



**SUMMER 2021**



THE UNIVERSITY OF ARIZONA  
COLLEGE OF SCIENCE  
**Geosciences**



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COVER PHOTO:

TAKEN BY GEORGE DAVIS. COVER PHOTO SHOWS GRAD STUDENT LAUREN REEHER AND DOG HENRY SITTING IN THE PARADOX BASIN

BACK PHOTO:

CANYON DE CHELLY, COURTESY OF JON PELLETIER

# A NOTE FROM THE DEPARTMENT HEAD



Dear Friends of Geosciences,

This last year has challenged all of us in unpredictable ways. Thanks to science and new vaccines, we are now seeing COVID numbers decrease, and with the help of everyone, we should be able to fight COVID and overcome this pandemic.

I am grateful to our staff, faculty, and students for pushing through these difficult times, for their flexibility, and for all their hard work. Despite the challenges, our staff, faculty, and students were able to adapt and find creative ways to be productive and successful.

I want to thank all our alumni and friends for their support over this difficult year. Thanks to your

continuous support, we were able to make progress towards scientific discoveries, acquire new instrumentation and facilities, and support our students.

Despite significant budget cuts this last fiscal year, the department was able to hire two excellent new faculty members. In January 2021, Dr. Mauricio Ibanez-Mejia joined our department, from the University of Rochester, as a new Assistant Professor. Dr. Ibanez-Mejia is an expert in Petrochronology-Geochemistry and we are very excited to have him in our department. In Spring 2021, we were able to hire Dr. Hervé Rezeau as a new Assistant Professor in economic geology and the Lundin Chair. Dr. Rezeau is currently finishing a post

doc at MIT and will start in the Department of Geosciences in January 2022. We are looking forward to having Dr. Rezeau join our department.

I would also like to introduce our new Dean of the College of Science, Dr. Carmala Garzione (UA Ph.D., 2000), an alumna of the Department of Geosciences. Dr. Garzione joins us from the Rochester Institute of Technology where she served as Associate Provost for faculty affairs. Dr. Garzione started her new position at the U of A on July 7th and the department of Geosciences is excited to welcome Dr. Garzione as our new dean and as a faculty member in our department. Dr. Garzione not only brings invaluable administrative and



leadership experience to the college and the U of A, but also excellent scientific knowledge and expertise to our department. We are excited to have her and members of her research group join the Department of Geosciences.

Whereas last year most of us could not travel and had to work remotely, this summer we are able to resume most in-person activities—including field camp. Our U of A Geosciences field camp is scheduled to start July 9th through August 12th and students and faculty are very excited to come back together and learn together through our beautiful western USA natural laboratory, from Arizona through Utah, Wyoming, and Nevada. After much isolation, this

experience will provide us with a unique opportunity to reconnect with each other and with nature. As a geoscientist, I feel lucky to have the field as my classroom and as an escape from the office and lab. I know many of you have taken our field camp and or have fond memories of your own experience, and we are happy to be able to continue to offer such incredible opportunities to our students. Although international travel is still restricted, we hope to be able to continue many of our scientific projects overseas starting this Fall.

After a challenging semester of remote teaching and learning, our faculty and students are now getting ready to come back to in-person teaching and research in the Fall 2021.

We are also looking forward to reconnecting with our alumni through upcoming in-person events. Although the isolation resulting from the pandemic has created challenges, it has also provided opportunities for us to experiment with remote teaching, learning, and communication. Some of these remote experiences will continue and will help us make our scientific collaborations and interactions more inclusive.

I wish you all a restful remainder of the summer and I hope to see you sometime in the Fall.

*Barbara Carrapa*

Barbara Carrapa  
Professor and Department Head



# FACULTY RESEARCH

## RECENT AWARDS

- » **Susan Beck:** TANGO: TransANdean Great Orogeny (NSF)
- » **George Gehrels:** Community Facility Support for Geochronology and Thermochronology at the Arizona LaserChron Center (NSF)
- » **Mauricio Ibanez Mejia:** Caught in the Act - The Petrology of Modern Lower-Crust Formation and Foundering in the North Andean Arc (NSF)
- » **Mauricio Ibanez Mejia:** Collaborative Research: The Zirconium Isotope Composition and Variability of the Silicate Earth - A Pilot Study (NSF)
- » **Paul Kapp:** Lithospheric Dripping in Central Tibet: Underappreciated Factor In Orogenic Plateau Development? (NSF)
- » **Luke McGuire:** Improving Debris Flow Inundation Modeling to Support Post-Fire Flash Flood and Debris Flow
- » **Jay Quade:** Developing Quantitative Methods to Address Sediment Modification (NSF)
- » **Kaustubh Thirumalai:** Collaborative Research: P2C2 - Subdecadal Pleistocene Indian Monsoon Variability: A Dual Archive Perspective (NSF)
- » **Kaustubh Thirumalai:** Collaborative Research: P2C2 - Variability, Impacts and Extremes of the ENSO-Asian Monsoon Relationship over the Common Era (NSF)
- » **Kaustubh Thirumalai:** Collaborative Research: Global Ocean Repeat Hydrography, Carbon, and Tracer Measurements, 2015-2020 (UCSD)
- » **Jessica E Tierney:** paleoCAMP: A Multidisciplinary Summer School For Graduate Students In Paleoclimatology (HEISING-SIMONS)
- » **Christopher Hamilton,** University of Arizona Department of Geosciences and Lunar and Planetary Laboratory Associate Professor, is currently in Iceland working with the University of Iceland to study a new eruption at Fagradalsfjall, one of several shield volcanoes in the Reykjanes Peninsula of Iceland. (Pictured, left)
- » **George Davis** traveled with graduate students Lauren Reeher and Lydia Bailey this spring to collect fault data in the Paradox Basin. Below, Lydia Bailey learns about faults from the expertise of George Davis at the independence fault in Lisbon Valley.



# DEPARTMENT NEWS

## STAFF NEWS

- » A team of staff members, researchers, and graduate students participated in this year's Move Arizona, an 8-week competition sponsored by UA Cooperative Extension and UA Life & Work Connections. Heather Alvarez, senior accountant in the Geosciences business office, led the Joggernauts to a 3rd place victory over 116 other teams. Team members Heather Alvarez, Denise Carrillo, Pat Waters, Hannah McCormick, Alex Burant, Alice Chapman, Xiaoyu Zhang, Lael Vetter, and Lilian Schwartz logged over 35,221 minutes of activity!
- » Undergraduate Advisor Shawna Matteson was the 2020 winner of the College of Science Staff/CoSSAC Excellence Award for the Department of Geosciences. Congratulations, Shawna! Thank you for your service and valuable contributions to our department and students.
- » Heather Alvarez, Accountant Extraordinaire, is celebrating 20 years in the department

this year!

- » Fifteen Geosciences staff, faculty, and researchers are being honored with Employment Service Awards in 2021. Congratulations to the following people for their service commitments:

**Anthony Jull - 40 Years**

**Andrew Cohen - 35 Years**

**Anne Chase - 25 Years**

**David Dettman - 25 Years**

**Jessica Kapp - 15 Years**

**Peter Reiners - 15 Years**

**Joellen Russell - 15 Years**

**Hexiong Yang - 15 Years**

**Derek Hoffman - 10 Years**

**Kenneth Kanipe - 10 Years**

**Jianjun Yin - 10 Years**

**Christopher Harig - 5 Years**

**Amanda Hughes - 5 Years**

**Eric Kiser - 5 Years**

**Lael Vetter - 5 Years**

- » The Department of

Geosciences welcomed Christine Duddleston as the new Business Manager in September 2020. Christine is a lifelong wildcat born and raised in Tucson. She started her career as a student worker in the Department of Emergency medicine in 1997 and has a wealth of institutional knowledge as well as financial management and research administration skills. Her hobbies include building furniture, baking, and spending time with her family.

- » Anne Chase will be leaving the Department of Geosciences in July 2021 after 25 years of service. Anne has provided invaluable support for our graduate students and faculty over the past three decades, and she will be missed. We wish you the best, Anne!
- » Hannah McCormick will be leaving the Department of Geosciences in July 2021 after 3 years of service.

**Below is an excerpt of Anne Chase's nomination letter for Shawna Matteson's College of Science Staff/CoSSAC Excellence Award:**

*"Shawna came to us with a clear interest in having ownership of her rôle as full-time undergraduate advisor, and with some well-developed ideas of how she could improve our undergrad program. I am very appreciative of her desire to take the lead for this program, which she combines with a truly collaborative approach to problem solving and a deep respect for the unique culture already established in our department.*

*In the past three years, Shawna has implemented a number of beneficial programs, including a faculty-undergrad mentor program, a freshman colloquium course for incoming students who are interested in learning more about the department and developing their academic skills, and a series of career talks designed for undergrads and presented by local geoscientists. She also helped to promote our faculty mentor program by organizing*

*a well-received Mentor Month of activities. Shawna has played a huge part in improvements to our engagement activities for undergraduates, and overall to making the department much more inclusive and welcoming for the students.*

*In addition to advising our students, conscientiously taking care of all the messaging an undergrad program requires, and developing these engagement activities, Shawna is always calm and welcoming to her fellow staff, faculty, and the students in Geosciences. She collaborates well with the other advisors in Science and has been very proactive about reaching out to other entities on campus to advocate for our students. She shows a truly deep concern for the well-being of our students and always goes above and beyond in finding the best resources to assist them."*

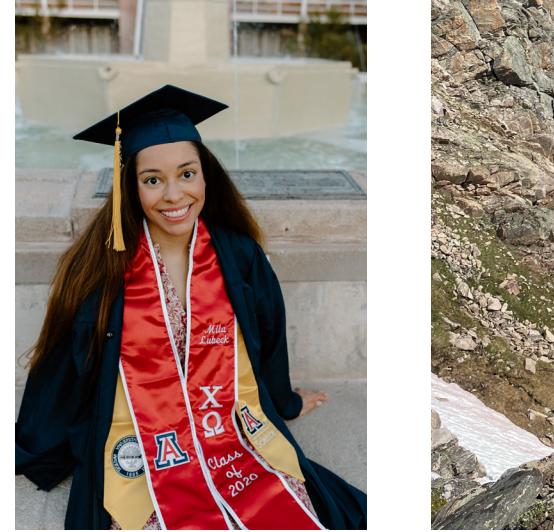


## STUDENT NEWS

- » Emma Reed, PhD student, published “Impacts of Coral Growth on Geochemistry: Lessons From the Galápagos Islands,” in Paleoceanography and Paleoclimatology and received the Global Change Scholarship. The article can be found at doi.org/10.1029/2020PA004051.
- » Alice Chapman, PhD student, received a Geological Society of America Graduate Student Research Grant and was the recipient of the College of Science Geosciences 2021 Graduate Award for Service and Geosciences 2021 Graduate Award for Teaching. Alice also received the Kenneth A. Lovstrom Memorial Scholarship.
- » Cassie Hanagan and Emilie Bowman, PhD students, maintained a GPS station—WHTA—at White Tank Mountain Regional Park. Cassie received travel funding from a Graduate Professional Student Council grant to maintain the continuous AZ GPS network.

