

ARTS SCIENCES EDUCATION

FLORIDA INTERNATIONAL UNIVERSITY
2019

CHANGE CHANGE IS COMING

THE ARCTIC IS WARMING AND THE WORLD IS FEELING THE EFFECTS. South Florida is not immune. FIU scientists are on the hunt for the global drivers of climate change.

INSIDE:

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FIU

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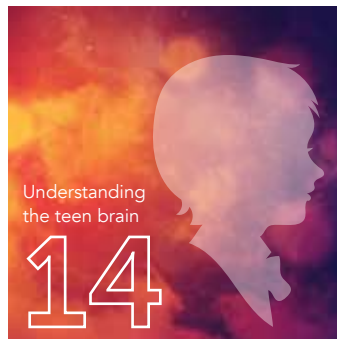


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FROM THE DEAN



When I was a young kid growing up in Ohio, Steve Oberbauer was making annual treks to the Toolik Field Station to study the Arctic. When I was in college, Steve Oberbauer was making annual treks to the Toolik Field Station to study the Arctic. Throughout my entire career with FIU, Steve Oberbauer has been making annual treks to the Toolik Field Station to study the changing Arctic. As I sit down to write this letter, he is just returning from his 43rd year at the Toolik Field Station in the Arctic.

Dr. Oberbauer has had a four-decade front seat to climate change and has produced a lifetime of answers regarding what is happening and what we can do to fix it. He knows better than most people how inextricably linked the Arctic is to the rest of the world, including our subtropical South Florida. His work is a great example of the broad portfolio of solutions-centered programs we lead in the FIU College of Arts, Sciences & Education. We are focused on identifying challenges, seeking solutions, and making sure they are communicated and implemented. We are focused on impact. For our students. For our community. For the world.

In the past year alone, our scientists discovered the secret to a mosquito's ability to zero-in on people when looking for a meal. It is an important first step in the fight to end the transmission of mosquito-borne diseases that kill 725,000 people a year. Our students are investigating changes in the Florida Everglades and our coastal oceans to keep algae from choking our waterways, ensure our drinking water is safe, and save ecosystems and species. Our psychology students have identified a stepped approach to childhood anxiety treatments that could cut the overall cost of treatment nearly in half and lead to better lives for kids and their families.

Our efforts have not gone unnoticed. We ranked No. 9 in the country for psychology research funding by the National Science Foundation. Our rehabilitation counseling program in the School of Education and Human Development has been ranked by *U.S. News & World Report* as one of the top in the country. Our storm surge modeling team and the National Hurricane Center received the Outstanding Achievement Award from the National Hurricane Conference for their combined effort to improve forecasting and life-saving early alerts for Haiti and the Dominican Republic. These are just a few examples of the great successes we've celebrated in the past year. We've also made incredible advances in the classroom, ensuring our students succeed at FIU and throughout their lives.

In a rapidly changing world, we're showing the world what is possible. Solutions to even our world's most complex problems are within our ability to solve. It is an exciting time for FIU as we have launched the Next Horizon capital campaign, an effort that could help us save more species, restore ecosystems, improve child mental health treatments, transform education, invent new scientific tools, fight gender inequality, and stop deadly diseases. As you read about some of our current efforts, I hope you will find inspiration in the bold ideas and efforts of our students and faculty. With your support we know we can have an even bigger impact. We never would have achieved all our successes without the help of our partners and supporters.

Change is coming. To everyone. Everywhere. We are ready. You can count on the College of Arts, Sciences & Education to deliver science with a purpose, humanities with an edge and to help build an inspiring future for all.

Mike Heithaus

Mike Heithaus
Dean, College of Arts, Sciences & Education
Professor, Department of Biological Sciences
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NEXT HORIZON
The Campaign for FIU

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SCIENTISTS UNEARTH CLUES TO SEISMIC EVENT THAT WIPED OUT DINOSAURS



A discovery confirmed the meteor strike that likely wiped out dinosaurs produced tsunami-like waves reaching what is now North Dakota.

The waves would have traveled more than 2,800 miles from where the meteor struck off Mexico's Yucatan Peninsula, according to FIU Professor Florentin Maurrasse, one of the researchers who made the discovery. Palm Beach Museum of Natural History Paleontologist Robert DePalma unearthed 66-million-year-old fossils from North Dakota's Hell Creek Formation rocks and the team of researchers determined the freshwater fish fossils found were the first casualties of Earth's last mass extinction event.

Maurrasse knows a great deal about tektites. He discovered them in 1992. Tektites are tiny glass beads formed by molten rock that indicate a meteorite impact. Fifty percent of the fossilized fish found by DePalma had tektites in their gills. Amber found at the site also contained tektites. Most of the geochemical analyses of the fossils were conducted in laboratories at FIU's Department of Earth and Environment.

Saturn's largest moon may hold key to cleaner engines

FIU chemist Alexander Mebel has been studying Saturn's largest moon, trying to unlock a mystery brewing beneath Titan's thick, hazy atmosphere — How is it that dunes of hydrocarbons exist on the moon's frozen surface?

Using data from NASA's Cassini-Huygens probe, Mebel and a team of international researchers determined hydrocarbons can form the type of complex chains that create Titan's orange-brown haze layers at temperatures as low as -298 degrees Fahrenheit. On Earth, these hydrocarbons are only known to occur during the combustion process under very high temperatures. They are the kinds of byproducts that engineers usually try to eliminate when engines burn fuel. Mebel's hydrocarbon research can inform engine design by updating models using this new finding.

Photo credit: NASA Jet Propulsion Laboratory, Space Science Institute, Caltech

What tiny particles mean for big stars

An international team of physicists has found that protons and neutrons — the tiny particles in the nucleus of an atom — work in pairs and affect how they move individually. If more neutrons are added to an atom, protons are more likely to move much quicker. This counterintuitive behavior was predicted by FIU theoretical physicist Misak Sargsian. With this discovery, scientists are rethinking the threshold at which a certain star known as a neutron star morphs into a black hole.

Made mostly of neutrons, neutron stars are the smallest, densest stars in the universe. There are roughly 100 million of them in the Milky Way galaxy alone. They provide insights on how the universe itself has evolved over time. The 151-member research team representing 42 international institutions used data from nuclear physics experiments proposed in part by Sargsian. This experiment was conducted at the Department of Energy's Thomas Jefferson National Accelerator Facility.

Photo credit: X-ray (NASA/CXC/ESO/F.Vogt et al); Optical (ESO/VLT/MUSE & NASA/STScI)

SCIENTISTS DISCOVER how mosquitoes zero in on our sweat

Finding creates roadmap for repellent design, population control

By JoAnn C. Adkins

Just like fresh-baked cookies or sizzling bacon is to us, the scent of your sweat is a mouthwatering aroma to mosquitoes. Now, scientists have discovered how these undesirable insects zero in on our delectable odor.

It's actually the odor from lactic acid and other acidic volatiles found in human sweat that some mosquitoes are attracted to when seeking a blood meal. A team of researchers from FIU's Laboratory of Tropical Genetics has identified a unique olfactory receptor used to detect these odors in *Aedes aegypti* mosquitoes, which are known to transmit dangerous and sometimes deadly diseases including yellow fever, dengue and Zika. The guilty receptor is known to scientists as Ionotropic Receptor 8a, or simply IR8a.

"People have been looking for more than 40 years," said FIU biologist Matthew DeGennaro, who leads the lab where the discovery was made. "Even in the 1960s, scientists knew it was sweat and lactic acid, but no one knew how those were sensed. Back then, mosquito scientists didn't have genetics."

DeGennaro made genetics history in 2013 when he created the first-ever mutant mosquito as a post-doctoral researcher at The Rockefeller University. He removed a gene and investigated how the absence of that gene changed the mosquito's behavior.

Since then, he has worked with countless mutants in a process of elimination until he and his team landed on IR8a. DeGennaro had a hunch and tasked Ph.D. student Joshua Raji with investigating the receptor. The scientists mutated the receptor in

mosquitoes and found IR8a mutants struggled to pick up the desired aroma of lactic acid and could not detect other acidic components of human odor. They were still able to detect carbon dioxide and heat, which people emit, but their inability to smell a person's acidic volatiles left more than half uninspired to feed.

Raji's first test was on his own arm — first wild-types and then mutants. His scent was popular among the wilds, but not a single mutant took an interest in the first four minutes of exposure.

"I knew at that moment, this is it. This is real," said Raji, who has dealt with his own bouts of Malaria while growing up in Nigeria and whose wife recently recovered from the mosquito-borne disease.

He repeated the test on 14 additional subjects. The results were the same. The FIU team's discovery could give rise to a new generation of attractants to lure adult mosquitoes to traps for population control. It also offers researchers a roadmap for making people invisible — at least to mosquitoes.

"Odors that mask the IR8a pathway could be found to enhance the effectiveness of current repellents like DEET or picaridin," DeGennaro said.

The team is beginning chemical screens in an effort to disrupt the IR8a pathway. DeGennaro's ultimate goal is to create a life-saving perfume to protect people from mosquito bites.



Ph.D. student Joshua Raji investigated the IR8a receptor on *Aedes aegypti* mosquitoes.

The research was supported by the National Institutes of Health's National Institute of Allergy and Infectious Diseases and by the Centers for Disease Control and Prevention's Southeastern Center of Excellence in Vector Borne Diseases.





#INAFLASH

Jonathan Flickinger
Ph.D. student

Claim to Fame

The self-described “Miami Myrtologist” named a plant species that is now a full-fledged member of the myrtle family.

Say what? Flickinger

studied fruitless samples of a previously unidentified plant found in Anguilla by a French botanist in 1955 and realized samples of the same plant found in 1995 by Mary Morris Walker (this time with flowers and fruit) were similar to other plants in the genus *Eugenia*. Flickinger described Walker’s specimens as members of a new species and named the species *Eugenia walkerae* in her honor.

What’s the big deal? No

longer relegated to the dustbin of history, this Caribbean plant now has a name and a family. That makes *Eugenia walkerae* easier to track. As a plant native to a tropical island with few specimens in botanical collections, Flickinger said more research is needed to determine whether *Eugenia walkerae* should be targeted for conservation.

AFRICAN CROCODILE: New species identified

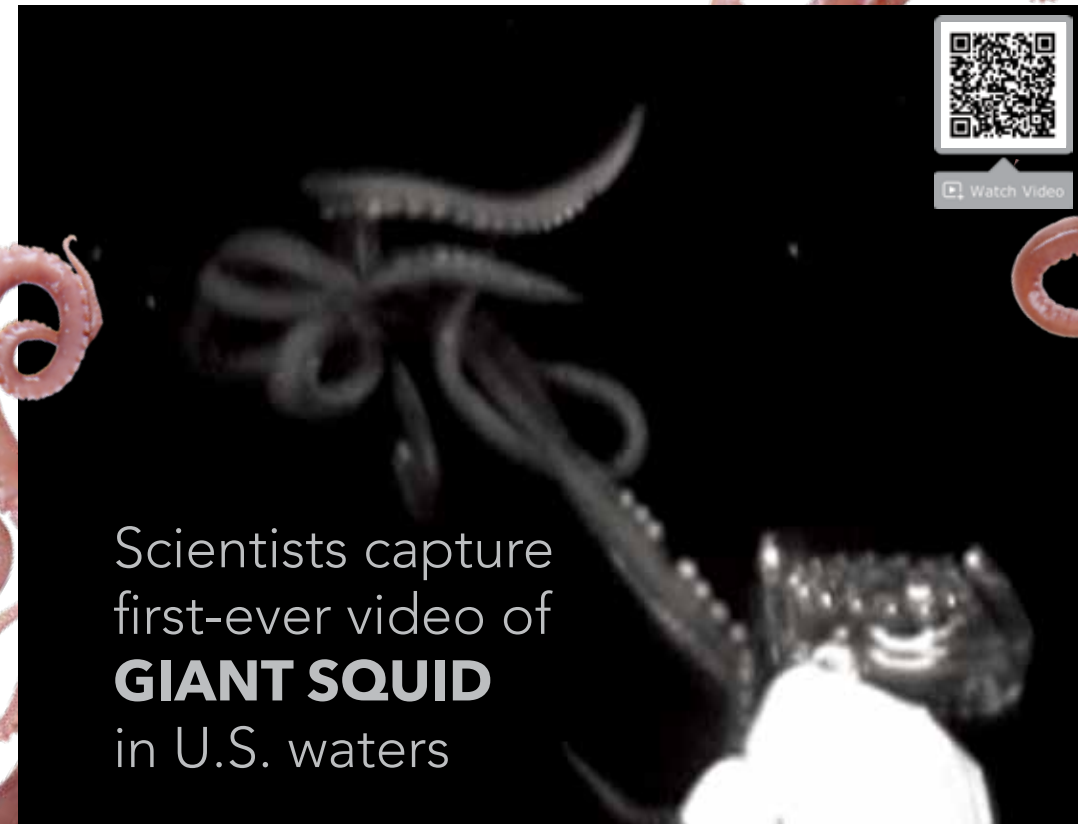
While studying the critically endangered slender-snouted crocodile, researchers made a startling discovery — what they thought was one species is actually two. The discovery raises concerns about whether current conservation practices are enough to protect them.

