FAU
BRAIN INSTITUTE
Florida Atlantic University

MASTERMINDS

The Bond Between Brain Inflammation and Behavior

Evolutionary Elegance: The Secret Life of Cavefish

Breaking Ground on Future Home of Discovery

2021

FLORIDA ATLANTIC UNIVERSITY
FAU BRAIN INSTITUTE

MASTERMINDS

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The cover image shows how viral infection can stimulate brain interleukin-1 receptor expression (red) and astrocyte (green) activation. The photograph is taken at the level of the paraventricular nuclei of the hypothalamus, a command center of the autonomic nervous system and the neuroendocrine system.
(Read more on page 11.)

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LETTER FROM THE EXECUTIVE DIRECTOR

I understand that the last thing many of us want to do is look back at 2020. It certainly was a year that most will never forget, with a pandemic surrounding us, engulfing too many, still. Most Happy New Year's memes I saw were some version of "Good Riddance! 2020."

Despite all the stresses, pain and loss, remarkable acts of devotion, kindness and resilience were evident. The successes achieved are definitely worth remembering. In particular, I was continually amazed by the steadfast attention our faculty and staff gave to each other and our students, trying their best to keep ships afloat and fill the void left by shutdowns, empty classrooms and work-at-home mandates.

One example of this was the Summer Neuroscience Scholars (SUNS) program, organized last summer by Dr. Nicole Baganz to minimize graduate students' loss of their summer research experiences. Many of us can look back to this time in our lives, when we were trying to decide our next steps after college – graduate school, medical school, a hundred other choices – and had the great fortune to engage in a summer research internship.

My summer internship led to a career as a neuroscience researcher, not as a clinician as I had planned. Medical school was an option, but a direction I was meandering toward until I found my path through a summer research experience. Without this opportunity, and the multiple conversations then about the road ahead with my peers and mentors, I doubt I would have had the confidence to decline my medical school offer, without another option having been identified, just weeks before classes were to start. Truly, I didn't know what awaited me in the next moment or the next months. I just finally saw the path that I was meant to take. I took that turn, and have never looked back, and feel very fortunate for the opportunity, a life-changer.

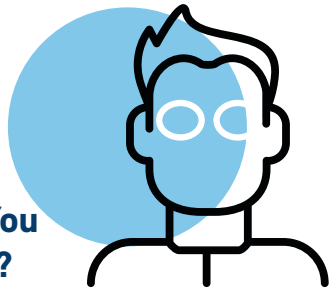
A shared understanding of what many of our students were missing led members of our faculty to offer the SUNS program, a summer-long session of intense online activities providing an opportunity for self-discovery through a guided tour of the questions, experiments, twists and turns of our past science, so they can better see what drives our research today. The program was built through collaborations with FAU faculty, Kate Guthrie, Ph.D., Maureen Hahn, Ph.D., Ceylan Isgor, Ph.D., Felix Mayer, Ph.D., Ning Quan, Ph.D., Osama Refai, Ph.D., Cathy Trivigno, Ph.D., Carmen Varela, Ph.D., Jenny Wei, Ph.D., Amy Wright, Ph.D., and with the help of graduate student Samantha Stilley and research assistant Samantha McGovern.

Through one-on-one discussions, student presentations and Zoom meetings we discussed research ethics and careers after college. Working with our SUNS students last summer was a career highlight, and something I used to steady my own efforts to cope. Their engagement was invigorating and continues to allow me to see just how much we had accomplished this past year, despite everything. Read more about the SUNS program on page 28 of *MasterMinds*, 2021.

Despite its adversity and tragic losses, the past year featured remarkable achievements by our faculty and trainees, many of which are profiled in the following pages of MasterMinds 2021. We made it through a year we will never forget, together. I cannot thank you all enough.

Randy D. Blakely, Ph.D.
Executive Director
FAU Brain Institute

BRAIN BRIEFS



What Are You Looking At?

In a first-of-its-kind study, FAU neuroscientists **Elan Barenholtz**, Ph.D., and **Michael J. Kleiman**, Ph.D., co-authored a study that found participants are more comfortable looking directly at a speaker's mouth, which has previously been found to be optimal for communicating thoughts into speech, when they think no one is watching them.

The research, published in the journal *Attention, Perception & Psychophysics*, demonstrates that social factors impact behavior during verbal interactions, according to the authors.

Barenholtz is an associate professor of psychology in the Charles E. Schmidt College of Science, member of the Center for Complex Systems and Brain Sciences, co-director of the Machine Perception and Cognitive Robotics Lab, co-founder of the Rubin and Cindy Gruber Sandbox, an artificial intelligence lab on FAU's Boca Raton campus, and assistant director of FAU's Center for the Future Mind. Kleiman, Ph.D., is a postdoctoral fellow at FAU.

Kudos to New NAI Members

Faculty members were recently inducted into the FAU chapter of the National Academy of Inventors. The chapter, one of more than 50 university chapters across the country, was established to recognize inventors for their accomplishments in research and commercialization, and to enhance the visibility of scientific innovated at FAU.

Inductees are:

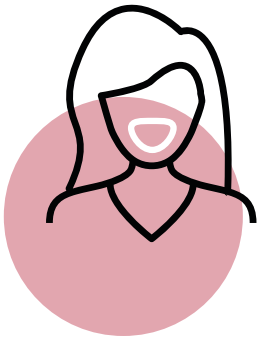
Behnaz Ghoraani, Ph.D., an assistant professor in the College of Engineering and Computer Science

Kenneth Dawson-Scully, an associate professor, in the Charles E. Schmidt College of Science

Howard Prentice, Ph.D., a professor of biomedical science in the Charles E. Schmidt College of Medicine

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

Lawrence Toll, Ph.D., a professor in the Charles E. Schmidt College of Medicine



Voice Disorders Impact Listeners, too

Connie Porcaro, Ph.D., and **Jacqueline Veraguas**, Ph.D., both in the department of communication sciences and disorders, College of Education, are collaborators on a recent study to determine any differences in the ability to be correctly understood when speaking, for those with healthy voices compared to those who have voice disorders, such as breathiness, hoarseness, loss of voice or a "croaky" voice.

The results, published in the *Journal of Voice*, showed that people with voice disorders were 10 times more likely to be heard incorrectly versus speakers with healthy voices. Their findings impact people in professions that rely heavily on the voice, such as teachers, air traffic controllers, attorneys, members of the clergy and performers.

ACCOLADES

Consolidated Fight Against Alzheimer's

FAU researchers were recently awarded grants from the Florida Department of Health's Ed and Ethel Moore Alzheimer's Disease Research Program, which supports research leading to the prevention and possible cure for Alzheimer's, as well as better prevention, diagnosis and treatment.

Among the awardees are:

Elan Barenholtz, Ph.D., an associate professor in the department of psychology, Charles E. Schmidt College of Science. He received a $99,863 grant to develop a gaze and speech behavior-based cognitive exam to assist in the detection of early-stage Alzheimer's and related disorders.

Qi Zhang, Ph.D., a research assistant professor of biomedical science in the Charles E. Schmidt College of Medicine. He received a $100,000 grant to investigate the connection between amyloid precursor protein and cholesterol to treat Alzheimer's. This adds to an existing award from the National Institutes of Health to study neural growth and maturation, totaling $373,750. (Read more about Zhang's research on page 20.)

World's Leading Expert

Lawrence Toll, Ph.D., a professor of biomedical science in the Charles E. Schmidt College of Medicine, was recently named by The Web of Science as one of the most highly cited researchers.

The annual list is comprised of names drawn from the publications that rank in the top 1% by citations for field and publication year in the Web of Science citation index.

Data from the Web of Science, which is the world's largest publisher-neutral index, includes nearly 1.9 billion cited references that go back to 1900.

Early-Career Scientific Leader

Behnaz Ghoraani, Ph.D., an associate professor in the College of Engineering and Computer Science, recently earned an early-career award from the National Science Foundation (NSF). The grant supports faculty who have the potential to serve as academic role models in their communities. Ghoraani received a $524,191 grant to study advanced data analytics for early detection of Alzheimer's using a smartwatch and cellphone.

'Lifetime Achievement' Honor

Herbert Weissbach, Ph.D., a professor emeritus in FAU's Center for Molecular Biology and Biotechnology (CMBB) in the Charles E. Schmidt College of Science, recently received BioFlorida's "Lifetime Achievement Award." The award recognizes outstanding leadership in the industry throughout an individual's career and for significant contributions to industry growth.

Weissbach joined FAU in 1997 as distinguished research professor, where he founded and served as director of the CMBB for 20 years. In 2017, he was appointed as distinguished research professor emeritus.

