Bio-X NeuroVentures
Unlocking the Secrets of the Brain


L. A. CICERO/STANFORD NEWS SERVICE

"Understanding the brain in health and disease is one of the greatest challenges of our century. We must have this knowledge to cure devastating disorders from autism to Alzheimer's and to grasp the nature of human behavior."

Bill Newsome
DIRECTOR, BIO-X NEUROVENTURES
PROFESSOR OF NEUROBIOLOGY

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Thanks largely to Stanford-grown technical and conceptual innovations, we now face a moment of exceptional potential in fathoming how the brain actually works—how billions of cells and thousands of interacting circuits create mental life, and how these circuits change dynamically throughout life with our experiences.

Decoding and treating conditions such as addiction, autism, depression, nervous system damage, memory loss, and dementia will increase our productive "mental life span" and the overall health and well-being of society.

Bio-X NeuroVentures (NV), a newly launched endeavor to answer some of the most challenging questions concerning the body's most complex organ, is ideally positioned to catch this unique wave of possibility. From its base in Stanford's pioneering Bio-X interdisciplinary biosciences institute, NV will develop new technologies and approaches *requiring* novel interdisciplinary collaborations between neuroscientists, engineers, physicists, and other members of the Stanford community.

Now is the right time to accelerate this bold undertaking—even in difficult economic times. Stanford has the talent base, an institutional culture of teamwork, invention, and entrepreneurialism, and a head start. In short, Stanford is the right place to lead the new interdisciplinary science of the brain and cognition. The potential return on investment, for the world and Stanford, is enormous.

INCUBATING REMARKABLE RESEARCH

Understanding brain function will require the tools of modern genetics to identify and manipulate neural circuits, the tools of physics and engineering to devise new instruments for measuring signal flow within circuits, the theoretical insights of mathematics and physics for understanding the behavior of dynamic systems, and the tools of psychological science for quantitative analysis of behavior.

NV seeks to catalyze highly focused research in four areas:

Cracking the Neural Code

Nerve cells group together into circuits to galvanize tasks such as holding a baby, solving a math problem, and remaining dedicated over decades to abstract ideas like equality. The combination of powerful new ways of mapping circuits, reading out their activity, and manipulating them creates the strong possibility of a tipping point for the entire field of neuroscience in deciphering the brain's fundamental code for processing and storing information. This knowledge is critical for understanding how the brain generates learning, memory, emotion, language, and thought, and will open up safer, more precise treatments for neurological and psychiatric ailments.

Imaging and Stimulating the Living Human Brain

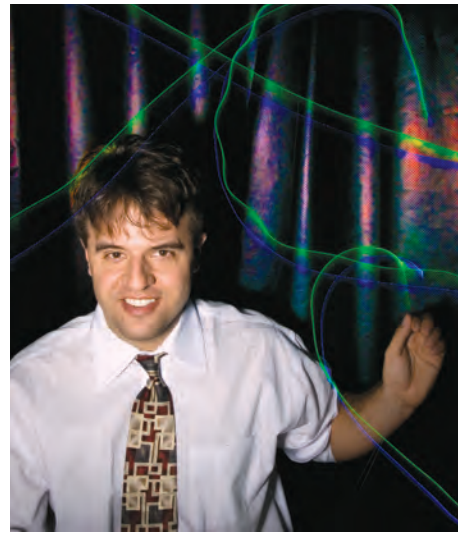
Collaborations across campus have already begun to develop the novel instruments and analytic tools necessary to make major leaps in noninvasive brain imaging. New combinations of scanners will allow researchers to probe human brain activity on the timescales in which neural processing actually occurs—in tiny fractions of a second. For example, researchers will watch connections being established in the brain while children learn to read—insight that may aid slow learners by seeing how particular teaching strategies affect the brain. A crucial challenge is to conceive technologies that do not just image the human brain, but can also modify, or "tune," brain signals from outside the head to treat neural disease.

Brain-Machine Interface (Neural Prosthetics)

Stanford researchers are pioneers in prosthetics for paralyzed patients that detect and interpret the brain's own signals in order to guide artificial limbs. The breadth and depth of expertise on campus enables rapid progress that may ultimately create better lives for a broad range of patients suffering from nervous system damage. The staggering complexity of neural prosthetic systems calls for an extraordinary level of collaboration between scientists, engineers, and clinicians.

