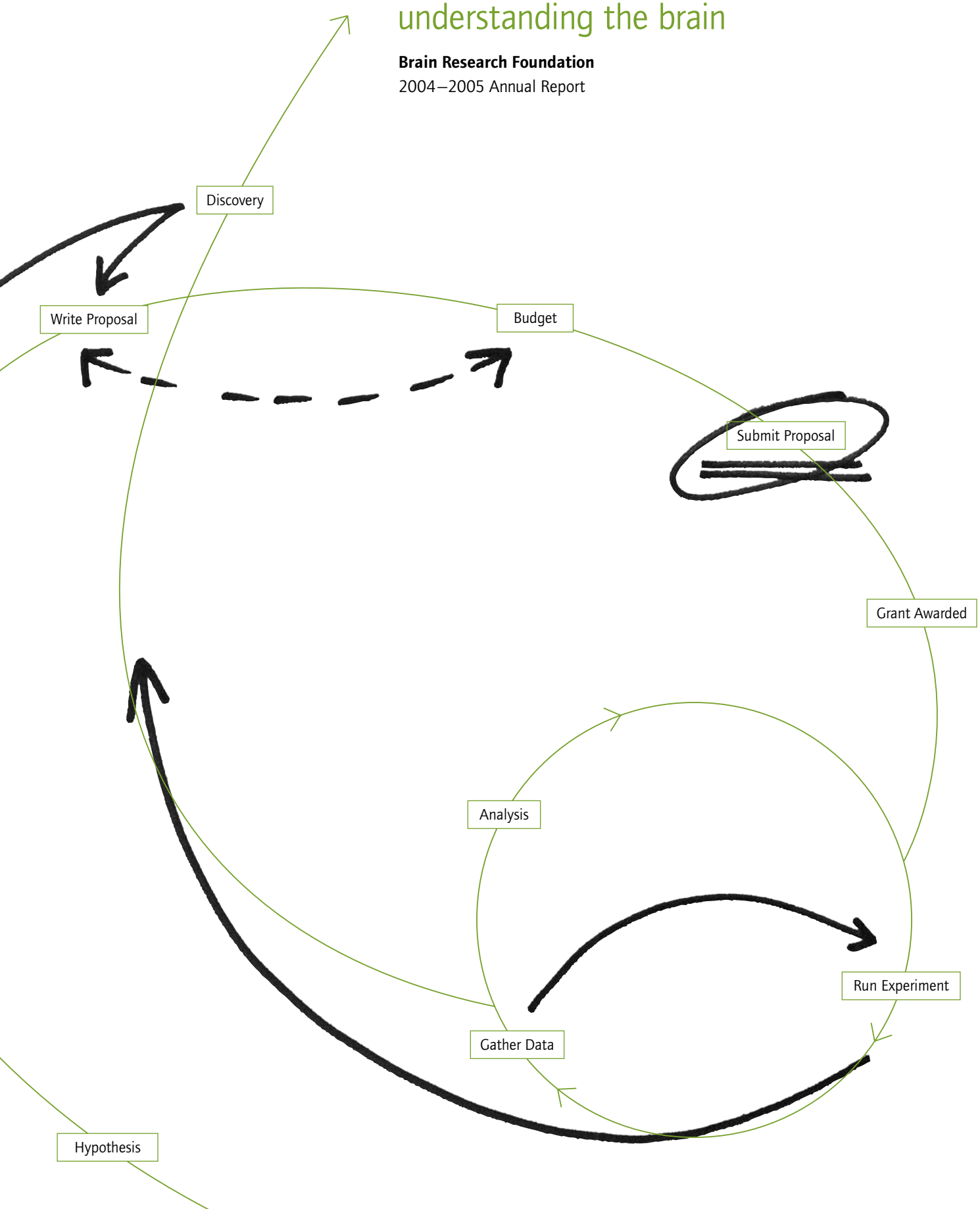
One step closer to understanding the brain

Brain Research Foundation
2004–2005 Annual Report



Hypothesis > Investigation >

The dynamic process of moving from experimental design to scientific innovation is intense and at times unpredictable.

Evaluation > Advancement

The Brain Research Foundation is committed to funding this exciting journey to discovery.

