

**West Virginia University**  
Researchers unearth an ice age in  
the African desert

**West Liberty University**  
Crayfish named after Loughman

**Shepherd University**  
Hendrickson to map Andean  
condor genome

# NEURON

WINTER 2019

West Virginia's Journal of Science and Research



MARSHALL UNIVERSITY

## Maria Babiuc Hamilton

Marshall physics professor believes collaboration  
further benefits gravitational waves research

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## WINTER 2019

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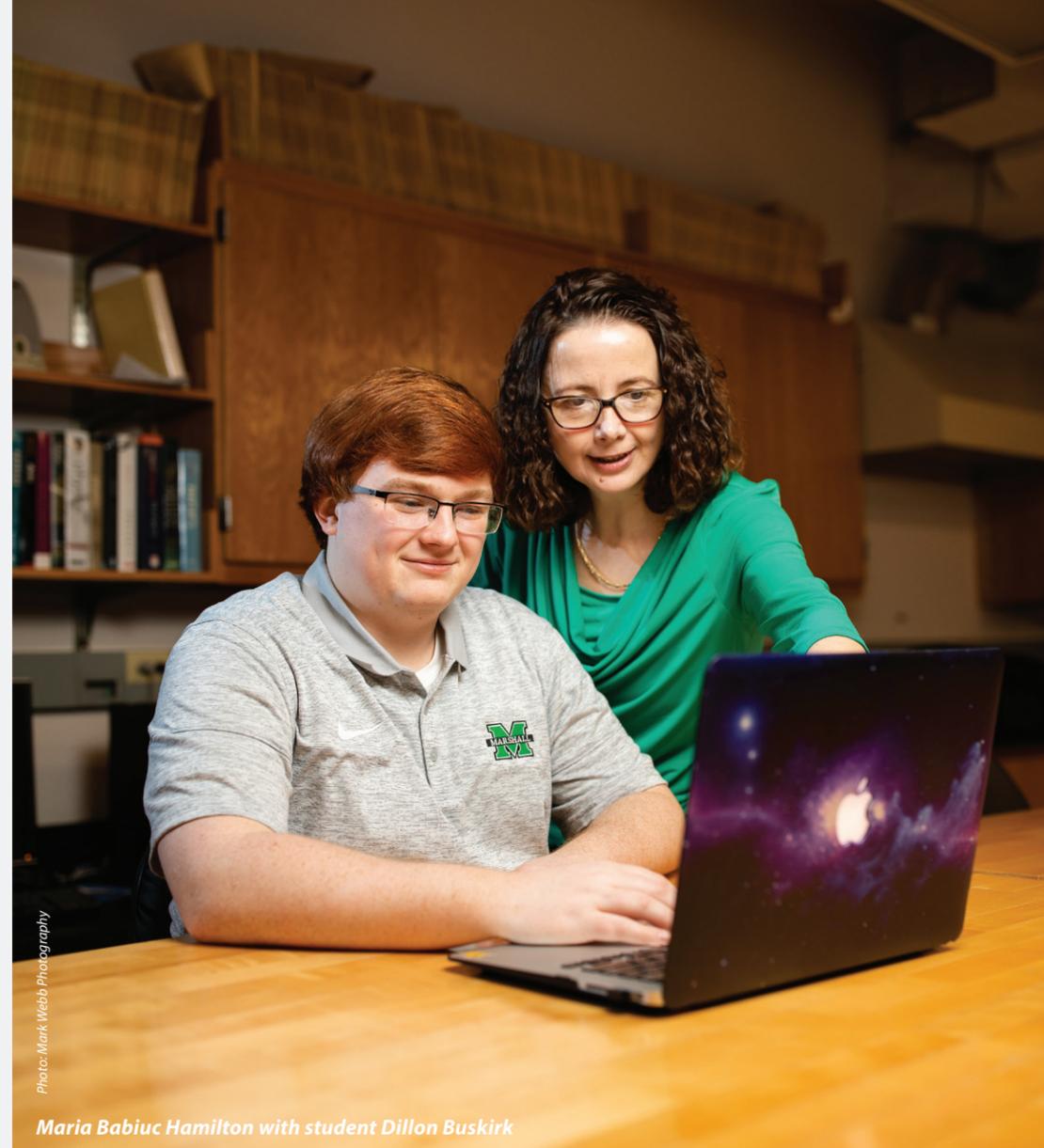
### ABOUT

West Virginia Science & Research, a division of the West Virginia Higher Education Policy Commission, provides strategic leadership for the development of competitive academic research opportunities in science, technology, engineering and mathematics. The office directs the National Science Foundation's Established Program to Stimulate Competitive Research (EPSCoR) in West Virginia, coordinates scientific research grants to academic institutions from federal and state agencies, and conducts outreach activities to broaden the public's understanding of science.

