

Stanford  
Neurosciences  
Institute

Annual Report 2016

September 2015 through August 2016

## Our Mission

The goal of the Stanford Neurosciences Institute is to understand how the brain gives rise to mental life and behavior, both in health and in disease. Our research community draws from and informs multiple disciplines, including neuroscience, medicine, engineering, psychology, education and law. New discoveries will transform our understanding of the human brain, provide novel treatments for brain disorders, and promote brain health throughout the lifespan. We aim to create positive benefits for individual people, families and society.

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## Message from the Director

The Stanford Neurosciences Institute marked a very successful third year. Building on the momentum of our first two years, our researchers continued bold, collaborative research projects. We supported the training of a new cohort of graduate students and postdocs, and we placed the finishing touches on the design of our new research center.

A successful faculty search in the area of molecular neuroscience will bring Julia Kaltschmidt (Department of Neurosurgery) into our community. She is trained as a developmental biologist as well as a neuroscientist, and studies circuits of the spinal cord. At Stanford she will expand her research into the nervous system of the gut, creating synergies with ChEM-H scientists studying the gut biome. Julia will enhance our strength in application of molecular techniques to understanding neural circuits.

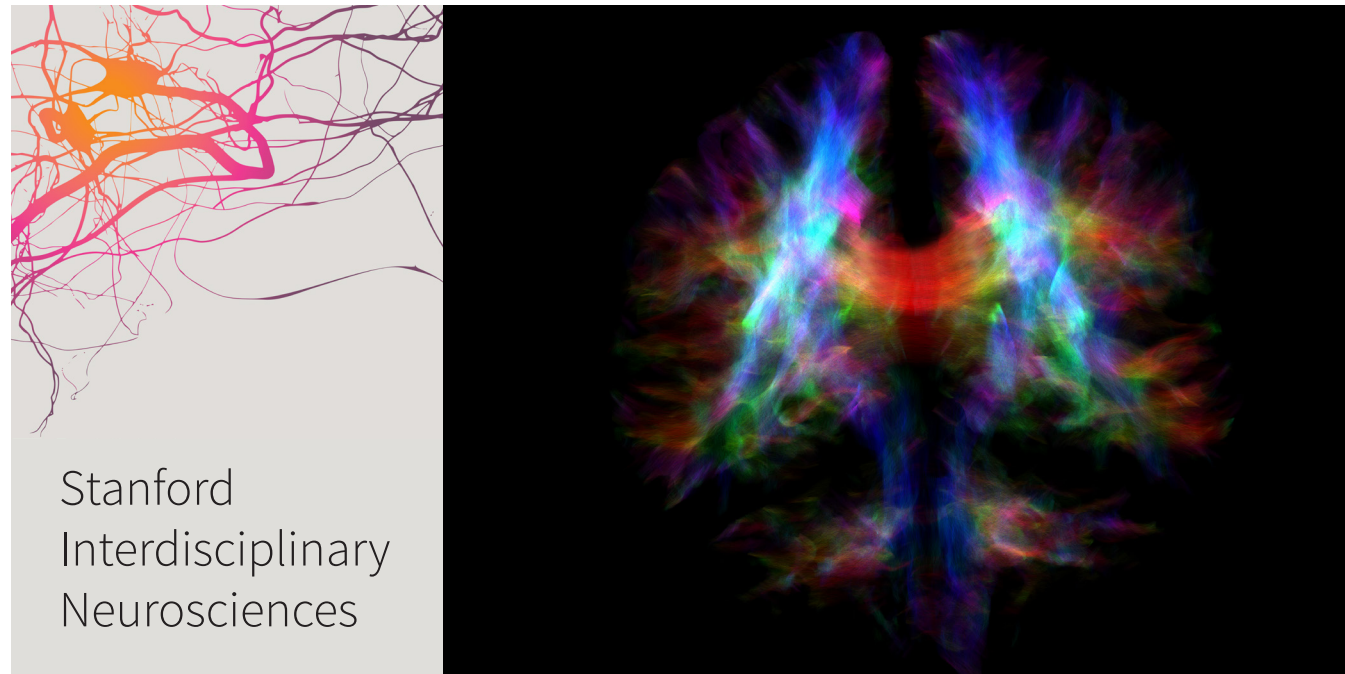
Professor Thomas Clandinin, Chair of the Department of Neurobiology, was named the first Shooter Family Professor. Tom has made important contributions to developmental neurobiology using the fruit fly as a model system. More recently, he has exploited the power of the fruit fly to study circuit mechanisms underlying vision, in the process discovering remarkable similarities between invertebrate and vertebrate motion vision. In addition to his research, Tom is highly respected throughout the Stanford neurosciences community for his devoted service to the community and his excellence as a teacher. Clandinin beautifully embodies the academic and community values of Dr. Eric Shooter himself, and we are delighted to appoint him as the inaugural holder of the Shooter Chair.

Our seven Big Ideas teams made substantial strides during their second year of phase 1 funding. We are currently in the process of a rigorous scientific review of the seven projects; the most promising will progress to phase 2 with more significant funding. We hope to offer a second round of phase 1 big ideas in the future. Our seed grant teams are in their second year of work, and we will announce a call for our second round of seed grants in Winter 2017.

The Institute is committed to training young interdisciplinary neuroscientists—a vital priority given the rapid changes in modern neuroscience research. We awarded four new fellowships to talented, cross-disciplinary postdoctoral scholars, and awarded two Mark and Mary Stevens Interdisciplinary Graduate Fellowships in the neurosciences. Both awards involve faculty mentors from the Schools of Humanities & Sciences, Engineering and Medicine.

In the coming year, we anticipate breaking ground on the new interdisciplinary research center, identifying the faculty who will occupy the center, and developing new programs to support the neurosciences at Stanford. We are grateful for the dedicated support and involvement of a large number of neuroscientists from diverse schools and departments—we couldn't do it without you!

William T. Newsome, Ph.D.  
Vincent V.C. Woo Director, Stanford Neurosciences Institute  
Harman Family Provostial Professor, Professor of Neurobiology, HHMI Investigator



The Stanford Neurosciences Institute fosters interdisciplinary research furthering our knowledge of the brain and behavior in health and disease. Understanding the human brain, our most complex organ, is no longer a problem for biology and psychology alone. We seek to build bridges between clinical and basic neuroscience and other disciplines, bringing a broad set of ideas, methods, techniques and technologies to bear on unraveling the mysteries of the three pounds of matter between our ears. In our third year, our research teams made great progress in broad areas of neuroscience, from the molecules in our synapses, to identifying and understanding the networks of neurons that control perception, thought, memory and behavior, to treatments of psychiatric and neurological disease and developing policy.

