

# The TECHtonic

**VT**  
VIRGINIA TECH™



2018 Spring Newsletter  
Department of Geosciences



# Welcome to The TECHtonic!



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**SUPPORT GEOSCIENCES.  
WHAT TO SUPPORT AND HOW TO GIVE.**

*See back cover.*

Dear Alumni, Stakeholders, and Friends of the Department,

As my first year as a Hokie draws to a close, it's gratifying to look back on all that's been accomplished by the department's faculty and students. It's been a banner year by any measure. Here are just a few highlights: The department was named a Virginia Tech Exemplary Department for the first time in over 20 years (p. 2); one of our faculty won the first NSF-CAREER award in department history (p. 6); the department finished first in the College of Science on Giving Day in both number of gifts and total dollars raised (thus winning an additional \$5,000 in incentive prizes); the grad students self-funded and organized another successful Graduate Student Research Symposium; and our faculty and students continue to win awards and publish groundbreaking discoveries. This issue's stories on Brian Romans' voyage to Antarctica (p. 3) and Ben Gill's expedition in Alaska are great examples of the globe-spanning nature of research in VT-Geo (p. 10-11).

For my part, I'm settling into the role of department head and enjoying getting to know our amazing students and alumni. Now that I've learned most of the VT acronyms (when I arrived I didn't know my ICTAS from my ICAT), I can really focus on my Year One mantra: "listen, learn, connect." This year has been a short course in "all things VT," and I've met a lot of dedicated Hokies who serve this university and care deeply about its future — which is bright.

Of course, some challenges remain, but with your support, I'm certain we will meet them. Our faculty and staff are working hard on curriculum revision, enrollment growth, and growing our endowments — among other things. These efforts will, I'm sure, pay dividends well into the future.

Enjoy this issue of *The TECHtonic* — I hope you enjoy this glimpse into our department's activities. As always, I look forward to meeting our alumni, friends and supporters. Please feel free to contact me directly ([wstevenh@vt.edu](mailto:wstevenh@vt.edu)) or to stop by and say hello in person.

A handwritten signature in blue ink that reads "Steve".

*Steve Holbrook, Head of Department*

**ON THE COVER** | The JOIDES Resolution drillship in the Ross Sea, Antarctica (January 2018). Photograph taken by Professor Robert Dunbar (Stanford University) from the R/V Nathaniel B. Palmer icebreaker, which was leading the JOIDES Resolution through patches of sea ice on its way into the Ross Sea.

# Exemplary Department Award

By Steve Holbrook

“Through providing extensive hands-on guidance in field geology/paleontology methods, Shuhai effectively transformed the outcrops into geological classrooms, and I truly do not believe that I have had a single learning experience as powerful either prior or since. In those moments, I learned—by example—how not just to be an advisor, but to be an exceptional one.”

**Jim Schiffbauer** (Ph.D., 2009), Assistant Professor, University of Missouri

“From identifying thin sections of rocks under the microscope, and then matching them with localities in the field to reconstruct depositional history, to writing code in R for statistical analyses of paleontological data, all of my graduate course work employed a wide range of hands-on learning.”

**Carrie Tyler** (Ph.D., 2012), Assistant Professor, Miami University

“[Dr. Hochella's NSF-IGERT] program provided me with a unique perspective on interdisciplinary approaches to address challenges in natural interfaces applied to environmental science and engineering, and complex human interfaces among interdisciplinary groups. Without any doubt, I received invaluable tools from this program to collaborate effectively with colleagues from the fields of biology, engineering, physics, chemistry, and social sciences.”

**José Cerrato** (Ph.D., 2010), Assistant Professor, University of New Mexico

Each year Virginia Tech recognizes three departments with the Exemplary Department award. The award honors departments who exemplify that year's theme, on topics such as “effectively linking research and teaching” or “developing effective large-class instruction.” This year, for the first time in more than twenty years, the Department of Geosciences was selected as a Virginia Tech Exemplary Department, on the topic of “hands-on, minds-on learning.” The award came with a \$10,000 cash award, which we will use to enhance our resources for hands-on, minds-on learning, including connecting the educational efforts of the Museum and the Modeling and Educational Demonstrations Laboratory.

In our department, experiential learning is in our DNA - *it's what we do*. The study of the Earth spans the full spectrum of activities, from hands-on (exploration of a field site, gathering of samples, measuring chemical and physical properties) to minds-on (data analysis, computer modeling, and interpretation). We embed these activities in our undergraduate curriculum, teach them to our graduate students through advanced courses and mentoring, and share them with the public through outreach and engagement.

To compete for the award, the department put together a 20-page proposal that included 16 letters written by alumni and students, testifying to all the ways Geosciences brings experiential learning into the classroom, lab, and field. Thank you to all of you who wrote in support of our nomination! If you'd like to read the nomination for yourself, you can find it here: <https://bit.ly/2qrkDsP>.



**Steve Holbrook**, head of the Department of Geosciences, accepts the 2017 Exemplary Department Award from **Cyril Clarke**, Interim Executive Vice President and Provost.

## Ceres Internal Structure From Geophysical Constraints (King et al., *Meteoritics and Planetary Sciences*, 2018)

Ceres is the largest body in the asteroid belt and due to its nearly round shape it is classified as a dwarf planet. Ceres spins on its rotation axis once every nine hours, and like all spinning bodies, its shape is not quite spherical but it is fatter at the equator and shorter at the poles. We use this shape to deduce the interior properties of Ceres, specifically whether or not it might have a dense core, as all of the terrestrial planets do. Our statistical analysis of the shape of Ceres shows that with a 1- $\sigma$  probability Ceres has a dense core; however, we are unable to place bounds on the core composition. It could be from anhydrous silicates to a mixture of metal and silicates. The crustal densities are consistent with the surface observations of salts, water ice, carbonates, and ammoniated clays from the Dawn mission.

