Students work on an assignment in a physics lab, 1972. Courtesy FAU Libraries' University Archives & Digital Library
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World-class research advances existing technologies and unveils discoveries to improve our lives and help us better understand the world we live in. The hallmarks of top-tier universities are faculty members who are at the forefront of research that does just that.

One great example is Erik Engeberg, Ph.D., a College of Engineering faculty member whose work could improve the quality of life for amputees and others who suffer from nerve damage. Along with a team of engineers, neuroscientists and an orthopedic surgeon, Dr. Engeberg is working to build a prosthetic limb that will give the sensation of touch to its users. It’s exactly the type of project that was imagined when we developed FAU’s “Strategic Plan for the Race to Excellence 2015-2025,” which outlines a vision to build on the university’s strengths, which include neuroscience, sensor technology and healthcare.

The National Science Foundation found Dr. Engeberg’s work compelling enough to award the project a $1.3 million grant. The results of the project could be life-changing for people with nerve damage. You can read about the fascinating work in this edition of Owl Research & Innovation.

Another area of strength for the university is ocean and environmental science. Over the years, Shirley Pomponi, Ph.D., and her colleagues at FAU Harbor Branch Oceanographic Institute have made a number of discoveries on their voyages into the deep recesses of the oceans.

Beyond finding new species of aquatic plants and microorganisms — some of which can be used to develop improved medicines — ocean scientists such as Dr. Pomponi have seen many unique animals that few others will ever observe in their natural environments. However, you can view images of some of Dr. Pomponi’s most interesting sightings in the photo story beginning on page 21.

We’re building on the work of faculty like Drs. Engeberg and Pomponi and many others. Together with collaborators, FAU’s research can enhance our lives and lead to world-changing breakthroughs.

John W. Kelly, Ph.D.  
President  
Daniel C. Flynn, Ph.D.  
Vice President for Research
Upgrading Undersea Software

Taking on an undersea wireless communications and surveillance project with applications for search and rescue operations, pollution monitoring and oceanographic data collection is a daunting task. Stella N. Batalama, Ph.D., and Dimitris Pados, Ph.D., have accepted the challenge. The National Science Foundation is backing their efforts with a $500,000 grant.

The College of Engineering and Computer Science researchers will design, deploy and evaluate a first-of-its-kind software-defined testbed, a platform for testing new technologies. This platform will provide the basis for a four-tier network involving multiple autonomous vehicles and satellites.

“Our goal is to significantly advance the state-of-the-art in three-dimensional undersea position findings by providing novel algorithmic solutions to address the challenges that exist in wireless networked communication, navigation and surveillance,” said Batalama, dean of the college. Plans are to test the technique first in a 30-foot-deep acoustic test tank and then in the Atlantic Ocean at FAU’s Institute for Ocean and Systems Engineering.

Applications include monitoring undersea machinery, disaster prevention, search and rescue, marine life studies and military tactical surveillance.
Novel Imaging System from Nanosatellite Yields Better Pix

Michael Twardowski, Ph.D., and Bing Ouyang, Ph.D., of FAU Harbor Branch Oceanographic Institute, received a $300,000 grant from the Office of Naval Research through the National Oceanographic Partnership Program to develop a novel earth-observing imaging system for miniaturized satellites called CubeSats. Harbor Branch’s system will overcome CubeSat limitations in data transmission, power and size, as individual units are only 10 centimeters on each side.

The system will collect high-quality images over coastal regions, where bright cloud and land reflections can border dark ocean reflections. "It uses compressive sensing algorithms to pick up only non-redundant information, so images collected with our camera will have better sensitivity, spatial resolution and color discrimination than the current state of the art," said Twardowski.

The grant leverages seed funding from FAU’s Institute for Sensing and Embedded Network Systems Engineering and holds possibilities of further funding. The images will yield information on water quality, phytoplankton distributions and possibly even bioluminescence. ♦

Published Research at College of Business is Flourishing

Multiple studies by scholars from the College of Business have been published on a wide range of topics in just a few months’ time.

A study published by Professor Rebel Cole, Ph.D., looks at the ability of small businesses to access bank credit following the financial crisis. He has found that banks have sharply curtailed their lending to small businesses, despite the fact that small businesses account for about half of all private sector employment, net job growth and gross domestic product. While lending to big businesses rebounded strongly during 2009-2015, lending to small businesses remains below pre-crisis levels.

Findings published by Assistant Professor Xu Han, Ph.D., provide systematic evidence that some nursing homes are inflating their self-reported ratings. Han’s findings will help the Centers for Medicare & Medicaid Services improve the nursing home inspection process and rating system. This benefits families considering using these facilities, since ratings are often their only source of information. ♦
For Oscar Curet, Ph.D., winning the highly competitive National Science Foundation Faculty Early Career Development Program grant allows him to mesh his expertise in engineering and biology, creating a propulsion system to dramatically improve vehicles’ underwater maneuverability.

“As engineers, we look at different problems, in particular with mobility, and how we can move in our environment,” said Curet, assistant professor in the Department of Ocean and Mechanical Engineering. “And basically, I use inspiration in nature to solve some of these problems. I look into how fish move and how they do different types of maneuvers, and how we can incorporate that on an engineering system.”

Improving maneuverability underwater, Curet adds, will allow underwater vehicles to perform more complex tasks such as inspecting submerged wrecks, vessels’ hulls, underwater pipelines, coastal structures and coastal zones.

Curet says the $500,000 grant for junior faculty is vital for his research and may also serve as a building block for his career, “not just looking at the period of time of the award, but also 10, 20 years from here.”

---

The devastating effects of stroke are no secret — nationally, it is the leading cause of disability and the third leading cause of death. Add to this the lack of medicines to treat the brain damage that results from stroke and traumatic brain injury (TBI), and the situation looks bleak.