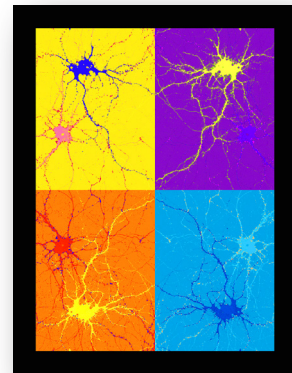
The research emphases of the Stanford Neurosciences Institute fall into three broad categories:

**NeuroDiscovery** - probing the inner workings of the brain

**NeuroEngineering** - creating innovative new technologies for interfacing with the brain

**NeuroHealth** - translating neuroscience discoveries into treatments

Our flagship research initiatives - *Big Ideas in Neuroscience*, are into their second year of phase 1 work. Seven teams of researchers spanning the Schools of Medicine, Engineering, Humanities and Sciences, Law and Education are tackling fundamental problems with the goal of



transforming neuroscience. In fiscal year 2017, the most promising teams will be selected to receive more significant support during phase 2. Smaller, more focused teams are using our *Seed Grant* funding to launch novel interdisciplinary projects that may develop into more significant advances in the future.

The *Stanford Program in Neuroscience and Society* has been developing a white paper on neuroscience prediction. The team is assessing the scientific possibilities of improved prediction of dyslexia, schizophrenia and Alzheimer's disease and their social consequences.

The heart of our Institute is our community, and we successfully recruited **Julia Kaltschmidt** as an associate professor in the Department of Neurosurgery. Her work focuses on the molecular neuroscience of the spinal cord and peripheral nervous system. We look forward to her joining Stanford in the Spring of 2017.

**Thomas Clandinin** was appointed as the *Shooter Family Professor*. Clandinin is the Chair of the Department of Neurobiology, and his work focuses on how neuronal circuits in the brain compute information, using the visual system of the fruit fly.

Neuroscience is in a renaissance period of rapid technological change. Our young scientists are the future of the field, and the Institute invests in training and mentorship for their future careers. In the past year, we awarded postdoctoral fellowships to four *Interdisciplinary Scholars* focusing on research areas from physics to psychiatry. Two *Mark and Mary Stevens Interdisciplinary Graduate*



*Fellowships* were awarded to students studying navigation systems in the brain and why neurons die in disease.

The Neurosciences Institute gathers our community to learn about and share recent discoveries at our Annual Symposium and our weekly Seminar Series. Our *Third Annual Symposium* was held on October 13, 2016, and we welcomed Connie Cepko (Harvard) and Tom Dean (Google Research). Speakers from Stanford included **Helen Bronste-Stewart** (John E Cahill Professor in neurology), **Keith Humphreys** (psychiatry), **Mark Schnitzer** (biology and applied physics), and **Tony Wyss-Coray** (neurology).

We hosted 33 speakers in our weekly *Neurosciences Institute Seminar Series*. Speakers are nominated by members of our community, and represent a wide diversity of disciplines. Eminent speakers this past year included Helen Mayberg (Emory University School of Medicine), Eric Nestler (Mt. Sinai), Bernardo Sabatini, (Harvard Medical School), Carol Barnes (University of Arizona) and Margaret Livingstone (Harvard Medical School).

In January 2016, four *NeuroChoice* Big Ideas team leaders attended the World Economic Forum conference in Davos, Switzerland. They lead an IdeasLab panel on the neuroscience of decision-making, introduced by Francis Collins, Director of the National Institutes of Health. **Brian Knutson** participated in a panel discussion entitled, "What If: Your Brain Confesses?" Other participants were **Deborah Gordon** (biology), **Keith Humphreys** (psychiatry) and **Rob Malenka** (Nancy Friend Pritzker Professor in psychiatry).

In September, fifty of our graduate students, postdocs and faculty learned the essentials of R at a Software Carpentry Workshop sponsored by the Institute. Our workshops teach important data analysis skills which are increasingly vital as the volume and complexity of

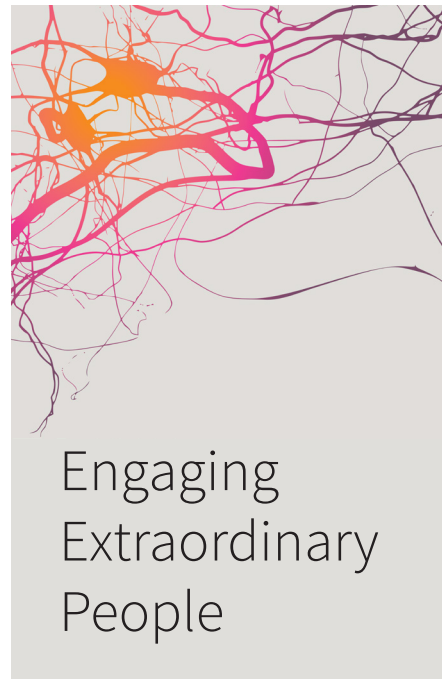
neuroscience data expands with the development of new experimental tools for neuroscience.

The Institute held its first *Art of Neuroscience* contest, and we received many beautiful entries from students, postdocs and faculty. Eleven finalists were selected, and their works were displayed at our Annual Symposium.



Also at the symposium, we presented the 8th Annual *Sammy Kuo Awards in Neuroscience*. The Sammy Kuo Awards encourage meritorious neuroscience research at the postdoctoral and graduate levels at Stanford. The postdoctoral award winner was **Peng Li**, from the lab of Mark Krasnow (biochemistry), and the graduate student winner **Nicholas Kramer**, from the lab of Aaron Gitler (genetics).

After two years of planning, the construction design of the new *Research Complex for Stanford Neurosciences Institute and ChEM-H* was completed. We expect to break ground on the facility in Fall 2016, and eagerly await the completion of what will become the hub for interdisciplinary neurosciences at Stanford University. We plan to house 24 faculty labs, 6 neuroscience service centers, and numerous collaboration and meeting spaces within.



## Engaging Extraordinary People



### Shooter Family Professor Named

**Thomas Clandinin** (neurobiology), was appointed the first *Shooter Family Professor*. Clandinin's work focuses on how neuronal circuits in the visual system of the brain compute motion. Clandinin has primarily studied the visual system of the fruit fly, called *Drosophila*. The professorship is a gift from Eric and Elaine Shooter. Eric Shooter is a professor of neurobiology, emeritus, whose work has largely focused on how nerves grow. The Shooters hope this endowment will promote innovative and collaborative interdisciplinary research that will lead to breakthroughs in the understanding of brain function and human behavior.

### New Faculty

**Julia Kaltschmidt** will join the Institute as an associate professor in neurosurgery. With training in developmental biology and neuroscience, Kaltschmidt has held an independent faculty position at Memorial Sloan Kettering Cancer Center. She currently studies synapse formation in the spinal cord, and plans to study the gut nervous system, an extensive peripheral 'brain' composed of millions of neurons that regulate all gastrointestinal functions, but is poorly understood. We look forward to her arrival at Stanford in Spring 2017.

