
**The MGH/MIT/HMS
Athinoula A. Martinos Center
for Biomedical Imaging**



ANNUAL REPORT
June 2002

CONTENTS

INTRODUCTION	3
RESEARCH HIGHLIGHTS.....	4
Cortical Thickness Mapping	4
BUILDING NEW BRIDGES.....	5
Collaborative Research Start-Up Grants.....	5
Cambridge-MIT Institute Workshop	6
Visiting Faculty Sabbatical Program in Cognitive Neuroimaging.....	7
EVENTS	7
Martinis Research Day at MIT.....	8
Retreat 2001	8
Dedication of State-of-the-Art Imaging Systems.....	8
Brainstorm 2002	9
RESEARCH RESOURCES.....	9
NEW THIS YEAR.....	9
7 Tesla Ultra High Field MR Imaging	9
Magnetoencephalograph (MEG).....	10
Siemens 3 Tesla Trio MRI System	10
Hospital Campus MR System Trailer	10
Behavioral Testing and Mock Magnet.....	11
PLANNED IMAGING RESOURCES	11
Primate Imaging Facility at MIT.....	11
NEW FACULTY	11
David Cohen, PhD	11
Joseph P. Culver, Ph.D.	12
Dara S. Manoach, Ph.D.....	12
Judith D. Schaechter, PhD, MSPT.....	12
EDUCATIONAL INITIATIVES	13
NIRS DOT course.....	13
MEG Training.....	13
Multimodal Imaging Visiting Fellowship Course.....	13

INTRODUCTION

In this the third year of the Athinoula A. Martinos Center for Biomedical Imaging, many of the projects set in motion in first two years came to fruition and the groundwork was laid for several important new initiatives. We continued to reach out to the biomedical imaging community by encouraging new collaborations, supporting the work of bright young scientists, providing educational experiences at many levels, and by making our innovative imaging resources available to all.

Several imaging systems, many years in the planning, were completed this year. We are especially proud of our new 7 Tesla magnet and MEG facilities, and we marked this event with a festive dedication ceremony in April. Both imaging systems, while just beginning to produce interesting data, are certain to inspire creative science in the coming years. Two additional MR systems were added to our imaging portfolio this year as well; a Siemens Trio whole body 3 Tesla system, which will allow, in addition to brain imaging studies, investigation of the heart, breast and other body organs, and a 1.5 Tesla Siemens Sonata located on the MGH main campus, to help facilitate translation of the Center's newly developed MR techniques to clinical practice. We also completed our behavioral testing facility with a long awaited, custom-built mock magnet system, which is already proving invaluable to researchers studying children and patient groups who benefit from acclimation to the MR environment.

After much negotiation and deliberation, a solid groundwork was laid which will allow the Martinos Center to create a satellite imaging laboratory on the MIT campus. This will originate as a dedicated primate imaging facility and will be operated conjointly with the Department of Brain & Cognitive Sciences and the McGovern Institute for Neuroscience. In addition to leading forward the developing discipline of primate neuroimaging, we hope this facility will inspire fresh bonds between the Martinos Center and the other major neuroscience programs at MIT.

To encourage collaboration and to promote biomedical imaging locally among the MGH, MIT and HMS research communities, the Martinos Center Collaborative Research Start-Up Grant program was initiated this fall. These awards are now supporting the biomedical imaging research of nine newly formed multi-institutional research teams. An international partnership was also formed with our colleagues at the University of Cambridge, England through the Cambridge-MIT Institute (CMI). Research proposed by this new collaboration will focus on the use of biomedical imaging in the development of pharmaceuticals for the treatment of neurological disorders and mental illness. A third important collaborative program initiated this year is our Cognitive Neuroimaging Visiting Scientist Program, through which we hope to bring distinguished cognitive scientists to the Center for an extended period of time to teach and learn from each other.

