

OWL RESEARCH & INNOVATION

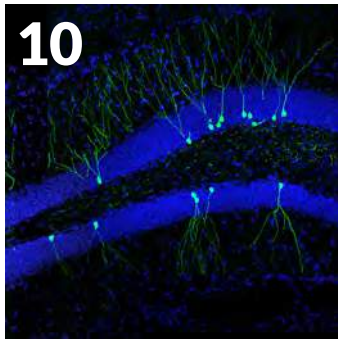
**Global
IMPACT**
FAU'S WORLDWIDE REACH

Framing Our Future
With Immersive Tech

Augmented Reality
Shows Rising Seas



Elias Bou-Harb, Ph.D.



NEWS BRIEFS

5
Aerial & Underwater Robotics
Transforming Fish Farm Operations

6
International Accreditation
High Standards for Laboratory Animals

6
Advancing Humanities Research
Fortunate Fellows Study Early American Life

7
Changing Melanoma Detection
Student Creates Tutorial for a Skin Cancer Detection App

7
Stopping Hackers in Their Tracks
Detecting Cyber Threats in Real Time

NEW FACES

8
Tracy Mincer
Understanding Marine Microplastics

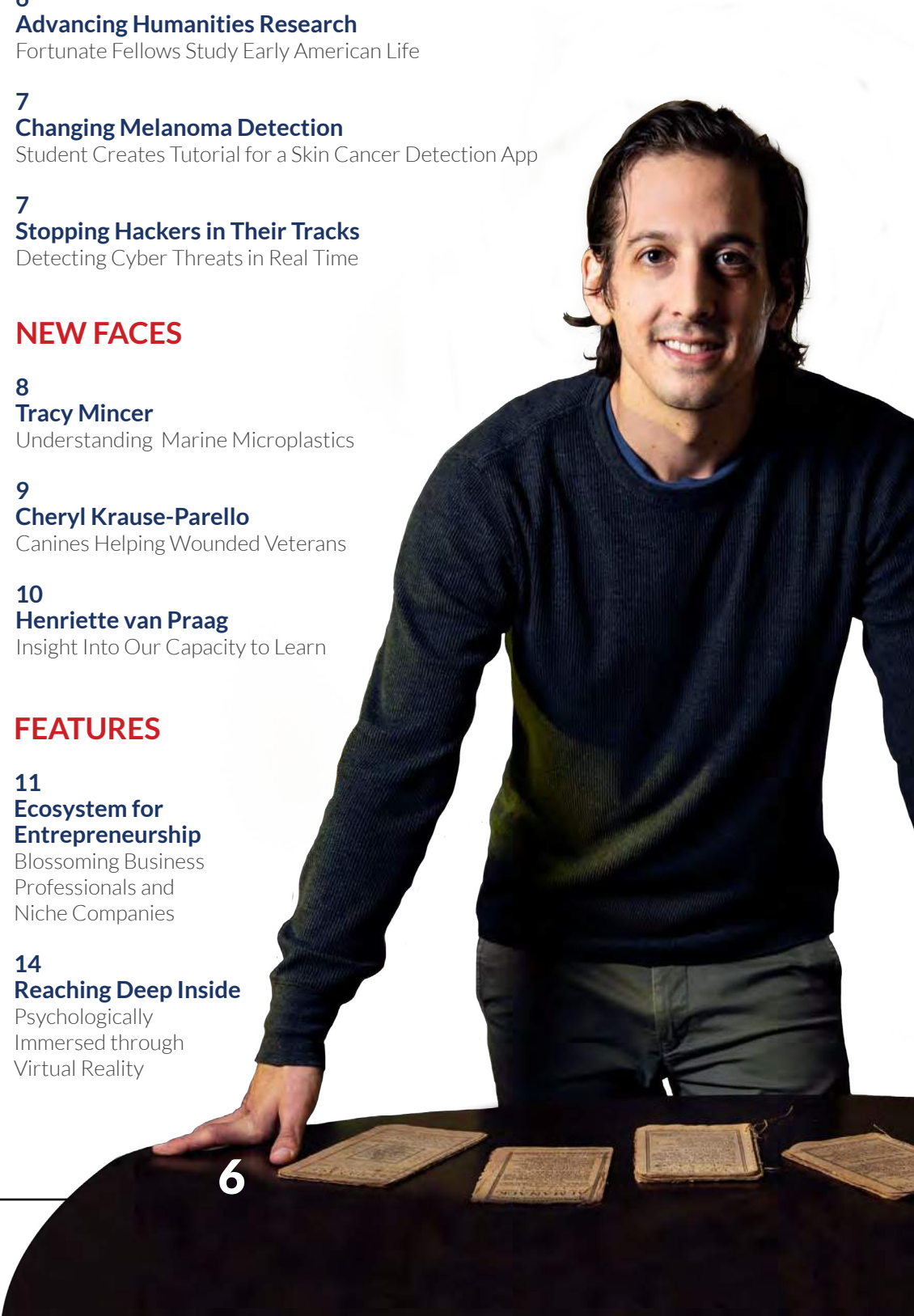
9
Cheryl Krause-Parello
Canines Helping Wounded Veterans

10
Henriette van Praag
Insight Into Our Capacity to Learn

FEATURES

11
Ecosystem for Entrepreneurship
Blossoming Business Professionals and Niche Companies

14
Reaching Deep Inside
Psychologically Immersed through Virtual Reality



spring2019

FEATURES Continued

16
Augmented Reality Shows Sea Level Rising
3-D Model Reveals Streets Inundated by Water

19
Faculty Leading Academic Journals
Editing Roles Put Researchers on Top of Their Game

22
Around the World
Making Marks Globally



Mohammad Uddin & Michael Boltri

INSIGHTS

28
Cancer Research
Coordinated Effort to Improve Human Health

30
Florida Center for Coastal and Human Health
Searching for Solutions to Water Algae Problem

32
Economic Growth Hub Keen to Go Global
International Companies Welcome at Research Park

34
Quantum Computing
The Good, Bad and a Scientist Behind Efficient Computers

36
Float Like a Jellyfish
Robo Jelly Fish to Track Ocean Health

38
Beginner Brain Lessons
A Hands-on Approach for Middle-school Students

40
One Community Pillar Turns to Another
Racing to Restore a Rabbi's Declining Vocal Abilities



Byron McCane, Ph.D.



OWL RESEARCH & INNOVATION

Executive Editor
Luis F. Perez

Editor
Beth C. Barak

Copy Editors
Cammi Clark; Linda Holtz; Lynn Laurenti;
David Lewellen; Spectrum Public Relations;
Sara Tompson

Contributing Writers
Cammi Clark; Gisele Galoustian;
Judy Gelman Myers; Linda Holtz; Lynn Laurenti;
Wynne Parry; Luis F. Perez; Robin E. Taber;
John Tibbetts

Photographers
ARRIS; Tracey Benson; Andrea Carter;
Brian Cousin; Alex Dolce; Maria Fadiman;
FAU Center for Urban and Environmental Solutions;
Gina Fontana; Kinneret Regional Project,
National Oceanic and Atmospheric Administration;
Kurt Nelson Innovative Images; Carles Roqué;
Zachary Zapetis; Dominic Zingale

Design and Graphics
Katarzyna Bytnar; Cammi Clark; Megan D. Moore;
Christina Page, Southeastern Printing; Robin E. Taber

Cover Illustration
Katarzyna Bytnar; Megan D. Moore; Robin E. Taber

Back Cover
FAU Libraries' University Archives & Digital Libraries

Available in alternate format by request.

Notice: Reasonable accommodations should be requested of the Division of Research at least 20 days in advance via dorcommunications@fau.edu



Member of the
University Research
Magazine Association

Connect with FAU Research

Daniel C. Flynn, Ph.D.
Vice President for Research
561-297-0777
fau.research@fau.edu

Anton Post, Ph.D.
Associate Vice President
Corporate & International Relations
561-297-0777
corp_engagement@fau.edu

Greg DelSesto, J.D.
Assistant Vice President for
Technology Development
561-297-1165
gdelsesto@fau.edu

Give to the Research Excellence Fund to support early career scientists, student research and research awards and prizes. Make a gift online at fauf.fau.edu/research or email faufoundation@fau.edu

Let them know you'd like to support the Research Excellence Fund.

FAU Imagination Impacts the World

Imagine building a device that crushes the power of Parkinson's disease to steal a patient's voice. Envision designing cryptography protocols to protect future communications in the quantum era. Picture creating a map of sinkholes to prevent people from being swallowed by the Earth. Think about executing professional development workshops overseas that will impact 10,000 teachers, shaping the lives of millions of students.

These are just a handful of initiatives that are turning FAU researchers' wildest imaginations into reality to build a better world – aligning with institutional goals and strategic actions of creating knowledge that benefits society.

Inside this issue, we take a look at FAU's global reach and collaborations that embrace our areas of strength, including healthy aging, neuroscience, ocean and environmental

sciences and sensing and smart systems technology.

One example: researchers using immersive technology to illustrate a potentially water-logged future of local streetscapes to help people better visualize how rising water could affect communities. This Spring 2019 issue of *Owl Research and Innovation* touts an augmented reality piece, where readers can watch the sea level rise — right off the page.

It's innovations like these that will propel FAU to become the country's fastest-improving public research university, and exemplifies the importance of imagination, the evolution of thinking, inquiry and research.

Daniel C. Flynn, Ph.D.
Vice President for Research

on the COVER

22
Global Impact
FAU's Worldwide Reach

14
Framing Our Future
with Immersive Tech

16
Augmented Reality
Shows Rising Seas



CONNECT WITH US:



Revolutionizing Inefficiencies in Fish Farming

Labor- and resource-intensive operations make it difficult to sustain fish farms, which supply more than half of all consumed seafood worldwide, said Bing Ouyang, Ph.D., assistant research professor at FAU Harbor Branch Oceanographic Institute.

But, Ouyang and co-investigators, Paul Wills, Ph.D., of FAU Harbor Branch, Jason Hallstrom, Ph.D., of the Institute for Sensing and Embedded Network Systems Engineering and Tsung-Chow Su, Eng. Sc.D., of the Department of Ocean and Mechanical Engineering, aim to change all that.

With a \$1.2 million, four-year integrative project grant from the National Science Foundation and the United States Drug Administration/ National Institute of Food and Agriculture, the group will design, develop and field-test a Hybrid Aerial Underwater Robotic System (HAUCS), a transformative collaborative robotic system. The HAUCS will fly to various locations in a fish farm to collect water quality data, dipping sensors in the water and sending the results back to a



Co-investigators, Paul Wills, left, and Bing Ouyang, both of FAU Harbor Branch Oceanographic Institute, are using an autonomous underwater vehicle in their aquaculture research.

central location to provide farmers with key information regarding water quality. This eliminates the need to perform these tasks

manually.

"It's a much more cost-effective way for fish farmers," Ouyang said. ♦

Accreditation Opens Door to Opportunities

FAU has achieved full accreditation from AAALAC International, the world's premier organization setting accountability standards for the care of laboratory animals.

This accomplishment continues FAU's rapid development as a center of important scientific research and places the university among 1,000 research-conducting entities worldwide that often prefer to collaborate with other accredited institutions due to their demonstrated commitment to responsible animal care and use. "AAALAC accreditation shows FAU's commitment to the well-being of the animals



Meet the leadership team behind the accreditation, from left, Sylvia Gografe, Robert Stackman, Elisa Gaucher and Kristen Ware.

in our teaching and research programs," said Sylvia Gografe, D.V.M., Ph.D., attending veterinarian and director of comparative medicine. "This would not have been possible without the collective effort of all researchers involved, the Institutional Animal Care and Use Committee leadership and members, Animal Research Protections Programs personnel and Division of Research leadership."

