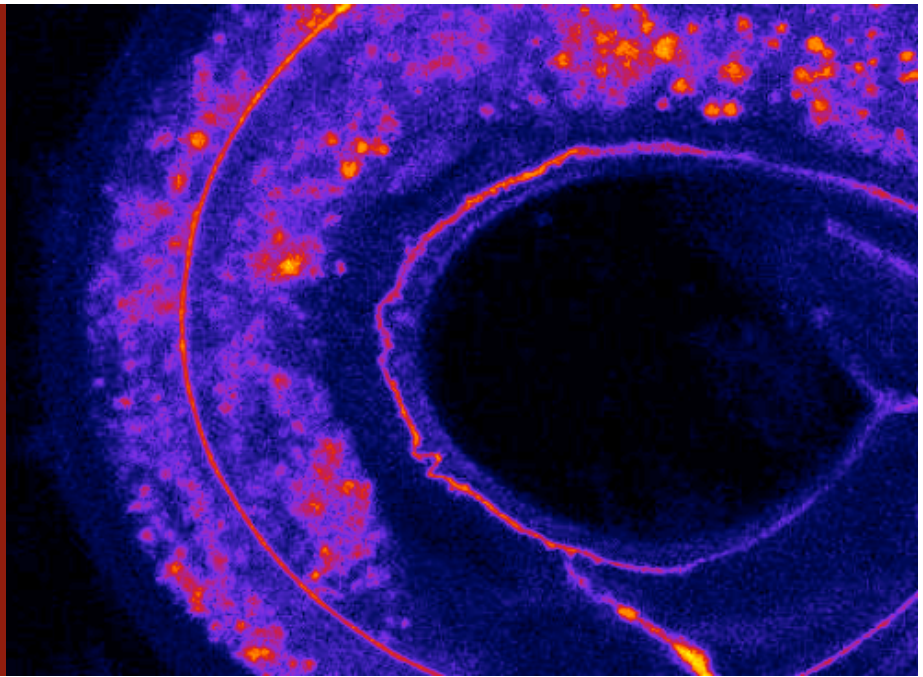




Stanford  
Neurosciences  
Institute

Annual Report 2014

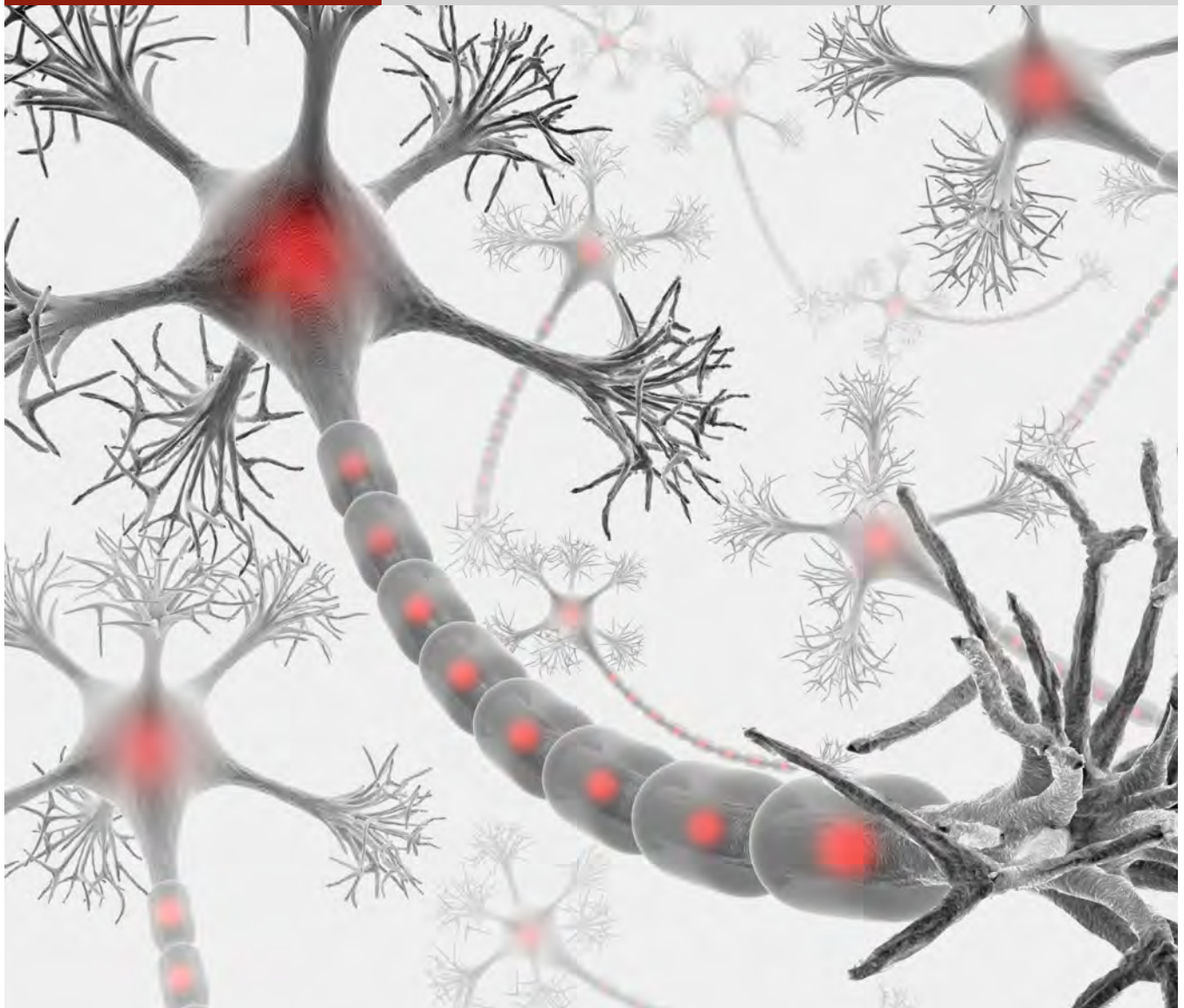
# Contents



- 1 Mission
- 2 Message from the Director
- 3 Introduction
- 4 Engaging Extraordinary People
- 6 Driving Interdisciplinary Research
- 8 Providing Vital Infrastructure

## 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.



## Message from the Director



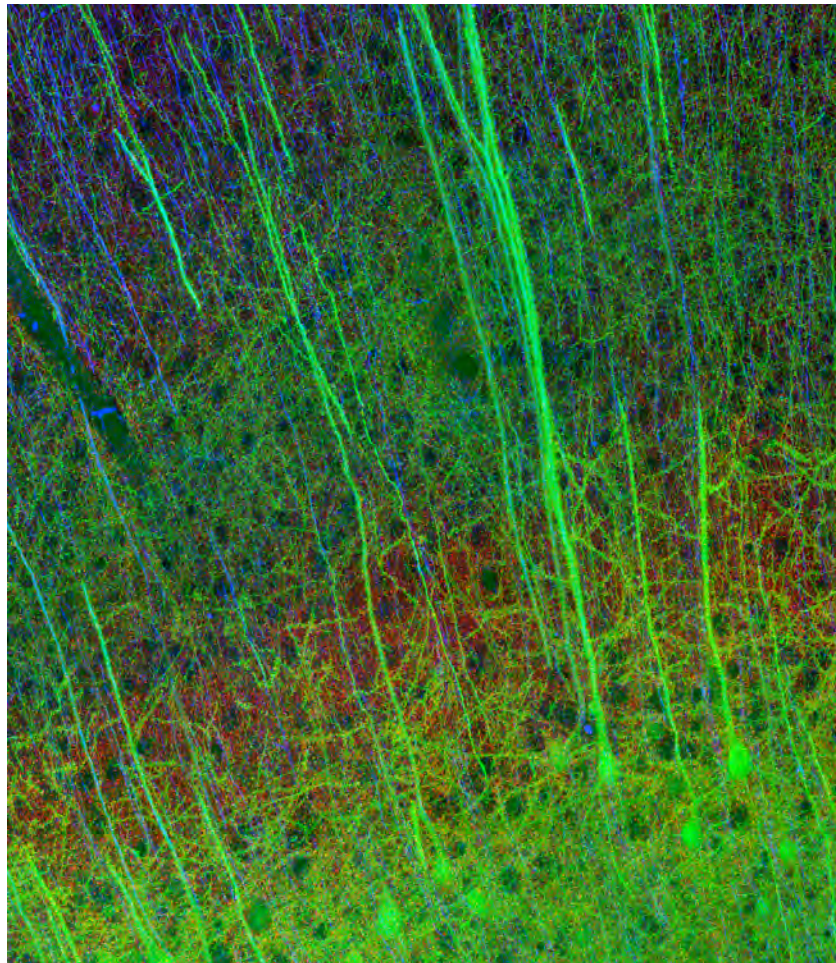
2014 has been transformative for SNI. A year ago we were an embryonic institute, just beginning to engage faculty and feel our way toward a specific research mission. Now we have a firm identity and are a gathering momentum on several important fronts, including catalyzing interdisciplinary neuroscience research, recruitment of new faculty at strategic disciplinary interfaces, fostering communication among existing faculty, training interdisciplinary postdoctoral scholars, planning a new research facility, and fund-raising to support all institute activities—all of which are described in this first SNI annual report. The year has been a whirl of productive activity! The SNI executive committee and I are very pleased with the institute's progress thus far, and we believe that 2015 will be even more productive.

