

March 2014 News Notes

- Alumni Change Lives
- Shell Leadership Conference 2014
- SES at AAPG - Houston 2014
- Earth Sciences undergraduates present their research
- Faculty Profile: Joachim Moortgat
- Fund Profile: The Third World Mapping Fund
- Brevia

Alumni Change Lives

Mark Peter (PhD expected 2014) received support from The Friends of Orton Hall fund. Here, Mark describes how this has helped advance his career.

I am a Ph.D. Candidate in my final year of dissertation work. My research in invertebrate paleontology, with advisor Prof. Emeritus Bill Ausich, focuses on the evolution and origin of the flexible crinoids. In collaboration with the Assembling the Echinoderm Tree of Life (AEToL) project, funded by N.S.F., I am in the process of constructing a comprehensive phylogeny of a clade of fossil crinoids, the Flexibilia, or flexible crinoids. The resulting phylogeny will be used to answer questions pertaining to the origin, biogeography, and evolution of the group, and will serve as a guide for a taxonomic revision of the group to reflect evolutionary relationships.

Because flexible crinoids are relatively rare, much of my “field work” has been in museums. The AEToL project has funded several trips to the Smithsonian Institute, where the world’s greatest collection of flexible crinoids is housed. In the course of my doctoral studies, I have had some great field experiences, including collecting crinoids in Estonia in support of my advisor’s research. The two-week expedition on the Estonian islands of Hiiumaa and Saaremaa was funded by a National Geographic travel grant. I have also collected crinoids in Ohio, on Lake Cumberland, Kentucky, and in southern Tennessee and northern Alabama. One of my best field experiences was a course in Carbonate Geology on San Salvador Island, Bahamas. This field course was subsidized in part with generous alumni contributions. It was on this trip to the Bahamas that I got my first glimpses of living crinoids, while snorkeling on a shallow patch reef.

Last autumn, funding from the Friends of Orton Hall helped to support my participation in the 2013 Annual Meeting of the Geological Society of America in Denver, Colorado, where I presented a poster entitled, “The variability within the infrabasal circlet of the cladid crinoid genus *Cupulocrinus* (Echinodermata) and



implications for the origin of flexible crinoids.” I thank all who support the Friends of Orton Hall for this great opportunity. In a recently submitted paper co-authored with my advisor, I had the opportunity to describe my first new species of crinoid. Describing a new fossil species is something I had wanted to do since I was a child, collecting fossils in my back yard in Cincinnati. My ultimate career goal is to obtain an academic position that allows me to combine teaching and research in paleontology.

Shell Leadership Conference 2014

Students at all levels in SES participated in the 5th Shell Leadership Conference held at Ohio State on February 8, 2014, themed “Leverage Your Strengths”. The interactive day gave the students opportunity to hone their leadership skills via case studies, group discussions and presentations by Shell leaders. Shown at right are some of the students who participated in the conference.



On the day before the conference, the SES student chapter of AAPG arranged for a presentation by Pat Jackson, geoscientist at Shell, on “How to Get a Job at Shell.” Also present was Mike Fairburn of Shell who helped answer questions about jobs at Shell. Approximately thirty SES students attended that talk.

SES at AAPG - Houston 2014

We are expecting in excess of 25 students, faculty and staff to attend the AAPG annual meeting from April 6 to 9 in Houston. As was the case last year in Pittsburgh, our undergraduates will be well represented. The School again will have a booth on the convention floor highlighting our research and facilities, educational opportunities in energy areas, and University-level programs.

As usual, there will be two alumni-related events.

All- Alumni Reception

Monday, April 7

5:30 – 7:30 p.m.

Hilton Americas Houston

SES Alumni Breakfast

Tuesday, April 8

7:30 – 9:00 a.m.

Hilton Americas Houston

Room: Lanier E

A flyer has been circulated to alumni to confirm your attendance at the breakfast.

The students are really excited about the meeting and the prospect of learning more about the petroleum industry. We hope to see y'all soon.

Earth Sciences undergraduates present their research

Among the 90 students presenting their research at the 2014 Arts and Sciences Natural and Mathematical Sciences Undergraduate Research Forum on March 5 were seven students majoring in or doing research in the School of Earth Sciences. Students presenting, their project titles, and their faculty research advisors are:

Daniel Barr, BS 2014, Analysis of Morphology and Alignments of Monogenetic Submarine Volcanic Cones in the Adare Basin, Antarctica. Research advisor: Terry Wilson.

Shannon Hibbard, BS 2014, Fruit of the Giants: Mega-faunal Fruit Species in Yasuni, Ecuador. Research advisor: Simon Queenborough, Evolution, Ecology, and Organismal Biology.