### Faculty Awards and Honors

Several faculty associated with Stanford Neurosciences Institute were awarded major prizes or were appointed to preeminent academies.

**Karl Deisseroth** (D.H. Chen Professor in bioengineering and psychiatry) has been named a recipient of this year's *Massry Prize* and a \$3 million *2016 Breakthrough Prize* in life sciences for his contributions to the development of

optogenetics, a technique that uses light to control the behavior of cells and has proved especially invaluable in the study of nerve-cell circuits in the brain.

**Carla Shatz** (Sapp Family Provostial Professor in neurobiology and biology, director of Bio-X) won the *Kavli Neuroscience Prize* along with Eve Marder of Brandeis University and Michael Merzenich of the University of California, San Francisco for the discovery of mechanisms that allow experience and neural activity to remodel brain function.

**Tony Wyss-Coray** (neurology and senior research career scientist at the Palo Alto Veterans Administration) received a *National Institutes of Health Pioneer Award*. Wyss-Coray's group studies the role of immune and injury responses in brain aging and neurodegeneration, with a focus on Alzheimer's disease.

Two professors were elected to the *National Academy of Engineering*: **Peter Kim** (biochemistry) for his work developing novel drugs and vaccines that are used worldwide, and **Scott Delp** (bioengineering and mechanical engineering, deputy director of Neurosciences Institute) for his computer simulations of human movement and their applications to the treatment of clinical movement pathologies.

Four faculty were elected to the *American Institute for Medical and Biological Engineering College of Fellows*:

**Kwabena Boahen** (bioengineering) uses silicon integrated circuits to emulate the brain. **Karl Deisseroth** (D.H. Chen Professor in bioengineering and psychiatry) develops techniques, including optogenetics, to examine and alter brain circuits. **Christina Smolke** (bioengineering) engineers functional RNAs to access and control information in genetic systems, and yeast biosynthesis platforms for complex plant natural products. **Garry Gold** (radiology)



uses advances in imaging technology to improve diagnosis and treatment of musculoskeletal problems.



### 2016 Interdisciplinary Scholars

We presented four outstanding postdoctoral scholars with *Interdisciplinary Scholar Awards*. The award includes a two-year fellowship and participation in a program for career development and network-building.

**Alan Ceaser** (psychiatry)  
Sponsor: Jong Yoon (psychiatry)

The goal of Dr. Ceaser's research is to better understand the neural mechanisms of complex cognition like working memory and executive control, particularly in the context of psychiatric diseases like psychosis, and to translate this work to improve treatment outcomes and functioning of individuals with psychotic spectrum disorders.

**Georges Goetz** (neurosurgery)  
Sponsor: E.J. Chichilnisky (neurosurgery and ophthalmology)

Dr. Goetz is developing new recording systems and computational frameworks for understanding how the primate visual system processes visual information. This will provide the first complete characterization of how a behaviorally significant neural computation is performed by large ensembles of sensory neurons.

**Peter Maurer** (physics)  
Sponsor: Steven Chu (physics and molecular and cellular physiology)

Dr. Maurer's work focuses on the development of novel nanoscale imaging techniques that aim at overcoming some of the problems commonly associated with imaging neural systems.

**Andrew Whittle** (psychiatry)  
Sponsors: Luis De Lecea (psychiatry), Bianxiao Cui (chemistry)

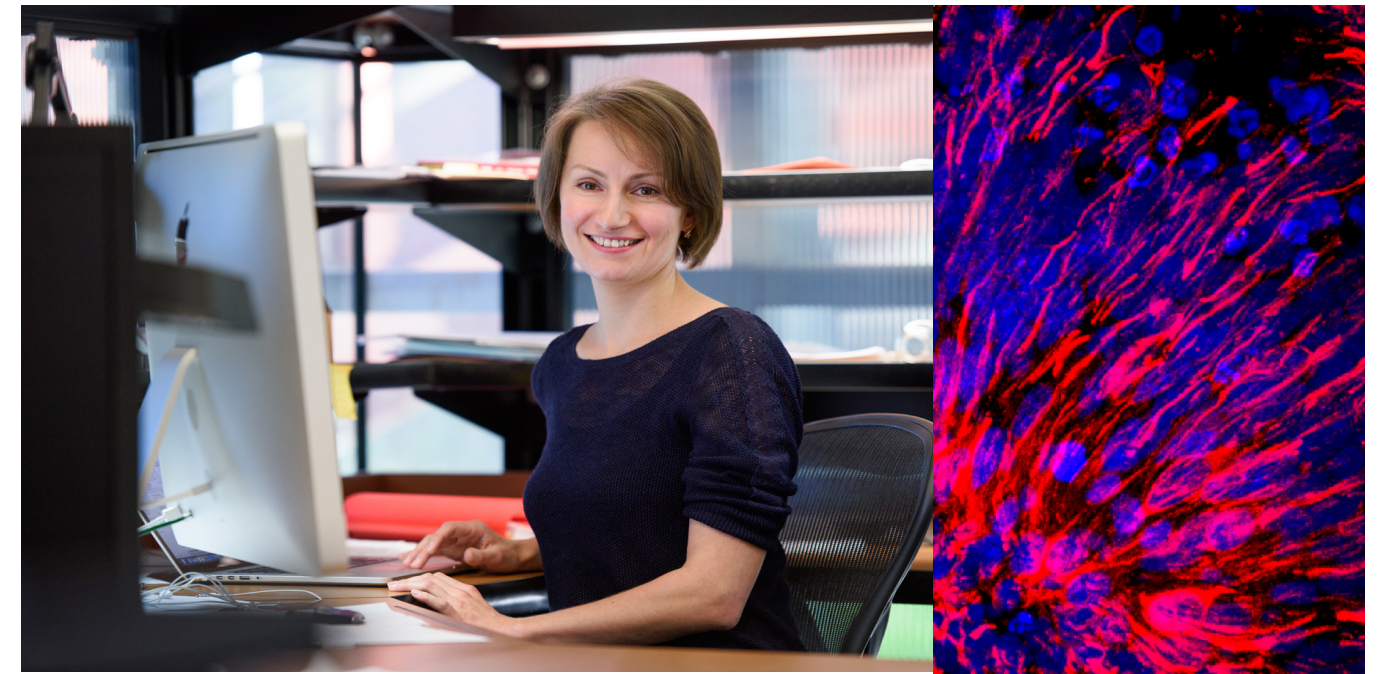
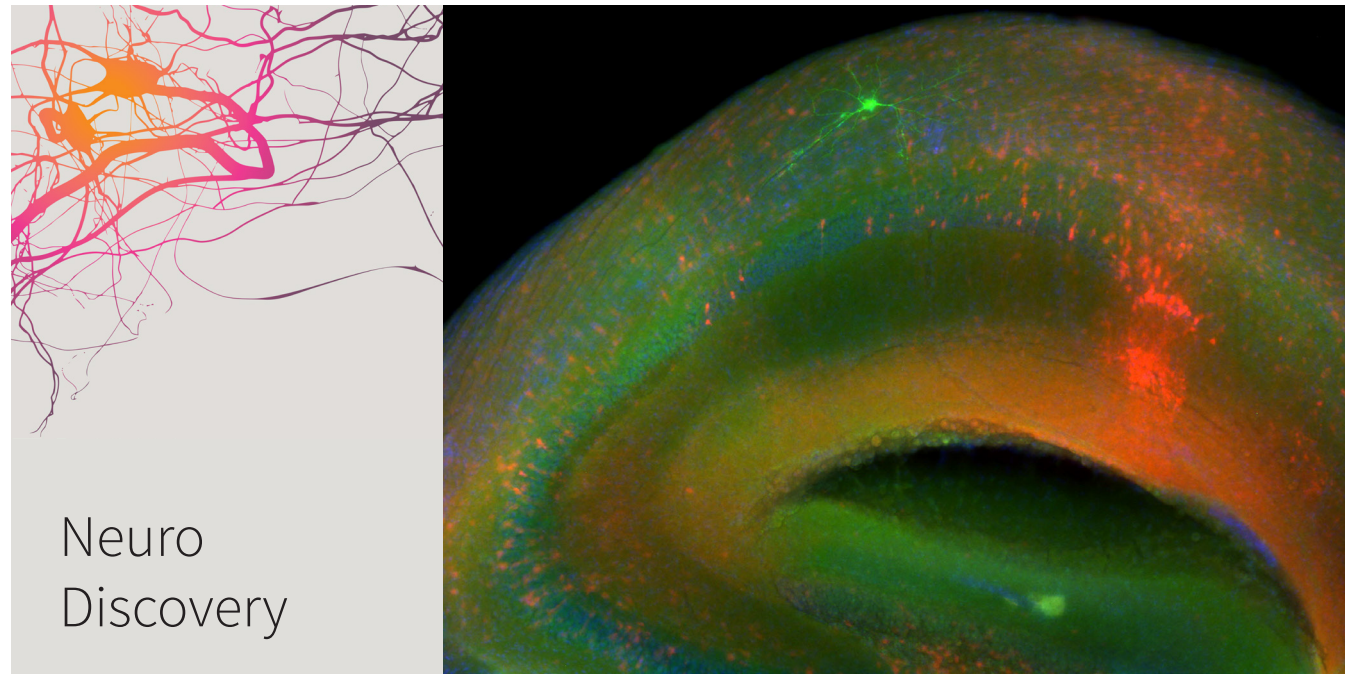
Dr. Whittle's project will utilize nano-scale electrode arrays to measure the sympathetic nervous system activity in brown adipose tissue in real-time, following modulation of the activity of specific neurons.