- » Dylan Carlini, MS student, wrote and submitted an essay for the 50th annual St. Gallen Symposium Global Essay Competition, a competition exclusive to graduate students from different fields and universities around the world. The theme of this year’s event was: Trust Matters.

Dylan’s essay titled, “Science Over Conspiracies: A Shift from Fact to Process” was selected as one of 100 global finalists. *“In any other year, I would have been invited out to St. Gallen University in Switzerland to attend in-person, but the pandemic necessitated a virtual conference this year, which I attended in early May as one of the 100 ‘Leaders of Tomorrow.’ I engaged with graduate students from all around in different workshops, and we discussed various topics related to regaining trust in major globe institutions. I was one of a few who chose science. Other topics included medicine, the media, and politics. We also had live talks from a diverse*



set of leaders, politicians, university presidents, philanthropists, and CEOs.

*It was a really impactful experience, and I am still in a group chat with the other essay finalists who represent dozens of different countries.”*

- » Lydia Bailey, PhD student, received the Tucson Gem and Mineral Society Scholarship for \$5000.
- » Eytan Bos Orent, PhD student, received the Tucson Gem and Mineral Society Scholarship for \$5000.



» Tshering Lama Sherpa, MS student, has been selected as the recipient of the ZEISS-GSA Research Grant, which awards up to \$10,000 for use of innovative microscopy in geoscientific research. With the award, she will be using in-situ monazite petrochronology to elucidate the tectonic history of western Nepal. In-situ monazite petrochronology is a relatively novel method that combines geochronology and geochemistry using optical and ion beam microscopy to approach macro-scale tectonic problems.

- » Brianna Hoegler, BS '21, was a College of Science 2021 Galileo Circle Scholar and a recipient of the George H. Davis Undergraduate Research Fund. Brianna was also the runner-up for the Best Undergraduate Poster at GeoDaze 2021.
- » Sophia Bautista, BS '21, won Best Undergraduate Poster at GeoDaze 2021 and was admitted into University of Alaska's field camp program.
- » Zoe Benson, BS student, was a George H. Davis Undergraduate Research Fund recipient, a College of Science 2021 Galileo Circle Scholar, and a recipient of a National Merit Scholarship.
- » David Cantillo, a rising senior at the University of Arizona studying Geosciences with a minor in mathematics and planetary science, recently published his first peer-reviewed paper that helped better quantify the regolith composition of asteroid (16) Psyche, the largest metallic asteroid in the solar system.

His paper titled, "Constraining the Regolith Composition of Asteroid (16) Psyche via Laboratory Visible Near-infrared Spectroscopy," can be found at <https://iopscience.iop.org/article/10.3847/PSJ/abf63b>.

- » Benjamin Mohler, BS student, co-authored a paper published in PeerJ titled, "First remains of the enormous alligatoroid *Deinosuchus* from the Upper Cretaceous Menefee Formation, New Mexico." The article can be found at <https://peerj.com/articles/11302/>.
- » Mila Lubeck, BS '20, received the Fall 2020 College of Science Outstanding Senior Award.
- » Peter Blake, BS '21, received the Spring 2021 Outstanding Senior Award for Geosciences.
- » Ryan Eden, BS '21, received the Spring 2021 Excellence in Undergraduate Research Award for Geosciences.

## FACULTY NEWS

- » Joellen Russell hosted a session and spoke on Carbon Budget Verification at the G7 Science Ministers' Summit - Future of the Seas and Oceans Initiative. (Pictured, top right)
- » Joellen Russell was selected as a University Distinguished Professor in recognition of her contributions and extraordinary commitment to undergraduate teaching, advising, and mentoring. Congratulations, Joellen!
- » Susan Beck was awarded the 2020 Walter H. Bucher Medal by the American Geophysical Union. "Susan Beck is an internationally recognized leader who has made seminal contributions to the study of mountain belts, subduction systems and the evolution of the crust and mantle lithosphere. Her research embodies a unique combination of seismology and structural geology that has advanced fundamental interpretations of lithospheric and orogenic evolution. Her work has revealed the

nature of orogen collisional processes, plateau formation and deterioration, megathrust fault zones and great earthquake ruptures. Over her career, Susan has done more than any other seismologist to transform our understanding of orogenic processes in the Andes. (Pictured, left)

- » Vance T. Holliday was awarded the University of Arizona's 2021 Henry and Phyllis Koffler Prize for Research/Scholarship/Creative Activity. The Koffler prize is "intended to honor individuals who have made major contributions to their field." Dr. Holliday's award was based on "international recognition as a leading scholar in the in geoarchaeology, in which a range of methods from geology and archaeology are applied to solving questions about ancient humans." (Pictured, top middle)
- » Eric Seedorff is retiring at the end of this semester after a distinguished career in the mining industry (Chief Geologist, Magma Copper

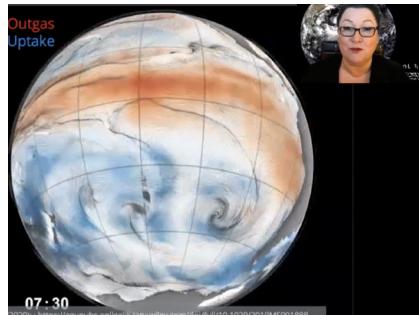
and VP BHP Copper, among others). Eric Seedorff joined the Geosciences faculty in 2002 as the first Lowell Chair in Economic Geology. Honoring David Lowell's intent, Eric created the Lowell Program in Economic Geology (LPEG) including the first-of-its-kind Professional Science Masters degree, specifically to address the need for top quality advanced training for industry geologists. As part of the program he led a series of intensive field-based courses that over 16 years attracted more than 1,000 professionals from all over the world.



- » Roy Johnson is retiring at the end of this month from the Department of Geosciences after 34 years at the University of Arizona. Fortunately for us Roy will continue to be an active emeritus faculty member and even teach exploration seismology again in the Fall of 2021. Read Susan Beck's tribute to Roy on page 14.
- » Bob Downs, our expert mineralogist-crystallographer, is retiring at the end of this semester after serving for 25 years as a Geoscience faculty member. Bob joined

our department as an Assistant Professor in 1996 after completion of a Master's degree in mathematics from the University of British Columbia and his Ph.D. degree in crystallography from the Virginia Polytechnic Institution, followed by a short period as a post-doctoral researcher at the Geophysical Laboratory. He has been the bedrock foundation and the go to person for mineralogy-crystallography in our department and a leader in the field nationally and internationally.

- » Bob Downs' co-authored book 'Deep Carbon' was selected as a CHOICE Outstanding Academic Title of 2020. CHOICE is a publishing unit of the Association of College and Research Libraries, a division of the American Library Association. They are awarded to books for "their excellence in presentation and scholarship, the significance of their contribution to the field, their originality and value as an essential treatment of their subject, and significance in building undergraduate collections." Notably, Deep Carbon is the only Earth Science title on the list.
- » Marcus Lofverstrom was the recipient of the 2021 Outstanding Faculty Award presented by the Department of Geosciences Advisory Board. (Pictured, bottom right)
- » George Gehrels received the Excellence in Postdoctoral Mentoring 2021 Award from the University of Arizona.



# ROY JOHNSON: 34 YEARS IN GEOSCIENCES

Professor Roy A. Johnson has retired from the Department of Geosciences after 34 years at the University of Arizona. Fortunately for us Roy will continue to be an active emeritus faculty member and even teach exploration seismology again in the Fall of 2021. Roy arrived at the UA in 1987 after a PhD from the University of Wyoming in 1984 follow by a few years as a Research Assistant Professor at Wyoming. Roy established a successful program and facility in seismic reflection data processing, modeling and interpretation in Geosciences always with the latest software and applications for seismic processing and interpretation.

Roy's research took him from the western US to Africa. He and his students and colleagues worked on Archean and Protozoic sutures, structures related to the Great Salt Lake in Utah, and low angle normal faulting in Nevada and Arizona. Roy made contributions to early Hominin sites and paleolakes Drilling projects in Africa with Professor Andy Cohen. More recently, Roy

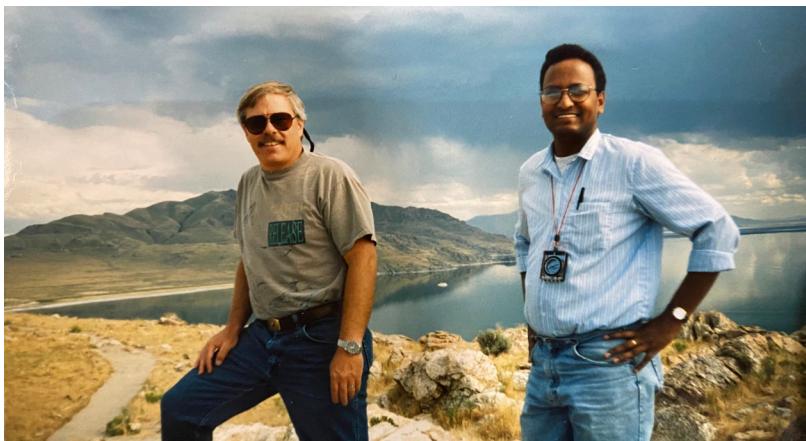
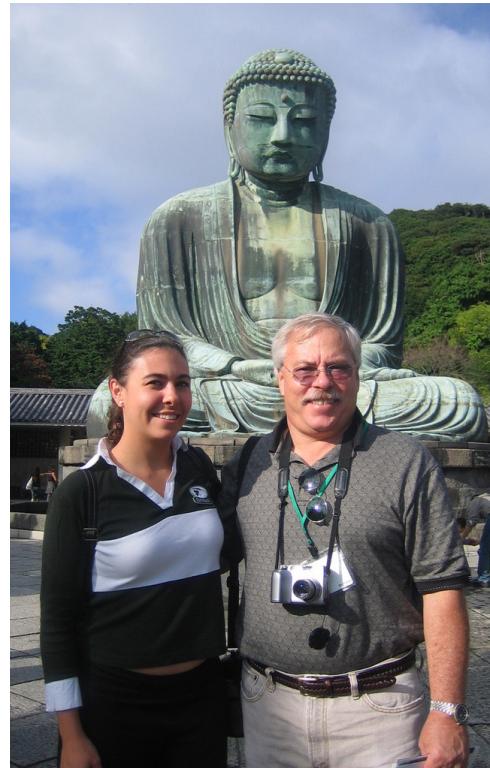


and his students worked on 3D seismic data interpretation of the interplay of volcanic deposits and normal faults off-shore Africa related to the opening of the South Atlantic. Roy authored or co-authored over 50 articles in scientific journals and had a major impact on the understanding fault geometries and crustal structure in Arizona

and beyond.