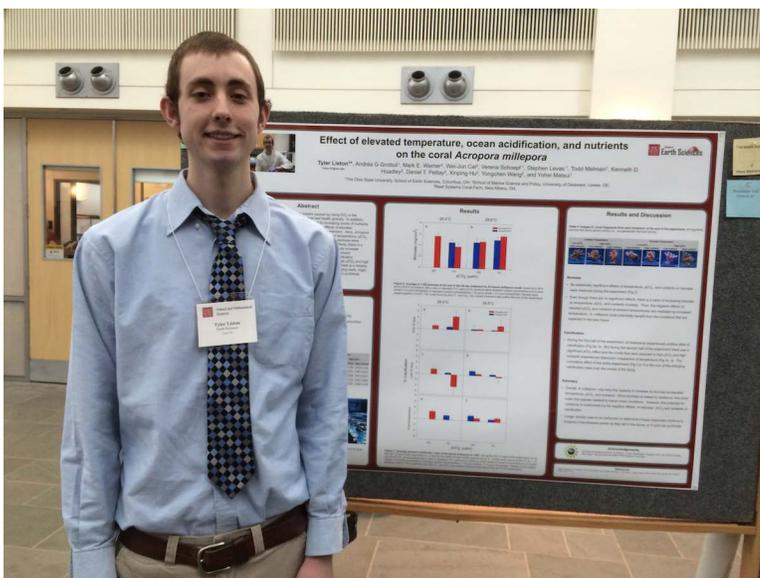
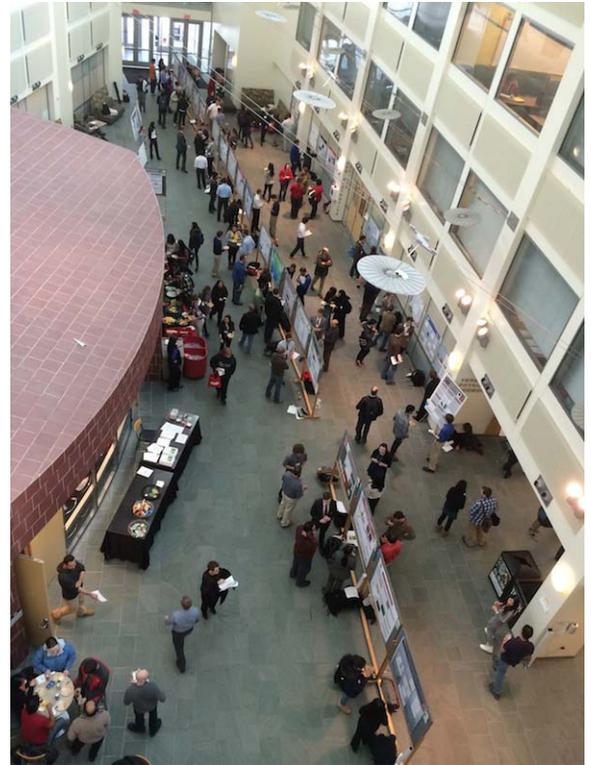
Amber Huston, BS 2015, Neodymium Isotope ratio Trends in the Ordovician Record: Initial Weathering of Rising Appalachian Mountains. Research advisor: Matthew Saltzman.

Tyler Liston, BS 2014, Effect of Elevated Temperature, Acidification, and Nutrients on the Coral *Acropora millepora*. Research advisor: Andréa Grottoli.

Michael McBride, BS Biology 2014, Effect of Repeat Bleaching Stress on the Biogeochemistry of the Caribbean Coral *Porites astreoides*. Research advisor: Andréa Grottoli.

Mackenzie Scharenberg, BS 2015. Evidence of Oxygen Fugacity Controlling Mantle Iron Distribution. Research advisor: Wendy Panero.

Christina Zerda, BS 2014. Partial Crystallization at the east Pacific Rise: Evidence for Deep Crustal Chambers. Research advisor: Michael Barton.



Above: The Arts and Sciences Natural and Mathematical Sciences Undergraduate Research Forum was held in the Physics Research Building, at Ohio State.

Left: Tyler Liston, BS 2014, won a prize for best research poster. Congratulations to Tyler and to all the students!

Faculty Profiles: Joachim Moortgat

Beginning with this issue, an informal bio of each SES faculty member will be featured each month, in (roughly) reverse chronological order. This month, we feature Asst. Professor Dr. Joachim Moortgat.