Moving forward, AAALAC accreditation will increase the visibility of the university's research program nationally and internationally, and help obtain funding from both public and private sources. ♦

Americana Collection, Visiting Scholars

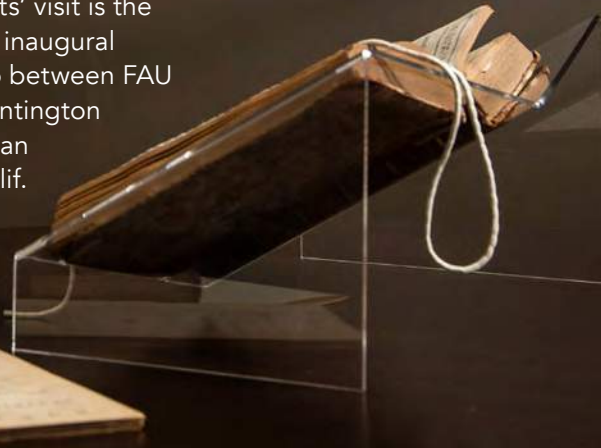
Three Ph.D. candidates recently studied rare primary sources at FAU that tell the story of American life from its earliest days — including some never before seen.

The Marvin and Sybil Weiner Spirit of America Collection, valued at \$3.8 million and housed in the S.E. Wimberly Library, contains 13,000 printed items. Scholars consider it one of the nation's top 10 collections dedicated to American political philosophy and history.

The students' visit is the result of an inaugural partnership between FAU and the Huntington Library in San Marino, Calif.

While working in the collection, one of the fellows, Jordan Wingate, University of California, unearthed a number of almanacs that changed the direction of his research. The other two fellows were Hannah Jorgensen, left, and Deborah Charnoff.

"The Weiner Collection drew nationwide attention during the fellowship application process, and now as these scholars publish their findings they will continue to turn a spotlight on humanities research at FAU," said Jason Sharples, Ph.D., assistant professor in the Department of History. ♦



Stellar Success Shines



Angelica Andrews, top left, an undergraduate computer science student, wrote the coding for a tutorial app set to revolutionize first steps in melanoma detection. She also happens to be Hispanic.

Earlier, she compiled multiple programs used to edit and manipulate images, under the direction of Borko Furht, Ph.D., bottom left, professor in the Department of Computer & Electrical Engineering

and Computer Science. As a result, at age 19, she co-authored a book on digital processing published by Springer. "Being Hispanic, and not having lots of opportunities, FAU opened doors for me," Andrews said.

To pave the way for amplifying Hispanic student success, a university-wide research and educational initiative is tackling challenges facing Hispanic students as they prepare to enter the workforce.

The initiative is co-directed by Andrés Ramírez, Ph.D., and María D. Vásquez, Ph.D., both faculty members of the College of Education. FAU is a federally designated Hispanic-Serving Institution. ♦

Hacker Tracker Catches Cyber Threats

An assistant professor in the Department of Computer and Electrical Engineering and Computer Science could stop hackers in their tracks.

Elias Bou-Harb, Ph.D., right, director of the university's Cyber Threat Intelligence Laboratory and FloridaSOAR (security operation and response), created an operational tool that detects cyber exploitations, pinpointing attacks in real time and sharing threats with Internet of Things (IoT) operators to remediate attacks. "Attackers are actually using vulnerable IoT to target internet assets," he said. His work could protect cyberspace security and mitigate privacy exploitations.

In his team's 24-hour study, funded by the National Science Foundation, more than 250,000 cyberattacks were detected nationwide. "The goal of real-time detection is to remediate infections and prevent future malicious activities."

Next: Bou-Harb is researching IoT-powered cyberattacks on critical infrastructures, like power grids, and how to remediate them, with support from the University of South Florida. ♦



NEW FACES

Microplastics Pollution Continuous 'Oil Spill'

By John H. Tibbetts

More than 10 million tons of plastic debris escape the waste stream and enter the sea every year, degrading into tiny shards called microplastics, according to Tracy Mincer, Ph.D., who is investigating how plastics disrupt ocean health and sea life.

"In terms of fossil hydrocarbon tonnage, plastic pollution can be viewed as one of the biggest oil spills in history, reoccurring each year, but no one is looking at it that way," says Mincer, research professor at FAU Harbor Branch Oceanographic Institute and Harriet L. Wilkes Honors College. Mincer is part of a growing effort to learn how to measure and understand marine microplastics.

Plastic debris inadvertently discharged into the ocean is on par with the nine largest marine oil spills in history combined, in terms of fossil hydrocarbon amount, Mincer said. As marine

"Microplastics have no boundaries in the ocean."

– Tracy Mincer, Ph.D.

microplastics break up, they leach smaller hydrocarbons that might attract colonizing microbes similar to those that respond to oil spills. Additionally, microplastics can be



Tracy Mincer, FAU Harbor Branch and Harriet L. Wilkes Honors College, is part of a growing global effort to learn how to measure and understand marine microplastics.

the same size as the prey of many marine animals. These particles have been found in the digestive tracts of more than 100 different species, causing a range of physical, chemical and potential biological harm. Mincer received his Ph.D. in marine chemistry in 2004 from the Scripps Institution of Oceanography.

He served as a postdoctoral researcher and lecturer at the Massachusetts Institute of Technology and as a faculty member at the Woods Hole

Oceanographic Institution in Massachusetts. Plastic garbage patches across miles of surface ocean receive widespread media attention, he said. But microplastics in the water column are largely unexplored. Mincer collaborates with FAU engineers to use spectroscopic tools, sensors and eventually robots that could identify marine microplastics in real time, guiding policymakers and informing the public.

Some nations have been better than others at managing plastic waste, so global initiatives are needed. "Microplastics," he said, "have no boundaries in the ocean." ♦

Human-Canine Research Healing Vets

By Linda Holtz

The devastating symptoms of post-traumatic stress disorder (PTSD) had become an all too familiar part of the life of Cheryl A. Krause-Parello, Ph.D. For her husband, a Marine veteran and possibly one of the estimated 300,000 veterans facing the ravages of the disorder, most days were a struggle as he took part in the rescue and recovery efforts at the site of the destroyed World Trade Center.

Krause-Parello tapped into her own human-animal interaction research to help her husband. Her background as a nurse scientist and anthrozoologist enabled her to see the significant healing impact her own pet dachshund had on her husband. This led her to create the "Canines Providing Assistance to Wounded Warriors" (C-PAWW) a health research initiative for military and veterans.

Krause-Parello recently relocated from the University of Colorado to take on a professorship in FAU's Christine E. Lynn College of Nursing, and brought C-PAWW with her.

"Through C-PAWW, my team and I are generating scientific evidence to advance the existing protocols for veterans who are diagnosed with PTSD," she said. "Currently I have several research projects in progress. I would like to use MRI technology to study the effects of service animals on brain anatomy in veterans."

The initiative will focus on research to develop new standards of treating and caring for wounded veterans, including those whose wounds aren't physically visible.

An alarmingly high number (some 7,300 men and women) of suicides occur annually in the veteran community. "One veterans life lost to suicide is one too many," Krause-Parello said. "We seek to change that."

C-PAWW will also continue to examine the motivating idea behind the initiative: how the unconditional bond animals form with humans promotes healing and recovery. In addition, the initiative aims to gain national momentum that will give it the leverage to promote public policy supporting the use of service dogs as a reimbursable medical expense for veterans suffering from PTSD. ♦



Cheryl Krause-Parello, Ph.D., standing, and Lyndon Villone, marine veteran and military veteran consultant for Canines Providing Assistance to Wounded Warriors program, with his service dog, Ice.

Research in Lifestyle and Brain Health

By Cammi Clark

Henriette van Praag, Ph.D., was a teenager in the Netherlands when a scientist made headlines for his advocacy for treating mood disorder patients with medication in addition to psychotherapeutic approaches.

"The concept that there is a biological basis for behavior was very controversial at the time," van Praag said.

A few years later as a psychology student, van Praag's interest in the subject elevated and she began graduate work at Tel-Aviv University in Israel, where she worked on opiates and the development of pain perception.

At Robert Wood Johnson Medical School in New Jersey, postdoctoral research on nerve growth factors led to an interest in brain plasticity. Later, as a staff scientist at the Salk Institute in La Jolla, California, she discovered that voluntary running wheel exercise

in rodents increases the number of new neurons in the hippocampus, a brain area important for learning and memory. Her expertise landed her a role as an

investigator at the National Institute on Aging in Baltimore, Maryland.

She recently joined FAU as associate professor in the Department of Biomedical Science in the Charles E. Schmidt College of Medicine, and the FAU Brain Institute.

"Dr. van Praag's research adds significant depth to our neuroscience research community."

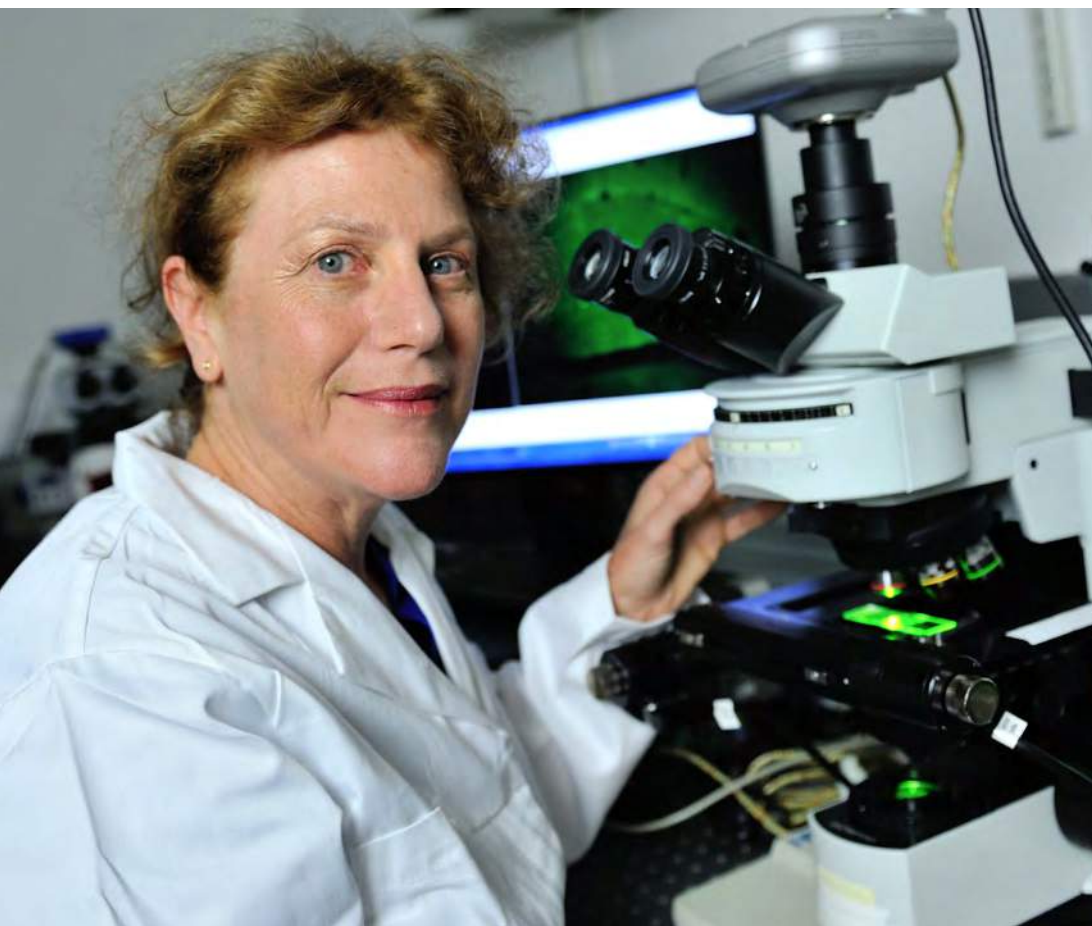
– Randy D. Blakely, Ph.D.