We are fortunate to welcome four new faculty members to the Martinos Center this year, each with very different expertise, but all with the goals of developing and using new biomedical imaging technology to improve understanding and care of the human mind and body. Two new educational programs, in Diffuse Optical Tomography / Near Infrared Spectroscopy and MEG

were offered this year, and a third program in multimodal brain imaging is planned for the coming fall. In addition to our Annual Center Retreat for investigators already involved with the Center, we hosted a Martinos Research Day at MIT to introduce and welcome new prospective users to the exciting work and resources of the Martinos Center. Finally, we have been excitedly planning all year for the Athinoula A. Martinos Center for Biomedical Imaging's first major international research symposium, *Brainstorm 2002, the Future of Neuroimaging* to be held in Athens, Greece this September.

This report details all these accomplishments, and presents some highlights of the Center's research this year as well.

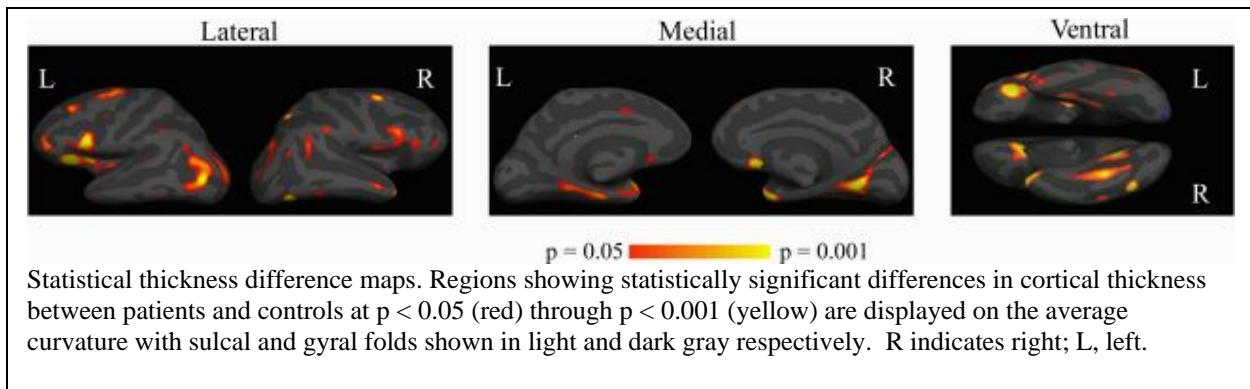
RESEARCH HIGHLIGHTS

Cortical Thickness Mapping

Accurate and automated methods for measuring the thickness of human cerebral cortex could provide powerful tools for diagnosing and studying a variety of neurodegenerative and psychiatric disorders. Manual methods for estimating cortical thickness from neuroimaging data are labor intensive, requiring several days of effort by a trained anatomist. Furthermore, the highly folded nature of the cortex is problematic for manual techniques, frequently resulting in measurement errors in regions in which the cortical surface is not perpendicular to any of the cardinal axes. As a consequence, it has been impractical to obtain accurate thickness estimates for the entire cortex in individual subjects, or group statistics for patient or control populations.

Martinis Center investigators Anders Dale, Ph.D., Bruce Fischl, PhD, and their colleagues have developed an automated method for accurately measuring the thickness of the cerebral cortex across the entire brain and for generating cross-subject statistics in a coordinate system based on cortical anatomy. These measures are shown to be very sensitive and accurate, providing researchers with the ability to detect focal atrophy in small populations or even individual subjects. This technique has already been used by several Martinos Center clinical researchers to investigate changes in the brain associated with such disorders as Schizophrenia, Huntington's Disease and Alzheimer's disease, and with normal aging.

Schizophrenic patients studied using cortical thickness difference maps showed a patchy pattern of thinning especially in prefrontal, cingulate and parahippocampal areas, as well as in the temporal lobes. These changes may be related to such symptoms as disorganized thought and hallucinations. More work is needed to relate these anatomical findings to symptoms, risk factors and possible treatment strategies. (Kuperberg, G. R., Broome, M., McGuire, P., David, A., Eddy, M., Goff, D., W.C., W., S., W., van der Kouwe, A. J. W., Salat, D. H., Dale, A. M. and Fischl, B. Regionally specific thinning of the cerebral cortex in schizophrenia, (2002) *Arch Gen Psychiatry*, Submitted.)



