UC Center for the Neurobiology of Learning and Memory

Wired for Extraordinary

BRILLIANT FUTURE THE CAMPAIGN FOR UCI

How are memories formed? How do they last? How do they come back?

We have learned so much, yet countless mysteries about memory are still waiting to be solved. Our discoveries at UCI can transform your future and catapult humanity to new frontiers in technology, education, and medicine.

Find out how your generosity can support the extraordinary.



Wired for **extraordinary.**

Memory is the sum of who we are. It is the bridge to our past and future. It takes a fleeting moment in our experience and allows it to last indefinitely. It stretches our consciousness over a lifetime and allows us to enjoy meaningful and fulfilling lives. It enables us to project ourselves into the future, imagining what is yet to come. It chronicles the history of our species and will tell our tale long after we are gone. Simply put, without memory, humanity could not exist. Yet, for something so essential and ubiquitous, we still know very little about how it works.

Unlocking the mystery of how memories are made and how our brains are wired to accomplish this incredible feat will transform our future and catapult us to new frontiers in technology, medicine, and education. But, it is also a formidable challenge that requires us to transcend scientific boundaries and work as a diverse and interdisciplinary team. The Center for the Neurobiology of Learning and Memory (CNLM) is the first institution in the world dedicated to this fundamental challenge. Biologists, engineers, computer scientists, and other specialists work together at the intersection of disciplines to generate fundamental and often unexpected breakthroughs. This approach has already yielded discoveries that have transformed our understanding of the workings of memory.

From uncovering how emotional arousal strengthens memories to understanding how false memories arise, to revealing the impact of stress, sleep and exercise on memory, to shedding light on how memories are stored in connections among brain cells, to discovering a rare and unusual form of superior autobiographical memory, our faculty have been at the forefront of discovery in the field for over 40 years.

Now, as we look to the future, our scientists are once again poised to make radical discoveries and critical scientific breakthroughs. We are far from traditional in our approach. We are lean and agile, so we can quickly adapt to new or unexpected findings. We collaborate extensively and foster an environment where the unconventional is the norm. We embrace diversity and creativity, because we know they are the only way to take on big challenges.

A challenge this big takes audacity to solve. That is exactly why we are the best team to take it on.

Progress to date has opened the door to a world that was scarcely imaginable just a few years ago. Picture a world where strategies for enhancing or recovering memory are not based on happenstance drug discoveries but instead on a deep understanding of brain machinery; where the formidable powers of memory are coupled with machine learning to produce true artificial intelligence; where memory-based technology revolutionizes the classroom experience.

Sound like science fiction?

This promising future can be here sooner than you think. *You* hold the power to make it a reality. Partner with us and the next transformative discovery is just on the horizon.





"In Jim we have the whole package in terms of inspired teaching, mentoring, helping to propagate the sense of enthusiasm and rigorous commitment to scientific discovery and quantification as well as knowing what it takes to run a university."

> - Ralph Cicerone (1943-2016), Former UCI Chancellor McGaugh Hall Dedication Ceremony 2001

6

Pioneering Beginnings.

From the day UCI first opened its doors, neuroscience and the study of the mind have been among our towering academic strengths. This is due in large part to the contributions and life's work of James McGaugh.

The UCI Department of Psychobiology, now renowned as the UCI Department of Neurobiology and Behavior, was the very first department of neuroscience in the world when it was established in 1964. Professor McGaugh moved from the University of Oregon to become its founding chair. The UCI Center for the Neurobiology of Learning and Memory, established in 1983, was the first research institute in the world dedicated exclusively to the multidisciplinary study of learning and memory mechanisms in the brain. Professor McGaugh was its founding director.

Professor McGaugh is a pioneer of brain science who has been at the forefront of virtually every advance in the field. He is internationally renowned for his studies of drug and hormone influences on memory as well as for his more recent work on highly superior autobiographical memory. Sir Isaac Newton famously said, "If I have seen further it is by standing on the shoulders of giants." In the field of brain science, James McGaugh is a giant. When Professor McGaugh first came to UCI, he was one of the 11 original department chairs of the university. In the years since then, in addition to all his scientific advances and achievements, he has served as dean of the School of Biological Sciences, vice chancellor for academic affairs, and executive vice chancellor and provost. He has received countless honors and awards from the American and international scientific communities, including membership in the National Academy of Sciences and fellowship in the American Academy of Arts and Sciences.

Here at UCI, he has received the Distinguished Faculty Award for Research, the Extraordinarius Award, which is the UCI Alumni Association's highest honor, and the UCI Medal, the university's highest recognition. In 2001, McGaugh Hall was named in his honor. In 2018, his generosity led to the establishment of the McGaugh-Gerard Distinguished Lecture in Learning and Memory, a tribute to his long-lasting friendship with Dr. Ralph W. Gerard (1900-1974), who served as the University's first dean of the Graduate Division.

