RESEARCH 2020: COLLABORATIONS

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This issue of Research marks the third year that we have published some highlights of faculty and student research. This year's theme is collaborations—and we celebrate research and creative collaborations that cross continents, age, experience, disciplines, and more.

One of the highlights of the past year was a panel discussion about research on underrepresented college student populations. Dr. Stacy Boyd moderated the discussion between panelists Dr. Christopher Jett, Dr. Dena Kniess, and Dr. Tommy Jackson about the work they do in this area and what their future work will likely include. We had a record turnout for this presentation, and we hope to continue to facilitate such discussions as we move forward. Many attendees suggested that we continue the conversation in a variety of formats, and we plan to do so in collaboration with researchers across campus.

In other good news, UWG closed the 2020 fiscal year with $3,754,726.53 in external funding. This makes it the second best year in the history of the institution (the best year was 2012). This achievement is the result of the creativity and talent of our faculty and staff. In the spring round of Textbook Transformation grants, UWG was ranked number one in the University System of Georgia in awards given, and in the past year we have been awarded funds from the National Science Foundation, the Department of Justice, and the National Endowment for the Arts, to name just a few. In partnership with the Faculty Development Committee of the Senate, the Office of Research and Sponsored Projects (ORSP) awarded more that $60,000 in Faculty Research Grants, and over the summer the ORSP offered online grant writing workshops for faculty.

Meanwhile, the ORSP continues to evolve to better serve the research community. In July, the Center for Research merged with the ORSP. As we move forward, we are excited about the community outreach and faculty development possibilities that this merger makes possible. Be on the lookout for more news about this.

It is impressive what we as an institution have been able to accomplish during this extraordinary year. As always, the staff of the ORSP and the Center for Research look forward to supporting our faculty and students in their research endeavors.

Denise Overfield, Associate Vice President


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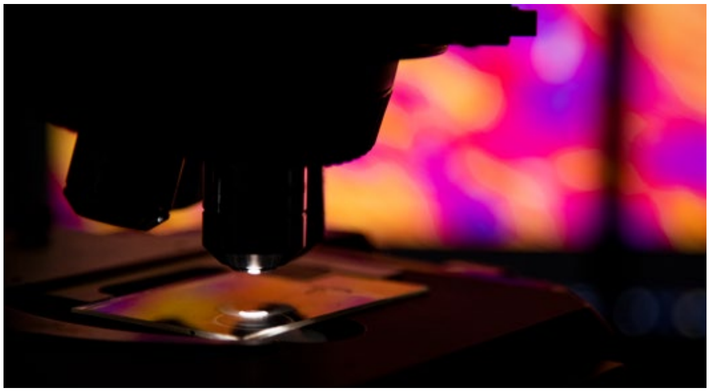
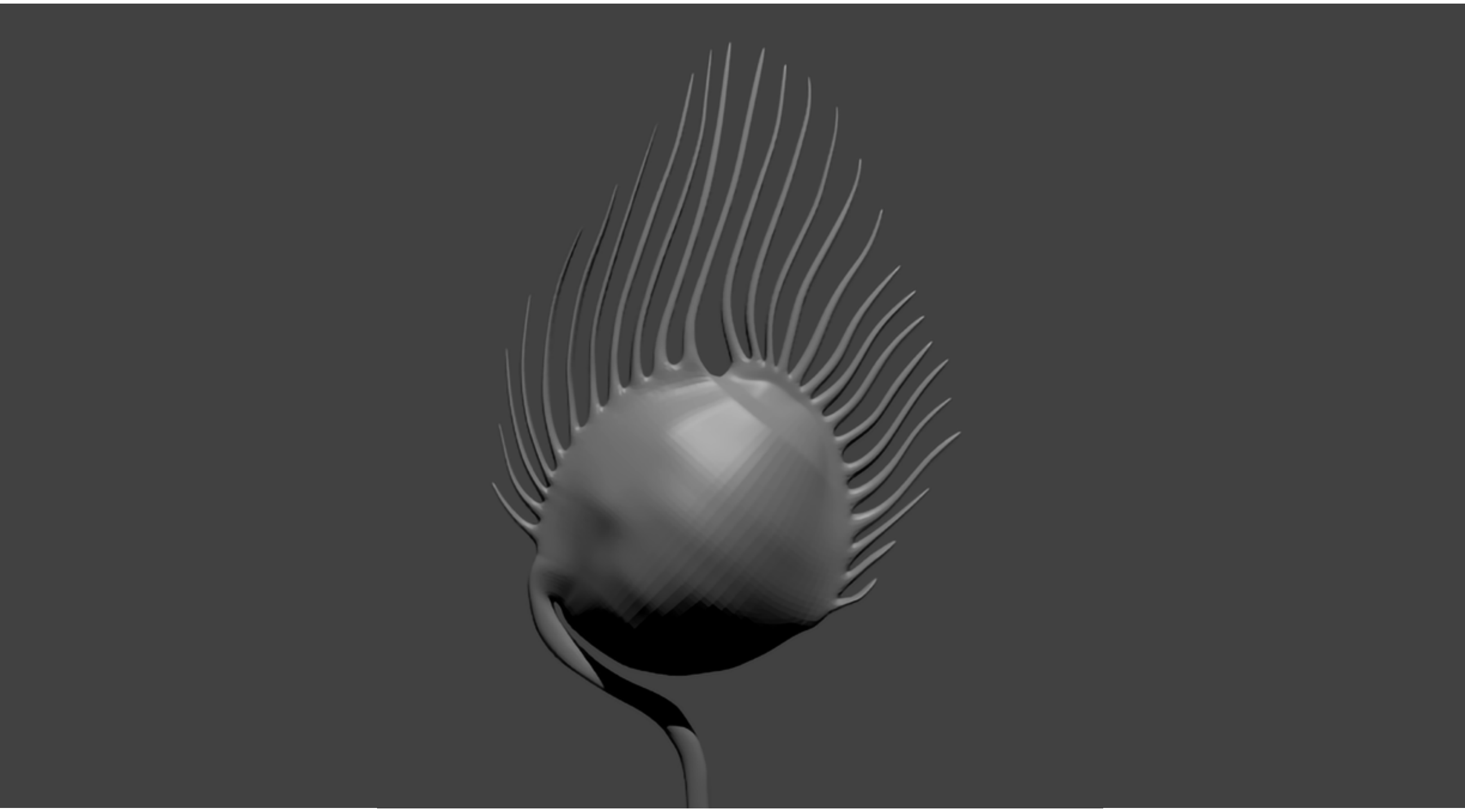