Roy is an outstanding teacher and mentor to students, and he advised or co-advised over 35 graduate students at UA. Roy always built a sense of community with his graduate students, many of which were international students coming to the US for the first time. He

By Susan Beck,  
Professor, Department of  
Geosciences



always put students first and made sure they felt welcomed in the department, they finished their degrees and found jobs afterwards. Roy made contributions to many more graduate students by serving as a committee member with insightful advice and help. Many of his former graduate students joined in on a Zoom retirement

“party” for Roy this past March and their heartful stories were a testament of how many lives he impacted across the world.

Roy always put people first no matter the situation and he is the model for collegiality across the department. Roy has been our connection to industry and helped maintain relationships

with many of our alumni. We are thrilled that Roy will still be around working with colleagues and students for the foreseeable future. Congratulations Roy and Kim and thanks for all your friendship and contributions to the department!

# MEET OUR NEWEST FACULTY MEMBERS

**G**et to know the three newest additions to the Department of Geosciences: Mauricio Ibañez-Mejia, Ananya Mallik, and Kaustubh Thirumalai. We sat down (virtually) with Mauricio, Ananya, and Kau to ask them about their research, geosciences, and Tucson. Keep reading to see their responses!

## Tell us a little bit about yourself. What first interested you in Geosciences?

**M:** I was born in Bogotá, Colombia, a city perched at 2600 m of elevation in the Eastern Cordillera of the north Andes. I lived in the city for 24 years, but while growing up my family and I would always spend our holidays in a smaller city in the Central Cordillera called Armenia (the coffee capital of the country). This city is close to the volcanoes national park, and every year my cousins and I would go hiking and camping around the Nevados del Ruiz, Santa Isabel and Tolima. It was during these trips that I got hooked! The volcanic landscapes, the landforms left by recent lava flows, the

hydrothermal pools reeking of sulfur, and snow-capped peaks right outside our tents in the mornings were enough for me to realize I wanted to become a geoscientist.

**A:** I was born and raised in Kolkata, India. I received my bachelor's and master's degree in Geology from Jadavpur University in Kolkata. I came to the US for a PhD and received my degree from Rice University in Houston, Texas. After this, I spent three years as postdoc in Bayerisches Geoinstitut in Bayreuth, Germany, and a few months at Brown University. Following this, I spent a year and half as assistant professor at University of Rhode Island before starting as an assistant professor at University of Arizona from Fall 2020.

I am also The RealReal Inc. Endowed Chair in Gem Science, and as the endowed chair, I spearheaded the development of an undergraduate emphasis in Gem Science within the Geosciences major. To our best knowledge, this is the first of its kind academic program in the

country.

Although I was initially interested to major in physics as an undergraduate, I ended up majoring in Geosciences and have never looked back even once. I was introduced to plate tectonics in middle school by my geography teacher which I found fascinating but had not really considered a career in Geosciences back then. Call it fate or otherwise, when I did end up choosing Geosciences as a major, I was fascinated by the breadth of knowledge I gained about our own planet as well





as our neighbors in the Solar System and beyond.

**K:** I was very interested in the interactions of animals and plants with the environment ever since I was a kid, inspired by family trips to the regional forests of Karnataka. Growing up in southern India, the monsoon was also a focus of fascination. However, I ended up on a pathway to an undergraduate degree in chemical engineering, and only during my 2nd year of college was I formally introduced to the geosciences at the Indian Institute of Science, Bengaluru.

There, I worked on monsoon rainfall isotope variability and there was no looking back!

**Give us a quick elevator pitch of your current research.**

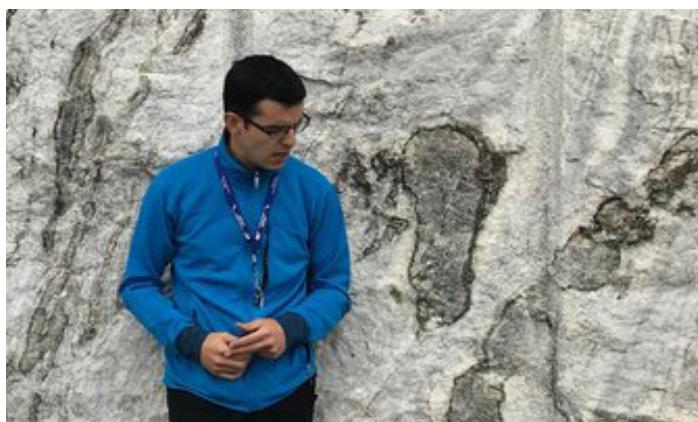
**M:** I am interested in the petrologic and geochemical evolution of the solid Earth, and one of my favorite tools for exploring this are isotopes. The isotopic compositions of igneous and metamorphic minerals tell us a great deal about the timing of mountain building and formation of continents, as well as the processes that have influenced

the chemistry of the mantle and crust over billions of years of geologic evolution.

My current research focuses on understanding these connections, and on developing new geochemical tools that can help us better reconstruct the history of our planet over a wide range of temporal and physical scales.

**A:** My research group simulates conditions (such as pressure and temperature) in the interior of the Earth and other planetary bodies to investigate first order problems related to planetary evolution. We study the feedbacks between the Earth's atmosphere-ocean-crust and the mantle to understand the evolution of these reservoirs in geological timescales. We also study the evolution of our celestial neighbors, specifically how hot and wet the Moon is and what can that tell us about the common origins of the Earth-Moon system.

**K:** I am a geoscientist who is motivated to understand the machinery of Earth's



climate system and the evolving interplay between the atmosphere, land, and the oceans. I am also interested in extreme events, geohazards, and learning how the geological record might provide perspectives on future risks. Towards these objectives, my lab focuses on reconstructing past environmental signals from carbonate geochemistry in rocks and fossils including single-celled plankton shells called foraminifera, snails, clams, cave stalagmites, and corals. We also use climate model simulations and modern observations in concert with these geochemical data to help us understand climate change across Earth's history.

#### What has been your favorite research project?

**M:** Tough question. I would probably say all of them! One of the coolest perks of academia is that you get to work on problems you are genuinely curious about and you learn new things all the time. I've been fortunate enough to never have had to work on a research project I found boring.

**A:** I will not pick any favorites.

**K:** For me, each one of my research projects are uniquely

special and memorable to me; and there are no favorites per se. More fleetingly however, whatever I'm currently working on (changes on a day-to-day basis!) is my favorite.

#### Who are your mentors within the field of geosciences? What would your advice be to students looking for a mentor?

**M:** Too many great mentors have influenced my career up to this point to list them all here, but a common characteristic is that they all share the same passion for the geosciences as I do. My recommendation for students looking for a mentor is to seek someone who is passionate about what they do, and who is generous with their time and scientific ideas.

**A:** Susan Beck, Raj Dasgupta and Cin-Ty Lee are my mentors. My advice to students: Mentors need not be your research supervisors (although one of my mentors was) – look beyond.

**K:** My mentors are Prosenjit Ghosh (Indian Institute of Science), the scientist who gave me a chance and introduced me to the geosciences, (the late) R. Ramesh (Physical Research Labs), a pioneering Indian paleoclimatologist whom I had

the great privilege to work with, my PhD advisor Terrence Quinn (U Texas), and postdoc advisors Steve Clemens (Brown) & Pedro DiNezio (CU Boulder), and my long-term collaborators and mentors, Dr. Julie Richey at the USGS and Dr. Judson Partin at UTIG. I am also greatly indebted towards mentors at the University of Arizona including Dr. Jessica Tierney, Dr. Andrew Cohen, and Dr. Jay Quade. There is a large list of many others without whom I would not be where I am today, including graduate school peers and contemporary scientists in (paleo)climate science.

My advice to students is that there is no bar on mentors – find as many mentors as possible, and to remember that mentors come in all forms and ages.

#### What do you think your students would be surprised to learn about you?

**M:** A fellow geoscientist and I co-own an independent record label called 'Batholith Industries' that only releases music on vinyl. We've spent a little fortune on this and have hardly made any of our money back, but it's been a fun time.

**A:** Not sure if this is something



to be surprised about – I am a trained Indian classical dancer (specifically focusing on Kathak). I have not performed on a stage for more than ten years now but do plan to resume at some point.

**K:** That I used to play in a doom metal band in India?

**What would you be doing if you weren't a geoscientist?**

**M:** I would probably be into physics and astronomy. The planetary sciences have always fascinated me.

**A:** I am quite sure I would have been a theoretical physicist – that was my original plan before Geosciences hijacked me.

**K:** I'd likely be working for the Forest Services in India.

**What's something about living in Tucson that has surprised you?**

**M:** I was a graduate student at UA, so living in Tucson again has felt like a homecoming to me. I've been particularly surprised about how the city and the campus surroundings have changed since I left seven years ago, and having the Sonoran Desert as my backyard once again has been amazing; the southern Arizona desert is full of

surprises.

**A:** I have never lived in a desert before. I was born and raised in hot and humid tropical climate, and add to that living in Houston for more than five years. The aridity and the difference in feel temperature between the sun and shade has really surprised me in Tucson.

**K:** That there is not a large Indian grocery store to be found! (although, I do like my *India Dukaan*)



# HERVÉ REZEAU JOINS THE DEPARTMENT OF GEOSCIENCES

*Dr. Rezeau Joins the Department of Geosciences as Assistant Professor and Lundin Family Endowed Chair in Economic Geology*



**D**r. Hervé Rezeau, who is currently a Swiss National Science Foundation Postdoctoral Fellow at the Massachusetts Institute of Technology's

Department of Earth, Atmospheric, and Planetary Sciences, will be joining the Department of Geosciences at the University of Arizona in spring 2022 as an Assistant Professor and the Lundin Family Endowed Chair of Economic Geology.