Neuroeconomics and Decision Making

Our lives are defined by the countless decisions we make, both large and small. Stanford scholars are leading the way in illuminating how we make these defining decisions. For example, taking direct measures of brain activity can be a more reliable indicator of a person's current mental state and future choices than simple introspection. New developments will profoundly influence fields as diverse as psychotherapy, marketing, and the law, potentially enabling more accurate diagnosis and therapy for psychiatric illness, as well as a deeper understanding of the choices made in a variety of economic conditions.



LEE ABEL

KARL DEISSEROTH, ASSOCIATE PROFESSOR OF BIOENGINEERING AND OF PSYCHIATRY AND BEHAVIORAL SCIENCES, WAS MOTIVATED BY THE PATIENTS HE TREATS TO DEVELOP MOLECULAR AND CELLULAR TOOLS TO REENGINEER BRAIN CIRCUITS. HIS TECHNIQUES ARE ALLOWING RESEARCHERS TO IDENTIFY AND MAP THE NEURAL CIRCUITS UNDERLYING INTELLIGENT BEHAVIOR AND TO SEARCH FOR WAYS TO REPAIR NEUROLOGICAL DAMAGE.

AS WELL AS BEING A PSYCHIATRIST, DEISSEROTH IS A BIOENGINEER, A TYPE OF SCIENTIST WHO COMBINES THE SEARCH FOR BASIC DISCOVERIES WITH THE DESIRE TO ENGINEER PRACTICAL SOLUTIONS. HIS TEAM WILL ADVANCE TECHNOLOGY CALLED OPTOGENETICS THAT USES LIGHT TO SEE SPECIFIC BRAIN CIRCUITS IN ACTION AND TURN THEM ON OR OFF AT WILL.

LEE ABEL

BIO-X DIRECTOR CARLA SHATZ HAS BLAZED MANY TRAILS IN RESEARCH AND IN ACADEMIA. HER WORK HAS ADVANCED THE UNDERSTANDING OF HOW THE EYE AND THE BRAIN BECOME PROPERLY CONNECTED DURING EARLY LIFE. SHATZ ALSO OVERTURNED THE LONG-HELD VIEW THAT THE BRAIN OPERATES IN ISOLATION FROM THE IMMUNE SYSTEM. ALONG THE WAY, SHE HAS CONSISTENTLY BROKEN NEW GROUND FOR WOMEN IN THE BIOSCIENCES, INCLUDING BEING THE FIRST WOMAN TO CHAIR HARVARD'S NEUROBIOLOGY DEPARTMENT. HER STELLAR LEADERSHIP, AS WELL AS INSIGHT AS A PROFESSOR OF BIOLOGICAL SCIENCES AND NEUROBIOLOGY, WILL BE A BOON TO BIO-X NEUROVENTURES.

GIVING OPPORTUNITIES

Stanford University has an unprecedented opportunity to take a lead position in the neurosciences. Stanford seeks major investments to support Bio-X NeuroVentures in accelerating research and discovery.

Bio-X NeuroVentures Support Funds .... $5 million per year for five years

Faculty members need funding for the earliest phases of research to show proof of concept, which can often attract funding from traditional sources of research support. Laboratories also need professional staff to enable faculty and students to conduct their research. Support in the form of expendable gifts, term endowment, and endowment payouts will aid our faculty in blazing new trails.

Bio-X Stanford Interdisciplinary Graduate Fellowships (SIGF)...........$600,000

Bio-X seeks endowed funds to support at least 30 graduate fellows at any given time. At least four of these fellowships will support graduate students who are integral to NeuroVentures research. Gifts of at least $600,000 will be matched one-to-one, creating endowed funds of at least $1.2 million to sponsor each fellowship.

Advanced Instrumentation and Facilities ....$15 million total

In the first five years, the Bio-X NeuroVentures projects require funds from donors for renovating, acquiring, and setting up 20,000 square feet of space for labs, research resources, data analysis, and computing. In addition, scientists from across campus will share cutting-edge instrumentation, such as a new-concept magnetic resonance scanner for noninvasive human brain imaging.

Bio-X NeuroVentures Program Endowment...........................$93 million total

Gifts of endowment from donors are sought to support the programs aimed at positioning Stanford as a global leader. The most profound secrets of the brain and human thought will only be revealed over time. A sustaining endowment will secure the ability to attract new faculty and launch new projects now and in the future.

CONTACT US

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