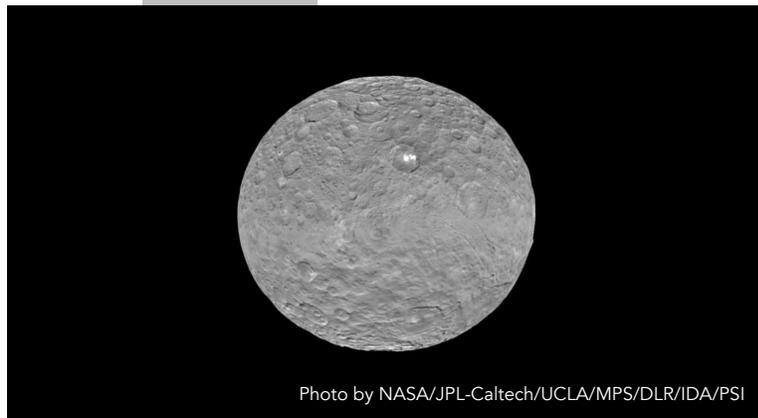
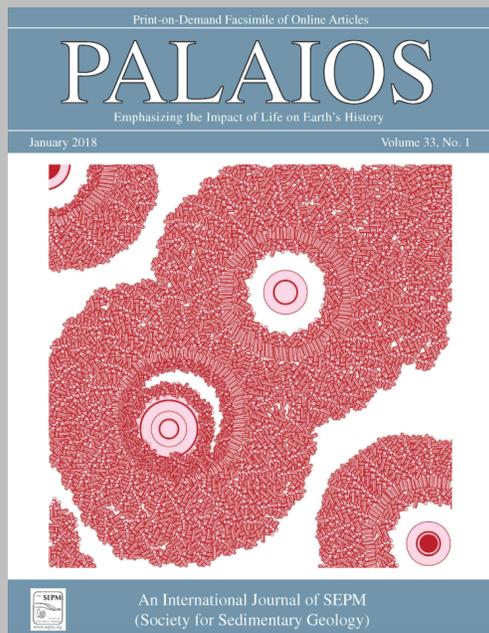


Photo by NASA/JPL-Caltech/UCLA/MPS/DLR/IDA/PSI



Hawkins, A.D., Liu, H.P., Briggs, D.E.G., Muscente, A.D., McKay, R.M., Witzke, B.J., and **Xiao, S.**, 2018, Taphonomy and biological affinity of three-dimensionally phosphatized bromalites from the Middle Ordovician Winneshiek Lagerstätte, northeastern Iowa, USA: *Palaios*, v. 33, p. 1-15, doi: 10.2110/palo.2017.053.

Muscente, A.D., Czaja, A.D., Tuggle, J., Winkler, C., and **Xiao, S.**, 2018, Manganese oxides resembling microbial fabrics and their implications for recognizing inorganically preserved microfossils: *Astrobiology*, doi: 10.1089/ast.2017.1699.



**W. Steven Holbrook** interviewed on Virginia Public Radio for a story about methane hydrates.



Scan QR code for the interview:



# Faculty Spotlight— Brian Romans

By Kannikha Kolandaivelu (Ph.D. Candidate)

Below the Antarctic Circle (66°33'47"S) and standing outside on the deck of the ocean-drilling research vessel, JOIDES Resolution (JR) (see cover photo) looking at the vast blue sea ice and spotting adorable penguins, **Dr. Brian Romans** reflected on being a shipboard scientist as part of the International Ocean Discovery Program (IODP) [Expedition 374](#). This two-month scientific cruise to the Ross Sea, Antarctica (January-February 2018), recovered sediment cores from which Romans and students will analyze grain size and other sedimentological characteristics. This study will aid in reconstructing ocean circulation patterns and ultimately lead to an understanding of how the West Antarctic Ice Sheet responded to climate shifts. This paleoclimate study is relevant to both contemporary and future climate change. "Looking at Earth history is very important and using the sedimentary record is essential to that overall goal. Our approach is to look at "experiments" that Earth has already run in the past: what happened to landscapes and life in response to climate change and what was the rate of those changes and their threshold points? Earth systems are sensitive and do not necessarily respond in a linear fashion," says Dr. Romans. This is his second scientific cruise with IODP, his first was [Expedition 342](#) to study sediment drifts of the Newfoundland Ridge in the North Atlantic in Summer 2012. Both of these expeditions have the broader goal of determining relationships between paleoclimate and ocean circulation.

Dr. Brian Romans is an Associate Professor of Sedimentary Geoscience, who joined the Department in 2011. His [Sedimentary Systems Research](#) group comprises a post-doctoral fellow and three Ph.D. students. Their research has implications for energy resources and climate where they strive to reconstruct geologic history from sediment deposits to study tectonic evolution and/or climate change. Currently his team is studying deep marine sedimentary systems both

in the ocean and those that are uplifted on land (Chilean mountain belts) to improve predictions of subsurface geology in deep-marine settings.