Dr. Rezeau's research focuses on the origin and the evolution of volatiles (H<sub>2</sub>O, S) and economic metals in the lithosphere addressing a key scientific question in economic geology: Why are some continental arc segments endowed with ore deposits while others are barren? As an economic geologist and igneous petrologist, Dr. Rezeau investigates magmatic processes that dictate the ore-forming potential of magmas and hydrothermal processes that are directly responsible for the formation of economic deposits using a multidisciplinary approach that includes fieldwork, petrology, geochemistry,

fluid/melt inclusions, and ore petrography. "I want to improve our understanding of Solid Earth processes to develop new geochemical proxies and strategies to evaluate the ore-forming potential of magmas and hence predict with more accuracy the location of hidden mineralized systems," says Dr. Rezeau. "Ultimately, this aims to find direct applications in the mining industry to limit the impact of mining exploration and ore extraction on the Earth's environment and climate."

Dr. Rezeau discovered his real passion for Earth Sciences after an unexpected trip to Vietnam lead by Vincent Pardieu, a former employee of the Gemology Institute of America (GIA), to look for pearls, rubies, sapphire, and blue spinels. "That experience made me realize that geology combines everything I love the most including traveling to remote places, discovering

new cultures, and of course doing Earth sciences,” says Dr. Rezeau. “The fascinating aspect of geology is that you operate as a detective gathering evidence from tiny rock-forming minerals to build theories and unravel Earth processes such as the formation of oceanic floor, continents, and minerals resources. The beauty of economic geology is that it offers opportunities to do fundamental research having direct applications for societal challenges, which in this case is the discovery of new mineral resources.”

As the Lundin Family Endowed Chair of Economic Geology, Dr. Rezeau hopes to develop a world-leading program in mineral resources and economic petrology to address the scientific challenges related to the ongoing global energy transition. “My vision for research education at the graduate level is two-fold: I want to offer fundamental research opportunities and applied research projects in partnership with the mining industry,” says Dr. Rezeau. “My main goal is to produce well-rounded scientists with diverse backgrounds that are highly competitive for both academic and mining industry employment.”

“The Department of Geosciences is excited to welcome Dr. Hervé Rezeau as a new Assistant Professor and as the Lundin Endowed Chair in Economic Geology,” says Professor and Department Head Barbara Carrapa. The Department of Geosciences is ranked #3 in geology according to US News & World Report and has been home to many renowned economic geologists, including David Lowell and John Guilbert, due to the university’s proximity to world-class copper deposits. Lowell and Guilbert were responsible for developing the alteration model for porphyry copper deposits in the 1970s. “The University of Arizona is surrounded by a vibrant mining industry,” says Dr. Rezeau. “The Lundin Family Endowed Chair in Economic Geology position at the University of Arizona represents an exciting opportunity to develop ambitious research and teaching programs in Economic Geology.”

After obtaining his DUT in Physics at the University of Maine in Le Mans (France), Dr. Rezeau realized his passion for geology and decided to pursue a degree in Earth Sciences. He joined the University of Nantes (France) where he received his bachelor’s degree in Geology

and Geophysics. Dr. Rezeau then moved to Switzerland to pursue his master’s and PhD degrees in Petrology, Geochemistry, and Ore Deposits at the University of Geneva under the supervision of Prof. Robert Moritz. Upon the completion of his PhD in 2017, Dr. Rezeau was the recipient of two successive Swiss National Science Foundation postdoctoral fellowships that enabled him to work as a postdoctoral scientist with Prof. Oliver Jagoutz at the Massachusetts Institute of Technology (MIT).

Dr. Rezeau’s current research projects include:

- » Sulfur and metals cycling in subduction zones from a lower crustal perspective.
- » Temporal and genetic relationships between arc magmatism and porphyry Cu-Mo-Au deposits.
- » Magmatism and metallogeny of the Central Tethyan orogenic belt.

Previous research has focused on the genesis of Archean orogenic gold deposits.

# FROM PROPOSAL TO FRUITION: CAREER PREP SEMINAR/WEBINAR SERIES

**A**t the 2019 GEOS Advisory Board Meeting, Members Marie Pearthree and Leslie Katz proposed forming a career planning series for GEOS undergraduates. The idea was to expose them to non-traditional career opportunities by inviting a series of speakers who had taken their geosciences degrees in creative and sometimes unexpected directions. The speakers were asked not only to talk about their backgrounds, the value of a GEOS degree, and the kind of work they were involved in, but also to provide suggestions as to how students could explore opportunities and further develop their interest in these career paths while in school and once they graduated.

Working with the Society of Earth Science Students (SESS), which sponsored the series, as well as Shawna Matteson, Senior Undergraduate Advisor and Hannah McCormick, Marketing Specialist, Marie and Leslie went to work recruiting speakers. The series started with in-person

presentations in September 2019, but pivoted to virtual presentations a year later. With the exception of Spring 2020 when UA activities were paused due to the pandemic, the series continued through the Spring 2021 semester, at which point it was also broadened to include graduate students and some talks on what are considered more traditional careers.

The series experienced a steady increase in the number of total attendees over time, averaging 15+ people per presentation and attracting as many as 22. Attendance particularly increased when the series became virtual. Attendees were a mix of GEOS undergraduate and graduate students, students from other departments, professors, and other interested parties, sometimes from external institutions.

We want to give a huge shout-out to all of the speakers who participated in this program, and thank them once again for the

interesting perspectives they shared.

**Julio Betancourt**, U.S. Geological Survey: impacts of climate change on terrestrial ecosystems

**Stacie Gibbins**, ExxonMobil/GEOS Advisory Board: an economic geologist in oil and gas



By Marie Pearthree,  
Geosciences Advisory  
Board Member

“

*The Career Prep Webinars this past semester helped me get a more complete picture as the diverse careers geoscientists can have. In turn, that helped me to better understand my options for a future career as a current undergraduate student, from academia to exploration and mapping to geoarchaeology.*

”

Brianna Hoegler,  
Geosciences Undergraduate Student

**Susan Hamm**, U.S. Department of Energy: science and technology in Washington, D.C.

**Kyle House**, U.S. Geological Survey: the art of geologic mapping

**Gary Huckelberry**, Consultant/Adjunct Professor, GEOS: geoarchaeology as a profession

**Leslie Katz**, Montgomery & Associates/GEOS Advisory Board: water resources consulting

**Ray Leonard**, Anglo Eurasia/GEOS Advisory Board: geology and climate change

**Marie Pearnree**, GEOS Advisory Board: water management and historic CAP Water issues

**Phil Pearnree**, Arizona Geological Survey: careers in state geological surveys

**Doug Silver**, Orion Resource Partners: the broad world of mineral resources

**Ann Youberg**, Arizona Geological Survey: geologic impacts of wildfires

**Hector Zamora**, Tucson Water Department: hydrology and data management

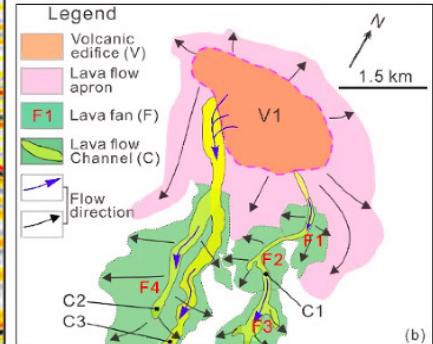
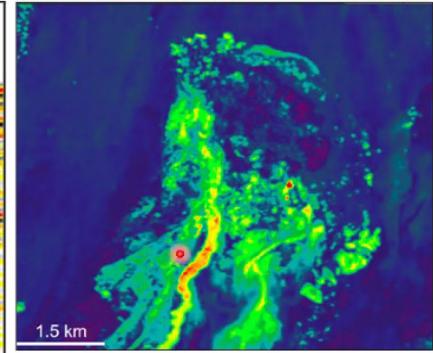
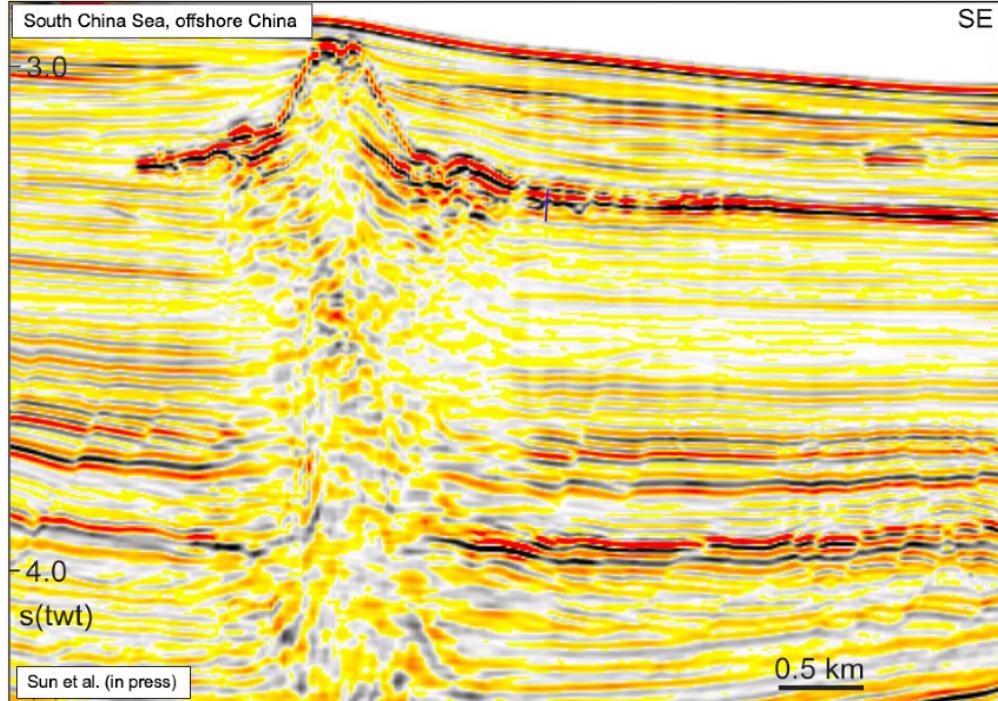
**Megan Zivic**, Montgomery & Associates: geologic/decision support modeling

At this point the series is looking for a new coordinator, as Marie Pearnree is stepping down. If interested, please contact Larry Archibald, Chair of the GEOS Advisory Committee.





## What's Inside a Volcano?



## GEODAZE 2021

This past April, we held our 49th annual student-run GeoDaze symposium. For the safety of our UA Geosciences community, this year we decided to hold GeoDaze virtually. Despite the challenges over the past year, our graduate and undergraduate students conducted outstanding research that was made available via the

GeoDaze website and Gather Town. The addition of Gather Town to GeoDaze allowed attendees to navigate through a virtual conference space to interact with other conference attendees, view poster and talk presentations, and attend live events using a personalized avatar. This year, 25 students gave oral presentations

and 11 students gave poster presentations made available during the week of March 29th-April 2nd. Each session was followed by a live question and answer session hosted using Zoom Webinars.