### 2016 Stanford Interdisciplinary Graduate Fellowships

Two remarkable graduate students were named Mark and Mary Stevens Interdisciplinary Graduate Fellows.

**Kiah Hardcastle** (neurobiology)  
Advisors: Lisa Giocomo (neurobiology), Surya Ganguli (applied physics)  
*A principled investigation into the heterogeneous coding properties of medial entorhinal cortex that support accurate spatial navigation*

**Kevin Guttenplan** (neurobiology)  
Advisors: Ben Barres (neurobiology), Michael Bassik (genetics)  
*Understanding why neurons die in disease*



## Probing the inner workings of the brain

### Big Ideas In Neuroscience

#### NeuroChoice

Probes how the brain makes decisions and expands that to influence public policy and economic decisions.

**Brian Knutson** (psychology), **Keith Humphreys** (psychiatry), **Rob Malenka** (psychiatry)

Our decisions define the quality of our lives as well as those of future generations. How do we decide when to play it safe, and when to go for broke? Our team has mapped brain circuits in mice that govern risky choice and use of psychoactive drugs. Functional MRI shows that similar circuits in humans are activated when making decisions to gamble or invest. We are examining evolutionarily conserved brain circuits at multiple levels of analysis across different species. We aim to establish conceptual and substantive links across levels of analysis -- from neural circuits to individual choice to group tendencies. Such links could spark major advances both in basic neuroscience research and in the application of neuroscientific findings to enduring social problems such as substance abuse, gambling and overeating.

#### NeuroCircuit

Combines a detailed understanding of brain circuits with technology that modulates neural activity to develop im-

proved ways of treating mental health conditions.

**Amit Etkin** (psychiatry), **Stephen Baccus** (neurobiology)

Decades of brain imaging research have generated pictures of the brain in action – both in healthy individuals engaged in acts of thinking and feeling and in patients with brain diseases who are impaired in those capacities. We still don't understand how brain circuits work together to produce these abilities, or how to use this information to develop new therapies for brain diseases. In fact, treatments for psychiatric disorders have not meaningfully progressed in decades, and we have little understanding as to how these interventions work. We are innovating technology for magnetic and ultrasound stimulation which can modulate brain activity non-invasively. Using brain stimulation tools with unprecedented power and precision, we will achieve a mechanistic understanding of how human brain circuits control cognitive and emotional behaviors. This will enable us to design and test a range of new treatments for psychiatric disorders.



#### NeuroVision

Develops optical technologies that enable neuroscientists to visualize the brain in unprecedented detail.

**Steve Chu** (molecular and cellular physiology), **Liqun Luo** (biology), **Tom Südhof** (molecular and cellular physiology)

Precisely flawed nanodiamonds could produce next-generation tools for imaging individual molecules in neurons. It starts with diamondoids, the tiniest possible specks of

diamond, found naturally in petroleum fluids. We use diamondoids to seed the growth of flawless, nano-sized diamonds in a lab at Stanford. By introducing other elements, such as silicon or nickel, during the growing process, we hope to make nanodiamonds with precisely tailored flaws that can produce single photons of light for next-generation optical communications and biological imaging. We aim to develop those nanodiamonds into miniature tools for imaging individual molecules in neurons.

### Seed Grants

#### *In vivo selection for gene mutations that counteract photoreceptor degeneration*

**Douglas Vollrath** (genetics), **Michael Bassik** (genetics), **Monte Winslow** (genetics and pathology)

Diseases involving death of nerves in the brain, such as Alzheimer's disease and age related macular degeneration, are a major health problem. Numerous disease models exist in which animals are born with a normal complement of nerves, but particular types of nerves degenerate over time. We seek to determine genes with mutations that can increase the survival of fatally flawed nerves. The genes/proteins we identify will be excellent targets for therapy development.