Looking back, Dr. Romans' fascination with sedimentology began with a Sedimentology and Stratigraphy course he took during his days at SUNY at Buffalo where he



received a B.A. in Geology. That course inspired him to pursue a M.S. in Geology & Geological Engineering at the Colorado School of Mines and later a Ph.D. at Stanford University. During graduate school, Dr. Romans did field work on uplifted, outcropping deep-marine sediment deposits that was funded by the petroleum industry with the aim of improving prediction and characterization of similar deposits in the subsurface. This eventually led to a research scientist position at Chevron Energy Technology Company, where Romans worked from 2008-2011. At Chevron, he was also engaged in developing and teaching internal training courses and workshops. But the desire to mentor, interact and feed the next generation of scientists brought him to Virginia Tech.

"Learning new things keeps me excited. I like taking on new ideas and projects in sedimentary geosciences. This can be done together as a team," says Dr. Romans. At heart, he is still the kid with a penchant for science and math whose engineering thinking came from observing his father. These skills translate to geoscience where creativity to engineer hypotheses about how the Earth works, and the ability to develop ways to test it with scientific rigor and reproducibility are essential.

To the question of what he would do if he was stuck on the ship in Antarctica for a few months with no communication, he answered "There is a wonderful physical library on board the JR and I could spend a lifetime reading." Such is his thirst for constant learning. Summing up his experience in the Department of Geosciences for the past seven years,

he says, "Being here has given me unbelievable opportunities to explore sedimentology in research and teaching to contribute to advancing Earth science. This department has given me freedom to explore my curiosities."



**Brian Romans** on the deck of the JR.

"If we are to understand Earth's events and conditions that have rarely or never happened in human history, we must interrogate the geologic record."

# ALUMNI FLASHBACK

By Neil Johnson (M.S., 1983 and Ph.D., 1986)

It was the best of times, it was the worst of times. It was life as a grad student in the department during the 1980's. How good was it? Imagine working with and around a future president of the Geological Society of America. Or a future National Academy of Sciences member. Or someone who ends up in charge of a remote control car...on Mars. How bad was it? Well, consider the thoughts of a Fred Read student, set to Folsom Prison Blues:

I hear the clock a tickin, it's quarter after ten.  
I haven't seen the sunshine since I don't know when.  
I'm stuck in geosciences, way down in Derring Hall.  
And the way this paper's coming, I won't get home at all.

Many of the articles in *The TECHtonic* are about the illustrious research of Geoscience faculty and alumni. But in between the alums research, there was snark. Satire. Elaborate practical jokes. All-in-all, a way to blow off some steam when needed.

Take, for instance, the tale of the conodont-bearing foraminifera. Sometime in 1982 or so, **Craig Faris** was diligently categorizing the forams from his field area in hope of finishing his thesis. When he returned to the microscope after a break, he discovered to his dismay that there were conodonts mixed in with his sample. At first, he feared contamination - until he noticed that it wasn't one or two, but dozens of them. Craig then realized that he had been pranked by that semi-obsessive collector of conodonts, **Mike Huggins**. (Seriously! Mike had digested 622 kilos of rock in his hunt for conodonts.) But how should Craig respond? Well, he took some photos of forams and conodonts, taped them together and with White-Out and photocopies, edited the table of contents from a paleo journal to highlight his ground-breaking paper on conodont-bearing foraminifera. This was posted prominently on the humor board of the 3rd floor grad student bullpen, located where **Dr. Michelle Stocker** now has her office.

Mike, not about to be one-upped, posted the subsequent issue of the paleo journal on the board which included his article "Conodont-bearing foraminifera are stupid." But at this point, Craig raised the stakes. He took the next issue of the journal, edited it to include multiple papers by prominent paleontologists, all about new occurrences of the fossil hybrid in question. He also included an editorial entitled "Should Huggins be dis-Pandered?," a reference to the society devoted to the study of conodonts and named for their discoverer, Heinz Christian Pander. If I recall correctly, the back and forth went on for a few more issues, but the general feeling was that Craig had won this particular skirmish.

How about we move onto softball? Circa 1980, **Bob Sartain** and **Fred "Bunky" Wehr** were casting about for a name for the grad student intramural softball team. Since at that time Derring also housed the introductory biology labs, the two of them were inspired by materials supplied by the Turtox-Cambosco company, and thus the Turtox Pigs were born! The team logo was turned into a silk screen template, as shown on my still extant jersey {Photo 1}.

With the name chosen, Bob and Bunky then contacted the president of Turtox-Cambosco requesting any available 'pig promotional materials', and (eventually) forwarding to him a Turtox Pig t-shirt. By good fortune, the guy had a sense of humor and sent along a sturdy plastic model showing a carefully dissected pig. This model held a place of honor above the graduate student mailboxes in the 4th floor bullpen, which is the space currently occupied by **Dr. D. Sarah Stamps**.



Left to right: Photo #1 & Photo #2.

There is one more thing...if you look at the flip side of my Turtox Pigs jersey {Photo 2}, the truth comes out: I was the original Neo! In fact, it is safe to say that after taking **Jerry Gibbs'** crystallography courses, *The Matrix* definitely had me.

# ALUMNI NEWS



Isabel Montañez

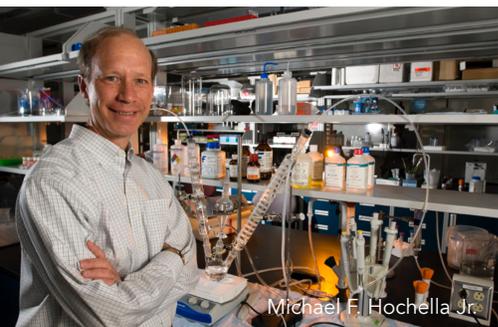
**Isabel Montañez** (Ph.D., 1989) is the 2018 commencement speaker. She is Chancellor's Leadership Professor of Earth Science at the University of California, Davis and the current President of the Geological Society of America.

