FAU

STILES-NICHOLSON BRAIN INSTITUTE
Florida Atlantic University

MASTERMINDS

Nicholson Vision Transforms FAU Neuroscience

Faculty Gain a Degree of Distinction

Palm Health Foundation Invests in Breakthrough Brain Science

2022

FAU
STILES-NICHOLSON BRAIN INSTITUTE
Florida Atlantic University

MASTERMINDS

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MESSAGE FROM THE EXECUTIVE DIRECTOR

WELCOME TO THE 2022 EDITION OF MASTERMINDS

These pages are filled with stories of transformative neuroscience research and scholarship that is building the future of brain health and training the next generation of scientists. The spirit of generosity, team building and determination fueled our success in 2021: what will forever be a landmark year for this institute.

INSPIRING GENEROSITY

First and foremost, we had the distinct honor of formalizing our new name: FAU's Stiles-Nicholson Brain Institute. Made official in June 2021, David J.S. Nicholson's $10 million gift further enhances our research facilities and core technologies as our team works tirelessly to unlock solutions to devastating brain diseases and disorders, and expands on an initial $35 million investment from the State of Florida.

This gift also places a major emphasis on advancing the frontier of brain science education. Our work on the "Journey through the Human Brain" exhibit at the Cox Science Center and Aquarium, West Palm Beach, Fla., introduced us to David in 2016. His critical support for the exhibit enabled us to take the show on the road, seeding ASCEND (Advancing STEM: Community Engagement through Neuroscience Discovery). Now our signature community education program, ASCEND bridges the gap between advanced scientific research and STEM learning opportunities for our youth. David Nicholson's vision of a community empowered and excited by brain science has challenged us to reach many more young minds, in-person and online.

His commitment also establishes the Stiles-Nicholson STEM Teacher Academy offering training programs for educators in our community. Under the direction of Joel Herbst, Ed.D, superintendent of FAU's nationally recognized University Lab Schools, teachers across Florida will learn cutting-edge techniques to foster a passion for STEM among their students.

Inspiration is radiating among our fellow community leaders. We have welcomed key support from the Heidenreich Foundation and Impact the Palm Beaches, allowing us to expand *MobileMinds*, a mobile experience that transports brain science experiences to children who would not have the opportunity otherwise.

Palm Health Foundation also joined the effort this year, launching our new Program in Computational Neuroscience. Its $1 million gift supports our scientific research via graduate fellowships, pilot research grants, technologies, faculty recruitment and community education.

BUILDING A TEAM OF VISIONARIES

The year 2021 also brought new faces to the Stiles-Nicholson Brain Institute. Chad Forbes, Ph.D., joins our team as the associate director. He led the Forbes Social Neuroscience Laboratory within FAU's department of psychology for years and brings depth in human neuroscience research. His work applies brain science to address prejudice toward and stigma amongst the disenfranchised suffering from brain disorders in our society.

FAU's Center for the Future Mind took shape with the arrival of Susan Schneider, Ph.D., William F. Dietrich distinguished professor of philosophy in the Dorothy F. Schmidt College of Arts and Letters. A collaborative venture of the college with our institute, the center is dedicated to exploring scientific and philosophical innovations to achieve a richer understanding of emerging technologies, like artificial intelligence and the future of the mind.

LAUNCHING A TOP-TIER GRADUATE PROGRAM

After five years of determination, planning and preparation, we achieved final approval for FAU's doctoral program in neuroscience, only the second such program in the state of Florida. More than the new buildings, labs and technologies now transforming FAU neuroscience, I am most excited by the inaugural class soon to join our family of scholars.

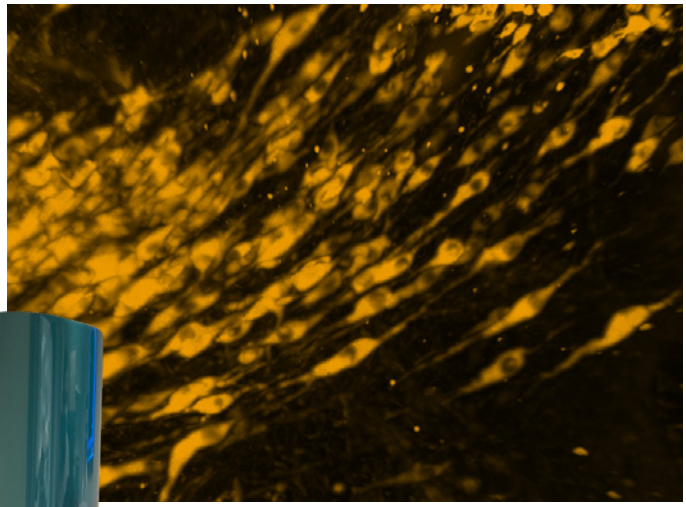
FAU's Stiles-Nicholson Brain Institute researchers are driving discovery in brain science from molecule to man. The critical support of community champions and investments ushers in a new era of research and collaboration that originates in South Florida but will touch all corners of the world. Whether you are just staying abreast of our latest news or working alongside us, thank you for being a part of this exciting journey.

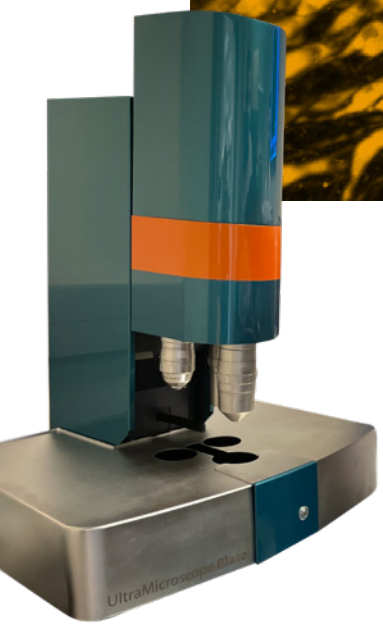
Sincerely,

Randy D. Blakely, Ph.D.
Executive Director, FAU Stiles-Nicholson Brain Institute
Director, Neuroscience Ph.D. Program
David J. S. Nicholson Distinguished Professor in Neuroscience
Professor of Biomedical Science, Charles E. Schmidt College of Science

SPECIAL ACKNOWLEDGMENTS:
Amid the grip of a global pandemic, our affiliated faculty, students and staff persisted, moving research and education programs forward. Masterminds 2022 is dedicated to all of you, for your determination, spirit and care for your colleagues, staff and trainees.

BRAIN BRIEFS





‘Blaze’-ing the Trail

Researchers in the Stiles-Nicholson Brain Institute are among the first to capture 3D images of brain cells using a powerful new microscope known as the ‘Miltenyi Ultra Microscope Blaze.’

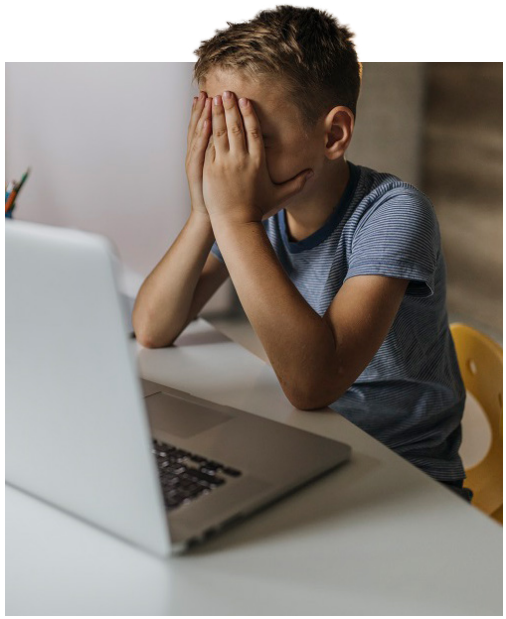
Unlike traditional microscopes, the Blaze offers a large field of illumination by using a sheet of light rather than a point of light. Such advanced imaging allows allows neuroscientists to image and rotate and entire mouse or rat brain yet zoom in to the level of single cells and their connections. Ultimately, these visualizations assist in understanding how diseases impact the brain, in an effort to find cures.

Computer Training Relaxes Preteens

Researchers in the department of psychology, Charles E. Schmidt College of Science, recently found that a completely remote training program helps mitigate negative emotions in preadolescents.

The study, published in the journal Applied Neuropsychology: Child, examined the relationship between anxiety, regulation of inhibition and natural impulses and the brain in preteens from ages 8 to 12, a critical age range for social and emotional development. The results reveal that when a preteen uses a computer to train their regulatory abilities, depression and anxiety are reduced significantly.

Collaborators include Nancy Aaron Jones, co-author, Ph.D., an associate professor College of Science, and a member of the FAU Stiles-Nicholson Brain Institute.



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Predicting New Drug Emergences with the Virtual World

It's possible that online forums and social media platforms, like Reddit, could be used as an early warning system of impending emergences of novel drugs, according to a new study published in the International Journal of Drug Policy.

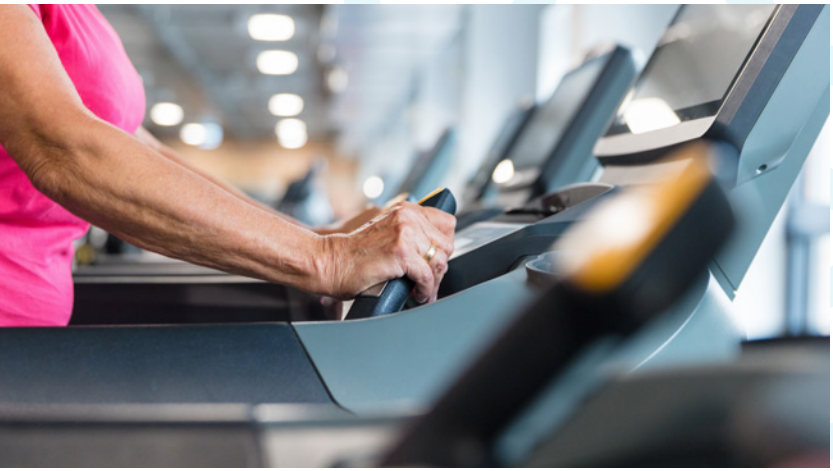
Synthetic or designer drugs, known as novel psychoactive substances, are created to mimic the effects of controlled substances. Due to their increasing potency and unexpected biological effects compared to their predecessors, they continue to present growing challenges for the scientific, medical and interventional communities.

"The psychoactive substance landscape changes rapidly and information about novel substances and their effects is scarce," said Elan Bareholtz, Ph.D., senior author, associate professor of psychology and member of the Center for Complex Systems and Brain Sciences, Charles E. Schmidt College of Science, and FAU Stiles-Nicholson Brain Institute. "There is a significant time lag in the percolation of information from groups or individuals who experiment with psychoactive substances (sometimes referred to as "psychonauts") and the broader scientific and healthcare communities."

Barenholtz, his team at FAU and other collaborators found that there are early signals that are detectable in certain social media data streams that can be harvested in order to detect and even predict broader novel trends much earlier than was previously possible.

This research is part of the National Early Drug Warning System, funded by the National Institute of Drug Abuse.

BRAIN BRIEFS



This is Your Brain on Cardio

Increased exercise in older adults results in better brain health, possibly leading to a decreased risk in cognitive decline, according to a recent study led by Henriette van Praag, Ph.D., an associate professor in the Charles E. Schmidt College of Medicine, and a member of the Stiles-Nicholson Brain Institute.

Results from the study, published in the journal Frontiers in Endocrinology, show that six months of treadmill enhanced exercise increases a biomarker (myokine Cathepsin B) implicated in learning and memory.

Breaking Myths for Older Adults

Older adults from diverse backgrounds need more than knowledge and guidance of traditional clichés about exercise to start or sustain physical activity, according to a new study published in the journal Geriatrics.

The study was led by Ruth Tappen, Ed.D., professor in the Christine E. Lynn College of Nursing, and member of the FAU Stiles-Nicholson Brain Institute and FAU Institute for Human Health and Disease Intervention. It shows that more African Americans with a decline in physical activity, were related to health issues, especially pain or fatigue, and lack of time, interest or motivation. The declines were more prevalent in the African American participants than in European American or Afro-Caribbean participants. Assistance in identifying meaningful, personal reasons to remain active and addressing pain and fatigue may help older adults to sustain physical activity.

JULTMARTIN EUGENE

Demystifying Negative Stereotypes

New FAU Faculty Member Hopes to Expand Diversity and Inclusion Efforts

BY **Bethany Augliere**

Stereotypes, such as the idea that women are worse at math compared to men, have the power to impact our lives. Chad Forbes, Ph.D., the new associate director of the FAU Stiles-Nicholson Brain Institute, is trying to explain how that happens within the brain.

Forbes, who joined FAU in the Fall of 2021 as an associate professor of psychology in the Charles E. Schmidt College of Science, said he takes an interdisciplinary approach and combines the fields of neuroscience and psychology to understand what's going on in the brain to cause biases and prejudices, and the consequences of those attitudes.

To do this work, he combines standard psychology methods such as surveys and questionnaires, with neuroscience tools, like examining the brain's electrical activity using an electroencephalogram test. For instance, he says, it's well documented in the U.S. that underrepresented ethnic groups are more likely to drop out of academic pursuits compared to white students. Forbes said he believes that a big reason for this discrepancy has to do with society labeling these groups with negative stereotypes indicating they are not expected to do as well in academics compared to people who are positively stereotyped in academics.

"We are excited to add Dr. Forbes to our leadership team as his work is fascinating and it adds depth in human neuroscience."

— Randy D. Blakely, Ph.D., Executive Director, Stiles-Nicholson Brain Institute

"A lot of my research deals with the basics of what it is about the situation and system that might prompt them to have these more negative experiences and how that works over time to push these people out at these disproportionate rates compared to people who are more positively-stereotyped in these areas," he said.

Forbes, a first-generation college student, said his research interests stem from growing up in a low-income household outside of Los Angeles, in a poor and diverse area. "There's a lot of negative intelligence-oriented stereotypes exacted on those groups," he said.

