THE OHIO STATE UNIVERSITY

SCHOOL OF
EARTHSCIENCES

January 2017 News Notes

Alumni Change Lives

Scott Hull is a senior undergraduate student working with Dr. Wendy Panero. Here he describes how Friends of Orton Hall helped further his studies. If you are interested in giving to support the Friends of Orton Hall or other funds, please visit our giving page (link).

I have been a student researcher in Dr. Wendy Panero's mineral physics group for nearly two years, and have been working in the blossoming field of exoplanetary science for the bulk of that time. The experience I have gained while operating in this new field is invaluable; I have gained much skill in the realm of mass computational geologic modeling. I have learned how to operate in highly theoretical scenarios, allowing me to apply geologic knowledge and programming skills to handle vast amounts of stellar data to make predictions about the geologic state of planets incomprehensively far away from our own. Ultimately, I have fulfilled a dream of making unique contributions to the scientific record, and that has only been possible with the support of organizations like Friends of Orton Hall. My project is one that fuses aspects of astronomy, planetary science, and big-data processing to make predictions about the potential for Earth-like worlds within a given stellar system. This is chiefly accomplished by simulating the potential for surface-to-interior mass flux via an Earth-based thermodynamic model where bulk composition, as reflected by the spectroscopically-measured composition of the host star, is the principle variable. Modeling the chemical evolution of a planet by creating a terrestrial planet's general constituents, such as the core, mantle, and crust, can tell us about the roles moderately volatile to refractory elements play in the subduction-versus-stagnation dichotomy. This is an attempt to see how frequently Earth-like plate tectonic regimes occur throughout the universe, which is thought to be a geologic phenomenon intimately related to the presence of life. I have been successful in creating a model and processing hundreds of stars over a one-and-a-half-year timeframe, which

has concluded with some unexpected results. Moderately volatile elements, such as sodium, play a vital role in our models by frequently being too abundant to initiate a negatively buoyant, down-going Earth-like plate subduction regime. These results differ from the initial hypothesis: Earth-like plate tectonics would be mainly influenced by "plate drag" introduced by the large mantle-crust density differential that occurs when basalt metamorphoses into eclogite. This project reinforces the unique geologic state of Earth and its rarity throughout the Cosmos.

Thanks to the funding given by Friends of Orton Hall, I was able to present my work and promote the impending publication detailing my models at the American Geophysical Union in December. At AGU, I was able to confer with planetary geologists and astronomers from around the world so that the paradigms this project has challenged will be considered and continuously refined in future studies. I also received feedback on this project and future work. I also discussed the modeling techniques and software we have developed, so that the growing list of stellar systems most likely to host geologically Earth-like worlds may continue to develop for more time-intensive follow-ups.

Faculty Profile: Doug Alsdorf

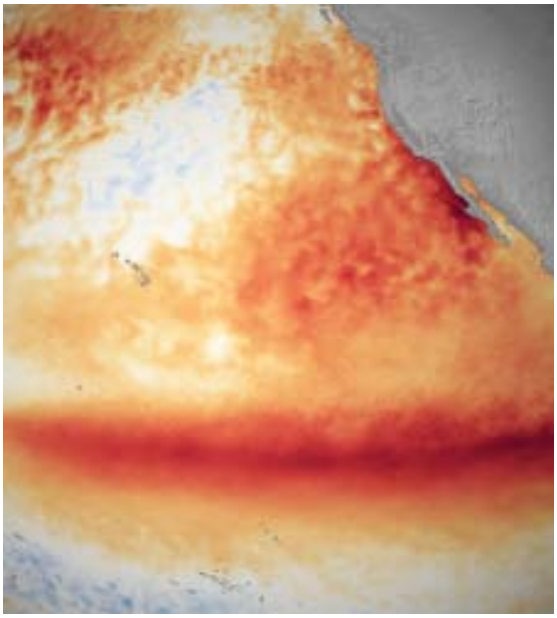
Hi fellow alumni. I graduated from our department in March of 1986 with my B.A. and then returned after working a couple of years to complete my M.S. in 1991. Perhaps we shared a class together, so feel free to send me an email of hello. I've been blessed with a varied research career. My Cornell Ph.D. focused on the tectonic structures of the Himalaya Mountains and the Tibetan Plateau whereas the fifteen years that followed were a wonderful assemblage of research using satellite based measurements of the Amazon and of other surface waters. Now, my focus is exclusively on the Congo and sub-Saharan Africa.

