August and early September of 2016 Ken Kodama lead an expedition to southern Greenland to collect paleomagnetic samples from the 1.3 Ga Eriksfjord basalts. Participating in the expedition were fellow faculty member Dr. Claudio Berti, student Lorrie Carnes, and Anna Kodama, who is conducting a related art project. The objective of the paleomagnetic study was to collect samples for absolute paleointensity measurements to confirm an earlier study of these basalts that suggests an increase in the Earth's geomagnetic field intensity at 1.3 Ga that could indicate the initiation of the Earth's solid inner core. Our study will use more modern paleointensity techniques in the laboratory that involve detailed stepwise heating of the samples in field free space and in the presence of a known laboratory magnetic field. Lorrie Carnes is making the laboratory measurements. Anna is participating partly in the tradition of a 19th century expedition artist and partly as a 21st century deconstructionist uncovering the metaphor of Earth processes.

Jill McDermott started as an Assistant Professor in EES this fall, and is setting up a lab to measure the geochemistry of deep-sea hydrothermal vents and ancient terrestrial fracture waters. She gave a talk at Penn State and attended the Ocean Worlds 2 meeting, with the goal to forge links between the oceanographic and planetary science communities. The two groups share a mutual goal to explore Earth's ocean and oceans beyond Earth. Jill then set sail on a 6-week cruise aboard the icebreaker R/V Polarstern, joining an interdisciplinary, international team hunting for seafloor hydrothermal vents at 87°N latitude in the Arctic Ocean. There she collected samples to reveal the biogeochemical signatures of a deep, submarine vent site on the remote Gakkel Ridge.

2016 was a busy year for seismology field work. **Anne Meltzer** completed a second two-year seismic deployment in Mongolia. Undergrad Julian Traphagan and PhD student Zhongxiong Cui helped pull out the seismic array and are busy analyzing data. Anne was in Quito Ecuador the day after the Mw 7.8 earthquake in April. She worked with colleagues on an international rapid response to deploy a seismic array to record aftershocks. The array will be in the field in coastal Ecuador for a year recording aftershocks.

Don Morris is happy to report the graduation of Rebecca Whiteash who finished her Masters project with flying colors this fall. The project investigated Mercury Binding to DOM Probed by an E. Coli Fluorescent Bioreporter. A tip of the cap to Steve Peters who helped to advise Rebecca with this project. During the past year he has continued his work on biological corridor projects in Costa Rica. With the help of interns (Iacocca and EI-STEPS summer interns), they are are measuring the growth rate, survival, and carbon sequestration of reforestation plots. This winter over 60,000 trees are being planted so this summer's interns will have their work cut out for them!

Frank Pazzaglia been engaged in earthquake research in Virginia and Italy and 2016 has been a particularly busy year. The Virginia research project, being pursued by graduate student Matt McGavick and undergr aduate Lorrie Carnes has been successfully presented at the Denver Geological Society of America (GSA) meeting and will be submitted for publication in 2017. Part of the Italian earthquake-related research has been published in a recent article in the journal Lithosphere.

The past year saw **Steve Peters** group conducting fieldwork in Virginia and Pennsylvania, digging soil pits and developing soil chemistry and chronology. Laura Markley (M.S. student) is leading the iron geochemistry in soil chronosequences. Steve traveled to Bermuda in May to help with Lehigh's engagement in the Bermuda Institute of Ocean Sciences (BIOS), specifically in Oceans and Human Health. Research on aeration of coal mine waters with PhD alumnae Jill Henry and USGS colleague Chuck Cravotta was just accepted in January and available online now. Research on using Rare Earth Elements as provenance indicators for some of the Appalachian Mountain Basins is also coming to press in January from Ph.D. alumnae Joanna Blake and LSU colleague Karen Johannessen. Rebecca Whiteash finished up her M.S. utilizing a biosensor strain of E. Coli that luminesces on exposure to Hg(aq). This work will see publication at the Mercury Conference this summer in Rhode Island. Ongoing projects continue to focus on soil and water chemistry and all the fun we can have in the lab and the field.