When applying to colleges, he said he initially looked at schools that didn't base admittance on SAT scores, as his was not high. He began his education at California State Long Beach, paying for tuition and books by working several jobs and living with his grandmother.

Originally, he attended college with the hope of becoming a doctor. Yet, after earning a C in organic chemistry, he said he knew he would never get into medical school. "I really was kind of lost and didn't know what to do, but I had taken this introduction to psychology class and loved it," Forbes said.

Eventually, he earned a bachelor's degree at California State Long Beach in psychology with minors in biology and chemistry. He went on to earn both his master's and doctorate degrees in social and cognitive neuroscience from the University of Arizona. Forbes also pursued postdoctoral training in cognitive neuroscience at the National Institute of Neurological Disorders and Stroke and the National Institute of Biomedical Imaging and Bioengineering, both based in Maryland. Before joining FAU, he spent a decade as an associate professor in the department of psychological and brain sciences at the University of Delaware.

In the Brain Institute, Forbes said he hopes his biggest influence is in diversity, equity and inclusion efforts and is actively pursuing grants. "I'm super excited about the idea that FAU is one of the most diverse schools in the state school system," adding he aspires to help assist in hiring more diverse biomedical faculty, so that the faculty represents the student body. FAU is a Hispanic-Serving Institution, and more than 50% of the population identifies as Hispanic.

In addition, Forbes said, his research will help create a more diverse learning environment that benefits everyone. "I'm really motivated in trying to make a difference in these classrooms for people who have been stigmatized and negatively stereotyped in these domains for a long time," he said.

NEW GREAT MINDS

Six faculty members recently joined the FAU Stiles-Nicholson Brain Institute. Their research spans across disciplines from genetics to memory and learning, exercise, harmful toxins and more.

Among the inductees are:

Working Memory

As a research psychologist, **Michael DeDonno**, Ph.D., studies peoples' performance in real-life scenarios.

DeDonno, an associate professor of research methodology and integrated medical science in the College of Education and the Charles E. Schmidt College of Medicine, examines cognitive factors, like working memory, which is one of the brain's executive functions. Working memory is linked to information processing, self-control, flexible-thinking, comprehension and problem-solving. It can also influence decision-making during critical, time-sensitive situations, according to DeDonno.

One of his projects looked at the influence of working memory on soldiers' performance during mission critical situations. He discovered that soldiers who could maintain more information in working memory, had higher probabilities for mission success.

Through his research, DeDonno aims to continue to help people learn, work and solve problems during critical or time-sensitive situations.

Exercise on the Brain

Behavioral neuroscientist **Shaefali Rodgers**, Ph.D., studies the impact of exercise on brain health and cognition. As an assistant professor in the Charles E. Schmidt College of Science, her work has the potential to offer insight into mechanisms critical in maintaining brain health, cognition and in the development of more targeted and effective exercise interventions.

Using rodent models, Rodgers discovered that short-term hormone treatment in midlife has long-term effects on voluntary exercise behaviors in females. She's further looking at how voluntary exercise shapes adolescent brain maturation and helps repair the damaged brain.

Fighting Off Toxins

The age-old reminder to eat more vegetables is proving to be more than just a parental phrase that could make people healthier, according to **Krista McCoy**, Ph.D., associate research professor in the FAU Harbor Branch Oceanographic Institute.

McCoy examines how the body reacts to the effects of toxic chemicals and how, with the help of natural supplements like sulforaphane, which is found in some green vegetables, those defenses inside the body can grow stronger. She also strives to better understand how humans and animals are able to be healthy after exposure.

To do this, she works at developing therapies that can help prevent birth defects, diseases and disorders, like autism spectrum disorders.

Researching Chronic Fatigue

Dawei Li, Ph.D., an associate professor and director of genomic medicine in the Charles E. Schmidt College of Medicine, researches chronic fatigue syndrome to help find a cure.

Chronic fatigue, a disease involving the immune system and brain currently lacks treatments or remedies, affecting thinking memory and concentration.

Li's research goal is to develop a genetic program that collects biological information such as deoxyribonucleic acid, and analyzes genetic variations that may lead to diagnosing diseases and treatment for chronic fatigue syndrome.

Tools for Early Detection

Alzheimer's disease, which can rob people of memory, is one of the most common neurodegenerative disorders linked to aging and has no cure.

Maré Cudic, Ph.D., an associate professor in the Charles E. Schmidt College of Science, studies the role of glycans (a molecule in the nervous system involved in memory and learning) in the onset and progression of Alzheimer's. Changes in the glycan composition can impact the normal functions of cells and lead to the development of several pathologies, including neurological disorders.

Cudic's research has found that glycans affect the formation of aggregates in the brain. Since these changes in Alzheimer's are initiated in the brain long before the clinical symptoms appear, her goal is to develop new early-on diagnostic tools and potentially new therapeutic approaches to help stop this disease in its tracks.

Cell Buildup

Hongjie Wang, Ph.D., an assistant research professor in the Charles E. Schmidt College of Science and member of the Institute for Human Health and Disease Intervention, studies abnormal proteins that buildup in the brain and are responsible for Alzheimer's disease.

He specifically looks at the amyloid precursor protein and its metabolic products, which forms bacteria and plaque around brain cells, and limits the communications between brain cells while impairing the learning and memory activities. However, the exact location of the amyloid protein remains unclear, so the process can begin years before symptoms appear. Wang's research aims to identify the location of the amyloid protein and identify ways to reduce the buildup in the brain.

The Beauty of Science

BY Bethany Augliere and David Lewellen

KRISTEN MORANO

Determining the cause of neurodegenerative diseases, like Alzheimer's disease, is one of the most critical questions in brain research today. So, the race is on for treatment — or even a cure.

Maciej J. Stawikowski, Ph.D., thinks the answer may lie in how cholesterol and other lipids move through cells and affect how cells communicate.

It's well-known that lipids and Alzheimer's are linked, and lipid imbalance may be leading to amyloid plaque formation — a hallmark of the degenerative disease, said Stawikowski, an assistant scientist, department of chemistry and biochemistry, Charles E. Schmidt College of Science, and member of the Stiles-Nicholson Brain Institute, who studies lipids within individual brain cells.

To do this work and because "biological systems are extremely complicated," Stawikowski designs artificial lipid molecules, called fluorescent analogs, that respond to light, so that they can be monitored in live neuronal cells with high resolution in both time and space. A better understanding of the issue could lead to the design of drugs to inhibit or enhance specific lipid movement and activity, he added.

At the Brain Institute, which Stawikowski joined in 2021, "I've found my niche," he said. This is largely due to the collaborative nature of the group of researchers. While Stawikowski focuses on chemical synthesis, characterization and computer simulation, he also collaborates with Qi Zhang, Ph.D., who brings expertise in neuronal cell work and imaging technologies. Together they tackle this interdisciplinary problem, he said. Zhang is a research associate professor in the Charles E. Schmidt College of Science, and a member of the Brain Institute.

Stawikowski said he always had a curiosity for science, and it was his seventh-grade chemistry class that got him hooked for life on the discipline. He continued to pursue that passion and earned a doctorate degree from the University of Gdansk, Poland, before coming to the U.S. for a postdoctoral fellow opportunity at FAU with Predrag Cudic, Ph.D., professor and associate dean for research in the Charles E. Schmidt College of Science and member of the Brain Institute, where he worked on the synthesis of antibiotics against MRSA, a methicillin-resistant staph infection.

But Stawikowski said his fascination with science is artistic as well as analytical. "The images of live brain cells labeled with these fluorescent compounds made in my laboratory are really mesmerizing," he said, adding that one of his photos of brain cells with color-enhanced molecules won first place in FAU's 2021 Art of Science photography contest shown on next page. "Science is complex and beautiful."

UNDERSTANDING CHOLESTEROL IMBALANCE

First place in the 2021 Art of Science Photography Contest by Maciej J. Stawikowski, Ph.D.

Cholesterol is structurally essential for all eukaryotic cell membranes. Functionally, cholesterol has been indicated in a variety of disorders beyond cardiovascular diseases. Cholesterol and other lipids control many aspects that are relevant for Alzheimer's disease pathogenesis. Maciej J. Stawikowski, Ph.D., and Qi Zhang, Ph.D., both of the Charles E. Schmidt College of Science and the FAU Stiles-Nicholson Brain Institute, teamed up to study novel fluorescent cholesterol probes that enable visualization of cholesterol and its trafficking in the live cells. This picture shows mouse brain cells (astrocytes) five days after short (1 hour) incubation with novel cholesterol probe made in the Stawikowski's Laboratory. Cells were stained with a fluorescent mitochondrial marker (cyan) and a novel cholesterol probe (yellow). The yellow puncta contain cholesterol probe localized in yet to be identified vesicles, which move within the cell. We believe that the intracellular cholesterol imbalance may hold the key to understanding Alzheimer's as well as other neurodegenerative diseases.

BUILDING SMART

Philanthropist Gifts $9.22M Toward New Neuroscience Building

BY **Bethany Augliere**

For philanthropist and wealth manager David J. S. Nicholson, the brain is the most complicated computer known to mankind. “It’s one of the last unsolved frontiers of science,” he said.

To support research efforts, as well as educate the next generation of neuroscientists, Nicholson gifted $9.22 million to help construct a state of the art research facility in Jupiter, further adding to the thriving neuroscience ecosystem at FAU’s Jupiter campus, adjoining the Max Planck Florida Institute for Neuroscience and Scripps Florida.

The new building, named the FAU’s Stiles-Nicholson Brain Institute, will provide 60,000-square-feet of space to house more than 100 researchers and support facilities. The expanded space brings more opportunities for collaborative research,


David J.S. Nicholson

CONCEPTUAL RENDERING

leading to increased opportunities for federal funding from entities such as the National Institutes of Health and the National Science Foundation, along with private entities looking to provide research grants and gifts to impact brain science and health.

The building is projected to house six new research centers, covering research from the mechanisms of Alzheimer's to supercomputing that examines large data sets from molecules to neural activity.

Nicholson's gift also establishes the David J.S. Nicholson Distinguished Professorship in Neuroscience to be held by Randy D. Blakely, Ph.D., executive director of the Brain Institute, the David and Lynn Center for Neurodegenerative Disease Research, focused on better understanding and treating Parkinson's, Alzheimer's disease, and other brain disorders, and the Stiles-Nicholson STEM Teacher Academy to provide STEM training to educators. In addition, his gift supports the Brain Institute's ASCEND (Advancing STEM Community Engagement through Neuroscience Discovery) program which introduces middle schoolers to brain science and health concepts, bringing the total of Nicholson's gift to $10 million.

"The gift allows for the creation of a world-class research facility, one that will return on the investment made by David Nicholson, FAU and the state of Florida many fold in terms of research success, recruitment of top faculty and trainees, as well as new opportunities, through our community education programs, to broaden awareness of the exciting brain research being done right here in Palm Beach County," Blakely said.

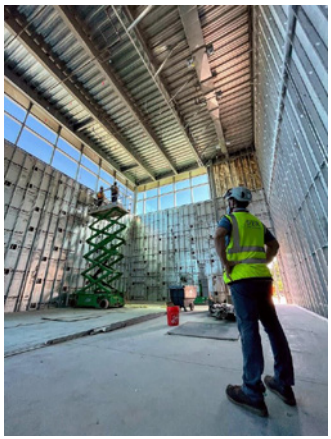
As vice chairman of the Board of Trustees for the Cox Science Center and Aquarium in West Palm Beach, Nicholson met Blakely while he was serving as scientific advisor for the now-open permanent exhibit called the Journey Through the Human Brain.

"I got to know Randy over that period of time, and then our foundation decided to support the ASCEND program," Nicholson said. "One of the aspects of the ASCEND program that I liked was that it was an outreach program to elementary, middle and high school students to show them the wonders of the discoveries in neuroscience. I'm very supportive of public education and public higher education, especially in Florida."

In addition to Blakely, it was the leadership at FAU that Nicholson said inspired him to donate this gift. "FAU has excellent leadership and that goes right up to the top. John Kelly (FAU president) has established these different pillars, one of which is the Brain Institute. In addition to outreach, the Jupiter campus is a neuroscience hub, and the new institute can support the research endeavors that Randy Blakely, executive director of the newly christened institute, wants to undertake."