Our signature research program is the *big ideas in neuroscience* initiative, which emerged from a series of 11 faculty dinner/discussions held in the fall of 2013. We challenged faculty to self-organize into broad interdisciplinary teams and imagine anew how Stanford might achieve new breakthroughs on fundamental problems in neuroscience. The resulting proposals were bold, and incorporated faculty from diverse disciplines, including many who had not previously worked in neuroscience. With input from a group of internal reviewers, the SNI executive committee selected 7 proposals for phase 1 funding (see *news article*). The energy generated during the big ideas process was unique in our experience, and we are eager to see these innovative ideas become reality.

The big ideas projects couple with other exciting institute activities, including two interdisciplinary *faculty searches* that are currently underway, and a recently concluded *postdoctoral interdisciplinary scholars competition*. And then there is the small matter of a new SNI research building that is currently in the design process. The coming year will be eventful for SNI, and we want to involve as many of you as possible. I am looking forward to it!

William T. Newsome, Ph.D.

Vincent V.C. Woo Director, Stanford Neurosciences Institute  
Harman Family Provostial Professor  
Professor of Neurobiology, HHMI Investigator



## Understanding the brain and behavior

*The Stanford Neurosciences Institute aspires to unravel the deepest secrets of the human brain—the biological source of thought, emotion and creativity.*

Launched in September 2013, the Stanford Neurosciences Institute (SNI) is a community of scholars working to unlock the mysteries of the brain, drawing from and informing a variety of disciplines, including neuroscience, medicine, psychology, engineering, education, law and business.

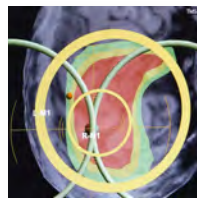
Right now is a critical time in neuroscience, with the emergence of new tools and techniques that are to neuroscience what the telescope is

to astronomy and the microscope is biology. Stanford is the ideal place to exchange new ideas, and invent and apply new tools. We have strength in medicine, basic science and engineering, and a tradition of blurring traditional boundaries between disciplines.

SNI is shaping the future of neuroscience in three areas: **NeuroDiscovery**, **NeuroEngineering** and **NeuroHealth**. We are engaging extraordinary people, driving interdisciplinary research, and developing vital infrastructure to enable our goals.

Highlights of our first year include:

- The **Big Ideas in Neuroscience** competition, where we challenged Stanford researchers to form new teams and set their sights on making bold advances in the field.
- We launched the SNI **Interdisciplinary Scholars Awards** to support the training of promising young postdoctoral scientists.
- The **Fundamental Themes in Neuroscience** seminar series brought 33 top neuroscientists from around the country to share their latest discoveries.
- Finally, we held our inspiring **Inaugural Symposium** on October 9 & 10, 2014.