The slender-snouted crocodile is medium-sized, lives in freshwater habitats and has a long and slender snout. Scientists led by crocodile expert Matthew Shirley of FIU’s Tropical Conservation Institute analyzed the DNA and physical characteristics of crocodiles in the wild and in captivity in six African countries. They found two distinct species of slender-snouted crocodiles — one unique to West Africa and one unique to Central Africa. The Central African slender-snouted crocodile is the first new living crocodile species to be defined and named in nearly 85 years.

The International Union for Conservation of Nature listed slender-snouted crocodiles as “Critically Endangered” in 2014. They are threatened by habitat loss, hunting and overfishing, which diminishes their food supply and leads them to drown in nets.

Slender-snouted crocodiles are understudied and underrepresented in conservation programs. First described in 1824, they live in very remote areas and have little interaction with people. They camouflage themselves from prey and seek refuge from potential predators in highly vegetated bodies of water. They’re also incredibly shy. Finding crocodiles to examine and collect DNA samples from in the wild has long been a challenge.

Shirley’s finding will have major implications for understanding crocodile evolution and diversity, as well as conservation. Conservation policies require the accurate naming of species and assessment of population numbers. The future of the West African slender-snouted crocodile will likely depend on the success of captive breeding and reintroduction programs, according to the researchers. With the help of Shirley and other researchers at the Tropical Conservation Institute, these crocodiles might have a fighting chance. Launched with support from the Batchelor Foundation, the institute offers the world’s most threatened species hope for survival.



Scientists capture first-ever video of GIANT SQUID in U.S. waters

FIU marine scientists Heather Bracken-Grissom and Lori Schweikert were among a team of researchers gathered around a monitor when the tentacle first came into view. It floated in and out of the darkness offering no hint of what was on the other end. Then, in an elegant explosion of arms and tentacles, the creature revealed itself — the phantom of the deep, known simply as the giant squid.

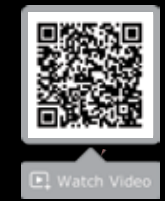
It is the first time the elusive creature has been caught on camera in U.S. waters — about 100 miles southwest of New Orleans in the Gulf of Mexico. It is only the second time the creature, which can grow up to 40 feet, has ever been captured on camera. The discovery was made toward the end of a 17-day research mission dubbed Journey into Midnight.

“It was magical and surreal to see how the animal behaves in nature,” Bracken-Grissom said. “To know that I was witnessing something that had only been seen once before in nature filled me with an overwhelming sense of gratitude and respect for what still is to be discovered.”

Giant squids have largely avoided interactions with people because they live at great depths, typically 1,000 feet below the surface or more. The sighting and video capture were made possible by a camera system called the Medusa. It features a ring of LED lights that resembles a bioluminescent jellyfish which attracts the squid. The Medusa was developed by Edie Widder, founder of the Ocean Research and Conservation Association and was part of the team that first captured a giant squid on camera in 2012 near Japan. Widder was on hand for the latest sighting as part of the research team exploring the Gulf of Mexico.

The entire team gathered around a monitor as the giant squid came into view, first stalking the LED bait and eventually wrapping its long tentacles around it. Quickly realizing the impostor jellyfish was not what it seemed, the giant squid thrust itself back into the darkness. As quickly as it had entered the picture, it was gone. But it was enough to take the breath away of each of the researchers. The researchers believe the squid they captured on camera this time around was a juvenile, measuring 10 to 12 feet long.

The Journey into Midnight research mission was led by Sönke Johnsen from Duke University and supported by the National Oceanic and Atmospheric Administration. The researchers embarked on the mission to study light and light below the twilight zone where light does not penetrate. Bracken-Grissom and the members of her Crustaceans Genomics and Systematics Lab are always on the hunt for new sources of bioluminescence and trying to better understand how animals survive at the darkest depths of the ocean.



Scientists find plant-eating sharks

The bonnethead shark has been outed for what it truly is — an omnivore! This small relative of the hammerhead, which swims in the waters of the Pacific, Atlantic and Gulf of Mexico, eats “grass.” Seagrass to be exact.

When munching on shrimp, crabs and other prey taking shelter in seagrass, a bonnethead could easily grab some seagrass in their jaws. But, for the first time, scientists including FIU marine scientist Yannis Papastamatiou, have discovered the sharks can and actually do get nutrition from these plants.

“Bonnetheads can digest seagrasses quite efficiently and they do that with a typical carnivore digestive system,” Papastamatiou said. “Understanding the connection between what an animal eats and what it actually digests is very important for understanding that animal’s role in the ecosystem.”

Not all carnivores can digest plants efficiently. The team conducted a series of lab-based tests in which they fed bonnethead sharks a diet of mostly seagrass with some squid. They analyzed how much of the nutrients the animals digested and how much they excreted. The sharks receiving the predominantly plant diet gained weight and were found to efficiently digest the fiber and organic matter from the plants. In fact, they proved better than pandas at digesting plants.

The findings are changing what scientists thought they knew about carnivores in the oceans. It’s possible, they say other predators could be broadening their diets and could be consuming plants.





UNLEASHING THE “AHA!” MOMENT

By Ayleen Barbel Fattal | Photos by Doug Garland

The STEM Transformation Institute has redesigned the education experience, creating a model for the rest of the nation

At 19, Laird Kramer saw himself as an accountant. One of his college professors saw a physicist.

Kramer was good with numbers so he enrolled as an accounting major at George Washington University. But an astronomy class during his freshman year changed everything. His professor noticed Kramer wasn't just good with numbers — he was really good at physics.

“He said ‘if you have talent, you should think about doing it,’” Kramer said.

Today he is a professor of physics in the College of Arts, Sciences & Education. He also directs the STEM Transformation Institute, a multidisciplinary collaboration dedicated to improving education in science, technology, engineering and math. Kramer is always looking for a spark — those students who should be the next teacher, astronaut, particle physicist, environmental chemist or other STEM professional but they just don't know it yet. He is surrounded by others like him — educators with a knack for unlocking hidden talents and who have the ingrained desire to help students reach their greatest potentials. They are not just feeding the STEM workforce pipeline, they are transforming it.

The institute's core team is comprised of 40 faculty members, post-doctoral researchers and master teachers, who are faculty members with exemplary secondary education teaching experience. More than 60 others from colleges all across FIU serve as faculty fellows, collaborating on projects and research while transforming their own courses using techniques pioneered in the institute.



Science made fun: Physics Professor Laird Kramer (center), director of the STEM Transformation Institute, interacts with students in a classroom designed and outfitted to promote active learning.

The learning assistant program was first implemented for physics in 2008 as a teacher preparation program. Today, there are 335 across 153 classes helping thousands of students in a variety of STEM classes as well as philosophy, music and architecture. It is the largest program of its kind in the United States.

THE AUTHENTIC SCIENCE EXPERIENCE

The STEM team is redesigning STEM education to improve outcomes, expand opportunities for underrepresented minorities, and create pathways for successful STEM careers. Students learn by doing. Lectures are gone, replaced with a problem to solve, a toy or tool to experiment with and a team of peers who work together to find the answer.

"We are driven by the "aha!" moments — watching students start in a state of confusion and, by the end, making statements as profound as Nobel laureates," Kramer said.

It looks a lot like play. Why does a ball bounce? Why are some magnets attracted to each other while others are not? And what's up with the Slinky? The easy answer is physics, but students at FIU discover just exactly what physics theories are at play, leading to more complex discussions and turning difficult concepts into relatable classroom experiences. It's called active learning and it's fun.

The institute's faculty has also pioneered a Learning Assistant program — fellow students who help their peers by guiding discussions and making sense of difficult course content. That is particularly important for Hispanic-serving institutions like FIU because underrepresented minorities in STEM, including Hispanics, blacks and women, often cite the absence of role models who "look like them" as one of the reasons for not pursuing STEM fields, according to the Pew Research Center. Being students themselves, the Learning Assistants help fill this void by creating more inclusive learning environments.

"We want diverse people involved because diverse people have diverse skills and diverse ideas to solve the world's problems," Kramer said.

The STEM team continually researches their methods to provide a scalable model that can be deployed across the United States. The White House, U.S. Department of Education, National Science Foundation (NSF), Howard

Hughes Medical Institute and others have taken an interest in how FIU is transforming STEM education. Most recently, Aimee Viana, who served as executive director of the White House Initiative on Educational Excellence for Hispanics spent a day exploring FIU's programs. Viana '01, MS '04 sees an opportunity to collaborate with FIU to increase the ranks of Hispanics in STEM careers.

"I was inspired by the call that FIU has had to rethink what education looks like in South Florida, because we're talking about what it looks like to rethink education in America today," said Viana, both of whose FIU degrees are in elementary education.

She points to NSF data that says Hispanics represent just 6 percent of the STEM workforce while fewer than 1 in every 10 scientists and engineers are minority women.

"This is a missed opportunity for the community and our country," Viana said.

CLOSING THE GENDER GAP

Education Associate Professor Zahra Hazari hopes to recruit 10,000 young women into physics through an innovative new training program that arms high school physics teachers with tools to unleash their students' hidden passions for physics. Hazari and her STEM Transformation Institute colleagues are partnering with 10,000 teachers all across the country with the expectation that each will recruit at least one female student to pursue a physics degree in college. Simply put, Hazari is looking for 10,000 sparks to ignite the largest increase of women in physics during a single decade.

"We could accomplish something that's never been done in history," Hazari said.

"We could change the face of physics in the United States."

The project could also help guide recruitment in other STEM fields.

20 YEARS IN THE MAKING

For Kramer, it has been a constantly evolving journey to build a new paradigm of what STEM education can be. It has also been a labor of love for the physicist who can't remember the year he got tenure, but knows exactly when and for how much his first course transformation grant was.

"It was 1999 and it was for \$55,140," he said without hesitation.

That was the beginning. Today, FIU has become the largest producer of STEM degrees for Hispanics nationwide and the STEM Transformation Institute has been recognized by the White House as a Bright Spot in Hispanic Education, placing it among the top programs in the nation helping to close the achievement gap. Even non-STEM majors are benefitting as more students are passing traditionally challenging courses like College Algebra. The institute's efforts have infiltrated the biological sciences, chemistry, engineering and computer sciences, environmental science, geosciences, math, physics and psychology.

Camila Monsalve is a two-time STEM graduate. In 2015, the Colombia-native was wrapping up her bachelor's degree in biological sciences and decided to take a couple of active learning physics classes. Professor Geoffrey Potvin saw the spark. She was a natural. Monsalve eventually became a Learning Assistant. She completed her biological sciences degree and, after conversations with Potvin and others at the institute, decided she wasn't done just yet. Two years later, she crossed the commencement stage again, this time with a bachelor's in physics.

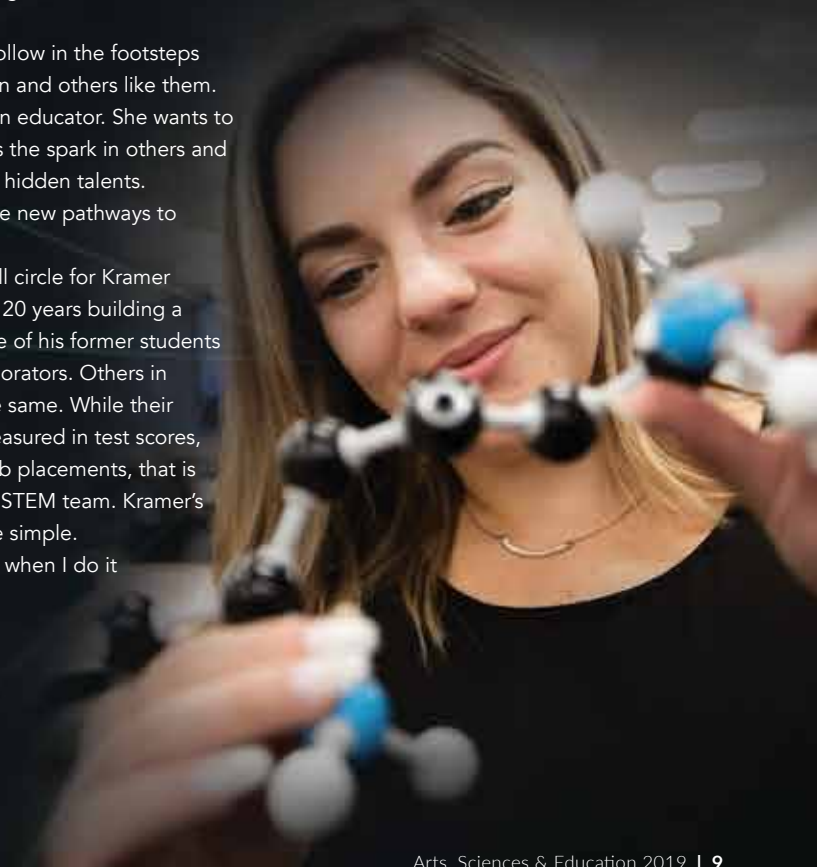
Monsalve hopes to follow in the footsteps of Kramer, Hazari, Potvin and others like them. She wants to become an educator. She wants to be the person who sees the spark in others and helps them realize their hidden talents. She wants to help create new pathways to STEM careers.

