

NEURO TIMES



UCI CNLM
Ayala School of Biological Sciences

Center for the Neurobiology
of Learning & Memory

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Transforming Technology, Education, and Brain Health

The Center for the Neurobiology of Learning and Memory (CNLM) at UC Irvine has devoted the

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last thirty-three years to a singular scientific pursuit - the quest to understand how the brain can acquire, store, and retrieve memories. Now, more than three decades after the CNLM's inception, we know more about the brain and the fundamental processes

underlying learning and memory than we ever thought possible. But behind each problem

tackled lie several more awaiting solutions to be discovered. Behind each mystery elucidated are even more compelling mysteries - mysteries unified by fundamentally asking what it is that makes us human. While our fervor for discovery is unwavering and our dedication to shedding light on the most fundamental questions about learning and memory is as steadfast as ever, we recognize the need to update our mission and vision for the future. Our successes have paved the way to solving real-world problems and improving human life.

How can we build better technology inspired by what we understand about the brain? How can we create intelligent machines and human-computer interfaces that improve the world? How can we optimize learning strategies in the classroom and other educational settings? How can we improve

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The CNLM presents several highly competitive end-of-the-academic-year awards. Awardees are chosen through a selection process by a special committee appointed by the Director. Awardees may receive each award only once. The purpose, criteria and eligibility requirements for each award are available at cnlm.uci.edu/awards

Here are our winners for 2016:

Alberto Lopez | Renée Harwick Advanced Graduate Student Award Winner. Alberto is a graduate student in Dr. Wood's laboratory.

Terra White | John Haycock Memorial Graduate Student Travel Award Winner. Terra is a graduate student in Dr. Guzowski's laboratory.

Dane Clemenson | Roger W. Russell Scholars Award Winner. Dane is a postdoctoral fellow in Dr. Stark's laboratory.

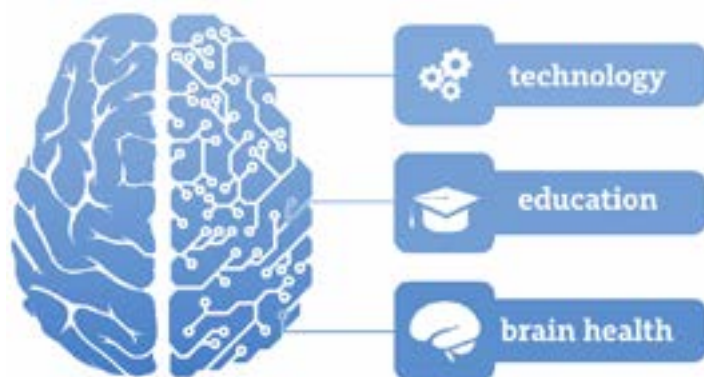
Mawaheb Hassan Kassir | Carol Becker McGaugh Award Winner. Mawaheb is an undergraduate student in Dr. Fortin's laboratory

Matthew Tsai | Friends of the CNLM Award Winner. Matthew is an undergraduate student in Dr. Yassa's laboratory.

Emily Provenzano | Friends of the CNLM Award Winner. Emily is an undergraduate student in Dr. Metherate's laboratory.

These awards are made possible through the philanthropic support of Dr. Renée Harwick, Roger Russell family and friends, John Haycock family and friends, Jim and Becky McGaugh, and the Friends of the CNLM group. The awards provide funds for pursuing training, research, or conference travel opportunities that would not otherwise be possible. We thank our donors for their generosity and are proud of our junior scientists for their hard work and dedication.

memory when it fails? How can we protect our aging brains from memory loss and stave off dementia? How can we develop effective therapeutics for brain diseases?



The answers to these questions and more can only be discovered through a comprehensive understanding of the inner workings of the brain and an integrated, well-informed approach to translation. **We believe that discovering the underlying principles that guide brain processes is the most important challenge of this century.** The implications of meeting this challenge are vast and far-reaching.

Three decades of excellence in research on learning and memory has positioned UCI's CNLM as one of the world's most renowned institutes for the study of the brain across all levels. It is only fitting that our mission and vision evolve to tackle humanity's most significant challenges and strive to improve lives locally, regionally, and globally.