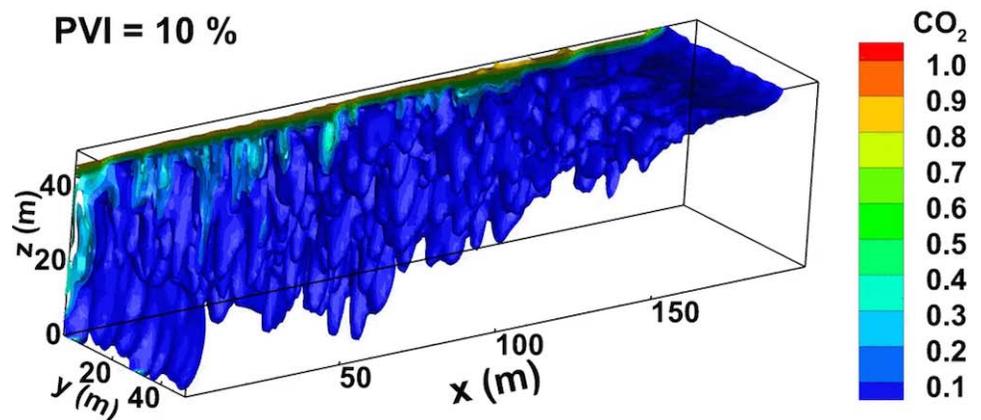
After hiking various types of (sometimes active) volcanos in New Zealand, South America, and Italy, I was excited to start my undergraduate education in a new geophysics program at the Utrecht University (Netherlands), determined to become a volcanologist. Before the first year was over, though, I became fascinated by Einstein's theories of special and general relativity in my introductory courses. I switched to a dual M.Sc. track in theoretical physics and astrophysics. After graduating from Utrecht University, I followed Jan Kuijpers to the

Department of Astrophysics at the Radboud University Nijmegen, where I continued my M.Sc. research as a PhD student. One of my findings was that gravitational waves generated by the catastrophic merger of binary neutron stars into a black hole (e.g. gamma-ray bursts) might generate an observable electromagnetic signals.

During a subsequent postdoc position at the University of Rochester I became somewhat frustrated with the limited impact and academic opportunities in theoretical astrophysics and decided to come full circle and descend back to Earth and below. I was fortunate to get a post-doctoral position at the Reservoir Engineering Research Institute (RERI) in Palo Alto, California. RERI is a non-profit research institute that is funded largely by the petroleum industry to carry out fundamental research related to energy resources as well as occasional field studies. At RERI I developed a multiphase compositional reservoir simulator. While astronomy is perhaps the oldest of the sciences (> 2000 yrs), our understanding and modeling capabilities of subsurface reservoirs are (arguably) less further developed, while having a major impact on society. Even in conventional oil and gas reservoirs, approximations must be made in the upscaling of small-scale features and processes to facilitate the numerical simulation of huge reservoirs in a reasonable amount of time.

Shale oil and gas formations provide new resources that are predicted to make the US energy independent in the next decades, but are particularly poorly understood. Shale formations have nano-scale porosities, high pressures, and extremely low permeabilities. At these conditions, Darcy convective flow is negligible, sorption processes are important, and phase behavior is only now being studied. Numerical modeling of the hydraulic fracturing process, as well as fluid flow through the generated fractures pose additional challenges.

Ohio is currently making a strong push in shale gas and oil production, and Ohio State is well positioned to contribute to the understanding of the relevant physics. In September 2013, I joined the SES faculty, where my team and I will pursue a vigorous research program in the modeling of flow processes in complex fractured subsurface formations, related to shale and to other conventional and unconventional resources.



The above shows gravitational fingering in an oil reservoir simulated by Prof Moortgat's group. CO₂ is injected from the top. When CO₂ dissolves in oil it increases the local density, which is gravitationally unstable. The fingering leads to unfavorable early breakthrough of injected CO₂.

The Third World Mapping Fund (#313332)

There are a number of tax-deductible Ohio State University development funds established so that interested donors can support specific scientific, technical or educational projects centered in SES. Each month, starting this month, one of these funds will be highlighted in this newsletter. This piece was written by Prof. Michael Bevis of SES.

Imagine living in a country without maps. How could its government plan school systems, rural health centers, transportation systems, energy and communication networks, or emergency responses? Similar problems apply to the business community. It has been said that cartography is the basis for development. In my experience this is true; a lack of adequate maps is both a cause and a consequence of pervasive poverty. A few years ago I decided to see if my research group could develop very low cost mapping techniques designed specifically to address this need. How can we make 'adequate' or even 'pretty good' maps, covering an entire country, at a cost of tens of thousands rather than the tens of millions of dollars associated with traditional national mapping programs?