Letter from the President and the Executive Director of the Brain Research Foundation

The pathway to scientific discovery is a challenging and lengthy process. A scientist poses a question, forms a hypothesis, runs experiments, analyzes results and hopefully uncovers new findings. This quick overview of how research is accomplished implies that a researcher single-handedly progresses science. What you must realize is all of the painstaking research that came before, all of the hours that were required to carry out the experiments, all of the resources utilized and all of the funding it took to answer just one question.

That is why the partnership between the Brain Research Foundation and the Brain Research Institute at The University of Chicago is so essential. Since the Institute's inception, the Foundation has worked tirelessly to supply the framework needed to expand the frontiers of brain research. With guidance from leadership within the Brain Research Institute, the Foundation has and continues to make an impact on neuroscience by supporting faculty research team recruitment, funding state-of-the-art equipment purchases and facilitating the expansion of new laboratory space.

Much of the recent progress in neuroscience can be attributed to a multidisciplinary effort now being used to understand brain function and its disorders. Interestingly, this concept was realized over fifty years ago by the Brain Research Foundation. One of the Foundation's goals was to create a brain research institute that brought together a variety of scientists with different backgrounds to increase the understanding of the human brain. The Brain Research Institute accomplishes this through a research environment that encourages creativity and innovation in a collaborative atmosphere, forming a scientific network within the neuroscience community at The University of Chicago. This network is comprised of more than 100 neuroscientists, from thirteen basic science and clinical departments.

Neuroscience is at an exciting threshold of discovery and unprecedented growth. The Brain Research Institute is also at an exciting threshold. New department leaders have recently joined the Institute. With these new leaders come new ideas and new perspectives. Fresh ideas are extremely important. In order for long term programs to succeed, they must be willing to, every so often, take some time to evaluate their current state and determine what is needed to continue momentum. This is an ideal time for the Institute to determine what is necessary for the evolution of neuroscience at The University of Chicago and create a plan for development and regeneration.

Regeneration is such a compelling word. In neuroscience, regeneration means the regrowth of nerves after injury or loss. In electronics, a regenerative circuit allows a signal to be amplified many times. Actually, both definitions are appropriate.

As scientists and physicians leave or retire from the Brain Research Institute, the void that is left must be filled by new faculty recruits. These new recruits strengthen the Institute with their new expertise and knowledge. And it is interesting to think that the Brain Research Foundation allows for "positive feedback" by funding cutting-edge technology and research facilities that amplify scientific discoveries.

It is these scientific discoveries that will one day reduce the suffering of millions of people afflicted with brain disorders. The Foundation's goal is to help this become a reality—in years instead of decades.

The success of our efforts could not happen without the generosity of our donors, the dedicated support of our trustees, and the tremendous work of our staff. We are extremely grateful to all of you.

Sincerely,

Thomas A. Reynolds III
President

Terre A. Sharma, Ph.D.
Executive Director

Letter from the Director of the Brain Research Institute

The term "regeneration" serves as a double entendre when utilized within the neurosciences at The University of Chicago. Of course, the most obvious application refers to our neuroscience research itself, and we have ample "regeneration" research being conducted here. For example, among our projects Yimin Zou's research studying the mechanisms of axon guidance in the developing spinal cord will contribute significantly to our understanding of how the spinal cord develops embryologically, and could also reveal mechanisms which may be relevant to the repair/regeneration of the spinal cord following injury. This could have significant implications for the options that may be available for treatment of spinal cord injury in the future.

Translational regeneration research (i.e. "translating" basic research to clinical trials) is also continuing at the University. Two projects are currently being prepared for translational trials within the section of neurosurgery. The first involves transplantation of an approved glial progenitor stem cell line into the spinal cords of patients with subacute spinal cord injuries, and is based upon encouraging research which has satisfied all pre-clinical criteria both in vitro and in vivo. The second involves transplantation of a human, GDNF secreting, neural progenitor cell line for the treatment of ALS (Lou Gehrig's disease), and is similarly based on extensive preclinical data.