Things have come full circle for Kramer who has spent the past 20 years building a movement at FIU. Some of his former students have become his collaborators. Others in the institute can say the same. While their results can easily be measured in test scores, graduation rates and job placements, that is not what motivates the STEM team. Kramer's reasoning is much more simple.

"I just have more fun when I do it this way." ■

“ We want diverse people involved because diverse people have diverse skills and diverse ideas to solve the world's problems.

— Laird Kramer



TAKING STEM CAREERS OUT FOR A SPIN

The STEM Transformation Institute offers hands-on opportunities to get students ready for real-world careers

Emma Odenweller is ready to be a scientist. Josue Simeon is on a path to medical school. Kevin Castillo wants to teach in the schools where most won't. Ariana Bueno has her sights set on space. Their sparks for STEM were ignited by experiences.

Odenweller is a Sarasota-native finishing up her junior year in Marine Sciences. She wants to make an ecological impact. Josue Simeon grew up in Miami's inner city with dreams of becoming a football player. After his first year as an interdisciplinary studies student, it became clear science was the only field he wanted to spend time in. Odenweller and Simeon participated in a career exploration program through the FIU Center for Aquatic Chemistry and the Environment in the Institute of Water and Environment.

The research center focuses on stressors in South Florida water and features an education component to prepare students for the work force, in collaboration with the STEM Transformation Institute. As a standard part of that coursework, Odenweller and Simeon learned science by working as scientists in the field and connecting their interests with the community. They learned to write scientific research papers, to communicate complex information to the general public and the basics of career prep — resumes, salary negotiations, and the day-to-day realities of a science career. It gave them the opportunity to test-drive a career while still in college. It's something Laird Kramer calls experiential learning.

"We give students an authentic science experience," said Kramer, the director of the STEM Transformation Institute.

These opportunities are not exclusive to aquatic chemistry. Ariana Bueno double majored in mechanical engineering and physics. The first was always part of her plan. The second was an unexpected turn of events after her own experiential learning.

In her first semester, Bueno landed an internship working as a systems engineer for Lockheed Martin. She valued the experience, but decided it wasn't the right fit. The following summer, she interned as a structural analyst for Boeing. She really liked the hands-on work. Then came the physics class where Bueno discovered

she loves physics. Professor Geoff Potvkin noticed she had a knack for making physics relatable. He encouraged her to become a learning assistant — students who help their peers learn by guiding discussions and helping them connect with course content. It's another form of experiential learning. She facilitates active learning for more than 70 students in Physics 1 and 2 courses.

"The most rewarding experience has been helping those who don't think they are good enough or smart enough to learn physics," Bueno said. "Everyone is smart enough. Everyone is good enough. Concepts are easy to grasp if they are taught the right way."

These experiences convinced Bueno she wanted a physics degree. She hopes to become a NASA astronaut someday.

Kramer knows for his team to continue providing pathways to STEM careers, K-12 education has to step up. The country is experiencing a growing teacher shortage. Kramer is working closely with Miami-Dade County Public Schools and the national Uteach program to produce a new crop of STEM teachers. Kevin Castillo is among them. But that was not always part of his plan. Castillo enrolled as an earth science major. When he heard he could earn his STEM degree along with a teaching certification, he gave FIUteach a try. He enjoyed the time spent with the program's master teachers and the experiences teaching in classrooms. He is now poised to become a teacher and plans to work in a high-needs, low-income school.

"Like Kevin, most college students question their paths at least once," said Laura Dinehart, senior associate dean of the School of Education and Human Development in the College of Arts, Sciences & Education. "We hope that as more students have the opportunity to take careers out for a spin as part of their classroom experience, they will consider a career in teaching."

The team at the FIU STEM Transformation Institute hopes this new model of experiential learning becomes the norm. They've designed it to be scalable and adaptable to almost any field. They hope as more students experience what it means to be a teacher, ecotoxicologist, physicist and more, they will find their true callings and embark on successful careers where they can have the greatest impact.

FIU's STEM education programs are scalable and adaptable to almost any field.

- Future STEM Professionals -



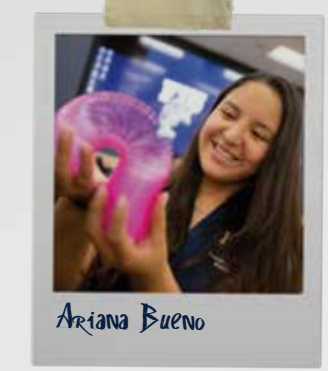
Emma Odenweller

- Wants to become a marine scientist



Josue Simeon

- Wants to become a doctor



Ariana Bueno

- Wants to become an astronaut



Kevin Castillo

- Wants to become a teacher
- Focus on science

- What do YOU want to be?
- How can WE help you achieve your goals?

IMPROVING STUDENT SUCCESS IN CALCULUS

FIU's STEM Transformation Institute received a \$1.49 million grant from the National Science Foundation to improve student success in calculus.

In partnership with Broward College, FIU will implement active, hands-on learning in calculus courses. The transformation will include a student-centered curriculum that involves working in teams using Learning Assistants — undergraduate students who help their peers interact with and discuss the material.

By Fall 2021, this new curriculum will be available to all students taking Calculus 1 at FIU.

Learn about how you can become a Learning Assistant, scan code:



THE CASE FOR TEACHING TO TEACH

Graduate students who learn to teach are more likely to be prepared for the realities of working in higher education, according to a new study co-authored by FIU biologist Sarah L. Eddy.

Even though 45 percent of doctoral students enter academia, where they are also responsible for teaching, most graduate programs focus on preparing students exclusively for a life in research.

It's not hard to understand why. Valued higher in tenure and promotion deliberations, research brings in large grants, leads to publications and builds prestige for both the researcher and the university.

However, the study found students who were taught to teach didn't publish less and didn't feel ill prepared to conduct research. They also showed an improved sense of confidence in communicating research.

EFFECTIVELY TREATING CHILDHOOD ANXIETY

By Ayleen Barbel Fattal

Anxiety disorders are among the most common and impairing child and adolescent mental health problems in the United States. Cost continues to be a reason why only 1 in 5 children receive treatment. But researchers at the FIU Center for Children and Families have found a way to significantly reduce expense without compromising effectiveness.

The key is to start with low intensity treatments such as computer-administered treatment sessions, then step up to standard, higher intensity interventions including in-person cognitive behavioral therapy. Researchers call this a stepped approach.

Using Florida Medicaid rates for mental health services, the total cost of standard treatment was calculated at \$780 per child. Applying the stepped approach, the average total cost for a full course of treatment dropped to \$433 per child. For anxiety disorders, a full course of treatment typically ranges from 12 to 16 weeks. In the stepped approach, almost 60 percent of patients completed treatment in only four weeks.

Psychology graduate student and study lead author Carlos E. Yeguez said the findings can inform service providers, administrators and policy makers about the potential of this approach to treating child anxiety.

Standard treatment for anxiety consists of several sessions of cognitive behavior therapy, which takes time and resources. However, research by study co-author and Department of Psychology Chairman Jeremy W. Pettit showed 69 percent of children with anxiety who first completed an eight-session computer-based intervention had significant improvement and spent half the amount of time with a therapist than those who only received cognitive behavior therapy.

Economics expert Timothy F. Page of the Robert Stempel College of Public Health & Social Work conducted the cost analysis for the study. According to Page, the amount of cost savings generated by the stepped approach was significant and suggests large system-wide savings if similar approaches are adopted on a large scale.

The next step in this line of research is to conduct studies in community mental health centers and evaluate whether the study findings are replicated. Before rolling this out, researchers must carefully evaluate the efficacy and cost savings of the approach in these settings, which requires funding and partnerships with local agencies. ■

FIU'S CENTER FOR CHILDREN AND FAMILIES is revolutionizing treatments for child mental health through research and clinical work. Our programs provide effective, low-cost treatments to more than 3,000 families each year. For information, call 305-348-0477.



COMPUTER-BASED INTERVENTIONS CAN CUT CHILDHOOD ANXIETY TREATMENT COSTS NEARLY IN HALF.

NATIONAL LANDMARK STUDY EXAMINES NEW TREATMENTS

FIU psychologists in collaboration with Nicklaus Children's Hospital will embark on the largest multi-site, multi-year clinical trial to examine face-to-face and internet-based therapy for children with anxiety. Researchers at the FIU Center for Children and Families will evaluate treatment of anxiety in nearly 2,000 children and adolescents ages 3 to 18 across four regions of the United States. Data collection and result analyses will be centralized with the center serving as the main data and biostatistical hub of the project.

The study was selected for funding through the Patient-Centered Outcomes Research Institute's Pragmatic Clinical Studies Initiative. Pragmatic clinical studies test a treatment's effectiveness in "real-life" practice situations including hospitals and outpatient clinics allowing for a wider range of study participants and making findings more generally applicable. FIU's \$3 million award has been approved pending completion of a business and programmatic review by PCORI staff and issuance of a formal award contract. The total funding award is for more than \$10 million across the four sites.

HOPE FOR THE MOST DIFFICULT CASES

Helping children diagnosed with anxiety hone their attention shows promising results for recovery, according to a new study by researchers at FIU's Center for Children and Families.

Computer-based attention training was used as treatment for children and adolescents who failed to respond to in-person cognitive behavior therapy, which is the most common and evidence-based psychosocial treatment for anxiety. Helping these children improve their ability to focus and shift their attention led to reductions in anxiety. After four weeks of the alternative treatment, 50 percent of study participants no longer met the criteria for an anxiety diagnosis.

The study is the first to provide an effective alternative treatment option for the 30 to 50 percent of children who do not respond to cognitive behavior therapy.

UNDERSTANDING THE ADOLESCENT BRAIN

EXPLORING THE CONNECTION BETWEEN SLEEP AND TEEN ANXIETY

Researchers at the FIU Center for Children and Families are working to improve treatments for teens with anxiety by uncovering the role sleep plays in processing emotional experiences. “We know that sleep is essential for healthy brain development in adolescence, and not getting enough sleep can be very hard on teens’ emotional and physical health,” said psychologist Dana McMakin who is leading the research team along with neuroscientist Aaron Mattfeld and psychologist Jeremy W. Pettit.

According to the Center for Disease Control and Prevention, approximately 70 percent of U.S. teens aged 12-14 get insufficient sleep, and 90 percent of youth who experience anxiety report sleep-related problems.

For children 6 to 13 years old, the National Sleep Foundation recommends 9 to 11 hours of sleep. For 14- to 17-year-olds, the recommendation is 8 to 10 hours. According to the American Academy of Sleep Medicine, sleeping the recommended number of hours is associated with better attention, learning and memory; better regulation of behaviors and emotions; and higher quality of life, mental and physical health.

TIPS FOR HEALTHY TEEN SLEEP:



NATION'S LARGEST ADOLESCENT BRAIN STUDY RELEASES MAJOR DATASET

Research teams all across the globe now have access to data from the largest study ever attempted on the adolescent brain.

The Adolescent Brain Cognitive Development (ABCD) study provides data for access by scientists worldwide. They can examine brain characteristics associated with impulsivity and traumatic events, study the impact of health behaviors including sleep and physical activity on cognitive and brain development, and look at traits associated with media-use including screen time exposure.

HOW CHILDHOOD TRAUMA AFFECTS THE TEEN BRAIN

Traumatic childhood experiences including domestic violence, abuse and parental incarceration impact brain functioning and increase the risk of substance use during adolescence.

This was the finding of researchers Nicole Fava and Elisa Trucco from FIU's Center for Children and Families. They assessed 465 children who experienced adversity beginning at ages 3 to 5 and followed them through early adolescence to understand why children exposed to adversity in early childhood are more likely to misuse substances later in life.

They found negative childhood experiences may disrupt functioning of brain regions associated with impulse control. Trucco says this supports early intervention for children exposed to trauma is crucial in preventing a pathway of risk towards substance use. Interventions focused on improving self-regulation training, including mindfulness and neurofeedback, are especially effective.

Through the Center for Children and Families and other community agencies, Fava is leading efforts to provide trauma-specific, evidence-based interventions for youth and families throughout Miami-Dade. Funded by The Children's Trust, Trauma-Focused Cognitive Behavioral Therapy helps children and caregivers cope with the aftermath of traumatic experiences and teaches emotion regulation and cognitive coping skills which reduce the risk of substance use in adolescence.

MEDIA DEVICES DO NOT CAUSE ADHD

While many teens appear to be constantly distracted by electronics, FIU psychologist Margaret Sibley says this does not mean they have ADHD. The FIU Center for Children and Families offers psychological evaluations for teens experiencing concentration problems. For information, call 305-348-0477.

IN THE CLASSROOM: INTERVENTIONS FOR KIDS WITH ADHD

Researchers at the FIU Center for Children and Families are evaluating interventions for children with attention deficit hyperactivity disorder (ADHD) to determine which are more effective in the classroom.

