

## February 2017 News Notes

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### Alumni Change Lives

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*Tingting Liu is a PhD student working with Prof Cole. Here she describes how Friends of Orton Hall furthered her studies. If you are interested in giving to support Friends of Orton Hall or other funds, please visit our giving page ([link](#)).*

I am very thankful for receiving the travel support from Friends of Orton Hall for the last year of my graduate study at Ohio State University. This grant enabled me to attend the 252nd American Chemical Society (ACS) National Meeting & Exposition, held in August 2016, Philadelphia, PA, and give an oral presentation titled “Water adsorption on olivine (010) surfaces: effect of doping” in the Geochemistry Division. I use advanced computational tools to study the structure and dynamics of fluids on mineral surfaces in Prof. Cole’s group, School of Earth Sciences. Recently the importance of olivine-fluid interactions has been identified in two very distinct ways. One involves utilization of olivine-bearing rocks as the reservoir for CO<sub>2</sub> sequestration leading to the formation of Mg-Fe carbonate minerals. The second concerns abiotic hydrocarbon generation observed in submarine hydrothermal environments due to carbon-bearing fluid interaction with ultramafic rocks, via a Fischer-Tropsch type (FTT) catalytic process. A fundamental question applicable to both processes is the behavior of water on the mineral surface. To address the question of how olivine interacts with water on an atomistic level, I performed density functional theory (DFT) calculations. Starting with forsterite (Mg<sub>2</sub>SiO<sub>4</sub>), we examined molecular water adsorption on doped forsterite (010) surfaces as well as on several other end members’ (Ca-olivine, fayalite, Mn-olivine, and Co-olivine) surfaces. The doping method is an analog for the existence of other common metal substitutions in olivine crystal structures. This modeling activity has provided a fundamental understanding of the water configurations on the surface with different metal cations, as well as the electronic structures of the water adsorbed on the surface. In parallel, my research encompasses the structure and dynamics study of water on olivine surface using molecular dynamics (MD) simulation method, where we can obtain the dynamical and vibrational characteristics of the adsorbed water molecules vs bulk water that can be compared with neutron spectroscopy experimental result. I was also very fortunate to receive the Student Travel Award given by the Geochemistry Division, ACS to partially cover



the meeting expenses, and was awarded 30 minutes for the talk. The meeting offered me a great opportunity to meet several well-known computational geochemists and gain valuable feedback for my research. Quite a number of high-quality cutting-edge talks within the Geochemistry Division were also very inspiring. After graduation, I plan to continue with a postdoctoral position to prepare me for an academic career. My goal for the future is to couple molecular-level modeling with complementary experimental studies that lead to a fundamental understanding of multi-scale processes associated with fluid-rock interaction.

## Cryolophosaurus Month

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March is Cryolophosaurus Month! Our Crowdfunding site is live as of March 1st, 12:00 am EST ([link](#)).

This month the Orton Geological Museum is raising funds to purchase and build a dinosaur in the lobby of Orton Hall – the Museum building. We will be erecting a skeleton of the carnivorous dinosaur Cryolophosaurus, that was found in Antarctica by David Elliot, now an emeritus faculty member of the School of Earth Sciences.



The Orton Geological Museum is in the School of Earth Sciences at Ohio State University ([email](#)). The Museum is free and serves a major function in STEM outreach to students from throughout Ohio.

Donate Early and Donate Often ([link](#))!

# Hydrogeology Class Observes Borehole Drilling

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Twenty-two students in Professor Audrey Sawyer's hydrogeology class (ES 5651) had the chance to observe a borehole being drilled near campus this month. We thank DLZ Corporation for providing us with an introduction to the drilling process. Geologist Will Baro demonstrated the soil sampling approach and taught us how to use blow counts to estimate density. We also saw rig chatter when drillers hit the top of bedrock. We learned more about the local geology beneath the campus area. Mr. Baro also kindly shared his experiences as a consulting geologist and lent advice for students seeking jobs in geology.



# Earth Science Undergrad Wins at Midwest Fencing Championships

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On Saturday, February 25, 2017, Stas Sudilovsky (BS, expected 2018, Geophysics specialty) won the gold medal in the men's foils as part of the Midwest Fencing Championships held on campus at French Field House.

The Ohio State team won the individual title for every weapon category and 15 medals overall during the individual competitions. On February 26, Ohio State won the Midwest Fencing Championship team championship.

Stas, from Haifa, Israel, is a third year student in Earth Sciences. He is an Ohio State Scholar Athlete who is conducting his research in geophysics under the direction of Professor Ralph von Frese. Congratulations to Stas!



## CaSiO<sub>3</sub>-Perovskite: The Engine that Powers Mantle Convection

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One of Prof Wendy Panero's papers in *American Mineralogist: Journal of Earth and Planetary Materials* is featured this month as a "Notable Article". Perry, Pigott, and Panero use *ab initio* calculations to investigate the solubility of Th, and U into CaSiO<sub>3</sub>-perovskite with and without Al. They find that enthalpies of solution favor the dissolution of Th<sup>4+</sup>, and especially U<sup>4+</sup>, as coupled substitutions with Al<sup>3+</sup>. Their work suggests that subducting slabs may provide a key mechanism for transporting heat producing elements into the deep mantle. Subducting slabs host Ca-Al rich minerals that promote the storage and transport of U and Th leading to the formation of Al-bearing CaSiO<sub>3</sub>-perovskite as slabs penetrate the lower mantle. The authors also suggest that their findings may help the recipes for synroc compositions so as to optimize their chemistry for U and Th dissolution into perovskite-like structures. Read more online ([link](#))!

## Field Camp Alumni 70th Anniversary

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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.

## Brevium

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SES graduate Eugenia Hyung, currently a PhD student at Harvard, won an OSPA award from the SEDI division of AGU at the Dec 2016 meeting. Congratulations!