1. Alzheimer's patients showed a very different thinning pattern, involving the entorhinal cortex, parahippocampal gyrus, and superior parietal regions. This pattern was also in contrast to the spatial distribution of changes in the cortex with healthy aging. These findings suggest that Alzheimer's disease does not simply represent an accelerated form of normal aging and that cortical thickness techniques developed will be useful for the discrimination of normal aging from this disorder. (Salat, D.H., R.L. Buckner, A.Z. Snyder, R. Desikan, J.C. Morris, A.M. Dale, and B. Fischl. Regional cortical thinning of the aging brain. *Nature*, 2001. Submitted.)

In Huntington's Disease, regionally specific heterogeneous thinning of the cortex was found to occur early, to differ among patients in different clinical stages of disease and to proceed from posterior to anterior cortical regions with disease progression. The sensorimotor region was most affected. The authors of the study propose that the cortex degenerates early in disease and that regionally selective cortical degeneration may explain the heterogeneity of clinical expression in HD. They hope that these measures might provide a sensitive prospective surrogate marker for clinical trials of neuroprotective medications. (Rosas HD, Liu AK, Hersch S, Glessner M, Ferrante RJ, Salat DH, van der Kouwe A, Jenkins BG, Dale AM, Fischl B. Regional and progressive thinning of the cortical ribbon in Huntington's Disease. *Neurology*. 2002 Mar 12;58(5):695-701.)

BUILDING NEW BRIDGES

Undoubtedly the most important asset of the Athinoula A. Martinos Center for Biomedical Imaging is the diversity of intellectual strengths that it brings together. The creation and development of novel imaging resources and their application to a broad range of biomedical investigation requires the contribution of individuals with distinct expertise and perspectives ranging across the basic, clinical and engineering sciences. It is our aim to foster collaboration among the best engineers, computer scientists, cognitive scientists, clinicians, and many others, not just among our home institutions, MGH, MIT and HMS, but with experts from around the world. This year, we initiated three new programs aimed at cultivating such collaborations and building bridges across disciplines and across institutions.

Collaborative Research Start-Up Grants

Applications were accepted in October of 2001 for the first Martinos Center Collaborative Research Start-Up Grant Program. These awards are designed to inspire collaboration across the Center's participating institutions -MGH, MIT, and HMS. Newly

formed, cross-institutional research teams were invited to apply for this competitive grant to support research projects in biomedical imaging that bridge the basic science/engineering and clinical/translational disciplines.

We received 22 excellent proposals addressing a variety of important research areas ranging from the study of brain morphometric abnormalities related to schizophrenia and other mental illnesses to developing imaging methods that will lead to better understanding of the neurophysiological meaning of functional imaging signals. Applications came from newly formed research teams representing investigators from many different departments and programs at the MGH, MIT and HMS. Four projects were awarded full support of \$50K and another five “runners-up” received imaging time funds. Awardees will present their progress at the Center’s Annual Retreat in September.

Full Award Winners

- Eric Grimson, MIT, Bruce Fischl, MGH, *Statistical study of cortical thickness in healthy aging and Alzheimer's disease.*
- Roger Tootell, MGH, Margaret Livingstone, HMS/MIT, *Electrophysiological testing of the fMRI labeled face-selective area in awake behaving macaque monkeys.*
- Maren Holden, MIT, Emilio Bizzi, MIT, Judith Schaechter, MGH., *Cortical correlates of motor generalization in patients with stroke.*
- Giorgio Bonmassar, MGH, James Weaver, MIT, John Belliveau, MGH., *Combining electrical impedance tomography (EIT) and current density imaging (CDI) for functional brain imaging.*