Led by center director William E. Pelham, Jr. along with researchers Nicole Schatz and Amy Altszuler, the three-year study, is part of a \$3.3 million grant from the Institute of Education Sciences. The center is recruiting 300 students entering first through fifth grade with an ADHD diagnosis or who are at-risk of being diagnosed due to distractibility, difficulties completing school work and frequent classroom rule violations.

The majority of students with ADHD are educated in general education settings; however, most students with ADHD require additional support to keep up with their peers. Schools currently use a problem-solving process called Response to Intervention (RTI) to identify students who require additional support and intervene. The amount of support increases gradually based on the student's individual needs before the student is referred to a special education setting.

“While RTI may seem like a great approach, it has not been well studied to address the particular needs of students with ADHD,” added Pelham. “This study takes evidence-based classroom interventions for ADHD, including behavioral approaches and stimulant medication, and places them within an RTI framework to understand how to best treat students with ADHD in general education settings and whether starting with low-level behavioral interventions can prevent the need for more intensive services, including special education referrals.”

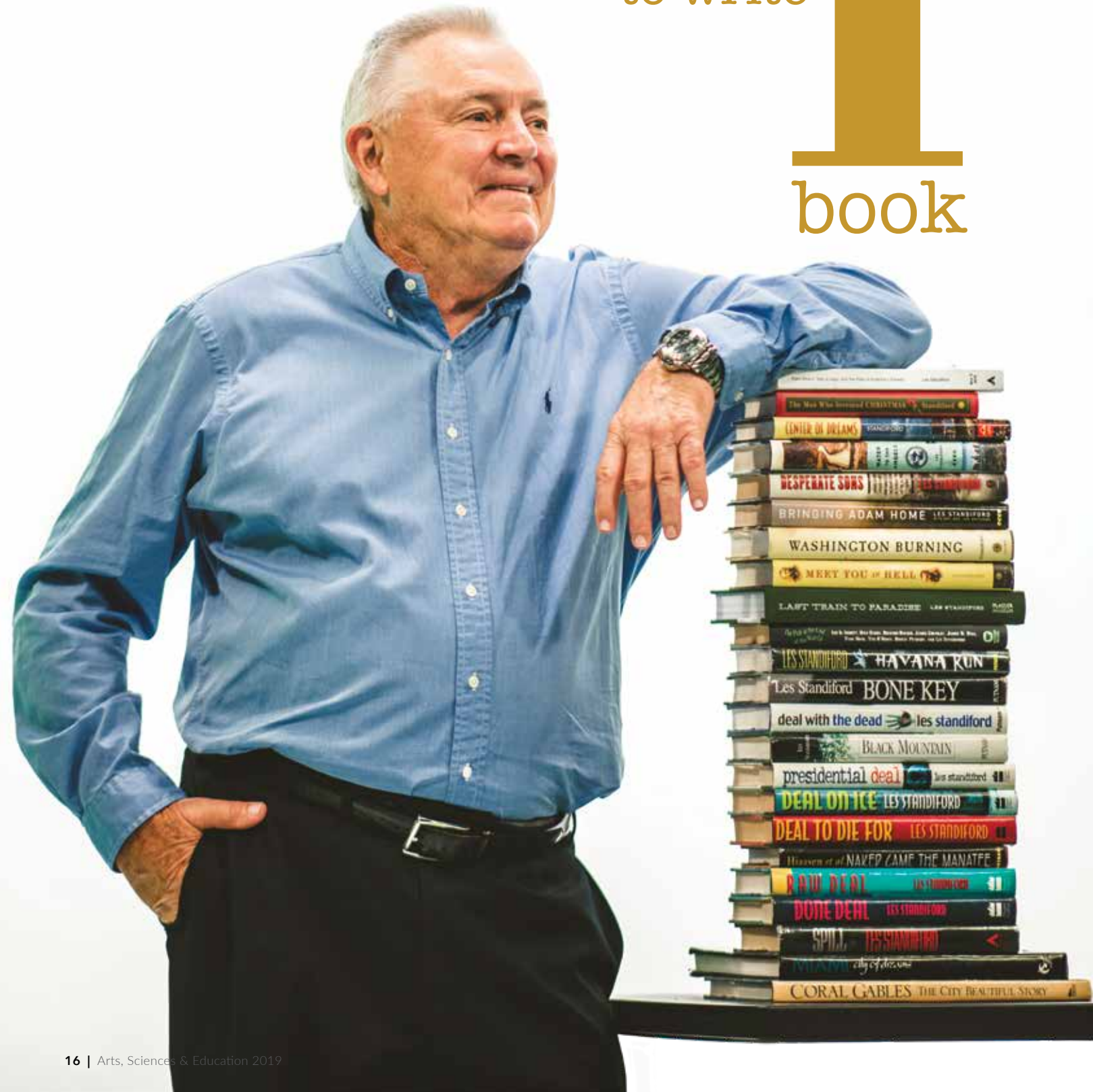
Parents who would like to learn more or find out if their child is eligible to participate, may call 305-348-1026. Students who currently have an Individualized Educational Plan related to ADD/ADHD or are taking medication for ADD/ADHD are not eligible.

EVIDENCE-BASED TREATMENTS

Researchers at FIU's Center for Children and Families are unlocking the secrets of cognition to develop key treatments for ADHD, anxiety and other mental health disorders. By helping support our researchers, you can help unravel the pathways leading to an improved human experience. To learn how you can help, contact gillrodr@fiu.edu | 305-299-0765.

He just
wanted
to write

1 book



Les Standiford is the essential South Florida storyteller

By JoAnn C. Adkins

When there is a good story to tell, Les Standiford knows how to tell it great.

This fall, the founder and director of FIU's Creative Writing Program tackles the transformation of Florida's island of Palm Beach — once a tangled landscape of mangroves and Palmetto brush that would become an exclusive resort destination lined with mansions of the societal elite. *Palm Beach, Mar-a-Lago, and the Rise of America's Xanadu* will be released in November.

His latest book comes on the heels of the 2018 publication of another historical account by Standiford, *Center of Dreams: Building a World-Class Performing Arts Complex in Miami*. That book recounts the convoluted 34-year journey to build Miami's Adrienne Arsht Center.

Standiford is the essential South Florida storyteller. His non-fiction works include a narrative on the people and places that make Miami unique, a historical reflection of Coral Gables, and a gripping account of the decades-long search for justice following the abduction of Adam Walsh in the 1980s. Among his most notable Florida narratives is 2002's *Last Train to Paradise*, which recounts the extraordinary construction and spectacular demise of the Key West Railroad — one of the greatest engineering feats ever undertaken, destroyed in one fell swoop by the Labor Day Hurricane of 1935, one of the strongest storms ever to hit the United States.

In his 45-year career, Standiford has celebrated the often-forgotten experiences that are so uniquely Florida. But the eclectic storyteller has never limited himself to just one genre or one state.

Standiford artfully captures the small moments in life that can forever change history. His 2008 *The Man Who Invented Christmas* is a reminder of how Charles Dickens' *A Christmas Carol* came into existence, saved Dickens' career, and forever changed how Christmas is celebrated. A film of the same title and based on Standiford's book was released last year to critical acclaim, starring Christopher Plummer as Scrooge.

Before he became a *New York Times* best-selling author of non-fiction works, Standiford was a best-selling author of fiction. His first book, *Spill*, took eight years to get published. The ecothriller centers around a germ-warfare agent dumped into Yellowstone National Park. The terrain is not unfamiliar to the writer who, before he launched a career in creative writing and moved to South Florida, was a seasonal park ranger in Yellowstone, taking tickets and scouting fires among the park's hydrothermal wonders.

While teaching at the University of Texas at El Paso, he found an agent who started shopping *Spill* to publishers.

The rejections soon followed. Standiford then went to the American Film Institute to study screenplay writing in the early 1980s. That experience inspired him to rework *Spill*. He found a new agent and sold the manuscript to the Atlantic Monthly Press shortly after. The book was optioned for film in the early 1990s and the movie, starring Brian Bosworth, was released in 1996.

"I always thought it was a good story," Standiford said with a chuckle.

Standiford's South Florida crime thriller series came next, following John Deal, an average-guy protagonist with a knack for getting in and out of trouble. Without fail, these novels capture the true essence of Miami. To date, Standiford has written eight John Deal novels and hints he might have another plot or two still brewing in his head.

When he is not writing, you can find him sharing his craft with others. Since 1985, he has been a member of the faculty in FIU's Department of English. In 2018, his contributions were honored with the FIU Worlds Ahead Faculty Award. A busy year, he also moderated a conversation at the end of last year between former president Bill Clinton and novelist James Patterson about their new political thriller *The President is Missing*. But that's not all. Standiford has helped organize literary seminars in Key West, directed an annual writers workshop, developed the Monthly Writers on the Bay Reading Series and is the creator of the annual Lawrence A. Sanders Award in Fiction. Past recipients include Isabel Allende, Pat Conroy and Amy Tan.

Standiford finds his greatest calling in his students, which have included now-famed authors Dennis Lehane (another recipient of the Lawrence A. Sanders Award), Barbara Parker and Ginny Rorby, to name a few.

"You would like to think the work, the books, are staying around," he said. "But we're also passing the torch of this creative undertaking. I really enjoy seeing the students experience their own successes."

Those same students also remain a great source of inspiration and gut-checking for the seasoned storyteller.

"The students give me ideas," Standiford said. "And sometimes, when I mention things in front of them and they frown, I realize maybe it's not the great idea I thought it was."

But with more than 20 books to his name and countless other publishing credits, it's apparent that his good ideas still outnumber the bad ones. And as long as the good ideas keep coming, Standiford will keep telling great stories.

THE EVERGLADES is getting saltier

By Chrystian Tejedor and Evelyn S. Gonzalez

More saltwater in the Everglades is troublesome for everyone.

On the surface, some plants might get bigger and more lush. It may be the first sign sea levels there are rising, according to a study led by FIU alumnus Ben Wilson.

As saltwater interacts with the limestone bedrock of the Everglades, it releases phosphorus — a nutrient that helps plants grow. Sawgrasses for one might look bigger, but underground, their roots will begin to wither and die if the water gets too salty.

Other plants and trees will weather the attack in a different way. Bald cypress trees hit with nutrient stress could absorb nutrients too quickly sometimes and other times, too slowly. The stress is enough to kill them, Lu Zhai discovered.

“Different species can be killed by salinity in different ways,” said Zhai, an ecologist in the FIU Institute of Water and Environment’s Southeast Environmental Research Center.

Intruding saltwater also could cause peat soil to break down and create another problem — the release of large amounts of carbon. It’s already happening. Sixty-five percent of plant roots in fresh water marshes and 72 percent of roots in brackish water marshes died because of increased salinity levels brought on by sea level rise, according another study led by Wilson and Research Assistant Professor Tiffany Troxler.

One solution proposed by Troxler, Wilson and others in the Sea Level Solutions Center is to get more fresh water to the Everglades.

“There is a lot that can be done,” Wilson said. “We’ve been making progress to bring more freshwater to the Everglades by putting parts of Tamiami Trail on bridges and building a new reservoir to store and then send clean water south. We need more measures like these that can improve freshwater flow from north to south. It’s what’s pushing back the saltwater.”

65% of plant roots in fresh water marshes and **72%** of roots in brackish water marshes **died because of increased salinity levels brought on by sea level rise**



Long-term changes chart future of ecosystems

Changes in ecosystems that happen over years can often go unnoticed. That is why long-term research is important in restoring and managing the Florida Everglades and other vulnerable ecosystems. John Kominoski, an FIU assistant professor of biology is a scientist in the Florida Coastal Everglades Long Term Ecological Research program housed at FIU. He is researching the role long-term data plays in providing context to environmental changes over decades.



Algae give clues into Everglades restoration success

Eric Massa wants to know if Everglades restoration is working. The FIU student is turning to periphyton for clues. Too much phosphorus causes these mats of algae, bacteria and fungi floating in freshwater to collapse, causing a cascade of changes at the base of the food web. By understanding where these collapses are occurring, Massa’s work can allow for better targeted water quality improvement efforts.



What’s behind the drop in bonefish catches?

Anglers are catching fewer bonefish in South Florida. Warmer temperatures, more predators, fishing and contaminants could be among the reasons for the drop, which dates back to 1985.

FIU coastal ecologist Jennifer Rehage and a team of scientists found the decline is affecting all of South Florida, with the highest declines in Florida Bay and the lowest in Biscayne Bay. These fish, which are great indicators of environmental health, provide an annual economic impact of more than \$450 million.

Information gathered from studies by Rehage and researchers in the Bahamas, Belize, Cuba and Honduras can help inform bonefish conservation and natural resource management.

FIU’s College of Arts, Sciences & Education is developing an Everglades observatory for field operation research, education and public outreach. It would be home to a sensor network to monitor water quality and provide rapid notification.

CHANGE UNCHANGE IS COMING

“
We’re
better off
if things
stay
frozen.”