COMPUTER SIMULATIONS

A KEY TO UNDERSTANDING THE PAST

By Julie Hawk



A balloon with a mohawk. That's how Professor Brad Deline describes the group of extinct animals he and his collaborators at several institutions have teamed up to start studying. Paracrinoids, relatives of sea stars and sea lilies, exist now only in fossilized form.

However, Deline studies evolutionary change within animals, reconstructing ancient ecosystems and understanding how animals interact with each other, all of which require knowing how an animal eats and lives. Normally, paleontologists use a principle called uniformitarianism, which is using the present as a key to the past – in this case, relying on finding an animal alive today that would work as a good modern analog, drawing comparisons between that living animal and an animal from the past.

In many cases, such as the case of paracrinoids, there just are not any animals alive today that have the body structures of features from a fossil animal. To understand this group of animals, Deline's team is collaborating to build three-dimensional computer models of the animals in order to place them into virtual flow simulations to explore how they fed and functioned in the ancient oceans.

Deline's team is comprised of three other researchers, each at different stages of their own career.

"Overall, collaboration is incredibly important for a few different reasons," Deline noted. "First, addressing complex problems requires the contribution of several different skill sets. It is just too much for one person to master everything they need. Second, collaborations are the way I learned how to do science. As a student, I worked on many projects with people who turned into my professional mentors, and now I have the opportunity to work in a similar role. Finally, it gives me the opportunity to work with my friends to answer questions of mutual interest."

His friends and collaborators include Leo Ouellette, a non-traditional undergraduate student, artist, and veteran of the U.S. Navy; Maggie Limbeck, a Ph.D. student with expertise in paracrinoid anatomy at the University of Tennessee-Knoxville; and Dr. Imran Rahman, a research scientist and the Deputy Head of Research at the Oxford University Museum of Natural History.

Together, the four collaborators hope to create simulations that provide answers to how the paracrinoids fed and functioned.

Ouellette's role in the project was to create the models that were to be used in testing. He took measurements and photos for reference and used a computer program called Blender to model the three-dimensional fossil specimen the team has (the balloon).

"With artistic skill, I modeled the parts that were missing (the mohawk)," he said. "I then made multiple models changing up different parts, such as different mohawk and stem styles. We then could see from our testing results which model made more sense as in was the best model for obtaining food."

Deline describes Ouellette as "super smart and detail-oriented" and said he is indebted to his undergraduate research assistant for the work he has done on this project. Indeed, the plan was for Ouellette to exhibit this project at the Southeastern Geological Society of America, but the conference was canceled due to the COVID-19 outbreak. Despite the disappointment of missing this opportunity, Ouellette said he found a lot of value in this collaboration.

"It shows me there are still scientific questions we can solve utilizing new technology," he observed.

Limbeck has worked with Deline since 2016. He was on her master's committee and is now a member of her Ph.D. committee, so Limbeck said collaborating with him felt natural to her.

"We've worked together on my own research, but he approached me about wanting to know more about how the unusual morphologies of these fossils would have functioned and affected the animal while it was alive," she said. "This kind of a collaboration is really exciting for me because it is the first project I have been brought in on as an 'expert' on the fossil group and one of the first where I feel like I am working as a peer rather than as a student."

While she has only tangentially worked with Rahman, Limbeck said that he has worked with many of her colleagues, so she was aware of his research and excited to work with him. She also was excited to work closely with an undergraduate student.

"The collaboration with another student who hasn't looked at these fossils as long is also great for the research on this group of fossils because he may see something that I have missed or interpret them in a different way that will expand our knowledge of this group," she explained.

The final team member is Rahman, whose role in the project has been to carry out computer simulations of water flow around the three-dimensional models of fossils created by Ouellette. Using an approach called computational fluid dynamics, Rahman's simulations allowed the team to better understand how changes in the shape of the fossils affected patterns of water flow, with implications for understanding feeding in an extinct group of animals.

Rahman noted that collaborating with a variety of individuals on this project has been rewarding.

"One of the things I enjoy most about my job as a research scientist is the opportunity to participate in collaborations like this one, which bring together experts with knowledge in different methods and topics to address a common goal and ultimately enhance our scientific understanding of the natural world," he shared.

Rahman is particularly impressed with not only how Deline kept everyone working together smoothly but also with the student collaborators.