This year's virtual format allowed us to invite Dr. Chris Jackson from abroad to deliver the

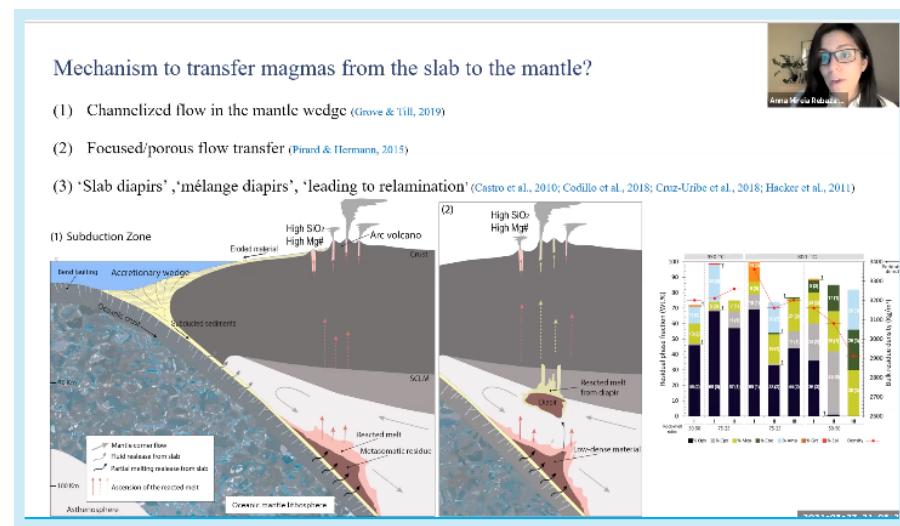
Keynote Address on April 2nd. Dr. Jackson shared his latest research with us during his Keynote Address, "Hot Rocks Under Our Feet: 3D Seismic Imaging of the Products of Crustal Magmatism". In addition, he gave a short talk and led a discussion event on April 1st hosted by the department's chapter of the Association of Women Geoscientists (AWG) called "Representation and Racism in the Geosciences".

We concluded the 49th GeoDaze symposium with a live virtual awards ceremony where 10 students were presented with awards for excellence in their presentation funded by our generous sponsors. This year's virtual format allowed us to once again reach a diverse audience across the globe. Over the course of one week, the GeoDaze squarespace website received over 300 unique visits per day from 6 continents, amounting to 3,212 total page views. We are truly grateful for the capable force of graduate student volunteers, sponsors, presenters, and attendees of GeoDaze that made this possible.

Cheers,  
Alice Chapman  
Emilia Caylor



## WHY CARBONATES?



### Mechanism to transfer magmas from the slab to the mantle?

- (1) Channelized flow in the mantle wedge (Grove & Till, 2019)
- (2) Focused/porous flow transfer (Pined & Hermann, 2015)
- (3) 'Slab diapirs', 'mélange diapirs', 'leading to relamination' (Castro et al., 2010; Codillo et al., 2018; Cruz-Uribe et al., 2018; Hacker et al., 2011)



## Congratulations to this year's winners!

### Oral Presentation Awards:

- Best Overall Talk: Audrey Dunham
- Best Graduate Talk: Caden Howlett
- Best Undergraduate Talk: Peter Blake
- Best Economic Geology Talk: Kyle Lewis
- Best Climate & Paleoclimate Talk: Julia Manobianco
- Best Geophysics Talk: Brandon Tober
- Best Tectonics & Structure Talk: Lydia Bailey
- Best Geochemistry Talk: Hannah Tompkins and Nitzan Yanay

### Poster Presentation Awards:

- Best Graduate Poster: Emilia Caylor
- Runner-up Graduate Poster: Pablo Martinez-Sosa
- Best Undergraduate Poster: Sophia Bautista
- Runner-up Undergraduate Poster: Brianna Hoegler

# AWG: SUCCESSES DURING A PANDEMIC

The Association for Women Geoscientists (AWG) Southern Arizona Chapter, founded in Spring 2018, is an organization run by members of the School of Earth and Environmental Sciences at the University of Arizona. The main goal of our chapter is to promote women and other marginalized groups in STEM fields by creating an inclusive environment and a strong network of allies in and around the Tucson community. We had really big plans for this year and were so excited to continue our chapter activities after a successful two years

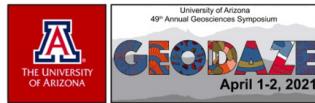
making a lasting impact on the UA Geoscience Department. However, the global COVID-19 pandemic had us thinking on our toes and adapting our ideas, all whilst being stuck isolating in our homes. Despite this, I am pleased to report that we overcame the hurdle and had an incredibly successful year! Below are just some snapshots into what we have managed to achieve.

In Fall 2020, we received the Geological Society of America's E-an Zen Fund for Geoscience Outreach Grant of \$1500. Our goals were to increase the

interest in STEM education and careers for students in the Tucson Unified School District, to empower the students, and to inspire interest in Geoscience among female-identifying and underrepresented students by increasing access to active learning opportunities even within the context of remote learning. We used the grant to cover the cost of take-home soil testing kits that were distributed to schools as an extra-curricular activity for middle- and high-school students. Some of our AWG members walked through exercises with the students over zoom, where they learned all about what's in their soil! To secure the longevity of more outreach projects in the coming years, we have also been awarded ~\$1000 from the UA Commission on the Status of Women (CSW) for our proposal 'Building Women in STEM Leaders through Geoscience Outreach'. We are thrilled that we managed to start an outreach program during a pandemic, and we hope this is just a glimpse of what we can achieve in the future.

## Representation, Racism, and Barriers to Participation in the Geological Sciences in the UK

Natasha J. Dowey, Jenni Barclay, Benjamin Fernando, Sam Giles, Jacqueline Houghton, [Christopher Jackson](#), Keely Mills, Alicia Newton, Steven L. Rogers, Rebecca Williams



By Lydia Bailey, PhD  
Student, Department of  
Geosciences

The huge success of our outreach efforts would not have been possible without the hard work of Emilie Bowman and Lavanya Ashokkumar, the Outreach Coordinators of our AWG chapter, and Julie Edwards, our Fundraising Chair.

AWG began a graduate/undergraduate mentorship program last year where graduate mentors were paired with undergraduate mentees to share experiences, career/school advice, and to bring together all students in the Department of Geosciences. This was hugely successful last year, and we are pleased that to announce that the pandemic did not get in our way! Alice Chapman and Cassie Hanagan, our Mentorship Program co-coordinators, did a great job to create 15 new mentor/mentee pairings. We hope that next year we can meet everybody in-person!

To keep up tradition of previous years, AWG hosted a virtual 'breakfast' with the keynote speaker of this year's amazing virtual GeoDaze symposium. The keynote speaker was Dr. Christopher Jackson, and he gave an excellent talk with the theme 'Representation and Racism in the Geosciences' followed by a great discussion.

We are so grateful that Dr. Jackson took the time to speak with AWG, our members, and the Department of Geosciences this year.

For many students who want to pursue geoscience careers, field experiences such as field camp provide transformative opportunities. However, field camp often creates a significant financial burden due to course fees, additional costs for camping and field gear, and having to forgo summer employment or internships. These costs can create a huge barrier for students and possibly deter them from pursuing a degree in Geosciences. To this end, this year we decided to create an AWG Undergraduate Field Camp Scholarship. We raised money by hosting a virtual screening of the movie "Picture a Scientist" and a subsequent discussion and are pleased to announce that we raised over \$1000! This year's scholarship has been awarded to Anna Miller, an undergraduate student who will be attending field camp at Idaho State University! Looking into the future, we plan to award an Undergraduate Field Camp Scholarship to at least 1-2 undergraduate students from underrepresented groups in STEM each year.



This past year has been a difficult one for all of us, but I am very happy to report good news from our AWG Chapter. We could not have done this without our dedicated members of our chapter and the Department of Geosciences, donations from alumni, and of course the incredible hard work of our AWG Officers. If we achieved all this during a global pandemic, there is no limit to what we can accomplish in the future. We look forward to continuing our mentorship program, outreach events, and scholarship fundraising to inspire geoscientists of all ages. Keep up with what we are up to by visiting our website [geo.arizona.edu/awg/](http://geo.arizona.edu/awg/) and Twitter: [@Arizona\\_AWG](https://twitter.com/Arizona_AWG). If you are interested in joining or donating to our chapter, please contact us at [awg.arizona@gmail.com](mailto:awg.arizona@gmail.com).

# CONGRATS GEOSCIENCES GRADUATES

FALL 2020 - SUMMER 2021

## *BS Graduates*

- » Omar Abdullah
- » Mohammed Abu Huray
- » Yousef Al-Awadh
- » Abdulrahman Hussam Aldulaim
- » Naif Ibrahim Alfayez
- » Nawaf Abdullah Alhelal
- » Omar Alhosani
- » Layali Ali
- » Murtadha Jubarah Aljubarah
- » Hamad Almarzooqi
- » Khalid Suhail Almutairi
- » Majed Alshehri
- » Ahmed Altalalwah
- » Shaikhah Althuwaiqeb
- » Joshua Alvarado
- » Sophia Bautista
- » Peter Blake
- » Colin Campbell
- » Sydney Chapin
- » Kayla Chaudoir
- » Charles Cunningham
- » Julian Diepenbrock
- » Ryan Eden
- » Brooke Cameron Elser
- » Maya Federbush
- » Gilbert Ray Gaxiola
- » Elizabeth Holz
- » Sarah Hughes
- » Jennifer Isbell
- » Anya Kadlubowski



### ***MS Graduates***

- » Andrew Lagrange
- » Guanhua Li
- » Ivo Alexandre Lima
- » Martin Pereira Luango
- » Mila Ann Lubeck
- » Deanna Mireles
- » Scott Mooney
- » Autumn Muhly
- » Miguel Orozco
- » Nathaniel Schwarz
- » Vilma Simao
- » Brandon Michael Widener
- » Dania Xavier
- » Anca Barla
- » Eytan Bos Orent
- » Dylan Carlini
- » Terrance Delisser
- » William Fitzpatrick
- » Olivia Hoch
- » Anthony Krupa
- » Patt Lamom
- » Samantha Portnoy
- » Melli Rosenblatt
- » Jordan Wang
- » Nitzan Yanay

### ***PhD Graduates***

- » Roy Greig
- » Jhon Jimenez Rodriguez
- » Lisa Jose
- » Jennifer Kielhofer
- » Clinton Koch
- » Emma Reed
- » Grace Windler

### ***PSM Graduates***

- » Jeffrey Cornoyer
- » Kyle Lewis

# ALUMNI NEWS

## ALUMNI NEWS

### David Wald, MS '86

The Eugene M. Shoemaker Award for Lifetime Achievement in Communications is presented annually to a scientist who creates excitement and enthusiasm for science among non-scientists by using effective communication skills.