—Steve Oberbauer

By Angela Nicoletti | Photos by Timothy Long

FIU biologist Steve Oberbauer is back at Toolik Field Station, one of the world’s most remote research sites, located hundreds of miles above the Arctic circle. Spending time in one of the harshest, most unforgiving environments on Earth would change anyone. But, Oberbauer has changed very little. In some ways, the 64-year-old still resembles his younger self — the one who first traveled to Toolik in 1985 when he was 30. His curly hair is only slightly greyer. He’s still slender. Although he is the shortest of his two brothers, Oberbauer still towers over most people at 6 feet 5 inches tall. And he still wears a bright blue puffer jacket — an upgraded version of the one he bought more than 40 years ago for \$20 that never kept him warm enough.

The Arctic, on the other hand, has changed.

“There’s always been changes,” Oberbauer explains. “Just not this fast.”

The Arctic is warming at twice the rate of anywhere else on Earth. It’s in the midst of a dangerous transformation. The rules are unraveling. Timing is being thrown off track. Oberbauer has had a front seat to these changes: The tundra soil is breaking down. Permafrost is thawing at the surface and collapsing. There are more shrubs, less moss and less lichens. Plants are growing taller and flowering earlier in the season.

“What happens in the Arctic is important globally. There’s enough carbon in the tundra that if it were to thaw and that carbon release, that’s at least twice of what’s currently in the atmosphere,” Oberbauer said. “We’re better off if things stay frozen.”

But, things aren’t staying frozen. This is why every summer, before the snow melts and the plants on the tundra begin to green, Oberbauer climbs behind the wheel of “Big Red” — a Ford F-350 Super Duty truck — and sets out north from Fairbanks, Alaska. The 10-hour journey is treacherous. The Dalton Highway is narrow with sharp curves. It snakes up steep hills and past snow-laced mountain ranges. Unpaved in parts, the road almost disappears into the landscape, giving way to gravel that’s full of rocks and potholes. It would be safer to find another route, but there aren’t any.

So, he drives through a wild land and all its wildlife. There is a moose standing at the edge of a bog, a lone caribou searching for lichens, a Dall sheep grazing on grasses. And always there in the background — behind the animals and stretching alongside the road — is the Trans-Alaska Pipeline.

Oberbauer drives hundreds of miles. He drives until “Big Red” is no longer red, but disguised in a layer of sand and mud. He drives until he reaches Toolik Field Station, nestled in the northern foothills of Alaska’s Brooks Range. There, work is waiting for him.

Oberbauer is principal investigator of the Arctic Observatory Network — one of the few projects funded by the National Science Foundation (NSF) to conduct research on the tundra ecosystem. Every year, the FIU team, which includes Oberbauer and post-doc Jeremy May, pick up where they left off the summer before.

They continue to capture the changes in the Arctic by documenting what’s happening to the tundra plant ecology. This data is extensive and long-term. It’s a legacy that will outlast them.

THE THAW

The Arctic tundra is essentially a vast frozen swamp that contains massive amounts of peat — dried, dead organic matter that contains a lot of carbon. For most of the year, this top layer stays frozen and plant growth is hindered by cold temperatures and limited nutrient availability. As temperatures rise and thawing begins, this organic matter decomposes, releasing greenhouse gases into the atmosphere. This triggers an endless cycle of warming.

“As it thaws, the environment warms up and you get more greenhouse gases. Then, it thaws even faster, which produces more greenhouse gases,” May said.

With a break from the colder temperatures, the plants are thriving. But, more green isn’t good.

Oberbauer was recently part of an international research team that found that tundra-dwelling plants are adapting to climate change by growing taller and with larger leaves. They looked at more than 55,000 plants in arctic and alpine regions, zeroing in on five traits: height, how many leaves they had and their size, how long leaves stayed on throughout the year, the rate at which they converted sunlight into energy and woodiness. Oberbauer believes the plant growth is a result of nutrients being released when the peat thaws and breaks down.

This presents an interesting dilemma: Can the increasing number of plants absorb enough carbon to counterbalance the amount being released?

Only time will tell.

Oberbauer’s research at Toolik will soon reach classrooms across the country. A video filmed by FIU photographer and videographer Timothy Long is now an educational resource through PolarTREC, a program that connects K-12 teachers and students with research happening in the Arctic.



Watch Video

OFF-BALANCE

What might be good for plants isn't necessarily good for an entire ecosystem. Oberbauer's research in the Arctic is also exploring how climate change impacts the timing of events in plants — when they flower, produce leaves, bear fruit and when the fruit is ripe. He believes these changes ripple outward.

Oberbauer co-authored a study led by the United States Forest Service that examined more than 10 years of data on the flowering times of more than 250 species from tundra environments. It found warming temperatures were causing plants to flower earlier than normal.

Plants and animals in cold regions take cues from weather and the day length to start their annual life cycles. Successful pollination relies on animals, including bees, beetles, birds and mosquitoes, being active at the same time plants are flowering. Shorter flowering time in the tundra could cause a mismatch if the animals are not following the same cues as plants. This could limit food availability and increase competition, impacting animals' abilities to survive.

"If the flower is coming out two weeks earlier, but the insect that pollinates that flower isn't coming out earlier also, then that plant isn't going to get pollinated," said Oberbauer. "If that plant doesn't get pollinated, it doesn't make fruit and so there's no fruit for the bears."

THE ESCAPE

Oberbauer first arrived in 1976 as a young undergraduate student from San Diego State University. Most of that first trip, he was locked away in a lab at the University of Alaska. By the end of the summer, he'd wasted away, losing so much weight he was all skin and bones. He was eventually diagnosed with Giardia, an intestinal parasite.

He almost convinced himself to never return. But, the following year, he went back. He escaped the lab and instead camped outside in a tiny, rustic field camp full of birdsong. Oberbauer helped conduct research on ecosystem models for the tundra that calculated energy, water and nutrient flow through the ecosystem. This experience changed everything. The Arctic became a wilderness wonderland to him. He fell in love. A love that's lasted more than four decades.

THE MIST

Clouds hang low, touching the tops of Brooks Range. Snow lays in a patchwork across the ground. Oberbauer appears in the distance. That tall, thin figure in the blue puffy jacket and baseball cap. He's a small speck in an expansive landscape, setting out to begin tracking plant progression over the summer.

Oberbauer and his team often have to hike several miles to reach the research sites. They will splash through frigid pools of melted snow. They will come across deep snow banks that swallow them up to their thighs. Using shovels, they will attempt to carve paths forward. Sometimes, the snow is piled too high and they turn back and find new routes. It is strenuous, exhausting work. Oberbauer moves with ease and determination.

When they arrive, Oberbauer and the team will walk the thin wooden planks that weave a way across the ground. This makeshift boardwalk protects the plants — because although they are hardy from surviving season after season in one of the harshest environments on earth, they are also incredibly fragile and delicate. Their duality mirrors the current state of our planet: Warming even by a few degrees can cause a catastrophic cascade of changes across the world.

The team sets a trolley-like machine called the Mobile Instrument and Sensor Platform (MIST) on a pair of steel coated wires floating four feet above the ground. It takes 20 minutes to complete the 50-meter journey across the plot. While it's moving, it's also gathering important data on the different plant species. The MIST is equipped with several different instruments: a thermal camera that looks at the plants temperatures, a 3D camera that measures their height and progression, as well as a camera that measures wave bands, or how the plants are absorbing and reflecting solar light — from UV to deep infrared light — which is key to understanding the overall health of plants. This data is then archived on an NSF arctic database.

These daily measurements are extremely valuable. They can tell how daily weather events have affected the plants and how they have greened up over the season. This is the best way to capture variations and understand what's driving the changes. NASA has shown interest in Oberbauer and the team's work with the MIST, because it's similar to what satellites are capable of doing, but the measurements happen over longer intervals and at a larger scale.



Oberbauer's first trip to the Arctic, 1977.



Oberbauer at Toolik Field Station, 2018

Oberbauer and the team have been taking these daily measurements since 2011. They have amassed so much data, it is too much for one team to sift through. But they aren't collecting this information for themselves.

"We collect more data than we could ever deal with at the moment, but it's for people in the future. It's for people 30 years from now, so they can look back on it as the baseline and see how things have changed," May said.

Future decisions on how the world will deal with a changing climate depend on this type of long-term data. Without it, there is no way to gauge how quickly changes are happening.

THE TIMES, THEY ARE CHANGING

From the tundra to the tropics, Oberbauer has spent his career studying climate change and how plants respond in these different areas. Since 1979, he's been measuring carbon balance in the Costa Rican rainforest, almost as long as he's been at Toolik. Wherever he goes, though, the message is the same: Things are changing. We're edging closer to a threshold that would be detrimental to cross. The signs are undeniable across the world — fires, floods, extreme weather events. As the temperature rises, the faster sea ice melts and glaciers shrink. This water has to go somewhere and South Florida is ground zero for sea level rise.

At times, the reality of climate change depresses Oberbauer, but he remains optimistic. He knows that humans have inherent talents and ingenuity to help solve the problem of our warming world.

That's why every summer he returns to Toolik. That's why he keeps working to record the changes that are happening. He'd like to use the data he's collected to create a tool to predict future changes, such as whether there will be more plant growth one year over the next.

He'd like to do the same thing with berries to forecast berry production.

He knows there aren't many 64-year-olds doing this type of research, but that never stops him.

"I love the work," he said. "It keeps you sane."

For as long as he can, he says he will return to his wilderness wonderland and continue tracking the changes in the Arctic. Because he knows one thing for certain: What begins there at the top of the world will ultimately end here.

And here is everywhere. ■

Biologist defies extremes to study climate change

Kelsey Reider's "Lower Ice Cave Lake" no longer has an ice cave.

That's because climate change impacts are early and severe in the high Andes Mountains.

Reider, who earned her Ph.D. in Biology from FIU and is currently a post-doctoral research associate, studied how frogs respond to temperature extremes, climate change and disease in the high Andes in Peru. She named a lot of the ponds and lakes after certain features in the glaciers as reference points, including "Lower Ice Cave Lake." In some cases, those glaciers are now gone.

"So much ice has been lost, I don't even recognize parts of my study site anymore," Reider said. "It's kind of crazy."

For three years, Reider lived and worked in her 4-foot by 7-foot tent. She had no electricity. No plumbing. No permanent cover. Conditions were extreme, so she spent two weeks in the city of Cusco and two weeks in Cordillera Vilcanota. Reider could easily get a sunburn in 30 seconds because, at 17,000 feet of elevation, the high Andes has half the atmosphere found at sea level.

As part of her Ph.D. research, Reider zeroed in on two species of frogs, including the marbled water frog and the threatened marbled four-eyed frog. Temperatures vary so much in the high Andes it's like summer every day and winter every night. Marbled four-eyed frogs seek refuge under rocks. The high Andes' glaciers are also melting, cutting off the steady water supply to the ponds, streams and wetlands where marbled water frogs live. They're moving up the snowy mountains, taking refuge in other bodies of water.

The frogs' survival tactics are working, for now. Eventually, they won't have anywhere else to go as the planet gets warmer. This, combined with the deadly amphibian chytrid fungus, could spell an unpromising future for frogs in the Andes.

"Even for people far away from the Andes, these frogs are sentinels for changes that will happen all over the world," Reider said. "A lot of the issues people face, wildlife faces too. For me, it's about using this story about frogs to communicate to people what will happen because of climate change."

I found my best friend in the Andes



Kelsey Reider went into the high Andes Mountains looking for frogs. She came home with a best friend.

While doing her research in the Andes, she met Karina, a spirited, fair-haired puppy who was a stark contrast to the timid, dark-haired wild dogs that populate the mountains.

Karina became increasingly attached to Reider. Eventually, the family who owned Karina allowed the dog to accompany Reider on her treks up the mountain. Karina kept Reider warm at night in exchange for ramen noodles — pretty much the only food Reider could haul with her.

After four months of camping together, Reider and Karina formed an unbreakable bond. The biologist worked up the courage to inquire if she could keep the dog, asking the family to name their price. They agreed to a trade — the dog for a stove. The family only wanted a simple upgrade, so Reider purchased a two-burner cooking stove and even threw in a couple of tanks of fuel.

Reider has since returned to South Florida. Karina came, too.

Reider followed USDA guidelines for Karina's relocation to the United States and stressed over transporting her beloved companion as cargo. She begrudgingly purchased a crate and decorated it with pictures, little cut-out hearts and adoring phrases in Spanish, just so any cargo handler would know Karina was truly loved. After two years, Karina has acclimated to living near sea level and the subtropical weather of Ft. Lauderdale.

The human-canine duo is as close as ever. For a dog who developed dental issues as a mountain puppy, Reider lovingly refers to Karina in Spanish as "Boca Sucia" or "Dirty Mouth."

"I see a lot of dentist bills in my future," Reider said. "I work hard so she can have a good life."

Nature offers most COST-EFFECTIVE SOLUTION FOR CLIMATE CHANGE

Restoring seagrass meadows, mangrove forests and salt marshes could play a big role in reducing global warming, according to a study conducted in part by FIU marine biologist James Fourqurean.

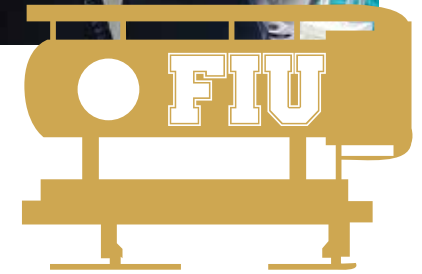
Most people thought carbon was stored in forests, said Fourqurean, director of FIU's coastal oceans research programs. Fourqurean and researchers from The Nature Conservancy discovered that coastal wetlands including seagrasses have more carbon per area than forests. Yet, we're losing coastal wetlands faster than we're losing forests.