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Maria Babiuc Hamilton with student Dillon Buskirk

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## News briefings



### Marshall chemistry department celebrates International Year of the Periodic Table

Marshall University's Department of Chemistry formed a large, human periodic table on the basketball court of the Cam Henderson Center to commemorate the Year of the Periodic Table on February 1.

UNESCO (the United Nations Educational, Scientific and Cultural Organization) declared this to be the International Year of the Periodic Table, commemorating the 150th anniversary of the establishment of the Periodic Table of Chemical Elements by the Russian scientist, Dmitri Mendeleev.

Dr. Michael Castellani, chair of Marshall's chemistry department, participated with students simply because the periodic table is foundational to what they do.

"Every new material created by scientists, from medicines to alloys used in airplanes or cell phones, ultimately can trace its invention back to the principles present in the creation of the periodic table," he said. "For aspiring chemists, understanding and being able to use the periodic table is highly important to their success."

### RCBI expands 3D printing and maker camps to four cities

The Robert C. Byrd Institute (RCBI) once again has received support for its popular series of 3D Printing & Maker Camps from Nuts, Bolts & Thingamajigs, the Foundation of the Fabricators and Manufacturers Association. RCBI will use the \$8,000 award to help fund its 2019 camps for middle and high school students in Huntington, South Charleston, Bridgeport and Williamson. Participants will gain first-hand experience in 3D design and printing, computer coding, soldering, electronics, electromagnetism and hydraulics. The cost is \$180 per camper with registration now available at [wvmakes.com/2019camps](http://wvmakes.com/2019camps).

### Alderson Broaddus professor published on climate change

Brandi Gaertner, Alderson Broaddus University assistant professor of environmental science, has published an article in the *Science of The Total Environment* journal.

The primary purpose of this study was to identify how climate change has impacted the length of the growing season, evapotranspiration and surface flow of rivers, which directly affects water resources in the central Appalachian region of the U.S.

Gaertner says that her next steps include identifying how different ecosystems in this specific region are affected by climate change.



McLaughlin

### Two WVU researchers featured in international science journal Nature

Maura McLaughlin, WVU physics professor, was named one of *Nature's* "Ones to Watch" in 2019. McLaughlin and her colleagues monitor neutron stars and work to detect gravitational waves. Kevin Bandura, assistant professor of computer science and electrical engineering at WVU, played a key role in developing the CHIME Telescope's F-Engine, which digitally processes signals from space into frequencies that are then processed into digital maps.



Bandura

Photos courtesy of Marshall University and West Virginia University

## FROM THE DIRECTOR: Jan R. Taylor

### Project based learning can develop critical thinking skills while keeping students engaged during class



Taylor

It is often remarked how our world currently lacks critical thinking skills. The information age brought access to knowledge like never before, but people find themselves duped by biased sources or overwhelmed at the amount of available material. Similar trends happen in the classroom where students must absorb the proper content without distraction while teachers struggle for their attention. Engagement could be the answer.

Project based learning offers a solution. Through activities, such as research, students learn by doing. Content and data are conveyed while putting the student at the forefront, solving real-world challenges and learning the content at hand.

Maria Babiuc Hamilton highlights her dedication to not only including

students in her research, but also publishing with them, in the case of Dillon Buskirk. Erika Klose emphasizes that our STEM-intense future will need people with strong "soft skills" as clear communication and sound reasoning become absolute necessities.

Focusing on a project also makes learning more meaningful. Students are often engaged in the process and develop a deeper understanding of the content and skills. This methodology also builds capacity for communication, collaboration and creativity in order to stand out and find success later in life.

