

Brain SCAN

McGOVERN INSTITUTE

FOR BRAIN RESEARCH AT MIT

Inaugural issue

Winter 2005

Welcome to the

inaugural issue of the McGovern Institute's quarterly newsletter—*Brain Scan*. We hope it will keep you up to speed on the accelerating pace of our scientific research and related activities. This first issue focuses on the recent, highly celebratory opening of the McGovern Institute in our new building at MIT.



The theme of the celebration was “Neuroscience and Society” and each speaker brought to this subject their unique personal and professional perspectives. At the conclusion of the daylong ceremonies, MIT President Susan Hockfield commented that everything that happened in the course of the day and evening events was interwoven into one fabric, making it clear that the Institute shared with the audience a common profound purpose—to understand the brain in order to relieve human suffering.

In subsequent issues, each newsletter will have a feature article about a research topic, reflecting some of that interwoven fabric. The topics will reflect the themes of perception, cognition and action which are the focus of McGovern Institute activities.

Bob Desimone, Director

The McGovern Institute at MIT is committed to advancing human understanding and communications. Led by a team of world-renowned, multi-disciplinary scientists, the McGovern Institute was established in 2000 by Lore Harp McGovern and Patrick McGovern to meet one of the great challenges of modern science—the development of a deep understanding of thought and emotion in terms of their realization in the human brain.

Additional information is available at:
<http://web.mit.edu/mcgovern/>



OPENING DAY at the McGovern Institute's New Home

The November 4th opening of the McGovern Institute's new home at MIT was a day of smiles, celebration, and connections. Pat and Lore McGovern, who founded the institute in 2000, hosted more than 500 guests in the sun-filled atrium of the largest neuroscience complex in the world, the Brain and Cognitive Science Complex at MIT. Speakers included Nobel laureates Eric Kandel and Phillip Sharp, Ethernet inventor Bob Metcalfe, Senator John Kerry, TV journalist Jane Pauley, and MIT President Susan Hockfield, who referred to the day as “historic”—for the McGovern Institute, for MIT, and for neuroscience worldwide.

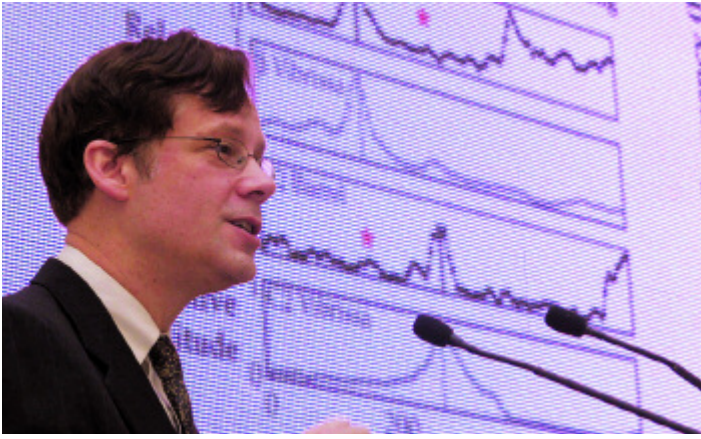
Pat and Lore McGovern unveiled a portrait of Phillip Sharp, the founding director of the McGovern Institute.



Pat and Lore McGovern A VISION SHARED

In the 1990s, Pat and Lore McGovern began their plans for founding an institute to improve our understanding of the human brain. Their advisors said: “The time was right, but you want a brilliant location.” MIT won out over 6 other considered sites because of its tradition of collaboration among departments and its “problem centered” approaches to research. Nobel laureate Phillip Sharp’s willingness to become the Institute’s founding director clinched the deal. During the celebration Dr. Sharp stated: “I couldn’t be more proud of anything than what’s happened here and what will happen in the future...This neuroscience complex is creating the future not only of neuroscience but of MIT,” directing it into more human areas of science, which is “most desperately needed.”

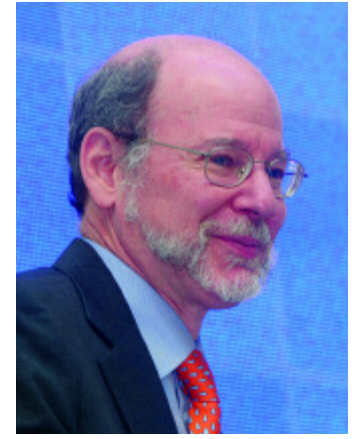
At the 2003 ground-breaking ceremonies, Pat and Lore McGovern, who have given the largest gift in MIT history, stood on a triangular dirt field with nothing but a railroad track and a vision of a future building. “This beautiful, stunning, gorgeous building goes beyond my wildest expectations,” Lore said. “It brings us closer to work together.” As donors, the McGovern’s feel an “awesome responsibility” to make certain that the Institute benefits humanity.