The Congo fascinates across the spectrum of science and society. At about three times the size of the Mississippi, the Congo River discharge is the second largest in the world. For much of its flow, the river is rather shallow at only a few meters in depth as it traverses thousands of miles across the Congo craton. Yet, within the last remaining three hundred miles, where the river spills over the craton edge and into the Atlantic, the Congo is the deepest in the world with 300 ft deep plunge pools and one pool measuring 700 ft in depth. In the late 1800s, the autocratic Henry Morton Stanley was the first to discover that the Congo flows uphill at the bottom of some pools.

Today's Congo science must overcome the economic and language barriers that have tended to paint a "Heart of Darkness" view from the outside. I'm humbled to work with researchers from the Congo who have spent their lives in careful study of the Basin's hydrology, climate, and vast "Cuvette Centrale" wetlands. Together, we are publishing science hypotheses assessing the hydraulic connections between the vast swamp and the massive river flowing through its middle. The swamp may receive the majority of its water via rainfall rather than the fluvial-wetland exchange typified by the Amazon. If we find this to be true, then it is a truly odd circumstance given the enormity of the Congo River. Our concerns focus, too, on the seasonally migrating tropical rainbelt that twice annually delivers life-giving rain. Millions of subsistence farmers rely critically upon the timing and amounts of rainfall. As anthropogenic climate change alters historic temperatures, differential hemispheric heating of the atmosphere may result in geographic shifts of the rainbelt. There are decades of historic stream discharge records yellowing on bookshelves in major Congo cities. These archives, combined with today's satellite technologies, should allow us to discern if any such shifts are occurring or not.

As the final stage of my science career comes to the fore, I'm energized by the discovery process. At Cornell, I was trained by Jack Oliver, a fellow Ohioan and lead discoverer of subductions zones, in the principles of scientific discovery. The Congo continues its discovery heritage: it has one-tenth the number of peer-reviewed hydrology publications compared to its Amazon cousin and thus we scientifically venture where few have gone before. Archival hydrologic measurements dating back to the 1930s have not been analyzed with modern computational algorithms, and thus new insights might be gleaned from old data. As the second largest watershed in the world, it is rich with hydrologic and climatic unknowns. The Congo is opportunity.

Interdisciplinary Climate Change Course Format is Promising



EARTHSC 1911 was an interdisciplinary course on climate change which was co-taught by Earth Sciences professor Michael Bevis, EEOB professor Steven Rissing and History professor Geoffrey Parker during Autumn of 2016. In its first semester, the course seemed to resonate with students, giving them information about not only the science of climate change but also its historical aspects and its impact on business and the arts. This multidisciplinary approach is crucial for reaching students who would not normally explore these issues. There are some people who are not interested in science in the abstract, but they are in the news of the day. And increasingly, the hard problems fall in between disciplines. With the success of this course the team of professors is hoping to offer an evolved version of the course in the future.

For more information, check out the Columbus Dispatch's article on the course.

70th Anniversary of Field Camp

We are currently planning the 70th Geology Field Camp Alumni Reunion to be held in Ephraim, Utah from June 21 to June 25th, 2017. Details for this event will be forthcoming!

Photo: Dr. Edmund Spieker, founder of field camp, conducting field work on the Wasatch Plateau c. 1920.