Two professors from the Charles E. Schmidt College of Medicine are starting to turn the tide. Jang-Yen (John) Wu, Ph.D., and Howard Prentice, Ph.D., have developed and patented a multidrug combination therapy involving three distinct classes of drugs. The combination therapy seeks to reverse damage to nerve cells in the brain.

This promising technology will be further developed and commercialized with help from CHS Pharma Inc., a South Florida-based biotechnology development company where Wu and Prentice are scientific advisors. Director and founder Stephen Chakoff says the company is “fortunate to be working with outstanding scientists like Drs. Wu and Prentice” and is optimistic for the outcome of the partnership.
The College of Engineering and Computer Science has received a $1.25 million grant from the United States Office of Naval Research to work on autonomous unmanned marine vehicle platforms for coastal surveillance, coastal surveys, target tracking and protection of at-sea assets.

“Our focus will be on developing a multi-vehicle system that can safely and reliably navigate coastal waters with a high level of autonomy while performing assigned tasks,” said Manhar Dhanak, Ph.D., left, principal investigator and director of SeaTech – The Institute for Ocean and Systems Engineering.

The five-year project will develop unmanned surface vehicles that serve as “mother ships” for unmanned underwater vehicles and aerial drones. The research team will develop capabilities, including multi-sensor perception, collision avoidance, mapping, and improved low-level control in adverse weather conditions.

Two innovators from FAU earned a coveted spot on Forbes magazine’s prestigious 30 Under 30 list of people making an impact far beyond their years in 2018.

Jan Bednar, right, the founder of ecommerce fulfillment company ShipMonk, earned a spot in the retail and ecommerce category. One of the first startups to graduate from the FAU Tech Runway Venture Class Program in 2015, the company has grown to having a projected $25 million in sales this year.

Hannah Herbst, an FAU High School student, made the list in the energy category with her ocean energy prototype called BEACON. She hopes it will one day help provide a stable power source in developing countries.

Trailblazing different paths, these young visionaries are change agents who are inspiring others near and far.
Peers Aren’t the Only Bad Influence

Peers pressure has often been labeled as the cause of teen substance use. However, according to a study conducted by FAU researchers and collaborators, genetics are not to be overlooked.

Using a unique sample of twin pairs, investigators looked at how genetics and environment influence individual differences in the development of substance use between early and late adolescence.

Results of the study, published in Psychological Medicine (a publication of Cambridge University Press), revealed genetic influences that are unique to the growth in substance use.

“Inheritance becomes increasingly more important in terms of determining drinking and drug use as adolescents get older,” said Brett Laursen, Ph.D., co-author of the study and a professor and graduate studies coordinator in the Charles E. Schmidt College of Science. “It’s a mistake for us to just assume that peers are the only factor responsible for the growth of substance use.”

Pre-Med Program Welcomes Young Scientists

Earning bachelor’s degrees while in high school, Sarah Palumbo, Maximilian Rabil and Nadia Sial became some of the nation’s youngest medical students when they were accepted into the Charles E. Schmidt College of Medicine as the inaugural class of the FAU High School M.D. Direct pipeline program. The 19-year-old scientists are working on cutting-edge research with faculty members.

Amplifying an Exemplary School Model

More good things are in the works for A.D. Henderson University School and FAU High School. A $2.24 million Jacob K. Javits Gifted and Talented Students Education Program grant will be spent over the next five years to enhance and replicate their early college model that helps students from all backgrounds excel and begin receiving college credits. In addition, a $1 million gift from Daniel Cane, CEO and co-founder of Modernizing Medicine, and his wife, Debra Cane, will establish an epicenter for research, education and technology transfer called The Cane Institute for Advanced Technologies.
Monkeys Crossing Mating Boundaries

A monkey behavior that has been occurring for hundreds of years was discovered, thanks to a study done by Kate Detwiler, Ph.D., associate professor in the Dorothy F. Schmidt College of Arts and Letters.

Detwiler is the first to provide genetic evidence that two distinct species of monkeys inhabiting Gombe National Park in Tanzania, Africa, have been successfully mating and producing hybrid offspring.

Using mitochondrial DNA extracted from the feces of 144 “red-tailed” monkeys (Cercopithecus ascanius), “blue” monkeys (Cercopithecus mitis), and hybrids, she found that all of them traced back to female red-tailed monkeys. For this lineage, it is the first time that science shows that not only is the DNA there, but so are the hybrids.

Her work was funded by a faculty research seed grant from FAU’s Division of Research, the Department of Anthropology, the National Science Foundation, the Leakey Foundation and the Wenner-Gren Foundation.
To most of us, babies are innocence personified. To Teresa Wilcox, Ph.D., new chair of the Department of Psychology, babies are complex learning machines. She’s spent 30 years investigating what babies learn during the first few months of life and how their knowledge changes over time.

Wilcox didn’t always study babies. Her undergraduate concentration was education, psychology and music. Her family all taught K–12, but she opted for a masters degree in child development from the University of California, Davis and a Ph.D. in psychology from the University of Arizona, with numerous professorships and grants to follow.

Though she’s asked the same questions throughout her career, her research has evolved, from behavioral studies that timed how long babies watched events on a puppet stage, to recording babies’ eye movements as they tracked a face on a video screen or objects that moved in and out of view.

Now Wilcox employs a noninvasive optical imaging technique known as functional near infrared spectroscopy (fNIRS). A near infrared light, sensitive to oxygenated blood, is shined onto a baby’s scalp. From there, it passes into the brain. As the baby processes objects, activated regions of the brain receive increased blood flow and refract more light.