To echo a common sentiment at all of UCI in the wake of celebrating our 50th anniversary, we are proud of our bright past, and we look forward to forging our brilliant future. We invite you to embark on this new chapter with us.



Director's Message



The CNLM has been the world's premier institute for learning and memory research for over three decades - a global epicenter that has churned out the best and brightest in the field. Thus, when Frank LaFerla, Dean of the Ayala School of Biological Sciences asked me to serve as Center Director, I accepted without hesitation. The prospect was at once humbling and exhilarating. This is a rare opportunity to support a vibrant and diverse Faculty Fellowship, a superb intellectual community, and exceptional training programs for graduate and undergraduate students. I am honored and thrilled to take on this role. Over the coming months, you will see many changes at the CNLM. Our brand is refreshed. We are expanding our academic initiatives, conferences, and workshops. We are building new core facilities and renovating existing labs.

We are embarking on new synergies and creative partnerships with other Centers and Schools on campus. We are developing plans for a high-risk high-reward pilot research program specifically supporting cross-cutting collaborations, as well as plans for new faculty hiring. To support these exciting developments, we will also launch the most ambitious fundraising campaign we have ever undertaken. We hope you will share our vision for the future and join us in our quest to lead the world in transforming technology, education, and brain health.

A handwritten signature in blue ink, reading "Michael A. Yassa".

Michael A. Yassa, Ph.D.

Director, Center for the Neurobiology of Learning and Memory

New Advisory Board Members



Roger Bingham is a renowned science educator, author and television host based in La Jolla, California. He is co-founder and director of The Science Network, a virtual forum dedicated to science and its impact on society. Bingham

is also founding director of The Collaboratory, an innovative venue dedicated to facilitating a constructive conversation between scientists, educators, politicians, academics, students, industry, and the lay public. Bingham brings to the CNLM a wealth of knowledge and expertise in science communication. Co-author of *The Origin of Minds*, he holds seven Los Angeles Emmy Awards, a Writer's Guild of America Award and the National Magazine Award. He is a member of the Board of Advisers of *Scientific American*. Welcome Roger!

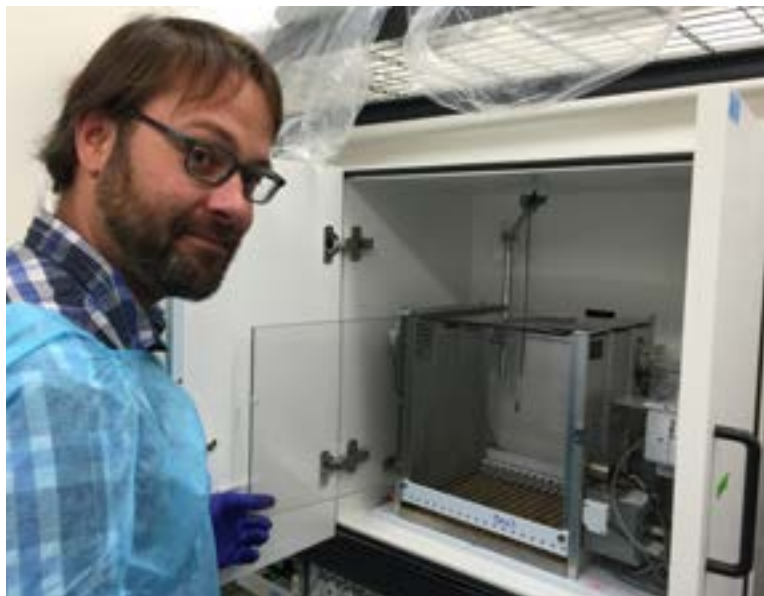
Bruce Tromberg is Professor of Biomedical Engineering, Director of the Beckman Laser Institute (BLI) and Medical Clinic at Irvine, and Principal Investigator of the Laser Microbeam and Medical Program (LAMMP), an NIH P41

National Biomedical Technology Center in the BLI. Tromberg is an elected Fellow of the American Institute for Medical and Biological Engineering, and a renowned pioneer in biophotonics, having over 300 publications and 18 patents. He is also a council member for the NIH National Institute of Biomedical Imaging and Bioengineering. Tromberg brings to the CNLM a wealth of expertise in fostering technological innovation and creating avenues for translation from the benchtop to the bedside. Welcome Bruce!