"I have greatly enjoyed working with both Leo and Maggie as part of this project. I have been deeply impressed by the speed at which Leo was able to learn how to create high-quality 3-D models using a free computer program called Blender, which has a steep learning curve. These have been integral to the computer simulations I carried out. I am sure these skills in 3-D modeling will be useful for Leo in future work. I am also extremely grateful for Maggie's insights on what these fossils might have looked like as living animals, which have been key for ensuring our analyses are as accurate as possible. She is one of the world experts in the fossil group we are working on."

Cutting-edge research, including collaborations with world-renowned experts, can and does take place here at UWG. Deline adds that this fact clearly shows his students that "science isn't something done in a faraway place in a lab or exclusively at big Universities, but here at UWG, and they have the opportunity to contribute to that overall body of knowledge.

SPACE ODDITIES

UWG ART PROFESSORS GET CREATIVE WITH LUNAR PROJECT

By Julie Lineback

“At the beginning, we didn’t know if these were going to be a series of sculptures and photographs or what. It turns out we’re making things that now can only exist as photographs. You never know; you just have to be open to the possibilities.”

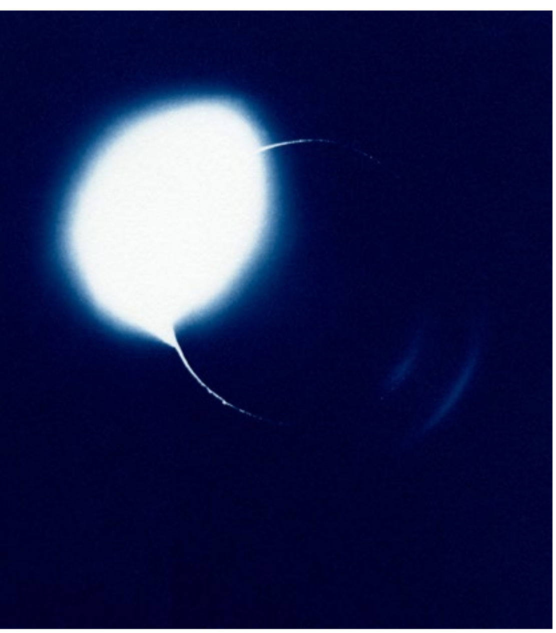
Mark Schoon and Casey McGuire are not only associate professors of photography and sculpture, respectively. Together, they hold the distinction of being the only members of the University of West Georgia community to have walked on the moon. Well, sort of.

In a far corner of the Visual Arts Building on campus, Schoon and McGuire play in their lunar sandbox, experimenting with materials while working on a collaborative project that has been evolving since 2015.

The project – "The Great Moon Hoax: Science and the Recreation of the Artificial" – was influenced by a series of images and articles that ran in the New York Sun in 1835. In that series, astronomer Sir John Herschel was credited for discovering life on the moon while gazing through his telescope on expedition to the Cape of Good Hope in South Africa.

The reality, although exciting for the early 19th century, wasn't nearly as sensational. There was no evidence of bat-men, unicorns, or massive craters with enormous amethyst crystals.

"The photograph Herschel took of the moon wasn't really of the moon," McGuire explained. "It was of a sculpture he made after looking through the telescope, trying to create what he was seeing so he could show people what it looked like. It wasn't a creative act or statement – it was scientific."



Schoon approached McGuire with a desire to recreate the Copernicus crater, a lunar crater Herschel modeled in 1842. They began with plaster, then added materials to it, like fish tank rocks. The lighting and photography process that followed helped them determine what would work and what required them to go back to the drawing board.

"Some of the very first images were created because I was casting concrete countertops and the loose concrete fell into a bucket," McGuire recalled. "It pitted and looked like the moon, so I knew I had to get a photo of that."

The pair purchased more concrete to play with and made other discoveries. Once the concrete hardened, they were able to pick it up, but if they hit it from the air compressor it fell apart because it was being held together with humidity.

"These acts of playing with the material are what lead to a lot of the outcomes we had," McGuire continued. "Mark would observe, 'That held together, and it kind of looks like Rosetta's comet.' That is where the most successful work happens – it's just that simple."

When casting for the planets, McGuire would string cocktail ice balls, dip them in water and hang them up to photograph. She continued to experiment by putting different colors and reflective objects in the ice balls, including glitter.

"Because the different pieces of glitter reflected the light, it totally changed the way the ice ball appeared when we slowed the shutter speed down and took a photo," McGuire observed. "Then swinging the ball made the lines look like Saturn's rings."

The aspect of play is important, especially when talking about research, Schoon said.

"It's something that gets diminished in the academic process in which you are just so focused on doing certain things for certain goals, toward certain outcomes, for certain people," he explained. "Even though we have goals, when we go into the studio everything is a game. We would let it lead us."

Although the project is not new, Schoon said the pair's partnership allows for a constant push and pull that keeps ideas fresh.

"The pull allows one of us to slow down and observe," he explained. "Those are the kinds of things that don't happen when you are working by yourself. You might be conscious that you need to do that, but it is hard to just pause for a second and see what's happening and if it's of value or not."

But it's not all fun and games. When it came to printing, they decided to once again take direction from the past.