We decided to tackle this Third World mapping problem in Bolivia, which straddles much of the high Central Andes, due to our existing long-term projects there, and because our local technical partners, the Bolivian military geographic institute or 'IGM' are responsible for cartography. Their big problem is lack of resources. They too want to know, how can we make maps at much lower cost?

In Bolivia, about 75 % of all roads, small towns and villages either do not appear on any map, or are misrepresented or badly mislocated on the few maps that do exist. There is not a single road atlas available for the country. Most maps that cover Bolivia as a whole, or even large portions of Bolivia, are faded copies of maps generated with the assistance of the US Defense Mapping Agency, or similar foreign mapping groups, more than 25 years ago. About half of all roads in Bolivia were built after these maps were produced. Less than 1 percent of the population has access even to these obsolete maps.

Our approach to producing very low cost maps is based on exploitation of free data sources plus the extensive use of low cost GPS receivers. We are using a digital elevation model (DEM) acquired using radar based on space shuttle (the SRTM project). This gives us the all-important topographic layer – for free! Working with personnel from the the IGM we are starting to digitize all of Bolivia's major and secondary roads, and all of its major rivers, using Google Earth imagery, and some other sources of free, high resolution satellite imagery. We have also begun providing low-cost GPS receivers to be installed in IGM vehicles. Using these 'road loggers' we can map road networks based on vehicle position. We have been mapping roads for more than 2 years, during an extended pilot study, and we are about to massively increase this activity as we shift into production mode. Merging data from the road loggers obtained via our IGM partners with available resources leads to the data with which to produce road maps of Bolivia.

We are also working with IGM on the issue of how to print these maps on tear-proof paper, using waterproof color inks, so as to improve the lifetime of each map. Bolivia can be very hard on maps!

Our goal is to begin producing and selling these maps, just above cost, within 18-24 months. If you are interested in supporting this activity, please contact Michael Bevis at mbevis@osu.edu.

At right: Travelling in Bolivia can be interesting but challenging. Here one of our vehicles is crossing a river in the northern SubAndes, mounted on two planks bound to two canoes. We made two similar crossings in a few hours during that particular day. This route is very hard to use during the rainy season.



Brevia

On February 21st, Melissa Wrzesien won second place in the Math and Physical Sciences Oral Presentations at the 2014 Edward F. Hayes Graduate Research Forum ([link](#)). The title of her talk was “Validation of Snow Cover Fraction for Regional Climate Simulations in the Sierra Nevada”.

On February 14th, Prof Lonnie Thompson was honored as one of our “National Champions” by the Columbus Foundation, at a Columbus Foundation luncheon. The National Champions honors the outstanding work of our business and nonprofit leaders and innovators in the city of Columbus. For more details on the Columbus Foundation’s website, click [here](#).

Prof Andréa Grottoli and Prof Matt Saltzman were elected to the University Faculty Senate where they will each serve three year terms.

M.S. student Bohyun Hwang (Cole Group) presented a poster at the Edward F. Hayes Graduate Research Forum. Her poster was titled: Water-Rock Interaction in the Coso Geothermal System.

Postdoctoral Researcher Siddharth Gautam (Cole Group) conducted neutron spectroscopy experiments on the behavior of ethane, CO₂ and their mixtures in nanoporous materials at Oak Ridge National Laboratory.

Postdoctoral Researcher Salim Ok (Cole Group) attended a workshop for young scientists in Costa Rica sponsored by the Sloan Foundation’s Deep Carbon Observatory. He presented a talk on “A High Pressure Magic Angle Spinning (MAS) NMR Study of Confined Methane”

Profs. Cole and Wilkins helped organize a workshop in Columbus on “Trends and Challenges in Sampling the Deep Subsurface” sponsored by OSU Colleges of Engineering and Arts and Sciences, OSU-SERC, NSF and the Sloan Foundation’s Deep Carbon Observatory. Attendees from SES included Dr. Julie Sheets, Dr. Sue Welch, Alex Swift, Edwin Buchwalter, and Brandon McAdams.

George Emerson Moore Jr., professor emeritus of Geology at The Ohio State University, has passed away. Prof. Moore taught field camp in Utah for numerous years. He was a fellow of the Geological Society of America, the Ohio Academy of Science, a member of Phi Beta Kappa, Sigma Xi, and the National Society of Geology Teachers.

Dr. Brian T. Huber (OSU M.S., 1984; Ph.D., 1988; Advisor: Peter Webb) is the curator of Planktonic Foraminifera and Chair of the Department of Paleobiology at the Smithsonian Institution. His research includes the study of foraminifera and stable isotopes to document global climate change in both short and long time scales. The March 4, 2014 New York Times had an article featuring Brian and trilobite collections at the Smithsonian ([link](#)).