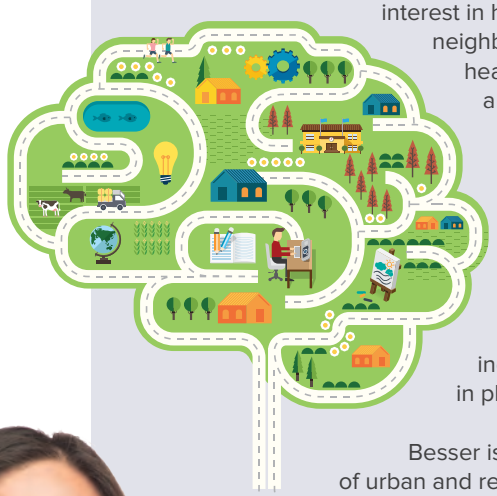
For a 15-year period (1961-1976), Weissbach was one of the top 300 most cited scientists in his field and has authored/co-authored more than 465 scientific publications. He is a member of the National Academy of Sciences, a charter fellow of the National Academy of Inventors, and the American Academy of Microbiology. The annual list is comprised of names drawn from the publications that rank in the top 1% by citations for field and publication year in the Web of Science citation index.

GRANTS

Neighborhood Map for the Aging Brain

Research Looks at Connection Between Community and Brain Disorders

BY **Eden McClave**



As someone who has moved around a lot, Lilah Besser, Ph.D., has an interest in how environment and neighborhood influence brain health. She recently earned a grant for a first-of-its kind study to research community-level interventions that can increase cognitive resilience and healthy behaviors, to promote healthy brain aging and ultimately, allow older individuals to age in place.

Besser is chair of the department of urban and regional planning, assistant professor in the Charles E. Schmidt College of Science, and a member of FAU's Brain Institute. Her five-year, $585,250 career-development grant from the National Institutes of Health and National Institute on Aging, is based on her research titled "Longitudinal associations between neighborhood greenspace and brain aging in cognitively normal older adults."

"First, I am trying to understand [if] Alzheimer's disease can be delayed or prevented by social and built environments, [if] there is an association," said Besser, adding that her research is a large concept to correlate, and requires the knowledge of many different expertise. Besser collaborates with faculty across the university to "find novel interventions or treatments for those people to help delay diseases that are complex such as Alzheimer's," she said.

"It's hard to be in a silo and do it by yourself, you really want to feel like you have [a community]. ... If I'm not collaborating with multiple disciplines, [my research] feels a bit hollow," she said.

Before coming to FAU, Besser was a senior researcher at the National Alzheimer's Coordinating Center, and a public health data analyst at the Centers for Disease Control and Prevention researching public health and birth defects. Her doctoral dissertation addressed the cross section of neighborhood planning, built environments and preventing neurodegenerative diseases.

Her work at the National Alzheimer's Coordinating Center led to her interest in brain diseases, she said. However, her interest in neighborhoods and their effect on brain behavior, stem from childhood. She grew up in rural North Carolina and traveled across the east coast, in addition to urban areas like London and Seattle. Living in different places shaped her interest in city and regional planning, she said.

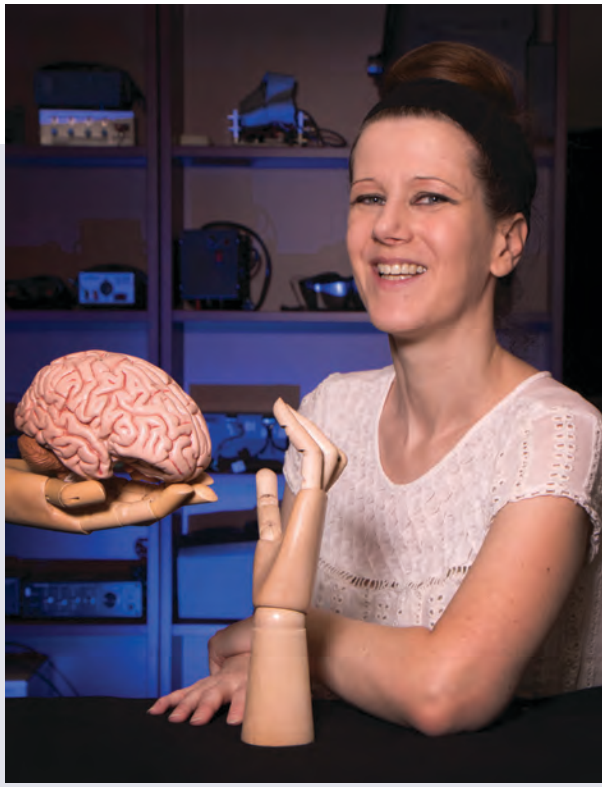
Besser said the goal for her research is to make lasting beneficial changes earlier in life to the health of those with brain disorders. "Public health researchers want to actually make a positive impact on health," she said.

Read about more recently-awarded grants at fau.edu/research/fau-research-daily.

Socializing 'Sweet Spot'

Prescription for Healthy Older Brains is Improving Social Engagement

BY **Judy Gelman Myers**



Socializing can keep us healthy in mind, body and spirit, but getting together with others often becomes more difficult as we age.

Compounding the problem, within programs designed to promote social interaction among older adults, there's often a lack of accommodation for issues that can accompany age, such as impaired hearing or mobility. "Opportunity for 'gymnastics' of the body and mind is not optimal in social programs who take the convenience of homogenizing participants' sensorimotor competencies too much," said Emmanuelle Tognoli, Ph.D., research professor in the Center for Complex Systems and Brain Sciences, Charles E. Schmidt College of Science.

Tognoli is part of a team of FAU researchers recently awarded a grant to design experiences that offer older adults meaningful social interactions while accommodating for such age-related impairments. The $675,000 grant is funded by the National Institutes of Health and National Institute in Aging grant.

The team of collaborators from the College of Science and the Christine E. Lynn College of Nursing, are developing a two-pronged approach that interfaces a mathematical model of group dynamics with observations of live group interactions in an experimental setting at FAU's Louis and Ann Green Memory and Wellness Center. (Due to COVID-19, the groups meet online, rather than face-to-face.)

"We are trying to find if interactions with a diverse group of others encourage the older adult to stretch their limits a bit," Tognoli said. "It is a 'nonlinear' problem: stretch a little bit, you get maximal exercise, stretch too much and you have withdrawal. We are trying to discover the science that points at the sweet spots."

A mathematical model portrays interactions in varied groups of people. It utilizes parameters incorporating different personal characteristics of hypothetical group members, as well as the strength of group interactions. For instance, some group members might walk, converse, or interact a bit slower. Differences in personal characteristics may cause the group to fragment or split into subgroups. Worse, some individuals may end up not participating meaningfully in the group at all.

Continual revisions to the model are based on data collected in the experimental setting — in this case, live online sessions in chair yoga (yoga exercises gently performed from a chair to prevent physical fatigue to interfere with engagement) or storytelling. Each investigator will analyze the data using their unique disciplinary perspectives to create a well-rounded portrait of social interactions that can help identify key behavioral factors for group leaders to track in practice.

"In this way, we can continually circle between the experiment and the model: the model tells us what to look for in the experiment, and the experiment gives us data to confirm the model," Tognoli said.

The goal of the research is to design settings that mesh people who have different levels of cognitive, sensory and physical abilities into a group that gives every member a sense of purpose and belonging. Sustaining healthy social behavior is one of the most impactful and cost-effective interventions to benefit an aging population, she said, even for people already in the throes of brain disease.

Shot in the Dark

Turning a Happenstance Lab Visit into a Promising Research Career

BY **Joseph Acosta**

Andy Khamoui, Ph.D., said he struggled finding his career path growing up, and couldn't imagine earning a doctorate degree or researching cancer.

"Teenage Andy kind of struggled in high school and wasn't like his peers who had everything together," said Khamoui, who found his path and now studies cancer cachexia, a life-threatening complication of cancer characterized by severe weight loss, skeletal muscle dysfunction, physical frailty and intolerance to anti-cancer treatment, as an assistant professor in the department of exercise science and health promotion in FAU's Charles E. Schmidt College of Science.

He narrows his research on cancer cachexia to how it affects different organs in the body, he said.

Khamoui earned a bachelor's and graduate degree in kinesiology at Whittier College, California, and California State University, Fullerton, respectively. But, he said, it wasn't until he joined fellow students working in a science lab that he decided he wanted to teach as a professor, and went on to earn a doctorate degree from Florida State University.

Recently, he was accepted into a prestigious training workshop on energetics and cancer, called the Transdisciplinary Research on Energetics and Cancer (TREC).

TREC, co-hosted by Yale University and Fred Hutchinson Cancer Research Center, funded by the National Cancer Institute, also came with a year-long mentorship that helps scientists develop skills in grant writing and completing applications to external funding agencies.