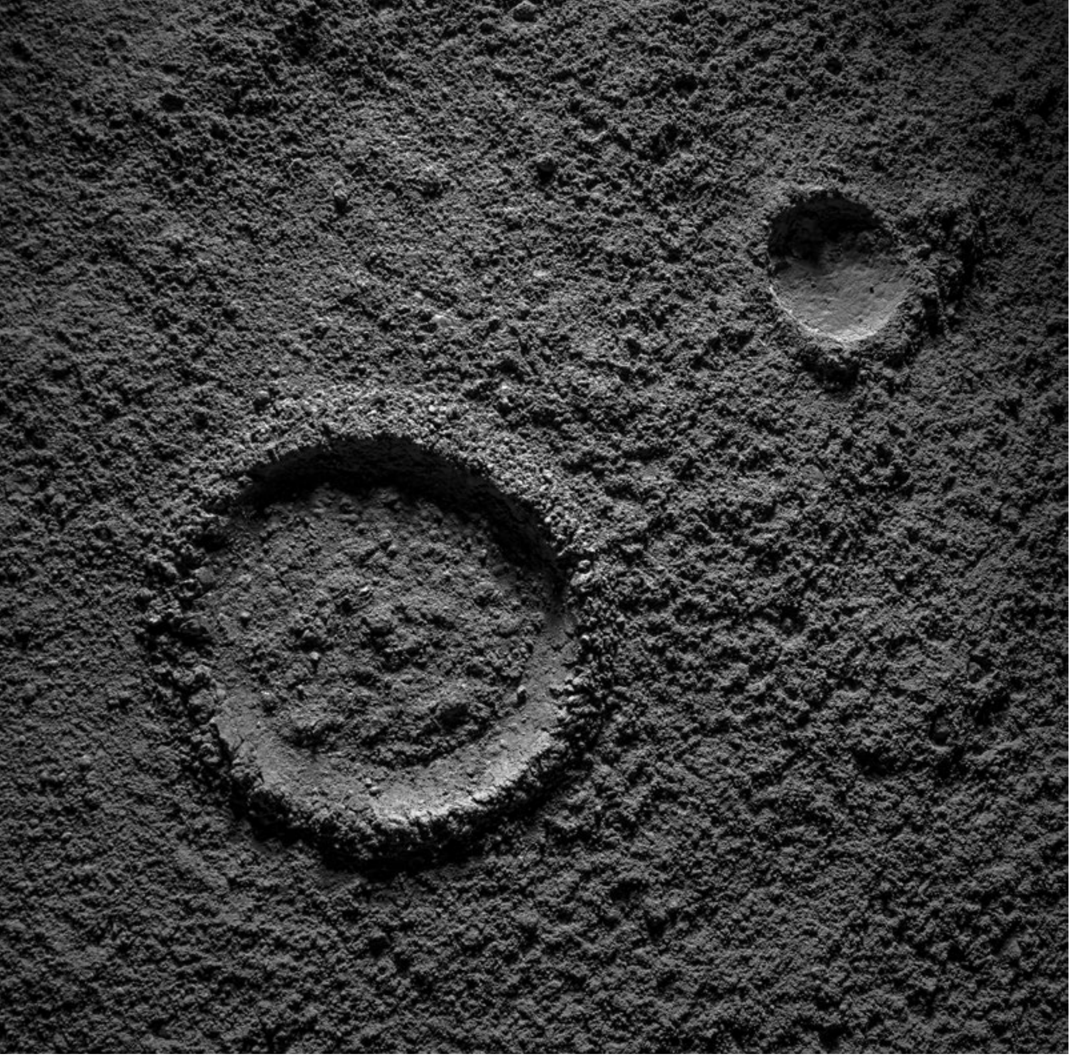
"Right along the same time Herschel was making important observations of the universe, he was helping to invent photography and making some of the earliest photographs," Schoon said. "He invented this process called the cyanotype, which we thought we should try and create along with salt prints."

Cyanotype is a photographic printing process that produces a cyan-blue print, which was later referred to as blueprints. The salt print is a paper-based photographic process for producing prints from negatives.

"The technical part of making the salt prints is definitely the most challenging," Schoon said. "It is a process that neither of us had done before – very finicky and very problematic. They are antiquated for a reason."

Because of this, McGuire said they may have 15 prints for every one salt print.

"You hand paint the silver nitrate onto the sheet of paper in the dark, and you can't see whether you have coated the whole thing or not so you have to be very meticulous about it," she explained. "We want these to be really well-crafted, very tight and perfect prints because that gives way to the conversation about the truth in the image. If you see big brush strokes of the silver nitrate through the print, that



is going to detract from the reality we are trying to create."

Space is also a challenge. Because they do not have a large enough exposure bed, the cyanotypes and salt prints have to be exposed in the sun.

"If it's not sunny on one of the days we work in the studio, we can't print," McGuire confessed. "We keep exceeding size and scale in different ways. For example, the diorama we use in my studio is a four-by-eight sheet of plywood against another four-by-eight sheet of plywood with a metal arm with which we can hang items. We keep running into growth problems."

Schoon described the patience that has accompanied this project as unique.

"It's been four-and-a-half years, and we are still making work, which is remarkable," he observed. "If I had been working on another photography project for this long, typically I'd have five times the number of images, or I'd have multiple projects. But with 'The Great Moon Hoax,' we have 25-30 images we've made, which, in photography, isn't that much."

Schoon and McGuire have hit the road with "The Great Moon Hoax" nine times in cities ranging from Atlanta to Chicago and New York to Los Angeles. That's in addition to work as full-time professors.