Each year, a broad-based committee that includes past Lifetime Achievement award recipients reviews the nominees and selects the winner. Denis LeBlanc, research hydrologist at the New England Water Science Center, and David Wald, a seismologist at the Geologic

Hazards Science Center, have both been selected as recipients of the 2020 Shoemaker Award for Lifetime Achievement in Communications.

In his more than 27 years with the USGS, David Wald has demonstrated an unparalleled capacity for both generating science critical to the rapid characterization and understanding of recent earthquakes, and for translating that information into forms digestible by a wide variety of audiences. The earthquake products that David and his

colleagues created have revolutionized the ways in which we respond to earthquakes and communicate information in a post-earthquake environment. David customized these products to meet the needs of contrasting user groups, ensuring that they are intuitive to use, can be quickly digested by their intended audience, and can be repurposed into downstream media usage. Consequently, David's suite of real-time products are now routinely used to describe recent earthquakes by major news outlets like CNBC, the New York Times, and

### Richard Robinson, MS '65

Richard writes, "I graduated in 1965. I spent 41 years teaching geology at Santa Monica College.

For the last 15 or so years, I have published geology guides designed for tourists describing the geology of all of the Hawaiian Islands.

My books are available on Amazon. And, last year I branched out and published a tourist guide to the Caribbean islands. Enclosed is a list of my publications."

#### Maui Books:

- » Geology and Geography of Maui, 8.5x 11, in color
- » Geology and Geography of Maui, 8.5 x 9, in b&w
- » Geological Guide to Haleakala National Park, 8.5x 9, in color

#### Oahu Books:

- » Geological Guide to Oahu, 8.5x 11, in color
- » Oahu Geology, 8.5x 11, in b&w
- » The Geology of Oahu, 8.5x 11, in b&w

#### Island of Hawaii Books:

- » Illustrated Geological Guide to the Island of Hawaii, 8.5 x 11, in color
- » Geological Guide to the Island of Hawaii. 6 x 9, in b&w, no photos
- » Island of Hawaii Geological Guide, 8.5 x 11, in b&w
- » A Geologic Guide to Hawaii Volcano National Park, 8.5 x 11, in color
- » A Geologic Guide to Hawaii Volcano National Park. in 8.5 x 11, in b&w
- » Hawaii Volcanoes National Park A Geological Guide, 8.5 x

the Wall Street Journal.

David has excellent communication skills and is a vocal advocate for the importance of data sharing for the advancement of science, giving over 100 talks to academic, civil, museum, and public audiences. David has mentored many students and post-docs who have themselves gone on to impactful positions in their fields, and he continues to energetically engage with scientists and non-scientists alike, both domestically and internationally, to promote

understanding of earthquake hazard, impact, and risk reduction. His achievements are recognized through a variety of major awards throughout his career, including a 1997 USGS Special Act Service Award for Outreach; in 2000, the Southern California Emergency Services Association's Diamond Award; the 2004 Distinguished Lecturer for the Seismological Society of America (SSA) and the Incorporated Institutions for Seismology; the 2015 Earthquake Engineering Research Institute Distinguished Lecturer; a USGS Exceptional

Service Award in 2008; a DOI Superior Service Award in 2010 and again in 2014; and a DOI Meritorious Service Award in 2016.

The USGS and the Nation have profoundly benefited from David's lifelong commitment to science and their unparalleled ability to effectively communicate to a range of audiences, reinforcing the relevance and importance of USGS science for years to come.

11, in color

- » Geological Guide to Haleakala National Park, in 8.5 x 11, in color

Kauai Books

- » Geology and Geography of Kauai, 8.5 x 11, in color
- » A Guide to the Geology and Geography of Kauai, 8.5 x 11, in b&w

Caribbean Books:

- » Illustrated Guide to the Eastern and Southern Caribbean Islands, 8.5 x 11, in color



## **Eleanora I. (Norrie) Robbins, MS '72**

### **Paul Martin Still Guiding My Research**

I miss my UofA Geosciences thesis advisor, Paul Martin. One lesson he taught us all continues to guide my research 40 years later. He said that we geologists

have to pay attention to the modern environment to interpret rocks, because the present is all we have.

And thus, there I was on the beach in San Diego yesterday, teaching the same lesson to

my San Diego State University student. I'm trying to interpret the redbeds along the San Diego coast. They form spectacular red cliffs at Torrey Pines State Reserve and Cabrillo National Monument. The sand that comprises the sandstone was



## **Constance N. (Dodge) Knight, MS '73**

Connie Knight, an Independent Geologist who lives in Golden, Colorado, will be featured in the 2020 edition of Marquis "Who's Who in America". She has worked the majority of her career as an explorationist in the oil and gas industry. She also worked at the Rocky Flats (Nuclear Weapon's) Plant Site in the 1990's as a Senior Principal Environmental Engineer. Connie asserts that a global effort to replace coal with natural gas as an energy source is a viable middle-of-the-road solution for curbing CO2 emissions related to climate change. Connie has generated and is seeking funding for a large natural gas prospect with over one trillion cubic feet of potential natural gas reserves.

Over the past 15 years Connie and her husband Roger have hosted U of A Geoscience alumni events at their home. If any of you are in Colorado during a future event, please attend.

Below are highlights from



deposited during the Pleistocene Ice Age and then uplifted to form cliffs. The geologists who mapped the rocks said that they represent sediment deposited on beaches. So after looking at innumerable samples of

redbed rocks, there I was at Imperial Beach digging down into the sand and collecting bags of beach sand to make my comparison. Thanks Paul, RIP.



Connie's "Who's Who" citation.

#### Education

- » BS Degree Western State College, Colorado 1970
- » MS Degree University of Arizona 1973
- » Professional Degree in Hydrogeology Colorado School of Mines 1993
- » PHD Colorado School of Mines 1999

#### Professional-leadership service

- » American Association of Petroleum Geologists (AAPG) 50 years (House of Delegates 15 years)
- » Denver Earth Resources Library (DERL) first board of directors
- » Rocky Mountain Association of Geologists (RMAG) board of directors, 2009, 2010.
- » Society of Independent Professional Earth Scientists (SIPES), Denver Chapter Chairman: 2016, 2017, 2018
- » Chief Technical Editor, joint AAPG-RMAG book - Series in Geology #65: Application

of Structural Methods to Rocky Mountain Hydrocarbon Exploration and Development. Published by the American Associated of Petroleum Geologists (AAPG, Nov 2013)

#### Activities and Achievements:

- » Honoree, Distinguished Worldwide Marquis Humanitarian Award (2021, 2020); Featured Member, Marquis Millennium Magazine, sixth edition; Inductee, Top Professionals of the Year, Marquis Who's Who (2019); Recipient, Albert Nelson Marquis Lifetime Achievement Award (2019); Marquis Who's Who in America (2020)
- » Featured as One of 100 Professionals for "Who's Who in Energy," Denver Business Journal (2017)
- » Featured as One of the "Top 40 women in Energy," Denver Business Journal (2017)
- » Recipient, Distinguished Public Service to the Earth Science Award, Rocky Mountain Association of Geologists (RMAG) (2011)
- » Creator and Owner, Geo-Educational Services, self-developed and marketed new geologic teaching product (1987). Sold concept and copyright to Ward's Science, an international company. Product is still produced and marketed as the "Ward's® Discovering Rocks and Minerals Lab Activity."
- » Speaker's Bureau Creator and Founder, Rocky Mountain Association of Geologists (RMAG) (late 1980's). Coordinated 25 speakers who delivered over 100 presentations during the first few months.
- » Delivered formal and informal oral/visual presentations, papers and posters for: AAPG, DOE, GSA, RMAG, SIPES, SPE, USGS, and WGA. Multiple publications. Presented short course at RMS-AAPG convention.
- » Colorado School of Mines and Rocky Mountain Association of Geologists (RMAG) mentor programs.

## Hala Alwagdani, BS '15

Hala writes, "Greetings from the Middle East! I am Hala Alwagdani, currently an exploration geologist at Saudi Aramco.

I graduated from high school in 2010 where my academic excellence throughout school has placed me amongst the top 1% in Saudi Arabia. This merited me a scholarship from Saudi Aramco to study geosciences and two national scholarships to study medicine. I chose to pursue geosciences for my undergraduate degree and career path because it was a discipline newly available to women in Saudi Arabia at that

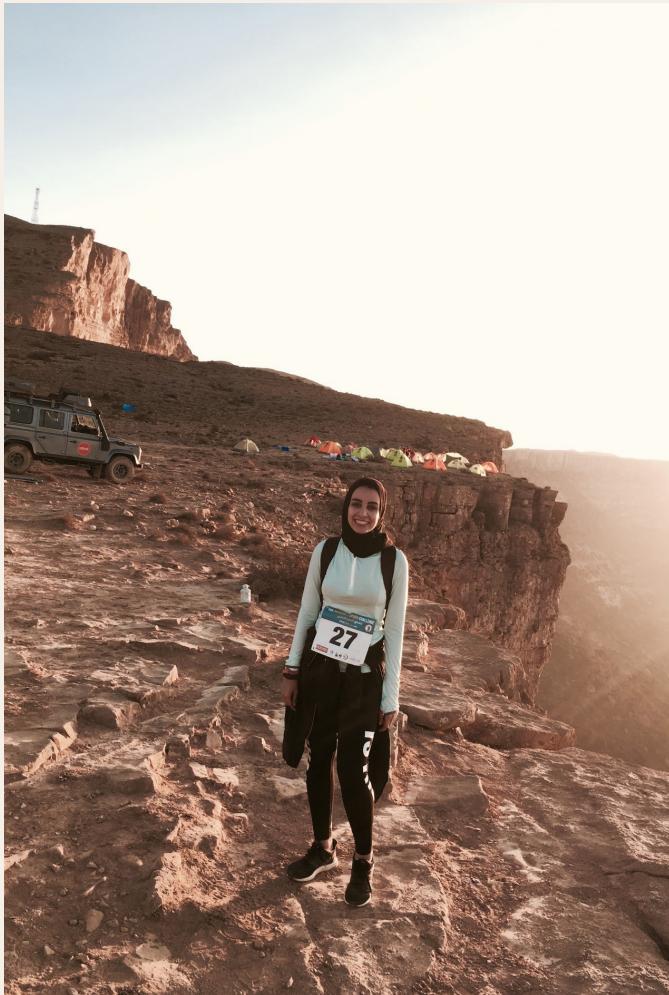
time.

