

## Geosciences April Highlight



*Neal Auchter and Sarah Jancuska collect data at the Chilean outcrop.*

### Where Geology, Industry and Adventure Meet

Patagonia. It may be infamous among outdoor adventurers for its rugged peaks and extreme mountaineering, but this remote South American region is attracting another kind of traveler as well: the geoscientist.



*Brian Romans in Patagonia.*

More specifically, a very large exposure of ancient sedimentary rock layers in the Ultima Esperanza District of Chile has attracted Virginia Tech professor, **Dr. Brian Romans**, as well as collaborators from the Universities of Utah and Calgary and a host of companies within the oil industry. The outcrop, which extends more than 100 km in length, approximately 2 km in thickness, and rises up to 1000 m above sea level, is helping researchers answer questions about subsurface geology and uncover secrets hidden by oceanic depths.

Romans and two of his graduate students, Neal Auchter and Sarah Jancuska, just returned from a 7-week research stint in Patagonia where he and his collaborators are working on a project called the **Chile Slope Systems**. It's a 3-year, \$1.5 million project funded by 13 companies in the oil industry.

Demand for crude oil is driving oil exploration farther offshore and deeper into the earth's subsurface, where high-resolution mapping of oil reservoirs is a challenge, if not impossible. Seismic-reflection data and well logs -- tools used by

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## The Geosciences Department and the Virginia Outstanding Scientist Award

From *VT News*:

“Established in 1985 and sponsored by the Science Museum of Virginia, the Outstanding Scientist Award honors scientists who, through their research and commitment to science, have made a recent contribution to basic scientific research which extends the boundaries of any field of science.”

The Geosciences Department is happy to count 3 professors among the 14 Virginia Tech scientists who have been honored with the award: Drs. Robert Bodnar, Patricia Dove and Michael Hochella.

## Geosciences News



*Dr. Claudia Mora speaking at the Spring Banquet.*

The Department of Geosciences and its upcoming graduates were honored to welcome Dr. Claudia Mora as the keynote speaker at the Spring Banquet. Mora is the vice-president and president-elect of the Geological Society of America – taking over as president in the summer of 2016. She is a group leader for the Earth and Environmental Sciences Division of the Los Alamos National Laboratory.

At the banquet, held on April 16, Mora gave a charming and inspirational talk about the different life and career paths available to geosciences students. She kept the audience entertained with her speech, which maintained the theme of the Three Little Pigs throughout. She talked about the professional routes taken by three “little piggies” she knows and discussed how each was able to keep the “big bad wolf” at bay to ultimately achieve success.

The next day, Mora -- who was also a professor at UT-Knoxville for 18 years and the first woman to head the Geosciences Department there -- joined in a roundtable breakfast discussion with students and faculty to talk about diversity in geosciences and in science in general. Mora provided insights from her own experiences and addressed questions from the attendees about issues faced by women and minorities in the work place.



*Roundtable discussion at the diversity breakfast.*

Mora completed her visit to Virginia Tech as the seminar speaker of the week. She spoke about working at Los Alamos National Laboratory, providing students a picture of the work opportunities available in the National Laboratory system.

The Department of Geosciences thanks Dr. Claudia Mora for her whirlwind trip to Virginia Tech, including three “performances,” and for her inspirational words and support.



From **VT News**:

Dr. Estaban Gazel’s recent paper in **Nature Geoscience** was highlighted by **VT News**.

“An international research team, led by a Virginia Tech geoscientist, has revealed information about how continents were generated on Earth more than 2.5 billion years ago — and how those processes have continued within the last 70 million years to profoundly affect the planet’s life and climate.”



Advanced Research Computing at Virginia Tech hosted a **High Performance Computing (HPC) Day** on April 6. One of the objectives was to exhibit how the “breadth, usage and impact” of HPC continues to improve research. Dr. Scott King was one of the presenters, giving a talk titled, “HPC and the Evolution of the Planet Mercury.” Visit King’s **geodynamics website** to learn more about how HPC is advancing his research.

...continued from April Geosciences Highlight

oil companies for underground exploration -- can't provide the constraints necessary to build accurate reservoir models. Romans and his team are turning to geologic history to help solve these problems.



*Sarah Jancuska steps carefully along the steep slope of the outcrop.*

The Cretaceous (~75 Ma) outcrop in Chile was once a deep marine sedimentary deposit, like those the oil industry is trying to model today. Romans, his students and his collaborators worked painstakingly in often rainy, soggy, and always windy weather to collect measurements and map the outcrop at a resolution that's impossible to achieve below the earth's surface. With these field data, the Chile Slope Systems team will build high-resolution stratigraphic models that the sponsoring companies will use to improve prediction and characterization of their offshore oil fields.