"Dr. van Praag's research adds significant depth to our neuroscience research community, specifically in areas related to brain plasticity and mechanisms by which the circuitry of the brain can be shaped by experience," said Randy D. Blakely, Ph.D., professor, College of Medicine and executive director of the FAU Brain Institute. "Her work reveals an unexpected dynamism of neural structures that ultimately drives our capacity to learn and enjoy the world around us."

van Praag says she's excited to join the institute to continue research in behavioral interventions, such as the profound effects diet and exercise have on brain plasticity, suggesting lifestyle intervention help enhance or maintain the brain.

She also credits the university's focus on healthy aging for drawing her here. And, she adds with a chuckle, "the nice local environment and weather." ♦

Henriette van Praag joins FAU's Department of Biomedical Science in the Charles E. Schmidt College of Medicine, and the FAU Brain Institute.



Cultivating ENTREPRENEURS

By
Cammi
Clark

FAU has created a hearty ecosystem for entrepreneurship, an environment that allows business professionals to grow and their unique companies to flourish.

"We see entrepreneurship as an extension of the academic research mission, and we want it to be a continuum," said Daniel Flynn, Ph.D., vice president of research. "So, we start from the earliest phases where a person has an idea and help them turn that idea into a real company, and then see it translate out into the real world and grow."

FAU has strategically positioned numerous programs to assist entrepreneurs at all steps of their journey, creating an atmosphere that has already helped more than 70 companies go from idea to success. From offering undergraduates attainable funding, mentoring and physical space to develop their ideas that counter real-world problems, to placing a subset of those ideas into physical space and providing the resources to develop companies to flood the market with solutions, jobs and money. "Then they can grow and move out in the world," Flynn said.

Candidate.Guru is one venture company that has optimized FAU Tech Runway's resources. Since graduating from the venture class program, the company has acquired Elevated Careers by eHarmony, raised \$2 million, expanded its product offerings and hired employees nationwide.

Another example is Neuro Pharmacologics, which is developing a novel way to test drugs to treat migraines and other disorders associated with pain.



Devin Willis presented SlideMap, his cancer detection device, to business leaders at FAU Tech Runway's Maverick Reception.

Potential entrepreneurs can take advantage of entering the ecosystem at any point, but optimal trajectory is to flood ideas through FAU Wave, incubate in Tech Runway, access the Florida Small Business Development Center (SBDC) at FAU, then move across the hedges to the Research Park to continue to grow regionwide. "And, then maybe they become research partners with FAU, and help us to advance our mission," Flynn said.

Over the past five years the Florida SBDC at FAU has helped entrepreneurs in Palm Beach and Broward counties access more than \$130 million in capital, increase general and export sales by more than \$795 million and win more than \$105 million in government contracts. "Having faculty take their ideas for research and develop companies is something that's been

Entrepreneurship Support System

FAU Wave is an innovative venture bringing together undergraduate students from across the university to catalyze solutions to real-world problems, or fill niches in business, for profit or nonprofit sectors. Undergraduates receive \$500 to develop their proposed projects, ultimately competing for monetary prizes.

FAU Wave



The Kenan Social Engagement Scholarship Program provides scholarships and seed funding to Harriet L. Wilkes Honors College students as they learn about social entrepreneurship, write business plans to start their own social enterprises, and partner with nonprofit organizations.

Kenan Social Engagement Program



Veteran's Florida Entrepreneurship Program



The Veteran's Florida Entrepreneurship Program offers entrepreneurship education through a self-paced online module, periodic on-premise workshops, cohort-based camaraderie and mentorship to qualified veterans.

Innovation Corps



Innovation Corps (I-Corps), an NSF-funded component of FAU Tech Runway – an early-stage business accelerator – nurtures multiple, local teams, giving them the opportunity to transition their technology concepts into the marketplace with advice, training, funding and more.

Florida Small Business Development Center at FAU



The Florida Small Business Development Center (SBDC) at FAU helps existing and emerging small business owners. The center helps with planning, contracting, exporting, finding access to capital and more.

around for about 35 years. But, integrating that with FAU Tech Runway and the mentoring mission, and then bringing in the SBDC at FAU to link graduating companies to the Research Park, that's all new, the pieces are not new, but putting all the pieces together is – and continuing on," Flynn said. "Anyone who comes in with a company idea, we lay out a path for them. Of course, it comes down to the quality of their ideas, do they have customers, and how are they going to find their market. FAU Tech Runway does a good job of helping them with that."

FAU is an equally ripe ecosystem for students.



Child Rescue Coalition, FAU Tech Runway alumni, partners with law enforcement and child advocates worldwide to shield and rescue children from sexual exploitation.

Currently, students are building companies like ones creating prosthetic devices inexpensively through 3-D printing, encrypting and protecting data, and even building detection software of online test takers going off page for answers. "At the end of the day, students are amazing, because they see novel solutions to problems that concern them," Flynn said. "They're not inhibited, they don't feel like there are any barriers to solutions. And they just come up with really great ideas."

Roland Kidwell, Ph.D., College of Business, is the director of the Adams Center for Entrepreneurship, which hosts a business competition that leads successful student teams to eventual placement at

Here's a glance at some of the programs and initiatives built to help entrepreneurs succeed, supporting FAU's ever-evolving entrepreneurship ecosystem.

FAU's College of Business programs offer a variety of majors, including entrepreneurship, for students to advance in the business world or become entrepreneurs. In addition, the college also offers minors and certificates for students looking to specialize and enhance their course of study.

College of Business



Housed in the College of Business, the Adams Center for Entrepreneurship's mission is to create successful entrepreneurial leaders who find sustainable solutions to economic and social problems. The center focuses on community engagement efforts through programs like an annual business plan competition and an entrepreneur boot camp course.

Adams Center for Entrepreneurship



FAU Tech Runway



FAU Tech Runway is a collaborative work space providing entrepreneurs a complete ecosystem to house, educate, mentor and fund their companies from origination through venture funding. Since inception in 2014, 72 companies launched, collectively raising more than \$63.5 million, creating nearly 351 jobs and more than \$64.7 million in sales revenue.

Research Park



The Research Park at Florida Atlantic University is home to technology companies and research-based organizations working to support the research and development activities of the university, as well as foster economic development and broaden the economic base of Broward and Palm Beach counties.

FAU Tech Runway. "We mentor students of all majors who want to start businesses, and the Adams Center is a kind of a community for people to start their own business or businesses," he said. "But, the overarching goal (of entrepreneurship education) centers on nurturing an entrepreneurial mindset. You really have to think about how you can innovate in your own business or in a company where you might work. Being able to turn an idea into a product or service for your business, or for somebody else you're working for – that's a pretty marketable skill."

Kidwell praises FAU's connections among all the entrepreneurship elements. "The entrepreneurial ecosystem and working together with that community are very important," he said. Community engagement is "a continual extension of our education and research mission ... Some of the student companies (entering Tech Runway) are successful; they grow, graduate and become big enterprises." ♦



From left, Congressman Ted Deutch with Dexter Dixon and Tadas Orentas of Innovation Corps, a program supporting further development of their electronic skateboard. Dixon and Gunnar Bjorkman (not pictured) created the device in FAU Wave.

VIRTUAL REALITY

gives research new dimension

By Robin E. Taber

If a picture is worth a thousand words, then a 3-D scene where you can reach deep inside and take a look around is worth far more — especially in research.

Scientists are quickly discovering the value of creating these 3-D scenes using immersive technologies such as virtual reality (VR), which places users into a fully artificial digital environment using a closed headset, and augmented reality (AR), which adds digital elements on to the real world viewed through smart gadgets or smaller headset type glasses.

These visually dynamic mediums can provide context to complicated subjects, enabling researchers to better communicate ideas to each other, students, patients and the public, according to Elan Barenholtz, Ph.D., associate professor of psychology and co-director of FAU's Machine Perception and Cognitive Robotics Lab.

"There are things you can do in VR that are just not practical, or even possible in the real world," said Barenholtz, adding that being psychologically immersed is key. "We don't just engage passively in VR, we engage actively."

Since the immersive experience evokes both physiological and emotional responses, which are measurable, this technology can be vital in research. While sight and sound are primary drivers of the experience, once other dimensions of brain research could potentially open up if the technology incorporates taste, smell and touch as well. "We want to push the needle on scientific research of the human mind," he said.

Barenholtz predicts that VR and AR will become standard lab tools for many types of

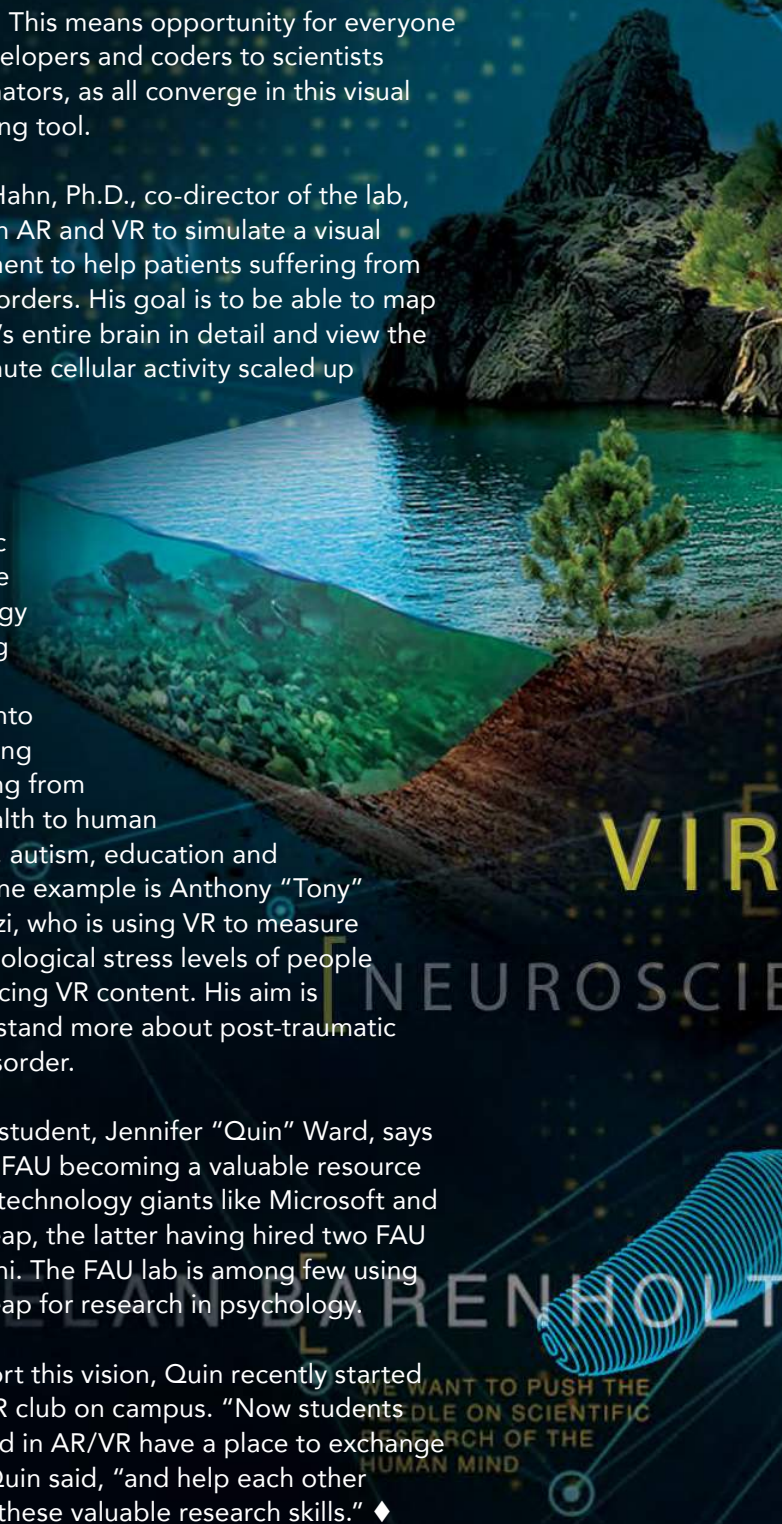
research. This means opportunity for everyone from developers and coders to scientists and animators, as all converge in this visual storytelling tool.