## Engaging Extraordinary People



### Beginnings: leadership, strategy and a table for ten

Under the direction of Bill Newsome, the SNI executive committee was established and includes deputy directors Brian Wandell (psychology), Scott Delp (bioengineering and mechanical engineering), Miriam Goodman (molecular and cellular physiology), Robert Malenka (psychiatry) and associate director Tanya Raschke. The committee rapidly established the strategic goal of engaging extraordinary people, starting with faculty. At a series of dinners in the Fall/Winter, 111 faculty participants sat down together 10 at a time, for small conversations to spark big discoveries. Many met for the first time and started dreaming together. The community of *SNI faculty affiliates* is now 216 strong, and continues to grow.

### Stanford program in neuroscience and society (SPINS)

*SPINS* is a multidisciplinary initiative to study how neuroscience affects society, and to bring to neuroscience knowledge of human behavior and cognition from scholars in law, education and business. Through *SPINS*, SNI will create cooperative dialogue and partnership between these disciplines. *SPINS* will be based in the Stanford School of Law and directed by law professor Hank Greely. Anthony Wagner, (psychology and neuroscience) will be the deputy director. The first meeting of the *SPINS* faculty advisory board, held on December 15, included representation from the departments of english, communications, neurosurgery, neurology, electrical engineering, and psychology, as well as the School of Law and Graduate School of Education.

### Fundamental themes in neuroscience seminars

SNI hosts a weekly seminar series entitled *Fundamental Themes in Neuroscience* to bring together members of the Stanford neuroscience community to hear about and discuss cutting edge basic and/or clinical research that is relevant to the future of neuroscience. In 2014, **33 speakers from across the country** shared their latest work and met with neuroscience students and faculty. The series is community-driven with neuroscientists nominating and hosting the speakers they most want to meet. SNI acknowledges the seminar series committee and Marjorie Powell for enabling this very successful series.



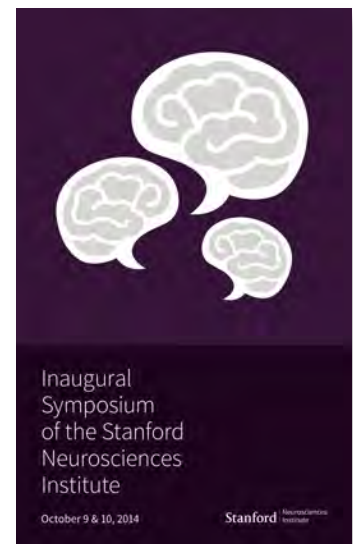


## Interdisciplinary scholar awards

The *SNI Interdisciplinary Scholar Awards* provide funding to extraordinary postdoctoral scientists at Stanford University engaging in highly interdisciplinary research in the neurosciences broadly defined. As neuroscience becomes ever more interdisciplinary, cross-training in multiple fields is essential for growing the next generation of university faculty. Scholars may have two co-principal investigators from different fields, or may be focusing their postdoctoral training in a field or discipline different from their graduate training. Five scholarships are awarded annually. Candidates in a variety of disciplines are considered: basic and clinical neurosciences, biomedical sciences, physical sciences, social sciences, engineers and experts in human behavior from the fields of education, law, business, and humanities. The five inaugural awardees, announced in December, 2014, come from labs in the departments of materials science and engineering, biology, radiology, neurosurgery, and neurobiology.