#### *Brain mechanisms of spatial reasoning in mathematics*

**James McClelland** (Lucie Stern Professor in psychology), **Bruce McCandliss** (education), **Anthony Norcia** (psychology)

Mastering the ability to form appropriate spatial representations from numerical and mathematical expressions is an essential step toward success in mathematics,

engineering, and the quantitative sciences. Very little is currently known about how our brains map numbers onto space, and even less is known about how education and experience shape these important neurocognitive processes. Ultimately, this work may lead to improved methods for enhancing mathematical ability.

#### *Creating an advanced transgenic animal model of autism*

**Karen Parker** (psychiatry), **Alexander Urban** (psychiatry and genetic), **Megan Albertelli** (comparative medicine), **Joachim Hallmayer** (psychiatry)

Autism is a highly genetic developmental brain disorder characterized by social impairments. Unfortunately, the basic biology of autism remains poorly understood. Consequently, there are currently no laboratory tests to detect, nor effective medications to treat, autism's disabling social deficits. Barriers to progress include the inability to directly study brain tissue in patients, and the fact that mice are poor models because they lack the complex social capabilities found in humans. There is tremendous value in creating transgenic marmosets, with stable large deletions in their genomes that resemble similar deletions found in humans, and which strongly predispose for autism. We have begun stably and precisely engineering relevant large deletion CNVs into the genome of marmoset stem cells. Future development of this model, including creation of a transgenic marmoset colony at Stanford, will seek to accelerate the discovery of autism biomarkers and novel drug targets, and streamline the development of the first effective medications to improve social functioning in people with autism.



## Neuro Engineering

### Creating innovative new technologies for interfacing with the brain

#### Big Ideas in Neuroscience

##### *Brain-Machine Interface*

Developing technology to interface with the brain and create intelligent prosthetics

**Kwabena Boahen** (bioengineering), **E.J. Chichilnisky** (neurosurgery and ophthalmology)

Future brain-machine interfaces will transform medicine, technology and society. The coarse neural stimulators currently used to treat illnesses ranging from deafness to Parkinson's disease will be replaced by a new generation of devices that both sense and stimulate the human nervous system, interacting with the brain using its native code. Our team is developing new electro-neural brain interfaces, brain-controlled motor prostheses, and retinal prostheses. Tens of millions of people suffering from blindness, paralysis and other neurological injuries or diseases, stand to benefit from this advance. Future devices will likely not only restore, but also augment, human capacities.

##### *NeuroFab*

Creating an incubator for next-generation neural interface platforms.

**Nick Melosh** (materials science)

The NeuroFab is a neuro-technology 'incubator' for developing next-gen neural interface platforms, enabling

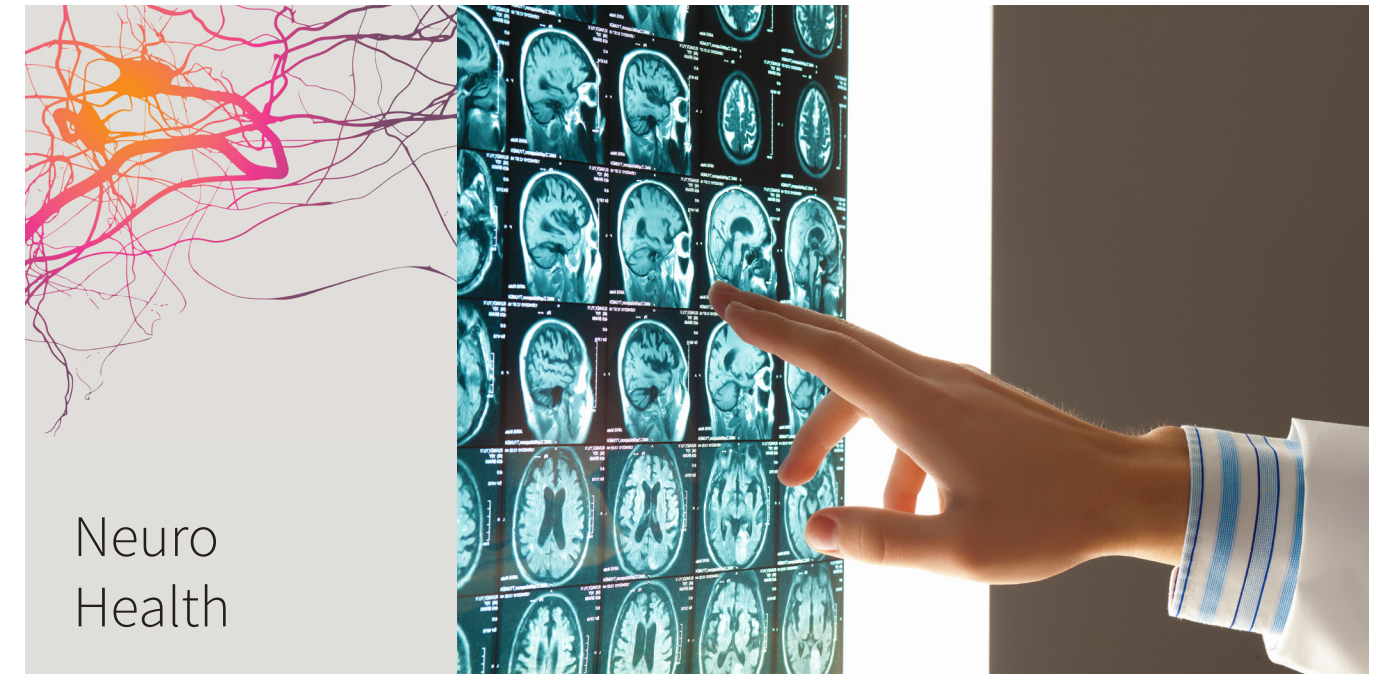
experts in the fields of engineering and nanotechnology to bring new ideas into the neuroscience space in close interaction with leading neuroscientists to achieve truly revolutionary capabilities. The NeuroFab will create a creative and active community of engineers and biologists working together without the technical and biological barriers typically associated with beginning new projects in this area. The NeuroFab will operate a "Hub" facility where new ideas can be rapidly implemented and tested, accelerating the pace of research and eventual translation to the clinic.

#### Seed Grant

##### *Massively parallel microwire arrays for deep brain stimulation*

**Jun Ding** (neurosurgery), **Nick Melosh** (materials science)

Parkinson's disease affects seven to ten million people worldwide, and the most severe cases are treated using Deep Brain Stimulation. This technique uses a large electrode to apply high frequency electrical stimulation. However, this single electrode indiscriminately affects the entire region around the implantation site. We are developing massively parallel electrode arrays (10,000+ electrodes) to deliver different spatiotemporal patterns of activity to optimize therapeutic efficacy. We are engineering bundles of microwires, each microwire is thinner than human hair. We will use a small LED display (similar to an iPhone camera) to deliver patterned stimulation by 'playing a video' on the display chip, where each pixel is connected to a microwire. This fiber based stimulation system can be implanted into the brain and provide high-resolution stimulation capabilities. This will allow more optimization of stimulation for individual patients and particular disorders, yielding more successful treatment outcomes.