But Romans and his team aren't stopping there. The companies sponsoring this research need to improve their oil reservoir models, but the data Romans has collected can also be applied to more general problems related to deep marine sedimentary processes. One of the big mysteries of deep marine geology that he seeks to address involves underwater avalanches of sediment and water, known as turbidity currents.

Modern mapping of the ocean floor reveals patterns similar to those seen on land caused by river processes. However, on the ocean floor, channels and canyons are created by these underwater avalanches of sediment. Turbidity currents often occur near seismically active regions, where they can destroy local marine habitats and wipe out fiber optics cables. However, these events can occur off of any slope that's steep enough, they can differ significantly in size, they can occur at any time without an obvious trigger, and they can transport sediment up to 1000 km or more into the deep sea. Predicting a turbidity current and the effect it will have is difficult, to say the least.

Adding to the complexity are all of the challenges typically associated with deep oceanic research. Turbidity currents shape the surface of the ocean floor, but limited access means scientists have to get creative if they want a better understanding of how these processes work.

This outcrop in Chile is an archive of turbidity current events that occurred over millions of years, depositing layer after layer of new sediments. While the outcrop may not reveal the timing and size for individual events, it can provide insight into **the longer-term history of sediment transfer** from land to the deep sea and the processes that sculpt the sea floor.

Romans is only halfway through the Chile Slope Systems project, but that hasn't stopped him from considering options for his next great geology adventure. On the contrary, the Patagonia research has piqued his curiosity about exposed sedimentary rocks from the same Cretaceous time period that have been found in an even more remote, desolate and extreme landscape: Antarctica.



*Neal Auchter waits patiently on the precipice of the outcrop.*

## Alumni Stories...

Just wanted to let folks know that I retired from ExxonMobil Upstream Research Company on January 1, 2015. This completed a 36 year corporate career in the Petroleum Industry after leaving Blacksburg in January 1979. In brief, I worked for Chevron for 2 years in Lafayette, LA (1979-1981). I moved to Superior Oil Company (Houston, TX) in 1981 to work as a carbonate geology specialist. This is where my true geology love is since completing a MS with Dr. Fred Read. In 1984, Superior Oil was purchased by Mobil Oil. So, Carrie and I moved to Dallas where I worked for Mobil Research Company, until the Exxon-Mobil merger in 1999. We moved back to Houston in 2000, and I worked at ExxonMobil Upstream Research from 2000 to year-end 2014. All the time at Mobil and ExxonMobil Research I participated in projects dealing with carbonate systems and reservoirs from many geologic time periods and within basins scattered around the world. It has been a most satisfying geology career, and I must say that my time at VaTech was critical to this satisfaction and success. Carrie and I will celebrate our 39th wedding anniversary this August 2015. Carrie works at the University of Houston as a Clinical Professor of Art Education, and continues to teach classes and be active in the Houston art scene.

We plan to stay in our Houston Montrose house during retirement and enjoy life with our 3 grown children and 2 grandsons (with more on the way). We have lots of travel on the schedule. I will stay engaged with the geoscience community, attend meetings and field trips, and consult for the industry. Please don't hesitate to contact me (jim.markello@gmail.com) and say hello.

-Jim Markello



*Markello teaching a class on modern carbonate sediments.*

## From the Museum...

On April 17, seismologist and science communications maven, Ariel Conn, visited The Golden Rule Montessori School in Princeton, WV to explain earthquakes to a group of about 20 children. She took the earthquake kit that the Museum of Geosciences keeps on hand for just such events.

The children -- mostly about 5 and 6 years old -- learned what an earthquake was, and they learned what to do if an earthquake occurs, having great fun with earthquake drills as they launched themselves under desks and tables. They also built houses of toothpicks and marshmallows to see what structural designs could best withstand a jello earthquake; they played with slinkies and did an earthquake line dance to learn about earthquake waves; and they used coloring books to learn the difference between a hypocenter and epicenter.

The afternoon was great fun for all involved. Conn sends a big thank you to Geosciences Museum for the use the earthquake kit. She says, "The kids learned a lot and had fun in the process."



*Two of the children drop, cover and hold during an earthquake drill.*

## Awards & Grants

Kyle Ashley was offered the Jackson School Postdoc Fellowship at UT Austin, and he'll be heading there this summer.

Natalia Bykova was awarded a GSA Graduate Student Research Grant, titled "Giant Ediacaran Macroalgae from Arctic Siberia and North-West India."

Two of Dr. Ben Gill's students, Teddy Them and Matt LeRoy, received graduate student research grants from the Geological Society of America. Matt's award, for \$1196, will be used to study environmental change during extinctions in the Late Cambrian Period. Teddy's award, for \$7500, will be used to investigate paleoweathering rates and their relation to anoxia in the ocean during the Early Jurassic.