William Hahn, Ph.D., co-director of the lab, uses both AR and VR to simulate a visual environment to help patients suffering from brain disorders. His goal is to be able to map a person's entire brain in detail and view the most minute cellular activity scaled up in VR.

Students alike are energetic about the technology and using it to dig deeper into researching everything from brain health to human behavior, autism, education and travel. One example is Anthony "Tony" Staracuzzi, who is using VR to measure the physiological stress levels of people experiencing VR content. His aim is to understand more about post-traumatic stress disorder.

Another student, Jennifer "Quin" Ward, says she sees FAU becoming a valuable resource for local technology giants like Microsoft and Magic Leap, the latter having hired two FAU lab alumni. The FAU lab is among few using Magic Leap for research in psychology.

To support this vision, Quin recently started an AR/VR club on campus. "Now students interested in AR/VR have a place to exchange ideas," Quin said, "and help each other develop these valuable research skills." ♦





AUGMENTED P

STUDENTS INTERESTED IN AR/VR
A BETTER PLACE TO
LEARN AND TEACH

TUAL REALITY

SCIENCE]

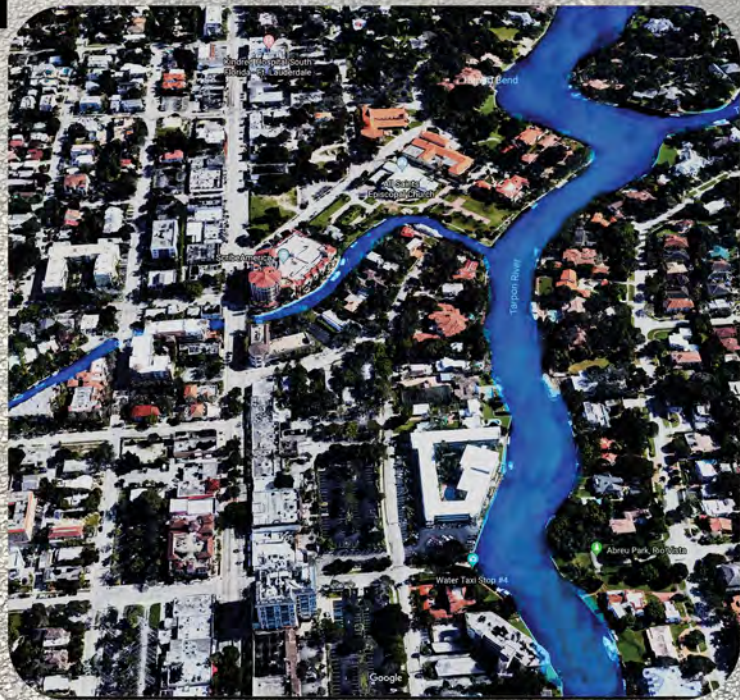
Z, PH.D.

WILLI

GIES

SEA LEVEL RISE

LAS OLAS BLVD



2040



2080



2100



Immersed by Future

sea levels

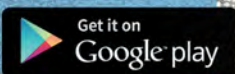
By
Wynne
Parry

Experience Augmented Reality

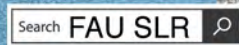
1. Download the app from the App Store or Google Play
2. Search for FAUSLR
3. Hold phone over top of image to the left.

DOWNLOAD APP FOR AUGMENTED REALITY

1



2



3



The encroachment of the ocean onto land is often described in dry terms, such as inches of water, or as lines on charts and maps. But FAU researchers are looking at more visceral ways to illustrate the potentially water-logged future.

Using immersive technology, such as virtual reality, a team led by John Renne, Ph.D., director of the Center for Urban and Environmental Solutions, is creating a 3-D model of streetscapes inundated by water at depths that experts warn may arrive in the coming decades.

"They say a picture is worth a thousand words," Renne said. "We hope to use that philosophy to move into better conversations about how we can respond and adapt."

Funded by the U.S. Department of Transportation, with collaboration from FAU's Florida Center for Environmental Studies, Louisiana State University, the Illinois Institute of Technology and the University of Arkansas, the project seeks to develop a new tool to aid planning efforts by helping people better visualize and comprehend how rising water could affect their communities.

Increasing sea levels are a consequence of global warming, which scientists have concluded melts ice sheets and glaciers, and causes the oceans to expand as they warm. Low-lying parts of South Florida are already seeing more flooding, although the full impact will take decades to materialize, Renne said.

To bring this abstract threat home, Renne's team



The Center for Urban and Environmental Solutions developed a virtual reality video that illustrates how rising water could affect Las Olas Boulevard in downtown Fort Lauderdale in 2080.

focused on the future of a current two-block stretch of Las Olas Boulevard in downtown Fort Lauderdale. The team took 360-degree photos of the shops, galleries and greenery along the boulevard, which is located north of the New River, a tidal waterway that flows into the Atlantic Ocean. Using a variety of software packages deployed by architects, urban planners, engineers and video game programmers, the team superimposed the imagery in three dimensions and added a rendering of rising water. Their simulation of the two-block stretch in the year 2060 shows life continuing unchanged. However, two decades later, water is

"We are trying to figure out the most cost effective, user friendly way to visualize the future."

- John Renne, Ph.D.

depicted blanketing the street and door steps of Las Olas Boulevard. In 2100, the area around the New River is projected to be under up to 37-inches of water, with people standing in waist-deep water.

Using virtual reality, this preliminary effort required that the user be

immersed in an artificial environment with goggles and sometimes headphones. Other visualization alternatives are being explored, including augmented reality, in which special glasses add virtual objects to a view of the real world.

"Eventually, we would like to create an app that would allow you to scan your environment with your phone, and see exactly where the water would be," Renne said. "We are trying to figure out the most cost effective, user friendly way to visualize the future." Renne hopes that immersive visualizations might help to prevent the most devastating consequences here by spurring people to think about ways to prepare and adapt.

"This will happen over the next couple of generations," Renne said. "The quicker we start to address it and do something about it, the better off we will be." ♦

A virtual reality video, depicting a potential high tide in 2100, will aid researchers engaging communities to plan.



Faculty Take on Lead Editing Roles at

PEER- REVIEW JOURNALS

By Cammi Clark

It's about impacting research. It's about staying at the forefront of your field. And, it's about making a difference in the world.

Those are some of the top reasons why FAU faculty choose to take on leadership editing roles or, in some cases, launch new peer-reviewed academic journals. Peer review is essential in academic research; the process helps maintain quality and integrity in research.

Douglas Cumming, Ph.D., a professor in the College of Business, is one of FAU's newer faculty members. Topping a long list of his journal roles: founding editor-in-chief of *Annals of Corporate Governance* and editor-in-chief of the *Journal of Corporate Finance*. Cumming also serves on the editorial boards of more than 25 journals, including *Corporate Governance: An International Review*,

Sameer Hinduja, Ph.D., professor in the School of Criminology and Criminal Justice, is the co-founder and co-editor-in-chief of the *International Journal of Bullying Prevention*, a new peer-reviewed journal from Springer International Publishing.

"Serving as an editor is a great opportunity to contribute to the profession, and to shape and focus the direction of impactful scholarship."

– Doug Cumming, Ph.D.



the *Journal of International Business Studies* and *Journal of Banking and Finance*.

"Serving as an editor is a great opportunity to contribute to the profession, and to shape and focus the direction of impactful scholarship," Cumming said.

He first dabbled in journal editing by leading some special issues, being a guest editor for regular issues and producing issues for conferences.

Even though editing the industry's top academic journals can be time consuming and is not an easy job (there are often hiccups along the way), there are certainly advantages of being an editor, Cumming said.

"Certainly, if you're not careful, you can spend your whole day dealing with emails from authors and reviewers and other people, and

end up doing a lot of reading," he said. "But, it's a learning experience every day."

Sameer Hinduja, Ph.D., professor in the School of Criminology and Criminal Justice, is the co-founder and co-editor-in-chief of the *International Journal of Bullying Prevention*, a new peer-reviewed journal from Springer International Publishing. He said creating and editing such a field-specific journal keeps him at the epicenter of new developments in this area.

"There has never before been a singular journal specifically devoted to bullying and cyberbullying prevention, as articles have historically been published across multiple disciplines since research is conducted from a wide range of perspectives," Hinduja said. "By creating and helping this journal, I stay at the forefront of our field and connect with a wider array of scholars who care about the topic like I do. Together, we are contributing to a growing body of knowledge that will

inform policy and practice in schools, workplaces, and communities. Ultimately, we are helping people to live well by building safe social environments."

Similarly, John L. Renne, Ph.D., of the School of Urban and Regional Planning, is co-editor for a new section of the international journal, *Transportation Research, Part D: Transport and Environment*, focusing on disasters and resilience.

"A scholar's job is to try to answer research questions that others haven't looked at before, that are important to our society, that are going to make a meaningful difference to the quality of life for everybody," Renne said. "Being an editor, you have a really unique perspective to be able to help. You're kind of a gatekeeper for the field. It's dynamic, and it's very rewarding." ♦

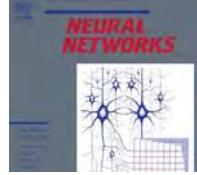


"Being an editor, you have a really unique perspective to be able to help. You're kind of a gatekeeper for the field."

– John Renne, Ph.D.

Faculty Editing Roles in *Academic Journals*

Numerous FAU faculty quietly lead peer-reviewed academic journals to position themselves at the forefront of their fields. Here is a look at some who hold higher-level editing positions at those journals.



Christine E. Lynn College of Nursing

- Charlotte Barry, Ph.D., editor, *Journal of Art and Aesthetics in Nursing and Health Sciences*
- Beth King, Ph.D., co-editor, *Journal of Art and Aesthetics in Nursing and Health Sciences*
- Maria Ordonez, D.N.P., co-editor, *Journal of Art and Aesthetics in Nursing and Health Sciences*
- Rose O. Sherman, Ed.D., editor-in-chief, *Nurse Leader*

College of Business

- Luis Garcia, Ph.D., co-editor, *Financial Analysts Journal*
- Ken H. Johnson, Ph.D., editor, *Journal of Housing Research (JHR)* and publications director, *American Real Estate Society**
- Paul S. Koku, Ph.D., J.D., editor-in-chief, *The International Journal of Marketing and Social Policy*
- Donald Neubaum, Ph.D., editor, *Entrepreneurship: Theory and Practice*

Charles E. Schmidt College of Science

- David Bjorklund, Ph.D., editor, *Journal of Experimental Child Psychology*
- Steven Bressler, Ph.D., action editor, *Neural Networks*
- Brett Laursen, Ph.D., editor-in-chief, *International Journal of Behavioral Development*
- Spyros Magliveras, Ph.D., co-founder and managing editor, *Journal of Mathematical Cryptology*
- Ata Sarajedini, Ph.D., science editor, *Journals of the American Astronomical Society***
- Rainer Steinwandt, Ph.D., managing editor, *Journal of Mathematical Cryptology*
- Paul Yiu, Ph.D., editor-in-chief, *Forum Geometricorum*

Dorothy F. Schmidt College of Arts and Letters

- Mehmet Gurses, Ph.D., editor, *Politics and Religion*
- Carol McGuirk, Ph.D., co-editor, *Science Fiction Studies*

Harriet L. Wilkes Honors College

- Warren Wm. McGovern, Ph.D., editor, *Algebra Universalis*

College of Education

- Yash Bhagwanji, Ph.D., founding and executive editor *International Journal of Early Childhood Environmental Education*
- David Devraj Kumar, Ed.D., editor-in-chief, *The Chemist* (official journal of the American Institute of Chemists)
- Deborah L. Floyd, Ed.D., editor-in-chief, *Community College Journal of Research and Practice*
- Len Sperry, Ph.D., M.D., editor, *The Journal of Individual Psychology*; founding editor, *Spirituality in Clinical Practice*; editor-in-chief, *The American Journal of Family Therapy*

College of Engineering and Computer Science

- Manhar Dhanak, Ph.D., editor, *Ocean Engineering and Oceanography*

*The American Real Estate Society manages *JHR*, *Journal of Real Estate Research*; *Journal of Real Estate Portfolio Management*; *Journal of Real Estate Literature*; *Journal of Sustainable Real Estate*; and *Journal of Real Estate Practice and Education*.