McGovern Institute Director Robert Desimone described the themes of the Institute's research as perception, cognition, and action.



McGovern faculty member, Tomaso Poggio, introduced Bob Metcalfe, Ethernet inventor and chairman of the Institute's new Leadership Board.



McGovern faculty member and fellow Nobel laureate, H. Robert Horvitz introduced Eric Kandel of Columbia University.

Robert Desimone

THE MYSTERY OF INNER SPACE

Robert Desimone, Director, illustrated the themes of the Institute's research on perception, cognition, and action by showing a clip of a train roaring head on towards the camera. "Perception is what happens when you see and hear the train. Action is what happens when you jump to safety. Cognition is what happens in between—fear, recognition of danger, and the decision to escape." Each of these areas is incredibly complex, in ways that scientists a generation ago could not comprehend. The McGovern Institute brings a "molecules to mind" approach to understanding their functions and malfunction using genetics, developmental biology, computational sciences, brain imaging, electrical recordings of neurons, animal models, and human patients and volunteers. In conveying his own passion for neuroscience, he said: "Throughout history, there have been two fundamental mysteries, outer space and inner space. Technologies such as the Hubble telescope and space ships have enabled us to explore outer space. Now technologies such as brain imaging and molecular biology are allowing us to understand our brains."

Ann Graybiel, left, graciously introduced Jane Pauley. She is seen with fellow McGovern faculty member, Bob Horvitz, and Drs. Carla Shatz and Eric Kandel, members of the Institute's Scientific Advisory Board.

Right: Lore and Pat McGovern welcome Eric Kandel.



**THE MCGOVERN
INSTITUTE BRINGS A
MOLECULES TO MIND
APPROACH TO
UNDERSTANDING...**

—ROBERT DESIMONE

Bob Metcalfe

THE BRAIN BUBBLE

Bob Metcalfe, MIT alumnus, inventor of the Ethernet, and chairman of the McGovern Institute's Leadership Board, regaled the audience with his talk on "Why the Internet is like the brain...or not." Both have massive connectivity and many layers, and they are both evolving, but the brain, unlike the Internet, has not yet had its "bubble." "Join us in inflating the brain bubble so we can understand its infrastructure and move forward together," he urged.



Eric Kandel

THE QUEST FOR HAPPINESS

Nobel laureate, Eric Kandel, said: "The next century will be for the biology of mental illness what the last century was for the biology of genes. Great universities will be judged by what they contributed." He went on to propose a systematic program to study mental illness scientifically, capitalizing on knowledge gained through brain imaging studies of fear, anxiety, and reward learning. In animal studies, for example, he found that mice trained to fear a stimulus, such as the sound of a bell, activate the amygdala, the anxiety center of the brain that is involved in depression, phobias, and many mental disorders. After "safety training," in which the bell is never associated with danger, the brain's pleasure center (in the basal ganglia) becomes active. The mice are not only without fear; they are happy. Kandel left the audience with an encouraging thought: "We might develop completely new approaches to depression, not just to get rid of anxiety but to enhance pleasure in life."





Lore McGovern, Jane Pauley, and President Susan Hockfield.



Jane Pauley has used her tremendous public stature to change the public attitude towards mental illness by discussing her own personal voyage with bipolar disease.



MIT President Susan Hockfield said: "Everyone picked up on the same themes. It's very clear that we have a single purpose here."

Jane Pauley "GIRL NEXT DOOR"

Jane Pauley put a human face to depression and loss by sharing her personal voyage with mental illness, the bipolar disease that nearly devastated her life four years ago. In introducing Jane Pauley, Ann Graybiel said: "It's a tremendous gift she's giving. She's gotten people to follow Pat and Lore's vision to improve society." Most people can't afford to talk about their mental illness because they can lose everything, she wrote in her memoir, *Skywriting: My Life Out of the Blue*. "I can. ... My goal is to yank mental illness into the realm of all the other bad things that can happen in a normal life rather than have it considered a shameful personal failing."