She has big plans for her department. “We’d like to get more top-notch researchers — people who ask interesting questions — and align ourselves with the university’s institutes, especially neuroscience, healthy aging, and sensing systems,” Wilcox said. She’s currently collaborating with a College of Engineering researcher who builds robotic hands for use in functional near-infrared spectroscopy — or neuroimaging — studies to gauge babies’ processing of human and nonhuman hands.

“As scientists we have ideas about why the questions we’re asking are important, but it’s becoming more and more critical to communicate to other people why they’re important.”
— Teresa Wilcox, Ph.D.

Wilcox also stresses the importance of science communications. “As scientists we have ideas about why the questions we’re asking are important,” she said, “but it’s becoming more and more critical to communicate to other people why they’re important to understanding our world more globally.”

By Judy Gelman Myers
Addiction Researcher Pitching Possibilities

By Cammi Clark

Growing up, Lawrence Toll, Ph.D., dreamed of being a pitcher for the Los Angeles Dodgers.

“It turns out, I’m better in science” than baseball, says Toll, an internationally recognized neuroscientist who has done groundbreaking research in drug addiction and pain management. Toll is a professor at the Charles E. Schmidt College of Medicine and investigator at the FAU Brain Institute.

His career path in science began in 1978 when he earned a Ph.D. from the UCLA School of Medicine, followed by postdoctoral fellowships at UCLA and Johns Hopkins University School of Medicine, with world-famous neuroscientist Solomon Snyder. Just before his 30th anniversary at SRI International in 2011, a research center in California, Toll joined Torrey Pines Institute for Molecular Studies in Port St. Lucie, Fla. as director of the neuropharmacology program.

Now Toll is part of the 21st Century World Class Scholar Program, designed to recruit and retain top faculty in science, technology, engineering and mathematics to Florida universities. Toll is the president of the International Narcotics Research Conference, one of many organizations he has been with for decades.

Toll says FAU is a good environment for research and he’s eager to collaborate with colleagues like Janet Robishaw, Ph.D., chair of the Department of Biomedical Science and senior associate dean for research at the College of Medicine, and Randy D. Blakely, Ph.D., executive director of the FAU Brain Institute. “Janet’s work is synergistic to what I do, looking at opioids with respect to genomics,” Toll says. “It’s possible we could work together on the mechanisms behind opioids. Randy works on ion channels and serotonin, and I work on pain and pain pathways, so it’s possible we could work on new compounds that target each.”

While Toll may not have landed his boyhood dream to be a major-league pitcher, his success as a major-league scientist will continue at FAU where, Toll says, “It’s all possible.”
When you grab a cup of coffee, you don’t think about it. The sensory neurons in your hand feel the pressure of the cup and alert your brain to stop contracting your muscles. If the cup starts to slip, sensory neurons detect it and alert your brain to contract your muscles again. For people whose sensory neurons have been damaged or cut altogether, this connection uniting touch, the brain and muscles is lost. And with it, the ability to properly grab that cup of joe.

People who have suffered nerve damage from injury, amputation or stroke have benefitted greatly from improvements to prosthetic limbs and mechanical hands.
Research also has shown that damaged nerves can regenerate with electrical stimulation. But the bigger picture of how to improve the lives of people with nerve damage has been missing. Until now.

A groundbreaking interdisciplinary research project is studying how nerves regenerate after injury and the best way to make it happen. With a $1.3 million grant from the National Institutes of Health, Erik Engeberg, Ph.D., associate professor in the Department of Ocean and Mechanical Engineering, has assembled a team to uncover the connections between the sense of touch and the capacity to manipulate a prosthetic device.

“As nerves regenerate, the amputee’s sense of touch evolves. As the sensation of touch improves with continued use and regeneration, the subject will gain improved control of (a robotic) hand. We’re looking at this synergistic interaction between motor control and evolving sensation of touch as nerve regeneration occurs, all simultaneously,” Engeberg said.

To study nerve regeneration, Engeberg and his colleagues have designed a “closed-loop” system that houses damaged nerve cells in fluid-filled chambers — this setup allows the team to study nerve regeneration in real time. The loop begins with a human subject, usually an amputee, who has been fitted with a sensor that measures electrical signals from muscles (this technique is called electromyography, or EMG).

When an amputee performs an action, such as grasping, electrical signals are sent to a robotic hand, impelling it to grasp. The robotic hand is equipped with sensors that mimic human touch. The touch sensations it “feels” are converted into electrical signals, which are then sent to the fluid-filled chambers to stimulate the damaged nerve cells. “The in vitro nerves are going to grow in response to the electrical stimulation, which is done in a way that’s biologically similar to the nerve impulses that travel in the peripheral nervous system,” explained Engeberg.

It is here, in the chambers, where the crux of the study lies. Each chamber contains an electrode and approximately 5,000 dorsal root ganglion cells (the type that send sensory information to the spinal cord). To simulate nerve damage, the investigators have cut away the cells’ axons, which are the long, slender threads that convey electrical impulses to other cells. The electrical signals from the robotic hand stimulate the neurons via the electrode. As the neurons regenerate in response to the stimulation, their axons grow down a specially designed microgroove that allows the researchers to better monitor and measure the process of regeneration.

“We have different frequencies feeding into the neurons, and we analyze the regeneration of those neurons to see whether those axons are going to grow back,” said Jianning Wei, Ph.D., associate professor of biomedical science in the Charles E. Schmidt College of Medicine. “My part is to see what kind of stimulation makes the peripheral neurons regenerate functionally and faster.”