Encouraging a project-based approach through research, experiments and more will provide all students, especially those STEM-inclined, to seek out the answers in thought-provoking ways that will only benefit them further as their careers and ambitions come into focus.

Jan R. Taylor  
Director, West Virginia Science & Research and NSF EPSCoR Project Director  
West Virginia Higher Education Policy Commission

The Science & Research Council was established by the West Virginia Legislature in 2009. The goal of the Science and Research Council is to increase the capacity of the state and its colleges and universities to attract, implement and use cutting-edge, competitive research funds and infrastructure. Members provide expertise and policy guidance regarding federal and state programs including EPSCoR, the Research Challenge Fund, and the former Research Trust Fund. Representatives of government, industry, business and academia make up the council.

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## Marshall physics professor believes collaboration further benefits gravitational waves research

Written by **Angela Sundstrom**

Photos by **Mark Webb Photography**

Sharing a birthday with Marie Curie might destine any person for a career in physics.

Maria Babiuc Hamilton, associate professor of physics at Marshall University, grew up in Romania under the Ceausescu dictatorship, but found inspiration in her parallels with Curie.

"I was curious," Babiuc Hamilton said. "I read her biography. She was my role model and also she was from Poland, which is very close to Romania."

Babiuc Hamilton grew up in Suceava, a Romanian city in the northeastern province of Moldavia. She was encouraged by her father to pursue physics. She even competed in the national Physics Olympiad competition.

"My father told my physics teacher not to spare me, to make it hard for me so that I'd learn," Babiuc Hamilton said. "He kept me on the edge all of the time. Putting a lot of effort into physics, it started to become easy."

Babiuc Hamilton earned her bachelor's, master's and doctoral degrees at Alexandru Ioan Cuza University in the city of Iași, just over two hours from her hometown. She studied the photoelectric effect for her master's work and

general relativity for her doctoral research. Upon starting her doctorate, she was initially concerned when her advisor provided only a thin, short book to learn relativity so she sought out more comprehensive material, relying on *Gravitation*, a one thousand-page book from Charles W. Misner, Kip S. Thorne, and John Archibald Wheeler.

While visiting the United States for a black hole conference several years later, she had two life-changing events: a job offer from the University of Pittsburgh and meeting her future husband, who is now a physics professor at Shawnee State University in Ohio. While in Pittsburgh, Babiuc Hamilton began working with Jeff Winicour, her postdoctoral supervisor, on supercomputer simulations of gravitational waves.

Opportunity eventually took Babiuc Hamilton to Huntington, where she still lives with her husband and two daughters. Babiuc Hamilton began working for Marshall University as an assistant professor in 2007. Today, she teaches introductory physics, medical physics and mathematical methods. She describes her teaching style as challenging, but in a safe environment where students can develop their understanding while encouraging learning outside of the classroom.

"Every time I am teaching, I am trying to adjust and learn from my students. There are no similar students. Each is a different learner and understands physics differently. It's not easy."

She also teaches biophysics with a writing intensive approach so students learn how to construct articles in hopes of publication. She has been published several times including a recent partnership with student Dillon Buskirk titled, "A complete analytic gravitational wave model for undergraduates" featured in the *European Journal of Physics*.

Babiuc Hamilton's research focuses on gravitational waves. Albert Einstein predicted the existence of these waves over a century ago and scientists today still work to gain a better understanding. In 2015, the first direct



Babiuc Hamilton



*"There are no similar students. Each is a different learner and understands physics differently."*

*- Maria Babiuc Hamilton*



Babiuc Hamilton discusses the day's physics lesson with student Dillon Buskirk

detection of gravitational waves occurred by the Laser Interferometer Gravitational-Wave Observatory (LIGO), a discovery that won the 2017 Nobel Prize in physics. In August 2017, the first detection was made of both gravitational waves and light coming from the collision of two neutron stars in a nearby galaxy. These observations create opportunities for comparison by developing theoretical models based on the new discoveries.

Gravitational waves originate primarily from black holes and neutron stars with further observation possibly leading to more breakthroughs. One intriguing aspect for researchers is reviewing the effect of strong gravity on an electromagnetic field.

"This is done by modeling Einstein equations that describe the gravitational field and the Maxwell equations that describe the electromagnetic field," she said. "We do this with supercomputers."