These coastal wetlands are not the only important ecosystems. Combined with forests, farmland and grasslands, scientists have found nature could store as much as 22 percent of the annual carbon emissions in the United States, according to the study. The findings offer the most comprehensive assessment to date of how greenhouse gas emissions can be reduced by nature. It is the first study to include coastal wetlands and grasslands alongside forests and agriculture.

NEEMO XXIII is the first Aquarius saturation mission since 2017's Hurricane Irma



A crew of NASA aquanauts installed coral nursery trees near Aquarius that are populated by two species of coral listed as endangered by the International Union for Conservation of Nature.



An all-female astronaut and science crew descended on Aquarius for a 10-day training mission to prepare for future deep space missions and assist with ocean conservation.

NASA's Extreme Environment Mission Operations (NEEMO) is the 23rd in the history of Aquarius but the first since Hurricane Irma idled the world's only undersea research laboratory in 2017. NEEMO 23 focused on exploration spacewalks and training for missions to the moon and Mars. As an analogue for future planetary science concepts and strategies, the crew also installed a coral nursery for a research initiative in the FIU Medina Aquarius Program led by FIU marine sciences associate professor Mauricio Rodriguez-Lanetty.

The crew of aquanauts installed coral nursery trees near Aquarius that are populated by two species of coral listed as endangered by the International Union for Conservation of Nature. Researchers from Rodriguez-Lanetty's Integrative Marine Genomics and Symbiosis Lab will spend the next four years studying the effects of nearby

fish communities on the composition, function and health of the corals and their interactions with assemblages of microorganisms and algae in the area.

"The results of this study will help to inform conservation and restoration efforts in the Florida Keys and beyond," said Riley Hatch, an FIU marine sciences graduate student who is leading the project Rodriguez-Lanetty's lab.

After the study concludes, the corals will be planted on surrounding reefs to improve the genetic variation in the area and increase coral presence in this critical ecosystem.

It is not the first time Lanetty and his students have worked with NASA to advance coral conservation initiatives. His lab has partnered with NASA on multiple NEEMO missions in which the astronauts-turned-aquanauts provided in-the-water research support during their training missions. The Medina Aquarius Program is a signature component of coastal oceans research in the FIU Institute of Water and Environment in the College of Arts, Sciences & Education.



Fins from threatened shark species seized by border control in Hong Kong. Photo courtesy of Diego Cardeñosa.

By JoAnn C. Adkins

Despite international protection, threatened species of sharks continue to be found in the Hong Kong fin trade.

A collaborative team from the United States and Hong Kong, led by FIU Marine Scientist Demian Chapman, conducted genetic analyses of 9,200 shark fin by-products. They found several threatened species remain common in the fin trade one to two years after being listed on the Convention on International Trade in Endangered Species of Wild Fauna and Flora. CITES is an international agreement protecting animals and plants from over-exploitation in international trade. Hong Kong is one of the world's largest importers of shark fins, which are used to make the delicacy shark fin soup. The study, published in *Conservation Letters*, is the first assessment of the species composition of the fin trade after CITES regulations were put in place for commercially important shark species.

Since September 2014, CITES has regulated scalloped hammerheads, smooth hammerheads, great hammerheads, oceanic whitetips, and porbeagle sharks, some of the world's most vulnerable and highly traded shark species. It requires permits to ship products from these sharks from country to country. From February 2014 to December 2016, the research team surveyed small scraps from processed imported fins — when the skin, meat and cartilage is trimmed off. They conducted DNA testing

THREATENED SHARKS STILL COMMON IN FIN TRADE

How to improve shark fin inspection:

- Scale up inspection capacity by employing additional inspectors
- Improve inspection efficiency by centralizing ports of entry for fins and conducting real-time DNA testing in the field
- Conduct assessments to flag high-risk shipments to prioritize inspections

on randomly selected scraps to look for CITES-listed species.

Among the species found, scalloped and smooth hammerheads represented the fourth and fifth most common species found in the survey that included 82 species and species groups in total. Although the research team can't rule out some delayed processing of fins, the disconnect between reported imports and how common these species were in the survey suggests that major under-reporting of CITES imports is occurring. The findings are consistent with other studies showing compliance with CITES regulations is relatively low during the initial phase of implementation.

"It is great that there is now a system in place to monitor trade in these threatened shark species," Chapman said. "But listing them is just the first step. Our study highlights that countries fishing, trading, and consuming shark products all have a lot of implementation work to do."

The team made some practical suggestions on how to improve inspection efficiency so that shark-importing nations like Hong Kong can better meet their obligations to CITES. Hong Kong has been successful in its implementation efforts — hosting nine CITES workshops for enforcement officials, which led to the seizure of 5.1 metric tons of fins from listed species since late 2014.

Scientist champions conservation of **NEGLECTED PREDATORS**

Some of the world's most threatened rays and sharks are one step closer to being saved.



Guy Fieri takes dive with FIU researcher for Shark Week

FIU marine scientist Mark Bond went free diving in a shark feeding frenzy for Discovery Channel's "Shark Week."

Bond joined celebrity restaurateur Guy Fieri in the Bahamas where warm waters are home to bull, Caribbean reef, hammerhead, lemon, tiger and oceanic whitetip sharks. Bond talked with Fieri about what sharks eat and the mechanics of how they eat.

That's a lot of culinary ground to cover since different shark species have different appetites and feed differently. They also created a shark feeding frenzy to see how sharks feed in large numbers.

Eighteen species of wedgetfish, guitarfish and mako sharks were listed for expanded conservation by the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) at the 2019 conference.

The governments of Senegal and Sri Lanka proposed listing giant guitarfish and wedgetfish. The government of Mexico proposed listing the shortfin mako shark and longfin mako shark in CITES.

FIU marine scientist Mark Bond was a key contributor to the successful campaign. Bond helped collect and analyze the data supporting Senegal and Sri Lanka's proposals. He helped authorities in Mexico organize regional workshops and gain support for its proposal.

"These developments are a significant step toward regulating highly traded, commercially valuable species," Bond said. "In some countries, this is the first piece of management for shark and ray fisheries. Given the strength of CITES legislation countries are mandated to implement, the hope of ensuring the sustainability of these species rests with CITES."

Guitarfish and wedgetfish are highly prized and traded for their fins. Mako sharks are targeted by sport and commercial fisheries, and they are often killed as bycatch in fishing lines intended for other fish. Despite their value and declining populations, these ray and shark species have little or no international management.

Bond has dedicated his career to studying the distribution, abundance and behavior of sharks and rays and whether they benefit from marine protected areas. His efforts have been instrumental in obtaining protections through international treaties. In 2016, he was part of an international effort to have four shark species and nine mobula rays added to the CITES list of protected species.

TACKLING THE PLASTIC PROBLEM

By Angela Nicoletti

The world's oceans are under invasion by a virtually indestructible enemy. From coastlines to the middle of the sea — floating along the tops of waves and hidden deep beneath the surface — it's there in its many forms. Plastic bags, plastic bottles, plastic food wrappers, plastic straws. One word: *Plastics*. Every year, an estimated 8 to 12 million tons end up in the ocean.

FIU and the International SeaKeepers Society have joined forces to combat this plastic problem. As part of a new collaborative project, dubbed the S.A.R.A.H. initiative, privately owned yachts become platforms for FIU scientists to conduct field research. Special nets are towed behind the vessels to gather samples of plastic debris in the water.

"Our relationship with SeaKeepers opens up access to areas of the ocean our researchers wouldn't normally have access to, because of the cost," said Mark Bond, an FIU marine scientist and lead on the SeaKeepers partnership. "This means we can spread our research dollars further and get more data to better map the type and scale of contamination."

The S.A.R.A.H. nets are not like traditional nets. They can collect even the tiniest bits of plastic — that can be smaller than a grain of rice — known as microplastics. Because it never decomposes, plastic tends to become a shape shifter. Tossed around in the ocean or exposed to the elements, larger fragments break down into microplastics. These little pieces pose a huge problem. Mistaken for food, they are regularly consumed by marine life. Studies have discovered that fish, seabirds and sea turtles all ingest plastic.

S.A.R.A.H. isn't just a name. It's also an acronym for the process to end this epidemic — sample, aggregate, return, analyze, help. After samples are collected in the nets, they are packaged and shipped back to FIU researchers for examination.

Whether they began as a plastic bag or bottle, these plastics cannot hide their original forms from FIU researchers. All plastic is made up of hydrocarbon polymers.

These polymers and an assortment of added chemicals are combined in countless ways to create different variations from polyester clothing to acrylic paints and water bottles. In the lab, samples are tested to pinpoint the type of plastics that are plaguing our oceans and the findings are archived in an online database.

The first S.A.R.A.H. expedition to Cuba recently concluded. The samples were full of microplastics and preliminary analysis revealed that the overwhelming majority were polyethylene (used to make plastic grocery bags) and polypropylene (bottle caps and rope).

"If we can paint a picture of what kind of plastics are being found throughout the world's oceans, we can help in the regulation of certain industries," said Tony Gilbert, program director of SeaKeepers. "This has already happened with sunscreen. Some states have banned the sale of sunscreens with chemicals that are bleaching and killing our corals reefs."

SeaKeepers supports oceanographic research and conservation by inviting scientists to conduct research and education from the yachts.

Plastic may be forever, but it doesn't have to be forever in the ocean. Data can be the foundation for future policy decisions that can ensure the ocean is home to more marine life and less plastic.

 **8-12**
million tons
of plastic end up
in the ocean
every year

To learn more about the S.A.R.A.H. Initiative and how you can join us in combatting the oceans' plastic problem, contact gillrodr@fiu.edu or call 305-299-0765.

No relief for reefs — even in the 'twilight zone'

Deep coral reefs provide shallow hope for near-surface reefs in need of recovery, new findings suggest.

A team of researchers including FIU marine biologist Yannis Papastamatiou explored reefs to test a widely held hypothesis that climate-stressed life from shallow reefs can take refuge at depths from 100 to 500 feet beneath the ocean's surface.

The results are clear: deep and shallow reefs are actually different systems with their own species, and deep reefs are just as threatened by climate impacts, storms, and pollution as their shallow counterparts.

700 sharks, 6 divers, 1 feeding frenzy

FIU marine biologist Yannis Papastamatiou joined an international team of researchers off Fakarava in French Polynesia to study one of the largest schools of sharks at night when they are most active and hunting for National Geographic's "700 Sharks."

Photo courtesy of Laurent Ballesta



Researcher tracks feisty gamefish for conservation

Anglers love to catch crevalle jack because they are big, move fast and put up a great fight. Guides rely on them as a backup if they can't find bonefish or tarpon. Now less and less of these jack fish are being caught.

Carissa Gervasi wants to help. A Ph.D. student in the Department of Earth and Environment, she is studying the effectiveness of marine reserves in Florida Bay protecting and restoring populations of the apex predator.

Heatwave devastates wildlife populations in World Heritage Site

Large numbers of dugongs, sea snakes and other marine animals disappeared from the UNESCO World Heritage Site in Shark Bay, Western Australia, after a heat wave devastated seagrass meadows, according to recently released research.

Population loss — whether an animal starved or left — varied from species to species, said Rob Nowicki, an FIU alumnus and postdoctoral research fellow at Mote Marine Laboratory.

Nowicki conducted the research along with College of Arts, Sciences & Education Dean Mike Heithaus. For more than 20 years, Heithaus has led the most detailed study of the ecological role of sharks collecting extensive data that provided the perfect baseline to assess the impacts of the extreme climate event.



Crabs, lobsters and shrimp now have A FAMILY TREE DATING 500 MILLION YEARS

Researchers have for the first time traced the roots of crabs, lobsters and shrimp to create the family tree of crustaceans people love to eat. The tree shows the 450-million-year evolution of these 10-legged decapods, when lobsters and crabs each diversified from a single evolutionary origin. Groups of shrimp evolved earlier.

The findings are part of a massive family tree project where researchers resolved the deep evolutionary relationships between crabs, shrimp and lobsters. The discoveries made by analyzing more than 400 genes from 94 species could also inform conservation policies to ensure their longevity.

"Understanding the origins of biodiversity across half a billion years in groups that are extremely ecologically and economically important is fascinating," said FIU marine sciences professor Heather Bracken-Grissom, the anchor author of the study. "This is extremely important since studying and preserving biodiversity needs to be at the forefront of our efforts in the biological sciences and across humanity."

The boom of diversification for crabs, lobsters and shrimp may coincide with the spread of modern reef-building corals, Bracken-Grissom said. It is possible the emergence of reef-building corals provided new habits for decapods to colonize and diversify, leading to the emergence of several new lineages after the mass extinction of life on Earth 250 million years ago.

LIFE-SAVING STORM SURGE MODELING

deployed in Hispaniola

The island of Hispaniola, a frequent target of hurricanes, is now armed with an operational system to improve early warnings for storm surge thanks to a research team from FIU and the National Oceanic and Atmospheric Administration's National Hurricane Center (NHC).