## Neuro Health

### Translating neuroscience discoveries into treatments

#### Big Ideas in Neuroscience

##### *Brain Rejuvenation*

Focusing on mechanisms of brain maintenance and regeneration

**Tony Wyss-Coray** (neurology), **Aaron Gitler** (genetics)

Aging leads to a precipitous loss of cognitive faculties and it is the key risk factor for dementia and neurodegenerative diseases. Many new genetic factors causing neurodegeneration have been identified but how they cause disease and how aging modulates disease is unknown. Our team of leading aging researchers, neuroscientists, chemists, and engineers strive to understand the basis of brain aging and rejuvenation and how they relate to neurodegeneration. The mission of the project is to slow or reverse aging to maintain brain function and extend health span, to rejuvenate brains for the treatment of neurodegenerative and neurological diseases, to understand mechanisms of neurodegenerative diseases, and to develop innovative therapeutic strategies. Our focus is on characterizing blood-based brain rejuvenation factors and mechanisms of neurodegeneration. We will also be able to identify novel neurodegenerative disease mechanisms by employing state-of-the-art screening platforms developed at Stanford.

##### *Stroke Collaborative Action Network*

Breaches barriers in our understanding of stroke to develop therapies and improve stroke recovery

**Marion Buckwalter** (neurology), **Maarten Lansberg**

(neurology)

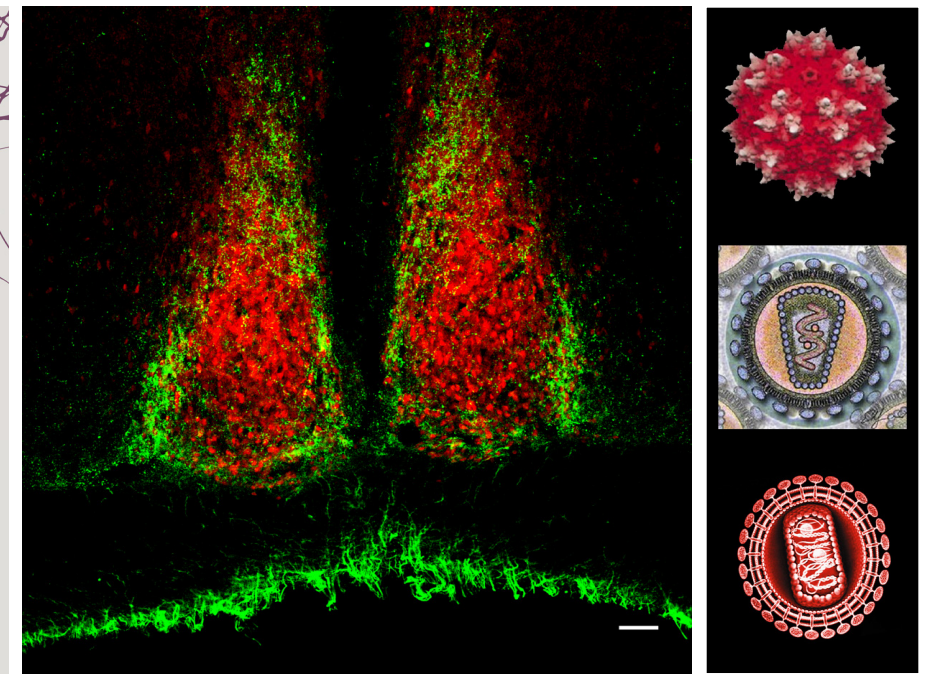
Stroke is the number one cause of serious long-term disability, affecting 7 million people in the United States alone. Despite this there is no proven treatment for stroke recovery and little understanding of why some people recover well while others do not. We will transform the way stroke research is performed by bringing together a team of Stanford faculty from wide-ranging disciplines to discover the mechanisms that underlie successful recovery and develop therapies that restore function after stroke. We are beginning to uncover basic truths about how the brain recovers from stroke and have generated new engineering solutions to measure and enhance recovery. Our team found that stroke induces a prolonged inflammatory response in the brain which impairs successful recovery and can lead to post-stroke cognitive decline. We will characterize the immune response after stroke, correlate it with cognitive and motor functioning, and test novel immunomodulatory treatments.

#### Seed Grant

##### *A novel PET radioligand to identify microglial inflammation in Alzheimer's disease*

**Katrin Andreasson** (neurology), **Michelle James** (radiology), **Sanjay Malhotra** (radiation oncology)

This interdisciplinary effort is aimed at developing a new PET ligand for imaging microglial inflammation in Alzheimer's disease. A novel PET agent targeting inflammation will have great potential for clinical translation and may impact many aspects of Alzheimer's disease research, including early detection and diagnosis and playing a crucial role in the development and translation of new disease-modifying therapeutics.



### Research Complex for Stanford Neurosciences Institute and ChEM-H

The construction design for the new research center that will serve as the hub for the Neurosciences Institute and Stanford ChEM-H was finalized and approved. Construction will be getting underway in Fall of 2016. The 235,000 square foot facility will be home to 24 interdisciplinary neuroscience laboratories, critical neuroscience core facilities, and vibrant meeting and interaction spaces. By bringing building residents together and drawing in researchers and students from many disciplines across campus, we will create an intellectual collaboration zone where serendipitous encounters could lead to breakthrough neuroscience discoveries. “This building is a physical manifestation of Stanford’s commitment to breaking down barriers between disciplines,” says Ann Arvin, vice provost and dean of research.

Embracing a light-filled courtyard, the Neuroscience wing of the center will provide state-of-the-art laboratories with bright, open shared spaces as well as customized zones for specialized equipment and techniques. Three to five faculty and their labs will be grouped into neighborhoods, where their trainees will work side-by-side with colleagues from different schools and departments. The second floor has a large, bright, two-story open space – the living room – with comfortable furniture, tables and white boards where researchers will come to mingle and interact when they want to get away from their experiments.

Another unique space is the neuroscience theory center. Surrounded with glass and embedded in the living room, this three-story structure within the building places theorists, who often work tucked away from view, front and center physically and intellectually. Reaching the import-

ant goal of understanding how the brain computes will require development of novel theories, and institute hopes to recruit the best and brightest to become a key center in this area.

Essential equipment will be available to researchers campus wide through the neuroscience core facilities. Gene viral vector, induced pluripotent stem cell, human neuroscience, advanced microscopy lab and animal brain imaging labs are all planned for the center.

In early 2017, the first building occupants from the institute will be selected. The anticipated move-in date for the center is Spring 2019.

“I really do believe the future of neuroscience is going to be collaborative,” Newsome says. “Being co-located with ChEM-H will bring neuroscientists in contact with chemists who are interested in biological applications.”