Babiuc Hamilton is currently part of the Established Program to Stimulate Competitive Research (EPSCoR) grant, administered by West Virginia Science & Research, that partnered her with researchers Zach Etienne and Sean McWilliams of West Virginia University in creating

**"It's a very complicated and not-yet-understood phenomena so this is one of the situations in which if there are more eyes and minds looking at it, maybe the solution for it comes faster."**

GiRaFFE, the first open-source general relativistic force-free electrodynamics code for dynamical, numerical-relativity generated spacetimes. What makes this unique is its accessibility.

"This code that we wrote is a public code. It is the only code that is released publicly. Other people can use it and actually look into this phenomena."

Collaboration is key as Babiuc Hamilton is the sole researcher at Marshall currently focusing on gravitational waves. She believes teamwork will lead to stronger results.

"It's a very complicated and not-yet-understood phenomena so this is one of the situations in which if there are more eyes and minds looking at it, maybe the solution for it comes faster."

Babiuc Hamilton writes formulas describing the propagation of gravitational waves



Photo: Mark Webb Photography

## WVU researchers unearth an ice age in the African desert

Written by **Katlin Swisher**

A field trip to Namibia to study volcanic rocks led to an unexpected discovery by West Virginia University geologists Graham Andrews and Sarah Brown.

While exploring the desert country in southern Africa, they stumbled upon a peculiar land formation - flat desert scattered with hundreds of long, steep hills. They quickly realized the bumpy landscape was shaped by drumlins, a type of hill often found in places once covered in glaciers, an abnormal characteristic for desert landscapes.

"We quickly realized what we were looking at because we both grew up in areas of the world that had been under glaciers, me in Northern Ireland and Sarah in northern Illinois," said Andrews, an assistant professor of geology. "It's not like anything we see in West Virginia where we're used to flat areas and then gorges and steep-sided valleys down into hollows."

After returning home from the trip, Andrews began researching the origins of the Namibian drumlins, only to learn they had never been studied.

"The last rocks we were shown on the trip are from a time period when southern Africa was covered by ice," Andrews said. "People obviously knew that part of the world had been covered in ice at one time, but no one had ever mentioned anything about how the drumlins formed or that they were even there at all!"

**"It's interesting to think that this was pioneer work in a sense, that this is one of the first papers to cover the characteristics of these features and gives some insight into how they were formed."**

Andrews teamed up with WVU geology senior Andy McGrady to use morphometrics, or measurements of shapes, to determine if the drumlins showed any patterns that would reflect regular behaviors as the ice carved them.



While normal glaciers have sequential patterns of growing and melting, they do not move much, Andrews explained. However, they determined that the drumlins featured large grooves, which showed that the ice had to be moving at a fast pace to carve the grooves.

These grooves demonstrated the first evidence of an ice stream in southern Africa in the late Paleozoic Age, which occurred about 300 million years ago.

"The ice carved big, long grooves in the rock as it moved," Andrews said. "It wasn't just that there was ice there, but there was an ice stream. It was an area where the ice was really moving fast."

McGrady used freely available information from Google Earth and Google Maps to measure their length, width and height.

"This work is very important because not much has been published on these glacial features in Namibia," said McGrady, a senior geology student from Hamlin. "It's interesting to think that this was pioneer work in a sense, that this is one of the first papers to cover the characteristics of these features and gives some insight into how they were formed."

The study is published in the Public Library of Science's PLOS One journal.



Crystal Boudreaux, Ph.D. (front left) studies rotavirus replication with her research team at WVSOM

## WVSOM researcher studies host factors in rotavirus replication

Written by **Tiffany Wright**

Crystal Boudreaux has worked at the West Virginia School of Osteopathic Medicine (WVSOM) for nearly two years, but she has spent the last six years in the lab researching rotavirus replication in order to find a solution to reducing the risk of childhood diarrheal deaths worldwide.

In West Virginia, enteric illnesses are the second most common type of disease outbreak in the state, and rotaviruses fall into that category, according to Boudreaux, who is an assistant professor of microbiology at WVSOM. Rurally populated areas in the state may be one attribute to increased outbreaks.