"One thing that surprised me as the project developed was that it reinforced so many of the things I do in the classroom," Schoon recognized. "The ideas and the critical thought and theory of photography that I try to talk to the students about is evident in this project. It bridges this gap between the historical aspect of photography and contemporary concerns and holds them together."

It is also important to emphasize there is a visual to accompany every story.

"Every time there is a discovery in space, if there isn't already a picture, they make one for it," Schoon explained. "In the art department, sometimes students get so discipline-specific, but being an artist is figuring out a solution to what you want to make. At the beginning of this project, we didn't know if these were going to be a series of sculptures and photographs or what. It turns out we're making things that now can only exist as photographs. You never know; you just have to be open to the possibilities."

McGuire said she catalogues different images in the back of her mind, saving them for future ideas.

"Recently I bought a little moon rover toy and models of space stations," she concluded. "I bought a bunch of emergency foil blankets, and we talked about using that in an image. People might not notice it, but we do. There are all these materials in the world around us that we can edit in a closure photo and change it. Everything is possible."

ARCHAEOLOGICAL RECONSTRUCTION

USING BONE MICROSTRUCTURE TO GAIN UNDERSTANDING OF PAST PEOPLES

By Julie Hawk

"If a person's skeleton grows in microscopic layers like tree rings, and it is made from what we consume around us, does that mean that we could read a record of health, behavior, and environmental change over months or years of their life?"

This question started Corey Maggiano, assistant professor of anthropology, on the research path that most defines his career. As a biological anthropologist and skeletal biologist, Maggiano studies bone microstructure to gain a better understanding of past peoples.

Traditional techniques destroy bone microstructural information during chemical analysis, but Maggiano was fortunate enough to collaborate with experts in bioarchaeology, Earth sciences, and time series data analysis to design a study measuring changes in drinking water determined by oxygen isotopes locked in layers of human bone as the person grew.

"To accomplish this, we used secondary ion mass spectrometry (SIMS) to achieve up to 120 measurements across 3 millimeters of layered tissue," he said. "This resolution amounts to roughly one measurement per month of growth, over a decade of the individual's life and shows a relatively evenly paced rise and fall in the oxygen isotopic ratio well-explained by seasonal changes in weather."

> **"What I hope this work does for my students is to shift their thinking from that snapshot to consider a fuller life lived long ago."**

Developing this type of analysis further will hopefully give similar information on an individual's changing diet, his or her movement across landscapes, and the incidence and progression of disease. It could, Maggiano said, even be useful in the identification of unknown individuals in historic or forensic contexts.

Indeed, isotopic analysis has a broad potential impact on society in several research contexts.

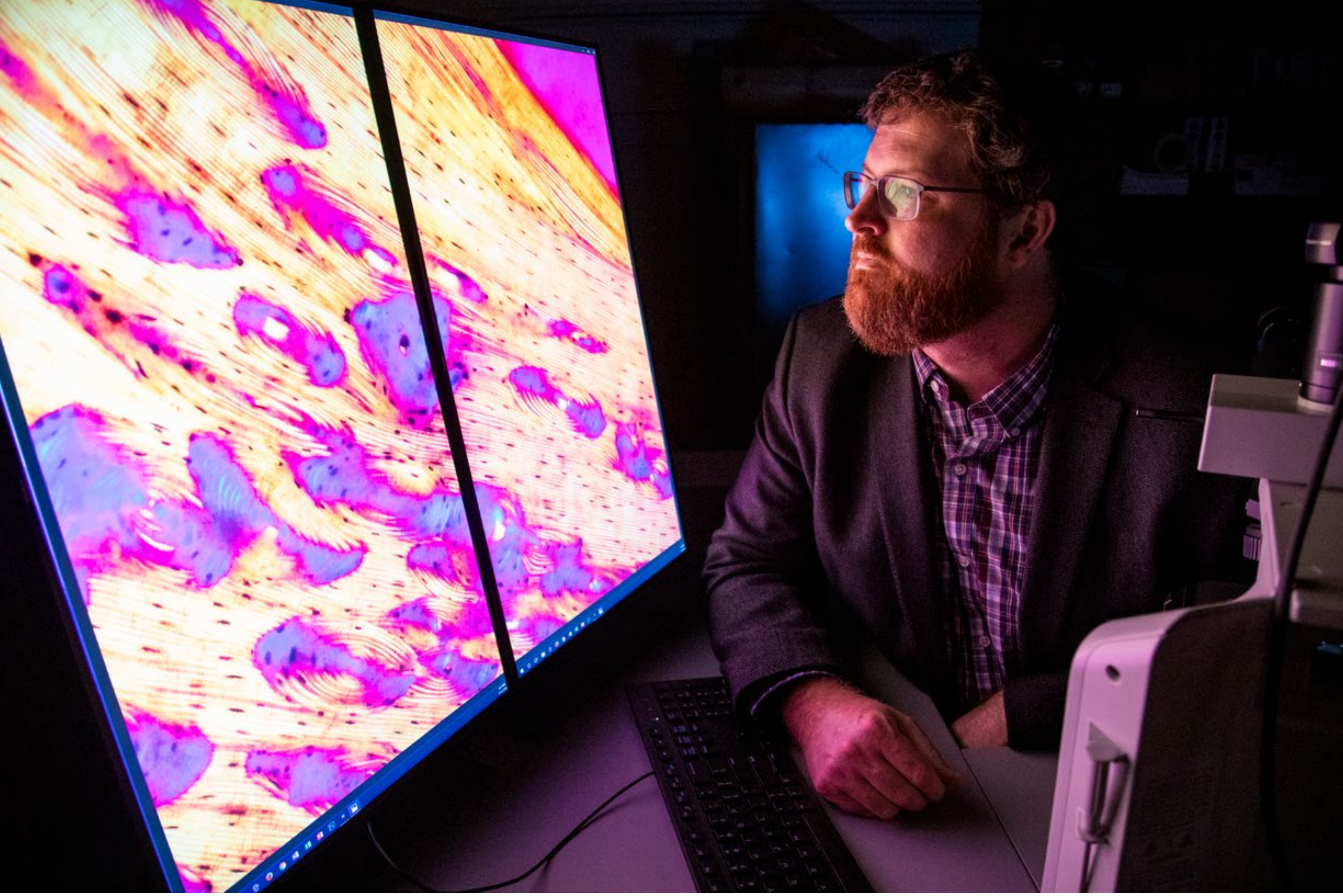
"Because isotopic analysis can provide information on numerous environmental and even physiological processes," Maggiano contended, "we may be looking at the beginning of unprecedented detail in our reconstructions of past lives from skeletal remains."