FIU and NHC were awarded the Outstanding Achievement Award for this effort during the 2019 U.S. National Hurricane Conference in New Orleans. The award recognizes an innovative achievement for a hurricane-related activity that can serve as a model to others. In the case of the storm surge project for Hispaniola, a Caribbean island shared by Haiti and the Dominican Republic, the team created a model factoring in the expected tide at a storm's landfall with the atmospheric pressure and wind characteristics of the oncoming weather system. It also builds in major coastal topographic features as coastal ridges and barrier islands, which are crucial to improved impact mapping and risk forecasts.

The storm surge model will help government agencies in the Caribbean Basin and elsewhere make informed decisions when hurricanes approach, including more refined evacuations. The researchers' ultimate goal is to save lives, according to Earth and Environment Professor Keqi Zhang, a researcher in FIU's Extreme Events Institute. The project received funding from NOAA and the U.S. Agency for International Development's Office of U.S. Foreign Disaster Assistance.

"For decades, storm surge has devastated countries and caused needless loss of life," said NHC Director Ken Graham. "While teams of experts and humanitarian organizations tried and tried to find a way to cut deaths, nobody could break through. Via FIU's innovative and bold efforts, this team managed to do what others could not — deliver actual capacity."

Coastal communities and island populations in hurricane zones are highly vulnerable to the surge often created by tropical storms and hurricanes. Nearly half of all hurricane-related deaths result from storm surge. Wind accounts for less than 10 percent. Better storm surge predictions can save lives. In this joint FIU-NHC breakthrough, the research team combined hydrodynamic modeling technology with low-cost satellite data to improve coastal risk mapping — and did so at a 92 percent cost savings compared to traditional methods.

The team is now working with other countries including Mexico and Belize to implement the same technology and method.

#INAFLASH

Pallab Mozumder

Economist, Department of Earth and Environment, Department of Economics.

Claim to Fame

An affiliate of the Institute of Water and Environment, he's making the responses to natural disasters less chaotic.

Say what? Mozumder

secured \$2 million from the National Science Foundation to help government agencies, utilities and people make better decisions as they work to recover.

How will that work? He

and his researchers will develop a mobile app where people can report which roads are blocked or which supermarket has food and water available. It will also help pair neighbors who have generators or gas grills with those who have fuel or food.



WORLD'S FROGS UNDER ASSAULT

BY LONE PATHOGENIC KILLER, SCIENTISTS SAY

By JoAnn C. Adkins

The fungal disease — chytridiomycosis — has been found on all seven continents and is associated with mass die-offs among 501 species of frogs and other amphibians in the past half century, according to biologist Alessandro Catenazzi of FIU's Tropical Conservation Institute. As a member of the international research team that produced the global assessment, Catenazzi said researchers had observed these catastrophic die-offs in their respective regions of the world, but this is the first time a global impact of this invasive disease has been put forth. Aside from the 90 species reportedly extinct, Catenazzi said 40 percent of the other impacted species continue to experience population declines. Only 12 percent of the impacted species have shown signs of recovery.

"We don't have any other example of infectious disease-causing biodiversity loss at any comparable scale," he said.

Chytridiomycosis can cause a variety of effects, but the most deadly is the thickening of a frog's skin which blocks the animal from keeping its blood mineral salts and water in balance. It can also disrupt skin respiration which in many amphibians is as important or more important than breathing. The chytrid fungus also produces toxins that paralyze white blood cells, thus impairing immune response of infected amphibians.

Catenazzi spends much of his time in the field exploring the slopes along the Amazonian Andes of Peru, which just happens to be the most diverse area for amphibians globally. He has long known that fungal diseases are increasingly threatening animals and plants — something he has witnessed up-close in his work. He also knows that as global travel increases and more people encroach into natural areas, these movements only serve to spread these diseases. The researchers say many of the impacted species are still at a high risk of extinction in the next 20 years due to ongoing population declines caused by the disease.

"It's really hard to remove chytrid fungus from an ecosystem — if it is in an ecosystem, it's pretty much there to stay unfortunately," said lead researcher Ben Scheele from Australian National University. "This is partly because some species aren't killed by the disease."

The researchers argue significant reductions in wildlife trade are needed to help slow the spread of chytridiomycosis and new technologies are needed for monitoring species recovery in the hopes of finding new ways to mitigate the deadly disease.



A fungal disease has wiped out 90 species of amphibians

FIU's Tropical Conservation Institute is fighting to save threatened and endangered species.



The year of red tide

In 2018 Florida red tide raged across the peninsula. FIU scientists including Thomas Frankovich, Jose M. Eirin-Lopez and Kathleen Rein were quick to respond, studying the effects of *K. Brevis* on people and the environment.

Before Hurricane Michael carved a path up the Gulf of Mexico and through the heaviest concentration of red tide, FIU convened a panel of cross-disciplinary experts to help the community learn about what causes Florida red tide and how it affects the environment, health, business and tourism.

Frankovich announced he had found a different type of red tide in a canal in the Florida Keys. Eirin-Lopez was studying how toxins from red tide might affect the DNA of marine life. Rein had begun developing a more effective treatment for manatees affected by red tide. And scientists from the Institute of Water and Environment also deployed a research buoy near FIU's Biscayne Bay Campus to monitor conditions in light of the outbreak in Miami-Dade County.

The red tide outbreak ultimately subsided. Whether it returns — and how strong — could very well depend on how people react.

If people can limit nutrients floating into the water, we can address an important factor feeding the lake, Eirin-Lopez said.

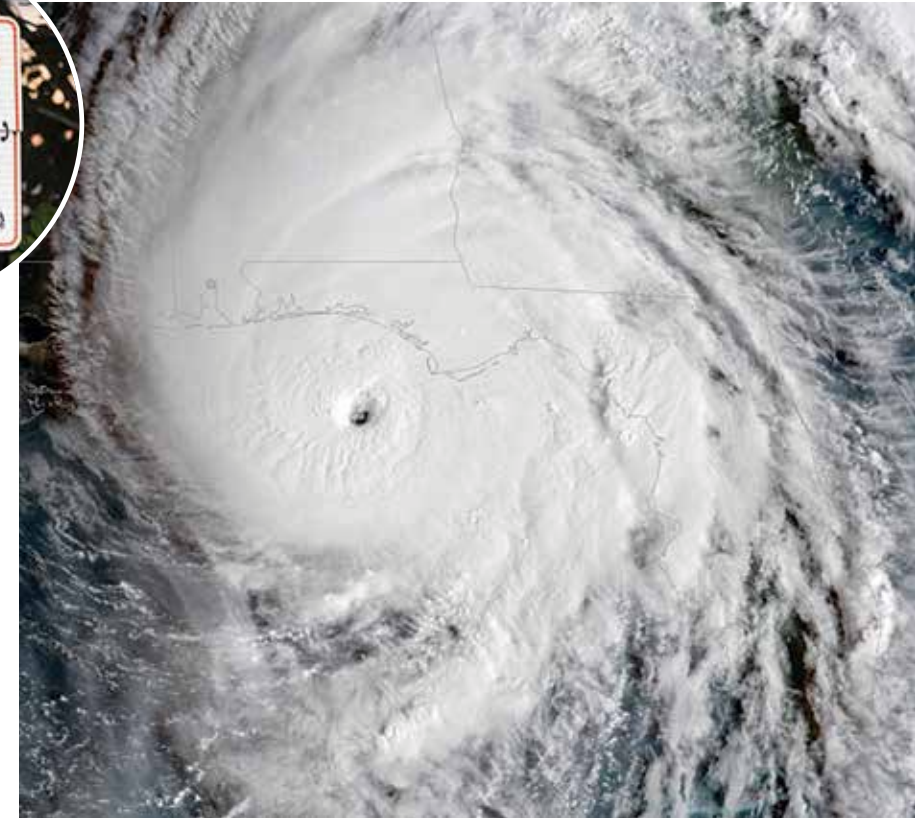
Hurricanes remind us sand is not a renewable resource

Hurricanes Florence and Michael changed coastlines in 2018 as beaches and dunes were overrun by waves, or in some cases, completely eroded.

Typical recovery plans call for large-scale beach nourishment and dune construction to protect areas behind the beach from future erosion and flooding. A study by FIU coastal geologist Randall Parkinson suggests this practice will become even costlier as the availability of sand dwindles.

"Sand is not a renewable resource," Parkinson said. "When sand is eroded from the beach during a storm, it typically accumulates in offshore areas as a very thin layer that can't be dredge again to construct a new beach or dune."

Depending on sea level rise, the cost to nourish beaches for the next 84 years just in the Florida panhandle could one day exceed \$72 million per year.



MAKING HURRICANE

INTENSIFICATION LESS UNPREDICTABLE

FIU meteorologist Haiyan Jiang is working to make the unpredictable predictable.

Using passive microwave satellite observations, Jiang has developed an algorithm that can help predict the onset of rapid intensification of major storms. Forecasters at the National Hurricane Center and the Navy's Joint Typhoon Warning Center are now using her data throughout the hurricane and typhoon seasons to improve storm modeling.

In 2018, the algorithm helped the National Hurricane Center predict Hurricane Michael's last intensification period. The deadly storm had at least seven 24-hour rapid intensification periods.

Jiang explained that nearly every storm experiences a period of rapid intensification — when maximum sustained winds increase at least 35 mph in 24 hours or less. However, Michael had three such periods in three days, going from tropical depression to a major category 5 hurricane.

"This is definitely not normal," Jiang said. "The environment was somewhat favorable, but not consistently favorable. Although the sea surface temperature in the Gulf had been warmer than the average, the shear was high initially which led to a gradual, instead of rapid, intensification forecast until the shear decreased Monday morning."

GUILTY UNTIL PROVEN INNOCENT:

police perceptions affect investigations

By Ayleen Barbel Fattal

When an investigator believes an innocent person is guilty, a wrongful conviction is a real possibility, researchers find. Research by FIU legal psychologist Steve Charman found that detectives and police officers who believe a suspect is guilty — based on their knowledge of certain evidence — tend to view additional evidence as more incriminating than it actually is, further increasing their belief in the suspect's guilt.

"We found police officers' evaluations of evidence were related to their initial beliefs in a suspect's guilt," Charman said. "The more likely they were to believe the suspect was guilty, the more incriminating they perceived subsequent ambiguous evidence to be, creating a bias snowball effect."

This is the first study to examine this bias snowball effect on the evaluation of evidence among experienced police officers.

Participants read about a crime that contained either incriminating, exonerating or neutral evidence against a suspect. They were asked how likely the suspect was to be guilty and then evaluated four pieces of evidence: the suspect's alibi, a comparison of handwriting samples, an informant's testimony, and a comparison between a facial composite and the suspect.

Results showed the more strongly the police officers initially believed the suspect to be guilty:

- The more they believed an informant's testimony;
- the more similar they thought the suspect looked to a facial composite of the criminal;
- the more similar they thought the suspect's handwriting was to a handwriting sample left at the crime scene.

According to the National Registry of Exonerations, there have been 2,285 exonerations since 1989. Of those, 52 percent were due to misconduct by police, prosecutors or other government officials while 24 percent were due to false or misleading forensic evidence.

Charman's study supports prior research which suggests that certain people in the legal system, such as forensic examiners, should be kept blind or unaware of certain case details in order to eliminate bias. However, his study showed this bias also exists in police officers and detectives — investigators who cannot reasonably be kept blind to case information. Charman says more research is needed to develop strategies that may mitigate these biases instead of just identifying them, especially for police officers and detectives.

“ The more likely they were to believe the suspect was guilty, the more incriminating they perceived subsequent ambiguous evidence to be, creating a bias snowball effect.

—Steve Charman



COGNITIVE INTERVIEW dredges up details



FIU psychology professor Ronald Fisher, one of the leading investigative interviewing researchers in the world, created the cognitive interview as a way to draw out more details from witnesses' memories. He has trained investigators from a variety of federal agencies including the FBI.

Fisher's research was cited by Rachel Mitchell during questioning of Christine Blasey Ford in the Brett Kavanaugh Senate Judiciary Committee hearing, pointing out the value of the interviewing technique in helping witnesses recall details that they have forgotten.

According to research conducted on cognitive interviews, the technique can generate up to 60 percent more information than a traditional interview. Investigators trained to conduct cognitive interviews ask as few questions as possible. Witnesses can provide long narrative responses that contain more information without the anticipated interruptions of a question-and-answer format.

"The cognitive interview is the most empirically validated, used and trained witness interviewing approach in the world," said FIU legal psychologist Nadja Schreiber Compo during a recent conference honoring Fisher and his impact on the field of investigative interviewing.

Today, Fisher's technique is used by the FBI; National Transportation Safety Board; Bureau of Alcohol, Tobacco, Firearms and Explosives; the United States military; national security agencies and others.

PSYCHOLOGY RANKED NO. 9
in the nation for research funding
by the National Science Foundation



#INAFASH

Yanet Ruvalcaba
Psychology Ph.D. student

Claim to Fame
She's advocating to protect victims of nonconsensual pornography.