GEOS Chapter Update

Welcome back, Earth Science students! To kick off the spring semester, the GEOS club will be hosting a presentation through Career Services on interviewing effectively. This is a great opportunity to enhance your career development skills, and all Earth Science students are welcome. The event is tentatively planned for mid-February; stay tuned for more details on time and location. Cookies and milk will be provided!

For questions on the chapter, please contact Katie Treiber at treiber.15@osu.edu.

March is Cryolophosaurus Month!

During March, the Orton Geological Museum will have a one-month Crowd-Funding Campaign to purchase and construct a full skeleton of Cryolophosaurus ellioti in the Orton Hall Lobby. Cryolophosaurus ellioti is the most complete dinosaur known from Antarctica and was discovered by Dr. David Elliot of the School. This is the first step in our efforts to modernize the exhibit hall in the Museum, which will greatly enhance the STEM outreach efforts of the Museum.Please consider supporting this effort during March. Of course, you may also contribute now or later by sending a contribution directly to the Museum at the following address:

Dale Gnidovec
Orton Museum of Geology
School of Earth Sciences
155 South Oval Mall
The Ohio State University
Columbus, Ohio 43210

Community Outreach activities of the Museum include many OSU, K-12 school, scouting, and community groups that come to the Museum, and Dale gives talks about geology and paleontology across the State of Ohio. In excess of 20,000 visitors come to the Museum each year, which will grow substantially with a DINOSAUR in the lobby. If you have any questions, please contact Dale (gnidovec.1@osu.edu), Bill Ausich (ausich.1@osu.edu), or visit the Orton Geological Museum website (link). We will circulate the URL for the Crowd-Funding Campaign in March.

Earth Sciences Baccalaureate Graduates, December 2016

Congratulations to the Autumn 2016 graduates receiving their baccalaureate degrees in Earth Sciences. Graduating in December were:

Daniel Ardrey, BS, thesis entitled "Experimental Shale-Fluid Interaction: With a Theoretical Comparison to Hydraulically Fractured Flowback Waters," advised by Professor David Cole.

Bryan Bruns, BA

Tommy Copeland, BS, thesis entitled, "Grain Size Analysis of the Watershed and Nearshore Coastal Sediments, in Coral Bay, St. John, U.S. Virgin Islands," advised by Assistant Professor Derek Sawyer.

Samuel Eckert, BS, thesis entitled "Helium: Properties, Historical Data, and the Viability of 4He Concentrations in Coalbed Solids in the Powder River Basin," advised by Assistant Professor Thomas Darrah.

Tess Green, BA

Andrew Hoolihan, BA

John Jones, BS, thesis entitled "Utilizing Noble Gas Geochemistry to Trace Hydrocarbon and Fluid Migration in the Northern Appalachian Basin," advised by Assistant Professor Thomas Darrah.

Chad Niddery, BS, thesis entitled "Analysis of Gas Samples from Coalbed Methane Wells in Sullivan County, Indiana using Gas Chromatography," advised by Assistant Professor Thomas Darrah.

Derek Sepelak, BA

Nick Steed, BS, thesis entitled "Idealized Body Modeling of a Methane Hydrate, Methane Chimney and Basement High System Based on Gravity Observations in the Central Aleutian Basin," advised by Professor Ralph von Frese.

Brevia

The School of Earth Sciences is sad to report that undergraduate student Zachary Franczek died suddenly on January 1, 2017 in Broadview Heights, Ohio. Zach's funeral mass of Christian burial was held on Saturday, January 7, 2017 at St. Albert the Great Church in North Royalton. Anyone who would like to remember Zach is asked to give a contribution to My Active Minds, 2001 S Street NW, Suite 450, Washington DC 20009. There is a student chapter of My Active Minds at Ohio State which should be mentioned along with any contribution.

Alumna J. Alexandra Hakala received the Presidential Early Career Award for Scientists and Engineers (PECASE). The PECASE is the very highest honor given by the U.S. government to early-career scientists. Hakala's adviser was Yo Chin. She currently works at the DOE. You can read more on the website (link). Congratulations, Ale!