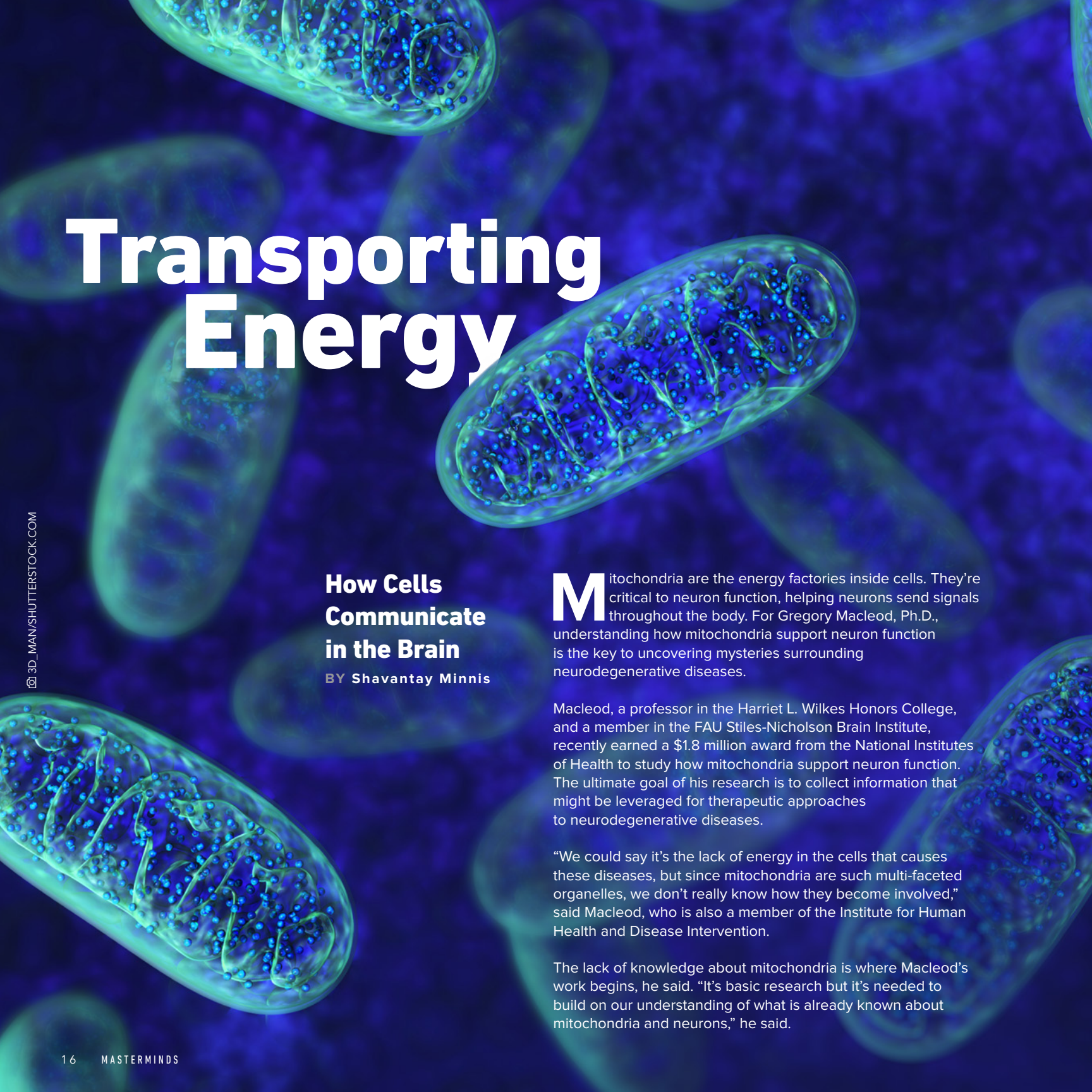
Nicholson knew from a young age he wanted to be a part of the technological future, inspired by the launch of Sputnik

> **I'm very supportive of public education and public higher education, especially in Florida."**
>
> — David J. S. Nicholson



(world's first artificial satellite) in 1957. "I've always thought that science is really the root word of, or you can call this the stem of, all improvements in the quality of our lives," he said.

He earned a degree in electrical engineering from Queen's University in Canada. He launched his own investment firm in 1978 and the Stiles-Nicholson Foundation in 1992. "As the mission of our foundation unfolded, and we grew, it became apparent that there was a major crisis and shortfall in education, as it related to the STEM fields and science in particular."



3D_MAN/SHUTTERSTOCK.COM

Transporting Energy

How Cells Communicate in the Brain

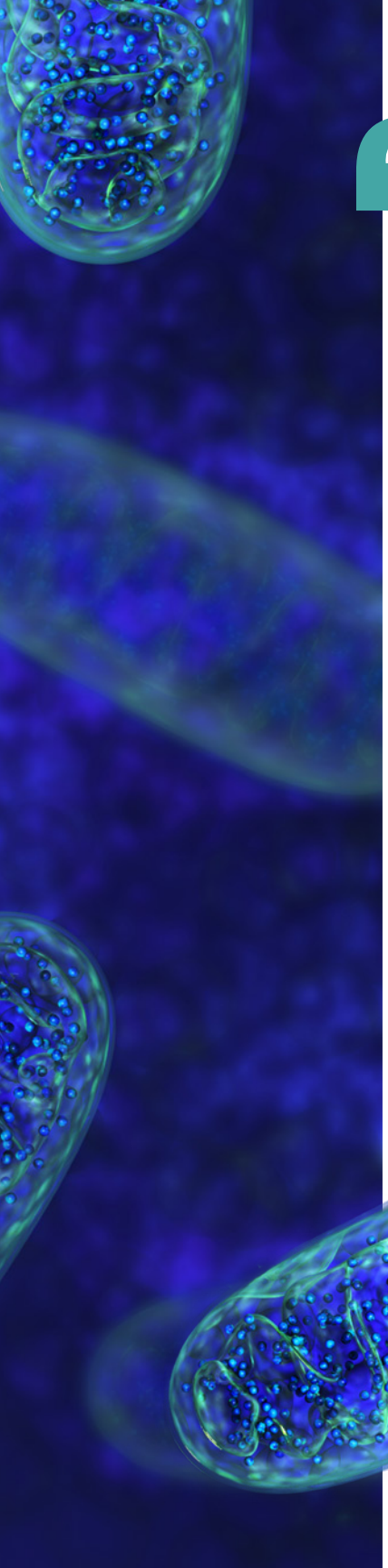
BY **Shavantay Minnis**

Mitochondria are the energy factories inside cells. They're critical to neuron function, helping neurons send signals throughout the body. For Gregory Macleod, Ph.D., understanding how mitochondria support neuron function is the key to uncovering mysteries surrounding neurodegenerative diseases.

Macleod, a professor in the Harriet L. Wilkes Honors College, and a member in the FAU Stiles-Nicholson Brain Institute, recently earned a $1.8 million award from the National Institutes of Health to study how mitochondria support neuron function. The ultimate goal of his research is to collect information that might be leveraged for therapeutic approaches to neurodegenerative diseases.

"We could say it's the lack of energy in the cells that causes these diseases, but since mitochondria are such multi-faceted organelles, we don't really know how they become involved," said Macleod, who is also a member of the Institute for Human Health and Disease Intervention.

The lack of knowledge about mitochondria is where Macleod's work begins, he said. "It's basic research but it's needed to build on our understanding of what is already known about mitochondria and neurons," he said.



> **It's basic research but its needed to build on our understanding of what is already known about mitochondria and neurons.**
>
> — Gregory Macleod, Ph.D.

Working with Drosophila, a tiny fruit fly, Macleod examines genes and the effects of their mutations on mitochondrial movement inside neurons. Mitochondrial movement is critical to a neuron's health, so when they cease movement, it disrupts neuron function leading to various disorders such as Lou Gehrig's disease.

Macleod's approach includes inserting or removing genes from the fly to determine which gene and which mutation is responsible for problems with mitochondrial movement, he said. A process, he said, is assisted by a dozen of his graduate and undergraduate students.

"At the moment, we are examining 25 different genes because of their association with mitochondria and the plasma membrane, as we suspect that a number of them might be involved in arresting mitochondrial movement," he said.

Through the Max Planck Florida Institute for Neuroscience, Macleod has access to cutting-edge expertise in electron microscopy. The microscopes use electrons to capture images of biological materials giving unparalleled resolution of neurons and their mitochondria.

"They've given us a lot of assistance, and if it wasn't for their help collecting data, we wouldn't have been successful at landing our recent grant," Macleod said.

Max Planck is also one of the reasons Macleod says he came to FAU, eight years ago. Previously he'd been an assistant professor at the University of Texas Health Science Center in San Antonio, Texas. "I liked the idea of ready collaborations with researchers of this caliber," he said.

Pondering the Future

Exploring Mind in an Age of Artificial Intelligence

BY **Bethany Augliere**

LEXX, PHONLAMAIPHOTO/ISTOCK.COM

Dr. Schneider is an internationally-recognized scholar whose work at the intersection of philosophy and cognitive neuroscience challenges us to consider a world, already upon us, where human mind lives, merges and competes with other forms of intelligence."

— Randy D. Blakely, Ph.D., Executive Director, Stiles-Nicholson Brain Institute

Right now, clinical trials exist to explore potential therapeutic uses for an artificial hippocampus — the small, seahorse-shaped region of the brain responsible for memory. Yet, "imagine brain implant technology in the hands of an authoritarian dictator seeking to track dissident populations," said Susan Schneider, Ph.D., director of the FAU's Center for the Future Mind.

The new center, which launched November 2020, focuses on the future of the self and mind as humans move forward with technological innovations in fields such as neuroscience and artificial intelligence (AI). It was conceived of as a collaboration between FAU's Dorothy F. Schmidt College of Arts and Letters and the FAU Stiles-Nicholson Brain Institute. To do this, the center hosts presentations for the faculty, students and public, advises Congress on AI policy and ethics, and supports research endeavors at the interface of AI and brain science.

"We're drawn to the ethical and conceptual challenges in neuroscience, medicine and AI, especially in relation to the big questions about the future of humanity – what we are, where it is all headed and what we will become" said Schneider, also the William F. Dietrich distinguished professor of philosophy in the College of Arts and Letters, and a member of the Brain Institute.

Schneider first appointed Elan Barenholtz, Ph.D., as associate director of the center. Barenholtz is an associate professor in the department of psychology in the Charles E. Schmidt College of Science, co-director of the Machine Perception and Cognitive Robotics Lab and co-founder of the Rubin and Cindy Gruber Sandbox, an artificial intelligence lab on FAU's Boca Raton campus.

"This is a time of remarkable convergence among different research areas that are concerned with the mind and brain," Barenholtz said. "When neuroscientists, psychologists, computer scientists, philosophers and other researchers gather around common goals, it can lead to groundbreaking ideas that transcend traditional disciplinary boundaries. The center is designed to be a space where these kinds of intellectual collisions take place and I believe it can play a defining role in the evolution of this emerging field."

Since opening, the center now has more than 40 members, including faculty, students and external fellows. It has also launched several high-impact initiatives led by different members. These initiatives range from examining the future brain enhancement, healthy aging to building a virtual brain. For example, the Public, Media and Congressional Engagement Initiative brings information to the public arena through Congressional advising, TV appearances, media interviews and op-eds.

"Public involvement and congressional understanding of what's ahead is absolutely key to avoiding dystopian scenarios and having humans flourish in the age of technology," Schneider said.

Another initiative, led by Andrea Miller, Ph.D., an assistant professor in the school of communication and multimedia studies in the College of Arts and Letters, examines the surveillance and sensing capabilities of AI systems in AI-based personal assistants like Siri and Alexa, military surveillance and weapons systems, and social media platforms like Facebook and Twitter.

"When it comes to the future, AI and neurotechnology are changing the shape of society, introducing machine intelligences that already outthink us in several domains, brain chips that may lead to revamping our minds, new methods of surveillance, and more," Schneider said. "It is up to us, as a society, to ensure that our technological innovations contribute to human flourishing."

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Harnessing the Power of Discovery

Palm Health Foundation Donates $1M for New Program

BY **Bethany Augliere**

Averaging just three pounds, the human brain is considered one of the most complex structures in the universe, controlling all functions of the body and interpreting information from the outside world. Analogies of the brain to supercomputers are common. Regardless of the similarities, neuroscientists are increasingly turning to mathematicians, statisticians, modelers and computer scientists to advance brain science.

"Since the creation of modern computers, researchers have tried to harness computational power to speed up scientific discovery," said Ilyas Yildirim, Ph.D., an assistant professor in the department of chemistry and biochemistry, Charles E. Schmidt College of Science.

That's why FAU's Stiles-Nicholson Brain Institute launched a new program in computational brain science and health, supported by the Palm Health Foundation (PHF) and its gift of $1 million. The gift will support the recruitment of an inaugural program director, support three graduate fellowships per year to advance training in computational neuroscience, and fund faculty pilot research projects that can lead to multi-year, external funding.

Yildirim recently received the first pilot award funded by the PHF. As a theoretical and computational biophysical chemist, his new pilot project will create a novel computational method to predict the 3D structures of RNA. "RNA molecules are produced by the DNA of our genomes to allow for protein production throughout our body, including the brain. Predicting how these molecules fold into complex structures remains a challenge", Yildirim said. Using advanced computational approaches, his team aims to reveal the folding properties of RNA molecules associated with brain diseases, such as those that impact risk for dementia,

"Since the creation of modern computers, researchers have tried to harness computational power to speed up scientific discovery."

— Ilyas Yildirim, Ph.D.

Alzheimer's disease, and Parkinson's disease, among others.

This research offers the possibility of developing novel RNA-targeted medications to treat brain disorders. "Developing computational models that can reliably predict the structure of RNA will have far-reaching and profound effects on our ability to rapidly and accurately develop targeted pharmacotherapeutics for millions of Americans," Yildirim said.

Palm Health FOUNDATION

2022 Palm Health Foundation Fellowships

Four doctoral students recently received 2022 Palm Health Foundation Fellowships in Computational Brain Science and Health, awarded by the Stiles-Nicholson Brain Institute. These fellowships were supported by the Foundation's $1 million gift to the institute to establish a program in computational brain science and health.

Hadi Esfandi, third-year graduate student

Mentor: Ramin Pashaie, Ph.D., associate professor, department of electrical engineering and computer science, College of Engineering and Computer Science

Research: Alzheimer's disease is associated with issues involving oxygen and nutrients reaching neurons, referred to as neurovascular coupling (NVC). Esfandi will design a computational model of disrupted NVC in the context of Alzheimer's pathology. This work will help scientists better understand the course and impact of the disease and promote the possibility of using blood flow signals for early detection of Alzheimer's.

Yosun Yoon, fourth-year graduate student

Mentor: Sang Wook Hong, Ph.D., associate professor, department of psychology, Charles E. Schmidt College of Science

Research: Computational models have identified the synchronization of neural activity among complex brain networks as key to flexible behavior. Within the brain's frontoparietal region exists the frontoparietal network, also known as the control network. This network is responsible for sustained attention, complex problem-solving and working memory. Yoon will use a non-invasive brain stimulation technique and computational analyses to examine the effects of externally induced neural synchronization of the brain's frontoparietal network on cognitive flexibility. The long-term goal of the project is to build a foundation for developing drug-free treatments for people with deficits in cognitive flexibility, such as those with autism spectrum disorder, attention-deficit/hyperactivity disorder and major depressive disorder.