Through this workshop, Khamoui said, he is also connecting with other scientists at the same stage in their career. It's opportunities like TREC that confirm to Khamoui that he's on the right path. "It was an opportunity to connect early-career scientists with more experienced researchers in the field of energy balance and cancer," moving him one step closer to his goal of better understanding cancer cachexia and providing new avenues of supportive care and treatment for the millions of patients that are fighting cancer.

The Brain Race

New Philosophical Center for the Future Mind Tackles Ethics of Advancing Neuroscience

BY **Bethany Augliere**

Using biotechnology, scientists can potentially edit the part of our brain genome that prevents cognitive decline. But what if in the process, they permanently change your personality?

Neuroscience and neurotechnology are advancing our knowledge of the brain and how it works. Yet, "brain monitoring and modifying technology is racing ahead and challenging our ability to keep up with the ethical issues these advances raise, as well as what it means to be human," said Randy Blakely, Ph.D., executive director FAU's Brain Institute and professor of biomedical science in the Charles E. Schmidt College of Medicine.

To tackle those questions, FAU's Brain Institute in collaboration with the Dorothy F. Schmidt College of Arts and Letters, launched the new Center for the Future Mind under the leadership of founding director, Susan Schneider, Ph.D., the William F. Dietrich distinguished professor of philosophy in the College of Arts and Letters. The new Center for the Future Mind brings philosophical and social considerations together with scientific innovations "to help humans better navigate our brave new world," Schneider said.

Schneider comes to FAU from the University of Connecticut where she was a professor of philosophy and cognitive science and the director of the AI, Mind and Society Research Group. She is also the NASA-Baruch S. Blumburg chair and a distinguished scholar chair at the Library of Congress. Her work has been featured in the *New York Times*, *Scientific American*, *Smithsonian*, the History Channel, and others. She also recently published a book that explores the abilities of AI and the human mind.

"The proper use of AI technology isn't just a matter of what we can do, it's a matter of what we should do," she said, adding that's the goal behind building the new interdisciplinary center. The center will consider both the science and social impact of emerging technologies with an emphasis on classic philosophical issues.

Bridging the Gap

Husband-Wife Duo Build a Bridge Between Biological and Engineering Research

BY **John Tibbetts**

Wanted: A new generation of cross-trained bio-engineers to work with neuroscience researchers.

That's the call answered by husband-and-wife duo Ramin Pashaie, Ph.D., and Mahsa Ranji, Ph.D., who recently joined FAU as associate professors in the College of Engineering and Computer Science, as well as fellows at both the FAU's Brain Institute and Institute for Sensing and Embedding Network Systems Engineering. The two are collaborating on multidisciplinary, bio-engineering research-and-training efforts to develop technologies to help diagnose and treat brain and nervous system disease and injury.

"We hope to build a bridge between biological and engineering disciplines for brain and nervous system research," Pashaie said. "We need to train more engineers who are familiar with biological systems and can communicate with experts in neurological disease and injury. The goal is to create more partnerships and help develop engineering systems for neuroscientists and others to use in research and treatment."

A new generation of bio-engineers would have a leg up in their careers. "Bio-engineering is one of the fastest growing engineering fields," Ranji said. "The employment market is very strong, involving many different technologies to address a large number of biomedical needs."

Ranji's laboratory, for instance, is developing optical imaging technologies to track metabolic changes in brain and retinal tissues and vascular systems. In one major project funded by the National Institutes of Health she is studying changes in the retinal cells of diabetic mice models as the disease progresses.

"We can understand the state of diabetes by looking at how it subtly changes the metabolism in the retina," she said. "Type II diabetes causes high blood-sugar levels, which can harm tissue and blood vessels in the brain and retina. "If you can monitor and detect these changes in very early stages of the disease and intervene, then you could potentially prevent vision loss."

Ranji is looking for collaborators among medical researchers and clinicians in the Charles E. Schmidt College of Medicine and the Research Park at Florida Atlantic University.

"This work in optical imaging is fascinating and exciting," she said, "but for me the bottom line is, will it contribute to early diagnosis or a cure for a disease and an impact on human health?"

Pashaie envisions a time when the power of engineering hardware and computer software can be partnered with brain and nervous system biology to help more patients with devastating disease and injury. "Engineering capability should be matched with people who are experts on the biological side," he said. "Veterans are coming from battlegrounds having lost limbs that have been replaced with robotic arms. We need engineers who can learn about the brain and use that knowledge to develop hardware and software that can communicate with the nervous system."

Pashaie and Ranji came to FAU after a stint as faculty at the University of Wisconsin-Milwaukee. In 1998, they met as graduate students at the K.N. Toosi University of Technology, Tehran, Iran.

"When we visited FAU, I saw a lot of active faculty here in research," Ranji said. "I knew it would be exciting to be part of this environment and develop a new bioengineering program or department. Because my field is very multidisciplinary, I'm always looking for new collaborators working on diseases who are interested in applying our technology to their models."

The Right Route

Neuroscientist Aims to Discover the Link Between Brain Inflammation and Behavior

BY **Judy Gelman Myers**

By creating novel maps of the brain that connect inflammation with behavior, FAU neuroscientists can better understand diseases like Parkinson's, arthritis and mood disorders, according to Ning Quan, Ph.D., and director of the Program in Neuroimmunology and Glial Biology (PNGB).

If you have an immunological problem like arthritis, you may not necessarily need to treat the white blood cells of immune system, but rather your autonomic nervous system, he said. "Conversely, if you have depression or anxiety issues, maybe the more effective treatment is not to change your neurotransmitter, but to dampen down inflammation in your brain."

This research is at the heart of a mapping project where Quan and other FAU collaborators will study areas of the brain that control learning, memory and mood and document how specific receptors, called cytokine interleukin-1 (IL-1) invite — rather than suppress — inflammation, said Quan, adding that the mapping project is part of a $1.7 million grant from the National Institutes of Health.

Previous studies have shown that elevated levels of IL-1 receptors are the link between brain inflammation and mental disorders, but not how, said Quan, co-investigator on the grant and professor of biomedical science in the Charles E. Schmidt College of Science.

So, that's the goal for Quan and his team — to figure out how those receptors affect neurons and how the receptor signals to induce the changes related to these psychopathologies.

To investigate that question, the team will first map out where the receptors occur in the brain, which has never been done before, Quan said. Then, by examining inflammation's role in changing behavior in mouse models, they can examine the cellular and molecular mechanisms by which this happens.

The PNGB builds on recent developments in psychoneuroimmunology, a multidisciplinary field that explores how the immune system activates the nervous system and produces psychological disease states and changes in behavior, he said. It also encompasses the study of brain cancer, brain trauma and fundamental brain mechanisms that do not involve psychiatric disease, as well as basic research into glial cells, which modulate neural signals.

The ultimate goal, Quan said, is to find unexpected ways to treat both immunological problems and psychopathological disorders.

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Discovery 'Offsets' Disease

FAU Scientists Patent Protective Compound to Slow Brain Degeneration

BY **Jenifer Rankin**

Two FAU professors recently discovered a compound with the potential to protect brain degeneration, which impacts millions of Americans every year who suffer from diseases, like Alzheimer's disease and Parkinson's.

Salvatore Lepore, Ph.D., a professor in the department of chemistry and biochemistry, and colleague Ken Dawson-Scully, Ph.D., a professor of biological sciences, both in the Charles E. Schmidt College of Science, are named inventors on the patent, along with members from both of their research teams.

This work is funded by their collaborative $440,000 National Institutes of Health (NIH) grant where Lepore serves as the principal investigator (PI) and Dawson-Scully as the co-PI. Dawson-Scully is also an associate vice-president for strategic initiatives in the Division of Academic Affairs.

What is the Invention?

Powering the brain requires a substantial amount of oxygen — about 20 percent of total oxygen the body needs to fuel itself. These brain cells use oxygen to perform intense metabolic activities that generate free radicals, which in turn, help support brain cell growth and cognitive

Ken Dawson-Scully, Ph.D.

Salvatore Lepore, Ph.D.

Supporting Research

In addition to the patent, here's a look at some related grants received by Ken Dawson-Scully, Ph.D., an associate professor and colleague Salvatore Lepore, Ph.D., a professor, both in the Charles E. Schmidt College of Science.

- **Synthesis of a Bridged Bicyclic Natural Product Using Allenyl Esters, National Institutes of Health, $448,000**
  This proposed study introduces new chemistry to significantly improve current methods used to make medicinally valuable compounds. A small library of compounds will be specifically targeted as neuroprotective agents against diseases such as Parkinson's and stroke.