Senator Kerry said the work of the McGovern Institute to improve communication "couldn't come at a more important time."

Susan Hockfield TURN ASPIRATIONS INTO REALITY

MIT President Susan Hockfield said it was "an incredibly exciting day for all of us as we formally introduce the McGovern Institute into this spectacular building." She praised the building as a "fitting home for the work that will be conducted here" by a "dream team" of the highest accomplished neuroscientists in the "cal-dron of excitement, energy, and new ideas" emanating from the MIT and the Kendall Square surroundings. The best way to thank Pat and Lore McGovern, the catalysts and sponsors of the Institute, is to "turn their aspirations into reality," she said. "Think outside of all boxes, departments, schools, and institutes."

Senator John Kerry GENEROSITY, VISION, AND POSSIBILITIES

Massachusetts Senator John Kerry expressed the hope that this new neuroscience complex would promote intellectual freedom and discovery. No science opens up more about the human mind than neuroscience, he said, and opening up the mind "will help improve understanding" and avert conflict. Senator John Kerry called the opening "a celebration of generosity, of vision, and of possibilities in the future [that] couldn't come at a more important time."

Both morning and evening guests enjoyed the unique performance of the Mass Ensemble.



“
THIS IS A DEFINING
MOMENT IN OUR
EFFORT TO UNDERSTAND
WHO WE ARE.”
—SENATOR JOHN KERRY



A GALA EVENING



At left, the atrium was transformed for the evening dinner.

Architect Charles Correa hopes the new building “will survive the snow and ice, with the sense of joyousness, warmth, and color from India.”

Alan Leshner

OPPORTUNITY AND OBLIGATION

Dinner speaker, Alan Leshner, CEO of the American Association for the Advancement of Science (AAAS) has worked to publicize the effects of drugs on the brain, health consequences of drug abuse, innovative approaches to prevention and treatment, and the benefits of science-based treatment. “The McGovern Institute has an opportunity and an obligation. You are at the core of where science abuts social values. Be part of the enterprise where science engages with the public—not just education but dialogue. I’m really struck by what’s happened here. On behalf of [AAAS’s] *Science* magazine, we salute you.”

Charles Correa

EMBODY THE IDEA WITHIN

The architect Charles Correa spoke about how he designed the new building to “embody the idea within,” a place of reflection, collaboration, and intersecting research paths within three separate entities, each with their own identities: the McGovern Institute, the Picower Institute, and the Brain and Cognitive Sciences department.

It was a challenge to design “a 400,000 square foot building fitted on a funny triangular site with a railway track,” where Vassar and Albany Street angle off of Main Street—and facing a very “exuberant

neighbor”—the Stata Center across Vassar Street and the urban façade of the technology buildings and biotech companies across Main Street.

Correa exploited the “loneliness of the railroad track”—which conjured up the “epic of America”—by bridging the building over the track to great a type of Grand Central meeting place in the atrium lobby. He combined that with “another mythic image,” a romantic ocean liner (or mother ship, as Pat McGovern called it) that points down Main Street, pulling the MIT campus along.



left to right:
Alan Leshner, CEO of the American Association for the Advancement of Science (AAAS).

Dr. Elizabeth McGovern, a member of the Institute’s Board of Directors, offered an opening toast to her parents, Pat and Lore.

Tod Machover, Professor of Music and Media at MIT, introduces his composition “Jeux Deux.”



Cover Photo for "Building Blocks of the Brain" by the book's producer, Tom Walker

In Commemoration: "Building Blocks of the Brain"

Like the McGovern Institute's new home, and the research that goes on within it, the 40-page commemorative book, "Building Blocks of the Brain" celebrates collaboration and community. "The goal of collaboration dictated the design of the building, starting with its two architects," says the book's producer, designer, and photographer Tom Walker. "The atrium full of light takes on a life of its own," as will the research spirit. To create something as visually inspirational as the subject itself, Walker juxtaposed brilliant brain images and computer-generated illustrations of neurons with abstract images of the new center—an innovative solution since the building was not yet completed. Journalist Spencer Reiss compiled the collective voices of the people whose vision or presence animate the building. "Neuroscience can seem pretty detailed and complicated to the general public," explains Reiss. "We focused on making it come alive and convey the McGovern Institute's message, that neuroscience improves people's lives."