**Nicholas Wigginton** (Ph.D., 2008) was the invited speaker for the Geosciences Spring Banquet. Dr. Wigginton is now an Assistant VP at the University of Michigan in the OVPR office after several years with Science Magazine - AAAS.



Nicholas Wigginton.

**Sven Morgan** (M.S., 1992 and Ph.D., 1998) has joined the Department of Geological and Atmospheric Sciences at Iowa State University as a new professor and chair of the department. Dr. Morgan completed his M.S. and Ph.D. research with **Rick Law** on pluton emplacement mechanisms in the White-Inyo Range of Eastern California.



Michael F. Hochella Jr.

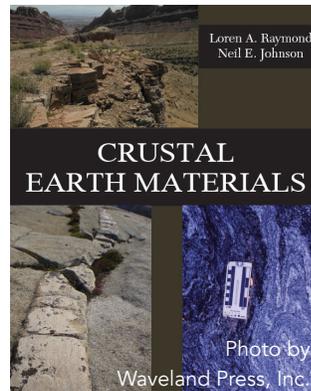
**Michael F. Hochella Jr.** (M.S., 1977) is a University Distinguished Professor of Geosciences and was a team leader on coal nanoparticles that was published in *Nature Communications*.

## SEND US YOUR NEWS!

Share professional and personal events, big and small, with fellow alumni and friends of Geosciences. So email, phone, or write to us with your news and your pictures. We would also love to receive photos from when you were a student for our archive. Use the contact information on page 13 or send to **Department Head Steve Holbrook** ([wstevensh@vt.edu](mailto:wstevensh@vt.edu)).



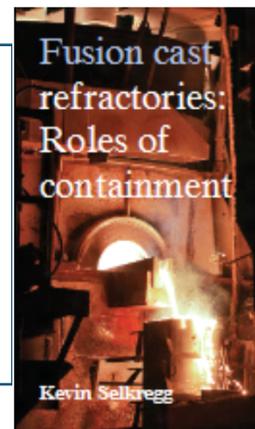
**Professor Fred Read** and Pauline Read circa 1984.



**Neil Johnson** (M.S., 1983 and Ph.D., 1986) has a new book *Crustal Earth Materials* published by Waveland Press Inc.

**Sean Zigah** (B.S., 2017) attended the National Association of Black Geosciences Technical Conference in Atlanta, GA Sept 6-9, 2017 and presented a poster titled '*Characterizing Surface Properties of Natural Iridescent Iron (Hydr)oxide Minerals*'. In October 2017, he attended the Geological Society of America Meeting in Seattle WA and presented the poster there also.

**Kevin R. Selkregg** (M.S., 1979) is an analytical lab manager for RHI Glass in Falconer, N.Y. and was on the cover story for March issue of *Ceramic Magazine*.



# Marc Michel Wins NSF's CAREER Award—the

By Michael F. Hochella Jr.

An NSF CAREER Award is akin to the gold standard of success for an untenured professor. NSF summarizes it like this: “The Faculty Early Career Development (CAREER) Program is a Foundation-wide activity that offers the National Science Foundation's most prestigious awards in support of early-career faculty who have the potential to serve as academic role models in research and education and to lead advances in the mission of their department or organization.” Yes, it's a very big deal, and also very hard to obtain. In fact, in the College of Science at Virginia Tech, in the last 20 years, only between one and two young professors on average are chosen each year by NSF as a CAREER Award recipient. And in these last two decades, or anytime earlier, no Geoscience professor has ever been chosen. This belies the fact that assistant professors in the Department of Geosciences are the best of the best out there, and nearly all have gone (or are going) on to fabulous careers.

Now, Assistant Professor **F. Marc Michel** has finally broken the CAREER Award barrier for Virginia Tech Geosciences. Raised in upstate New York, Marc earned a B.S. (1998) from Colgate University and a Ph.D. (2007) at Stony Brook University (both in New York), and spent five years as a Post-Doctoral Scholar and then a Research Scientist at Stanford before joining VT Geosciences in 2012. Over his early career, he has gained world-wide attention in the area of environmentally-related mineralogy and low temperature geochemistry, mostly at the nano-scale. With publications in *Science* and *Nature* journals, many collaborations around the world, a user of synchrotrons at Department of Energy facilities around the country, and

a citation count that already exceeds 3,000, Marc has taken off in his first five years in Blacksburg. Clearly, the NSF has noticed. And although he admits that he knew virtually nothing about teaching when he first joined us, he has found an innate love and skill for this aspect of his profession. To show that teaching must be in his DNA, he has described the teaching experience as “exhilarating.” He has developed a wonderful and productive rapport between himself and geoscience undergraduates and graduate students alike. And, impressively, he also teaches undergraduate courses for the new Virginia Tech major in Nanoscience along with physicists, chemists, and biologists.

Combining research and teaching, Marc has commented that each one of his research students (both graduate and undergraduate) has made what he considers to be amazing achievements in their research. One of the most exciting aspects of mentoring students in research is that they have led him in directions that he would never have considered, and he is most appreciative.



Dr. Michel with graduate student, **Karel Kletetschka**.

Photo by **Steven Mackay**.



Dr. Michel with graduate student, **Karel Kletetschka**.

Photo by **Steven Mackay**.