- **Type I - Florida Atlantic University National Science Foundation (NSF) I-Corps Site Advancing Entrepreneurship and Innovation, National Science Foundation, $254,000**
  This project will create an NSF I-Corps Site at Florida Atlantic University as a component of the FAU Tech Runway, the university's early-stage business incubator/ accelerator.

- **Type I - Florida Atlantic University National Science Foundation I-Corps Site COVID-19 Supplement: Advancing Entrepreneurship and Innovation, National Science Foundation, $44,231**
  This project enhances the continuous development of expert entrepreneurs that will ultimately cultivate a strong local innovation ecosystem in one of the most densely populated areas of the country.

abilities. But, when the body produces too many free radicals (a condition known as oxidative stress), damage occurs to the brain, resulting in diseases like Parkinson's and Alzheimer's. Lepore and Dawson-Scully have created a unique compound to protect the brain against this effect, potentially slowing down the progression of diseases related to oxidative stress.

"It's not a cure," Lepore said. "We don't think the compound attacks the disease. It just offsets it."

Lepore said he hopes a patient could take a small dose over time to treat the disease. "Someone who has high blood pressure will take a dose of high blood pressure medication, it doesn't cure the disease, but it helps the patient live with it," Lepore said.

The two teams collaborated to create compounds, with unique structures using chemical reactions pioneered by Lepore and his team over nearly a decade. "He (Lepore) is the brilliant chemist who actually created the molecule," Dawson-Scully said.

In collaboration with Dawson-Scully, an internationally recognized neurobiologist, these novel compounds have been tested on cells in non-human brain tissue models. "That was the breakthrough," Lepore said. "These compounds almost serendipitously exerted this protective ability, and they do so in extremely small amounts."

Now that Lepore and Dawson-Scully have secured patent protection for their breakthrough, they will seek industrial partnership to help take the project into a more advanced stage of drug development. Part of their strategy will be to broaden their group of collaborators, including teams from industry, FAU Tech Runway and the Research Park at FAU, "in hopes of improving medical outcomes," Dawson-Scully said.

iStock.com/GlobalP image_jungle

Gut Feelings

Researchers Gain Insight into the Gut Microbiome of Birds

BY **Bethany Augliere**

It may seem outlandish, but what if studying the bacteria living in a bird's gut could help researchers understand more about how humans learn to talk or even human brain diseases?

Billions of microorganisms, such as bacteria, yeasts, fungi and viruses, live inside the human digestive tract dubbed the gut microbiota. In recent years, studies have linked this microbiome with heart health, brain function, the immune system, mood and sleep. Some even call gut bacteria the "second brain," which actually refers to the communication between the digestive system and central nervous system (the brain and spine) through biochemical messages. Yet, few studies have examined this relationship in species other than mammals, like rats and humans.

However, researchers at FAU set out to change that. In a recent study published in the Royal Society's journal *Biology Letters*, Morgan Slevin, lead and corresponding author and an FAU doctoral student in integrative biology and neuroscience, studied the gut microbiota in relation to

cognitive performance in 38 zebra finches, a common, small, striped bird originally from Central Australia. “Ultimately, we were interested in how the gut microbiome affects the brain and decision making,” Slevin said.

The zebra finch is a songbird, and just like humans, songbirds are among only a few animal groups in the world considered vocal learners, which means they must hear the sounds of adults of their species to develop normal adult vocalizations. This makes them a good model for understanding human learning, he said.

“If we can find parallels with the avian gut, like we see in rodents, then we might be able to use songbirds as yet another way to understand human cognitive performance, whether that relates to vocal development or other aspects of human cognitive performance,” said Rindy C. Anderson, Ph.D., senior author, assistant professor of biological sciences in FAU’s Charles E. Schmidt College of Science.

To study the link between cognition and gut bacteria, Slevin first needed to know what the microbiome of each bird looked like. He took a swab from the birds’ cloaca, an all-purpose vent used for excretion, urination, mating and laying eggs. Then, his colleagues at Cornell University genetically analyzed the samples, so Slevin could determine what different species were present (called alpha diversity), but also the composition of the entire microbial community in each sample (beta diversity). Next, he tested the birds’ cognition by assessing how quickly they could learn a completely novel feeding technique.

A male zebra finch, learning to flip lids in search of food rewards, is midway through solving the final stage of the novel foraging task.

> “Ultimately, we were interested in how the gut microbiome affects the brain and decision making.”
>
> ***– Morgan Slevin, an FAU doctoral student in integrative biology and neuroscience***

“Animal cognition is incredibly complex, so trying to find the right way to analyze behavioral tests of cognition is really a challenge,” Anderson said. “But, I think we’re on the vanguard. There are only a few labs in the country that are studying avian gut microbiomes and how that might be linked to behavior, including cognition.”

Results of the study showed that male and female finches had different microbiomes, and that some groups of females or males with a certain type of microorganism community structure, the beta diversity, did worse on cognitive performance tests, while others with a different type of diversity structure did better. Slevin and Anderson also found that birds that did worse on the cognitive tests tended to have a greater abundance and prevalence of two genera of bacteria, Helicobacter and Gallibacterium. This raises the question, do certain species influence cognitive performance?

Many experts advocate for probiotics to help the gut, even if the science is still a bit murky. “It can’t hurt,’ jokes Slevin, who said he plans to continue this work in wild birds and with experiments.

From Molecules to Mankind

Building a Solid Foundation for Exploration

BY **Judy Gelman Myers**

Neuroscience has flourished so dramatically over the past two decades at FAU that the university has given it a home of its own.

Construction recently began on that home – FAU's Neuroscience Research Building, a 58,000-square-foot, state-of-the-art building located on FAU's Jupiter campus. The $35 million project will provide laboratory, lecture and small meeting space to support research, the hiring of new faculty, and rich educational experiences for trainees in neuroscience and its partner fields of biotechnology, bioengineering, bioinformatics/computer science, biochemistry and psychology. The building will also facilitate collaborations with FAU's renowned research neighbors, the Scripps Research Institute and the Max Planck Florida Institute for Neuroscience, on FAU's home turf.

With a projected Center for Comparative Medicine, a Center for Cellular Neuroimaging and a Center for Computational Neuroscience, the Neuroscience Research Building delivers a key component of the University's Strategic Plan for the Race to Excellence, 2015–2025, where neuroscience was designated one of the four "pillars," or key focus areas, for its investment in research and education.

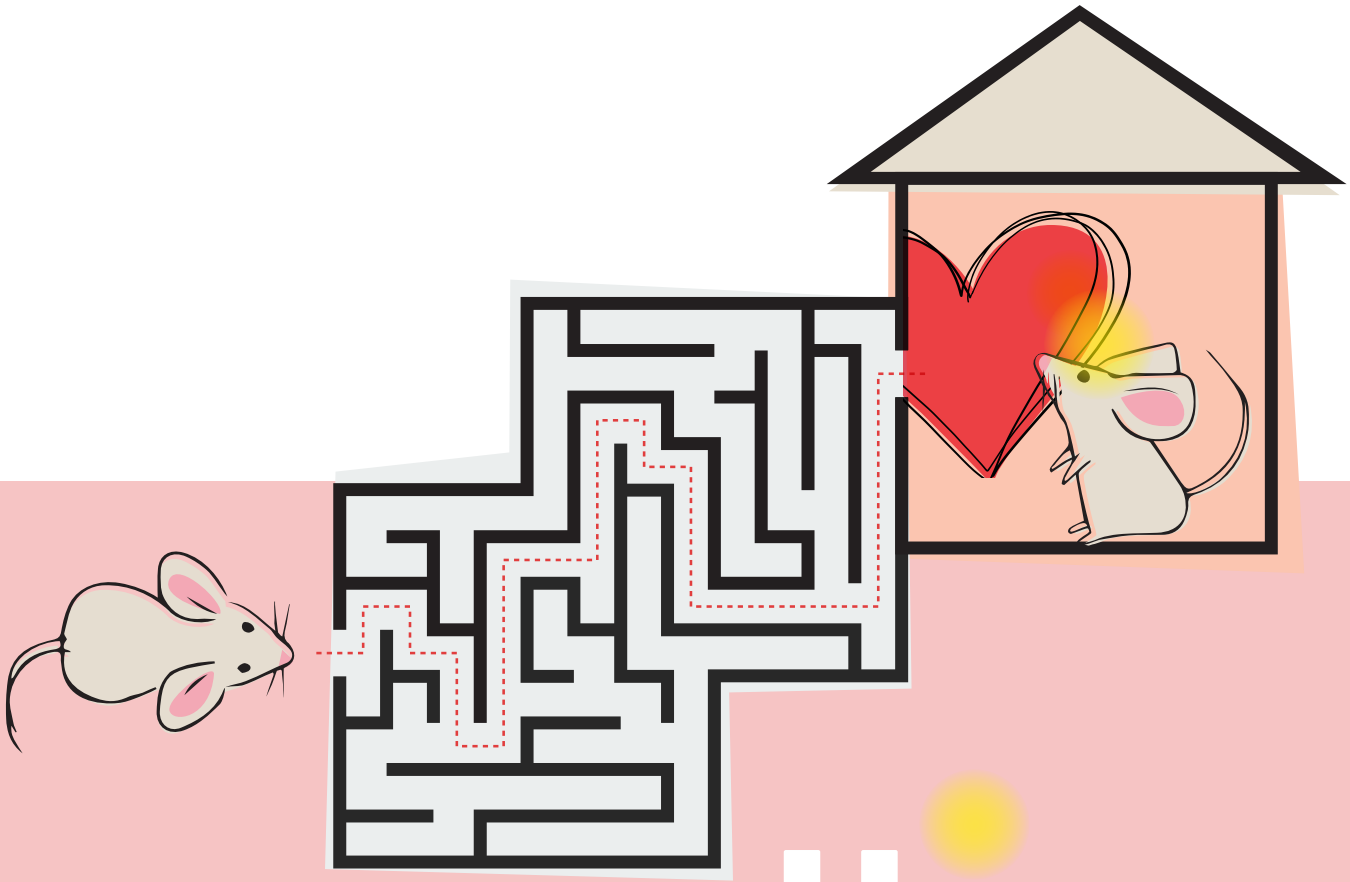
Expanded space for collaborative research can translate into growth in federal funding, employment opportunities and private grants. "The new building will allow us to recruit outstanding faculty and promote collaborations with existing scientists. The private sector will see the critical mass we possess in neuroscience and want to invest, not just in the activity within this facility, but more broadly across FAU," said Randy Blakely, Ph.D., executive director of FAU's Brain Institute and professor in the Charles E. Schmidt College of Medicine. "We see the research investments made here as a key piece in encouraging biotech companies to move into the area. We are certainly excited for the opportunity the new building presents — including the launch of new programs and centers," he said. The new building will also be home to the Brain Institute's new Program in Neuroimmunology and Glial Biology, directed by Ning , Ph.D., a professor in the College of QuanMedicine, and a leader in the field of psychoneuroimmunology.