**Microchips, Sensors and Unlimited Data**

To close the loop, the amputee manipulating the robotic hand will wear an armband that houses a microchip. “The chip accepts signals from the touch sensors connected to the prosthetic hand, allowing neuron regrowth after injury,” said Sarah Du, Ph.D., assistant professor in the Department of Ocean and Mechanical Engineering. “And the neuron regrowth signal, together with the EMG signals, will be used to improve the operation of the robotic hand.”

In that sense, explained Engeberg, the team is creating new mappings between the robotic fingertip forces and the microchip in the armband based on the way the nerves regenerate. “It’s pretty exciting,” he said.

The team includes a clinical perspective with collaborator Douglas Hutchinson, M.D., an orthopedic surgeon at the University of Utah, who has experience implanting neuroprosthetic electrodes in amputees. His expertise will be needed...
Amputee wearing EEG cap — used to monitor brain activity — is fitted with a sensor measuring electrical signals.

EMG — a technique for recording electrical activity produced by muscles — signals robotic system, commanding hand to move.

Touch sensations from sensors are converted into electrical signals then sent to fluid-filled chambers.

Rather than a petri dish, neurons grow in a lab in chambers mimicking the function of a living cell.

Soft actuator communicates robotic arm’s sensation back to amputee.

In her lab in the College of Medicine, Jianning Wei will test what type of stimulation makes the neurons regenerate functionally and faster.
soon when the team starts working with amputees. While an amputee operates the robotic hand, Emmanuelle Tognoli, Ph.D., associate research professor at the Center for Complex Systems and Brain Sciences, will use electroencephalography (EEG) to monitor the amputee’s somatosensory cortex, the area of the brain that processes information about pressure, vibrations and spatial patterning. This noninvasive technique will allow the team to safely and objectively quantify the amputee’s perception of touch.

The team is certainly not the first to study how electrical stimulation improves prosthetic use. Multiple researchers have collected these kind of data, frequently by implanting a chip in an amputee rather than using an external armband — a procedure that is not only costly and invasive, but also constrained, as data are limited to a single subject. What’s new about Engeberg’s approach is that it allows the team to work with multiple amputees and different robotic hands, stimulating thousands of nerves according to different types of movements, thus generating a lot of data in a short period of time.

“Receptors in hands that can sense are very complicated,” Tognoli said. “By studying the nerves in vitro, we can test richer ways to restore communication of tactile information. It’s a very fruitful way to test the interaction between plasticity at the neuron level, and perception, behavior and action of the whole person.”

The National Science Foundation initially funded the project in 2013. FAU’s Institute for Sensing and Embedded Network Systems Engineering added a seed grant. In October 2017, the NIH awarded the researchers a $1.3 million grant.

While the study’s application to neuroprosthetics is clear, the research is also relevant wherever
damaged nerves can regenerate and form new connections: the high school gymnast who returns to competitions after recuperating from a spinal fracture, later landing a college scholarship. The paralyzed father taking his child to a sporting event will once again feel his child’s hand in his while ascending the bleachers.
The university, which counts Bank of America and Office Depot among its long-standing trusted partners, is making a concerted effort to elevate its corporate engagement. More recently, scientists from Sancilio & Co., Inc., a local biotech company, have developed a graduate course giving students hands-on laboratory experience in preparing and analyzing pharmaceutical solutions. Aside from giving the students new skills, this course is also helping train the highly skilled employees biopharmaceutical and drug development companies need.

The university recently charged Anton Post, Ph.D., associate vice president for corporate and international relations, with spearheading an increased effort to engage with corporations to promote economic growth and achieve cutting-edge research.

Moving at Critical Speed

Imagine trying to create a medicine for an incurable form of muscular dystrophy. While it may seem like an impossible task to some, that’s the initial focus of Expansion Therapeutics, a drug discovery and development company working on developing medicines for diseases that have no cures.

And, according to co-founder Matthew Disney, Ph.D., the company’s partnership with FAU helps turn the impossible into the possible. “FAU has been invaluable for us because we are an early-stage company and we have raised a significant amount of capital,” he said.

**Partnerships with FAU Make the Impossible POSSIBLE**

By Cammi Clark
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“FAU has been invaluable for us because we are an early-stage company and we have raised a significant amount of capital,” he said. “That
money goes extremely quickly because there are a lot of moving pieces in trying to make a drug that is virtually unimaginable. These patients need it very badly."

“Speed is critical. We needed the ability to have a place that would be very efficient and allow us to tie in to key infrastructure. FAU has allowed us to do that very quickly. It allowed us to get things moving at lightning speed and it allowed us to leverage all the infrastructure that was in Jupiter, which is very unique and very invaluable.”

**Your Partner in Innovation**

It’s potential partnerships like this that piqued the interest of some 40 companies that attended a day-long event, Discovery at FAU — Your Partner in Innovation, hosted by the Division of Research and the Business Development Board of Palm Beach County, to learn about the university's corporate engagement strategies.

Vice President for Research Daniel Flynn, Ph.D., led the day, talking about FAU’s direction, assets and partnership opportunities. While its research is broad and far-ranging, the university focuses on neuroscience; healthy aging; sensing and smart systems; and ocean engineering and environmental sciences.

“We think we have a lot to offer here,” Flynn said, adding that it all starts with a conversation. ”The challenge to potential partners is to determine the things at FAU that intersect with your interest. Then, ascertain if we can collaborate in those areas and partner in meaningful ways, not only to promote the local economy and economic development, but to execute projects of mutual interest.” Upon aligning the university’s strengths and interests with a company’s, FAU will then identify funding opportunities.

**Dynamic Biotech Partnerships**

Thomas Kodadek, Ph.D., of Deluge Biotechnologies, is the recipient of funding from the King Foundation — in collaboration with Gregg Fields, Ph.D., chair of FAU’s Department of Chemistry and Biochemistry — to develop
candidate drugs to test against proteins known to contribute to cancer metastasis.