“The spread of rotavirus is based on cleanliness and hygiene. Norovirus is also popular, but we don’t have a vaccine for that virus. Rotavirus is its close cousin and answering questions about it can also answer questions about Norovirus,” she said.

Rotaviruses are the leading cause of childhood diarrheal death worldwide due to dehydration, Boudreaux said. That is why her lab is focused on cellular host factors that assist in rotavirus replication and why her team is working to develop improvements to vaccination efforts and new antiviral treatments.

“Research remains important because we want to study how host factors help the virus replicate. Host factors play a significant role in response to not only rotavirus infections but all viral infections and that makes what we do here in the lab applicable to the virus community as a whole,” she said. “What we do in terms of host factor studies and multiple virus infections is two-fold — it’s a model for other viruses to elucidate host factor involvement and it correlates the new external selective pressures in a population.”

As is the case with most research, finding a solution can be a long process and one that requires patience.

Photo courtesy of West Virginia School of Osteopathic Medicine

Photo courtesy of West Liberty University

“The topic we are studying could last my entire career,” Boudreaux said. “I always tell my students that 362 days of the year you will get a negative result and just those three days you will have an ‘aha’ moment. Patience is a virtue in science, and something that drew me to it is curiosity. It’s new questions and new curiosities that keep you waking up every day to do this. It’s a challenge to figure out a successful outcome.”

Ever since her graduate school training at Mississippi State University and her postdoctoral training at Virginia Tech Carilion School of Medicine and Research Institute, Boudreaux said she has always been fascinated and intrigued by viruses because they require a host to survive.

“It’s not a symbiotic relationship. We don’t want a virus. I’ve always been intrigued by how viruses are the maestro of the orchestra in our body. They redirect immune function and they usurp our own proteins. There is a lot that we still don’t know about these processes and it’s intriguing to me,” she said.

She knows that the success of research is rarely dependent on one person, which is why the contributions of her lab team — consisting of three medical students and two technicians — are so invaluable. Research opportunities have always been attractive to medical students as well.

“My team, technicians and students, are the ones who have all hands on deck and are carrying out the experiments,” she said. “The care they give in their clinics really stems back to research, ideas and findings of a scientific community as a whole.”

Boudreaux and her team’s research is funded by a West Virginia Idea Network for Biomedical Research Excellence (INBRE) NIH grant.

## Crayfish named after West Liberty’s Loughman



Written by **Maureen Zambito**

West Liberty University (WLU) now has a unique honor thanks to some of its students and alumni from the College of Sciences.

The distinction is in the form of a crustacean, named after WLU professor Dr. Zachary Loughman.

“It’s awesome that I have a crayfish named after me! It’s an all blue burrowing species that only occurs in West Virginia,” Loughman said.

Two former students David Foltz and Greg Myers, current WLU graduate student Nicole Sadecky, as well as Loughman’s professional colleagues from Denison University and the Carnegie Museum of Natural History, along with his mentors from the U.S. Geological Survey in Morgantown and Midwestern Biodiversity Institute, played a part in publishing the scientific paper describing the new species.

“The best part of this honor is that it was due to the scientific work of former and current West Liberty University students that led the charge and were mentored by my own crayfish biology mentors; it really was a joint effort,” he said.

An associate professor of biology, zoology and ecology, Loughman also serves as the Zoo Science and Applied Conservation Coordinator in the Department of Natural Sciences and Mathematics where he is graduate advisor to 11 biology graduate students. He is internationally known for his work with crayfish and maintains an active lab that completes research both on campus and in the field across the eastern United States.

The new crayfish study was published in the most recent issue of the *Journal of Natural History*, one of the oldest journals in biology, which was established in 1841.

## Marshall physics professor to publish groundbreaking acoustic laser research

By Jean Hardiman

Marshall University Physics Professor Thomas E. Wilson's research on high-frequency acoustics has resulted in the discovery of the acoustic equivalent of a laser, and will be reported as a Rapid Communication in *Physical Review B*, a leading scientific publication.

Compared to optical lasers, the development of acoustic lasers is in its infancy. Wilson's approach stems from a so-called "non-linear" light/sound interaction that can occur in a custom atomic-layered "superlattice."

The approach is advantageous because there are no electronic transitions involved, which would create waste heat. Also, the fabrication of Wilson's acoustic parametric oscillator is simpler because it does not use conventional mirrors.