Joan Ramage was on sabbatical last year and enjoyed having time to do new geoscience projects in her daughters' elementary school. She has a New Directions Fellowship from the College of Arts and Sciences to develop a project using LiDAR remote sensing to study forest structure and biodiversity. She greatly enjoyed visiting Iceland, a geologist's paradise, and landed a NASA grant collaborating with the Nurture Nature Center in Easton PA . The new project will support undergraduate interns from Lehigh and Morgan State and uses the theme "6 degrees of Interconnectedness" for Science on a Sphere program that the students develop.

Dork Sahagian has been blurring the lines a bit between research, teaching and service. Research this year in tectonics, river meanders, volcanic ash hazards, and STEM education in public schools blends with the classroom and the public. He has been continuing his efforts in teaching not only of our own Lehigh students, but also reaching out to the broader public here and abroad. As part of the National Council for Science and the Environment, Dork represents Lehigh in the Council of Environmental Deans and Directors, and, in both of their national meetings this year, he compared notes on academic programs, pedagogy and outreach. More locally, he gave presentations throughout the region on various topics, but the most popular is climate change and its impacts. Every summer, he updates the textbook he wrote for intro to environmental science course. In its table of 20 warmest and 20 coolest years on record, he must, every year, add the present year to the list of warmest, kicking off some previous year, yet the list of coolest years remains always unchanged. This highlights the importance of public outreach- who is responsible to ensure all citizens are scientifically literate and able to make informed decisions? ...only us, the academic community, so we must redouble our efforts in public education and outreach, or face those who only appeal to the uneducated.

Zicheng Yu enjoyed another year of traveling. He went to Tierra del Fuego and Patagonia in southern Chile in January 2016 for fieldwork on an NSF-funded project with his PhD students Zhengyu Xia and Jonathan Stelling, and then attended the VIII Southern Connection Congress in Punta Arenas, Chile. In early May, Yu attended a peatland workshop in northern Scotland and then flew directly from London to Helsinki, Finland to serve as an Opponent (Examiner) at a PhD Public Examination at University of Helsinki. In late summer, he traveled to Asia to give lectures at universities and the Chinese Academy of Sciences in Beijing, Changchun and Nanjing, China, and then attended the XXXIV SCAR (Scientific Committee on Antarctic Research) Open Science Conference in Kuala Lumpur, Malaysia. In November, he attended a SHAPE (Southern Hemisphere Assessment of PalaeoEnvironments) – SWEEP (Southern Westerlies Evolution in Environments of the Past) joint workshop in Santiago, Chile.

Peter Zeitler's year was most eventful in its second half. In the summer, Peter traveled to UCLA twice, first for a project workshop on Tibetan crustal evolution, and then again with his graduate student Kalin McDannell to experiment with using an ion microprobe to analyze Pb diffusion profiles at the edges of apatite grains. In September Peter attended the 15th International Conference on Thermochronology, which took place in the gorgeous seaside setting of Maresias, Brazil (picture below). It was a busy week as he gave a talk on the apatite depth-profiling work, chaired meetings of the International Standing Committee on Thermochronology, and was honored to be awarded the 2016 Dodson Prize in thermochronology. In October Peter gave an invited talk at Princeton University, and in November his graduate student Lenny Ancuta did a very nice job defending his PhD research on the geochronology and geochemistry of basalts from central Mongolia. Finally, in December Peter traveled to the American Geophysical Union (AGU) annual meeting to present a poster on the tectonics of the Gobi Altai in Mongolia, coauthored with his former MS student Janelle Thumma ('16).

Help Save Trees:
EES offers an electronic only option for newsletters. To receive the annual newsletter electronically please e-mail: nr00@lehigh.edu with e-newsletter in the subject line and your preferred e-mail address. This and past newsletters are archived on the department webpage.

http://www.ees.lehigh.edu/alumni/ees_newsletter_current.pdf

15th International Conference on Thermochronology, which took place in the gorgeous seaside setting of Maresias, Brazil

Recent Alumni

Mary Pettit, BS '16 is currently living in Demorest, Georgia. She teaches full time as a co-teacher in a public high school while taking on an accelerated masters program through the Woodrow Wilson teaching Fellowship. She does all of the tasks that a certified teacher does, in addition to being a masters student. Her decision to pursue this program was made easier due to the encouragement and support of Dave Anastasio.