Runners up

- Thomas Deisbock, MGH, Sui Huang, Children’s Hospital/HMS, Don Ingber, Children’s Hospital/HMS, *Interdisciplinary brain tumor growth model.*
- Jill Goldstein, HMS, Anders Dale, MGH, Sandy Wells, MIT, *Affective arousal deficits in women with schizophrenia: Investigation of abnormalities in brain structure and function.*
- Eric Halgren, Donald Schomer, BIDMC/HMS, Stephan Heckers, MGH, Anthony Wagner, MIT, *Neurophysiological basis of hippocampal dysfunction in schizophrenia*
- Gregory Sorensen, MGH, Calibration of perfusion MRI with a thermal diffusion probe.
- Emery Brown, MGH, Anthony Wagner, MIT, *Functional imaging of memory under anesthesia using simultaneous EEG and fMRI.*

Cambridge-MIT Institute Workshop

A new collaboration was initiated this year between the Martinos Center and a group of researchers from the University of Cambridge, England, with the assistance of the Cambridge-MIT Institute (CMI). The CMI is a strategic alliance between the University of Cambridge and the Massachusetts Institute of Technology (MIT), whose mission is to support research and educational partnerships, which link science and industry. The Martinos Center and our colleagues from the School of Clinical Medicine at the University of Cambridge, led by Professor Ed Bullmore, received funds from CMI to assemble a workshop in Boston this April. The goal of the workshop was to initiate a

formal proposal to CMI to support an integrated research program in the area of human brain mapping, psychopharmacology and drug development.

The application of new brain mapping techniques, including MRI, PET, MEG/EEG, in the fields of psychopharmacology and pharmaceutical drug development is novel and potentially important for understanding the neurochemical basis for cognitive neurophysiology. These techniques will also allow improved characterizing of psychoactive drug effects at the level of large scale neurocognitive networks in the living human brain. These scientific outcomes have major commercial interest for pharmaceutical companies interested in accelerating the drug development process that precedes launching of new drugs in important markets such as treatment of depression, psychosis and cognitive impairment.

Participating in the workshop were Martinos Center faculty from MGH and MIT, as well as other colleagues from MIT's departments of Brain & Cognitive Science, Nuclear Engineering, Health Sciences and Technology, Electrical Engineering & Computer Sciences, and the McGovern Institute, Industrial Liaison Program, and the Whitehead Institute.

Visiting Faculty Sabbatical Program in Cognitive Neuroimaging

A Visiting Faculty Sabbatical Program in Cognitive Neuroimaging was established by the Center's growing Cognitive Neuroimaging Group. The program will be accepting applications beginning this summer from mid- and senior-level scientists throughout the cognitive neuroscience community, to spend their sabbatical or fellowship year investigating the neural bases of cognition using the Center's state of the art neuroimaging facilities. This full or half year program is an excellent way to bring new ideas to the center, build collaborative relationships and share our expertise with others.

The program offers opportunities for intensive training and hands-on experience in the various imaging modalities, including imaging time and technical assistance with experimental design, execution and data analysis. The real draw of the program is of course the opportunity to collaborate with Martinos Center faculty in a wide variety of disciplines and to interact with students and faculty from the numerous cognitive neuroscience programs affiliated with the Center. Visiting faculty will participate in the research activities of the Center, give seminars, share their expertise and help to stimulate creative ideas and new directions in cognitive neuroimaging research.

EVENTS

The Athinoula A. Martinos Center hosted three major events this year: Martinos Research Day at MIT, the Annual Center Retreat, and the Dedication Ceremony for our new 7 Tesla magnet and MEG system. In addition, we have been busy planning the first Athinoula A. Martinos Center International Symposium to be held this September in Athens, Greece.

Martinos Research Day at MIT

Martinos Center Research Day – From Structure to Function and Beyond was held on September 13, 2001 in the Atrium of Building E25 at MIT. This event marked the grand introduction of the MIT students and faculty to the fascinating research and important resources of the Martinos Center. The event featured a poster session by Martinos Center labs and affiliates, brief addresses by the administration and refreshments. The event generated much interest in the Center among the MIT community and we plan to make this an annual occurrence.