In addition, Deluge recently moved into lab space on the John D. MacArthur campus in Jupiter. “I’m very grateful to FAU. If it weren’t for that (space), there’s really no place else to work around here.”

Maneesh Pingle, Ph.D., of BlinkBio, agrees. The biotechnology company started using FAU’s Jupiter space in December to develop new technologies that would “deliver toxin payloads to cancer cells selectively and kill them.”

While the current partnership includes only infrastructure, Pingle said, “We’d like to try to see if there’s a way to have a couple of interns from FAU who can work with us. It’s good for us and it’s good for them.”

**Collaboration Pathways**

Vice President for Research Daniel Flynn, Ph.D., identified the following areas of opportunity and encourages other ideas to partner with the university.

- **Collaboration:** companies team up with FAU on projects of mutual interest, which could involve jointly approaching funders with proposals
- **Contract:** FAU faculty execute projects for companies
- **Technology transfer:** numerous faculty patents are available for licensing
- **Pipeline:** internship and job training programs.
After high school, Shirley Pomponi, Ph.D., was convinced she should become a nurse. Her mom insisted that she attend college first, although a college degree in nursing was not required then.

“I’m glad she made me go,” says Pomponi, because college is where she got hooked on marine biology. In 1984, she was offered an opportunity to work at FAU’s Harbor Branch Oceanographic Institute, where she combines her interests in marine and biomedical research. Pomponi is also an FAU Harbor Branch based research professor and executive director of the National Oceanic and Atmospheric Administration’s Cooperative Institute for Ocean Exploration, Research and Technology.

Pictured here are some of the strangest-looking animals Pomponi has encountered in the ocean. Pomponi’s success in her career is based on the same advice she offers others: “Be open to new opportunities and be willing to step out of your comfort zone.” ♦

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**Acorn Worm**

Common name for worm-shaped marine invertebrates with a three-part body that consists of a protruding sucking organ, followed by a short, fleshy collar and ending with a long, wormlike trunk.
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**Black Coral**
Displays an unusual feeding strategy – apparently using its tentacles to “sweep” the ocean floor.

**White Lobsters**
Bottom dwellers, often blind and usually soft, allowing them to squeeze into crevices for protection.
Swimming Sea Cucumbers

Using highly modified feet that have turned into fins, moves along the sea floor, feeding on sediment.

Tongue Fish

A flatfish that lives near sulfur pools in the deep sea. It is hypothesized that there are chemo-synthetic bacteria in its gut that provide “food” for the fish.
Swimming

**Sea Cucumbers**
Using highly modified feet that have turned into fins, moves along the sea floor, feeding on sediment.

**Tongue Fish**
A flatfish that lives near sulfur pools in the deep sea. It is hypothesized that there are chemo-synthetic bacteria in its gut that provide “food” for the fish.

**Xenophyophores**
A single-cell animal found sifting through sea floor sediment.

**Pom-Pom Anemone**
Rolls along the bottom, unattached. When disturbed, it sheds its tentacles.

**Frog Fish**
Masters at mimicry, often “disguised” to look like sponges, especially in shallow water.
In addition to the national organization, the academy also has 47 local chapters hosted by its member institutions. FAU recently established its own chapter. Each year, the university's chapter will recognize inventors who translate their research findings into inventions that hold the promise of benefitting society.

“Our NAI chapter allows us to showcase the commercially viable technologies developed by our faculty,” said Daniel C. Flynn, vice president for research.

The chapter is overseen by the Office of Technology Development, which works with inventors to legally protect and license technologies to both established and startup companies.

With a combined 47 patents to their names, faculty members Randy Blakely, Ph.D., and Amy Wright, Ph.D., are no novices when it comes to inventing.

“Although I am pleased to be considered ‘inventive,’ commercialization of my research was the last thing I thought about as I started my career,” said Blakely, executive director of the FAU Brain Institute and biomedical science professor in the Charles E. Schmidt College of Medicine.

“But I realized that the need to protect intellectual property through patents is vital if one’s discoveries are to make their way into the hands of those who can develop new tests for illness and treatments for brain disorders.”

Blakely and Wright, a research professor at FAU Harbor Branch Oceanographic Institute, were recently inducted into the newest class of Fellows of the National Academy of Inventors, a nonprofit organization comprising more than 250 research universities and governmental and nonprofit research institutes that recognizes and encourages inventors, and raises the visibility of academic technology.

They join Gregg Fields, Ph.D., and Herbert Weissbach, Ph.D., faculty members who were inducted in 2015 and 2013, respectively.

NAI fellows are named inventors on at least one U.S. patent and are nominated by their peers for outstanding contributions in areas such as patents and licensing; innovative discovery and technology; significant impact on society; and support and enhancement of innovation.

**Novel Agent for the Treatment of Stroke**

**System for Larval Fish Enumeration and Growth Monitoring**

**Method for Real Time Assessment of E-Learning**

**TECHNOLOGIES AVAILABLE FOR LICENSING**

Here are a few technologies created by chapter members that are currently available for licensing:
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“But I realized that the need to protect intellectual property through patents is vital if one’s discoveries are to make their way into the hands of those who can develop new tests for illness and treatments for brain disorders.”

**National Academy of Inventors Inducts Faculty**

Blakely and Wright, a research professor at FAU Harbor Branch Oceanographic Institute, were recently inducted into the newest class of Fellows of the National Academy of Inventors, a nonprofit organization comprising more than 250 research universities and governmental and nonprofit research institutes that recognizes and encourages inventors, and raises the visibility of academic technology. They join Gregg Fields, Ph.D., and Herbert Weissbach, Ph.D., faculty members who were inducted in 2015 and 2013, respectively.