Research on the interactions between the immune system, the central nervous system, and behavior in relation to brain cancer, brain trauma and fundamental brain mechanisms will complement work on brain disorders at the Center for Comparative Medicine, neural circuits at the Center for Cellular Neuroimaging, and analysis of large data sets at the Center for Computational Neuroscience.

Diversity is the key to the neuroscience ecosystem in Jupiter thriving. There's diversity in the questions scientists ask, in their methods of scientific inquiry as well as their personal identities. The new building will take advantage of that diversity by opening its doors to new faculty bringing further expertise, and opportunities for high school students, undergrads and postdoctoral fellows to collaborate with world-famous researchers, raise unanticipated questions, and possibly surprise discoveries that spring from offhand conversations over a lunch table in the new cafeteria. Contemplating the future, Blakely said, the Neuroscience Research Building can make contributions that range "from molecules to mankind — exciting times indeed."

Renderings of the new, state-of-the-art neuroscience research building in Jupiter.

Follow the progress.



Home, Sweet Home

For Mice, Returning Home is a Powerful Reward

BY **Bethany Augliere**

> Going home is pretty much like biting into a nice piece of chocolate."
>
> *– Felix Mayer, Ph.D., a postdoctoral fellow at FAU's Brain Institute*

Scientists have known for nearly a century that when you give mice access to their home cage as a reward, it boosts their ability to navigate through a maze.

"Going home is pretty much like biting into a nice piece of chocolate," said Felix Mayer, Ph.D., a postdoctoral fellow at FAU's Brain Institute. But how exactly that happened was unclear — until now.

In a new study published in the journal *Neurochemistry International*, Mayer and Randy Blakely, Ph.D., executive director of FAU's Brain Institute and a professor of biomedical science in FAU's Schmidt College of Medicine, have shown that when mice return home, it causes a surge of dopamine — a signal for pleasure. Surprisingly, the magnitude of this surge was comparable the response to a single dose of cocaine, a drug that is widely consumed for its rewarding effects.

To test mice brain chemistry, the two neuroscientists used a relatively new technique called fiber-photometry. It's an imaging technique that collects and measures light in deep brain regions in real-time and it can be used on freely moving, living mice.

The researchers introduced a gene that makes a special protein into a brain region that is involved in the brain's reward circuitry. The thing about this protein is that it is a sensor that emits light when it binds to dopamine. By inserting a hair-thin fiber into the mouse's brain to catch the light signal and send it to an external receiver, they could measure second-to-second changes in dopamine across the course of the experiment.

Yet, it was serendipitous that the two neuroscientists made this discovery. They were testing the fiber-photometry technique for a completely different study, and it was Mayer who noticed the change in dopamine when moving the mice between experimental cage and home-cage. "This is an occasion where the unexpected turns out to be more important than perhaps what we were pursuing in the first place," Blakely said. "In this particular case, it was nice because it really opened up a new area of research for us and for many others, potentially, which has to do with the role that dopamine plays signaling comfort."

After realizing this discovery, the resulting study was fairly simple, he said. Mayer and Blakely documented the dopamine surge of mice in an unfamiliar, experimental cage compared to their own home-cage, with familiar bedding, water and smells. They compared this to the dopamine response to cocaine. In both cases, they found an increase in dopamine levels of about tenfold. "When the mouse goes home, the response is comparable to instant reward that it gets with cocaine," Mayer said.

Ultimately, the scientists said they hope their work leads to better research and treatments for mood disorders, such as depression, autism and attention-deficit hyperactivity disorder, which have links to altered dopamine signaling. "We need better ways of testing our animals so that we can identify better medications," Blakely said. "So many people don't respond well enough to current medications for behavioral disorders. Some of this may simply be the context in which the tests are done? Maybe we've got a leg up on that."

Behind the Brain

From Autism to Alzheimer's, Scientists Uncover Secrets

BY **Judy Gelman Myers**

Throughout FAU, neuroscientists are investigating a range of cognitive disorders, including research into autism, designing early-detection tests of Alzheimer's disease and devising individualized treatment plans for patients with dementia.

Here's a look at some of their recent relative discoveries.

Addressing Autism

In the lab of Randy Blakely, Ph.D., professor in the Charles E. College of Medicine and executive director of the Brain Institute, researchers have discovered mutations in a gene that affects regulation of serotonin, a neurotransmitter implicated in autism spectrum disorder.

Using genetically engineered mice, the researchers found that a single mutation can cause changes in how a key serotonin regulatory molecule (SERT) interacts with partner proteins, resulting in a reduction of serotonin at brain synapses during development and throughout life, which Blakely believes can support traits of autism.

"It's quite amazing that one of the smallest changes you can make in SERT can alter interactions with its partners," Blakely said. The findings will enable scientists to identify SERT's interacting proteins as possible drug targets.

Aging With Alzheimer's

Qi Zhang, Ph.D., research assistant professor in the College of Medicine, hypothesizes that the root cause of Alzheimer's is an imbalance of cholesterol in brain cells and that the long-studied amyloid precursor protein (APP) is one of the regulators for cholesterol balance in the brain.

Cholesterol is indispensable for the functionality and integrity of synapses. As we age, our brains continuously lose cholesterol, making neurons more vulnerable to challenges like stress. Zhang's lab discovered an intriguing relationship between APP and cholesterol — cholesterol dysregulation caused by APP mutations linking to familial Alzheimer's. Working with genetically engineered mice whose APP was nullified, they found signs of synapse failure, neuronal death and dementia. "We hope to find whether the regulatory role of APP and cholesterol is neurologically meaningful and plays a role in the development of Alzheimer's disease," said Zhang, adding that he is also collaborating with The Scripps Research Institute to screen for drugs that can rebalance brain cholesterol and make brain cells more resilient during aging.

Early Detection

There's currently no good test to detect early-stage Alzheimer's, but Elan Barenholtz, Ph.D., associate professor at the College of Science and co-director of the Machine Perception and Cognitive Robotics (MPCR) Lab, and assistant director of FAU's Center for the Future Mind, is working to remedy that gap with a test that measures eye movements and language skills.

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Eye movements are good indicators of very small changes in cognition, like ones that occur in the early stages of Alzheimer's. The test, which is short and easy to administer, sits patients in front of an eye tracker capable of taking 150 snapshots per second. As the patient reads simple sentences or describes a picture, the machine measures various types of eye movements, while another records the patient's verbal acuity.