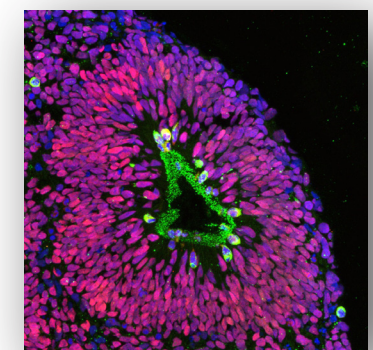


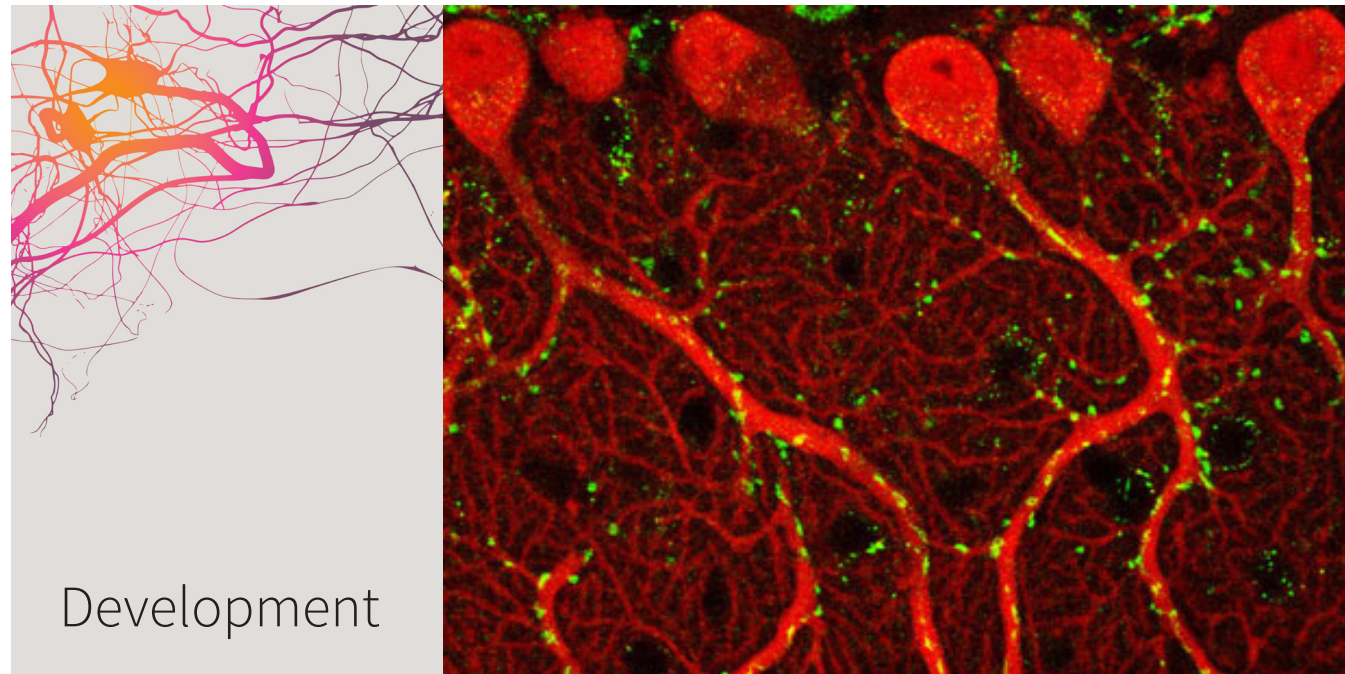
### Neuroscience service centers

Stanford Neurosciences Institute facilitates the efforts and productivity of a broad array of neuroscientists by providing core facilities and services. These cores allow researchers to access tools, techniques and expertise that would be costly or impractical to replicate in individual laboratories. **Gary Steinberg** (neurosurgery) and **Mehrdad Shamloo** (neurosurgery) direct a trio of neuroscience cores. The *Stanford Behavioral and Functional Neuroscience Laboratory* is a preclinical discovery platform providing expertise in all aspects related to the design and implementation of behavioral experiments as well as data analysis and interpretation. The *Neuroscience Microscopy Service* provides access to high-end, capital-intensive microscopy equipment that is often not available to individual labs. The *Gene Vector and Virus Core* creates vectors for virally mediated molecular manipulations which allow unprecedented experimental control over synapses, cells and circuits in model systems as well as in vivo in the mammalian brain. Together, the three cores have supported more than 150 laboratories throughout Stanford with more than 13,000 hours of services in the past year. The cores provide services that are well-matched to the faculty’s funded research aims, as demonstrated by 29 peer-reviewed publications and 6 manuscripts in preparation.

**Joachim Hallmayer** (psychiatry), **Richard Reimer** (neurology) and **Sergiu Pasca** (psychiatry) launched a new *Neuroscience Induced Pluripotent Stem Cell (iPSC) Core* in 2015 in collaboration with psychiatry and the Neurosciences Institute. Technology for generating induced pluripotent stem cells (iPSC) allows the derivation of neural tissues directly from patients with neural or psychiatric disorders and healthy individuals alike, and has tremendous potential for research and individualized medicine.

We plan to introduce new cores when the research center opens in 2019, including a human neuroscience core, a small animal imaging facility and a sandbox laboratory for training the next generation of interdisciplinary neuroscientists.





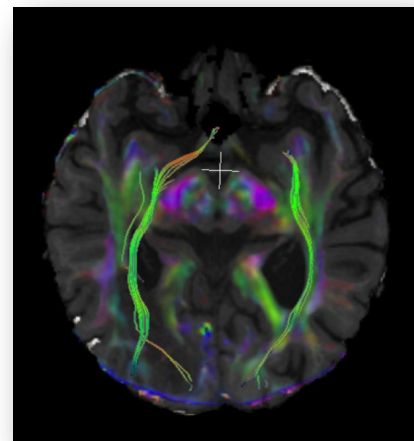
## Development

Development efforts continue to focus on awareness building, engagement and cultivation strategies with high-end volunteer leaders and potential donors. Thanks to the efforts of President Hennessy's ChEM-H/Neuro Task Force, which held its final meeting last year, the Stanford Neurosciences Institute strengthened its positioning and compelling messages, leading to the engagement of a broader group of alumni, parents, and friends.

Additional activities included personalized stewardship reports for donors who support the Big Ideas in Neuroscience research initiative as well as interdisciplinary graduate student fellowships. Further, the development team facilitated faculty speaker events, including special gatherings in Los Angeles, CA and Greenwich, CT, as well as many individual meetings with potential donors involving faculty leaders.

In FY2016, the Stanford Board of Trustees gave approval for the design of a new interdisciplinary research complex that would serve as the home base for the Stanford Neurosciences Institute and Stanford ChEM-H. This approval has led to increased efforts by the development team to engage and involve potential donors in support of this state-of-the-art facility. Progress is well underway toward securing significant gifts in support of the new research complex as well as priority programs within the Institute.