The birth or death season, weaning practices, injury and disease, land use, migration, drought, trade, diet – these can all alter the isotopic composition of our bodies in complex ways. As better techniques are developed, a better understanding of these systems will grow, which will enable researchers to transform the types of inquiries they can make about the lives of ancient peoples. Beyond archaeology, however, this technique could help to identify unknown remains in historic and forensic contexts or inform researchers on the rate of bone growth or disease progression in medical and clinical research.

Maggiano said that his research allows him to inspire students in the classroom and to challenge their concept of what it might be like to study human behavior through skeletons in the future.

"In bioarchaeology, we are normally limited to making general observations across large numbers of individuals or interpreting a single snapshot in the life of an individual," he explained. "What I hope this work does for my students is to shift their thinking from that snapshot to consider a fuller life lived long ago."

Maggiano wants his students to consider questions such as, "Did this woman travel



with the trade caravan? How often or far did she go, and in what season? Did she stop traveling after the birth of a child, or did it affect her health? How did her diet change when she was on the coast?”

He said that, although these questions can only be asked with continued development of techniques like the one he has only begun to explore, they “change the way a student can think about their ancestors. They make people different than them less different, and they make skeletons more human.”

Collaboration, Maggiano explained, is absolutely essential to the success of this research. The team is comprised of a tight knit collaborative group from across five departments, three institutions, and two countries.

Bioarcheaologist Dr. Christine White and Earth scientist Dr. Fred Longstaffe, both at the University of Western Ontario, had been thinking about ways to access the time series of environmental change that could be locked in bone chemistry.

Maggiano’s specialty was understanding the microstructure of human bone during growth. For his dissertation, he had studied regions of uninterrupted sequential bone formation, similar to tree rings, which were large enough for chemical analysis to reveal seasonal patterns. Unfortunately, most techniques couldn’t permit small enough measurements for the team’s purposes.

That is when Dr. Richard Stern from the Canadian Centre for Isotopic Microanalysis at the University of Alberta brought on board his considerable experience with advanced technology that could help the team measure just 25 microns of bone at a time, nearly four times smaller than the width of a human hair. The data this analysis produces is time series data, which requires a specialized knowledge of the appropriate mathematical and statistical techniques for analysis.

“Fortunately, here at UWG, Dr. Sal Peralta was familiar with this type of data from his work in political science and threw himself into unfamiliar waters to help the project greatly,” Maggiano said.

Collaboration was not without its challenges. Maggiano admitted it was the biggest challenge over this study’s seven years in the making, though ultimately incredibly rewarding.

“The application was archaeological, the techniques were geochemical, the data was highly specialized, and none of it would work if we did not understand the details of extremely small structural properties of human bone,” he concluded. “Only in collaboration could we see the vision for our project through to completion.”

GROWTH MINDSET

UWG PROFESSOR RECEIVES EXTENSION ON LAURA BUSH GRANT

By Julie Lineback

While serving as a school library media specialist for more than a decade before moving to higher education, Dr. Melissa Johnston made an observation that would affect her future as well as others in the field.

"I noticed that I didn't work with the math and science teachers nearly as much as the language arts and social studies teachers," she recalled. "As I moved into academia, I carried that knowledge with me. It became apparent to me the reason school librarians are not working with STEM teachers is because they were not prepared for working with teachers in those areas."

Today, Johnston is an associate professor in the University of West Georgia College of Education's (COE) Department of Educational Technology and Foundations. Together with the University of Buffalo's Dr. Dan Albertson, she received the Laura Bush 21st Century Librarian Program grant from the Institute of Museum and Library Services in 2017.

"This grant is significant because it addresses a real need in the field of school librarianship and national priorities," she said. "STEM education equips students with the skills needed to take advantage of career pathways in their regions, strengthens local workforce development, and increases employment opportunities."

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The National Science Foundation's National Science Board estimates that by 2026, STEM jobs are predicted to grow by 13 percent compared with a 7 percent growth in the overall U.S. workforce.

"Therefore, STEM education is a focus in education," she said. "I believe that a school library media specialist equipped with advanced digital information skills, coupled with applied STEM knowledge, can engage students and support teachers by facilitating meaningful use of digital resources and, in turn, provide real-world collaborative opportunities for STEM learning."