Her experience at Lehigh prepared her in terms of being resilient, since entering an accelerated masters program, while working a full time job is not an easy task. Coming out of the rigor of Lehigh she has yet to feel overwhelmed. Having professors that expected nothing less than exemplary work truly prepared her for the program she is a part of and when she does find herself struggling she can always rely on the skills she learned at Lehigh.

One of the best experiences she had at Lehigh was being an EES major. She never felt more at home at Lehigh than she did while in the EES department. It was comforting to walk around STEPS and have professors know more about her than just her name. She felt the EES department was a family that was there to support her when she presented her research at the Geological Society of America (GSA) conference in Baltimore. Ken Kodama went out of his way to ensure she was well prepared for the presentation and made this once-in-a-lifetime opportunity a reality. The amount of support she received is what makes the EES department such a special place on campus.

Mary is really enjoying her time in the classroom, and is truly happy with her decision to pursue this career path. She hopes that she can continue to travel and experience different parts of the country, or beyond while continuing in the teaching profession.

Ryan Herbert, BS '16 is currently enrolled at Lehigh for a 5th year under the university's President's Scholar program. He is applying to PhD programs in ecology and evolutionary biology. To broaden his biology background, he is taking a variety of biology department courses, such as genetics and evolution of development and is working in the Rice Lab at Lehigh University to research speciation and hybridization in chickadees. His activities include DNA extraction and analysis, checks on nests in the field, care for lab-raised chickadees, and behavioral tests on the birds to assess cognitive abilities.

The EES department gave Ryan ample background for his new work in evolutionary biology. He regularly draws on knowledge from courses like Ecology, Wetlands Science, Ecophysiology, and Earth History. His thesis work on testate amoebae with Bob Booth was excellent for introducing him to professional research. He finds himself easily transitioning towards a graduate student's workload and lifestyle (which includes quite a few early morning hours and weekends).

Five years from now, he is hopeful to be in the final year of his PhD. Exactly where, he can't be certain, but he is applying to a variety of programs. He is enthusiastic to complete a degree that will allow him to help maintain environmental balance - restoration ecology is one specific field that he is considering.

When Ryan was in Frank Pazzaglia's Earth History class during second semester of his freshman year he hadn't yet become accustomed to the friendliness of the department, and kept calling him "Professor Pazzaglia". A few weeks in, Frank stopped him. He told him that if he addressed him as Professor Pazzaglia one more time, he'd fail him. So he, a scared freshman, said "okay, Frank." He shared this story to show that the EES department is very unique in fostering an environment where students and professors see eye to eye. A first name basis is only the beginning. The department is more open than any he has found, eager to promote student interest, research, and criticism.

Molly Mulhern, BS '11 is currently working for FTI Consulting's Environmental Solutions practice segment. She and her colleagues work as mediators between the EPA and both public and private entities to allocate cleanup costs for superfund sites. They review historical ownership and operations to understand who did what, where, and when. They then weigh those facts against results of technical reports, such as remedial investigations, and the anticipated site cleanup costs to assign a dollar value to each party involved.

A background in environmental science prepared Molly for the scientific aspect of her work. A basic understanding of sampling methods, groundwater flow, soils, and chemistry prove invaluable when reviewing technical reports from the contaminated sites. Her EES background also taught her how to critically examine scientific studies, and have a healthy skepticism towards every report she reads. After Lehigh, she went on to get a Master's degree in Geological Sciences, with a focus on estuarine circulation and dynamics. As some of her largest projects at FTI are contaminated estuaries, this graduate work was directly applicable to what she does now.

In five years, she likely will be continuing her work at FTI. The practice is never wanting for work, and it provides ample opportunity for professional development and networking. For example, she attended a 3-day intensive environmental law course in Washington, D.C. in November that will help her expand her understanding of the legal framework for the work she does.