It is difficult to imagine what UCI would be like today if Jim McGaugh had decided back in 1964 to stay at the University of Oregon.

Visionary Leadership.

After spending several years as a faculty member at Johns Hopkins University, a premier academic and medical institution, Michael Yassa moved back to his doctoral alma mater, the University of California, Irvine in 2014 to take on a different kind of challenge. "I came to UCI because I saw an opportunity to build on past successes and help take our research and education profile to the next level. UCI is young and agile and can make positive change happen quickly, unlike many other institutions firmly grounded in traditional structures."

In 2016, Michael was selected to lead the Center for the Neurobiology of Learning and Memory, where he infused new energy and led with a vision of growing an interdisciplinary unit that tackles the problem of memory from all angles from engineering to biology to psychology to philosophy. His focus on integration of fundamental and clinical science has led to numerous strategic partnerships and collaborations across campus.

His creative strategies and forceful advocacy have brought in millions of dollars in new funding to the Center and helped

recruit a number of rising stars in the field. His efforts also led to the establishment of several new core facilities over the last three years including human biology shared research labs, a two-photon microscopy facility, a brain clearing facility, and an animal MRI facility. He also significantly elevated the Center's public profile in the Orange County community.

In 2018, under Michael's leadership, the CNLM held a firstof-its-kind international scientific conference in Huntington Beach that attracted over 1,000 scientists from more than 35 countries. The conference, held in celebration of the CNLM's 35th anniversary, cemented its status among globally preeminent institutions and resulted in myriad new ideas, discoveries, and collaborations.

In 2019, the National Institute on Mental Health awarded the CNLM a highly coveted training grant to support an innovative PhD training program in learning and memory that is grounded in team science.

And this is only the beginning.





"Michael's extraordinary accomplishments as a scientist are equally matched by his leadership skills and ability to quickly transform vision into reality. It is indeed unusual to have an academic leader combine big vision with strategic, scientific, and administrative excellence."

- Hazem Chehabi, M.D., Former Chair, UCI Foundation Board of Trustees; President and Founder, Newport Diagnostic Center.

For a full list of **more than 100 faculty** affiliated with the CNLM and descriptions of their research and discoveries visit us online at **http://cnlm.uci.edu**

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Wired for impact.

James McGaugh

Founder and trailblazer who discovered much of what we know about how memories are made and strengthened.

Elizabeth Loftus

Distinguished pioneer who revolutionized our understanding of how false memories arise as well as their legal implications.

Bruce McNaughton

Groundbreaking leader whose fundamental technologies were the basis for discovering how the brain navigates and remembers space.

Tallie Z. Baram

Visionary risk-taker who is uncovering the impact of adverse experience during early life on brain development and risk for mental illness during adolescence and adulthood.

Sunil Gandhi

Bold explorer who is rewriting our fundamental knowledge of the brain's wiring using the most innovative microscopy and computational technologies.

Ruth Benca

Preeminent scholar who is investigating the mystery of the sleeping brain and the impact of sleep on memory and brain health.

David Reinkensmeyer

Entrepreneurial Innovator who is developing cutting-edge intelligent robotic systems to help the nervous system relearn movement after injury.

Christie Fowler

Fearless champion who is making major strides in understanding the neurobiological basis of addiction and taking on big tobacco.

This is just a sample of the caliber of our scientists and the **impact of their research**.

Wired for innovation.

We know exactly how to speed up the pace of scientific discovery, by creating unique interdisciplinary collaborations that quickly move ideas from concept to reality. We need your help to keep us at the leading edge of innovation by investing in extraordinary people and technologies. **With your generous help we will:**

Strategically Recruit World-Class Scientists

We will increase our research capacity in strategic areas that are in need of expansion and growth by recruiting several new research groups led by top experts that can accelerate the pace of discovery at UCI. For example, the CNLM recently recruited distinguished scholar Bruce McNaughton to campus, where he now supervises an interdisciplinary team of productive scientists who are developing the next generation of memory prosthetics and machine intelligence capable of human-like learning.

Catalyze High-Risk, High-Reward Science

The most critical scientific breakthroughs require investment in research that may be too early or too unconventional for government funding. This is exactly the kind of research we do at the CNLM. For example, a small seed investment in a groundbreaking research collaboration among three of our top scientists was recently leveraged to successfully secure a multimillion-dollar grant from the U.S. Brain Initiative to study the brain's immune system. With your help, we will provide seed grants and fellowships to investigator teams to test other outof-the-box ideas and develop proof-of-concept for breakthrough technologies.

Expand Our Scientific Core Facilities

To attract and retain top-notch scientists and accelerate their research efforts, we need to provide them with cutting-edge tools. For example, the campus built a new state-of-the-art brain imaging facility in 2017, which allowed us to successfully retain two senior investigators and recruit three rising star faculty members. We need your help to expand our scientific core facilities and resources for next-generation microscopy, animal behavior, and large-scale computation to stimulate further growth and innovation.