NAI fellows are named inventors on at least one U.S. patent and are nominated by their peers for outstanding contributions in areas such as patents and licensing; innovative discovery and technology; significant impact on society; and support and enhancement of innovation.

**A Chapter of its Own**

In addition to the national organization, the academy also has 47 local chapters hosted by its member institutions. FAU recently established its own chapter.

Each year, the university’s chapter will recognize inventors who translate their research findings into inventions that hold the promise of benefiting society.

“Our NAI chapter allows us to showcase the commercially viable technologies developed by our faculty,” said Daniel C. Flynn, vice president for research.

The chapter is overseen by the Office of Technology Development, which works with inventors to legally protect and license technologies to both established and startup companies.

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**TECHNOLOGIES AVAILABLE FOR LICENSING**

Here are a few technologies created by chapter members that are currently available for licensing:

**Novel Agent for the Treatment of Stroke**

Jang-Yen (John) Wu, Ph.D.
Charles E. Schmidt College Medicine

A cerebral ischemia, or stroke, is a condition of insufficient blood flow to the brain. This technology is a novel agent for the treatment of stroke and other neurodegenerative conditions such as Alzheimer’s. The treatment utilizes the compound carbamathione, which exhibits neuroprotective properties through its unique property of maintaining brain communication while suppressing brain injury from excessive stress.

**Method for Real Time Assessment of E-Learning**

Hari Kalva, Ph.D.
College of Engineering & Computer Science

E-Learning has become an important component of education. Developers seek real-time review and validation of course materials to structure them to the greatest advantage of students. This technology is an analytical approach for predicting student learning and enables individualized and adaptive e-learning. The approach is based on the analysis of biological indicators such as eye response, neural signals and facial expressions.

**System for Larval Fish Enumeration and Growth Monitoring**

Bing Ouyang, Ph.D.
Harbor Branch Oceanographic Institute

Current methods of enumeration and growth monitoring for larval fish are manual, which require significant resources and suffer from inaccuracy. This system is comprised of a light field rendering camera, strobe light, and proprietary algorithm that allows for reliable enumeration and continuous growth monitoring in a non-intrusive manner. The technology could potentially reduce feed costs, improve survivability and lower production costs of aquaculture.
When Rachel Wong learned of the local school shooting earlier this year, she frantically tried to reach her Parkland family and friends to check on their safety. The incident also solidified Wong’s belief in the urgent need for her FAU Wave invention called SafetyNet, an algorithm that monitors public places and identifies “abnormal behaviors” indicative of violence, such as shootings, human trafficking and terrorism. Through immediate identification, SafetyNet could give authorities the chance to stop violence before it starts.

“I want this to be implemented as a safety, to detect if something is not normal,” Wong said. “This could be part of the solution for a safer world for everybody.”

Wong’s innovative project was one of several ideas selected as part of the 2017-2018 FAU Wave program, an undergraduate research and entrepreneurship competition challenging students to create original ideas to combat society’s problems. Each team receives $500 toward project development, and winners receive up to $1,500.

Through FAU Wave, “students get a chance to engage in social entrepreneurship, and figure out how they can solve an important problem,” said Daniel Flynn, Ph.D., vice president for research. “The projects are high-impact, low-cost and important contributions.”

Prior to winner announcements at the award ceremony, Flynn spent one-on-one time...
listening to students explain the significance of their projects.

This year, five projects earned honors, including a first-time award from Academic Affairs’ Office of Community Engagement, for a “strong focus on community engagement.” Natalia Perez and Sydney Yu received the award for their nonprofit, Learning Enrichment and Activities Pals, which provides social enrichment to pediatric patients.

Stephen Hoover took third place for inventing a portable olfaction machine with smelling capabilities to eventually replace things like a diabetes assist dog, trained to monitor human smells related to blood sugar levels.

Second place went to Vithulan Suthakaran (last year’s first-place winner), for developing an artificial leaf designed to mimic the photosynthesis process. Potentially, Suthakaran said, it could help in developing countries where carbon dioxide emissions are high, or provide oxygen for long-term space exploration.

Two students tied for first place: Evita Conway, (pictured below) who created a detection model for mood disorder classification using eye movements, and Devin Willis, whose SlideMap project may improve the speed and accuracy of tumor cell classification and cancer diagnoses.

Reese Humphreys, creator of BookMe – a web and mobile-based service to enable charities to easily post and find resources – said he’s grateful for opportunities like the FAU Wave program. “It’s the university really believing in you, by backing what you’re working on and supporting you.”

**Spotlight on FAU Wave Projects**

From robots to counterfeit drug detection systems and beyond, here are some of the challenges students are addressing:

- an artificial leaf to create a transportable device to convert carbon dioxide emissions into a source of oxygen that could be used to reduce air pollution
- a synthetic sea urchin exoskeleton as a safe byproduct for neutralizing ocean acidity
- a weight-sensing electric skateboard with assisted navigation
- a drone that autonomously uses 3D mapping to navigate uncharted regions
- a ferro-fluid-infused, corrosion-resistant industrial and marine metal grease that could be a money saver
- a nonprofit organization raising funds and awareness of safe houses for human trafficking survivors
- the creation of novel antibiotics
Partnership Aims to Bring ‘Best and Brightest’ to FAU

By Mitch Teich

Around the country, the competition to recruit the leading science, technology, engineering, and math high school students is fierce. A newly created honors program may prove to be the difference-maker that brings top students to the university.

The FAU Max Planck Honors Program is the latest expansion of a partnership between the university and the Max Planck Florida Institute for Neuroscience, the only such institute in North America. While the German-based Max Planck Society partners with many universities at the graduate level, the undergraduate honors program will be the first of its kind in the world.