Retreat 2001

The Annual Retreat was again located at Castle Hill in Ipswich, MA in October, 2001. This year the Retreat agenda included technological, scientific and administrative updates, a research lab poster session, and talks on how researchers can incorporate new technologies being developed at the Center into their current research programs. The Retreat was attended by over 150 basic, cognitive, clinical and computer scientists from all over the Boston area who currently utilize the Martinos Center's resources. It was a beautiful early autumn day - perfect for frisbee on the beach - and for the very bold, a dip in the chilly Atlantic.

Dedication of State-of-the-Art Imaging Systems

In April, the Athinoula A. Martinos Center of Biomedical Imaging dedicated two state-of-the-art imaging systems, the first of their kind in the region. The 7-Tesla Magnetic Resonance Imaging (MRI) system, made possible through a grant from the Office of National Drug Control Policy (ONDCP), will permit researchers to visualize the brain with sufficient resolution to identify tiny anatomic details and to study neurochemical and metabolic processes with greater precision than ever before. This ultra high field system will help us to better understand the "circuitry" of the brain, and how that circuitry gets perturbed in patients suffering from substance abuse, or from other neurological or psychiatric conditions such as, Alzheimer's Disease, schizophrenia, depression, chronic pain, and other devastating conditions.

The second system, a 306-channel magnetoencephalograph (MEG) was sponsored by the Mental Illness and Neuroscience Discovery (MIND) Institute, who's mission is to enhance the lives of all people living with mental illness by applying advanced neuroimaging technologies to the study of the basic neurosciences and clinical applications. This unique system can image brain activity with real-time temporal resolution. In approaches pioneered by researchers at the Center, the combined MEG and MRI information can, in essence, provide movies of the brain at work, looking at how the different parts of the brain communicate with each other.

The ceremony and mini-scientific symposium featured a history of these projects presented by Center Director, Bruce Rosen, MD, PhD., scientific talks by Center investigators Hans Breiter, MD and Jack Belliveau, PhD, who were instrumental in bringing these new systems to the Center, and by Nancy Andreasen, MD, PhD, Director of the MIND Institute and world renowned schizophrenia investigator. Representatives

of the ONCDP, MIND Institute, MIT and MGH administration presented words of congratulations and gratitude.

Brainstorm 2002

The Athinoula A. Martinos Center will hold its first major scientific conference this September at the Aphrodite Astor Palace outside of Athens, Greece. This international symposium will bring together top neuro- and imaging technology scientists from the Martinos Center and around the globe to design strategies for developing and applying innovative imaging technologies to the resolution of today's major questions in the basic and clinical neurosciences.

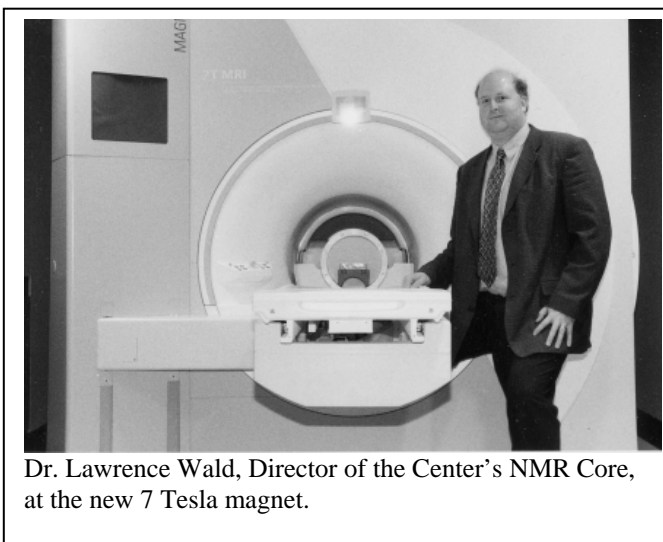
During this three day interactive encounter, we'll explore the impact of modern imaging tools including MR, PET, MEG, EEG, CT and Optical Imaging, on the advancement of our understanding of brain function and how to best use this knowledge to treat human brain disorders. The conference sessions are designed around six important aspects of brain research: systems neuroscience, genomics, brain structure, neural connectivity, neurotransmission & metabolism, and plasticity & development. Participants are encouraged to present new and unpublished findings, to think freely and creatively, and to explore provocative and original ideas with the goal of determining the agenda for the next decade of neuroimaging research.