The grant, "Rural Engagement to Advance Learning in STEAM Digitally (REALISD)," has been such a success that Johnston's funding was extended, continuing the project for another year.

"There is a high need for this professional development for school librarians," she explained. "In the first two years of the project, we have had over 400 school librarians apply for 80 available slots."

The past two summers, school library media specialists from nine states attended professional development workshops in which they learned about the methods and standards behind STEM education, digital tools to support instruction, how to support teachers by utilizing emerging technologies, and how to identify funding opportunities.

The participants then completed a three-hour credit master's level course through COE's Instructional Technology, Media, and Design program. In the class, each student built a STEM-in-Practice action plan for their schools and documented the implementation progress throughout the school year.

Johnston described UWG as uniquely poised to train media specialists exploring STEM subjects.

"The school library preparation program at UWG is the largest in the state and focuses on school library media specialists as leaders in technology integration," she explained. "The faculty are well respected in the field and have research interests and practical experience in these areas. As we continually update our program to meet the needs of our students, it is important to stay current, and supporting STEM education efforts in schools is currently a need in the field."

As a faculty member at UWG, Johnston witnesses the struggles rural schools have with STEM initiatives, such as tight budgets, limited technological infrastructures, struggles with recruiting and retaining teachers, and few professional development opportunities.

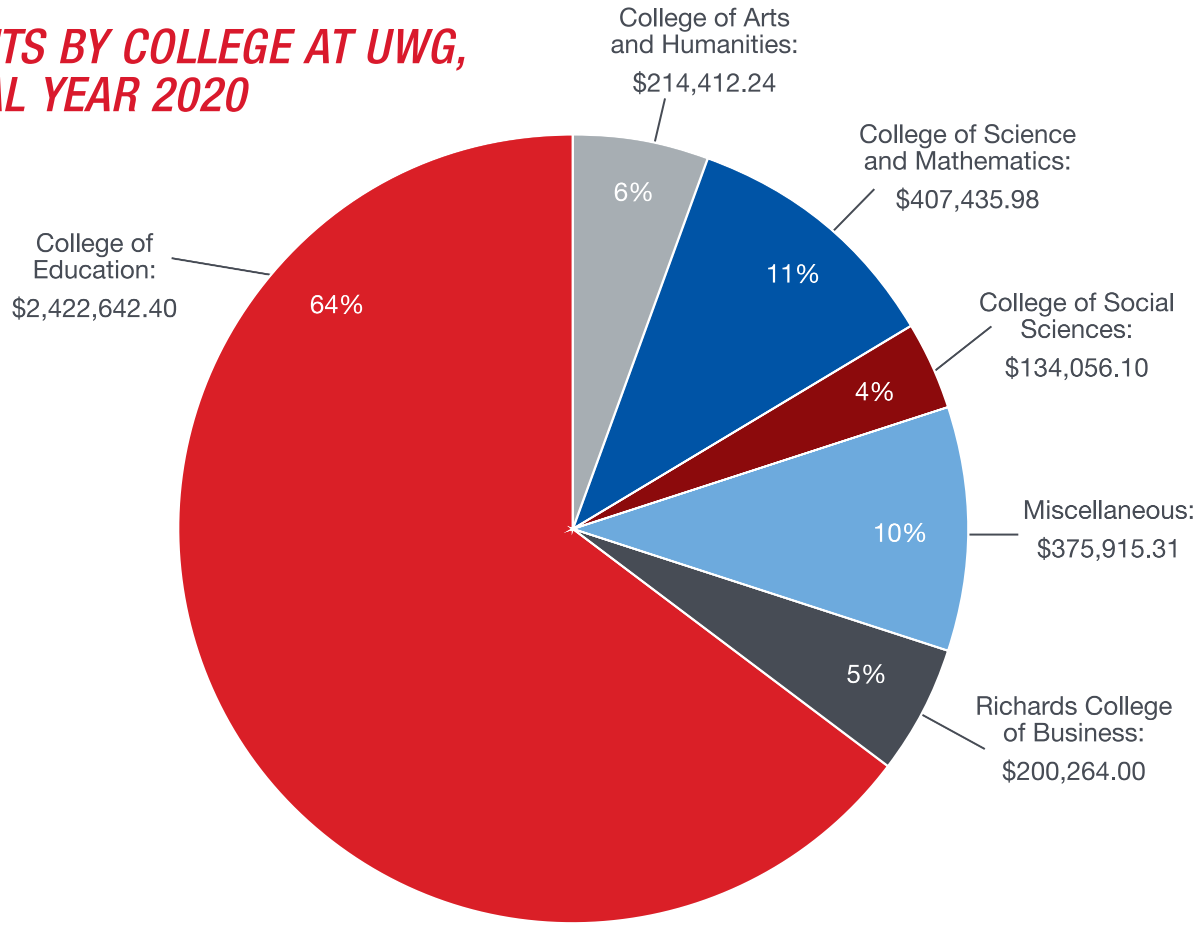
"Even in rural areas with resources and access to technology, there is a lack of educators who possess the necessary content, technological, and pedagogical knowledge to facilitate applied STEM learning," she said. "Students in rural areas need additional support that school library media specialists can provide."

Due to COVID-19, the REALISD project is on hold until summer 2021. Johnston looks forward to helping the next round of school media specialists find their place in STEM education.