**Journals of the American Astronomical Society is comprised of *The Astrophysical Journal Letters*; *The Astronomical Journal*; *The Astrophysical Journal*; *The Astrophysical Journal Supplement Series*; and *Research Notes of the AAS*.

FAU'S WORLDWIDE REACH

By Judy Gelman Myers

Building on the effort to become the preeminent research institution in the Southeast, FAU is rapidly expanding its global reach across Israel, from the top of Mount Carmel to Jerusalem to the Mediterranean Sea and beyond.

One example is the exchange of fourth-year medical students between FAU's Charles E. Schmidt College of Medicine and Technion Israel Institute of Technology. This exchange includes students rotating at Boca Raton Regional Hospital as acting interns in internal medicine and general surgery, and similar rotations at Technion.

Anton Post, Ph.D., associate vice president for corporate and international relations, recently returned from Israel, where he lay the groundwork for continued fruitful collaborations and exchanges of Israeli and FAU faculty, institutional leaders, researchers and students. While new collaborations exist, FAU and Israel's partnership began about 20 years ago when Florida created

"linkage institutes" for post-secondary institutions and foreign countries. FAU, Broward College and Israel partnered, creating the Florida-Israel Institute.

When FAU President John Kelly, Ph.D., and Governor Rick Scott visited Israel in December 2017, they decided to rev up the institute broadening FAU's network. They turned to Post, formerly with the Hebrew University of Jerusalem for 22 years, to expand connections with academic and funding institutions.

After, Post leveraged FAU research strengths by bringing Randy Blakely, Ph.D., director of the FAU Brain Institute, and Jason Hallstrom, Ph.D., director of the Institute for Sensing and Embedded Network Systems Engineering, to Israel to meet their counterparts.

In seminars and meetings with faculty, students and researchers at Hadassah Medical School, the Technion Israel Institute of Technology, the Weizmann Institute of Science and other leading centers of medical education in Israel, Blakely and Hallstrom described their endeavors and explained why FAU is the go-to university for research and post-doctoral work. They also explored opportunities for joint programs related to translational research where both countries would be stakeholders in moving laboratory research achievements into the commercial marketplace as products, Blakely said. "It was a successful visit, with a lot of mutual appreciation and understanding of the potential," Post said. "Now we have to think about how to bring potential to fruition."

Post returned with a fully executed memo of understanding with Hebrew University and the Technion, and he put external funding mechanisms in place for additional exchanges between Israel and FAU. A future initiative will be small, joint brain-storming workshops involving 10 to 12 scientists — six from each country. The format will create a bottom-up, synergistic collaboration benefitting both sides as well as medical research as a whole. "In the United States, we can be more practical



Byron McCane, left, of the Harriet L. Wilkes Honors College, co-director of the Kinneret Regional Project, an international archaeological expedition by the Sea of Galilee, Israel, recently discussed the project during an FAU Florida Israel Institute seminar.

with our research approach, whereas in Israel there tends to be an emphasis on the importance of theoretical considerations," Post said. "That's a nice complementarity."

Global Center

The FAU International Center for Emergency Management partners with The Chaim Sheba Medical Center in Israel to train in emergency management, leadership in crisis and disaster management for public safety, public health, first responders, law enforcement, fire, rescue and medical professionals in South Florida. In addition: Elhanan Bar-On, M.D., director of Sheba's Disaster Medicine and Humanitarian Response, led a training session at FAU.

Yitshak Kreiss, M.D., director general of Sheba, honorary president of FAU's center and former surgeon general of the Israel Defense Forces (IDF), led a lecture on leadership in times of crisis. Kreiss also has affiliate professor appointments in FAU College of Business and Charles E. Schmidt College of Medicine.

IDF Medical Corps associates also trained about 70 nurses in emergency management at FAU. "The World Health Organization ranks the Israelis No. 1 in the world in deployment of field hospitals, rescue missions and crisis response and recovery," said Rebekah Dickinson, chief program officer of the FAU center. "Our partnership with Sheba allows us to tap into that expertise."

FAU's international center will also hold biannual training sessions with the Israelis, focusing on first response, search, rescue and post-traumatic stress disorder healthcare. Dickinson is designing a mission to Israel focused on healthcare and disaster management for FAU students, academic leaders and community supporters.

Collaborative Research

Stephen Kajiura, Ph.D., right, director of FAU's Elasmobranch Research Laboratory in the Charles E. Schmidt College of Science, is leading a joint program with the University of Haifa to study shark distribution and movements in the eastern

Mediterranean Sea, where they have begun to proliferate. Researchers will track sharks to learn the environmental conditions they prefer and predict where they will be in abundance. They will also test sensory capabilities of sharks, which can detect electrical signals and smell minute quantities of chemicals in the water. One objective will be to use these sensory cues to develop shark repellents.

Kajiura will teach a graduate course on the biology of sharks at the University of Haifa's Leon H. Charney School of Marine Science. An exchange program also allows students to conduct research at the reciprocal institution.

Enthusiastic Support

Being recognized as a premier research university matters for at least two reasons. First, such high regard attracts top-notch faculty and students, thus energizing research opportunities and supporting world-class academics. Second, the Florida Legislature and the State University System's Board of Governors guarantee millions of dollars to Florida's top-performing schools.

The Jewish community shows support for the newly revived Florida-Israel Institute. "We're trying to bring together Israel, FAU and the Boca Raton community to build a triangle of positive relationships — cultural, political, academic," Post said. "This is a partnership that's going to lift all our boats."



The background features a pair of hands holding a globe. The scene is overlaid with a digital aesthetic, including a grid of white dots and thin white lines connecting them, resembling a network or data flow. Binary code (0s and 1s) is scattered throughout the image, particularly in the lower half. The color palette is dominated by blues, oranges, and greys.

Global IMPACT

FAU'S WORLDWIDE REACH

INTERNATIONAL FOOTPRINT

FAU is leaving its mark worldwide. Through international agreements, research collaborations and double degree and exchange programs with more than 25 countries, you'll find an FAU connection in most corners of the globe. Here's a look at some recent global efforts:

Supported by NATO's Science for Peace and Security Programme, FAU's Center for Cryptology and Information Security is partnering with Slovak University of Technology, **Slovakia**, University of **Malta** and Universidad Rey Juan Carlos, **Spain**, to explore cryptographic protocols for secure communication in the quantum era.

ECUADOR

With the help of a U.S. Ambassador's Fund for Cultural Preservation grant and community members, the Department of Anthropology's **Ecuador** Field School Program is conserving archaeological collections for future research and museum exhibits.



CUBA

Collaborating with **Cuban** scientists aboard a research ship, a team of FAU Harbor Branch Oceanographic Institute researchers studied Cuba's mesophotic coral reefs, circumnavigating the country's 1,500-mile coastline in a month.



SPAIN

The College of Science is collaborating with three **Spanish** universities, the **British** Geological Survey and the Geological Survey of **Israel** to study sinkholes. The aim is to create a map of active and potential sinkholes (including in Florida) to help people avoid these dangerous formations.



EGYPT

The Balanced Education (BalancedED) company in Egypt is collaborating with the Egyptian Ministry of Education and FAU College of Education faculty with the goal to train 10,000 teachers in three years through the Educate for Egypt project, employing professional development workshops.



BHUTAN

In **Bhutan**, a researcher from the College of Science studied medicinal plants, documenting names and uses in four languages for analysis and baseline data to support the creation of a cultural sanctuary.



In 2017–18, 330 FAU students studied abroad in 20 countries, chief among them **Guatemala, United Kingdom, Italy, South Africa and China**. More than 230 FAU students participated in other university-related activities such as service, research or internships.

RWANDA

Students from the College of Education use video conferencing to treat Rwandans with speech and language issues including stuttering.



FAU hosted 823 students, 37 visiting scholars and 172 students in practical training, representing a total of more than 100 countries – top were **India, China, Brazil, Venezuela and Saudi Arabia**.



United in the Fight Against Cancer

By Wynne Parry

Science is the best weapon against cancer. A number of labs across the FAU have joined the fight, investigating aspects of the disease and potential means to prevent it. Now, the university

is seeking to connect these independent efforts, an initial step in a longer-term plan to develop a center for research and cancer care.

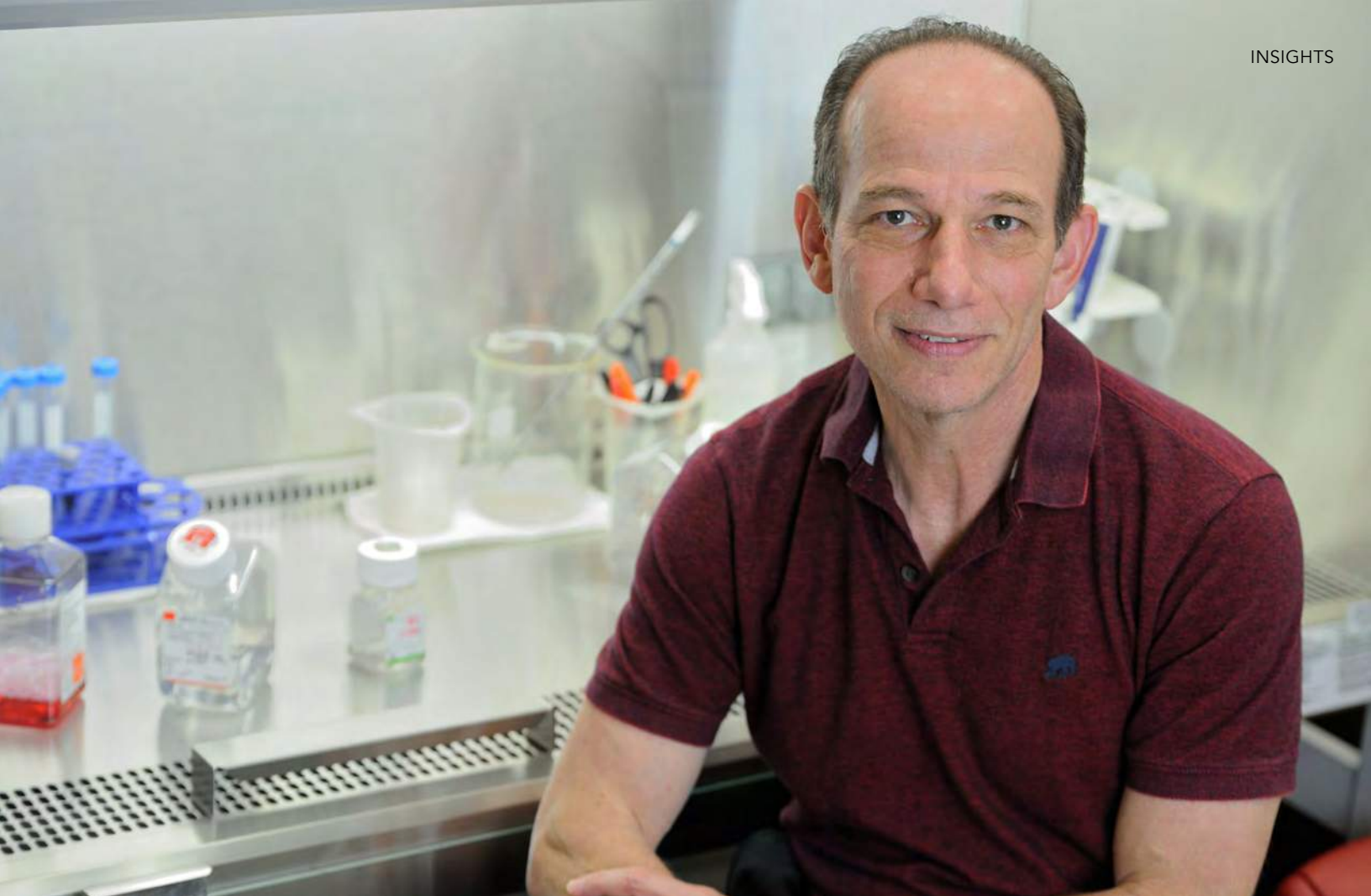
“We are systematically looking at the cancer research already underway at the university to see how these efforts could best be coordinated,” said Gregg Fields, Ph.D., professor and chair of the Department of Chemistry and Biochemistry, who is leading this effort.