RESEARCH RESOURCES

NEW THIS YEAR

7 Tesla Ultra High Field MR Imaging

After two years of design, construction and testing, our Office of National Drug Control Policy (ONDCP) sponsored ultra high field 7 Tesla MR system is taking images. The 7.0 T 90-cm whole-body magnet was built by Magnex Scientific, and the console, gradient drivers and patient tables were provided by Siemens Medical Systems. Integration of these components and the design and construction of RF coils were performed by Martinos Center personnel. The system is shielded with a 460-tons of steel. With its high performance gradient set, the system can provide better than 100- μ m resolution and promises to provide unprecedented views of the anatomy and

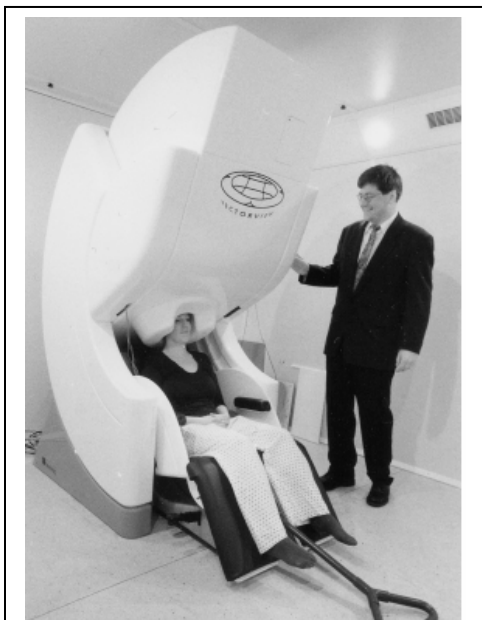


Dr. Lawrence Wald, Director of the Center's NMR Core, at the new 7 Tesla magnet.

neurochemical make up of the brain. While our first 7T images were of phantoms and animals, the magnet should be cleared for use with humans this summer. The 7T device was built for research purposes, but because it has been fully integrated into a conventional MRI console, investigators will be able to translate scientific findings on this system to improve patient care on more widely available clinical MRI systems.

Magnetoencephalograph (MEG)

Our new state-of-the-art MEG facility supported by the Mental Illness and Neuroscience



Valerie Carr, chief MEG technologist demonstrates the new imaging system to Seppo Ahifors, technical director of the MEG.

Discovery (MIND) Institute, was completed and open to users this spring. It features a 4DNeuroImaging/Neuromag Vectorview 306 channel whole head neuromagnetometer. The system comprises 2 planar gradiometers and one axial magnetometer at each of 102 locations. 128 channels of EEG can be simultaneously recorded. The MEG/EEG laboratory is very quiet for an urban location, and the magnetically shielded room is one of the most effective in the world. The room (IMEDCO), with 3 thick layers of mu metal as well as active compensation systems, (minimum attenuation specifications of 78dB@.01Hz, 80dB@.1Hz, 86dB@1Hz, and 95dB@10Hz). The laboratory is equipped with complete auditory, visual and somatosensory stimulation systems for cognitive and clinical neuroscience research paradigms. Also included in the suite is a whole-head combined 64 channel EEG (Neuroscan system) and DOT (diffuse optical tomography), with appropriate behavioral stimulation devices. In combination with the

center's MR technology, this system will be used to provide real-time movies of brain activity during cognitive processing.

Siemens 3 Tesla Trio MRI System

The Center replaced one of its Siemens Allegra head only 3 Tesla MR systems this year with a Siemens Trio 3T whole body magnet. This newly available system received FDA clearance in January and is currently fully equipped for investigation in human subjects and patient populations. The system has features that are complimentary to the head scanner, including a full 60cm bore, RF body excitation, and, importantly, whole body imaging capability. This system promises to revitalize the Center's spine, heart and other body organ imaging programs.