I attended the University of Arizona from 2011 to 2015 and truly fell in love with geosciences as I came to recognize it as a story-based science. I looked forward to attending lectures and listening with rapt attention throughout. I was, and still am, intrigued by a science that proves how the Earth we live on is composed of continents that physically unite and drift apart!

Personally, the academic aspect was easy to grasp and pass, but the challenge was the fieldwork aspect. My first field trip was to the Bright Angel

Trail of the Grand Canyon. The descent part of the hike was easy, as I comfortably named the formations and located faults across the layers. My physical challenge kicked in on the way up as I was silently wailing, resting every other minute and mentally drafting a letter to the department explaining why a disclaimer to sedentary students was essential. Once I reached the top, I recognized that moment as a turning point in my geoscience path and physical interests. It was also clear that in order to graduate, I had to overcome this fitness challenges.

For years since the Grand





Canyon trip, I steadily worked on my fitness and love of the outdoor. None of that stopped after successfully graduating with a degree in geosciences and joining Exploration in Saudi Aramco. In fact, the academia to workforce jump change in life style propelled that pursuit. Eventually I seriously committed to running and outdoor adventure challenges.

In 2017, I participated in my first 50 km ultra-marathon challenge down Jabal Samhan in the city of Salalah, Oman. A flash back experience similar to the Bright Angel Trail but in this I finished the race and won 1st place on

females and 4th overall in an overall race participation of 120.

The seventh Sinkhole to Tahery Cave route is a vertical sinkhole on the top of the Salma plateau that leads to a cave at the bottom of the plateau. The experience of descending into the sinkhole with ropes and hiking deep into the pitch-dark core of the plateau was so appealing that it made this route a destination for extreme adventurers in the region. The search and rescue team had a mission to scan the route, map it, train personnel to go through it, and identify possible shelters in case of seasonal floods and I



was a part of that team.

A few months ago, I was a part of an expedition set to explore Harrat Khaybar (Khaybar Lava field) in Northwestern Saudi Arabia. The team aimed to discover and map out the longest lava tube in the area. I am forever grateful to have been given the chance to study geosciences, to have done it at the University of Arizona with many field-focused experiences, and to all the professors and TA's that made my introduction to such exciting science positive. Because of you all, I am passionate about what I do."



### **John-Mark Staude, PhD '95**

John-Mark writes, "We are living in Vancouver, Canada working in mineral exploration as the CEO of Riverside Resources Inc and other mineral resource ventures. We catch up with fellow UofA graduates including Tom McCandless, Brook Clements, Wojtek Wodzicki, Lance Miller, Moira Smith, Peter Megaw, Gene

### **Triffon Tatarin, BS '17**

Triffon writes, "To catch you up on what's going with me, it's been a lot since my last visit to Tucson. Since then, I interned with BP in Alaska as a geophysicist working on seismic inversion. In the summer of 2019, I completed my Masters in Applied Geological Sciences at the University of Alaska Anchorage under Dr. Simon Kattenhorn. I was looking at fault evolution along the North Slope and opening of the Canada Basin via 3D seismic. During that same time, I was interning with Chesapeake Energy in Oklahoma City as a geologist, working on evaluation of some shallow sands; basically, a petroleum system overview. Following the internship, I was offered a full-time position with Chesapeake Energy and am now

working here full-time. I'm in the South Texas/Eagle Ford business unit, but working in the main Oklahoma City office. I've had a few other specialty positions since joining Chesapeake, but most recently, I am the sole asset geologist for the entire Eagle Ford.

I still try to utilize my structural geology knowledge and skills as much as possible and I think it has had a big impact on my performance so far as most geologists in the industry don't have specialized focus on structural geology. Anyways, that's what I've been doing since my time in Tucson."

### **Rob Sternberg, MS '77, PhD '82**

Rob writes, "I'd [like to] mention my relatively new blog (<https://internationalgeophysicalyear.blogspot.com>), which partly emanated out of my degrees in geophysics at Arizona, and invite people to have a look. Also, two central figures in the IGY were Hugh Odishaw, who was dean of the College when I was in Tucson, and Lawrence Gould, namesake of the building, who was a professor emeritus at the time. I was acquainted with both, although not really close. I'd like to see if anyone has any stories about them which I might include in my blog."

Schmidt, Wolf Schuh and others. For the coming summer 2021 we will be traveling in Mexico for work on copper and gold. We have Ontario Canada gold projects progressing and also developed partnerships with other companies.

For copper we are working with

BHP as their exploration alliance on finding new large porphyry Cu deposits in Sonora, Mexico.

Looking toward 2022 we will hope to have another spin out company as we did with the open pit, heap leach gold project in Durango Mexico in the company Capitan Mining for

which I am the Chairman and we are expanding the compliant gold resource now and will continue into 2022.

Great to be in contact with fellow alumni."

## Brooke Clements, MS '91

"Every year in January, students and alumni from the U of A meet at the Exploration Roundup conference in Vancouver, one of the largest exploration conferences in the world. Of course, the conference was virtual in 2021, nonetheless, a number of us still managed to network.

We are looking forward to going live again in 2022."



# NEW SCHOOL OF MINING AND MINERAL RESOURCES APPROACHES FINAL STAGE OF APPROVAL

*Industry, faculty and students work together to design the future of mining and mineral resources education at UArizona*

We are pleased to update those of you following the progress of the new interdisciplinary School of Mining and Mineral Resources. The school has been approved by UArizona leadership and is progressing toward final approval by the Arizona Board of Regents later this month. We hope to be announcing some very good news, soon!

This school has been a long time in the making, with input and support from many, many stakeholders. As we approach our final hurdle, it's worth taking a look at how we got here.

The process began by gathering input from the mineral resources industry regarding top concerns of executive leadership, change drivers and related workforce

and innovation implications. Stakeholders represented 20 different companies (and USGS) across 9 different areas of the business and operating in over 12 different countries. Feedback was largely consistent and key points are as follows:

- 1. Mining skills of the future are broader and more sophisticated**, requiring more data, systems, social, complex problem solving, and resource management skills in addition to solid traditional technical skills,
- 2. There is a perceived widening gap between industry and academia**, with universities often seen as operating in isolation,

**3. Mining curriculum is seen as outdated**, and too narrow, failing to incorporate the latest technology, or critical issues like environmental and social aspects,

**4. Minerals programs fail to attract the very best talent**, and are currently facing critically low enrolments globally, with workforce shortages projected,

**5. Siloization and a lack of diversity** in the workplace is not only hindering progress and innovation but is considered a threat.

The importance of minerals is increasing, and demand for a new kind of talent that few can provide is rising. Isolated siloes—



disciplinary or organizational, are widely recognized as standing in the way of achieving the sea change needed. So, a small industry-academic taskforce began exploring the best ways to meet these needs and determined that UArizona has what it takes, and that the time to act is now.

The taskforce felt that breaking down siloes between existing programs and extending interaction to other programs like business, social and environmental sciences had the potential to improve the sustainability and competitiveness of each individual program. Rallying students and faculty around a real-world challenge rather than a single discipline would

not only improve the quality of education, but also increase research output, bring visibility to an important topic, and enhance the student experience.

With a generous gift from the Lundin Family, UArizona was able to secure the resources and support needed to pursue a new interdisciplinary school. Comprised of faculty from across campus, the school will consider the evolving education and innovation needs of sustainable mineral resources against UArizona's capacity.

Over the course of this past academic year, a dedicated, interdisciplinary working group of faculty fleshed out plans to meet these needs and defined clear goals and programs for

development.

At an open-invitation faculty and researcher briefing held in January 2021, 86% of responders agreed or strongly agreed that this is an important initiative for UArizona, and 83% of responders agreed or strongly agreed they would like to participate in this initiative.

At a recent industry-academic assembly, participants described the new school concept with words like: important, exciting, necessary and ahead of the curve. On a scale from 1 to 10, 1 being "no value at all" and 10 being "game changer," participants rated the new school at 8.7, agreeing it had great potential value to the mining industry.

## Interdisciplinary initiatives are a positive.



They're associated with "bridging a gap," being well rounded, allowing for a diversity of knowledge and people, reaching across boundaries to include experience from multiple areas to solve a problem, introducing different world views, and translating between different disciplines or cultures.

## Students want exposure to a broader field of vision.



Often, their primary field of study is too technically focused, they don't feel like they get the big picture or thought process.

## Flexibility and options are super important.



Students want to tailor their studies to their areas of interest and career goals, and they want to be able to change their minds as they learn more about subjects and career options.

## For those looking to add onto existing studies, try a minor.



A broad, transdisciplinary minor could be great for exposing students to a wide range of topics and helping them find their area of interest.

## Students often aren't aware of their education and career options.



Someone to help students identify where they want to end up and map out a corresponding path that is best for them would be extremely valuable. That requires a student-centered, discipline-neutral approach.

## Networking, networking, networking.



Meeting people outside of their core area of study is considered very important for future success. It's necessary in the real world, where you never know with whom you'll have to work.

## What do students think?

To ensure alignment with student needs and priorities, we've engaged a Student Advisory Panel comprised of six undergraduate students from Science and Engineering, many of them double majoring across the colleges. As we move into Fall 2021, we will expand this panel to at least 12 students from more disciplines, and include graduate students. The panel is currently helping us refine our program design and test our value proposition, playing a prominent role in shaping the school and continuous improvement efforts.

Since we do not yet have that

broader, more diverse Student Advisory Panel to consult, we decided to do some polling in a new general education course, "Nonrenewable Resources and Human Civilization" attended by a healthy representation of social sciences and business students, along with those studying science and engineering.

Findings from this survey are consistent with those we've conducted previously with UArizona engineering students and students in general. The more they know about mining and mineral resources, the more interested they become.

Based on three years of research on students and their choice of studies and career, we're confident that with our

school offerings we can attract the diversity, quality and quantity of students needed to meet the grand challenge of providing a sustainable supply of responsibly sourced mineral resources for this, and future generations.

As we move into the final stages of school approval, and begin to build out our academic programs, we welcome continued input and questions.

For more information or to find out how you can get involved, please contact Jodi Banta, Program Manager, Lowell Institute for Mineral Resources at [jbanta@arizona.edu](mailto:jbanta@arizona.edu).



**72%**

of students said it was valuable or very valuable to study nonrenewable resources in an interdisciplinary course.



**39%**

said they'd like to continue studying nonrenewable natural resources in additional interdisciplinary courses.

An additional 34% said "maybe."



**38%**

said they were interested in learning how to apply what they're studying in their current major to improving the sustainability of nonrenewable resources.

An additional 30% said "maybe."