Leadership Board Formed: Bob Metcalfe Heads

On the morning of the opening celebration, Bob Metcalfe chaired the inaugural meeting of the McGovern Institute's new Leadership Board. Robert Desimone and Phillip Sharp, the Director and founding Director, joined Metcalfe in thanking the founding members for their commitment. Members include Dr. Tenley Albright, Dr. Gerald Burnett, Dr. Eric Cosman, Mr. Nicholas Covatta, Mr. Perry Ha, Mr. Kenneth Kaplan, Mr. Zack Lynch, Mrs. Patricia Poitras, Mr. James Poitras, Mr. Sheldon Razin, and Dr. Nancy Wexler. The mission of the Leadership board is to work with the faculty to make long-term plans for their research programs, to communicate these plans to the Institute's various constituencies, and to gather the required resources. While members are drawn from a wide range of personal and professional backgrounds, they share a common devotion to the highest standards of neuroscience research and have committed their time, talent and resources to ensuring the ongoing success of the Institute.

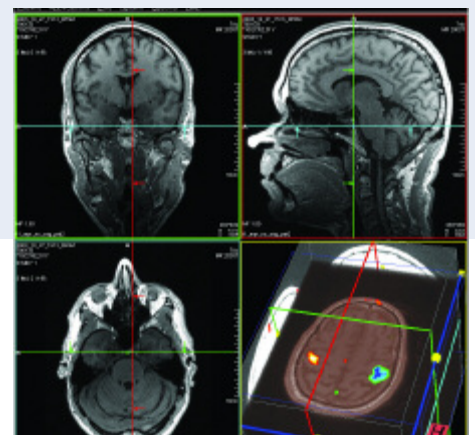
Imaging Center

The Martinos Imaging Center at the McGovern Institute opened this fall within the new neuroscience building. The center, which houses a 3T Siemens MRI scanner and a future 9.4T animal scanner from Bruker, provides one of the few places in the world where researchers can conduct comparative studies of the human brain and the brains of differing animal species. It also occasions the first time in its 140-year history that MIT has an on-campus capability to image a living person's brain. The onsite brain-imaging center will help the McGovern Institute achieve its overarching goal of fostering a higher level of collaboration among researchers from different divisions, including some of the top brain imaging experts in the world. The Institute's imaging center forms a joint "center without walls" with the Athinoula A. Martinos Center for Biomedical Imaging at MGH, and the faculty will continue to collaborate with MGH researchers. Investigators and students from MIT's Brain and Cognitive Science Department, as well as the MIT community at large, will also conduct studies using the McGovern's magnets. John Gabrieli, an Associate Member of the McGovern Institute, heads the Center at MIT, and Bruce Rosen, of MGH, heads the overall Martinos Center.

New Faculty 2005

THOMAS BYRNE: Associate Member of the McGovern Institute and Visiting Clinical Professor of Neurology and Health Sciences & Technology at MIT, Harvard Medical School, and Massachusetts General Hospital; Senior Lecturer, Department of Brain and Cognitive Sciences, MIT. Dr. Byrne focuses on how the human brain works in health and disease, including brain tumors and cancer, with an emphasis on clinical cases.

JOHN GABRIELI: Associate Member of the McGovern Institute and the Grover Hermann Professor in Health Sciences and Technology and the Brain and Cognitive Science Department. Gabrieli is the new director of the Martinos Imaging Center and also conducts research on human cognition and its disorders, including dyslexia. Gabrieli previously was at Stanford University.



Prizes and Awards 2005

Emilio Bizzi has been elected to the Institute of Medicine and will receive the “Empedocles” Prize on November 26, 2005.

Jim DiCarlo and **Chris Moore** share the 2005 MIT Science Award for Excellence in Undergraduate Teaching. Moore also was awarded with the Mitsui Career Development Chair.

Ann Graybiel received the 2005 Ibsen Neuronal Plasticity prize for “outstanding work...in the domain of Motivation and Associative Learning,” awarded by the French Foundation IPSEN pour la Recherche Thérapeutique. Dr. Graybiel also received an Honorary Doctor of Science degree from Tufts University on May 21, 2005.

Robert Horvitz received the 2005 Harvard University Centennial Medal from Harvard University and the 2005 National Cancer Institute’s Alfred G. Knudson Award.

Alan Jasanoff has received an award from the Raymond and Beverly Sackler Foundation, which also supports his postdoctoral student, Gill Westmeyer.