The test assesses memory functioning, executive functioning, and attention. Similar assessments have been used separately to measure cognitive dysfunctions such as concussions and attention deficit hyperactivity disorder (ADHD), but applying machine learning algorithms to the data enables Barenholtz to combine them into a single test to construct a global cognitive rating that can more accurately predict the disorder. "The point of this research is to push the needle to see if there might be patterns in these various behavioral measures that are subtle enough that they may have never been detected by a human diagnostician," Barenholtz said. "The goal is to push that window to an earlier point in the evolution of the disease."

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Parkinson's Disease Study is 'On the Nose'

Ning Quan, Ph.D., a professor in the Charles E. Schmidt College of Medicine, and a team of researchers, recently published a study on the link between inflammation of neuron cells in the nose and degenerative diseases, such as Parkinson's disease (PD).

They used mouse models to demonstrate inflammation induced in the nasal tissue by a type of molecule found in bacteria leads to toxic forms of a protein that degenerates and triggers Parkinson's-like symptoms in mice. Quan and his team found this inflammation is triggered by a single receptor protein, interleukin 1 beta. The findings were published in the journal *Brain Pathology*.

Quan is also director of the Program in Neuroimmunology and Glial Biology.

New Links Between Serotonin and Autism

Neuroscientists in the laboratory of Randy D. Blakely, Ph.D., professor of biomedical science in Florida Atlantic University's Schmidt College of Medicine and executive director of the FAU Brain Institute, have discovered a new link between autism spectrum disorder (ASD) and serotonin, a mood-regulating molecule in the brain.

The supply of serotonin is regulated by a protein called the serotonin transporter (SERT), which sweeps away serotonin from synapses to limit its action. Activity and regulation of the SERT protein are critically dependent on a number of other proteins that tell the protein where to locate on nerve cells and how to act.

It turns out that one specific mutation of this transporter, called SERT Ala56, changes the structure of the SERT protein cells in ways that keep these partner proteins from interacting with it and leading to abnormally high activity of the transporter. The high-activity state results in the removal of too much serotonin from brain sites where serotonin is needed, both during development and in adults.

Blakely and collaborators have published the findings in the journal *Frontiers in Molecular Neuroscience*.

Brainy Postdocs Take Charge

To advance the understanding of brain disorders, three postdoctoral fellows in FAU's Brain Institute recently earned prestigious grants for groundbreaking research in neuroscience.

- **Lorena Areal**, Ph.D., Charles E. Schmidt College of Medicine, received a pilot grant from the National High Magnetic Field Laboratory and the Advanced Magnetic Resonance Imaging and Spectroscopy Facility at the University of Florida for her work evaluating changes in the brain that might underlie behavioral changes, including those related to Autism and ADHD.

- **Idaly Velez-Uribe**, Ph.D., Charles E. Schmidt College of Science, earned an award from the Ed and Ethel Moore Alzheimer's Disease Research Program of the Florida Department of Health, to study the effects of bilingualism on emotional processing and memory in dementia.

- **Paula Gajewski-Kurdziel**, Ph.D., Charles E. Schmidt College of Medicine, received nearly $200,000 grant from the National Institutes of Mental Health to study the connection between the immune system and psychiatric disorders.

FAU Center for Brain Health Launches

New Center Adds Clinical Dimension to Research in Dementia

BY Judy Gelman Myers

As the population ages, a large segment of society will be affected over the next decade with Alzheimer's disease and various related dementias, according to Janet Robishaw, Ph.D., senior associate dean for research and chair of the department of biomedical sciences in the Charles E. Schmidt College of Medicine.

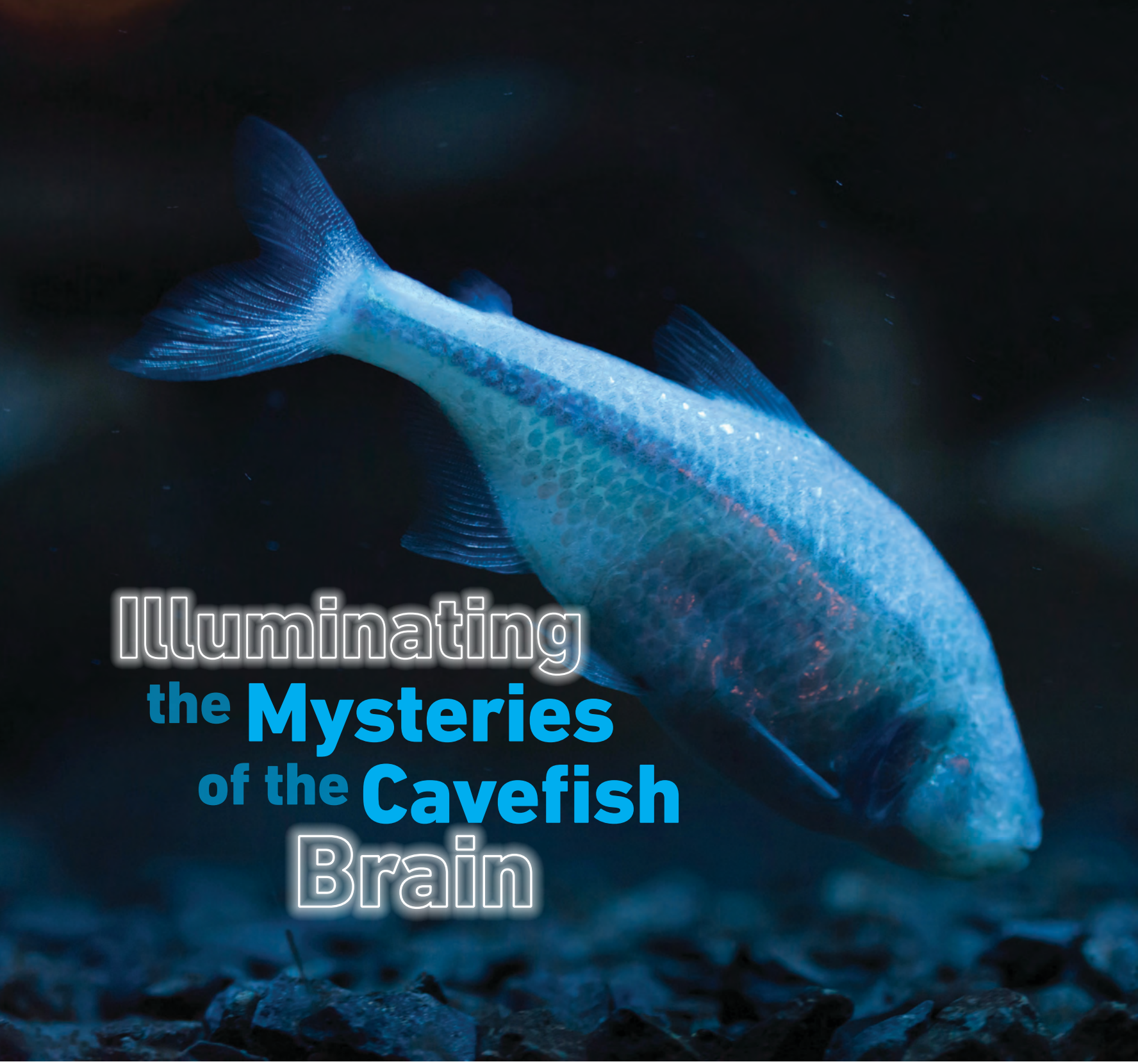
In response to the growing burden this will place on families, caregivers, and the economy as a whole, the College of Medicine is launching the FAU Center for Brain Health to support basic research, clinical care, education and outreach for Alzheimer's disease and various related dementias, with support from The Harry T. Mangurian, Jr. Foundation

Robishaw will lead the initiative, which will bring a clinical component to dementia research at FAU. Little can be done to treat patients already diagnosed with Alzheimer's, so efforts will focus on identifying who's at risk of developing the condition, and designing personalized prevention strategies to delay or possibly prevent its onset.

The center will adopt a model called the "learning healthcare system." In this model, research is embedded in the clinical care of patients, whereby their health data — with their consent — drives new research. The system works on a bidirectional, continuous cycle. Patients are entered in a research study, then their genomes are sequenced, and their genetic background, family history and lifestyle are entered into their health records.

This provides two benefits: patients' data are used to develop individualized treatment plans, while also serving as an important resource for researchers. "What we were really missing here at the College of Medicine was the clinical component. Without the patients you can do a lot of basic science research, but it's like doing it missing one hand," Robishaw said.

The College of Medicine has also developed a certificate program in genomics and predictive health, slated to graduate the first group in May 2021. According to Robishaw, the college will develop the certificate into a doctoral program, enlarging FAU's fight against Alzheimer's by educating the next generation of physicians, researchers and patients.



Illuminating the Mysteries of the Cavefish Brain

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Investigating Dramatic Variations in a Single Species

BY **Wynne Parry**

From left, Erik Duboué, Ph.D., Johanna Kowalko, Ph.D., and Alex Keene, Ph.D., are the driving forces behind field of cavefish research at FAU.