“The big picture is thinking about how we take discoveries from our labs and find ways to implement them to treat patients,” he said. To accomplish this, the university is looking for partners to create a new cancer center.

Fields is one of roughly 20 researchers spread across the university and partner institutions, such as Scripps Research located on the Jupiter campus, conducting cancer-related research. He recently received more than \$708,000 in grant funds from the Florida Department of Health to develop compounds to stop the spread of breast cancer and melanoma, a type of skin cancer, within the body.

Research in his lab focuses on enzymes that help cancer cells escape from an initial tumor to invade other parts of the body, a process that can make cancer much deadlier. The compounds on which Fields is working, in collaboration with a biotech company, interfere with these enzymes.





Gregg Fields, chair of the Department of Chemistry and Biochemistry and director of Center for Molecular Biology and Biotechnology

Others are taking different approaches to identifying cancer-fighting compounds. Amy Wright, Ph.D., research professor at FAU's Harbor Branch Oceanographic Institute, looks under water. She extracts molecules from sponges and corals, and hands them over to her colleague Esther Guzmán, Ph.D., associate research professor at the institute, to test for promising cancer fighting activity. Together, they have identified a number of compounds that reduce levels of a cancer-linked protein, called survivin, in cells.

Still others are examining complications of the disease itself. Andy Khamoui, Ph.D., an assistant professor in the Department of Exercise Science and Health Promotion, studies muscle wasting and weight loss in cancer patients, a deadly condition known as cachexia — for which there is no approved treatment.

To further develop their discoveries, scientists need to involve patients. This is where the right partnership comes in. Such a relationship would, for example, give scientists access to patients' tumor samples or to patients themselves.

"The big picture is thinking about how we take discoveries from our labs and find ways to implement them to develop new treatments."

— Gregg Fields, Ph.D.

Patients would benefit from a partnership, too. Florida has a significant elderly population, the group most affected by the disease, and some densely populated areas lack good access to existing cancer centers. An FAU-affiliated center could potentially fill the gap that exists in Palm Beach and Broward Counties, Fields said.

"Of course, there is an intellectual component to what we do, but scientists do like to see their discoveries go somewhere," Fields said. And in this case, the destination may be better health for patients. ♦

A 'Soup-to-Nuts' Study of East Coast Algae Blooms

By Wynne Parry

Algae flourish in the Indian River Lagoon and are an essential part of the food chain. Though striking, when these phytoplankton (commonly known as algae), take over the water — or bloom — they can wreak havoc: harming wildlife, local economies and even people.

In recent years, damaging algal blooms have become a fixture of the approximately 160-mile-long Indian River Lagoon lining Florida's Atlantic coast. A new initiative at FAU's Harbor Branch Oceanographic Institute has set out to better understand what's happening in the lagoon and the water that flows into it.

Until now, the toxic "Florida red tide" on the Gulf coast has received most of the attention. "People have been doing sporadic research on the East coast, but we need a collaborative, organized effort to address this ongoing crisis," said James Sullivan, Ph.D., executive director of the institute.

Sullivan secured \$650,000 from the institute's foundation to establish the Florida Center for Coastal and Human Health. The center has also received private donations and is seeking federal grants. Its research capitalizes on expertise already in place. About half of the institute's faculty are participating, Sullivan said.

Scientists strongly suspect human activities are behind the blooms. Certain types of pollution, such as fertilizer carried by runoff, can prompt algae to flourish. Other factors, including warmer water occurring for longer periods also contribute, Sullivan said. The color and effects of blooms vary; some can poison animals and people; others block sunlight

and harm sea grasses essential for a healthy lagoon. Still others use up oxygen, harming fish and other aquatic animals.

A few types of toxic algae afflict the lagoon and the water feeding it. They include microcystis which produces a liver-damaging toxin and whose bright green blooms blanket Lake Okeechobee, which discharges into the lagoon; pyrodinium, which can cause paralysis, and pseudo-nitzchia, which makes a toxin associated with amnesia.

"We need a collaborative, organized effort to address this ongoing (alga) crisis."

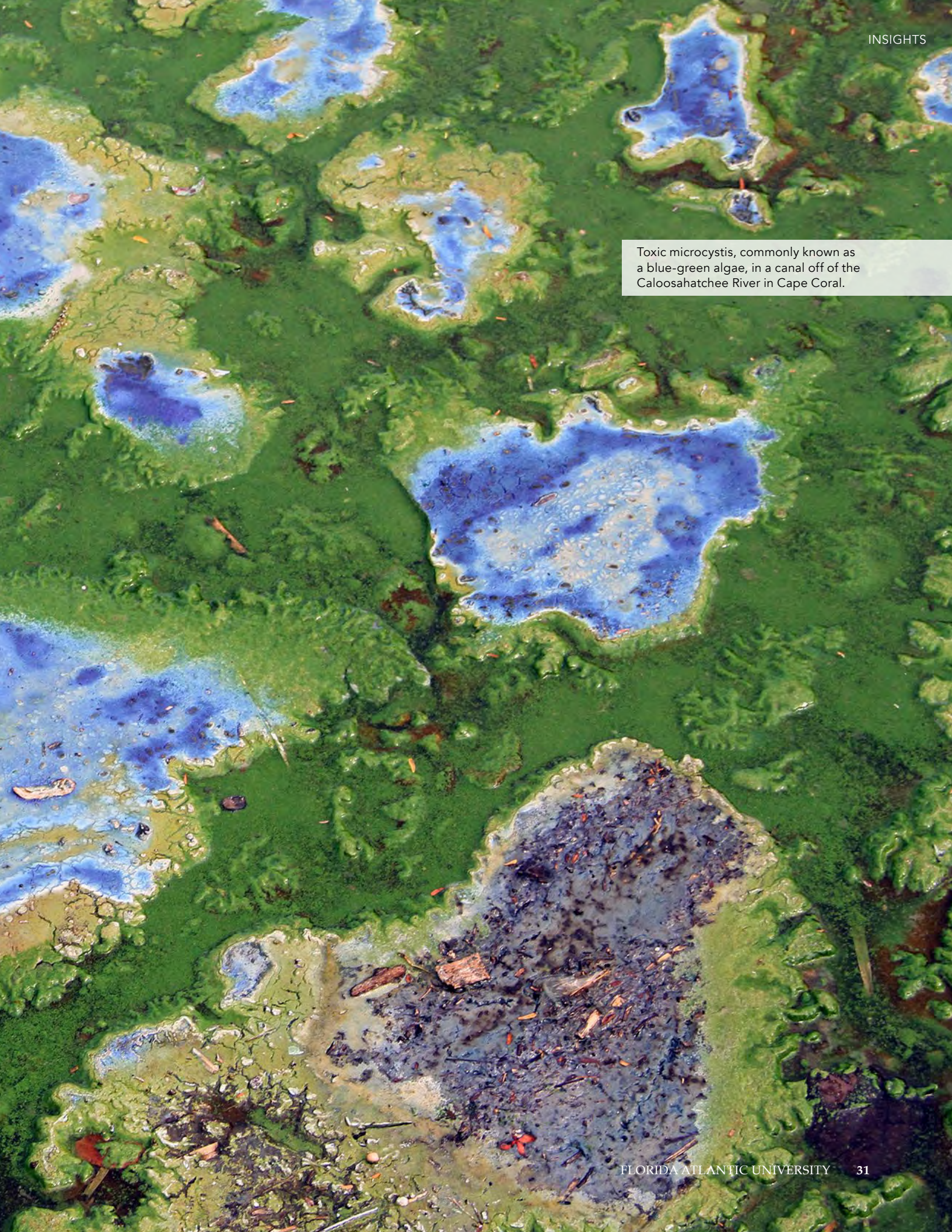
— James Sullivan, Ph.D.

The center's work may make it possible to predict, and eventually, prevent them, said Amy Wright, Ph.D., research professor at the institute and the center's administrator. "We hope we can contribute to

finding some of the solutions."

The center's research will take what Sullivan described as a "soup-to-nuts" approach. Its scientists will examine water quality, as well as microorganisms and compounds, including toxins, in the lagoon. In addition, they will look at toxins' path up the food chain into larger animals, including sharks, rays and turtles.

The animals at the top of that hierarchy — people — will be a primary research focus, since little is known about the degree to which humans are exposed to algal chemicals and the health effects beyond the most severe consequences. An initial study involves analyzing samples from people, such as blood and urine, for toxins. "Conditions in the lagoon are not likely to get better any time soon without some radical changes," Sullivan said. We need to know the risk to people during these events." ♦



Toxic microcystis, commonly known as a blue-green algae, in a canal off of the Caloosahatchee River in Cape Coral.

Research Park Sets Sights on International Prominence

By Lynn Laurenti

The Research Park at FAU, a well-established engine of economic growth in South Florida, is looking to broaden its horizons in the years ahead.

"The university has begun to be much more active in its efforts to interact worldwide, and we want to support that," said Andrew Duffell, the park's president. "We want companies everywhere to understand that it's not necessary for them to relocate their headquarters facilities here. They could establish small research units that align with the interests of FAU researchers."

Of course, larger organizations are also welcome to join the park's roster of heavy hitters, which includes

five-time Inc. 5000 honoree Modernizing Medicine. The only university-affiliated facility of its kind in South Florida, the park is moving forward from its already strong position. In 2017, its 33 high-tech tenant companies employed more than 3,000 people at an average annual salary of \$88,315, including nearly 200 FAU interns and graduates. With locations in Boca Raton and Deerfield Beach, the same year, the park's regional economic impact exceeded \$535 million.

"The focus going forward is on deepening the intellectual contributions to the economy," Duffell said. "We're always seeking opportunities for private sector companies to collaborate with FAU's researchers in areas of importance to our regional economy."

Two very special features of the park are its Technology Business Incubator and FAU Tech Runway. Startup and emerging companies in the incubator receive valuable business and mentoring services, with the goal of helping them become established companies and permanent residents of the park. Fifteen young enterprises are currently benefiting from the incubator's services.

FAU Tech Runway is a public-private partnership that provides a wide range of services to accelerate the development of innovative startup companies. Since its



Nesvio team members, from left: Scott Alcius, Martine Charles, Walner Alcius and Fedner Alcius, sought help from FAU Tech Runway for their contract-free, affordable, subscription-based company that connects immigrants with internet, Wi-Fi and live-streaming cable from their home cultures in Central and South America, the Caribbean and Africa.



TOP: Aerospace Technologies Group, a manufacturer of electromechanical shade systems for private and commercial aviation, is located in Research Park at FAU.

LEFT: ARRIS, located in Research Park at FAU, is a world leader in entertainment and communications technology.

inception in 2014, it has launched 72 companies, collectively raising more than \$63.5 million, creating nearly 351 jobs and generating more than \$64.7 million in sales revenue.