# First for Geosciences

Marc has said that he has absolutely enjoyed his experience as a junior faculty member. In many ways, joining us at Virginia Tech was his dream job because of the combination of geosciences and nanoscience. He admires the vibrancy of excellence and his colleagues, both junior and senior, in the department. This love of his environment extends well into the Blacksburg community. Along with his wife, Neus, Blacksburg is the perfect place to raise their children. After moving every four to five years from place to place for almost two decades, they were more than ready to feel settled and call someplace “home.” Their first child, Benny, was born in California, and two when they arrived. Their second and third children, Oliver and Eloise, were born here in Blacksburg. They all love the small-town feel, especially during the summer, and truly appreciate the easy access to the natural outdoors and the great public school system. They have made many close friends locally, and as a bonus, their central east coast location helps with seeing family spread between Massachusetts and Florida. Believe it or not, it also gives Marc access to his favorite hobby, racing totally-serious, high-speed go-karts with his father and younger brother.

Going back to the CAREER Award, it is definitely expressed in Marc’s own words:

“I was convinced that the two years spent working on an NSF CAREER proposal would result in nothing more than 15-pages of plans that I would use as a guide for the following five years. It was almost unimaginable to learn that, on the second attempt, the proposal would be funded. The award has been an amazing boost for me and my group. It has given me new confidence that the different directions we are pursuing in our research actually have the potential to make positive impacts.”

Marc hopes that by the end of his career to have made contributions through research and teaching toward solving some of the biggest problems facing our society. Sustainable energy and clean water are two issues that are extremely important to him, and he is confident that he and his group will contribute to future innovations in these fields.

Marc is grateful for the support and mentorship provided by the faculty and staff in the Department of Geosciences and the Academy of Integrated Science in the College of Science, and for being awarded the Luther and Alice Hamlett Junior Faculty Fellowship in 2017 through the College of Science and Nanoscience program. And, to be sure, the Department of Geosciences is most grateful for having Marc!



**Dr. Michel** with his family. From left to right: Sparky, Neus, Eloise, Marc, Oliver, and Benny.



**Dr. Michel** (#82) go-kart racing with his father and younger brother.

# FACULTY NEWS

## Awards

### **Robert J. Bodnar**

*University Distinguished Professor*  
*C.C. Garvin Professor of Geochemistry*  
Thomas Jefferson Medal for Outstanding  
Contributions to Natural Science,  
Fellow of Geochemical Society

### **F. Marc Michel**

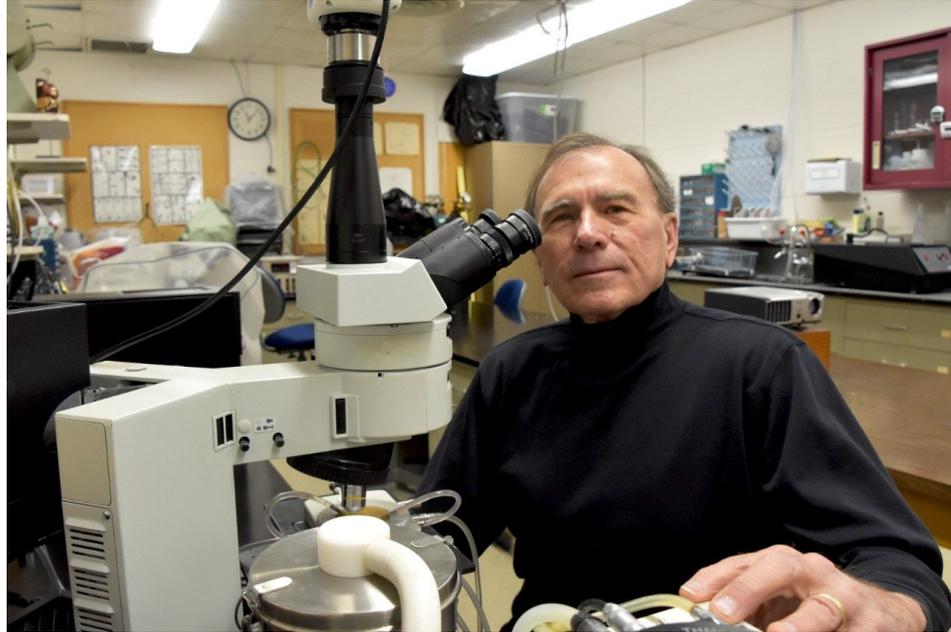
*Assistant Professor of Nanoscience*  
2017 Luther and Alice Hamlett Junior Faculty  
Fellow, NSF CAREER Award

### **Sterling Nesbitt**

*Assistant Professor of Geobiology*  
Three-year Grant from the David B. Jones  
Foundation

### **Madeline Schreiber**

*Assistant Professor of Hydrogeosciences*  
2017 Elected to the Board of Directors for the Cave Conservancy of the Virginias



**University Distinguished Professor and C.C. Garvin  
Professor of Geochemistry Robert J. Bodnar.**

## Leadership

### **W. Steven Holbrook**

*Professor and Head of Department*  
Lecture at the 14th Annual Potter Lecture at Dickinson College in Carlisle, Pennsylvania.

**Robert Weiss**, *Associate Professor of Coastal Hazards*  
Jennifer Irish, *Professor of Civil Engineering, Virginia Tech*  
Mark Warner, *U.S. Senator*

**Patricia Dove**, *University Distinguished Professor*  
*CP Miles Professor of Science*

The 2018 Summit of the Virginia Academy of Science, Engineering, and Medicine will be co-organized by geosciences faculty. This workshop-based event will focus on the assets, stressors, and opportunities associated with changes in the coastal zone of Virginia and the role of this region in the well-being of the Nation.

The mid-Atlantic region is facing combined pressures of increasing population, infrastructure, and rising sea level due to both eustatic (ocean volume) and isostatic (rebound) changes. Attendees will be national and state industry and government leaders, National Academies members, and academics from a wide range of disciplines. The Summit aligns with the Coastal@Virginia Tech initiative. Register at [vasem.org](http://vasem.org).