Faculty Spotlight: Dr. Stephen Mahler

We sat down with CNLM Fellow Dr. Stephen Mahler to find out more about his work.



How did you become interested in neuroscience?

During college I became exposed to psychology and social psychology and I was interested in trying to figure out why people do what they do. I went on to complete a Master's degree at the University of Chicago in behavioral pharmacology during which I became interested in addiction. During my doctoral work at the University of Michigan, I studied the neural substrates of natural reward-seeking behaviors in rats. During this time, I realized that there are tremendous technological advances in biology that are now available to me, a psychologist by training. I was in a position where I could use gene therapy approaches to ask new questions that have never been asked before in ways that have never been asked before. Once I learned that, there was no going back.

What are your current research interests?

My lab examines brain circuits underlying motivated behavior. Much of our work is relevant to addiction since these brain circuits evolved to produce appropriate behaviors that allow us to attain natural rewards (food and sex, for example). Addictive drugs chemically hijack these circuits and refocus motivation on drug reward as opposed to the other types of rewards. This is a common behavior that we see in addiction where people forsake other pleasures for more and more drugs. What we do in the lab is try to examine and manipulate these circuits to see how they work normally and to see how addictive drugs change them in ways that cause the disorder.

Why is it that people who quit drugs after being addicted relapse so often? What is it about drug addiction that causes this persistent propensity to go back to this very obviously disruptive pattern of behavior? Something is changed, maybe permanently, in the brain. In working with animal models of addiction, we are always trying to keep the models honest, doing everything we can to make sure that our models are relevant to the world. I am interested in how brains work but I am mostly interested in how *human* brains work. We use rats and mice because we can use very focused targeting approaches to validate the models, then ask much more specific questions in humans. For example, now instead of asking a very general question like "what is going on in the human brain?" we can ask much more focused questions like "is this specific set of characteristics going on in the human brain?"

What is your favorite part about neuroscience?

I love that the hardest practical problem that we deal with is selecting the most exciting questions for us to ask among an ocean of interesting and exciting questions and approaches in neuroscience. That's a pretty good place to be.



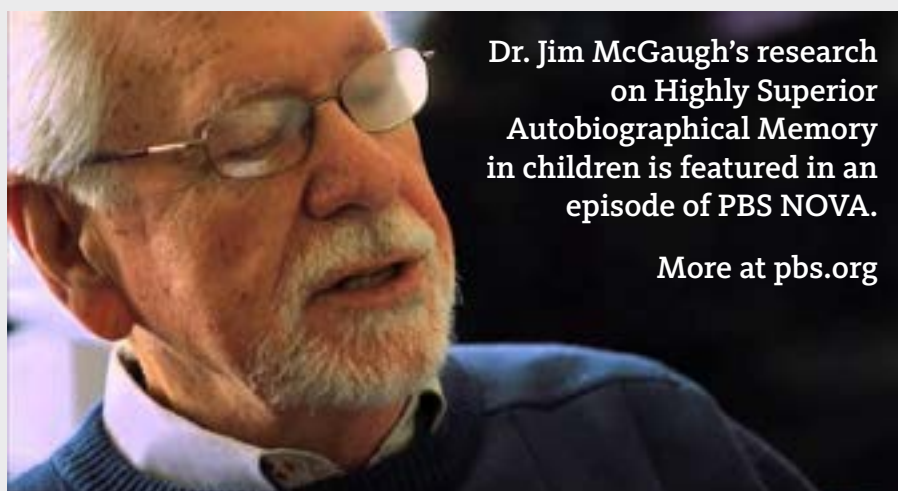
To find out more about Dr. Mahler's work, please join us for his **Evenings to Remember** seminar on December 14th, 2016.