Hospital Campus MR System Trailer

The Center has installed a Siemens Sonata MR system, housed in a trailer, at the MGH Main Hospital campus. This system is intended to facilitate the translation of new MR

techniques being developed at the Center to clinical practice. Feedback from the hospital's clinical staff has been very positive!

Behavioral Testing and Mock Magnet

The Center opened its Mock Scanner and Behavioral Testing Suite this year to facilitate studies of children, patient populations and other groups for which acclimation to the MR scanner environment effects study outcome. The mock scanner was custom built and features a real patient table, recorded scanner noise and full stimulus presentation and response monitoring systems. The behavioral testing suite is available to all center users for pre and/or post imaging behavioral testing and interviewing and provides a much needed resource for our growing Cognitive Neuroimaging Program.

PLANNED IMAGING RESOURCES

Primate Imaging Facility at MIT

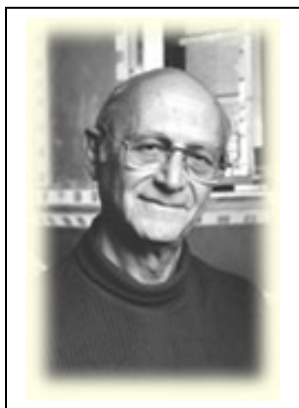
There is a growing recognition of the value of NMR techniques in the study of non-human primates, and in the value of these investigations in the exploration of human brain function and disease processes. Studies of the human brain are best modeled using non-human primates because, more than any other animal, their brains are organized like ours anatomically, cerebrovascularly, neurochemically, immunologically, developmentally, and in terms of higher cognitive function.

Martinos Center investigators were among the first in the world to develop and perfect MR techniques for cognitive studies in awake behaving monkeys. Center investigators, in collaboration with the MGH Radiology department, are also establishing a major biomarker initiative for invasive outcome studies of disease processes and therapeutic intervention. To further these important pursuits, the Martinos center has initiated a major effort to establish a dedicated primate imaging facility to be located at MIT. This Martinos Center facility will be operated in conjunction with MIT's McGovern Neuroscience Institute and the Department of Brain & Cognitive Sciences, and will represent the first Athinoula A. Martinos Center imaging facility to be located on the MIT campus. Preliminary site planning for the facility began this spring.

NEW FACULTY

Joining the Martinos Center this year are four outstanding new faculty members.

David Cohen, PhD



We are very fortunate to have Dr. David Cohen officially join us as Center faculty. During his 25 years as MIT's Biomagnetism Group Leader at the Francis Bitter Magnet Laboratory, Dr. Cohen was *the* main pioneer in the field of Biomagnetism (magnetic fields produced by living entities), and is the "inventor" of MEG. (He has been called the "father of MEG" by SCIENCE Magazine).

Dr. Cohen was invaluable in helping to set up our new MEG facility and is looking forward to using the new system to study the physics of MEG and the MEG/EEG connection, and to measure dc in the brain, which is not possible using any other technique. His input will also be a great asset to the research of other Center neuroscientists in planning their experiments and understanding the physics of this new technology. David is also a talented violinist and is addicted to playing chamber music!

Joseph P. Culver, Ph.D.



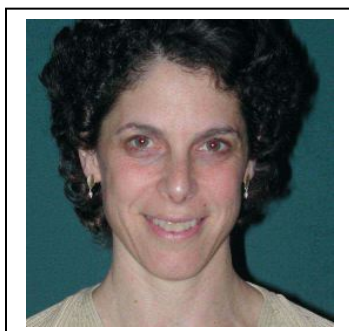
Joe Culver is one of those rare scientists whose work truly spans from “bench to bedside”. A physicist by training, Dr. Culver is developing Diffuse Optical Tomography (DOT) methods and equipment with which to study stroke-related derangements in small animals. In the coming years, through collaborations within the Athinoula A. Martinos Center and the MGH, he plans to establish a parallel program in humans, taking advantage of DOT’s unique ability to continuously image the brain right at the patient’s bedside. He is confident that the technology that he is helping to develop will yield important new insights into the progression of cerebral-vascular disease, and will someday be used routinely in the management of acute stroke in humans.