# Connie Lowe Retires

By Madeline Schreiber

**Connie Lowe** retired on December 31, 2017 after 21 years in the Department of Geosciences and 34 years total at Virginia Tech. As the Geosciences Student Program Coordinator and Advisor, Connie advised hundreds of undergraduate and graduate students through their academic programs. Her expert knowledge of all things academic, her ability to fix problems that seemed unfixable, and her amazing capacity to simultaneously manage many complex parts of the academic machine, were remarkable. She could use “tough love” when it was needed to keep students on track. But she also had compassion and empathy, and was a confidante for students and faculty alike.

In addition to her multiple duties, Connie coordinated the Geosciences Commencement, which she made special for each student. Her attention to details, from securing all of the diplomas, to making sure that the program was perfect, to choreographing the intricate details of the ceremony, was impeccable. At every Commencement, Connie received a multitude of cards and flowers from students and parents, a testament to the importance she had in students’ lives. As one of her parting gifts from the Department, we prepared an honorary degree for Connie in “extraordinary advising, specializing in child, adolescent and geriatric psychology, event planning, human systems engineering, round-the-clock counseling, and other heroic deeds.” Although these words were meant to be humorous, they express both our acknowledgement and our deep appreciation of all of her contributions to the Department of Geosciences.



## STUDENT NEWS

### Undergraduates

**Alexander Bradley** published an article in the *Journal of Vertebrate Paleontology*.

**Alexander B. Bradley & Sterling J. Nesbitt** (2018) A possible new specimen of *Ruhuhuarua reisi* from the Manda Beds (?Middle Triassic) of southern Tanzania and its implications for small sauropsids in the Triassic, *Journal of Vertebrate Paleontology*, 37:sup1, 88-95, DOI: [10.1080/02724634.2017.1393823](https://doi.org/10.1080/02724634.2017.1393823)

**Hunter Edwards:** Attended Lunar and Planetary Sciences Conference

**Sean Malloy:** EarthCube Early Career Travel Grant

### Graduates

**Brady Ziegler:** 2018 Graduate Teaching Excellence, Sigma Xi Ph.D. Research Award

**Jessica Schobelock:** 2018 Seismological Society of America Meeting Travel Grant

**Joshua Robert Jones:** 2018 UCAR Summer Internship

**Rick Jayne:** Mickey Leland Fellowship from the Department of Energy

**Andrew Parent:** Harry and Joy Jamison Grant from American Association of Petroleum Geologists Grants-in-Aid Program

**Kannikha Kolandaivelu:** Will sail on the JOIDES Resolution from May 5-July 5, 2018 off the coast of New Zealand

**Research Grant Recipients**  
**GSA:** Christopher Griffin, Alexandra Nagurney, Mitchell Riegler

# Spikes and Flights— Deciphering an

By Benjamin Gill



The research team below the Kennicott Glacier in McCarthy, Alaska before departing for the field. From left to right: **Selva Marroquín** (Virginia Tech), **Ben Gill** (Virginia Tech), Andrew Caruthers (Western Michigan University), **Theodore Them** (Ph.D., 2016) (Florida State), João Trabucho-Alexandre (Utrecht University); Martin Aberhan (Museum of Natural History-Berlin).



A fossil of an ammonite (an extinct cephalopod), one of the many groups of organisms affected by the end-Triassic mass extinction.

The past summer my student **Selva Marroquín** and I got the opportunity to do fieldwork in the remote Wrangell Mountains of Alaska as part of a study of the end-Triassic mass extinction. This event occurred 200 million years ago and is known as one of “Big Five” mass extinctions in the history of the planet. During this event, 70-75 percent of the known species on the planet went extinct including, but not limited to, groups of ammonites, corals, bivalves, and plankton in the oceans and amphibians and reptiles on land. This event also paved the way for dinosaurs to become the dominant animals on land later during the Jurassic.

Our team from Virginia Tech is working with a group of collaborators from across the globe, including geologists, paleontologists, and geochemists from Florida State University, Western Michigan University, Durham University in the United Kingdom, Utrecht University in the Netherlands and the Natural History Museum in Berlin, Germany. Our team has been investigating a variety of sites capturing the Triassic-Jurassic boundary around the globe including locations in the deserts of Nevada, the coast of the United Kingdom and most recently the Wrangell Mountains of Alaska. Our goal is to understand the environment changes during the end-Triassic extinctions and their effect on life living (and dying) at the time.

## Making a Disaster

The leading hypothesis for the cause of the extinctions are the large volcanic eruptions known to have occurred during this time during the rifting of the supercontinent Pangea. The igneous rocks that resulted from these eruptions can now be found up and down the eastern seaboard of United States and include the Palisades on the Hudson River in New York State. They also occur in South America and Africa, which should give you an idea of how widespread these eruptions were.

The large eruptions caused major changes to the surface environment of the planet. Scientists have hypothesized that they significantly increased the amounts of carbon dioxide and methane in the

# Ancient Crisis in the Mountains of Alaska

atmosphere. This in turn is thought to have potentially caused global warming, carbon dioxide poisoning, ocean acidification, and the loss of oxygen within the oceans. The goal of our research is to try to find evidence for these changes and their severity in the marine realm.

## Investigating One of the Scenes of the Crime: Alaska

The shales and limestones in the Wrangell Mountains represent sediments that were deposited on the seafloor around tropical islands in the ancient Panthalassic Ocean (now the Pacific Ocean). Over time, the movement of the plates transported these islands from the equator to the northeast, where they collided with North America and were uplifted to become part of the Wrangell Mountains.