In Memoriam: Dr. Norman M. Weinberger



Our Center could not have existed without the Founding Faculty who had the incredible vision to create it in 1983. On February 14th of this year, we lost one of those luminaries. Dr. Norman M. Weinberger was one of the longest serving faculty members at UC Irvine and a staunch supporter of the CNLM. Norm was a distinguished scientist, gifted mentor, and treasured colleague. He was also a loving father to seven children and a devoted husband to our dear friend Jacquie Weinberger. While Norm is no longer with us, his profound impact on all of us is ever-present. In honor of his memory, we have dedicated a conference room in the Bonney Research Building in his name. Adjacent to the conference room, we will create a reference library to house Norm's enormous collection of academic books and scientific volumes as an everlasting resource to the Center that commemorates his legacy. Norm's vision and myriad accomplishments will continue to guide the Center in the years to come.

Memory Hackers on PBS NOVA



Dr. Jim McGaugh's research on Highly Superior Autobiographical Memory in children is featured in an episode of PBS NOVA.

More at pbs.org

Memory is the glue that binds our mental lives. Without it, we'd be prisoners of the present, unable to use the lessons of the past to change our future. From our first kiss to where we put our keys, memory represents who we are and how we learn and navigate the world. But how does it work? Neuroscientists using cutting-edge techniques are exploring the precise molecular mechanisms of memory. By studying a range of individuals ranging—from an 11-year-old whiz-kid who remembers every detail of his life to a

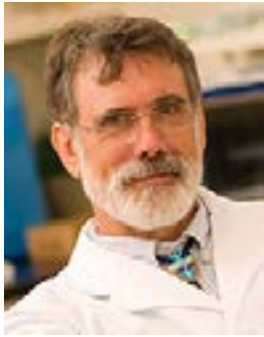
woman who had memories implanted—scientists have uncovered a provocative idea. For much of human history, memory has been seen as a tape recorder that faithfully registers information and replays intact. But now, researchers are discovering that memory is far more malleable, always being written and rewritten, not just by us but by others. We are discovering the precise mechanisms that can explain and even control our memories. The question is—are we ready?

Source: PBS NOVA

Episode first aired on Feb 10, 2016 and is now available on DVD.



Research Highlights



Distinguished Professor and CNLM Fellow Bruce McNaughton awarded National Science Foundation grant to study how knowledge is extracted from memory

The grant was one of 18 funded projects from the cross-disciplinary NSF Integrative Strategies for Understanding Neural and Cognitive Systems program. This program supports bold ideas that go beyond single-discipline research efforts in order to advance brain science. The proposed research hopes to tackle one of the fundamental problems in psychology and neuroscience – how do transient memories of an experience become stabilized and available as long-term memories? Congratulations to Dr. McNaughton and his research team on this prestigious award. Stay tuned for more about this exciting research!

CNLM Fellows Xiangmin Xu and Sunil Gandhi uncover new mechanism for correcting childhood visual disorders



Amblyopia is the most common cause of permanent visual defects among children and is often a result of improper brain development due to deprivation during the “critical period”. In a new landmark paper that appears in *Neuron* (online September 15, 2016), the two CNLM Fellows along with their research teams describe a new molecular and circuit mechanism for targeting visual cortical plasticity during the critical period, thereby possibly opening a window for therapeutic intervention. The paper is available online at www.cell.com/neuron/

Newly Elected Faculty Fellows



Christie Fowler, Ph.D.

Christie is an Assistant Professor in Neurobiology and Behavior. She studies the neurobiology of addiction and the role of the habenula in motivated behaviors and disorders such as depression.



Kei Igarashi, Ph.D.

Kei is an Assistant Professor in Anatomy and Neurobiology. He studies the circuit mechanisms underlying olfactory perception and memory using electrophysiological and anatomical techniques.



Susanne Jaeggi, Ph.D.

Susanne is an Assistant Professor in Education and Cognitive Science. She studies working memory and brain plasticity, and in particular the impact of cognitive training on enhancing cognitive function.



Stephen Mahler, Ph.D.

Steve is an Assistant Professor in Neurobiology and Behavior. He studies the neural circuits underlying reward and addiction as disruptions of these circuits in neuropsychiatric disease.