Our vision is bold and ambitious precisely what is needed to ensure a brilliant future.

UCI built a state-of-the-art **brain imaging facility** in 2017, which allowed us to successfully retain two senior investigators and recruit three rising star faculty members.

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Others

Amygdala (1) • Mario Elabd Nahle Khalili SasiHean Semthyahu <u>Cerebellum</u> (2) Jiyeen Lee Mario Lee Adam Brown Sylhie Crite Yorge " Hippoctam Pus Mina Clabe

NeuroScholars are actively learning to disseminate **cutting-edge techniques** developed in the laboratories of CNLM Fellows that promise to reveal the brain's intricate architecture.

Wired for the future.

We are a globally renowned hub for developing exceptional scientists and innovators. Exciting opportunities have recently emerged in research and industry and there is an urgent need for a diverse workforce with cutting-edge training and unique skill sets. We need to amplify our education efforts beyond the traditional classroom setting to prepare our best trainees for current and future opportunities. **With your generous help we will:**

Support Undergraduate NeuroScholars

We recently launched NeuroScholars — an innovative program that provides opportunities for undergraduate students from diverse backgrounds to engage in faculty-mentored research, coursebased laboratory training in advanced topics, and networking with industry leaders to prepare them for diverse careers in neuroscience. NeuroScholars are actively learning to disseminate cutting-edge techniques developed in the laboratories of CNLM Fellows that promise to reveal the brain's intricate architecture. NeuroScholars are already garnering coveted research positions across campus. The program is in high demand — at present we can accommodate less than 5 percent of applicants. Help us support and grow NeuroScholars to cultivate the next generation of leaders in neuroscience.

Ensure Graduate Student Success

The future of neuroscience presents both challenges and

opportunities. We must expand our graduate education efforts to arm our students with the tools and skills to meet the challenges and capitalize on the opportunities. The CNLM has recently secured a coveted institutional training grant in learning and memory from the National Institute on Mental Health. However, the funds only support graduate stipends and tuition. Tomorrow's scientists need to be trained in many other skills and areas that are critical for their success. We need your help to supplement this federally funded program to include specialized technical instruction, 360-degree leadership coaching, training in scientific communication, and engagement in the local community.

Provide Career Mentorship for Postdocs

Postdoctoral fellows are at an optimal time in their careers to expand research skills, develop independence and shape career trajectories. This training period is critical for cultivating the next generation of leaders in neuroscience. There are currently no formal mechanisms at UCI to prepare postdoctoral fellows for careers in learning and memory. With your help, we will implement a new career training program that equips postdoctoral fellows with the tools and knowhow to pursue academic and industry careers by providing specialized training in team science, teaching, mentorship, grant writing, project and lab management, and other life skills that are critical for success.

13

Wired for Orange County.

From its inception, the CNLM has partnered with the community to create opportunities to experience world-class research and share in the discovery process. Orange County is home to a thriving economy and some of the most creative minds in the world. We strive to create a joint community centered on the thrill of discovery in brain science. **With your generous help we will:**

Expand the UCI Brain Explorer Academy

The UCI Brain Explorer Academy is the CNLM's flagship K-12 STEM education and outreach program that is free for Orange County elementary and middle school children. It is the *first* program in the world to combine modern neuroscience research, scientific communication, and critical thinking for young minds. So far, the program has trained 120 second through eighth graders, most of whom have never been exposed to brain science before. Help us support and expand this important program and enhance its reach to underrepresented minorities.

Grow our Public Lecture Series

A staple at UCI since 1995, the Distinguished Lecture Series in Brain, Learning and Memory is UCI's most successful public lecture series, held several times a year at the Irvine Barclay Theatre to capacity audiences. Speakers are renowned scientists from all around the world. So far, we have hosted more than 65 public lectures with a total audience of over 30,000 attendees from the Orange County community. Help us support and grow this important effort to increase our reach and amplify our message that science is for everyone and not just academics.

Build an Industry Partnership Program

In collaboration with University Lab Partners, a nonprofit biotechnology incubator, we are building a new entrepreneurial research apprenticeship program. We will place highly trained NeuroScholars in Orange County startup companies that are pioneering the commercialization of new biomedical innovations. With your help, we can launch this unique program and create a diversified and highly skilled workforce that will accelerate the pace of discovery and innovation.

Help us amplify our message that science is for everyone and not just academics.



The Brain Explorer Academy is the **first program in the world** to combine modern neuroscience research, scientific communication, and critical thinking for young minds.

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We are at a pivotal point in history.

We stand on the brink of making discoveries in brain science that can radically transform our lives and redefine our limits. There is no better time than now, and no institution more well-suited to taking on the challenge.

Your generosity will help ensure a brilliant future for all.



UC Center for the Neurobiology of Learning and Memory

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