Say what? Ruvalcaba and her advisor Asia Eaton conducted a nationwide survey in partnership with Cyber Civil Rights Initiative. They found 1 in 12 respondents have been victims of nonconsensual porn. Typically, the person sharing the sexually explicit material without permission was someone known to the victims and more often than not, was a current or former intimate partner.

What is next? Passing a national law criminalizing nonconsensual porn is an important part of the picture, but a cultural shift in the narratives around this form of violence is necessary. They say more research is needed to better determine the actual harms inflicted upon survivors as well as the motives and characteristics of perpetrators.

SEXUAL HARASSMENT IS ANOTHER BARRIER FOR WOMEN IN STEM

Subtler forms of harassment erode women's feelings of legitimacy in physics



Having more female physics majors, empowering them and supporting them are ways to begin changing the culture.

By Chrystian Tejedor

In a survey of undergraduate women studying physics who were attending professional conferences across the country, 74.3 percent said they experienced forms of sexual harassment in their physics communities including gender harassment and unwanted sexual attention. Other studies showed a lower incidence rate across academia.

"What we did find was that the most impactful forms of harassment were forms that are maybe considered the least extreme," said Zahra Hazari, a co-author of the study and associate professor of science education at FIU's STEM Transformation Institute. "The underlying cultural current has people

making sexist comments or implying women are not as good, which makes you feel you're not good enough all the time."

Often, women live with the subtlest, most pervasive forms of sexual harassment, researchers said. The study found this behavior erodes women's confidence in their ability and sense of belonging, which makes it much more likely for them to switch majors.

Having more female physics majors, empowering them, and supporting them are ways to begin changing the culture, according to the researchers. It's something Hazari is working on. She's leading an effort to increase the number of female physics majors in a coordinated campaign with high school physics teachers nationwide. If the initiative is successful, it could change the face of physics in the United States.

"Having experienced it, I know it's something you live with day-to-day. It happens frequently in different forms — your contributions not being taken seriously or people not including you in conversations or just being treated slightly differently," Hazari said. "This is why I do what I do. I don't want other women to face these barriers and experiences trying to pursue their dreams."

The researchers recommend hiring diverse women faculty and graduate students in physics to help create opportunities for social support across underrepresented groups in a field traditionally dominated by men.

Universities and colleges should create and publicize professional codes of conduct that identify and promote behaviors that increase collaboration, inclusion and problem solving. They should also speak directly against sexual harassment and move quickly to handle cases of sexual harassment by focusing first on the needs of the victim, not trying to rehabilitate the alleged perpetrator.

REBEL WITH A CAUSE



By Chrystian Tejedor

A little rebellion does a lot to improve education. James Burns learned this simple truth 22 years ago. It was the first day of his first teaching job. He was a paraprofessional working with special needs children from kindergarten through fourth grade. A young boy was about to give Burns a crash course in rebellion.

The boy was growing frustrated with his math assignment. He told Burns "I can't do this. I don't want to be here." Burns, a former U.S. Marine, pulled him aside. Instead of giving him the drill sergeant treatment or worse — adhering to a zero-tolerance disciplinary policy on disruptive behavior — Burns talked to the boy.

"To meet behavior or a situation with immediate push back, causes more push back," Burns said. "When you can tell a kid is getting spun up, you have to back away from it."

Today, Burns is a world away from the small elementary school at Joint Base Pearl Harbor. He is an assistant professor of curriculum and instruction in the College of Arts, Sciences & Education. He teaches those who want to teach how to teach. He also teaches them to rebel.

Burns thinks there's no way for schools to achieve the impossible mission imposed on them by politicians who wonder why they fail. After all, Burns said, it's unrealistic to expect schools to educate a workforce, end racism and educate people out of every life situation. He explored the subject in *Rethinking Curriculum as Counter-Conduct and Counter Politics*, winner of the American Educational Research Association's 2018 Outstanding Book Award.

Still, Burns wants his students to be properly prepared to enter a classroom like he was prepared before starting his career in Hawaii. He is part of the movement at FIU to transform teacher education. He wants his students to know what they're in for and how to manage a classroom. He also wants them to be nimble and revel in the unexpected moments that make teaching exciting.

For instance, when Burns was teaching high school in Virginia, a student questioned why she needed to learn trivial details about U.S. government. Realizing she had the potential to do more than memorize facts, Burns did something he wasn't supposed to. He offered her an independent study and had her present alternative models for local government at the end of the year.

"The way we teach teaches things," he said. "I don't want to go along and perpetuate things. I want to cultivate people who are thinking, truly thinking outside the box."

As for taking his own advice, Burns continues to rebel. When starting a new course recently, Burns was given a ready-made syllabus detailing the assignments his students were to complete. He threw it out.



#INAFASH

Bianca Falcon and Ashley Herrera

Recreational Therapy majors

Claim to Fame

They organized Sweat for a Cause.

Say What? During an internship with the Therapeutic Recreation Department at Jackson Rehabilitation Hospital, the duo organized the exercise benefit class that raised money for buying adaptive equipment and supporting programs offered by the department. They partnered with Redbike Studios Miami and Club Pilates in Brickell to host a fun fitness event featuring a 30-minute cycling class followed by a 30-minute mat Pilates class.

How do these events help?

They educated participants about recreation therapy and advocated for people with disabilities. The more they advocate for recreation therapy within the community, the more it becomes understood and respected.

NEW DNA TEST STOPS ILLEGAL SHIPMENT OF ENDANGERED EELS

New method to identify illegally trafficked European eels led to the arrest and prosecution of smugglers in Hong Kong.

By JoAnn C. Adkins

A new DNA testing method has proven to be quick, highly accurate at detecting protected wildlife, easy to administer and cheap, costing about \$1 per sample. It was originally developed to help customs officials identify protected shark species for fins and other shark meat passing through borders. Initially deployed in Hong Kong, customs officials there advised they also needed help identifying illegal shipments of the critically endangered European eel (*Anguilla anguilla*). Within weeks, the researchers were able to replicate the testing method for the eel, according to FIU marine scientist Demian Chapman, one of the developers of the testing method.

"This test works for anything with DNA," Chapman said. "The endgame for us is that this technology will be at every border checkpoint in the world."

The European eel is currently listed in Appendix II of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). That means any trade of the species requires permits certifying traded specimens were legally caught and traceable through the supply chain. The traceable part has been one of the biggest challenges for customs officials. Many European eels are traded as juveniles, making

them hard to identify because many species look the same at this stage. This new testing method uses a quick DNA test developed by the research team.

The test can identify a species from a processed meat sample, living specimen or even the water they are transported in, picking up environmental DNA left behind by the animal. Any customs officer can quickly test dozens of items in a shipment. If DNA of a European eel is identified from countries where export is illegal, it's enough evidence for authorities to detain suspected smugglers, seize shipments and pursue a more in-depth investigation, including confirmatory testing in a lab.

The researchers are already working with countries in Latin America to test for illegally trafficked sharks and continue to develop new sets of primers in anticipation of more shark species gaining protection under CITES.

"At the end of the day, it's all DNA," Chapman said. "We always knew there was a need for this for sharks, but we also know this mirrors a need for other wildlife. For us, it has always been about getting the technology at the borders for sharks and then see what else it can be used for."



#INAFLASH

José R. Almirall

Director, Center for Advanced Research in Forensic Science

Claim to Fame

Named by the National Science Foundation as one of eight Hispanic scientists who is a national leader in his field.

Say What? From helping bring criminals to justice, to developing the latest technology in forensic chemistry, Almirall has led the charge for innovation and standardization in forensics. He has testified in more than 100 criminal cases prior to his academic appointment at FIU in 1998. Almirall has mentored more than 50 graduate students and post-doctoral fellows in forensic chemistry research over the last two decades. His research group has received three patents based on air sampling devices designed to detect drugs and explosives in air, and he leads a scientific committee sponsored by the National Institute of Standards and Technology that aims to improve the standardization of forensic chemistry methods.

What's next? Almirall was recently appointed to a new federal technology working group at the Department of Justice and the National Institute of Justice – an effort to create an effective network of crime labs across the country.

The research is supported by the **Paul G. Allen Family Foundation** and conducted in collaboration with the **Agriculture Fisheries and Conservation Department in Hong Kong**.

FIU helps Moroccan forensic lab earn its first international accreditation

Morocco has earned its first international forensic accreditation with the help of the National Forensic Science Technology Center (NFSTC) at FIU.

Forensic scientists from the Management and High Throughput Genotyping Unit of the Directorate General for National Security Police Scientific Laboratory in Casablanca trained with NFSTC through a 12-month grant from the U.S. Department of State Bureau of International Narcotics and Law Enforcement Affairs.

The lab is home to the only DNA databasing unit in Morocco and controls the uploading of genetic profiles that could lead to the identification of suspects in criminal investigations.

Making the undetectable **DETECTABLE**

Julian Mendel is among a group of researchers at FIU's International Forensic Research Institute who have invented the portable Venturi vacuum device. It can collect touch DNA left behind at a crime scene, pollen from fabric and even fungal pathogens inside trees. Ideal for crime scene investigations that currently rely on rudimentary cotton swabs, the Venturi vacuum device does not require electricity to retrieve previously undetectable trace evidence. It also offers a solution for industrial operations searching for a better way to retrieve hard-to-collect materials.





#INAFLASH

Haydee Borrero
Ph.D. student

Claim to Fame

She found fly larvae in Cuba.

Say What? This was the first time larvae from a specific fly was found on a very rare Mule Ear Orchid on the island, giving researchers another way to gauge the effect of climate change.

What does this mean

for South Florida? Now researchers have a way of anticipating what will happen to the flies and Mule Ear Orchids that have made their home in the salt marshes of Florida's Everglades National Park. As the climate continues to change, so could the flowering time of the orchid. Flies might miss their chance to lay their eggs in the plant's stalks, leading to a boom in the number of orchids because larvae won't be there to consume the plant. Rising temperatures might also push the orchid farther north into other parts of the state.



LET SLOW-GROWTH FORESTS RECOVER before logging once more

Loggers need to control their appetite for slow-growing trees to spare the Amazon rainforest from deforestation.

A new study by Ph.D. student J. Aaron Hogan points to changes in tree composition in a long-term study site in French Guiana to sound the alarm.

Demand for dense, slow-growing tropical hardwoods has ballooned over time. In 2015, more than 4.2 million square feet of tropical timber was harvested, up from the 2.7 million square feet harvested in 2007, according to the study.

The wood, primarily from the South American Amazon, feeds a global industry that benefits timber processors in Asia and its ultimate consumers in the United States and Europe.

If loggers were to return to a particular area too quickly, it could put a strain on the tree species they covet the most.

"We want to use long-term data to inform their practices," Hogan said. "We think it can be done in a good fashion that creates jobs and creates resources that can be used by people. We just need to make sure we're not logging too quickly."

Hogan, who was one of only 70 students chosen to participate in an exclusive U.S. Department of Energy research program, co-authored the study with International Center for Tropical Botany Director Christopher Baraloto and an international team of researchers.

Local conditions shape plant communities

The local environment plays a key role in determining what kinds of plants grow there, according to a new study that could change how threatened species are managed.

FIU botanist Christopher Baraloto and a team of researchers found local conditions, including soil, the interaction of plants and animals, and disturbances, are more important than climate and other landscape conditions in the development of plant size, leaf size, leaf shape and other traits. The information refines scientists' ability to predict where plants can grow and how they might respond to climate change, deforestation and other global changes.

The research team included 105 researchers from more than 90 universities. They relied on data from more than 1.1 million vegetation plots spanning 50,000 plant species.



Ecologist suggests wild approach to selling threatened plants

Selling plants could save them from extinction. The key is growing them in their natural habitats, not on private properties or nurseries, according to FIU conservation ecologist Hong Liu.

Threatened plants that are set aside would replenish populations in nature. The restoration-friendly, small-scale cultivation scheme could provide plants needed for food, medicine, decorations and other uses while generating income for farmers.

SMALL TREES MAKE BIG IMPACT in climate change fight

When it comes to trees storing carbon, don't underestimate the little guys. Trees absorb carbon dioxide from the atmosphere and store it in their roots and leaves. FIU ecologist Jason Vleminckx and a team of researchers found small trees can store carbon for an average of 74 years whereas big trees can store it for an average of 54 to 57 years. That's because the small ones grow slower and live longer than the big ones.

"This actually makes them very efficient and competitive," said Vleminckx, a post-doctoral researcher in FIU's Department of Biological Sciences and International Center for Tropical Botany. "The study highlights the importance of considering forests as a whole when assessing carbon stocks."

Assessments on how much carbon dioxide has been taken out of the atmosphere and stored in a forest have traditionally focused on big trees because they're easier to see and measure, Vleminckx said. Although forests are made up mostly of big trees, they suffer the most during droughts. The understory where small trees live is also more biodiverse than the canopy where big trees live. Small trees, therefore, offer long-term stability in moving carbon through the atmosphere. Accounting for all the trees in a forest is critical for accurately predicting carbon cycling and effective conservation management, according to the researchers.

The study was led by the Royal Museum for Central Africa, an ethnography and natural history museum in Belgium.