Jasmine Chan, fourth-year graduate student

Mentors: Terrence Barnhardt, Ph.D., associate scientist, department of psychology, Charles E. Schmidt College of Science

Behnaz Ghoraani, Ph.D., associate professor, department of electrical engineering and computer science, College of Engineering and Computer Science

Teresa Wilcox, Ph.D., professor, department of psychology and interim dean of the Charles E. Schmidt College of Science

Research: When people are presented with new situations, they often have to search their knowledge to form a new category of items that are appropriate to use for the given scenario. Interestingly, these ad hoc categories are not generated as effectively among older adults and patients with Alzheimer's. Chan will use tensor decomposition, a powerful signal processing approach, along with machine learning to identify the patterns of brain activity that occur when individuals form ad hoc categories in novel situations. Findings from this project may yield diagnostic tools for the identification of cognitive deficits in older adults and patients with Alzheimer's.

Joseph McKinley, fourth-year graduate student

Mentors: Christopher Beetle, Ph.D., associate professor, department of physics, Charles E. Schmidt College of Science

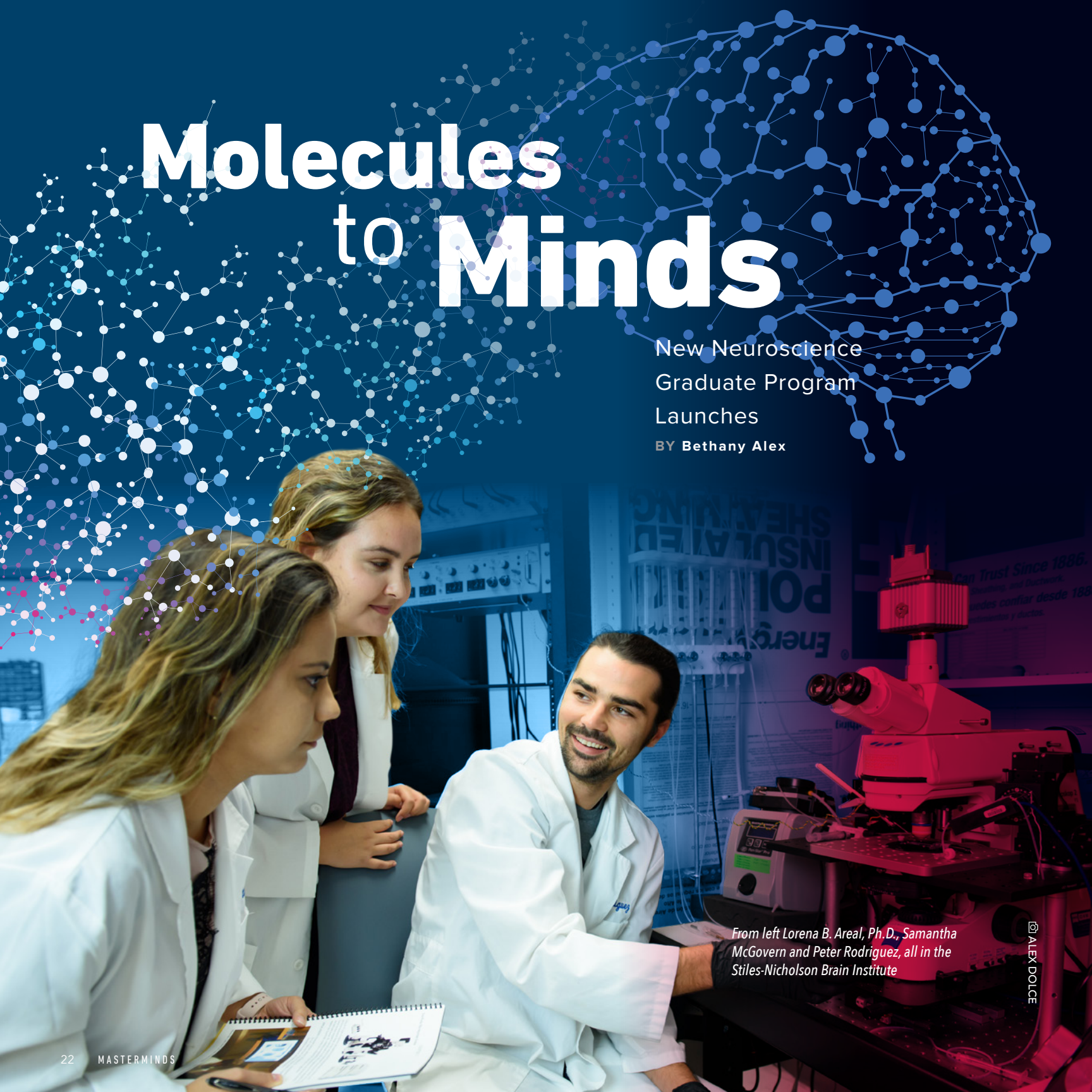
Emmanuelle Tognoli, Ph.D., research professor, Center for Complex Systems and Brain Sciences, Charles E. Schmidt College of Science

Summary: Neurostimulation is a health intervention that disrupts pathological states of neuron activity, with broad applications in the treatment of many illnesses including Parkinson's disease, chronic pain, and major depression. McKinley will develop computational models to provide a theoretical foundation for the dynamics of neurostimulation. Such a framework will help tailor treatment protocols to the unique needs of individual patients, improving efficacy and minimizing side effects.

Molecules to Minds

New Neuroscience Graduate Program Launches

BY **Bethany Alex**



From left Lorena B. Areal, Ph.D., Samantha McGovern and Peter Rodriguez, all in the Stiles-Nicholson Brain Institute

ALEX DOLCE

The brain is dizzying in its complexity, challenging the brightest neuroscientists to understand the workings of even the tiniest patch of tissue, which can contain millions of nerve cells and billions of connections, that can change shape within seconds. As a result, headway in understanding and treating brain disorders moves agonizingly slowly. And help is needed now.

Consider this:

- Nearly 100 million Americans are impacted by at least one of more than 1,000 brain disorders.
- The centers for Disease Control estimates that one in every 44 children has autism spectrum disorder.
- Nearly six million Americans live with Alzheimer's disease.
- Depression impacts one in every three American adults, with suicide rates rising 30% over the last decade.

"Each of these disorders involve changes in the brain that can ultimately rob many Americans of their memories, independence, productivity and often, their lives," according to Randy D. Blakely, Ph.D., executive director, FAU Stiles-Nicholson Brain Institute. "I've simply lost too many to take this situation lightly."

To add muscle to the effort, the Brain Institute, in collaboration with the Charles E. Schmidt College of Science, has launched the Neuroscience Graduate Program (NGP). The program seeks to attract and train the next generation of interdisciplinary brain scientists so they can pursue a career-long effort to demystify the brain and pursue new treatments and preventions of life-altering brain disorders.

FAU's NGP, one of only two comprehensive neuroscience graduate programs in Florida, will combine broad didactic training that runs from molecules to mind with the cutting-edge research experiences needed to explain the basis of neural complexity and the origins and treatments of brain disorders, according to Blakely, who also serves the director of the NPG. The hidden complexities of the brain continue to drive the development of new technologies that students must be prepared to utilize, if not invent, he added.

"This challenge fueled our efforts to develop a program oriented to supplying the technically sophisticated brain science workforce of the future. If we build it right, our graduates will have outstanding opportunities to have successful, independent careers while they help make the world a much better place. ... Indeed, neuroscience is among the fastest growing in terms of job opportunities and the salaries within the field are among the highest in the sciences," Blakely said. "Our leadership clearly sees the NGP as essential to the university's effort to become a preeminent research university."


Teresa Wilcox, Ph.D.

From left Randy D. Blakely, Ph.D., Director, Kathleen Guthrie, Ph.D., Coordinator and Linda Peterson, Director of Graduate Studies, all of the Nueroscience Graduate Program.

In addition, the program draws on faculty expertise from FAU's Charles E. Schmidt College of Medicine, College of Engineering and Computer Science, College of Education and the Harriet L. Wilkes Honors College, as well as from affiliate faculty at Scripps Research and the Max Planck Florida Institute for Neuroscience. The NGP initiated activities in January of 2022, and will welcome its first cohort in the Fall of 2022. In the first year of their program, students don't immediately join the lab of someone whose research they may only have recently become acquainted with, an approach that is particularly important for graduates from undergraduate programs without extensive research opportunities, or where their exploration across the wide expanse of neuroscience has been limited, as for example happens when students pursue other time-intensive opportunities for personal growth besides science.

"The program provides trainees with the flexibility to evaluate research projects and mentors prior to making a final decision as to the direction of their doctoral research journey," said Teresa Wilcox, Ph.D., Charles E. Schmidt College of Science. "NGP students can identify their primary research from among the program's three areas of research and education emphasis – cellular, molecular and biomedical neuroscience; sensorimotor, cognitive and behavioral neuroscience; and theoretical and computational neuroscience – with each area presenting the opportunity to work across disciplines that are leading advances in neuroscience today."

A Touch of Reality

Connecting Biology and Artificial Intelligence to Design Prosthetics That Feel

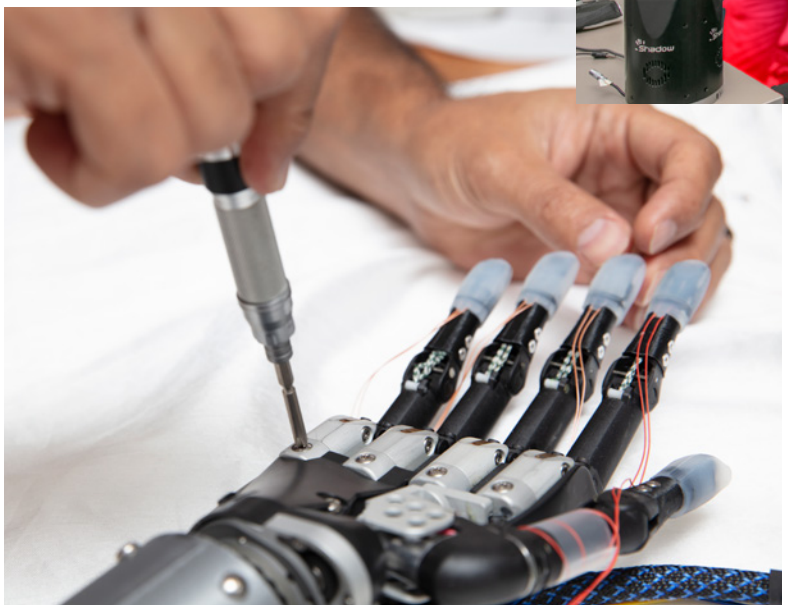
BY **Shavantay Minnis**

Imagine being afraid to pick up your grandchild. That's the reality for some amputees when they can't control the strength of their grip because they can't feel it, said Erik Engeberg, Ph.D., professor in the College of Engineering and Computer Science.

But Engeberg's recent research just might change all that.

Prosthetics are useful, he said, but they lack touch, which means amputees have less information about the world around them. Improving robotic parts that allow individuals to regain sensation and ultimately feel the sensation of touch is the goal, said Engeberg, who is also the director of the BioRobotics Lab at FAU, member in the FAU Stiles-Nicholson Brain Institute, fellow in the FAU Institute for Sensing and Embedded Network Systems Engineering and the FAU Center for Complex Systems and Brain Sciences.

Erik Engeberg, Ph.D.



ALEX DOLCE

For his work on prosthetics, he uses liquid metal sensors on artificial intelligent (AI) fingertips to provide a more realistic experience by creating an advanced sensation of touch. Using custom fabricated fingertips for a prosthetic hand, Engeberg inserts a liquid metal sensor on each fingertip to collect individual sensory data that can eventually send signals to the entire hand, so it senses what it's touching.

"Imagine using an individual finger to feel a keyboard or a mouse. The ridges on the keys, or the wheel of the mouse, signals your hands and it can then automatically determine what it's touching," Engeberg said. "A prosthetic hand should be no different."

With four different corduroy style textures, each with a different distance between the ridges of the texture, and with a different speed set, the artificial fingers learn how to determine complex multi-textured surfaces. The sensors attached to the fingertips send information to a computer software system that trained machine learning algorithms to predict a recognized pattern of textures, he said.

Engeberg chose liquid metal sensors because it's a softer, stretchable material with a higher flexibility and it's highly conductive, meaning it has the potential to pick up stronger sensations from the fingertips. The sensors, likewise, detect the speed of a moving object better than other sensors used on robotic hands, he continued. It's also possible that the material used on an entire prosthetic hand or arm will give it a closer, more human-like touch.

"If prosthetics could have a lighter softer touch, it'll prevent amputees from abandoning their prosthetic hands altogether," he said.

Recently, Engeberg tested the artificial sensations of touch with amputee participants and discovered so far, they've successfully distinguished multiple sensations of touch from multiple fingertips simultaneously, which is not possible with current prosthetic technology, he said.

"This is key to all the work we've worked so hard towards. I know there are so many other amputees who will benefit from better artificial limbs," he said.

Engeberg and his team started the work with robotics in 2014. He created his first robotic AI hand that provides individual movement to a specific robotic finger. They discovered ways to mimic the flexion and extension behaviors of human fingers by training the AI finger to open and close the cap from a water bottle.

"Our goal is to get one step closer to helping improve an amputee's quality of life with more natural prosthetic options that lets them feel and respond to their environment. Eventually every sensation on an artificial prosthetic should feel more natural," Engeberg said. "It's the future of AI."

Engeberg also developed a system that merges live nerve tissue with a robotic prosthesis to create a living robotic hand — a multidisciplinary project funded by National Institutes of Health with collaborators from the colleges of engineering, medicine, and science at FAU. That project used an amputee's movement and sensors that measured electrical signals to capture touch sensation and stimulate their damaged nerve cells.

This was their first approach to the problem of a lack of touch sensation and now with liquid metal sensors added to the project their goals feel closer than ever, he said. For his next step, Engeberg plans to design other in-depth textures that an AI prosthetic can determine, such as rocky surfaces or a smooth texture

"I've been working with prosthetics, mixing biology and applied engineering for more than 15 years," Engeberg said. "It's exciting to know this really is making an impact."