As Molly relayed to EES undergraduates, when she gave the undergraduate symposium address, do not be discouraged by the job search process. When she was finishing her degree at Lehigh, she was having no luck finding a job. She applied to over a hundred positions online and never heard back from anyone. What she learned from that first job search is that you need to be uncomfortably aggressive – call the company, email people who work there, try seeking them out at conferences, and try more than once. Many times the algorithms for the online applications filter out perfectly suitable candidates. It is on you, not on the company, to make yourself seen and heard. She applied twice to FTI through the online application and never heard back. It wasn't until she found the email of the practice head online, and sent him a tailored and succinct email inquiring about the position listing her qualifications, that she was brought in for an interview.

Marisa Repasch , BS '14 is a first year PhD student in the Geomorphology section at the Helmholtz Center for Geoscience Research in Potsdam, Germany, where she works with an international group of geologists, geochemists, and geophysicists to solve fundamental problems related to Earth surface processes. Her current research is supported by the StRATEGy international research training group, in which students and scientists in Argentina and Germany collaborate on significant geoscience research efforts in the Andes. She is developing a new project in the NW Argentinian Andes, where rivers transport a significant volume of sediment and terrestrial organic carbon from the mountain range to the Paraguay River, which eventually reaches the Atlantic Ocean. Her research group is working on novel use of compound-specific stable isotopes to trace leaf wax organic matter through river systems which has the potential to be a powerful tool for sediment provenance. Before moving to Germany, Marisa earned her M.S. degree in Geology from the University of New Mexico.

During her four years at Lehigh, her experiences with faculty members and students, both in the lab and in the field, inspired her to pursue a career in academia. In classes and in undergraduate research experiences, she was continually challenged by questions that remain unanswered. Thinking like a geologist is a skill that is honed when spending time in the field and devoting your mind to thinking about the landscape. Lehigh offers abundant opportunities for students to get out in the field and develop these critical thinking skills. She remembers almost every field excursion led by Frank Pazzaglia, Dave Anastasio, Steve Peters, and Bob Booth. She acquired the ability to collect various types of data in the field, such as taking strikes and dips, stream cross-section profiling, and plant species identification.

Prior to her senior year at Lehigh, Marisa was given the opportunity to do an undergraduate research project with Dave Anastasio, studying kinematic processes in the foreland of the Pyrenees Mountains. Through this experience she learned how to carry out a scientific research project from asking the research question to developing the methodology to answer the question and finally, collecting and interpreting the data to answer the question. Every undergraduate student should consider undertaking an undergraduate research project in order to practice the scientific method and prepare for graduate school or even projects that may arise in their careers.

After completing her PhD dissertation in Germany Marisa plans to pursue opportunities to be a post-doctoral scholar at a research institution, either in the U.S. or abroad and plans is to pursue a career in academia.

2016 EES By Numbers!

48 Majors

22 Graduate Students

2 Endowed Professors

16 Faculty

9 Minors

5 Major award winners (AGU, GSA, international professional societies)

4 Fellows Geological Society of America

21 Majors completed internship or research projects

1 Fellow American Association for Advancement of Science

2 Fellows The American Geophysical Union

EES WEEKLY SEMINAR SERIES

*Supported by the endowed **Bertolet and Blaustein** funds*

EES seminars are scheduled every Friday, 12 noon in STEPS 101- Please join us!

Spring

Ellyn Enderlin, University of Maine, **February 1st** "Chasing Ice(bergs): An interdisciplinary approach to studying the shrinking Greenland Ice Sheet"; **February 2,nd** "Cryosphere-climate feedbacks: Iceberg armadas"

Jessica Hinojosa, California Institute of Technology, **February 4th,** "New archives of Quaternary southern hemisphere climate variability from southwest New Zealand"; **February 5th,** "A southern perspective on the interplay between climate and tectonics"

Bronwen Konecky, Oregon State University; University of Colorado, **February 8,** "Water isotope tracers of tropical climate change: A modern take on past dynamics"; **February 9th,** "Ice ages and tiny horses: Long-term fluctuations in Earth's climate and atmospheric CO_2"

Jill McDermott, University of Toronto, **February 11th,** "Distinguishing abiotic from biotic carbon and sulfur sources in the deep, dark biosphere"; **February 12th,**"Ocean circulation impacts on Earth's carbon cycle and climate"

Tolulope Olugboji, University of Maryland, **February 15 th,** "Seismological investigations of the Crust"; **February 16th,** "Ears to the ground: Seismic spectrum and it's applications".