He has been invited to present his research at the Fourth International Conference on Metamaterials and Nanophotonics this July in Russia. He is also organizing the 16th International Conference on Phonon Scattering in Condensed Matter – PHONONS, to be held at Marshall in 2021.

"Thomas has emerged as a leader in the field of acoustic lasers, which is a wonderful thing for the College of Science, and for our students," said Chuck Somerville, dean of the Marshall University College of Science. "He has clearly demonstrated the importance of determination and persistence."

## BIOLOGY

## Shepherd's Hendrickson to map Andean condor genome



From **Shepherd University Communications**

Thanks to Shepherd University professor Sher Hendrickson there will soon be a genome for the endangered Andean condor.

Hendrickson, an associate professor of biology, initiated and is leading the Andean Condor Genome Project as part of the effort to save the bird from extinction.

Among the groups involved in the project are the Andean Condor Conservation Program (Programa Conservación Cóndor Andino, or PCCA), which was founded in Argentina in the 1990s, and the San Diego Zoo's Frozen Zoo. Hendrickson said the genome could provide clues to how the condor adapts to its environment, which could help scientists devise strategies to save the species.

"Condors live at high altitudes, in hypoxic conditions. They are the

largest flying bird, with a 10-foot wing span, and are scavengers," Hendrickson said. "That lifestyle is going to affect things like metabolic and reproductive rates. Once we have the genome we can start looking at some of these biological stories. We will also look at how birds that have been bred in captivity and introduced into the wild have contributed to the genetics in the wild populations."

Hendrickson's research took place before the Human Genome Project was completed in 2003 and her study found there was no genetic variation in the few genes looked at, but she thought that was due to evolution and natural selection. With the advancements in genomics in the past 16 years in which whole genomes can be sequenced, Hendrickson sees new opportunity to revisit the questions she attempted to answer in the 1990s.

Photo courtesy of Shepherd University

Photo courtesy of West Virginia University

## PUBLIC HEALTH

## WVU researcher investigates little-studied patient population: pregnant women with eating disorders

Written by **Kimberly Becker**

Eating disorders can offer people a false sense of control: control of what they eat, how much they weigh and how they look. Few things can shatter that sense of control the way pregnancy can.

Elizabeth Claydon, an assistant professor in the West Virginia University School of Public Health, is parsing how eating disorders may affect women's experience of - and attitudes toward - pregnancy. The journal *BMC Pregnancy and Childbirth* has published her study's findings.

**"I wanted to do a more qualitative study because the lived experience is so nuanced and so diverse. What everyone goes through is very different."**

For many women with a current eating disorder, pregnancy can make their unhealthy relationship with food even more so. For women with a previous eating disorder, it can sometimes rouse a dormant obsession with caloric restriction and a hypercritical body image.

"It's a really challenging time period, and it's not talked about much," said Claydon, who teaches in the Department of Social and Behavioral Sciences.

The project, supported by the Centers for Disease Control and Prevention through the WVU Injury Control Research Center, is unusual because it is qualitative, not quantitative. To put it another way, more eating-disorder studies have focused on how much pregnant women weigh or birth outcomes than on how pregnancy weighs on women psychologically.

"I wanted to do a more qualitative study because the lived experience is so nuanced and so diverse. What everyone goes through is very different," Claydon said.

She and her team interviewed 15 women with a current or previous eating disorder. Participants came from the United States, the United Kingdom, Canada and Central America.

The researchers used a qualitative data-management tool to categorize the information they gleaned from all of the interviews. Six themes emerged: maintaining a sense of control; disclosing the eating disorder to medical professionals; grappling with weight and body image concerns; heeding the demands of motherhood while silencing those of the eating disorder; fearing that disordered eating would be passed onto the child; and strategizing to cope with pregnancy.

The theme that surprised Claydon the most was intergenerational transmission - or, women passing their own dysfunctional view of food onto their daughters and sons. Every woman the team interviewed mentioned this.

Claydon's findings may help pregnant women with eating disorders surmount barriers to pre- and postnatal care. Particularly, Claydon is pursuing a rapid assessment tool to help physicians identify patients with eating disorders and guidelines for treating them with sensitivity and efficacy.