Mimicking the Spine

To help treat patients with degenerative disc conditions, Erik Engeberg, Ph.D., is creating artificial spines to give surgeons a "preview" of the effects of surgical interventions for spine disc replacement.

In his BioRobotics Lab at FAU, Engeberg developed a robotic cervical spine that imitates the human neck. He used a 3D printer that builds objects, and a CT scan of a neck to create the robotic spine's shape.

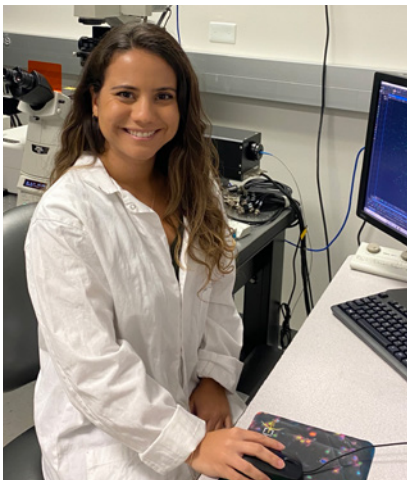
Engeberg then inserts an implant, or an artificial disc, that has a soft magnetic sensory array into the replicated spine.

"This new method lets us use soft and stretchable magnets by mixing silicone with magnetic powder, which helps capture the spine's movement more precisely," Engeberg said.

As the artificial neck flexes, the soft magnetic sensor array analyzes the spine's posture with four different machine-learning algorithms. Engeberg then compares the algorithms to classify five different postures of the human spine.

The results of the study, recently published in the journal Sensors, shows that the soft magnetic sensor array has higher capabilities to classify the spine, "which can help predict the different problems of the spine that people experience and allow surgeons access to reviewing and comparing the effects of different surgeries," Engeberg said.

Brain Networking

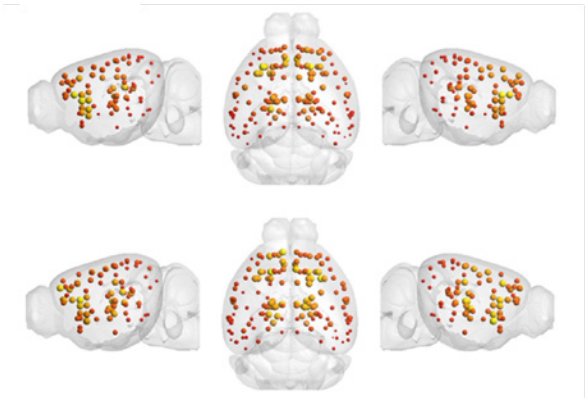


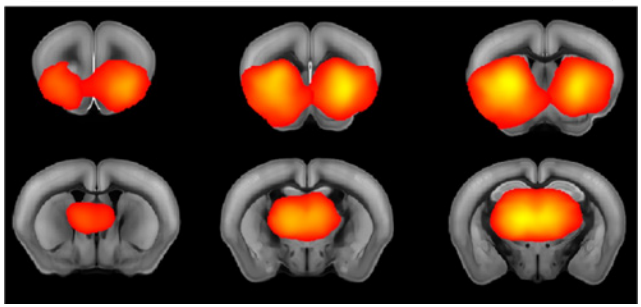
SAMANTHA MCGOVERN

Using genetically engineered mice, postdoctoral fellow Lorena B. Areal, Ph.D., studies the effects of dopamine-related mutated genes found in patients diagnosed with bipolar disorder, attention deficit hyperactivity disorder and autism spectrum disorder, on brain signaling and behavior.

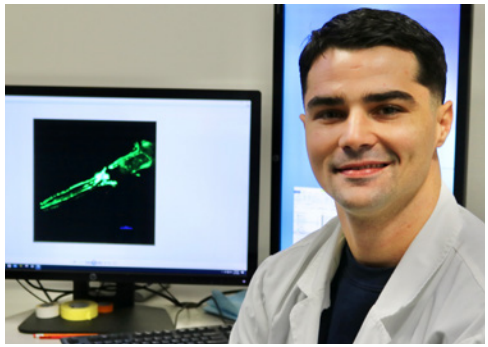
Areal was recently awarded the Advanced Magnetic Resonance Imaging and Spectroscopy pilot grant, supported by the National High Magnetic Field Laboratory, the National Science Foundation, the National Institutes of Health and the State of Florida.

This grant gives Areal access to a functional MRI to investigate how dopamine dysfunction can drive these disorders and help uncover more precise treatment strategies. The studies funded establish a collaboration with brain imager Marcelo Febo, University of Florida.





Resting state fMRI scans and connectome maps in a mouse brain. Images provided by Marcelo Febo, Ph.D.



BETHANY ALEX

Glial Support for Neurons

Peter Rodriguez, graduate research assistant in the Charles E. Schmidt College of Medicine, was recently awarded the Delores Auzenne Fellowship, sponsored by the State University System. The fellowship is designed to encourage students to pursue graduate degrees in areas where they are historically underrepresented.

Rodriguez, president of the FAU Neuroscience Student Organization, focuses his work on identifying molecular pathways in glial cells that are critical to the health and proper function of neurons. These cells are responsible for supporting neuronal energy supply and metabolism, but when glial cells are disrupted, degeneration of nearby dopamine neurons occurs increasing the risk of diseases such as Alzheimer's and Parkinson's.

Combined with results of his previous studies, which have shown similar traits to the major dysfunctions observed in human patients with brain disease, Rodriguez aims to leverage the knowledge gained from his research to provide therapeutic insight for multiple neurodegenerative diseases.

Rodriguez' work contributed to a newly funded grant to the Blakely lab from the Florida Department of Health to link worm discoveries to Alzheimer's disease (see page 34).

From Football to Neuroscience

Former NFL Player Researches the Brain and Body's Impact on Behavior

BY **Bethany Augliere**

JULTMARTIN EUGENE

Inspired by his time as an professional football player and athletic trainer, neuroscientist Claudius Osei is trying to understand how the brain influences behavior — and the body. For scientists who research the brain, it's a controversial notion. But, his research could shed light on what makes elite athletics perform the way they do.

"Neuroscience that solely focuses on the brain is discounting the impact of the body in cognition, and that's what I'm focusing on," Osei said. For example, he said, the best football players aren't necessarily the fastest or the strongest players. It takes special cognitive abilities to specify the perceptual information that leads to the desired outcome. "I'm interested in how the brain and the body solve those complex problems."

Osei is a doctoral student working in the lab with Elan Barenholtz, Ph.D., an associate professor of psychology, member of the Center for Complex Systems and Brain Sciences in FAU's Charles E. Schmidt College of Science, and member of the FAU Stiles-Nicholson Brain Institute. Recently, Osei was a runner-up in the Three-Minute Thesis Competition organized by FAU's Graduate College.

Additionally, Osei was recently awarded the FAU Graduate Diversity Fellowship and is involved with the Brain Institute's outreach program, ASCEND (Advancing STEM Community Engagement through Neuroscience Discovery) for middle and high school students in Palm Beach County. "I think it is important to encourage underrepresented communities to do science," he said.

Before joining FAU, however, Osei was not a formally-trained scientist. In 1999, he relocated to the U.S. from Germany during his senior year of high school as part of the NFL Europe's

developmental football program. Afterward, he earned a scholarship to play college football at Florida State University, where he earned an undergraduate degree in business. After graduating, he played professional football for the NFL, including the New York Giants and Tampa Bay Buccaneers.

He found neuroscience after leaving the NFL to work as an athletic trainer. To better understand how to motivate his clients, he spent hundreds of hours poring over psychology research. In the process, he developed his theory to identify his client's favorite childhood activities and apply similar movements to their training regimen. Eventually, he wanted to conduct more rigorous research, which led him to apply to the doctoral program at the Brain Institute.

Now, Osei studies the brain and body by coding neurological functionality into 3D models using a game engine called Unity. In traditional psychophysical experiments, humans are essentially playing a video game, he said. His experiments are replacing the human with a digital representation that performs various actions inside the software's virtual world. Thus, Osei can identify the neural activities of the AI agent's brain during its behavior without restricting its movement to control the environment, like in traditional behavioral experiments. This involves creating a physical body for the agent, which he hopes will elucidate the importance of the entire nervous system in behavior.

"Imagine a basketball player taking a shot," Osei said. That movement is not easily replicated, not just because of environmental disturbances, but also due to internal factors such as muscle fatigue and stress level, he said. "So, assuming the brain can simply give the same command to the body to repeat a specific behavior would lead to consistent errors in performance. Our peripheral and autonomic nervous systems play an intricate part in our behavior. They should therefore be treated as partners in cognition instead of passive executors of the brain's instructions."

"My research is for anybody with a brain," Osei said. "If you wonder why you or other people behave in a certain way, we have to understand the cooperation between the brain and the body."

Claudius Osei

ELISENDA ROIG/GETTY IMAGES

ACCOLADES

ALEX DOLCE

Diversity in Science

For her research in experimental psychology, Gianna Cannestro, a student in the Complex Systems and Brain Science doctoral program, recently earned the McKnight Doctoral Fellowship.

The fellowship, created to build equity, diversity and inclusion for under representation of African American and Hispanic populations for those in pursuit of a career in research and teaching at a college or university level, provides students pursuing doctorate degrees at Florida universities with tuition up to $5,000 per year, plus an annual stipend of $12,000.

Cannestro studies how the sense of touch alters or is altered by other activities in the brain. By understanding the relationship between human touch perceptions and chronic pain, Cannestro's goal is to further advance dynamic approaches to pain management.

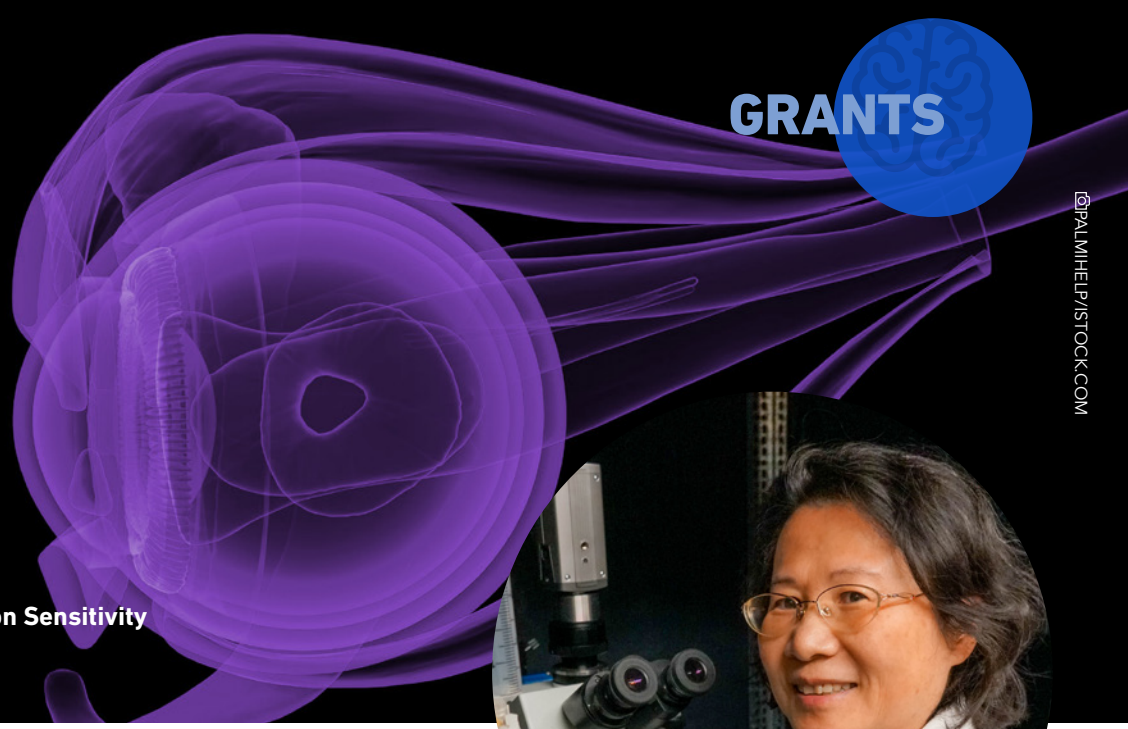
BETHANY ALEX

Rewarding Neurons

Felix Mayer, Ph.D., a postdoctoral fellow in the laboratory of Randy D. Blakely, Ph.D., and the Charles E. Schmidt College of Medicine, was recently selected for the Max Kade Fellowship by the Austrian Academy of Sciences, which encourages the transatlantic exchange between German-speaking countries and the U.S., to identify non-addictive treatment methods for patients diagnosed with attention-deficit/hyperactivity disorder (ADHD).

Those endeavors address an unmet medical need as current standard medications are associated with a high abuse liability and may serve as a gateway to stronger stimulants. Mayer's research uses mice engineered to express a gene variant found in patients who were diagnosed with ADHD, autism spectrum disorder and bipolar disorder. Hence, the findings of his studies could potentially be applied to other neuropsychiatric disorders as well.

With a light-emitting sensor that allows him to measure the levels of dopamine in the brain in real time, Mayer looks at the behavior and release pattern of dopamine in the brains of freely behaving mutant and normal mice. These studies are supported with biochemical approaches to assess the underlying neurochemistry in additional detail. Mayer has been invited to several national and international conferences to present the results of these studies.



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Light in the Dark

Researching Ways to Improve Vision Sensitivity

BY **Shavantay Minnis**

KATARZYNA BYTNAR

Wen Shen, Ph.D., associate professor of biomedical science, Charles E. Schmidt College of Medicine, and member of the FAU Stiles-Nicholson Brain Institute

As someone steps into a dimly lit room, their eyes adapt slowly to the dark, temporarily affecting their vision, according to Wen Shen, Ph.D. But for older adults, or those with vision ailments, that adaption process takes much longer, potentially creating an unstable situation.

That's why Shen, supported by a $500,000 grant from the National Science Foundation, is researching how eyes adapt during varied light conditions with the aim of developing treatment strategies that could help eyes improve when switching from dim to brighter lights.