One example of the ingenuity being nurtured at FAU Tech Runway is Nesvio, a contract-free, affordable, subscription-based company that connects immigrants with internet, Wi-Fi and live-streaming cable from their home cultures in Central and South America, the Caribbean and Africa. In addition, Nesvio provides these services to members of the U.S. military stationed around the globe. The Lake Worth-based company, which is also a client of the Florida Small Business Development Center at FAU, has

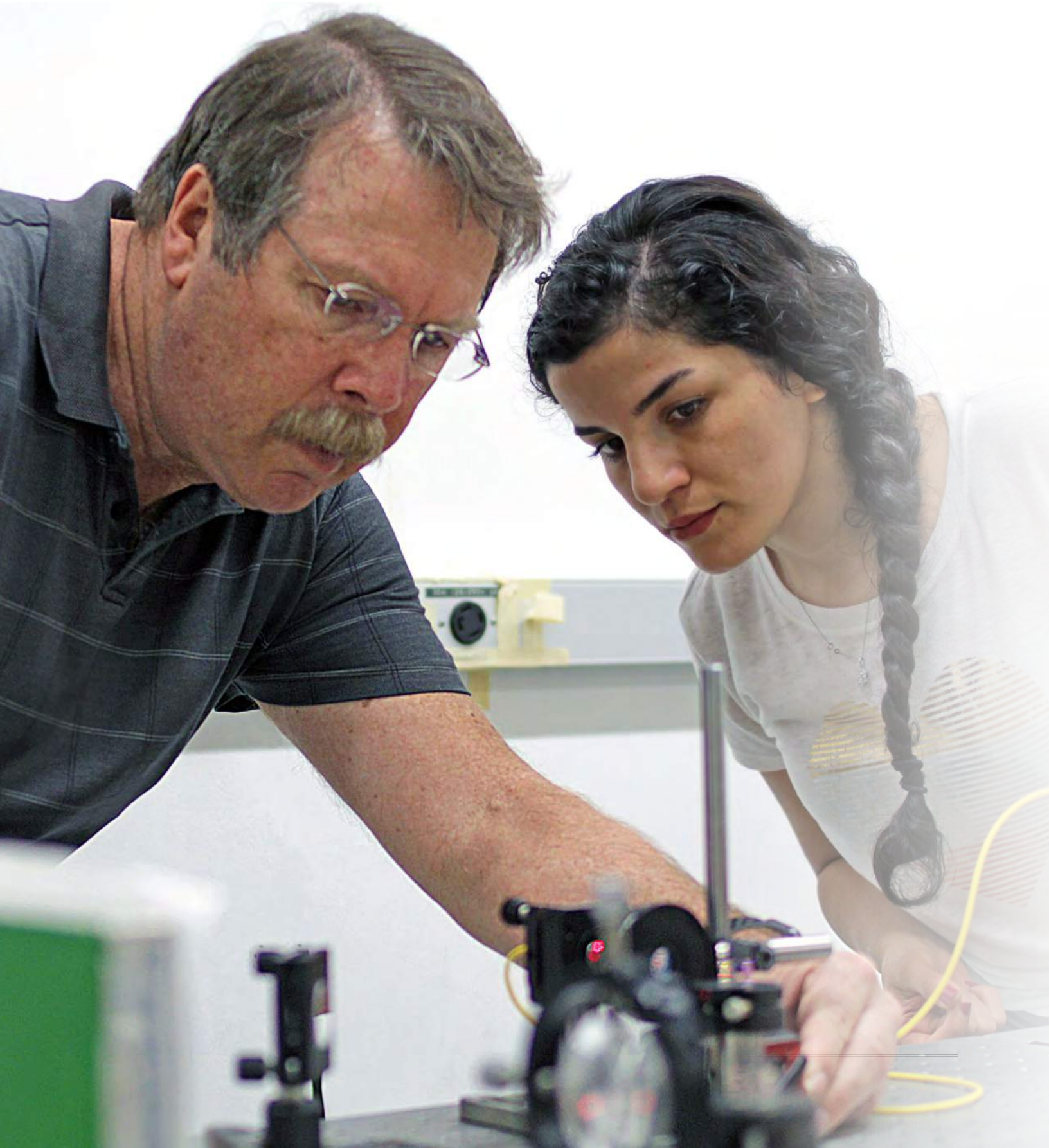
doubled its revenue in two years. From helping new entrepreneurs succeed to spurring the growth of established industries, the park continues to transform South Florida's economy.

"Collaborations between FAU researchers and members of the business community give us the opportunity to translate what we do to the marketplace," said Daniel Flynn, Ph.D., FAU vice president for research and treasurer of the park's governing board. "We want corporations to know that we want to work shoulder to shoulder with them to solve problems." ♦

"The focus going forward is on deepening the intellectual contributions to the economy."

— Andrew Duffell, president
Research Park at FAU

Tahereh Rezaei, Ph.D. candidate, right, and her advisor, Warner Miller, make fine adjustments to the Mach-Zehnder interferometer used to explore the stronger correlations between entangled photons. Rezaei is the lead manager of the quantum laboratory.



Enhancing Computer Supremacy for National Security

By John H. Tibbetts

Building the first full-scale quantum computers would be a revolutionary technology with problem-solving capabilities — both good and bad.

The quantum computer innovation performs calculations far more efficiently, allowing for improvements in machine learning, leading to medical breakthroughs and other advances, said Warner Miller, Ph.D., professor of physics and associate dean for research in the Charles E. Schmidt College of Science. But, the risk is that such advanced technology, also known as quantum supremacy that will far surpass today's supercomputers, could also be used to crack encryption codes — quickly threatening financial institutions, the electric grid and national security.

"Quantum computing is evolving rapidly, and it could quickly accelerate in development and trust in our data security could erode very quickly," said Miller, adding that even our institutions could become more vulnerable if quantum computers exist.

Miller is an advisory board member of the Quantum Alliance Initiative organized by the Hudson Institute, a Washington, D.C.-based think tank. The initiative brings together U.S. government, academic and industry partners to

help guide and support the nation and its allies' global leadership in quantum research and development. The importance of this area is underscored by the U.S. House of Representatives recent passage of a \$1.275 billion National Quantum Initiative Act.

"The United States is still leading in the field of quantum computing, but we should have a clear focus for national needs in this area," Miller said.

The U.S. Department of State appointed FAU to represent the U.S. at the International Telecommunications Union, the United Nations specialized agency for information and communications technologies. As academic members of the organization, Miller and his colleagues develop international standards for two crucial technologies that could combat quantum-resistant cryptography. The two technologies include quantum random number generators, preventing external secret hacking by rapidly generating random strings of digits, and quantum key distribution, a novel way to securely communicate using a fundamental law of nature that a quantum state can't be cloned,

which would stop hackers from intercepting and copying data. "What's exciting is that FAU is participating in this first-ever development of international standards in the quantum area," Miller said.

FAU is also creating an important new quantum information science collaboration with Harris

"We've shown that at FAU we can address some very clear needs in quantum computing, and we have the resources to help others."

— Warner Miller, Ph.D.

Corporation in Palm Bay, while continuing partnerships with SK Telecom, the largest telecommunications company in Korea, and IDQuantique, a Swiss company focused on quantum-safe cryptography, and the Air Force Research Laboratory Information Directorate. Miller's work is funded by grants from the Air Force Research Laboratory and from the Air Force Office of Scientific Research.

"We've shown that at FAU we can address some very clear needs in quantum computing, and we have the resources to help others," Miller said. ♦

Bio-Inspired Robot at Home Under Water

By Judy Gelman Myers

In the millions of years that moon jellyfish (*Aurelia aurita*) have existed, they have evolved into some of the world's most efficient swimmers. That is why Erik Engeberg, Ph.D., associate professor in the Department of Ocean and Mechanical Engineering, chose them as a model for his lab's newest invention, the JenniFish — a soft, stretchy, nine-tentacled, free-swimming robot.

The device will collect data on ocean health as it swims along the briny deep. Its nickname is JenniFish, for Jennifer Frame, a student who helped develop the original prototypes, and now works with the navy. Assistant professor Oscar Curet, Ph.D. helped design and evaluate the performance of the Jennifish.

The latest iteration of the robot is made of flexible, glow-in-the-dark rubber molded in a 3-D printed cast. Sensors in its micro-controller,

or "brain," detect its orientation and track water temperature, depth, and plankton and algae levels.

The JenniFish is the latest technology to emerge from Engeberg's BioRobotics Lab, where he and his team research how biological entities and processes can be harnessed to create life-enhancing technology — a branch of science called bioinspiration. "You take traits of nature that took millions of years to evolve to a very sophisticated state, then apply them to artificial systems," said Engeberg. "That's what we did with the JenniFish."

Ironically, given the live model's aquatic talents, Engeberg's greatest challenge was designing the JenniFish to swim. Moon jellyfish move through the water in two distinct ways: either they float along on ocean currents, or they propel themselves, by

contracting their muscles to force jets of water out of their bodies, then relaxing their muscles as a second water vortex gives them another push forward.

The JenniFish uses both modes of propulsion. When launched into the Gulf Stream, the current moves the robot to another location, where it can drift-dive within the current toward features of interest, like algae or red tide. In self-propulsion mode, the robot's actuators inflate with water, then three battery-powered pumps move the tentacles, allowing the robot to swim in three dimensions.

The most difficulty was in perfecting interaction between actuators

and pump, and gauging how that interaction affected the thrust force the device generated while swimming.

"Interaction between the variables, along with the frequency and method of actuation, is very complicated," said Engeberg. "Finding the sweet spot was really tough."

The JenniFish's greatest limitation is also its greatest strength. It is slow, just like a live moon jellyfish, whose efficient swimming technique only works at low speeds.

However, slow

speed provides two advantages to the robot. It enables long battery life and it minimizes damage if the device bumps into fragile underwater features like coral reefs.

Funding for the JenniFish comes from Engeberg's own startup accounts and departmental sources. The device has already collected data on test dives along the ocean floor, but it's still in its preliminary stages. With the help of a student, Dan Luvisi, future prototypes will collect data on the damage that climate change wreaks on coral reefs.

Engeberg's innovation has attracted widespread media coverage including NBC, BBC, the New York Post, Yahoo News and WIRED magazine, and has garnered global interest through translations into Japanese, Chinese, Thai, Portuguese, Spanish and Russian. ♦

Sparking Interest in the Brain

By Lynn Laurenti

One effective way to engage the interest of potential neuroscientists is to give them the opportunity to see how the brain controls muscle movement in organisms ranging from a tiny worm (*C. elegans*) to human beings.

That's part of the hands-on approach of the FAU team leading a new educational

program for middle-school students called Advancing STEM Community Engagement Through Neuroscience Discovery (ASCEND). STEM is an acronym for science, technology, engineering and mathematics — career fields of vital importance to the United States' competitive strength in the 21st century.

The ASCEND program, funded by a four-year \$780,000 grant from the Stiles-Nicholson Foundation, began with a series of one-day events called Brain Sparks, held at the South Florida Science Center and Aquarium's STEM Studio in Abacoa, adjacent to the Jupiter campus. At the introductory sessions, students learned how their brains control muscle movement by putting electrodes on their cheeks and visualizing electrical activity



By focusing intently, middle school students learn how the brain concentrates through electrical activity.



on an iPad as they chewed gummy bears. That and other demonstrations of brain activity in real time, and demonstrations of the unique brains of worms, fish and octopuses, prompted some of the seventh- and eighth-grade participants to sign up for a more comprehensive two-semester program. They will work together in monthly after-school sessions under the guidance of post-doctoral fellows, graduate students and undergraduate students with neuroscience expertise. Collaborating institutions include the Max Planck Florida Institute for Neuroscience, Scripps Research and FAU's Harriet L. Wilkes Honors College.

"We've created three teams that together drive the ASCEND program," said Nicole Baganz, Ph.D., who is overseeing the program in her capacity as director of community engagement and programming for the FAU Brain Institute.

"The Talks and Tours team has responsibility for creating the program's hand's on and lecture-based curriculum.