Getting to the exposures of these rocks, however, is no easy feat. Our research team met up in Anchorage and drove 350 miles east to the remote village of McCarthy at the end of Wrangell-St. Elias National Park. A third of this trip was on a dirt road on an old railroad bed that is notorious for causing flat tires on the railroad spikes that still dot the road. McCarthy is an old mining town that is a common entry point for those exploring the backcountry and has a year-round population of ~28. From McCarthy, we took light planes (Piper Super Cubs) up into the mountains where we landed in an alpine meadow near the field site — this description is actually relative because we still had to hike 2.5 miles from the landing site with a 1,500-foot climb over a pass to finally arrive at the exposures.

For more than a week at the field site, we carefully documented the succession of sedimentary rocks and the occurrence of fossils. Because our work doesn't stop when we leave the field, we collected samples of the rocks to analyze their chemistry back in our laboratory at VT. We are currently looking for changes in the chemistry of the sedimentary rocks to give clues about how the chemistry

of the oceans and atmosphere changed during the event and pinpoint the cause of these changes.

Our work has just begun, but so far from the sedimentary rocks in Alaska we've discovered chemical evidence that the ocean became oxygen deficient, or anoxic, during the extinctions. This suggests that this could be one of the causes of the extinctions. We're returning the Wrangells this summer to do more work and are looking forward to finding out what else these rocks from Alaska can tell us.

## Learning from Our Planet's Past

You might ask, "Why study something that occurred hundreds of millions of years ago?" Well, one of the reasons our lab group studies these ancient events is we can use what happened in the past to place into context recent climatic and environmental change. We can think of these past events as experiments that offer a window into how the Earth's environments and climates can change and respond over time. This helps us understand what is presently happening on our planet today and also helps us predict what might happen in the future.



Selva Marroquín climbing out of the canyon where the sedimentary rocks that capture end-Triassic mass extinction are exposed.



The research team hauling gear over a pass in the Wrangell Mountains to get to the field site.

# THE MUSEUM PIECE

By Gracie Gilbert & Llyn Sharp



Interdisciplinary Art and Science Exhibit from an Independent Study by **Justin Lau** (Industrial Design, 2018) with Geosciences faculty **Michelle Stocker**. Justin learned to do dissections in the Paleobiology lab and then made scientific illustrations to inform his understanding of animal anatomy and shared features. Photo by Lau.

The Museum of Geosciences has become active on social media, thanks to **Gracie Gilbert** (B.S. Environmental Design, 2019)! Gracie has a love for geology and is an officer in the Geology Club. She has developed regular updates for the Museum's Twitter account **@hokiesaurus** and for the Facebook page **Virginia-Tech-Museum-of-Geosciences** (VT MoGs).

These social media updates highlight specimens in the collection and ongoing exhibit upgrades, as well as some of the history of the Museum. Gracie has done all the photography and text for these updates: a few of them are shared here as well.

With the growth of social media, the Museum is able to create a more connected community among potential and current students and alumni, and enabling Gracie to share the aesthetics of Geosciences with a wider audience. The beauty of these Museum specimens to the eyes of non-specialists inspires interest in the Earth Sciences. We appreciate her commitment to this effort.

## NEWS FLASH!

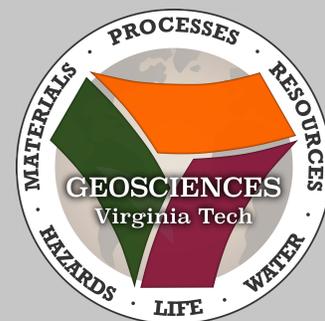
Renew old friendships and make new ones at Virginia Tech's first-ever Alumni Reunion Weekend on June 7-10, 2018! The Museum of Geosciences with Assistant Professor **Sterling Nesbitt** will present a family-friendly program on Dinosaur Relatives on Friday, June 8th at 11:00 a.m. We will also host an Open House for all ages at the Museum on that afternoon. We hope to see you! For more information: <https://www.alumni.vt.edu/events/2018/06/.reunion2018.html>.



# Geosciences Student Research Symposium (GSRS) 2018

By Kannikha Kolandaivelu (Ph.D. Candidate)

February 22nd and 23rd, 2018 saw a phenomenal GSRS in Kelly Hall and featured 42 graduate student talks and 12 undergraduate student posters. Opening remarks were delivered by **Dr. Robin Panneton**, Associate Dean for Undergraduate Programs and **Dr. J.P. Morgan**, Associate Dean of Strategic Initiatives from the College of Science on 22nd and 23rd respectively. To close GSRS, a catered banquet took place on February 23rd in the Museum of Geosciences where prizes for best talks and posters were announced. Thank you to all donors and supporters for making this possible. For more information visit: <https://crowdfund.vt.edu/project/7398>.



## 2018 Spring Newsletter

Editor: Patricia M. Dove

Graphics Editor:  
Lidia R. Guerra

Design & Copy Editor:  
Mary Jane Smith



Poster session in full swing and was widely attended by faculty and students of our department.



**Kirkland Broadwell**, a PhD student, giving his talk on quantifying intermediate depth seismicity by utilizing chemical diffusion profiles in garnet crystals.

## THANK YOU TO ALL DONORS ON GIVING DAY!

**College of Science Amount Raised Leaderboard**

What College of Science fund is going to bring in the most dollars during Giving Day? Give what you can to your department to keep them at the top of the list!