Specifically, Shen looks at the retina inside the eye, and how neurons like photoreceptors in the retina — a layer of tissue in the back of your eye that senses light and sends images to your brain — communicate with another neuron as the eyes adjust to bright or dim lights.

"When the eyes adapt during dark or light situations, the retinas inside the eye adjust to lesser or greater levels of light in the environment," she said. "However, with light-sensitive problems or diseases, the adaptation functions in the eyes decline progressively."

To effectively intervene in the visual functional impairment, scientists need to understand the retina's neural circuitry and functions of the neural chemicals involved in the adaptation process, she added.

Shen has discovered that a chemical called glycine, might play an important role to help eyes improve adapting faster.

"People don't think about how to adjust one's vision performance in dim light or lower light conditions or if it's needed at all, but it is," she said. "By understanding how normal neurons function and the physiology of the retina, it helps me understand when something goes wrong in the eyes, and it enables more effective treatment plans for people with abnormal vision or diseases found in the retina."

So far, Shen said, the glycine has been shown to balance the neurons while improving visual sensitivity.

This method she hopes will aid in the rehabilitation process with those who lose sensitivity and have trouble determining light from dark. Shen's grant also seeks to integrate research and education, updating the way student researchers learn and understand neurons in the retina, she said.

"We've discovered something unique here and it's just the beginning," she said. "The more knowledge and information we discover about the adaptation process in the eyes, the more we can determine which part of the neurons are suffering and find better methods for diagnosing and treating patients throughout South Florida."

UNTANGLING the KNOT

New Funding Supports Scientists as They Tease Out Clues to Alzheimer's Disease and Related Dementias

BY **Wynne Parry**

Age brings wisdom, but Alzheimer's disease can take it, and so much more, away. Yet, after more than a century of research, scientists are still working to understand how this degenerative disorder robs the brain of the basic functions that have carried someone through a lifetime. Likewise, they have yet to fully delineate the factors that put someone at risk, or that protect them. Because this complex disease is not well understood, options for treating it remain limited.

"Alzheimer's remains a knot in need of much more research to untangle," said Randy D. Blakely, Ph.D., executive director of the FAU Stiles-Nicholson Brain Institute. Despite the challenges, he remains optimistic. "I think we're going to make some tremendous strides, but we have got to be realistic about the investment it takes, at many levels."

Researchers in fields across FAU are securing funding to tease out much needed insight on Alzheimer's and related dementias. Their work opens the door for more promising treatments — and for hope.

Carmen Varela, Ph.D., an assistant professor of psychology in the Charles E. Schmidt College of Science, is among those to receive funding recently. The Alzheimer's Association's Research Fellowship to Promote Diversity $149,871 award will fund research in her lab on the relationship between sleep and memory.

Although this is her first foray into research explicitly related to Alzheimer's, Varela is an expert on one of the brain functions most ravaged by Alzheimer's and other dementias: memory. Sleep, a deceptively simple activity, supports it by allowing the brain to stabilize memories and integrate them with prior knowledge.

Research suggests that disruptions to sleep, such as waking up frequently and changes in the rhythms that characterize brain activity during sleep, can emerge early in the progression of Alzheimer's, even before a patient receives a diagnosis. By studying sleeping rats, Varela and her team hope to better understand these disruptions and,

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> "Alzheimer's remains a knot in need of much more research to untangle."
>
> *— Randy D. Blakely, Ph.D., Executive Director, Stiles-Nicholson Brain Institute*

ultimately, to lay the scientific groundwork for a method for diagnosing and monitoring Alzheimer's and other dementias based on sleep. Funds from the fellowship are supporting experiments looking to link rats' movement and brain activity as they sleep with their brain activity.

"Sleep patterns are relatively easy to monitor non-invasively, as compared to blood tests or brain imaging, which are often used in these disorders," Varela said. "If you can track sleep, then you have a way to monitor the progression of the disease at home, on a daily basis."

FUNDING A BETTER FUTURE

Researchers at FAU received funding to investigate Alzheimer's disease and dementia from perspectives that range from the molecular to the social. Here's a look at some of these projects:

Lung-Ching Chang, Ph.D., an assistant professor of mathematics in the Charles E. Schmidt College of Science, is participating in the following National Institutes of Health (NIH) grants.

People living in rural areas are more frequently affected by Alzheimer's and related dementias than residents of cities or suburbs. Chang is a co-investigator on a NIH grant to investigate this disparity. The principal investigator is James Galvin, Ph.D., of the University of Miami (UM).

Methods for detecting the onset of Alzheimer's and other forms of dementia generally depend on invasive tests that are not accessible to many people, such as those without insurance. As co-investigator on another NIH grant, Chang is working with Galvin and his team at UM to test a more accessible approach to screening.

Research suggests that seniors who have access to parks have better brain function and a reduced risk for Alzheimer's disease. Chang is a co-investigator on an NIH grant investigating how improvements to neighborhood environments can prevent cognitive decline, delay the onset of Alzheimer's, and allow the elderly to age at home. Lilah Besser, Ph.D., also of UM, is the principal investigator. The following three projects were funded by the Florida Department of Health's Ed and Ethel Moore Alzheimer's Disease Research Program.

Like other areas of medical research, Alzheimer's has a diversity problem: Most studies have focused on white, non-Hispanic patients. Postdoctoral fellow Idaly Vélez-Uribe, Ph.D., and her mentor neuropsychologist Mónica Rosselli, Ph.D., professor and associate chair of psychology in the Charles E. Schmidt College of Science, want to know how bilingualism and other experiences common among Hispanics might alter risk.

Growing evidence suggests that cholesterol deficiency may contribute to aging-associated brain disorders including Alzheimer's. Qi Zhang, Ph.D., associate professor, department of chemistry and biochemistry, College of Science, is investigating whether or not rebalancing brain cholesterol can reduce or even reverse neurological degeneration.

Using cells in culture and mice, Howard Prentice, Ph.D., professor of biomedical science in the Schmidt College of Medicine, will investigate the ability of sulindac, a nonsteroidal anti-inflammatory drug, to protect against harmful neurological changes that occur in Alzheimer's.

MORE ARE ON THE WAY.

These FAU investigators recently learned they are winners of new grants from the Florida Department of Health.

Taking advantage of his recent discovery of a new gene that supports neural health in the simple worm model *C. elegans*, Blakely and Maureen Hahn, Ph.D., managing director of the FAU Neurobehavior Core and research associate professor in the Charles E. Schmidt College of Medicine, seek to understand why the human version of this gene increases risk for Alzheimer's disease.

Lisa Ann Kirk Wiese, Ph.D., associate professor, Christine E. Lynn College of Nursing, will conduct a study that aims to positively impact the health of rural Floridians by demonstrating the best avenue for increasing early rates of Alzheimer's disease detection and treatment in rural underserved communities.

GRANTS

Using Worms to Find a Cure for Alzheimer's

Evolution Paves Path for Curing Devastating Neurological Condition

BY **Judy Gelman Myers**

If someone said a worm gene could illuminate a cause or cure for Alzheimer's disease, you might doubt their good sense.

But Randy Blakely, Ph.D., believes this is possible, and worth spending several years to find out. He plans to further this research through a $350,000 grant from the Florida Department of Health, opening new opportunities to treat a disease that currently affects more than six million Americans.

Blakely, Stiles-Nicholson Distinguished Professor in Neuroscience and professor of biomedical sciences in the Charles E. Schmidt College of Medicine, said his work is all about evolution — of our species, technology and of an idea he began pursuing 30 years ago.

IN THE BEGINNING

Neurotransmitter transporters, which are complex molecules that enable neurons to communicate with each other, have always piqued Blakely's interest, he said. While he wanted to study how they contribute to brain disease, he first needed to understand their structure.

In 1991, he isolated a human transporter gene, but the technology for solving the structure of the protein it encoded wasn't available for another 15 years. "We had the gene. We knew the amino acids that made up the protein. But we didn't know how these amino acids, connected to each other like beads on a string, folded to make the transporter protein in the shape needed to whisk away neurotransmitters like dopamine and serotonin from the synapse," Blakely said.

A few years later, he made a choice that defined a significant part of his research for the next 25 years: he turned to evolution — specifically, its bias to protect structures that are important to survival, a feature revealed by sequence conservation. "What I needed was a genome from a distant organism that was making a form of the same protein that I had discovered in humans," he said.

He chose *Caenorhabditis elegans* for his research, a tiny worm with 302 neurons that multiplies rapidly and prolifically. The last common ancestor it shared with humans lived 500 to 600 million years ago. Blakely said his next goal was to identify amino acids in the worm that were conserved in the human protein predicted by the gene he had cloned, in order to determine which ones were critical for how the protein worked.

The genome of the worm, published in 1996, helped him identify the worm's dopamine transporter gene two years later. Next, "I wanted to see where the transporter was expressed in a living nervous system," Blakely said.

COLLABORATION

Blakely and postdoctoral fellow Richard Nass., Ph.D., applied the Nobel Prize-winning technique of putting a green fluorescent protein from algae in cells of another organism, and making them glow green, to worms in an attempt to light up the dopamine neurons of worms. "For the first time, the dopamine neurons of a living nervous system could be seen in all their glory," said Blakely, adding if he could see the presence of dopamine neurons, he could identify when they were missing.

TAMPATRA, HEITIPAVES/ISTOCK.COM

Since dopamine neurons selectively die in Parkinson's disease, he said, he wondered if he had stumbled on ways to protect dopamine neurons from this disease.

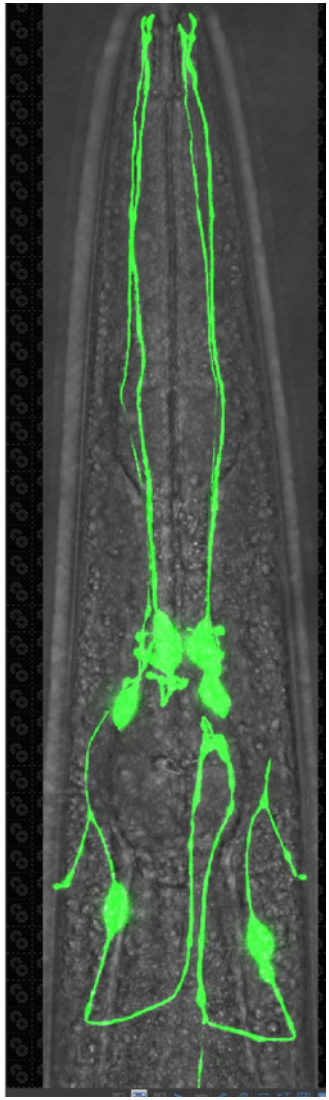
In 2002, Blakely and his team verified that genetic elimination of dopamine transporters keeps dopamine neurons alive, even when the worms are bathed in toxins. "If I stayed with this line of research, I'd be orienting my work to the study of dying cells. I was more interested in the function of normal synapses and wanted to understand how transporters work in a living synapse," he said. "So I gave the model to my postdoc so he could build his own lab."

BACK TO WORMS

Blakely resumed research on living worms, searching for a way to identify worms whose dopamine transporters were not working.

Five years later, another postdoctoral fellow, Shannon Hardie, Ph.D., discovered that when worms lack dopamine transporters, they crawl on solid surfaces relatively normally but rapidly paralyze when placed in water, due to a buildup of dopamine that deactivates neurons needed for swimming. His lab coined a term for this phenotype — swimming-induced paralysis, or SwIP.

In 2015, Andrew Hardaway, Ph.D, a graduate student working with Blakely, led the effort that identified the gene swip-10, a molecule whose loss caused an extremely rapid form of paralysis when the worms were placed in water. Hardaway's research showed that paralysis was due to the dopamine neurons being excessively excited by other neurons, which was triggering the release of too much dopamine. Just as striking, another graduate student working with Blakely Chelsea Gibson, Ph.D, discovered that the dopamine neurons were not just excessively excited – they were dying as if they were the dopamine neurons of a Parkinson's patient. "I saw that there might be a two-for-one prize here — a gene that regulates both the signaling and the health of dopamine neurons," Blakely said.



Dopamine neurons in C. elegans

A deeper examination of swip-10 structure revealed that the swip-10 protein shared a piece of its sequence with a human protein called MBLAC1. The element shared between MBLAC1 and swip-10, called an MBD, is ancient, having appeared first in bacteria millions of years earlier to allow these cells to inactivate lethal toxins made by fungi.

In 2018, a third graduate student working with Blakely Cassie Retzlaff, Ph.D,, a graduate student working with Blakely, established that the antibiotic ceftriaxone binds directly to MBLAC1 and appears to be the primary, if not sole, brain target for the neuroprotective drug.

FUTURE RESEARCH

The next step in this research is studying how swip-10 and MBLAC1 keep neurons alive. Blakely's current lab members are researching mice whose MBLAC1 protein has been genetically eliminated, a project funded by the Florida Department of Health. (Critical initial funding for the project was provided by a Mangurian Alzheimer's Disease and Related Disorders pilot grant.)

That should be the final credit. The film should be done. But like a modern adventure movie, there's always something waiting at the back end.

In 2019, a team of scientists reported that MBLAC1 is a risk factor for late-onset Alzheimer's in people with cardiovascular disease. Blakely and his current team (Maureen Hahn, Ph.D., Peter Rodriguez, Jacob LaMar, Matt Gross), suspect that in humans, MBLAC1 protects not only the brain, but also the heart and its blood vessels, leading to both brain and heart disease arising together.

"If we can understand why the loss of swip-10 causes neurons to die in the worm, we should be able to understand why MBLAC1, its human version, is a risk factor in Alzheimer's disease, and maybe then we can use what we have learned to develop medications to treat the disorder," Blakely said. "That's a dream of course, but that's what our grant is all about."

Supporting Brain Research

Pilot Award Winners Announced

BY **Bethany Augliere**

From projects that explore the link between emotion and oxytocin in autism to the use of dogs to help alleviate post-traumatic stress symptoms in veterans, FAU researchers are tackling critical questions related to brain science and health.