## Inaugural symposium

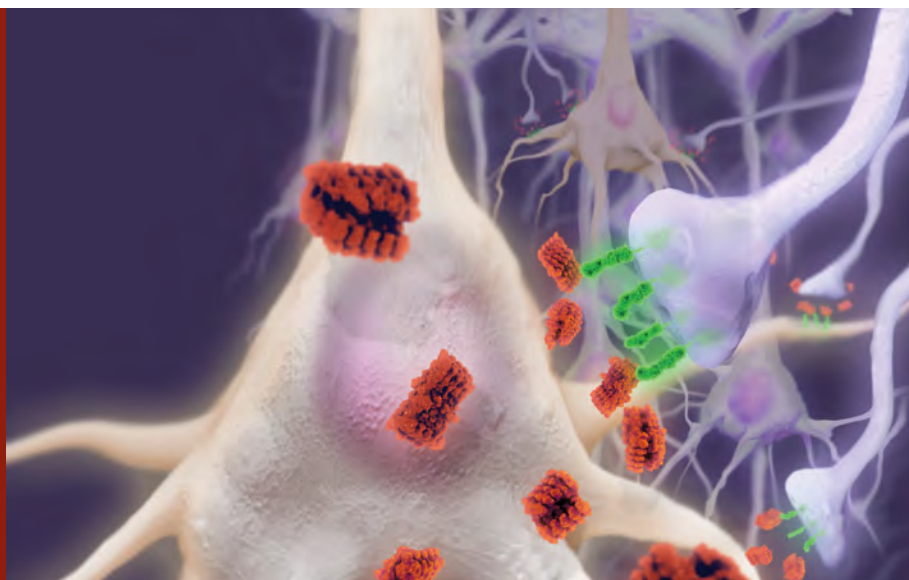
The inaugural *Symposium* of the Stanford Neurosciences Institute was held on October 9 & 10, 2014. Four hundred members of our community attended the talks. The line up of world-renowned speakers included Ann Arvin, John Rogers, Bruce Rosen, Thomas Insel, Carla Shatz, Karl Deisseroth, Nita Farahany, Thomas Südhof, John Hennessy and William Newsome. The topics covered a broad spectrum of disciplines including molecular & cellular neuroscience, circuits & systems, neuroengineering, human brain imaging, neuroscience policy, and neuroscience & law.



## Faculty recruitment

By strategically recruiting promising young faculty, SNI hopes to further develop Stanford's breadth of scholarship and discovery in the neurosciences. This academic year, SNI is conducting two junior faculty searches, one in neuroscience and engineering, and the second in theoretical and/or computational neuroscience. The departments of bioengineering, psychology and electrical engineering are partnering with SNI for the searches. Our ideal candidates will expand Stanford's expertise and form new research collaborations to advance our understanding of brain and behavior. We are pleased to be a partner in recruiting Bruce McCandliss to the Graduate School of Education, and are collaborating with the School of Engineering to recruit a major senior faculty member to Stanford to transform our program in neuroengineering.

## Driving Interdisciplinary Research



### Big ideas in neuroscience

What happens when Stanford faculty get together and dream big? Interdisciplinary teams of researchers created projects from the bottom up to tackle fundamental problems in neuroscience. SNI received letters of intent from 22 teams, and selected 7 to become the first prioritized research initiatives of the institute. Below are our Big Ideas and team leaders.

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

##### NeuroChoice

Brian Knutson (psychology), Keith Humphreys (psychiatry), Rob Malenka (neurobiology and psychiatry)  
Probes how the brain makes decisions and expands that to influence public policy and economic decisions.

##### NeuroCircuit

Amit Etkin (psychiatry), Stephen Baccus (neurobiology)  
Combines a detailed understanding of brain circuits with technology that modulates neural activity to develop improved ways of treating mental health conditions.

##### NeuroVision

Steve Chu (molecular and cellular physiology), Liqun Luo (biology), Tom Südhof (molecular and cellular physiology)  
Develops optical technologies that enable neuroscientists to visualize the brain in unprecedented detail.

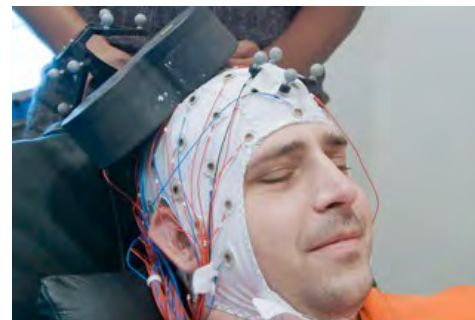
#### NeuroEngineering - creating innovative new technologies for interfacing with the brain