The program will focus exclusively on neuroscience and will be located on the John D. MacArthur campus in Jupiter. “This program is like no other in the world for undergraduate research quality,” said FAU President John Kelly, Ph.D. “It will propel our national and international visibility as well as enhance partnership opportunities for joint hires, faculty appointments and research grants with our outstanding colleagues at the Max Planck Florida Institute.”

The development of the honors program will be guided by the College of Science, the Harriet L. Wilkes Honors College and members from the institute, including Ken Dawson-Scully, Ph.D., who was recently named associate vice president for strategic initiatives and head of institutional partnerships at FAU and the institute, to lead the initiative.

Dawson-Scully’s new position represents another first – a position supported jointly by the two institutions. He previously served as associate professor of biological sciences and associate dean for graduate studies in FAU’s Charles E. Schmidt College of Science.

FAU and Max Planck have partnered since 2009, which has led to the development of programs including a Ph.D. in Integrative Biology, and the International Max Planck Research School for Brain and Behavior.

Dawson-Scully says the creation of the honors program marks an exciting time.

“We’re hitting our groove. FAU is making it a priority to attract the best and brightest students to our university.”

— Ken Dawson-Scully, Ph.D.

Students will be exposed to novel technologies, such as super-resolution microscopy. “They’ll be interacting with faculty at FAU and Max Planck on a regular basis throughout their educational career,” Dawson-Scully said. Students will be required to complete a capstone project and take a minimum of three enrichment courses.

The program welcomes its first students in the Fall 2018 semester. The incoming class will consist of 10 to 20 students; there are plans to grow the program in the coming years.

“Many will choose to pursue graduate degrees in related fields at FAU, says Dawson-Scully. “We see this as a pathway to retain these students.”
Students will graduate with honors distinction with one of three degrees from the Charles E. Schmidt College of Science: B.S. in Biological Sciences; B.S. in Psychology; and B.S. in Neuroscience and Behavior, or a B.S. in Liberal Arts and Science from the Harriet L. Wilkes Honors College.
Most of us have a favorite song, musical group or a style of music we especially enjoy. For senior adults with Alzheimer’s disease, reconnecting with that music can generate a bright note in an otherwise challenging period of their lives.

Musicians play for and with seniors through Mind&Melody, a nonprofit that got its start in the Harriet L. Wilkes Honors College. The nonprofit implements music programs at health care facilities, nursing homes, day centers and assisted living facilities. The work is especially important in Florida, where 540,000 people are living with Alzheimer’s disease, according to the Alzheimer’s Association.

More than 5.7 million people in the U.S. suffer from Alzheimer’s, a disease which has a profound effect on its victims, robbing them of their memory as it progresses, and eventually claiming their lives.

While there is no cure for the degenerative disease and few medical interventions can slow its progression, there are tools and techniques – such as music – that can improve quality of life.

“Through the power of music, we re-engage static minds and infuse them with new life at long-term care facilities and at home,” said Cristina Rodriguez, Mind&Melody president and co-founder.

The nonprofit has scaled up significantly since the initial light bulb moment Rodriguez and Lauren Koff, her co-founding partner, had as juniors at FAU, when they researched the effects of music on neurocognitive disorders. It started as a thesis idea and evolved into a quality improvement project they carried out in 2014 with the Christine E. Lynn College of Nursing’s Memory and Wellness Center in Boca Raton.

“Since music stores information in many different parts of the brain, it can reach hidden areas that are spared by Alzheimer’s,” Rodriguez said. “This is what allows us to still connect with our loved ones through music even when it seems like hope is lost.”

Rodriguez recalls meeting a Mind&Melody participant who used to play the piano at his home quite often but stopped due to his dementia. “During one of our sessions, he gained the courage to improvise on the piano while a volunteer musician played her violin next to him,” she says. “It was a truly magical and impressive moment to witness. Moments like that are what led Lauren and I to abandon our original career paths and dedicate our lives to Mind&Melody.”

Since its early days as part of FAU Tech Runway’s Venture Class program, musicians have performed with seniors and their caregivers more than a thousand times across the state.
Most of us have a favorite song, musical group or a style of music we especially enjoy. For senior adults with Alzheimer’s disease, reconnecting with that music can generate a bright note in an otherwise challenging period of their lives.

Musicians play for and with seniors through Mind&Melody, a nonprofit that got its start in the Harriet L. Wilkes Honors College’s Kenan Social Engagement Scholarship Program and FAU Tech Runway, a business accelerator for startup companies. The nonprofit implements music programs at health care facilities, nursing homes, day centers and assisted living facilities. The work is especially important in Florida, where 540,000 people are living with Alzheimer’s disease, according to the Alzheimer’s Association.

There is an increasing need for the work of Mind&Melody as the senior population grows exponentially. “Our vision is to bring Mind&Melody nationwide and worldwide,” Rodriguez said. “Music is a universal language. It has the ability to reach everyone regardless of their age, background and cognitive ability. It can transform a person, their life and their world.”

As team members play live music and create musical activities with seniors in one-hour sessions, they are measuring engagement, socialization and mood, according to Rodriguez.

There is an increasing need for the work of Mind&Melody as the senior population grows exponentially. “Our vision is to bring Mind&Melody nationwide and worldwide,” Rodriguez said. “Music is a universal language. It has the ability to reach everyone regardless of their age, background and cognitive ability. It can transform a person, their life and their world.”

Mind&Melody is just one social startup out of FAU Tech Runway that’s making a difference. Here are a few others.