"How do we talk about weight with women who have a history of an eating disorder? How do we approach weighing in the office? How do we appropriately identify someone with an eating disorder who may not be telling us?" Claydon asked. "It's a very delicate subject."





Ye

**WVU researcher awarded \$1 million for artificial intelligence development**

Yanfang (Fanny) Ye, assistant professor of computer science and electrical engineering at West Virginia University, was awarded a National Institute of Justice grant to develop novel artificial intelligence techniques to combat the opioid epidemic and trafficking. The award comes with about \$1 million in funding.



Flores-Saviaga

**Flores-Saviaga named Facebook scholar**

Claudia Flores-Saviaga, a doctoral candidate at West Virginia University, won a 2019 Facebook Emerging Scholar Fellowship. The highly competitive fellowship is given to outstanding Ph.D. students from across the world who are engaged in innovative computer science research. Her focus is on investigating how citizens work to stop misinformation campaigns across social media.



Rankin

**Marshall's Rankin receives career award**

Gary Rankin was awarded the 2019 Career Award from the American Society for Pharmacology and Experimental Therapeutics (ASPET) Division for Toxicology for his mentorship and leadership in the field of toxicology and his exemplary service to ASPET, as well as in recognition of his long history of scholarship in the area of nephrotoxicity.



Gharib

**Gharib recognized by chemical society**

West Virginia State University junior Oddai Gharib received the 2019 Student Leadership Award from the American Chemical Society (ACS). The program recognizes emerging leaders in the ACS student chapter network and helps them prepare for leadership opportunities at volunteer organizations and in their professional career.

Photos courtesy of West Virginia University, Marshall University, and West Virginia State University

**COMMENTARY: Erika Klose**

*Developing soft skills to prepare students for a STEM-intense future*



Klose

As I approach my one-year anniversary of leaving the classroom, I am thankful for the perspective that a year of reflection provides. Reflection requires time and intent, but it is a tremendously valuable skill. Reflection answers questions about what worked and what didn't work. It allows us to realize that we may not know the answer to a question, and that we need additional data to find solutions. For an educator, reflection happens every day in preparation for the next day. But reflection, a tool of self-awareness, isn't unique to education.

As I reflect on the skills our students need to be successful in the STEM-intense future that undoubtedly awaits them, I think back to my first career as a geologist for the U.S. Geological Survey. I worked among talented scientists and technicians mapping the sea-floor. We collected vast amounts of data at sea. When we were not at sea, we processed these data; wrote reports; presented our interpretations; and communicated our science to the public. We constantly reflected, an important skill in making sure we were doing our science correctly.

Taking time to reflect; presenting material; and managing timelines were necessary skills in my work in science, in the classroom and continue to be important

in my job today. All the science I learned, and all the teaching practice I mastered, would have been useless without the skills, the soft skills, that professionals employ on a daily basis. I am a firm believer that as educators, we educate the whole child. Soft skills, such as reflection and time-management, cannot be absent from a student's daily school experience. These soft skills should be incorporated into integrated projects that draw from multiple content areas, seeking solutions for the types of community-based problems for which we are all seeking resolution.

What do I believe students need? Students need opportunities to fail safely and to recover successfully. Daily reflection needs to be taught and modeled. Managing projects that integrate multiple subjects, over extended time, should be common practice. Prioritizing tasks, and breaking those tasks down into their components, happens through problem-solving, or solution-finding, endeavors. Task persistence can be taught through extended assignments. Presentation skills, extensive writing and effective discussion skills can be incorporated into classroom activities. It's not always simple to teach these skills in our classrooms.

**“Students need opportunities to fail safely and to recover successfully.”**

Teaching in this manner requires a teacher-student relationship built on trust and respect. But the truth is that we owe it to our students to support them as they hone these skills, so that as they enter the workforce, whether upon leaving high school or college, they are prepared for the unknown that lies ahead.

*Erika Klose is the K-12 Technology Integration Coordinator for STEM and Computer Science for the West Virginia Department of Education. A geologist, she is the current president of the West Virginia Science Teachers Association. Klose recently completed 10 years teaching seventh grade science. In 2017, she received the Milken Educator Award.*

Photo courtesy of Erika Klose



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