Kelsey Winsor, University of Massachusetts-Lowell, **February 18th,** "Ocean drivers of deglacoal Greenland ice sheet retreat"; **February 19th,** "volcanism, climate and mass extinctions"

March 8, Jonathan Price, State Geologist Emeritus, Nevada Bureau of Mines and Geology Mackay School of Earth Sciences and Engineering University of Nevada, Reno "The origin of Carlin-type gold deposits"

March 25, Karen Harpp, Colgate University, "New insights into the sources of the Galapagos Mantle plume"

April 1, Katie Snell, University of Colorado, Boulder, "Hot and high times in the western U.S.: Paleoclimate and paleoelevation, 80 Ma to present"

April 8, Greg Hirth, Brown University, "Subduction zone earthquakes: A case study on the application of lab data to understand earthquake processes"

April 15, Brad Hacker, University of California, Santa

Did you know...
On Friday's before the our seminars our graduate students cook lunch for the department?

Best lunch Spring 2016- **Zhonxiong Cui**
Best lunch Fall 2016- **Katie Jaeckel** and **Darwin Janes**

Please join us in STEPS 102 on Fridays at 11am

Fall

September 2, Earth and Environmental Sciences Graduate Students and Faculty, Summer Photo Presentation

September 9, Irina Marinov, University of Penssylvania""Southern Ocean deep convection and global climate implications via ocean and atmospheric teleconnections"

September 16, Tamara Carley, Lafayette College "Origin stories: Using Icelandic zircon to investigate the generation and evolution silicic magma and juvenile crust"

October 7, Paul Olsen, LDEO at Columbia"Fire and Ice: Mass extinction at the close of the Triassic and the rise of dinosaur dominance"

October 21, Tara Troy, Lehigh University "Improving knowledge of flood mechanisms and flood risk estimation"

October 28, Neil Pederson, Harvard University "Vulnerability of Our Forests and Similar Temperate, Mesic Forests in the Northern Hemisphere to Climatic Change"

November 10 and 11, **D. Foster Hewett** *(see below)*

November 18, Santiago Herrera, Lehigh, Visiting Assistant Professor Biological Sciences, "Dynamic biogeography of deep-sea hydrothermal vent fauna: A barnacle perspective"

December 2, Loyc Vanerkluysen, "It's a Trap! Origin, emplacement and impact of the Deccan large igneous province"

The 39th annual
D.Foster Hewett Symposium

"SIGNIFICANCE OF A CHANGING ARCTIC"

November 10 and 11th

Keynote Lecture ***Dr. Jennifer Francis***, Rutgers University

"Crazy Weather and the Arctic Meltdown: How are they Connected?"

Dr. Julie Brigham Grette, University of Massachussetts Amherst

"Deja Vu: How Previous Arctic Warm Periods Inform Our Possible Future"

Dr. Thorsten Markus, National Aeronautics and Space Administration

"Monitoring the Changing Sea Ice and Ice Sheets from Space"

Dr. Carin Ashjian, Woods Hole Oceanographic Institution

"Arctic Ecosystems in a Changing Climate"

On the shoulders of giants:

Lehigh Field Camp renews its mission of training the next generation of Earth scientists and professionals.

This year marked a new beginning for the prestigious Lehigh Field Camp program under the first full year of field camp director, **Dr. Claudio Berti,** who is committed to introduce new projects, topics and techniques to enhance the diversity and the many strengths of a program that trained students in the field for over four decades. This past summer was a great success, with a class of 29 students from 18 different universities selected nationwide from over 90 applications. Field Camp explored new projects in the Bighorn basin (WY) looking at folds and thrusts in the famous Sheep Mt. Anticline as well as sequence stratigraphy of the Frontier Fm. The caravan also travelled to familiar places like the Copper Basin, Wildhorse Canyon and Mackay, ID, where surficial processes and sediment source to sink projects are shaping up, alongside crystalline and metamorphic ones.