Chris Griffin received the competitive NSF Graduate Research Fellowship Program fellowship.

Rui Sera Mai was awarded the College of Science's Make-a-Difference Scholarship. This competitive award is made possible by an endowment from the College of Science's advisory group, The Roundtable. Nominations are taken from across the college and the top four finalists are interviewed by The Roundtable who select the winner.

Dr. Marc Michel was awarded a three-year NSF grant, totaling approximately \$270,000. The title of the award is: "Mineral formation by cluster self-assembly: Scwertmannite as a partially crystallized nanomineral." Michel also received a 2-year ICTAS Junior Faculty Collaborative Seed Grant, totaling approximately \$120,000, titled, "Probing novel mechanisms of nanoparticle crystallization in situ." Chang Lu from VT Chemical Engineering is co-PI and senior mentor.

## Conferences & Publications

Kyle Ashley presented a talk at the AGU-GAC-MAC joint assembly meeting in Montreal, Canada this month.  
Title: Computing dynamic titanite activities through metamorphic evolution and implications on Ti-in-quartz thermobarometry  
Authors: Kyle T. Ashley, Richard D. Law

Natalia Bykova, Drew Muscente, Jesse Broce (ex-master student of Shuhai Xiao, now PhD student at University of Missouri), and Jim Schiffbauer (ex-PhD student of Shuhai Xiao, now assistant professor at University of Missouri) proposed Topical Session for an Annual GSA meeting to be held in November, 2015, and it was accepted. The title of the session is "T152: Geobiology of critical transitions: Integrating fossils, proxies, and models"

Cottle, J.M., Searle, M.P., Jessup, M., Crowley, J.L. & Law, R. Rongbuk revisited: Geochronology of leucogranites in the footwall of the South Tibetan Detachment System, Everest Region, Southern Tibet. *Lithos*, 227, 94-106. doi:10.1016/j.lithos.2015.03.019

Dr. Brian Romans and three collaborators proposed Topical Session for an Annual GSA meeting to be held in November, 2015, and it was accepted. The title of the session is "T196: Revisiting the Atlantic Continental Margin: New Insights on the Geologic Evolution of North American Passive Margin Basins."

N.L. Ross, J. Zhao, C. Slebochnick, E.C. Spencer, B.C. Chakoumakos (2015) Petalite under Pressure: Elastic Behavior and Phase Stability. *American Mineralogist*, 100:714-721.

## Congratulations to the graduate students who successfully defended their Masters and PhDs!



Congratulations to Zach Kiracofe, who successfully defended his masters degree, titled, *Assessing the geologic sources of manganese in the Roanoke River watershed*. The objective of his research was to develop a better understanding of why elevated concentrations of manganese — occasionally exceeding both standard drinking water and human health standards -- have been observed in the groundwater of the Roanoke River watershed. Analysis of ore samples and groundwater chemical data suggest that, though there is no one single cause, carbonate rocks may be important contributors of manganese to groundwater.

Good luck to Shreya Singh, who will defend her PhD on April 30, titled, *Exploring the relationship between crustal permeability and hydrothermal venting at mid-ocean ridges using numerical models*. Her research looked at the hydrothermal systems of oceanic spreading centers. These systems account for a quarter of the Earth's total heat flux, and the warm vents support rich biological communities. Shreya's models of these systems provided new insight into how permeability at the vents plays a key role in hydrothermal circulation, as well as the composition and temperature of the fluids surrounding the vents.



## Upcoming Events...

**The International Potluck:** Finals are almost upon us, and that means it's time for the annual International Potluck lunch hosted by the student SEG chapter! This year's potluck will be on reading day, **Thursday, May 7 at 12:00 pm in the Geosciences Museum.**

To make it a little easier to coordinate the potluck this year, we have set up a [Google Doc](#) so everyone can sign up with the dish they plan to bring. All students, faculty, and staff are encouraged to come and bring a dish! Foods that reflect the diverse cultural heritage of our department are particularly encouraged. Appetizers, entrees, side dishes, and desserts are all welcome. There will be prizes for the 3 dishes voted Most Popular. See if you can out-cook your friends! Don't have time to cook? Come enjoy the food anyway -- packaged food or donations to the SEG are always welcomed too. The potluck has been a great success the past few years, and we are sure that this one will be just as amazing!

**Geosciences 2015 Graduation Ceremony and Reception:** Please join us as we celebrate our 2015 graduating class!

**Location:** 100 Hancock Hall Auditorium

**Date:** Saturday, May 16, 2015, Time: 10:00AM

**Commencement Speaker:** Dr. Seth Stein, William Deering Professor with the Department of Earth and Planetary Sciences at Northwestern University

**Reception:** Lunch will follow on the 2nd floor deck of Derring Hall