##### Brain Machine Interface

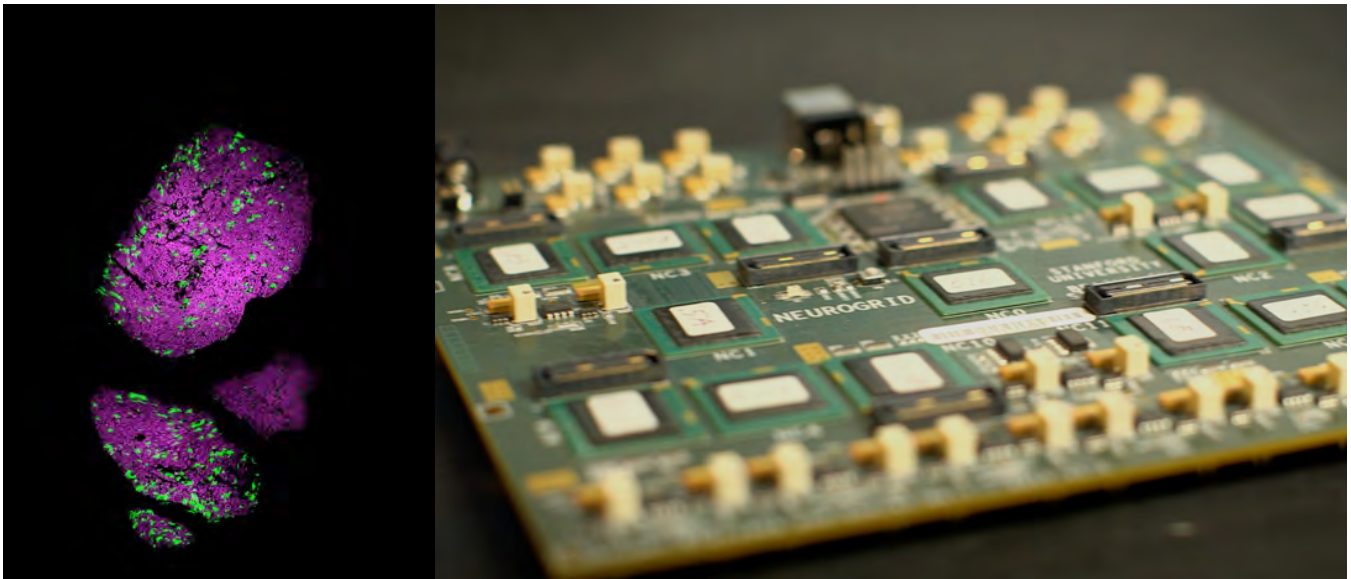
Kwabena Boahen (bioengineering), E.J. Chichilnisky (neurosurgery and ophthalmology)  
Develops technology to interface with the brain and create intelligent prosthetics.

##### NeuroFab

Nick Melosh (materials science) and John Huguenard (neurology)  
Creates an incubator for next-generation neural interface platforms.







## NeuroHealth - translating neuroscience discoveries into treatments

### Brain Rejuvenation

Aaron Gitler (genetics), Tony Wyss-Coray (neurology)  
Creates a center for neurodegeneration research focusing on brain maintenance and regeneration, and the role of the immune system in these processes.

### Stroke Collaborative Action Network

Marion Buckwalter (neurology, neurosurgery), Maarten Lansberg (neurology)  
Breaches barriers in our understanding of stroke to develop therapies and improve stroke recovery.

## NeuroVentures

**NeuroVentures** began in 2008 as the first venture of Stanford Bio-X. With the inception of SNI, essential functions of NeuroVentures were incorporated into the new institute. The projects funded by the venture continue to thrive and have resulted in many peer-reviewed publications and success in obtaining additional grant funding.

**Seed Grants** were awarded in 2012 to 5 interdisciplinary projects including understanding pain, imaging neural dynamics, learning how we pay attention to stimuli in our environment, engineering new sensors to detect electrical activity within brain cells, and developing ultrasound as a way to control and study human brain circuits.

**Equipment Grants** were awarded in 2013 to enable a wide variety of research projects. These include an imaging system to measure protein expression, biosensors to measure student engagement in the classroom, an upgrade to a shared animal MRI for better brain measurements, a high-speed camera to watch mechanosensitive ion channels signal in real time, a confocal microscope to image live cells integrated with a wide variety of engineered devices, building of a MRI-compatible haptic interface to measure brain activity of people while doing physical tasks, and a high-performing virtual machine platform for neuroimaging.