Field camp students continue to benefit from the generosity of our alumni through the Vic Johnson Fund and a scholarship established by the Imhof family which allowed full support of Lehigh students in 2016. *"I was one of the lucky students that were able to travel with Lehigh field camp, an opportunity that was made available to me through your generosity. This has been a source of inspiration for what I want to do while finishing my studies here at Lehigh and in moving forward. It will not be forgotten"* said **Guerric Vornle von Haagenfels**, one of the awardee of this past summer scholarship.

In the summer of 2017 field camp will include a new pool of field tablet computers and a drone for processing 3D aerial images and topographic analysis in the field, among other innovations in tools and instrumentation. Introducing new technologies is one of the ways the program is enhancing the professional development of the participants to meet the demands of a competitive job market.

The recruiting for next summer is ongoing and the 2017 class is shaping up to meet expectations of excellence and diversity, we look forward to another successful year. If you want to know more about the program, visit the Lehigh field camp website (http://www.lehigh.edu/~clb208/fieldcamp) or contact the director (Claudio Berti: clb208@lehigh.edu), and if your summer travels take you close to our route, please do not hesitate to join us in the field!

Field camp director is supported by:

Chevron

Jocelin (and Martha) working on the bird-strike survey at San Luis, Costa Rica

Lehigh in Costa Rica

The Lehigh in Costa Rica program provides summer internship opportunities to students involved in research related to tropical forest conservation and sustainable development. Last summer the participants were also involved in a community service project that installed a biodigestor for a rural farm family. In addition to reducing pollution from animal waste, the unit provides natural gas to the community for cooking. Last summer EES majors **Jocelin Gregorio** and **Sarah Stern** worked in the San Luis Valley and the Osa Peninsula respectively.

When contacted for a quote, Jocelin had this to say about her experience:

"I want to thank the various Lehigh programs (including EES) that provided financial support for the internship program. As an intern, I had the opportunity to work on a variety of research projects including butterfly conservation, tropical forest canopy closure, bird window-strike collisions, and biological methane production from biodigesters. As an Earth and Environmental Science major, Sustainable Development and Latin American Studies minor, this program exceeded my needs and expectations by allowing me to immerse myself in the local culture and conduct valuable research in the field I plan to pursue."

In 2017, the program will take place between June 20th and August 10th. The program is financially supported by the Lee Iacocca International Internship Program, the EI-STEPS Summer Internship program, and the EES Department.

EES Endowed Accounts

Bradford Willard

Bradford Willard '21, was a distinguished geologist, internationally known and respected for his work on the Devonian stratigraphy of Pennsylvania.

In 1915, Willard entered Lehigh University as a freshman and chose to major in geology. The late Professor Benjamin Miller was head of the department of geology at that time and most of Willard's courses in geology were taken under Professor Miller. Years later, upon Professor Miller's retirement, Willard succeeded him as head o f the department of geology.

He graduated with honors from Lehigh in 1921 and received the B.A. degree and then entered graduate school at Harvard University where he received his M.A. in 1922 and Ph.D. in 1923.

Brad joined the faculty of Lehigh University in 1939 as professor and head of the department of geology. He held this post until his retirement in 1959. The period of his tenure was one marked by crises and great events in the history of both the university and the department. World War II almost drained the campus of faculty and students, and for a time, the instructional program almost ceased to exist. Brad and a very few colleagues in the geology department kept it running during the war so that by 1946, when the students returned, the program could be resumed with no loss in quality. During this same period, in the late 1940s, the graduate program was enlarged and greatly strengthened, and under Brad's leadership, the department initiated a Ph.D. program. The first Ph.D. recipient did his dissertation under Brad's direction and received his degree in 1950.

The Bradford Willard Memorial Fund was endowed to Lehigh to "further the educational programs of the Geology Department" in 1982 by ***George D. Bouline, Jr. '53,*** *Chief Geophysicist for Moncrief Oil Co. in Houston, TX. George Bouline lived next door to Professor Willard when growing up in Harrisburg, Pennsylvania. Willard was, at that time, head of the Pennsylvania Geological Commission and he encouraged Bouline to go into geology.*

Homer A. Bachert '18 Endowment Fund

Homer Bachert was a 1918 Lehigh electrical engineering graduate who was deeply interested in the Natural Sciences. In order to honor her father, the Bachert fund was established in May, 1995, by Margaret A. Bachert. The funds were designated to facilitate participatory undergraduate educational experiences through both laboratory and field studies. Through the years the Bachert funds have supported student travel to professional meetings as well as providing supplies needed for research projects.