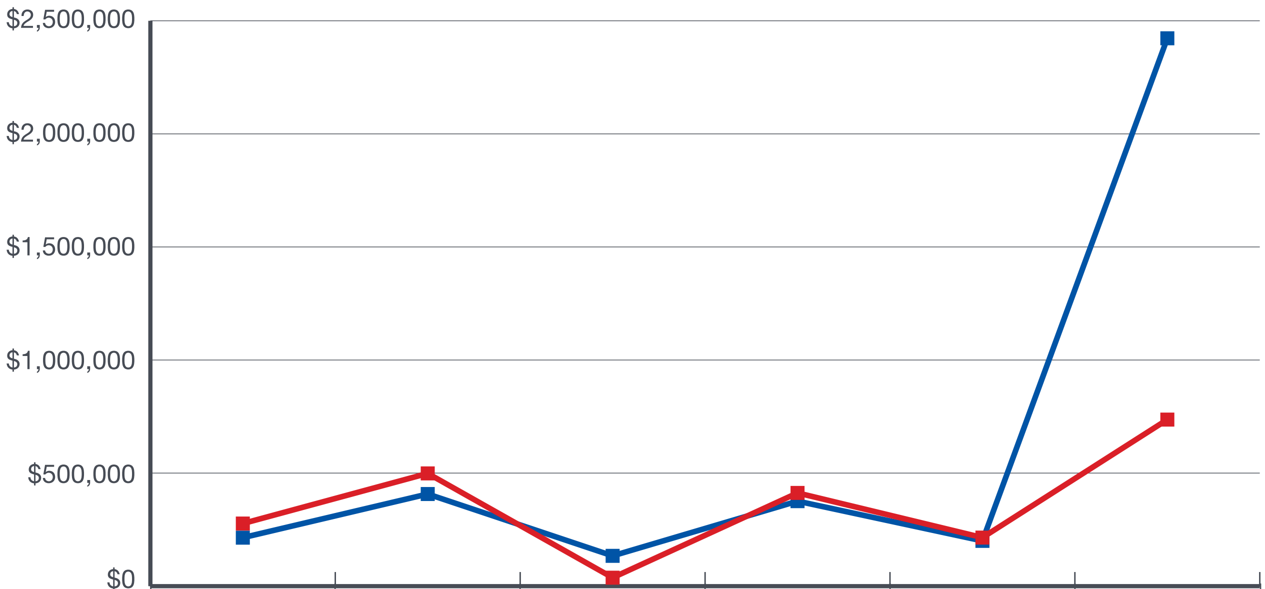
"While school librarians do not have to be experts in all curricula, they do need to know enough about the pedagogy and the standards that guide each of these areas," she concluded. "This project allowed me to address this gap, but more needs to be done."

EXTERNAL GRANTS AWARDED IN FISCAL YEAR 2020

GRANTS BY COLLEGE AT UWG, FISCAL YEAR 2020



FISCAL YEAR 2019 VS. FISCAL YEAR 2020 GRANTS



	College of Arts and Humanities:	College of Science and Mathematics:	College of Social Sciences:	Miscellaneous:	Richards College of Business:	College of Education:
FY ’20	$214,412.24	$407,435.98	$134,056.10	$375,915.31	$200,264.00	$2,422,642.40
FY ’19	$276,919.19	$498,614.00	$37,468.75	$412,257.00	$214,780.28	$736,536.70

FACULTY RESEARCH GRANT RECIPIENTS FOR 2020

Frank Fontanella, Ph.D. "Cryptic Diversity and Adaptive Potential in a Warming World: Integrated Phylogenomics for the Diadophis Punctatus Species Complex"

John Garner, Ph.D. "The Greek Imaginary: Translating and Introducing Castoriadis's Research Paradigm"

Lisa Gezon, Ph.D. "Survival on the Margins: Health and Medical Pluralism in Madagascar"

Jung Eun (Jessie) Hong, Ph.D. "Testing the Knowledge Base for Geography Teaching and Building a Taxonomy of Geography Learning Activity Types"

Melissa Johnson, Ph.D. "Phosphatase Expression in Organs for Sense of Smell"

Nathan Lawres, Ph.D. "Evaluating the Performance Characteristics of Spiculate Tempering in Archaeological Ceramics"

Sungwoong Lee, Ph.D. "Development of Mixed Reality-based Social skills Training Video Game"

Lok Lew Yan Voon, Ph.D. "A New Theory of Contact Electrification in Two-Dimensional Materials"

Cody Mason, "How Fast Do Mountains Erode? A Case Study From The Panamint Mountains, California"

Sasha McBurse and Jamie Brandenburg, "UWG P.A.L.S."

Casey McGuire, "Silent Spring: Research and Development of Sculptures Based on Rachel Carson's Silent Spring"

Sara Molesworth-Kenyon, Ph.D. "Conversion of Inflammatory Response to HSV-1 Model from hHuman to Murine"

Nathan Rees, Ph.D. "Mormon Visual Culture and the American West"

Andrea Smith, Ph.D. "Do You See Me? An Examination of Black Pre-Service Teacher Experiences in a Teacher Preparation Program"

Stephanie Smith, "Mokuhanga: Japanese Woodcut Printmaking"

Nicholas Sterling, Ph.D. "Development of an NSF/NASA Grant Proposal for Computational Atomic Physics"

Michelle Venn, "The Impact of Mindfulness on Student Stress Levels and Performance in Clinical Simulation"

Henry Zot, "Attend Annual Meeting of the Biophysical Society 2021"

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