# DOWNTOWN JEWEL: ALFIE NORVILLE GEM & MINERAL MUSEUM SETS SIGHTS ON OPENING

The University of Arizona Alfie Norville Gem & Mineral Museum (ANGMM) continues to get closer and closer to opening. Construction inside the museum space began in 2018 but due to COVID-19, the museum faced several delays.

Earlier this year in February, the museum completed the renovation and build out of the new facility at the historic Pima County Courthouse, located in downtown Tucson. Population of cases with the University of Arizona Geoscience collection

and loan items began shortly after, with the museum currently at 97% of exhibits completed.

The museum features three main galleries: Mineral Evolution Gallery, Arizona Gallery, and Gem Gallery. Visitors begin

By Selena Valencia,  
ANGMM Assistant  
Manager, RII



with the evolution of minerals, a theory developed by Dr. Robert Hazen at Carnegie Institution of Geophysical Laboratory and George Mason University, and Dr. Bob Downs, Professor Emeritus with the University of Arizona Geoscience department. The second gallery will focus on minerals native to Arizona and Mexico regions, featuring a replica of a Bisbee mining stope and a platform showcasing the progression of mining in Arizona. Visitors will finally end in the Gem Gallery and Treasury, a brand-new addition of the museum that focuses on gem science, crystallography, gem cutting processes, jewelry and

gem art.

Special and Changing showcases in the museum include:

- » Minerals from the Ed and Ann David Collection
- » Minerals from the Mark LeFont Collection
- » Tucson Gem and Mineral Society Young Mineral Collectors 2019 Winners
- » Nicolai Medvedev's Intarsia boxes and other works
- » American Jewelry Design Council 2020 Competition:

#### Secret Garden

- » Selection from Paula Crevoshay's Butterflies & Spiders series
- » Dieter and Andreas Roth Cameos
- » Gem Encrusted Tapestry sponsored by Mertel Family (COMING SOON)

Visitors of all ages will be able to take part in engaging interactive activities throughout the museum. Once open to the public, ANGMM plans to have events to engage the community. Working with Dr. Jessica Kapp and UArizona's Society for Earth



Science Students (SESS Club), the museum will be able to provide community centric days that include fun activities and demonstrations.

The lower level of ANGMM consists of high-density storage for the museum's collection, a teaching classroom, prep room for incoming specimens, lab space for community gem & mineral testing, research laboratory available for students and researchers to use, reference library open to the public, and staff offices.

The museum staff has also grown from two to five employees on staff. Adding to the team is Exhibit Specialist Elizabeth Gass, Guest Services Coordinator Jordan Halter, and Assistant Curator Susan Leib. A former curator at Jewelry

Television, Gass holds a B.S. in Geology and Environmental Studies from University of Tennessee as well as a Fellow of the Gemological Association of Great Britain (FGA). Halter has over 9 years of customer service experience with a B.A. in Interpersonal Communications from Kent State University. Halter is also currently finishing her Graduate Gemologist (GG) with the Gemological Institute of America (GIA). Leib holds a B.S. in Geology from Olivet Nazarene University, a M.S. in Geology from University of Kentucky, and a M.A. in Museum Studies from Western Illinois University. Leib has been working on her Ph.D. in Geosciences from Texas Tech University and is anticipated to complete her program in Fall 2021.

In addition to staff, ANGMM has

launched a new docent program that is open to the public. Anyone interested in applying to be a docent, volunteer, or intern can contact us via email at [selenavalencia@arizona.edu](mailto:selenavalencia@arizona.edu) or by phone at 520-621-7320.

The museum plans to begin opening for Exclusive Museum Preview guided tours mid-summer 2021. Tickets for this 2-hour special experience will be available for advance purchase on our website for a limited time. ANGMM general admission is anticipated to begin in Fall of 2021 with a Grand Opening for the museum scheduled for the beginning of 2022.

For more information on the museum, visit <https://gemandmineralmuseum.arizona.edu>. (Photos courtesy of ANGMM)

# UPCOMING EVENTS

## *Welcome Back Party*

Tuesday, September 14, 2021

6:00 – 10:00 PM

UArizona Alfie Norville Gem & Mineral Museum

115 N Church Ave  
Tucson, AZ 85701

RSVP by September 1, 2021 at  
[forms.office.com/r/h9g2MdSies](https://forms.office.com/r/h9g2MdSies)



## *Tucson Alumni Event*

Wednesday, October 20, 2021

5:30 – 8:00 PM

7248 N Cloud Canyon Place  
Tucson, AZ 85718

RSVP by October 6, 2021 to  
Larry Archibald at [larchibald@gmail.com](mailto:larchibald@gmail.com)



## *Southern California Alumni Field Trip*

Saturday, October 30, 2021

Time TBD

Dana Point Harbor Area  
California

RSVP by October 16, 2021 to  
Rick LeVeque or Tony Murer  
at [ibral1000@gmail.com](mailto:ibral1000@gmail.com) or  
[tonymur92@gmail.com](mailto:tonymur92@gmail.com)



# GEODISCOVERIES: THE FUTURE OF GEOSCIENCES

Thanks to the support of our alumni and friends, we were able to raise \$32,238 in six weeks for the new GeoDiscoveries Fund!

The GeoDiscoveries Fund allows the department to continue offering experiential and interdisciplinary educational opportunities to the next generation of geoscientists by providing access to state-of-the-art laboratories.

Gifts to of GeoDiscoveries Fund also provide cutting-edge instrumentation and equipment for our faculty and researchers, as well as the imperative maintenance of these technologies. With cutting-edge equipment and technology, geoscientists can make impactful scientific discoveries that benefit the worldwide scientific community, teach and train the next generation of geoscientists and provide invaluable research opportunities to students.

With nearly \$33,000 raised, the Department of Geosciences was able to make its first

three awards using the GeoDiscoveries Fund. The awards were made based on one or more of the following criteria:

- » Project uses cutting-edge technology to improve laboratory capabilities
- » Project impacts faculty and student research productivity
- » Project uses new technologies to enhance education and training in areas such as big data and machine learning
- » Project uses new technologies to increase inclusion in research
- » Project fosters interdisciplinary collaborations within the Department of Geosciences

Congratulations to our first three awardees!

1. Mihai Ducea: ESR (Electron Spin Resonance) and OSL (Optical Stimulated Luminescence) Methods Applied to the Provenance of Quartz: A New Technique
2. Peter DeCelles: RocksAwe: Where “Cutting Edge” Geoscience Begins
3. Mauricio Ibañez-Mejia: A collector block upgrade for the Nu Plasma MC-ICP-MS: enhancing technique development and applications of non-traditional stable isotopes at the Department of Geosciences

We are hopeful that the department will be able to fund many more projects in the coming years. To help us reach our original \$50,000 crowdfunding goal, please visit [geo.arizona.edu/SupportGeosciences](http://geo.arizona.edu/SupportGeosciences).

# FOLLOW US!

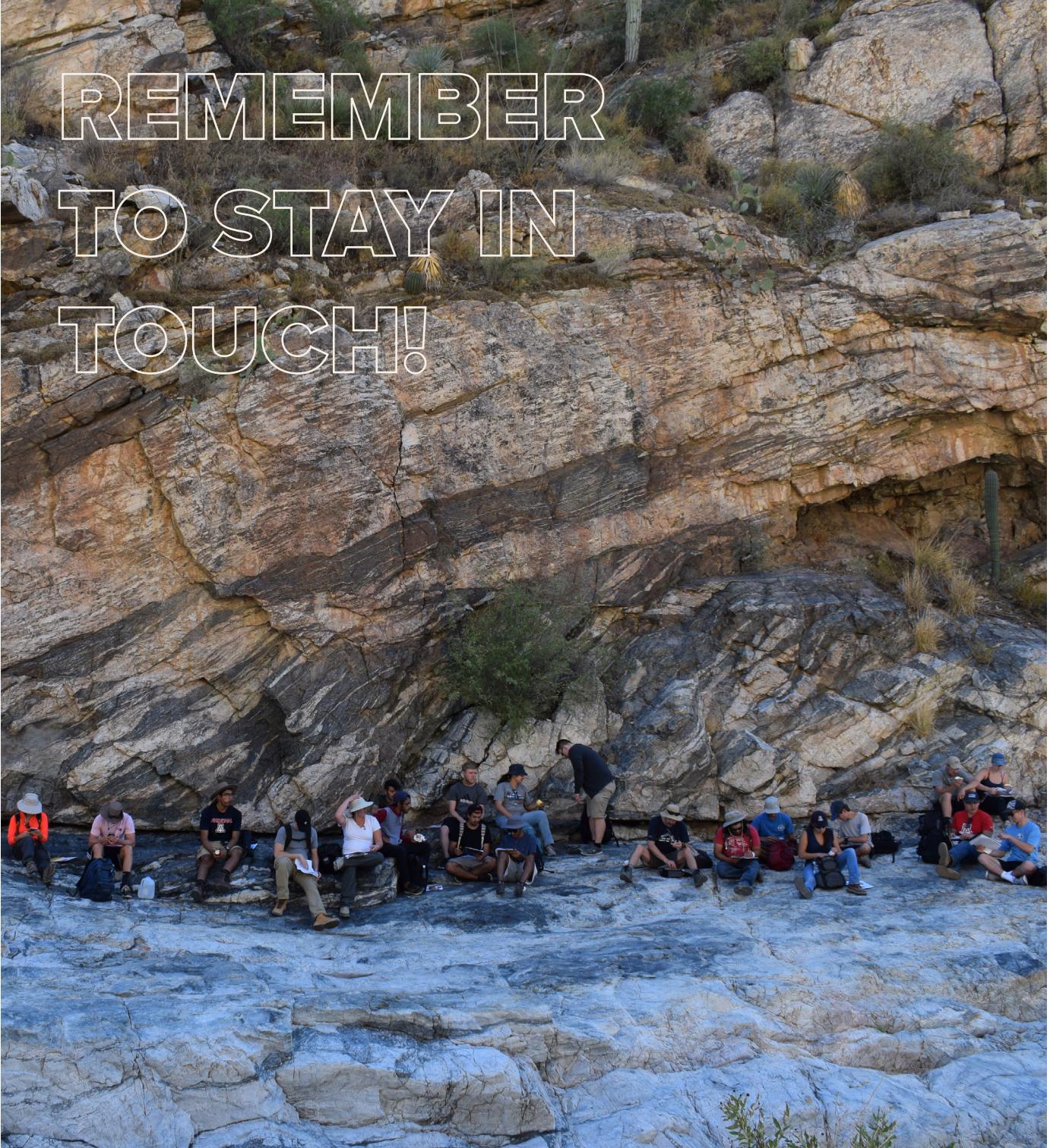
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