We are fortunate to utilize the fundamental successes of NeuroVentures as an essential building block in the foundation of Stanford Neurosciences Institute.



## Providing Vital Infrastructure



### Planned SNI/ChEM-H research facility

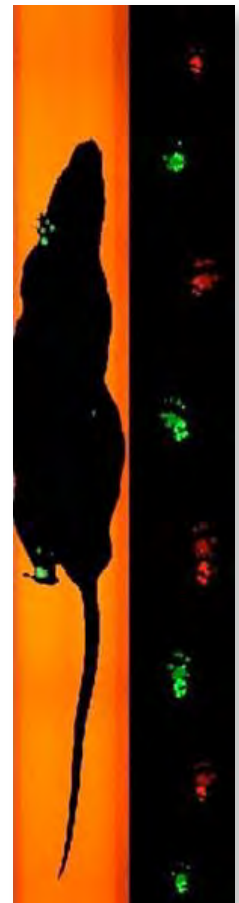
SNI and another new interdisciplinary research institute, *ChEM-H*, are planning a new facility to serve as a hub for their intellectual communities. The \$252.6 million project will provide facilities designed to foster great ideas and innovative scholarship, including wet, dry and computational laboratory space, offices for faculty, postdoctoral scholars and students, and collaborative common spaces for formal and informal teaching and learning. The building will be located on the west side of campus on the site currently occupied by the Cardinal Cogeneration Plant Facility. The location of the building will facilitate easier and more frequent collaboration within a single physical space among the faculties of the schools of Medicine, Engineering, and Humanities & Sciences. The facility is planned to open in 2018.

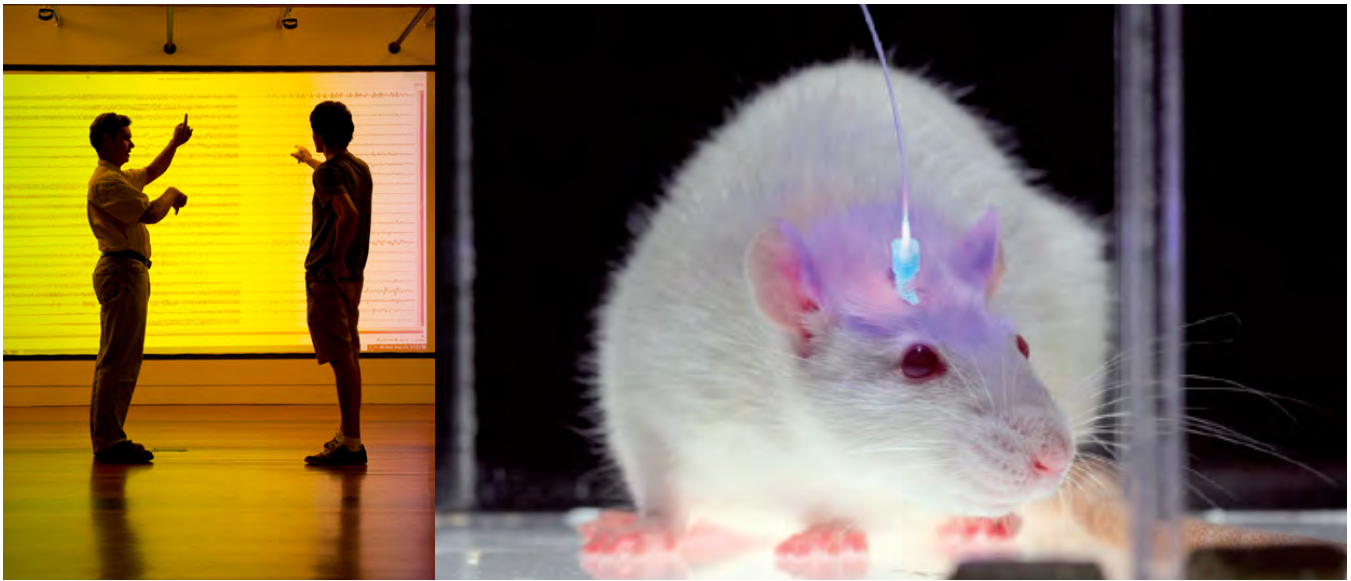
### Neuroscience service centers

SNI 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. Together, the *Behavioral and Functional Neuroscience Laboratory*, the *Neuroscience Microscopy Core* and the *Gene and Viral Vector Core* have supported over 200 Stanford faculty and contributed to more than 72 peer reviewed publications.