To help in that battle, 12 FAU researchers were recently awarded grants totaling more than $100,000, as part of the Stiles-Nicholson Brain Institute's 2021 Pilot Grant Awards program.

"The Institute's Pilot Award program is one of our most important academic research support activities," said Randy D. Blakely, Ph.D., executive director of the Brain Institute. "Investigators receiving these awards apply the funds toward the acquisition of critical technologies and foundation data that can allow them to apply for major research awards. In fact, our return on investment historically is over 2,000%."

Research studies must be designed to be completed in one year and often promotes the training of undergraduate, graduate and postdoctoral researchers, as well as the creation of new faculty collaborations.

"The winners of this year's competition were drawn from what was a truly competitive pool of applicants, one that reflects the breadth of neuroscience represented by the Brain Institute, and features scientists from five colleges," Blakely said.

Here's a look at the winners:

Development of sulindac encapsulated PLGA nanoparticles: novel approach to target neuronal cells
Shailaja Allani, Ph.D., Herbert Weissbach, Ph.D., James Kumi-Diaka, Ph.D., departments of chemistry and biochemistry and biological science, Charles E. Schmidt College of Science, and Waseem Asghar, Ph.D., department of electrical engineering and computer science, College of Engineering and Computer Science

Epigenetic consequences of intermittent cocaine exposure in rats
Andrea Cippitelli, Ph.D., department of biomedical science, Charles E. Schmidt College of Science

Behavioral consequence of neural synchronization of executive network
Sang Wook Hong, Ph.D., and Summer Sheremata, Ph.D., department of psychology, Charles E. Schmidt College of Science

Brain-gut-immune effects of oral therapy with combination benzimidazoles and chitin microparticles for late-stage breast cancer
Ceylan Isgor, Ph.D., and Vijaya Iragavarapu-Charyulu, Ph.D., department of biomedical science, Charles E. Schmidt College of Medicine

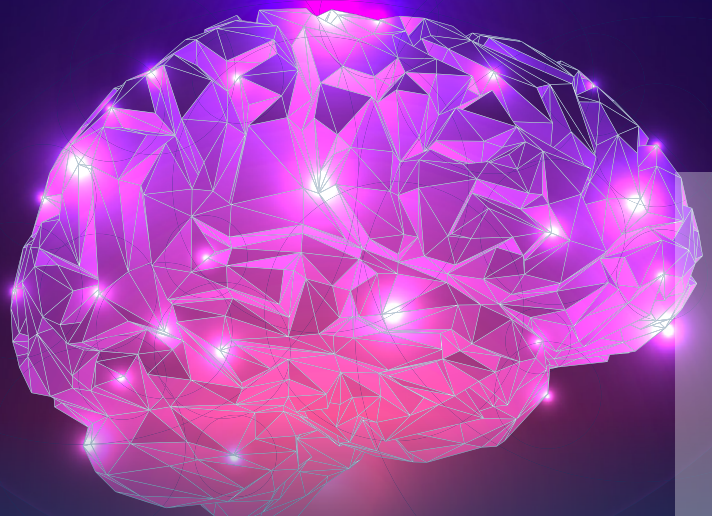
Emotion recognition and the oxytocin gene: An autism study
Nancy Jones, Ph.D., and Krystal Mize, Ph.D., department of psychology, Charles E. Schmidt College of Science

Assessment of biopsychosocial indicators linked to canine intervention treatment response in veterans with Post-Traumatic Stress symptoms
Cheryl Krause-Parello, Ph.D., and Beth Pratt, Ph.D., Christine E. Lynn College of Nursing and Institute for Human Health and Disease Intervention, and Christine Spadola, Ph.D., Phyllis and Harvey Sandler School of Social Work, College of Social Work and Criminal Justice

Palmitoylated membrane protein 2 as a target for improving memory in adult mice
Robert Stackman, Jr., Ph.D., department of psychology, Charles E. Schmidt College of Science

An integrated framework to define the role of the thalamus in predictive coding and learning
Carmen Varela, Ph.D., department of psychology, Charles E. Schmidt College of Science

Gene therapy for Alzheimer's disease using AAV-granulocyte-colony stimulating factor and AAV-choline acetyltransferase gene vectors
Jang-Yen Wu, Ph.D., department of biomedical science, Charles E. Schmidt College of Medicine



Seeding Advances in Brain Research

The awarding of four new $25,000 Pilot Research awards collectively support the activities of seven faculty researchers. Three of these projects were funded through a gift from philanthropist David J.S. Nicholson under the auspices of the David and Lynn Nicholson Center for Neurodegenerative Disease Research.

Here's a look at the researchers' projects:

Deciphering the Role of APP O-Glycosylation in the Pathogenesis of Alzheimer's Disease
Maré Cudic, Ph.D., Deguo Du, Ph.D. and Shallaja Allani, Ph.D., department of biomedical science, Charles E. Schmidt College of Science

Role of the Myokine Cathepsin B in a Mouse Model of Alzheimer's Disease
Henriette van Praag, Ph.D., department of biomedical science, Charles E. Schmidt College of Medicine

Greasy and Glowing - Developing Modular Lipid Reporters to Probe the Role of Lipids in Neurodegeneration
Maciej Stawikowski, Ph.D., department of chemistry and biochemistry, Charles E. Schmidt College of Science, and Qi Zhang, Ph.D., department of biomedical science, Charles E. Schmidt College of Medicine

The fourth project was funded by the Palm Health Foundation as a component of the Institute's new program in computational brain science and health.

Modeling RNA to Inhibit Brain Disorders
Ilyas Ildirim, Ph.D., department of chemistry and biochemistry, Charles E. Schmidt College of Science

Matching Funds Support Students

Three FAU graduate students were recently each awarded a $1,000 stipend enhancement award as matching funds to a gift from the Heichemer Family Foundation, whose giving supports the new Stiles-Nicholson Brain Institute building in Jupiter.

The students will conduct research under FAU's Program in Neuroimmunology and Glial Biology, led by Ning Quan, Ph.D., professor of biomedical science, FAU Stiles-Nicholson Brain Institute.

Here's a look at the three students, their mentors and projects:

Nuran Kocak
Mentor: **Ning Quan, Ph.D.**
Project: Microglia regulate neurodevelopment downstream of neuronal IL-1R1 signaling

Peter Rodriguez
Mentor: **Randy D. Blakely, Ph.D.**, David J. S. Nicholson Distinguished Professor in Neuroscience and executive director of the FAU Stiles-Nicholson Brain Institute
Project: Identification of genes responsible for neuronal and systemic health

Heather Butler
Mentor: **Gregg Fields, Ph.D.,** professor, department of chemistry and biochemistry, Charles E. Schmidt College of Science and executive director of FAU's Institute for Human Health and Disease Intervention
Project: Delivery of therapeutic agents across the blood-brain barrier for treatment of glioblastoma and neurodegenerative diseases

Roadmap to Recovery

Research Aims to Uncover Treatment Options for Veterans with Mild Traumatic Brain Injuries

BY **Shavantay Minnis**

KATARZYNA BYTNAR

Not all wounds of war are visible. For veterans who suffer from mild traumatic brain injury (TBI), it's a hidden battle that often limits their mental and physical capabilities.

TBI can be caused by blunt force trauma or blow to the head or body said Cheryl Krause-Parello, a professor and interim associate dean for nursing, research and scholarship in FAU's Christine E. Lynn College of Nursing, and member of the Stiles-Nicholson Brain Institute.

Krause-Parello created a platform giving veterans with a mild TBI and their caregivers a voice in developing a pathway for increasing relevance of patient-centered outcomes that are important to them so they can live their healthiest lives. This project is being executed through her newest community engagement award titled Mind Over Matter (MOM) funded through a $250,000 award from the Eugene Washington PCORI Engagement Awards program, an initiative of the Patient-Centered Outcomes Research Institute.

"TBI and its sequelae exhibit differently in different people, and there is no 'one size fits all' TBI treatment," said Krause-Parello, who is also the director of Canines Providing Assistance to Wounded Warriors and a faculty fellow of FAU's Institute for Human Health and Disease Intervention.

Collaborators on the MOM project include veterans, caregivers, researchers, clinicians, TBI community advocacy organizations and others who have a connection to, expertise in, or lived experience related to dialogue on the four cognitive domains of TBI, including attention, memory sequencing, problem-solving and executive functioning. Once completed Krause-Parello, we will uncover meaningful veteran-centered research ideas and questions to create a roadmap to research on mild TBI, she said.

This method of patient-centered engagement is a familiar one to Krause-Parello. Her previous work with veterans with post-traumatic stress disorder also focused on working with them in the field to determine remedies for better health.

"It works, and that's what encourages me to be engaged because I'm seeing firsthand how veterans partnering with researchers and key community stakeholders can make a difference in healthcare outcomes," she said.

Guiding Next Generation of Neuroscientists

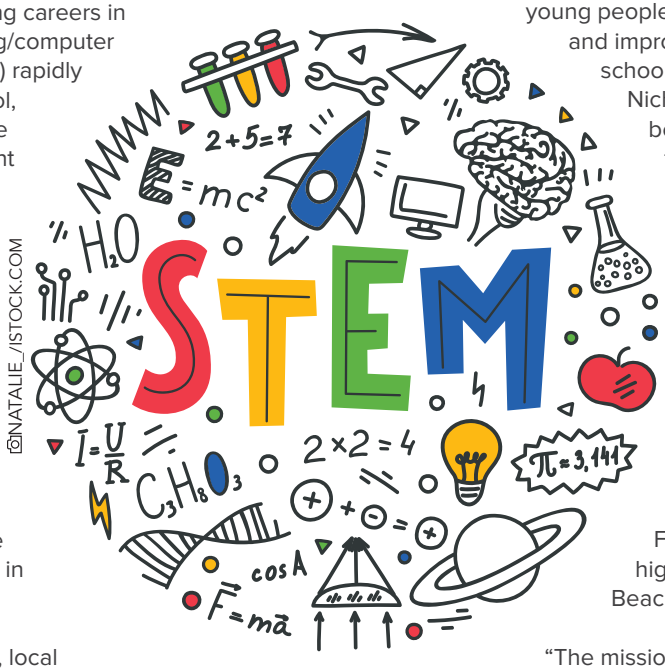
Gift Aims to Increase STEM Opportunities

BY **Bethany Alex**

Did you know, interest in pursuing careers in science, technology, engineering/computer science and mathematics (STEM) rapidly declines starting in middle school, with only one-third of U.S. middle school students scoring proficient on the U.S. national report card?

By the time students graduate from high school, less than 20% are prepared for college-level coursework in STEM disciplines.

These statistics are even worse in populations with limited access to STEM education resources, highlighting the disproportionate representation of the population in STEM careers.



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To help combat this discrepancy, local business leader and health-science advocate, David J. S. Nicholson, gifted FAU Stiles-Nicholson Brain Institute's ASCEND (Advancing STEM Community Engagement through Neuroscience Discovery) program an additional three years of funding as part of his recent $10 million gift to the university. ASCEND, created in 2018 with a four-year, $780,000 grant by the Stiles-Nicholson Foundation, exists to increase public awareness and understanding of contemporary brain science research activities and brain health. In addition, ASCEND aims to facilitate an increase for young minds to learn and work in neuroscience-based disciplines.

"It is my hope that the FAU Stiles-Nicholson Brain Institute's ASCEND programming will foster a revitalized interest among young people to pursue STEM as a career and improve U.S. rankings in high school science and math education," Nicholson said. "Kids may only be 25% of our population but they are 100% of our future – educating them is our best investment, especially in science."

ASCEND is a mentored program, comprised of direct and digital media-based interactions between neuroscience trainees at FAU, Max Planck Florida Institute for Neuroscience and Scripps Florida, that targets middle and high school students in Palm Beach County.

"The mission of ASCEND is to positively impact the national shortage of students pursuing STEM education and career-related opportunities through inspiring and intellectual, hands-on learning experiences between post-baccalaureate and post-doctoral neuroscience trainees and students in our community," said Nicole Baganz, Ph.D., director of community engagement and programming at the Brain Institute, and director of ASCEND.

"We want to excite young minds and illustrate the amazing advances being achieved in brain science, and with Mr. Nicholson's gift, we can continue implementing an innovative education program to engage and motivate the next generation of scientists in our community."

Brainy Days 2021 Recap

Virtual Celebration of Neuroscience Offers Diverse Brain Science Education

BY **Bethany Alex**

Almost 700 people tuned into the fourth annual Brainy Days – a series of seven, expert-led virtual workshops offering insight into novel topics in the field of neuroscience hosted by the FAU Stiles-Nicholson Brain Institute and Palm Health Foundation.

Supplementing the recognition of national Brain Awareness Week (March 14-21, 2021), FAU's 2021 "Brainy Days: A Celebration of Neuroscience" program provided the community with a month-long series, pulling back the curtain on the mysteries of the mind and promoting brain health and education.

"The diverse and unique programs offered to the community for the 2021 celebration was incredible," said Nicole Baganz, Ph.D., assistant director for the Brain Institute and director of community engagement and programming. "Our goal is to enhance the public's understanding of the multi-dimensional aspect of brain research and its benefits. Individual brain health is strongly linked to community health, and through our Brainy Days programs, we can show our community that brain science truly impacts the well-being of everyone.

The programming showcased scientists discussing topics from how to reduce the stigma associated with brain injuries, illnesses and disorders, to what brain imaging tells us about how dogs love us.

From top left: Randy D. Blakely, Ph.D., David Cinalli, Ph.D. and Peter Rodriguez

Bottom left: Nicole Baganz, Ph.D. and Becky Mercer, Ph.D.

Participants also heard from the astronomer who inspired the Jodie Foster character in the movie Contact, joining a philosopher and an expert in artificial intelligence to ponder the search for extraterrestrial intelligence and implications for humanity should it be found.