During our initial sessions, we caught the students' interest by allowing them to see the neurons of the microscopic worm *C. elegans*, engineered by FAU neuroscientists to become fluorescent."

The second team, Media Mavens, is developing podcasts and webcasts based on knowledge gained through Talks and Tours. The third team, Virtual Voyagers, is demonstrating and developing content using touch screen interactives, virtual reality and augmented reality applications.

ASCEND participants start by learning about cells and advance to gaining knowledge of neural networks and complex brain disorders. Students will finish the program with a science poster presentation.

"The students are really excited about this program," Baganz said. "It goes far beyond the typical classroom experience. As students were leaving a session, I heard one boy say to his mother, 'I love it, Mom! It's the coolest thing I've ever done in my life!'" ♦

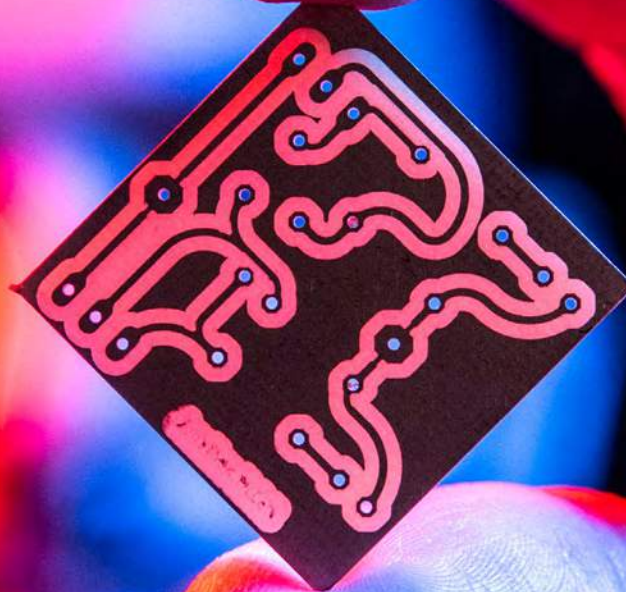
Making the Rabbi's Voice Heard

By Cammi Clark

Rabbi Merle Singer has been a rock in the Boca Raton community for decades. But when the strength of his voice started to weaken because of Parkinson's disease, Singer turned to another pillar of the community for help — FAU.

"(My voice) was my signature," says Singer, who has challenged FAU students to invent a device that can counter the effects of Parkinson's disease on the voice, such as low volume, muffled speech and fast speed of slurred words. The intended prototype should be small, unnoticeable, easy-to-use and rechargeable.

"What my phone can do in delay time, I'm looking to do in real time," he said referring to his phone's capability to do some of those things.



Carl Boukzam holds a sensor he and teammates are developing as part of a prototype aiming to give Parkinson's patients their voice back.

As a professional public speaker, Singer said the loss of his voice to Parkinson's left him feeling "isolated and hopelessly helpless. I can't help myself," he said, which is why he turned to FAU. "I'm looking for something to give me my voice back."

Singer's connection to FAU began in 1978 when he became an adjunct professor teaching Jewish history courses. His many years of service to FAU and the greater community have been recognized by a President's Distinguished Service Medallion, an honorary doctorate and the key to the city of Boca Raton. Throughout the decades, he has watched with pride as the university blossomed into the powerhouse it is today.

Singer was diagnosed with Parkinson's, a nervous system disorder, in 2002. There is no known cure. "I'm fighting it every which way I can," he said. "My issues are universal issues" among those living with Parkinson's. A device developed to help him has the potential to make a difference for the more than seven million people worldwide who have Parkinson's disease.

Singer frequently visits the Louis and Anne Green Memory and Wellness Center of the Christine E. Lynn College of Nursing on the Boca Raton campus. The center offers specialized services grounded in caring science for people living with Parkinson's disease.

"I'm looking for something to give me my voice back."

— Rabbi Merle Singer



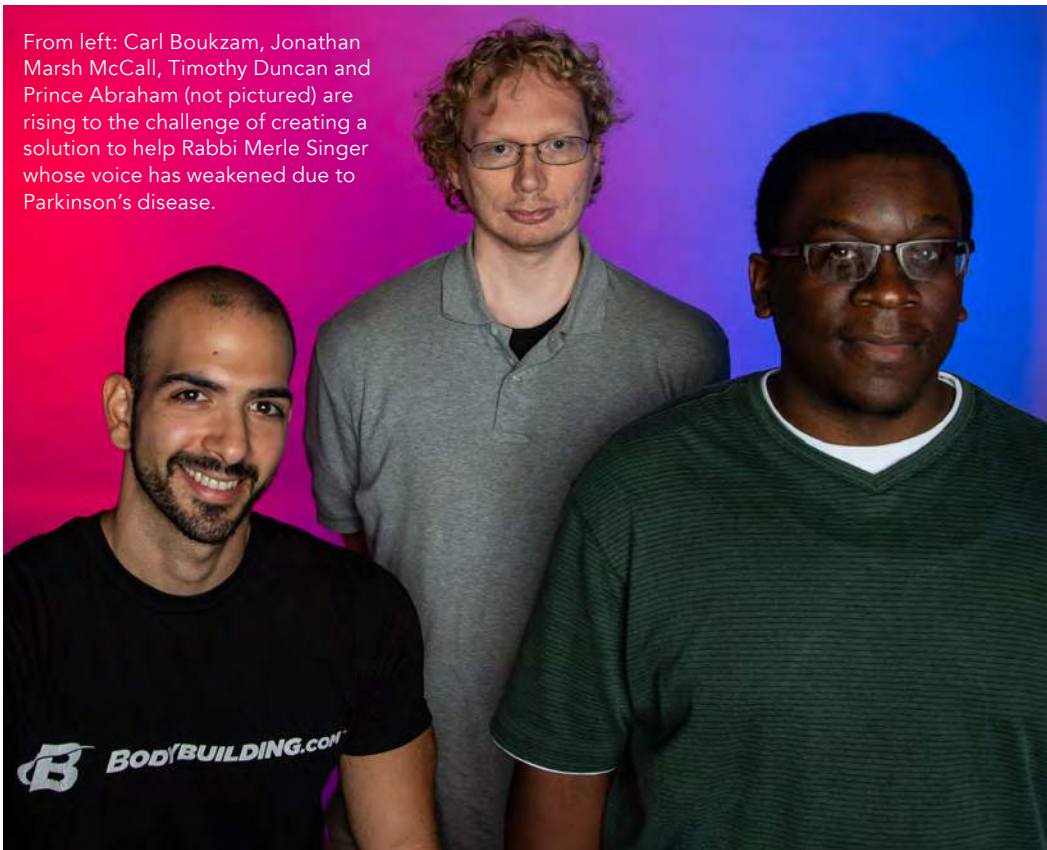
This connection led him to Daniel Flynn, Ph.D., vice president for research, and Hanqi Zhuang, Ph.D., of the College of Engineering, whose students are now working on creating ways to help remedy Singer's declining vocal abilities. The prototypes they produce will be part of this year's design showcase, a culminating project for seniors. Some of the students are part of FAU Wave, an innovative program that brings students together to work on solutions to real-world problems.

"In engineering design, we solve problems," Zhuang said. "In this case, it is really linked to people, people who have a disease and want to find solutions."

The students are tackling the challenge from two angles, he said. The first is to create a functional adaptation for existing technology, such as the iPhone. The other is to create a prototype, something designed from scratch that is able to record the voice and play it back cleanly with amplified volume, less vibration and more steadiness.

"This is a step in that direction, and I hope we can provide solutions for this problem," Zhuang said. "This is a very meaningful part of modern technology and future design." ♦

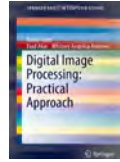
From left: Carl Boukzam, Jonathan Marsh McCall, Timothy Duncan and Prince Abraham (not pictured) are rising to the challenge of creating a solution to help Rabbi Merle Singer whose voice has weakened due to Parkinson's disease.



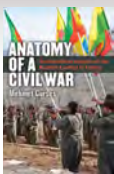
OFF THE SHELF



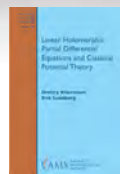
The Children of Spring Street: The Bioarchaeology of Childhood in a 19th Century Abolitionist Congregation
Meredith A. B. Ellis, Ph.D.
Dorothy F. Schmidt College of Arts and Letters
Published by Springer International Publishing, 2018



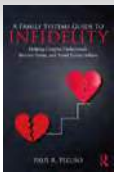
Digital Image Processing: Practical Approach
Borivoje Furht, Ph.D., Esad Akar and Whitney Angelica Andrews
College of Engineering and Computer Science
Published by Springer International Publishing, 2018



Anatomy of a Civil War: Sociopolitical Impacts of the Kurdish Conflict in Turkey
Mehmet Gurses, Ph.D.
Dorothy F. Schmidt College of Arts and Letters
Published by University of Michigan Press, 2018



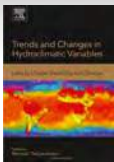
Linear Holomorphic Partial Differential Equations and Classical Potential Theory
Erik Lundberg, Ph.D.
Charles E. Schmidt College of Science
Published by American Mathematical Society, 2018



A Family Systems Guide to Infidelity: Helping Couples Understand, Recover From, and Avoid Future Affairs
Paul R. Peluso, Ph.D.
College of Education
Published by Routledge, 2018



L'art 'a l' 'etat vif: La pensee pragmatiste et l'esthetique populaire (Art in a lively state: Pragmatist thinking and popular aesthetics)
Richard M. Shusterman, D. Phil.
Dorothy F. Schmidt College of Arts and Letters
Published by L'ecolat Paris, 2018



Trends and Changes in Hydroclimatic Variables: Links to Climate Variability and Change
Ramesh Teegavarapu, Ph.D.
College of Engineering and Computer Science
Published by Elsevier, 2018



Not for ESOL Teachers: What Every Classroom Teacher Needs to Know About the Linguistically, Culturally, and Ethnically Diverse Student, 3rd Edition
Eileen N. Whelan Ariza, Ed.D., College of Education
Published Kendall/Hunt Publishing, 2018



Post-Famine Politics, a chapter in "The Cambridge History of Ireland"
Douglas Kanter, Ph.D.
Dorothy F. Schmidt College of Arts and Letters
Published by Cambridge University Press, 2018



Immigration, a chapter in "Keywords in Social Studies: Concepts and Conversations"
Dilys Schoorman, Ph.D., and Rina Bousalis, Ph.D.
College of Education
Published by Peter Lang, Switzerland, 2018

Sponsored Content



FAU
CHARLES E. SCHMIDT
COLLEGE OF SCIENCE
Florida Atlantic University

Propelling young scientists to save our seas

The Charles E. Schmidt College of Science would like to extend its heartfelt gratitude to the National Save The Sea Turtle Foundation for supporting undergraduate students. The foundation gave a generous donation to create four undergraduate scholarships for the 2019-2020 academic year.

These unique scholarships will not only provide financial assistance to superior students, they will support individuals who demonstrate the commitment and ability to become scholars and ambassadors of marine science at the Florida Atlantic Marine Research Laboratory located at Gumbo Limbo Nature Center.

Learn more about National Save the Sea Turtle Foundation by visiting: savetheseaturtle.org.

We invite you to join the college as we support young scientists, preserve the future of Florida's marine ecosystems, and propel sea turtle research with your tax-deductible gifts.

To learn how you can help, please contact Mary Beth Mudrick at 561-799-8665 or mmudric1@fau.edu.

Contribute today!

561-799-8665

<https://fauf.fau.edu/science>



Florida Atlantic University
Division of Research
777 Glades Road
Boca Raton, FL 33431

Non-Profit Org.
U.S. POSTAGE
PAID
BOCA RATON, FL
PERMIT NO.77

Students in a chemistry lab on the Boca Raton campus, 1960s.
Courtesy FAU Libraries' University Archives & Digital Library