After dwelling for millennia in pitch black pools largely cut off from the outside world, Mexican cavefish have taken on some strange behavior. Not only have they lost their eyesight and turned pink, the fish sleep, fight, and get stressed much less than their river-dwelling counterparts.

Scientists at FAU — which has emerged as a central player in the field of cavefish research — want to know how evolution has tweaked their biology.

“People have been studying behavior in these fish for decades, but we know very little about the brain anatomy and the neural activity associated with the changes in cave populations,” said Alex Keene, Ph.D., an associate professor in the Charles E. Schmidt College of Science.

Keene works closely with two other cavefish researchers at the university, Johanna Kowalko, Ph.D., and Erik Duboué, Ph.D., both assistant professors of biology in the Harriet L. Wilkes Honors College. No other institution is home to three labs that focus on the fish, although scientific interest in them is growing, Keene said.

Cave and river fish belong to the same species, Astyanax mexicanus, making the differences between the two all the more striking. Earlier work by Keene and Duboué has shown that cavefish sleep, on average, 80% less than river fish, a discrepancy Keene continues to explore in the hopes of gleaning insights into human insomnia.

Top left: Johanna Kowalko, Ph.D., center, collaborates with researchers.

Bottom left: Erik Duboué, Ph.D., with tanks of cavefish at FAU.

Top right: Alex Keene, Ph.D., in his research lab at FAU.

Meanwhile, Duboué, is studying how the fish react — or don't — to stressful stimuli. Cavefish, it turns out, get much less freaked out when, for example, he puts them into a new tank.

Cavefish also lead minimal social lives, appearing to pay little attention to each other. Kowalko is investigating how they differ from river fish, which swim in coordinated groups, called schools, and sometimes chase and attack one another.

The trio has developed a number of tools, including genetically engineered fish, to explore the underpinnings of these behaviors.

"I have always been interested in how the brain works, and in order to see that you have to look at neurons' activity in the entire brain in a living, breathing, behaving animal," Duboué said.

By altering a fish so its neurons express a protein that fluoresces when they become active, Duboué can determine how each neuron responds when the fish is stressed or just going about life as normal.

In a complimentary effort, Duboué and Keene have been mapping the fish' brain anatomy. To create what are known as brain atlases, the researchers use microscope images to reconstruct a single brain in three dimensions. Then, with software, they average together individual brains, creating a composite.

In an effort described recently in the journal *Scientific Advances*, Duboué, Keene and Kowalko made four atlases, one for young river fish, the others for three populations of cavefish that evolved separately. The team then compared the volume of 18 regions of the fishes' brains and mapped neuronal activity while the fish were sleeping and getting food. These comparisons uncovered subtle differences between not only cave and river fish, but also among the groups of cavefish.

Other studies from the researchers' labs are also turning up evidence of neural variation. Duboué, for instance, has found cavefish have higher levels of molecules known to dampen the stress response.

Of course, there's still a lot to do. With new grant funding, for example, Kowalko's lab is beginning to catalog the quarrelsome behavior of river fish, a necessary step before comparing them with their more laid-back relatives.

"We know a decent amount about social behavior and aggression in other animals, but it's not clear exactly what's changed in cavefish to produce such vast differences," she said.

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Fishy Firsts

Grants Supporting Cavefish Research

Undergraduates have joined researchers' exploration of cavefish' unusual biology with the help of a training grant from the National Institutes of Health.

Alex Keene, Ph.D., an associate professor, and Evelyn Frazier, Ph.D., a senior instructor of biology, both in FAU's Charles E. Schmidt College of Science, have been awarded a five-year, $1.4 million Undergraduate Research Training Initiative for Student Enhancement grant to place students in biomedical labs throughout the university.

In addition to the primary award, Keene and Frazier received a supplement of $42,000 to offer a research-intensive class focusing on cavefish.

Last fall, eight first-year biology students participated. Although they could not conduct experiments in the lab because of restrictions meant to prevent the spread of COVID-19, the students worked remotely, analyzing data from sleeping, scared and eating fish, and looking for genetic relationships that might explain differences in these behaviors.

"We are currently writing up a paper on their results, which is an unusual accomplishment for an undergrad course," Keene said.

Here's a look at some of the other current cavefish research-related grants:

Uncovering the Contributions of Albinism to the Evolution of the Mexican Cavefish, National Science Foundation, $200,000
The major goals of this project are to examine if the gene responsible for albinism in cavefish, oca2, also plays a role in the evolution of cavefish behavior.

Functional Genomics Toolkit for Genotype-Phenotype Mapping in Cavefish, National Science Foundation, $1.148 million
This project helps develop functional genetic tools for cavefish.

Collaborative Research: The Evolution of Phenotypic Plasticity in Sleep Across Variable Environments, National Science Foundation, $426,639
Efforts in this project are to determine the genetic basis of differences in phenotypic plasticity between cavefish and surface fish, and to characterize behavior in natural populations.

Summer Integrative Neuroscience Experience in Jupiter, National Science Foundation
This grant supports a summer program for undergraduate students during summers of 2020 through 2022.

The relationship between eye morphogenesis and brain development, National Institutes of Health, $437,673
Through this research, investigators aim to examine the cellular basis of eye developmental defects in cavefish, as well as the relationship between development of the eye and development of the brain.

Evolutionary Approaches to Identify Genetic Architecture Regulating Aggression, National Institutes of Health, $1,691 million
The major goals of this project are to examine the genetic and neural basis of evolved differences in behavior between cavefish and surface fish.

OUTREACH

Neuroscience: Brain Games

Turning Science into Hands-On Fun for Students

Next Generation of Neuroscientists

More than a dozen FAU graduate students were part of the Brain Institute's inaugural Summer Neuroscience Scholars (SUNS) program in 2020.

The eight-week program allowed students to engage with institute faculty through remote learning to prepare for research in the laboratory. Under the direction of faculty mentors, students were immersed in career networking, research ethics in the laboratory and best practices in communicating science to the general public. The participants worked on research projects ranging from the roll of Interleukin 1 receptor cells and their role in neuroimmunology to neuropsychiatric disorders.

"The SUNS program allowed me to meet and interact with professors and directors of the FAU Brain Institute that I never would've had the chance to meet outside of this program," said Megan Giovanniello, above, bottom row, second from right, a student in the Charles E. Schmidt College of Science, and part of the SUBS inaugural cohort. "It was an awesome way to meet students with similar career goals as myself and be surrounded with like-minded individuals. I was able to develop valuable skills and knowledge about the extensive research process."

There was no cost for participation, and participants gained valuable background in reviewing primary literature in areas of interest. Participation can accelerate entry into the lab, and/or fill in gaps in understanding of the history of the mentor's research. At the end of the program, SUNS Program participants received a certificate of completion signed by the program director and the faculty mentor.

Brain Science in Your Pocket

The South Florida Science Center and Aquarium is unveiling a new brain exhibit application based on their 2,500-square-foot permanent exhibit called Journey Through the Human Brain, which cost $2.5 million.

The app will feature interactive activities and augmented reality that resemble the 2-year-old exhibit, which is a result of a collaboration with the FAU Brain Institute and allows visitors to get hands-on with state-of-the-art technology for a better understanding of the brain.

From left, Stephen Hoover, Claudius Osei, Lindsey Pugh, Allison Walsh, Sean McGlaughlin, Madeline Martinez and Akiva Katz

New GNTP Cohort

The Brain Institute welcomes the latest class of the Graduate Neuroscience Training Program (GNTP). The program unites scientists, educators and students from three FAU doctoral programs, integrative biology-neuroscience, complex systems and brain sciences and experimental psychology, and from two internationally-recognized research institutes, the Max Planck Florida Institute for Neuroscience and the Scripps Research, into a one-of-a-kind training opportunity for those at the beginning of their neuroscientific careers.

FAU's Advancing STEM-Community Engagement through Neuroscience Discovery (ASCEND) outreach program brings neuroscientists into the community to work with students, and is directed by Nicole Baganz, Ph.D., assistant director for community engagement and programming, FAU Brain Institute.

Fun Fridays for All

In an effort to provide educational opportunities to at-risk and underprivileged youth, FAU Brain Institute neuroscience students visit the Edna W. Runner Tutorial Center in Jupiter after school on Fridays.

The after-school program, called Fun Fridays, educates students about the brain using interactive lessons focused on science, technology, engineering and math.

David Cinalli, Ph.D., coordinates the program.