Nancy Kanwisher was elected to the National Academy of Science, one of the highest honors for a U.S. scientist or engineer. She was recognized for her research focusing on the mechanisms of visual cognition in the human brain.

McGovern Institute Awards

Edward M. Scolnick Prize: awarded to **Judith L. Rapoport**, Chief of the Child Psychiatry Branch at the National Institute of Mental Health for her groundbreaking studies of Attention Deficit Hyperactivity Disorder (ADHD), Obsessive-Compulsive Disorder (OCD), and Childhood Onset Schizophrenia. On April 14, 2005, Dr. Rapoport spoke at MIT on Brain Development in Healthy, Hyperactive and Psychotic Children

Shoemaker Fellowship: awarded to **Marnie Phillips**, a senior graduate student in Martha Constantine-Paton’s lab.

Prime Minister of Vietnam Phan Van Khai Visit

On June 25, 2005, the McGovern Institute, together with founders Patrick J. McGovern and Lore Harp McGovern, hosted a luncheon in honor of the Prime Minister of Vietnam, Phan Van Khai. Prime Minister Khai made his visit to MIT during a weeklong tour of the U.S.

McGovern Institute Symposium: Smart Molecules

This May 13, 2005 event sampled the brave new world of intelligently designed molecules for studying the nervous system. The Symposium’s six invited speakers are all leaders in creating and applying innovative tools to probe or control biological systems; their lectures described new methods to look at cells (with genetically-encoded fluorescent indicators and noninvasive imaging agents) and new strategies to manipulate cells with precision stimuli and custom-made proteins that perform entirely new functions in living organisms.

New Funding for New Knowledge

A major non-profit Foundation has granted the McGovern Institute \$1.5 million, and has offered a challenge grant of an additional \$500,000, if \$1 million in new private funds for the new fMRI equipment is raised by September, 2006.

Dr. and Mrs. Joseph Byrne have made a \$25,000 gift in support Nancy Kanwisher’s research on Macular Degeneration. Dr. Byrne received his SM and SCD in 1948 and 1959 respectively in the School of Engineering.

Mr. and Mrs. Arch Copeland have also made a generous gift to support Dr. Kanwisher’s research on Macular Degeneration. Mr. Copeland received his SB in 1938 in the School of Science.

Mr. Robert Farmer has made a gift to the Director’s Discretionary Fund in support of basic research in honor of Pat and Lore McGovern.

Amgen, Merck, Boston Scientific and Bristol-Myers Squibb made gifts in support of our Smart Molecule Symposium, and the **Raytheon Corporation** has made a gift in support of the Director’s Discretionary Fund.

The faculty of the McGovern Institute

Principal investigators conduct research on all levels of the brain pertaining to its capacity to learn and react, including: the molecular and genetic foundations of neural activity, processing of sensory, emotional, and motivational input and their effects on behavior, and how the brain makes decisions and becomes conscious of its own activities.



Top row, left to right

Middle row, left to right

Bottom row, left to right

Emilio Bizzi: how the central nervous system translates brain messages signaling motor intent into muscle activation

Martha Constantine-Paton: activity-dependent development of synaptic connections in the central nervous system

Robert Desimone: exploration of the brain mechanisms underlying attention, memory and control

James DiCarlo: object recognition in the visual system

Not pictured:

Dr. Thomas Byrne: focuses on how the human brain works in health and disease, including brain tumors and cancer, with an emphasis on clinical cases.

Michale Fee: how the brain learns and generates complex sequential behaviors

Ann Graybiel: the neurophysiology of a brain region that is implicated in the control of movement and cognition, as well as in our ability to learn habits

H. Robert Horvitz: genetic control of the functions of the nervous system and of the fate of cells and synapses

Nancy Kanwisher: human visual perception and cognition using functional magnetic resonance imaging to identify the location of brain activity in people as they carry out visual tasks

Christopher Moore: touch perception, with an emphasis on brain dynamics and how they shape what we feel

Tomaso Poggio: computational neuroscience, study of information processing in brains and computers; processes by which the brain learns to recognize and categorize visual objects

Associate Members of the McGovern Institute
John D.E. Gabrieli, Ph.D.: studies the organization of memory, thought, and emotion in the human brain, primarily via brain imaging, and how disruption of that organization leads to neurological and psychiatric diseases.

Alan Jasanoff, Ph.D.: non-invasive functional imaging methods to study systems-level neural plasticity involved in low-level learning and perceptual behavior in small animals.



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