**FAU TECH RUNWAY NONPROFITS MAKING AN IMPACT**

**CHILD RESCUE COALITION**
Uses cutting-edge technology to apprehend criminals and rescue children

**BIONIC GLOVE PROJECT**
Uses 3-D printing to create mechanical limbs for people around the world

**FLOWING POWER**
Renewable marine energy source created by FAU researchers for people without electricity in the Western Hemisphere
“The depth of knowledge and services I’ve received throughout my relationship with the Florida SBDC at FAU continues to support the ongoing dynamic changes in my business and its impact in the community.”

— David Rosen, Kira Labs
Business Partner Grabs Nation’s Highest Export Accolade

By Judy Gelman Myers

Having your own ideas can lead to great things, but incorporating other people’s ideas can magnify the results a thousandfold. That’s how David Rosen, founder and CEO of Kira Labs, recently won the U.S. President’s “E” Award, the highest honor an American firm can get for significantly increasing American exports.

On the advice of his Florida Small Business Development Center at FAU consultant, he expanded his company’s line of beauty products to enter the European, Russian, Canadian and Asian markets, and he applied for and won the E Award. This recognition is the latest in a long line of accolades, including the Small Business Administration’s 2017 State of Florida and South Florida District Exporter of Year. That same year, a trade group, the National Association of Small Business International Trade Educators, recognized the company as an Outstanding Exporter Honoree.

Rosen, a native of Australia, grew up with a strong immigrant work ethic that emphasized education. If David had an idea, his parents encouraged him to pursue it. He created some successful enterprises and was heading for a role in finance when he met his future wife, the daughter of a plastic surgeon. She and her father had written a book about the effect of cosmetic ingredients on skin. Rosen suddenly found himself face to face with a beautiful new world. “As I discovered the world of beauty and cosmetics, I realized that if you could provide a quality product, there was great opportunity and high demand,” Rosen said.

Working out of Rosen’s garage, the couple began digitally marketing high-end, anti-aging skincare to dermatologists and plastic surgeons. Their focus switched when they started following beauty trends online. They invested heavily in R&D and innovation, as well as waste reduction and green initiatives, while staying in touch with customers’ preferences and needs. They grew a vertically integrated company that developed, manufactured, marketed and distributed high-quality hair, skin, and body care products for consumers across the socioeconomic spectrum. The couple worked with mass retail chains to deliver a low-cost luxury product.

Several years after relocating to South Florida in 2003, Rosen looked for outside advisors. In 2009, he discovered the Florida SBDC. In 2012, Parbatee Chang, a consultant at the center, evaluated Rosen’s business and created a 100-page export marketing plan in collaboration with Enterprise Florida and the U.S. Department of Commerce. Chang identified the need for a men’s product line. Rosen immediately jumped on the suggestion and quickly penetrated a number of new international markets.

“The depth of knowledge and services I’ve received throughout my relationship with the Florida SBDC at FAU continues to support the ongoing dynamic changes in my business and its impact in the community,” Rosen said.

While his products are carried in more than 10,000 stores including CVS, T.J. MAXX and others, Rosen is eyeing the Latin American and African markets. He also wants to deepen his relationship with FAU, collaborating with students who have fresh ideas in artificial intelligence, remote sensing and machine learning. “We’re hoping our organization can learn to leverage ideas that haven’t been explored before,” Rosen said. ♦
Christopher Minasi’s undergraduate research may help scientists combat Huntington’s disease, a devastating neurological disorder that results in progressive loss of speech, thinking, reasoning and motor coordination.

He worked under the supervision of Jianning Wei, Ph.D., associate professor in the Biomedical Sciences Department, investigating one of the possible underlying mechanisms of the disease. In normal brain cells, tiny structures called lysosomes digest worn-out particles throughout the cell. In Huntington’s disease, the lysosomes clump together, indicative of functional defects. It is an inherited disorder caused by a faulty gene that manufactures a mutant, overly sticky protein. Wei’s lab studies the role the mutant protein plays in clumping the lysosomes together.

Using the CRISPR-Cas9 gene-editing tool, Christopher developed a line of cells that lacked the gene altogether. He then used a special microscope that produces high-resolution photographs to compare these cells against those that occur in nature. His findings backed Wei’s hypothesis that the mutant protein, called huntingtin, contributes to the abnormal clumping.

“Christopher worked as an independent researcher under my supervision,” said Wei. “He conducted the experiment, analyzed the data and presented the work at an undergraduate symposium. This novel cellular model should help us better understand the function of huntingtin in protein trafficking.”

Christopher might have used sophisticated equipment at FAU, but the fundamental tools behind his research lay at home. When he and his brother, Daniel, were in elementary school, their...
mother left her engineering job at Motorola to home-school them. It was the most difficult decision Eloisa Minasi had ever made, but it paid off when both boys got into FAU High School — a public school that transitions rising sophomores to the University for three years of undergraduate study. There Christopher and Daniel earned 3.9-plus averages and won FAU’s Presidential Award. Daniel, who is 17 years old, is currently in his third year in electrical engineering, and Christopher recently received his BA in neuroscience at the age of 18.

Christopher is well aware of the benefits his mother’s tutelage gave him. “Home schooling definitely had an effect on my attitudes and work habits,” he said. “My mother was very thorough in creating a personalized and well-rounded curriculum for me. She also pushed me to develop one very important skill: the capacity to self-learn. That was the single most important ability I used to succeed in college.”

Now Christopher is heading to Harvard, where he plans on earning a Ph.D. in neuroscience. He’s received a $35,000 research stipend, a relocation package and will take graduate courses at no cost.

And Eloisa? The FAU alumna is back in the engineering field, designing communications systems for the Department of Defense. Her husband, also an engineer, designs Lidar systems for self-driving cars. Both happily give professional advice to students who are interested in engineering, although Eloisa has taken down her home-schooling shingle. ♦
OFF THE SHELF

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