Dara S. Manoach, Ph.D.



Dr. Manoach is a neuropsychologist who became interested in schizophrenia during her work with patients at the Behavioral Neurology Unit at the Beth Israel Deaconess Hospital in Boston. She began a collaborative research program with Martinos Center investigators from the Psychiatric Neuroimaging Group several years ago, investigating the role of prefrontal cortex dysfunction in cognitive deficits in schizophrenia. She is especially interested in executive functions - those cognitive abilities that allow us to direct our responses to the environment volitionally rather than reflexively. These abilities play a critical role in adaptive human behavior and are notably impaired in patients suffering from schizophrenia. Dara aims to use both fMRI and MEG technology to precisely delineate the spatiotemporal patterns of brain activation associated with these executive function deficits in schizophrenia. This research will shed light on the basic cognitive processes that may underlie stereotypic and preservative behaviors in that devastating disorder.

Judith D. Schaechter, PhD, MSPT



Dr. Schaechter also comes to neuroimaging from a clinical perspective. As an Assistant Professor in Physical Therapy at Northeastern University, she was curious about the neural mechanisms for the sensory and motor recovery she saw in her stroke patients as a result of her treatment. Her work here at the

Martinos Center aims not only to visualize these changes in the brain, but to develop prognostic biologic markers of sensorimotor recovery. Her long-term goal is to use what she has learned from her neuroimaging studies of brain reorganization to develop new and rational post-stroke therapeutic interventions that promote recovery of sensorimotor function. Judith is the recipient of a Martinos Center Collaborative Research Start-Up grant for her proposed study of motor function with Drs. Bizzi and Holden of the Brain & Cognitive Science program at MIT.

EDUCATIONAL INITIATIVES

Educating the next generation of basic and clinical scientists in the use of applications of the imaging technology being developed at the Martinos Center is one of our most important goals. In addition to our two ongoing fMRI Visiting Fellowship programs, and our graduate level course in fMRI offered through MIT's HST department, the center offered two new courses this year, in Optical Imaging and MEG. Coming this fall, we plan to add a third course in Multimodal Function Brain imaging as well.

NIRS DOT course

Twelve students from labs around the country participated in a two and a half day introductory course on Near Infrared Spectroscopy and Diffuse Optical Tomography, directed by David Boas, Ph.D. The course featured lectures on the physics of diffuse optical spectroscopy and imaging of the brain, the instrumentation necessary to perform such experiments, the basics of experimental design, and some possible clinical and research applications. Participants received plenty of hands on experience in the application of optical techniques to studying brain activity. A highlight of the course was the design and implementation of optical brain activation experiments by the students.

MEG Training

The Center held several training sessions for users of our new MEG facility. Each course involved a day of theory and demonstration on the basics of MEG instrumentation, recordings, and data analysis, followed by a full day of intensive practical hands-on work designed to familiarize users with the practical aspects of performing an MEG experiment. The course was presented by Eric Halgren, Director of the MEG Core, Seppo Ahlfors, PhD., and our other MEG scientists and staff. Components of this course, which was developed specifically for Center users, will be incorporated into our Multimodal Imaging Visiting Fellowship Course to be offered in the fall.

Multimodal Imaging Visiting Fellowship Course

The National Center for Research Resources (NCRR) sponsored Center for Functional Neuroimaging Technologies at the Martinos Center will offer a course in Multimodal Brain Imaging this fall. The course is designed specifically to disseminate the technology and data analysis techniques and software being developed by the Resource, including tools for cortical surface modeling, optical imaging, statistical improvement of functional imaging data and multimodal MRI-DOT and MRI-MEG/EEG integration.

Modeled on our other successful programs, this course, which will be open to the international neuroimaging community, will also offer theory-based lectures and demonstrations, practical training and hands on experimental design.