Growing NeuroExplorers

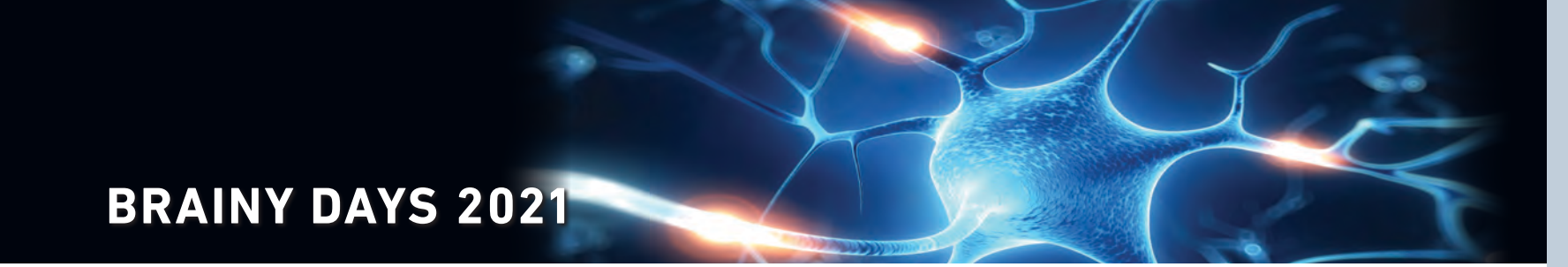
FAU's Advancing STEM-Community Engagement through Neuroscience Discovery (ASCEND) program, which aims to make science fun for middle schoolers, partners with the Stiles-Nicholson Foundation to create a program called NeuroExplorers.

Through the the NeuroExplorers program, more than 20 middle school students were introduced to neuroscience using cutting-edge educational tools, including virtual and augmented reality applications, age-appropriate neuroscience experiments, and a monthly Brain Box filled with hands-on activities.

The program is led by professional neuroscientists and students from FAU Brain Institute labs, the Harriet L. Wilkes Honors College, Scripps Research and Max Planck Florida Institute for Neuroscience.

ASCEND also creates digestible brain science podcasts, educational videos and educational resources available for teachers and students at www.fau.edu/ibrain.

Chelsea Bennice, Ph.D., assistant to the director of the ASCEND program, helps steer the program.



BRAINY DAYS 2021

Brainy Days 2021 is a monthlong celebration of neuroscience to engage, empower, and educate the public about brain diseases and ultimately reduce the stigma associated with brain disorders.

This year's virtual presentations cover a range of topics from understanding how dogs love us to insights into the treatments for Alzheimer's disease.

FAU Brain Institute's Brainy Days is sponsored by the Palm Health Foundation, with additional support by Dana Foundation, Osher Lifelong Learning Institute and the South Florida Science Center and Aquarium.

Virtual event Information and registration: fau.edu/ibrain/brainydays

SPONSORED BY

Palm Health FOUNDATION

Tuesday, March 2, 4 to 5:30 p.m.

How Dogs Love Us: Insights from Brain Imaging

***Gregory Berns**, MD, Ph.D., director of Center for Neuropolicy and Facility for Education and Research in Neuroscience, department of psychology, Emory University.*

*Hosted by **Cheryl A. Krause-Parello**, Ph.D., professor, Christine E. Lynn College of Nursing, and director of Canines Providing Assistance to Wounded Warriors (C-PAWW).*

Join to better understand the mind of your pooch and how dogs are reducing the mental stress of wounded warriors.

Tuesday, March 9, 1 to 2:15 p.m.

New Insights into Mechanisms and Treatments for Alzheimer's Disease

***Allan Levey**, MD, Ph.D., chair, department of neurology and director of the Alzheimer's Research Center, Emory University.*

*Sponsored by **Osher Lifelong Learning Institute at Jupiter**.*

Gain an up-to-date understanding of Alzheimer's disease and how research is offering new insights into diagnosis and treatment.

Friday, March 19, 1 to 2:15 p.m.

The Mighty Worm: Nobel Prize Powerhouse for the Study of Neurodegenerative Disease

***Randy Blakely**, Ph.D., professor, biomedical science, Charles E. Schmidt College of Science, and executive director, FAU Brain Institute, and **Peter Rodriguez**, graduate student, FAU's integrative biology doctoral program.*

*Hosted by **Becky Mercer,** Ph.D., professor, biotechnology and associate dean, Academic Affairs, Palm Beach State College.*

FAU neuroscientists describe the discoveries made through study of a simple soil worm and how research with these animals offers insights into Parkinson's and Alzheimer's disease.

Saturday, March 27, 9 to 11 a.m.

Brain Blitz: Neuroscience Fun for Kids

*Hosted by **FAU's Advancing STEM-Community Engagement through Neuroscience Discovery program and South Florida Science Center and Aquarium***

Virtual research tours and brain fun.

Thursday, March 4, 6 to 7:30 p.m.

Brains, Minds and Aliens: The Search For Extraterrestrial Intelligence and its Relevance to Brain Science

***Jill Tarter**, Ph.D., emeritus chair, Search for Extraterrestrial Intelligence (SETI) Research, SETI Institute, and **Elan Barenholtz**, Ph.D., co-director, FAU Machine Perception and Cognitive Robotics Lab.*

*Hosted by **Susan Schneider**, Ph.D., professor of philosophy, Dorothy F. Schmidt College of Arts and Letters, and director, FAU's Center for the Future Mind.*

This program brings together a world-famous astronomer profiled in the movie "Contact" and an innovative neuroscientist whose work seeks to explore the connections between human and artificial intelligence.

Thursday, March 11, 9 to 12:30 p.m.

Brains on Trial: What Brain Science Tells Us About the Origins and Limits of Responsibility

***BJ Casey**, Ph.D., director, Fundamentals of the Adolescent Brain Lab, Yale University; **Josh Buckholtz**, Ph.D., department of psychology, Center for Brain Science, Harvard University; **Carey Haughwout**, public defender, Palm Beach County, and **Judge Ginger Lerner-Wren**, presiding county court judge, Misdemeanor Mental Health Court, 17th Judicial Circuit, Broward County.*

*Hosted by **Wendy Guastaferro**, Ph.D., interim director and associate professor, FAU School of Criminology and Criminal Justice, College of Social Work and Criminal Justice.*

Prominent brain researchers and legal advocates for individuals with mental health challenges share perspectives on how to consider and implement a more fair and compassionate legal system.

Tuesday, March 23, 6 to 7:30 p.m.

Brain Gains for Mental Illness: Progress for Science and Society

***Audrey Gruss**, founder and chairman, Hope for Depression Research Foundation, and **Susan G. Amara, Ph.D.**, scientific director, National Institute of Mental Health.*

*Hosted by **Randy Blakely**, Ph.D., professor, biomedical science, Charles E. Schmidt College of Science, and executive director, FAU Brain Institute.*

Key national thought leaders in mental health research describe opportunities to drive discovery for those who suffer from mental illness.

Join the 2021 Neuroscience Seminar Series

Each semester, the Brain Institute features a variety of nationally known brain scientists at their 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.

The Spring 2021 semester is no exception. Here are some highlights of 2021 lineup:

MARCH 2
1-2 p.m.

Special Neuroscience Seminar

10 years & 100 MRI-Dogs: Progress in Decoding Dogs' Brains

Gregory Berns, M.D., Ph.D.
Emory University

MARCH 9
4-5 p.m.

New Insights into Mechanisms and Treatments for Alzheimer's Disease

Allan Levey, MD, Ph.D.
Emory University School of Medicine

MARCH 23
4-5 p.m.

Novel Signaling Pathways Supporting Amphetamine Action

Susan G. Amara, Ph.D.
National Institute of Mental Health

APRIL 6
4-5 p.m.

Spreading Depolarization and Seizure Due to Cerebral Edema and Stroke

Thomas Richner, Ph.D.
Mayo Clinic, Rochester, MN

APRIL 13
4-5 p.m.

Multiple Maps for Navigation

Lisa Giocomo, Ph.D.
Stanford University

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

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

BRAIN SCIENCE ON THE MOVE

The FAU Brain Institute unveiled a new brain van that delivers on-the-go neuroscience lessons. Neuroscientists are the driving force behind the MobileMinds program, created to engage students in Title I schools, teachers in workshops and underserved communities in South Florida. The program is part of the already-existing program called Advancing STEM-Community Engagement through Neuroscience Discovery, in partnership with the Stiles-Nicholson Foundation and Palm Health Foundation.

In addition, MobileMinds' partners with the South Florida Science Center and Aquarium (SFSCA) to build science lessons for students in grades six to eight that include activities derived from the SFSCA brain exhibit, *Journey through the Human Brain*, and STEM lessons created by FAU neuroscientists.

The museum exhibit was designed in a way to make several of its exhibits transportable so that young minds throughout Palm Beach county can experience the wonders of the brain in programs led by FAU faculty and students.

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