RANK	PRIZE	FUND DESIGNATION	RAISED
1	\$2,500	Geosciences Department Annual Fund	\$12,660.18
2		College of Science Annual Fund	\$11,160.18
3		Biological Sciences Department Annual Fund	\$7,838.38
4		Economics Department Annual Fund	\$6,373.30

**College of Science Gifts Leaderboard**

What department is going to bring in the most gifts during Giving Day?

RANK	PRIZE	FUND DESIGNATION	GIFTS
1	\$2,500	Geosciences Department Annual Fund	148 🎁
2		Economics Department Annual Fund	118 🎁
3		Biological Sciences Department Annual Fund	79 🎁
4		Statistics Department Annual Fund	69 🎁

Thanks to your generosity, Geosciences won both \$2,500 Giving Day competitions in the College of Science — we had both the highest number of donors and the largest total contributions! That makes a total of >\$17 K for our Annual Fund, which will enable us to do some great things for our students.

Letters to the editor, suggested articles, and other comments are welcome at this address:

Department of  
Geosciences  
926 West Campus Drive  
4044 Derring Hall  
(MC 0420)  
Blacksburg, VA 24061

Phone: 540-231-6521  
Fax: 540-231-3386  
Email: [mjsmith@vt.edu](mailto:mjsmith@vt.edu)

Geosciences Department at Virginia Tech  
 926 West Campus Drive  
 4044 Derring Hall (MC 0420)  
 Blacksburg, Virginia 24061

## SUPPORT THE FUTURE. SUPPORT GEOSCIENCES.

Please consider donating to the **Department of Geosciences Annual Fund**. Your support is critical to the department's future success. Contributions from our alumni and friends help our many deserving students, provide state of the art facilities, and expand research of career opportunities. Gifts made without restriction allow departmental leaders to immediately respond to opportunities and to allocate resources where they can have the greatest impact. When you receive the College of Science Annual Fund letter or phone call, please earmark your support for the Department of Geosciences Annual Fund.

<https://www.giving.vt.edu/> or all the Office of Accounting at 1-800-533-1144.



Other ways to make an impact:

**Scholarships** - create a named scholarship for a deserving student

**Faculty Chaired Position** - attract an eminent scholar to join our department

**In-kind Gifts and Volunteering** - donate an old car or help in the museum

**Bequests** - support VT Geosciences in the future

**Endowment** - invest in our long-term future with a permanent charitable legacy

**Designated Gifts and Sponsorships** - let us know your passion for a personal gift

Please contact:

**Steve Holbrook**, Geosciences Department Head at 540-231-6521 or [wstevenh@vt.edu](mailto:wstevenh@vt.edu)

**Wade Stokes**, Assistant Dean of Advancement at 540-231-4033 or [lwstokes@vt.edu](mailto:lwstokes@vt.edu)

LINKEDIN:

GEOSCIENCES  
 AT VIRGINIA TECH

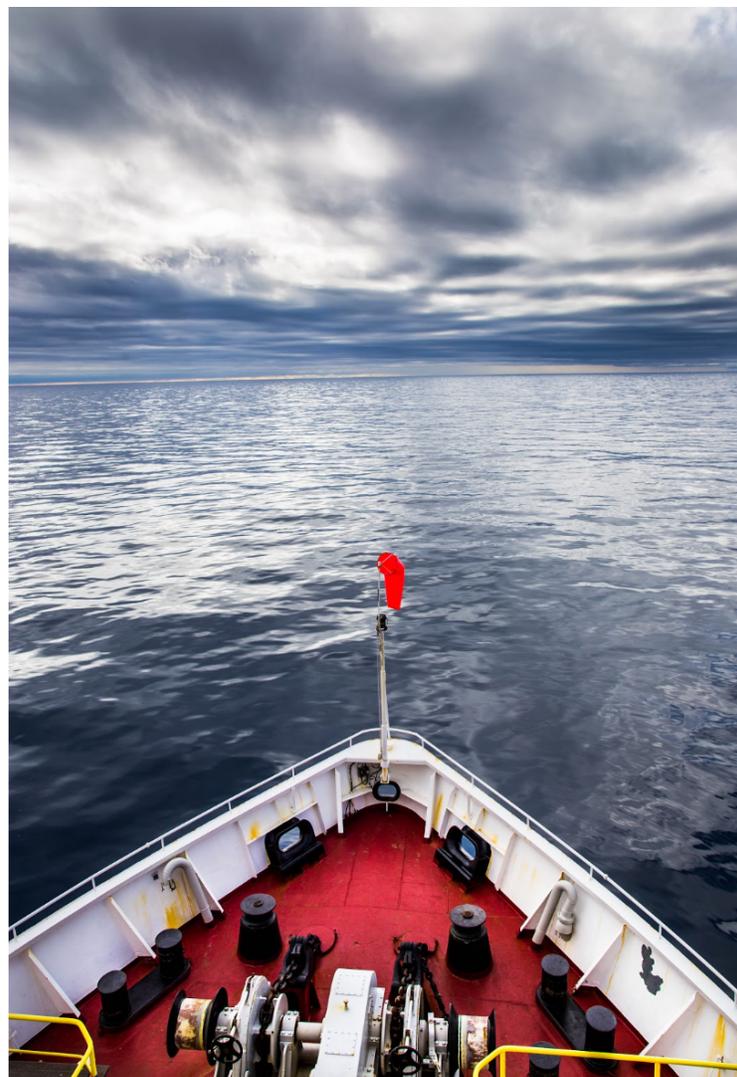
WEBPAGE:



FACEBOOK:



## PARTING SHOT



Looking off the bow of the JOIDES Resolution on a calm day in the Ross Sea (February 2018). Photo by Jason Dodd of Northern Illinois University.