Viewers also heard from an internationally prominent clinical scientist discussing the latest research and treatments for Alzheimer's disease and the scientific director of the National Institute of Mental Health joining a local philanthropist to discuss the critical steps needed to vanquish mental illness.

"It was an extraordinary show of support and beyond," Baganz said. "This truly was a celebration of neuroscience and an accomplishment that will continue to drive FAU's Stiles-Nicholson Brain Institute's public outreach and community engagement for years to come."

By the numbers:

Due to the continuing COVID-19 epidemic, for the first time, the Brainy Days presentations were recorded and available at **www.fau.edu/ibrain/brainydays/**

During the celebration, more than

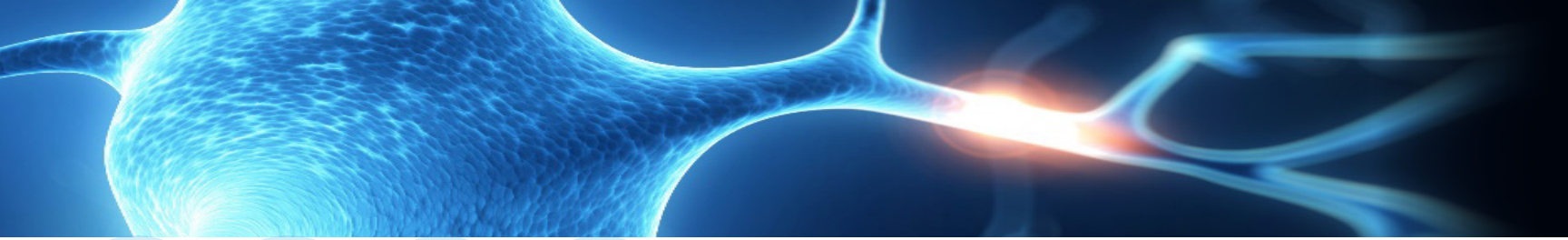
4,000

people viewed the recordings.

In addition, efforts reached almost

35,000

people across the FAU Stiles-Nicholson Brain Institute's Facebook, Twitter and Instagram platforms.



2022 BRAINY DAYS

Monday, Feb. 28

Never Enough: Personal and Research Experiences of Drug Addiction

Speaker: Judith Grisel, Ph.D., FAU alumna, behavioral neuroscientist and professor of psychology at Bucknell University

WHERE: Room 119, administration building, FAU's Jupiter campus
WHEN: 4 p.m. (followed by book signing)

Sunday, March 6

Team NeuroSquad
Autism Speaks Walk

WHERE: Meyer Amphitheatre, West Palm Beach, Fla.
WHEN: 9 a.m. Registration, 10 a.m.

Tuesday, March 15

Gifts of the Crow

Speaker: John Marzluff, Ph.D., Ridgeway Professor of Wildlife Science at the University of Washington and member of the U.S. Fish and Wildlife Service's Recovery Team for the critically endangered Mariana Crow

WHERE: Spanish River Library, Boca Raton, Fla.
WHEN: 6 p.m. (followed by book signing)

Saturday, March 19

Brain Blitz! (Neuroscience fun for children)
Team NeuroSquad

WHERE: Cox Science Center and Aquarium, West Palm Beach, Fla.
WHEN: 9 a.m. to 2 p.m.

Wednesday, March 23

COVID – In It for the Long Haul? How Immune Responses Impact the Brain and Mind

Speaker: Ning Quan, Ph.D., professor of biomedical science, Charles E. Schmidt College of Medicine

WHERE: Osher Lifelong Learning Institute, Jupiter, Fla.
WHEN: 4 to 5:30 p.m.

Friday, March 25

Diversity in Science Festival
NeuroSquad and FAU's Neuroscience Student Organization

WHERE: Breezeway on FAU's Boca Raton campus
WHEN: noon to 6 p.m.

Thursday, March 31

The Past, Present, and Future of Alzheimer's Prevention

Speaker: Richard Isaacson, M.D., director FAU's Center for Brain Health, Charles E. Schmidt College of Medicine

WHERE: Spanish River Library, Boca Raton, Fla.
WHEN: 6 to 7:15 p.m.

Journey Continues

MobileMinds Receives Funding to Continue Brain Education on the Move

BY **Bethany Alex**

The U.S. National Report Card recently collected data illustrating a devastating equation. At every stage of education, kindergarten through senior, students who attend high-poverty schools are least likely to have access to science, technology, engineering and math (STEM) resources, courses and opportunities.

MobileMinds program, a branch of the FAU Stiles-Nicholson Brain Institute's ASCEND (Advancing STEM Engagement through Neuroscience Discovery), was created to


David Cinalli, Ph.D.

help combat that staggering deficiency by bringing STEM education on the road and into the classroom to give students equal access to brain science education.

"The statistics are staggering but can be overcome with fresh, innovative ideas and creative educational opportunities to close the STEM gap," said Nicole Baganz, director of community and engagement and programming for FAU's Stiles-Nicholson Brain Institute, which includes MobileMinds. "The MobileMinds program has become a reality with the generous support from the Per and Astrid Heidenreich Family Foundation and Impact the Palm Beaches, giving us the capability to inspire their young minds and realize that their future in science is possible."

And it looks like there's a long road ahead for MobileMinds. The Per and Astrid Heidenreich Family Foundation, a private philanthropic foundation, recently pledged $160,000 to the MobileMinds program to offset costs associated with operations, equipment and educational resources necessary for program implementation in Title I schools, where children from low-income families make up nearly half of the enrollment, and afterschool centers in Palm Beach and Martin counties. The program also received $13,050 from the merit grant program with Impact the Palm Beaches, a philanthropic organization dedicated to enhancing educational programs and projects in Palm Beach County schools.

The MobileMinds program is geared towards middle school students, grades six through eight, and is completely voluntary and free to the schools and students. In partnership with the Cox Science Museum and Aquarium, MobileMinds offers students an engaging, expert-led brainy curriculum and technologically advanced experience, bringing the frontier of brain science education to their classroom desks. Last year, FAU's Stiles-Nicholson Brain Institute secured funding from the Stiles-Nicholson Foundation, the Palm Health Foundation and the Cox Science Center


Alaina Tillman

and Aquarium to obtain the MobileMinds vehicle. The acquisition of the van launched the mobile program into action, bringing scientists, educators and resources into the classrooms.

"The generous funding opportunities give the program the ability to extend our mobile educational outreach programs to more students in our community and surrounding counties, particularly in areas that have been historically underserved," said Chelsea Bennice, Ph.D., assistant director of ASCEND. "Bringing STEM learning to these students is not only to introduce them to the content but to promote innovating thinking, creative methodologies and logical problem-solving. With the funding, we can cultivate a high-impact program to inspire the next generation of global thinkers."

Another All-star Lineup

Join the 2022 Neuroscience Seminar Series

Each year, the FAU Stiles-Nicholson Brain Institute features a variety of nationally-known brain scientists during the Neuroscience Seminar Series. These seminars provide faculty and trainees with insights into state-of-the-art research and methods and provide critical networking opportunities that spur collaborations and grants.

Here's a look at the spring 2022 headliners:

TUESDAY, MARCH 1

Sex Differences in the Causes and Consequences of Alcohol Exposure in Mice

Speaker: Judith Grisel, Ph.D.,
FAU alumni, behavioral neuroscientist and professor of psychology at Bucknell University

WHERE: ZOOM
WHEN: 4 P.M.
REGISTER: https://bit.ly/3yvWF1F

TUESDAY, MARCH 15

Peaking Under the Hood: Crow Brain Activity Associated with Complex Behavior

Speaker: John Marzluff, Ph.D.,
professor, environmental and forest sciences, College of the Environment, University of Washington

WHERE: ZOOM
WHEN: 4 P.M.
REGISTER:
MEETING NUMBER: 816 1011 8294
MEETING PASSWORD: SEMINAR22

TUESDAY, APRIL 5

Rats Can Make Good Choices: Effect of Alternative Food and Social Rewards on Drug Self-Administration and Relapse in Rat Models

Yavin Shaham, Ph.D.,
chief of Behavioral Neuroscience Research Branch and Neurobiology of Relapse Section, National Institute of Health, Baltimore, Maryland

WHERE: ZOOM
WHEN: 4 P.M.
REGISTER: https://bit.ly/3m8e37q
Meeting Number: 827 1663 3667
Meeting Password: Seminar22

TUESDAY, APRIL 12

Daniel G. Isom, Ph.D.,
assistant professor, molecular and cellular pharmacology, University of Miami

WHERE: ZOOM
WHEN: 4 P.M.
REGISTER: https://bit.ly/3GLIKZe
Meeting Number: 8827 7155 7735
Meeting Password: Seminar21

TUESDAY, APRIL 26

Ila Fiete, Ph.D.,
professor, department of brain and cognitive sciences, and associate investigator, McGovern Institute for Brain Research, Massachusetts Institute of Technology

WHERE: ZOOM
WHEN: 4 P.M.
REGISTER: https://bit.ly/3dXDRid
Meeting Number: 895 4719 5000
Meeting Password: Seminar21

Please pre-register for each seminar at **fau.edu/ibrain/neuroscience-lecture-series/**

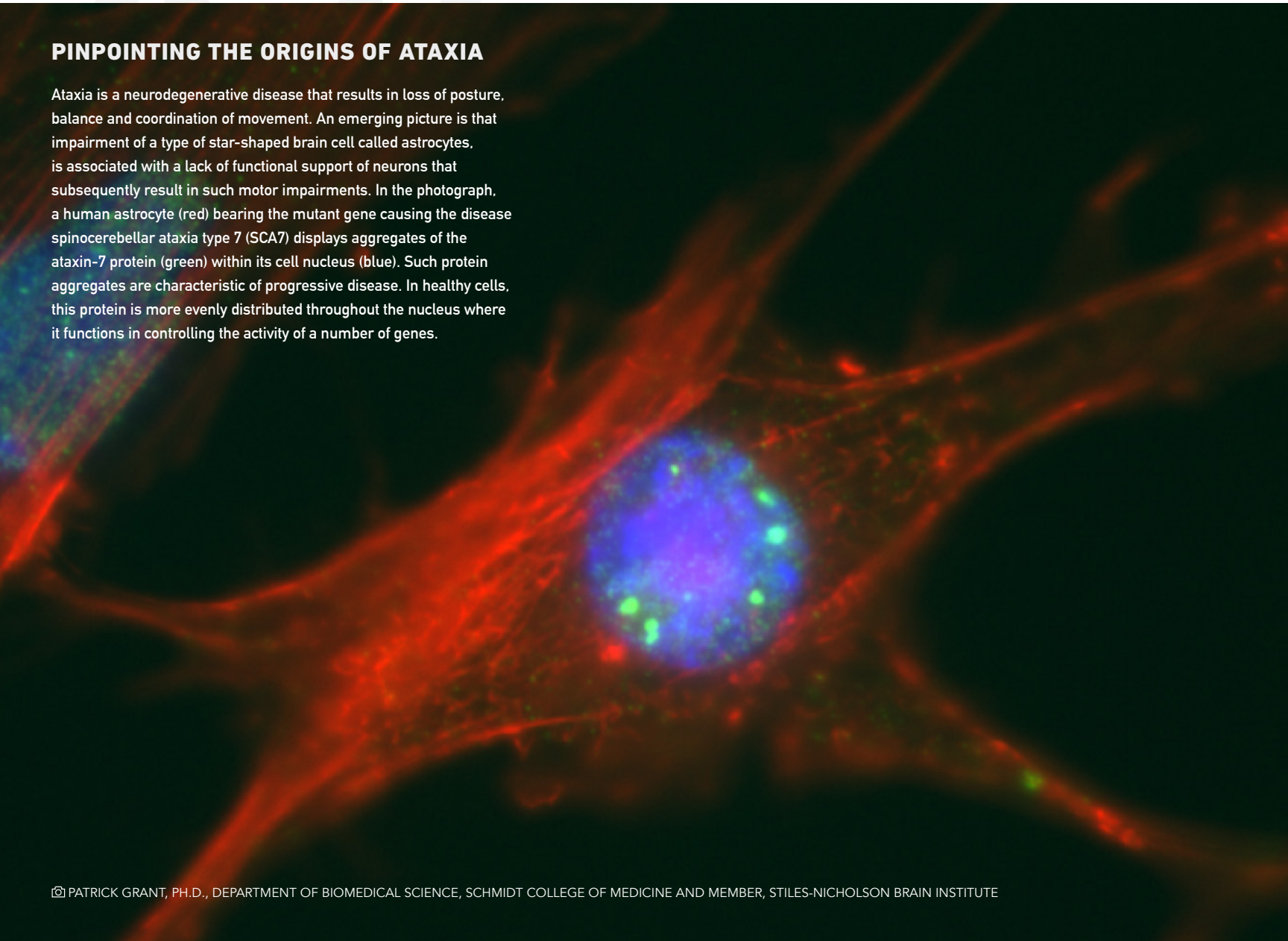
For more information, contact **Linda Petersen, lpetersen@fau.edu.**

FAU

STILES-NICHOLSON BRAIN INSTITUTE
Florida Atlantic University

PINPOINTING THE ORIGINS OF ATAXIA

Ataxia is a neurodegenerative disease that results in loss of posture, balance and coordination of movement. An emerging picture is that impairment of a type of star-shaped brain cell called astrocytes, is associated with a lack of functional support of neurons that subsequently result in such motor impairments. In the photograph, a human astrocyte (red) bearing the mutant gene causing the disease spinocerebellar ataxia type 7 (SCA7) displays aggregates of the ataxin-7 protein (green) within its cell nucleus (blue). Such protein aggregates are characteristic of progressive disease. In healthy cells, this protein is more evenly distributed throughout the nucleus where it functions in controlling the activity of a number of genes.



PATRICK GRANT, PH.D., DEPARTMENT OF BIOMEDICAL SCIENCE, SCHMIDT COLLEGE OF MEDICINE AND MEMBER, STILES-NICHOLSON BRAIN INSTITUTE