James F. Farny, '50

In 1989, James Farny endowed a gift that is the James F. Farny Research Fund. Use of this fund was designated to further studies in both the scientific and political science area.

Farny received a Lehigh degree in chemical engineering and studied graduate-level transportation engineering and regional planning at the University of Pennsylvania. He served two years in the Army Chemical Corps. He was a process engineer, quality engineer, production supervisor and, staff engineer at Thiokol for 32 of his 42 years in industry.

EES Gifts 2016

All gifts, no matter the size, contribute to the success of our program. We wish to thank the following alumni and others who have generously donated to the EES Department in 2016.

Anonymous
Scott A. Andres '80
James E. Baxter '80
Thomas P. Becker '02
Robert C. Booth '55
Keith A. Brugger '78
Merritt B. Lewis '92
Lori A. Burkert '06
Patrick A. Burkhart '93
Kristin M. Carter '93
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Luke F. Wilson '08
Marjorie T. Zimmerman '81

Please accept our apologies if we missed your name on the above list, and we will acknowledge your gift in the next newsletter. We are grateful for all the support to the department and its scholarly activities. Gifts are used to support undergraduate and graduate education and research activities to make much of which is reported in this newsletter possible.
Please notify Nancy Roman nr00@lehigh.edu

An Invitation to Get Involved and Support Your Department

The faculty and staff would like to extend an invitation to alumni to stay in contact with EES and to get involved with your Department. Contact us and let us know how you would like to be involved. Some activities and events open to all alumni include:

- The weekly Friday lunch, ST 102 and seminar, ST 101 (11 AM-1:00PM) •
- The Graduate Student Symposium, **Friday, March 3, 2017•**
- Undergraduate Symposium, **Friday**, **May 5, 2017**
- *Department picnic and awards presentations follow the* Undergraduate Symposium on May 5

Many of the programs we offer in EES that allow us to excel in education and research are made possible by endowed accounts and annual donations by alumni. We are always looking to augment our resource base for graduate and undergraduate research, EES field programs, and Departmental laboratory and educational facilities. If you are in a position to donate, please fill out the form below with your gift and send it to us. We will acknowledge receipt as soon as it arrives. Please make your check payable to Lehigh University and we thank you, in advance, for your consideration and support.

Name: _____

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Don't forget about a possible company match.

I prefer to make an unrestricted gift in the amount of $ _____

I would like to make a donation to support the EES graduate programs in the amount of $ _____

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Total personal donation $ _____

Employer matching gift (if applicable, include employers matching gift form) $ _____

Please send the completed form with your check payable to Lehigh University.

Mail to:
Nancy Roman
Department of Earth and Environmental Sciences
Lehigh University, 1 W. Packer Ave., Bethlehem, PA 18015-3001

If you prefer to give a donation online, you can simply visit the Lehigh giving page at mylehigh.lehigh.edu/makeagift and indicate EES in the comment box to select the EES department as your designation.

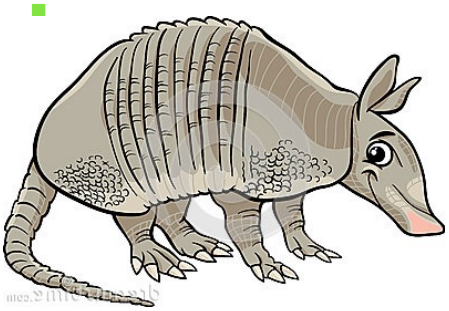
SAVE THE DATE

Please join us for an
Earth and Environmental Sciences event

at

Sambuca

909 Texas Avenue
Houston, TX 77002



Monday, April 3, 2017
5:30-8:00 PM

Welcome remarks at 6:30 PM

AAPG 2017
100th Annual Convention and Exhibition
Houston, Texas,
2-5 April 2017

Address here

stamp

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