Supporting CNLM Research

The CNLM would not exist if it were not for the dedicated community of supporters who share our vision. Your philanthropy allows us to build state-of-the-art laboratories, provide scholarships to train the next generation of exceptional scientists, support our public lectures, and serve the Center's tripartite mission of discovery, mentorship, and service. There are many ways to support the CNLM:



Dedicate Brick in Memory Lane

Create a memory that will last forever. The CNLM courtyard is home to cherished memories inscribed on the bricks of our courtyard's Memory Lane. With a one time donation of \$500 you can memorialize a loved one, celebrate a special occasion, or champion a cause. Brick dedications are tax deductible.

Become a Friend of the CNLM

Friends of the CNLM are community patrons who generously support and sustain the CNLM and its research, education, and service programs through commitments to annual giving:



NeuroSilver (\$250) | Patrons at this level are acknowledged at all public lectures and events, receive access to our quarterly newsletter, and VIP admission to the annual Distinguished Lecture in Brain, Learning and Memory at the Irvine Barclay Theater including invitation to the backstage dinner reception, premier reserved seating, and an exclusive opportunity to meet the distinguished speakers of the series.



NeuroGold (\$500) | Patrons at this level receive all of the thank you gifts of NeuroSilver PLUS invitation to our exclusive **Evenings to Remember** Dinner and Lecture series by CNLM Fellows. This is a great way to get to know our Faculty Fellows and their research.



NeuroPlatinum (\$1000) | Patrons at this level receive all of the thank you gifts of NeuroGold PLUS a choice between lunch for two with the CNLM scientist of your choice* or an exclusive guided tour of one of the CNLM laboratories.



NeuroDiamond (\$2000) | Patrons at this level demonstrate extraordinary commitment to the CNLM. In addition to all of the NeuroPlatinum gifts, invite a CNLM scientist of your choice* to give a lecture at a dinner party at a location of your choosing.

* subject to availability

Join the CNLM Legacy Society

The Legacy Society honors supporters who designate the CNLM as a beneficiary of a planned gift. Legacy Society members receive special benefits including invitations to all of our events and seminars including the annual Barclay lectures and our Evenings to Remember series, an invitation to an annual luncheon at the UCI Chancellor's home, as well as exclusive Legacy Society mailings. Gifts include:

Charitable Bequests | A simple and flexible way to support the CNLM using provisions in your will or trust.

Charitable Lead Trust | Make a gift while passing on appreciated assets to your loved ones.

Charitable Remainder Trust | Create a trust that pays you for a specific period of time and makes a gift of the remainder to the CNLM.

Charitable Gift Annuity | A simple contract which provides you with a fixed income stream for life. At the end of the contract term, the remainder of the gift is used to support the CNLM.

Retirement Account | Designate CNLM as the remainder beneficiary of your retirement accounts.

For more information on how to support the CNLM, please contact Mr. Robert Avalos, Executive Director of Development at robert.avalos@uci.edu or at 949.824.4428. The UCI CNLM is a 501c(3) nonprofit organization.



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Dates to Remember

Wednesday December 14th, 2016

The Dale Melbourne Herklotz Evenings to Remember

Dr. Stephen Mahler, Playing the Strings of the Mind: Gene Transfer Approaches in Neuroscience of Today, and Psychiatry of Tomorrow



Tuesday February 7th, 2017

The 23rd Distinguished Lecture on Brain, Learning and Memory

Public lecture at the Irvine Barclay Theater

Dr. Ruth Benca, What Can We Learn from the Sleeping Brain?



Wednesday February 22nd, 2017

The Dale Melbourne Herklotz Evenings to Remember

Dr. Oswald Steward, Title TBA



Thursday March 2nd, 2017

Special Seminar

Co-hosted by the Exercise Medicine and Sport Sciences Initiative

Dr. Wendy Suzuki, Practical Neuroscience for Everyday Life



Wednesday May 10th, 2017

The Dale Melbourne Herklotz Evenings to Remember

Dr. Tallie Z. Baram, Maternal Care and Adolescent Vulnerabilities: How Early-Life Experiences (Including Your Mom!) Shape Your Memories Throughout Life