Working in partnership with various colleagues over the last 18 months, new gifts and pledges were secured totaling over \$6 million. These gifts include support for phase 2 of the Big Ideas program, endowed funds for interdisciplinary graduate fellowships, and expendable support for various priorities.



Development is also working with faculty leaders to help establish a new interdisciplinary council for the Dean of Research, which will bolster the flourishing bioscience institutes—Stanford Bio-X, the Stanford Neurosciences Institute, and Stanford ChEM-H. While these three institutes have different areas of focus, they have incredible synergies, shared interests, and many faculty members in common. All three strive to foster collaborative research and create new knowledge at the intersections of disciplines. As such, a new advisory council is being formed that will help all three to refine their collective and individual stories and highlight the novel opportunities they provide to advance discoveries and their applications to improve human health and well-being. This new council will include about 35 members, including former Bio-X Council and ChEM-H/Neuro Task Force members, and will have its first meeting in February 2017.



## Our Team

Stanford Neurosciences Institute owes the success of its third year to its leadership and to the dedicated team that makes our events and program happen.

### Executive Committee

**William Newsome** (neurobiology), Vincent V.C. Woo Director and Harman Family Provostial Professor

**Marion Buckwalter** (neurology and neurosurgery)

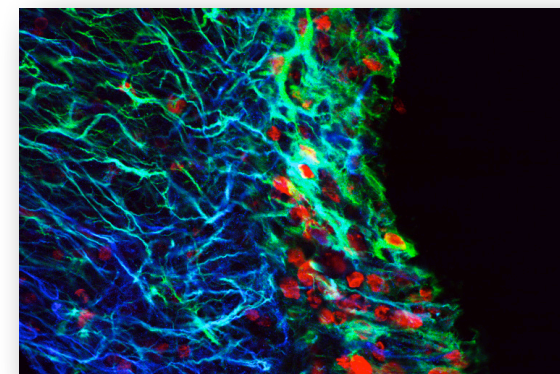
**Scott Delp** (bioengineering and mechanical engineering), Deputy Director and James H. Clark Professor

**Miriam Goodman** (molecular and cellular physiology), Deputy Director

**Robert Malenka** (psychiatry), Deputy Director and Nancy Friend Pritzker Professor

**Brian Wandell** (psychology), Deputy Director and Isaac and Madeline Stein Family Professor

**Tanya Raschke**, Associate Director for Planning and Operations



### Staff

**Tanya Raschke**, Associate Director for Planning and Operations

**Roula El-Asmar**, Program Manager

**Cathy Lau**, Financial Analyst

**Taylor Miller**, Administrative Associate

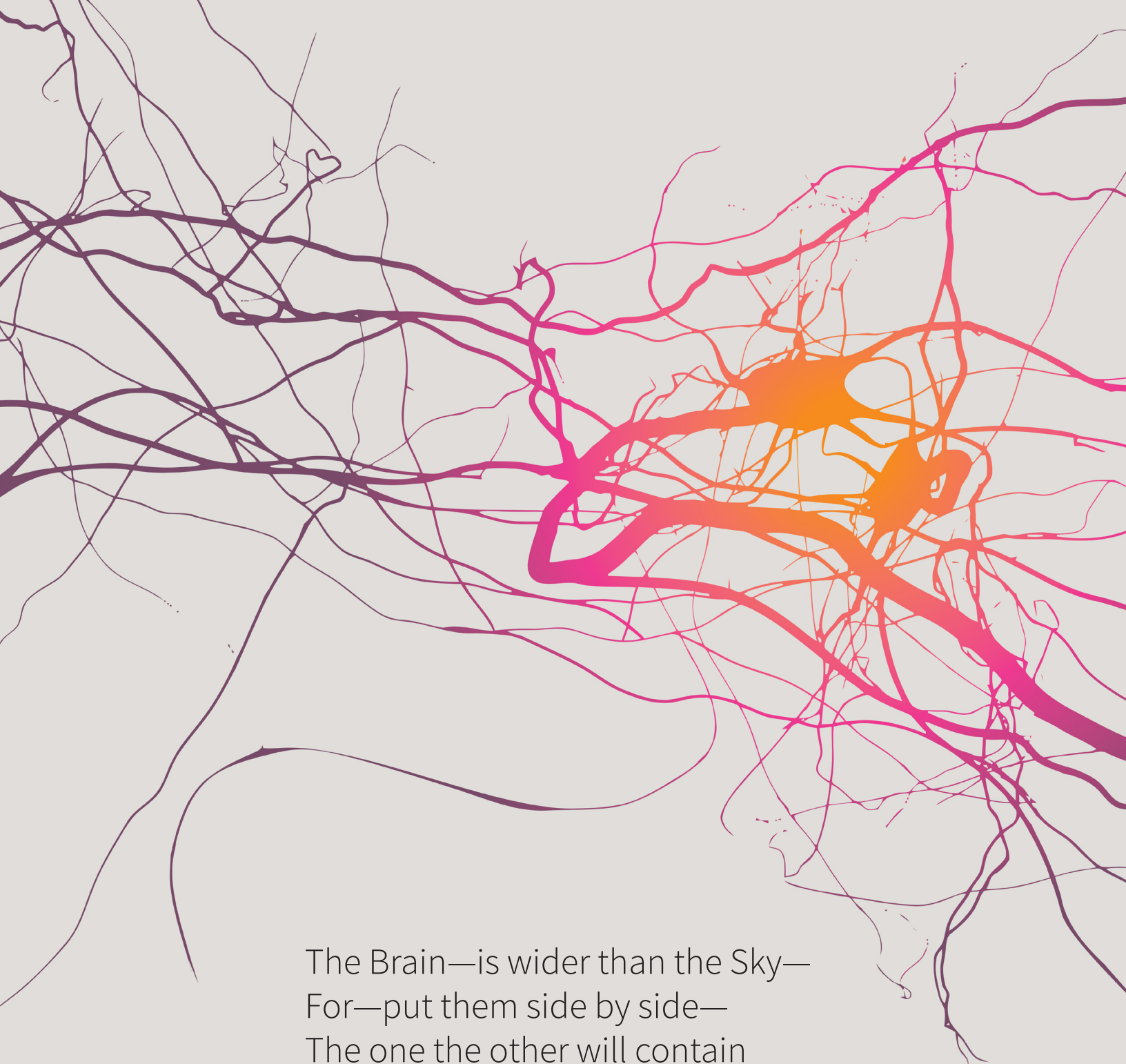
**Maura McGinnity**, Development Director

**Patrick Gutteridge**, Development Director

**Amy Adams**, Communications Director







The Brain—is wider than the Sky—  
For—put them side by side—  
The one the other will contain  
With ease—and You—beside—

-Emily Dickinson

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