The SNI *Two-Photon Microscopy Pilot Grants* program provides seed funding for neuroscience-related projects requiring two photon microscopy. Because two photon microscopy is an important technique for neuroscience investigations that typically involves complex experiments, microscope time and training is essential. These grants will provide funding for training and use of a Neuroscience Microscopy Service (NMS) two photon microscope for a limited time period.

Joachim Hallmayer (psychiatry), Richard Reimer (neurology) and Sergiu Pasca (psychiatry) are planning to launch a new *Neuro iPSC Core* in 2015 in collaboration with psychiatry and SNI. 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.





## Development

Since the launch of the Stanford Neurosciences Institute, the Office of Development is building awareness around our vision for driving campus-wide interdisciplinary neuroscience research. At this early stage of the institute, we are focusing on cultivation strategies with high-end volunteer leaders and potential donors. Our long-term goals are to raise naming gift support for the institute and the new research complex as well as gifts for research funds, professorships, and fellowships.

Under the leadership of Bill Newsome, along with the partnership support from development director Maura McGinnity, we made progress in two main areas this year: refining the compelling case and gift opportunities as well as engaging key individuals in the mission and activities of SNI. We are leveraging the many substantive programs (Big Ideas, inaugural symposium, etc.) launched by the institute as well as the new website and ongoing accessible, compelling news articles regarding novel brain research at Stanford.

In terms of outcomes, we were able to capture the energy and interests of potential volunteer leaders and donors. Presentations by Bill Newsome to the Board of Trustees, Bay Area Principal Gifts Advisors, and Southern California Advisors have helped us build momentum. Additionally, Bill and other neuroscience faculty leaders were featured in three engagement events hosted by President Hennessy (Hoover House), Patrick and Michele Soon-Shiong (LA), and Hal and Linda Ritch (NYC). Bill also participated in two Stanford+Connects programs (NYC and Atlanta) and 18 meetings with select individuals. Thanks to strategic stewardship and cultivation endeavors, we received notable gifts from Jim Clark, David Deng, Alice Woo, Lubert and Andrea Stryer, the Pfeiffer Foundation, and Eric and Elaine Shooter. These gifts will provide vital support to the institute for neurosciences research, fellowships and professorships.

## Team SNI

Stanford Neurosciences Institute owes the success of its first year to its leadership and the dedicated team who make our events and program happen.

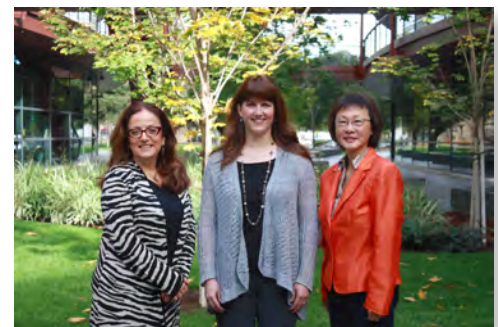
William Newsome, Vincent V.C. Woo Director

Tanya Raschke, Associate Director for Planning and Operations

Lisa Gounod, Administrative Associate

Cathy Lau, Financial Analyst

Roula El-Asmar, Program Manager



“How our brains enable us to feel, think and act is among the most exciting and consequential problems in all of science.

Answers to these questions will shape our deepest ideas about what it means to be human.

We cannot over estimate the potential of this inquiry to transform the ways we educate our children, treat illness, seek justice, or pursue innovation.”

*- Stanford President John Hennessy*



James H. Clark Center, 318 Campus Drive, Suite S170, Stanford, CA 94305  
650.497.8019 | [neuroscience@stanford.edu](mailto:neuroscience@stanford.edu) | [neuroscience.stanford.edu](http://neuroscience.stanford.edu)