The other application of the term "regeneration," however, applies to what is happening to the neurosciences, in general, at The University of Chicago. As highlighted throughout this report, the University has recently recruited significant new neuroscience "fire-power," both in leadership positions and in its clinicians and scientists.

Staying "at the forefront," of course, demands periodic self analysis and re-creation of long term plans. In the wake of successful recruitments of new leadership in several basic (Dr. Sherman, Dr. Gillam) and clinical (Dr. Coccaro, Dr. Fessler) neuroscience departments over the last few years, it is particularly timely that Dean Madara has recently convened a task force to plan the University's neuroscience future. This task force

will be charged with the duty to evaluate where our neuroscience strengths and weaknesses are now, and where the field seems to be headed in the short and long term future. Their recommendations will be key to the future of neuroscience at the University.

Where we stand right now is on the precipice of decision. With vision, foresight, and commitment, The University of Chicago can propel its neurosciences to the pinnacle of American research and clinical practice.

Sincerely,

Richard G. Fessler, M.D., Ph.D.
Director, Brain Research Institute

Direction of Neuroscience at the Brain Research Institute: An Interview with Three Recently Appointed Department Chairs

Often with new leadership comes new ideas and new objectives. Terre Sharma, executive director of the Brain Research Foundation, sat down with Emil F. Coccaro, M.D., S. Murray Sherman, Ph.D. and T. Conrad Gilliam, Ph.D. from The University of Chicago to talk about the direction of neuroscience research within the Brain Research Institute.

Emil F. Coccaro, M.D.

PROFESSOR AND CHAIRMAN OF PSYCHIATRY

In 1999, Dr. Coccaro came to The University of Chicago from the Medical College of Pennsylvania – Hahnemann School of Medicine. He founded and serves as director of the Department of Psychiatry's Clinical Neuroscience and Psychopharmacology Research Unit.

Dr. Coccaro received his B.S. in biology from Fordham College in 1975, followed by his M.D. from New York University School of Medicine in 1979. After an internship in internal medicine at the University of Cincinnati and a residency in general psychiatry at Mount Sinai Medical Center in New York City, he joined the faculty of Mount Sinai School of Medicine in 1983. In 1989, Coccaro was appointed assistant professor of psychiatry at Medical College of Pennsylvania – Hahnemann School of Medicine.

Area of Research: Dr. Coccaro studies the neuropharmacologic and genetic mechanisms of mood, anxiety, and personality disorders, and is a leading authority on the neurobiology of suicidal and impulsive aggressive disorders, with a particular interest in intermittent explosive disorder.

Before you came to U of C, what was your perception of neuroscience research there?

Coccaro: I thought neuroscience research was fragmented here [The University of Chicago]. But there was a new initiative to have a brain research imaging center.

Gilliam: I came mainly for genetics, human genetics, and evolutionary biology, so most of what I learned came from discussions from neuroscientists at Columbia, and meetings with faculty once I got here. My impression was, compared with Columbia, there was perhaps less of a critical mass, but there were smatterings of excellent research. I wasn't sure what the central focus was.

Sherman: My perception was that U of C was not strong. After one visit, I was very pleasantly surprised at how much good neuroscience there was here [The University of Chicago]. And since I have been here meeting first time visitors coming to campus, they've expressed similar sentiments.

Once you joined, did your perception change?

Coccaro: It has changed more since I have become chair. I recruited a junior imaging person, Luan Phan. Luan has galvanized those of us interested in neuroimaging research. We are forming more formal collaborations with people in the department of psychology, specifically John Cacioppo. As far as future recruits, if there is a choice between a neuro-imager or someone in systems neuroscience, I would be more likely to recruit the systems neuroscience person.

Gilliam: Well, I really haven't taken it all in yet. Phil Ulinski [professor, Department Organismal Biology & Anatomy] was a very positive interaction and I could see that he focused questions about how to improve neuroscience here . . . The recruitment of Murray [Sherman] was great for neurobiology; and Emil [Coccaro] has been a great colleague.

Sherman: It changed after my first visit . . . very good neuroscientists spread around various departments. U of C is underachieved in this area [neuroscience] partly because it has not projected an image of neuroscience here that represents its strengths.

What would you consider to be the most promising neuroscience research on campus?

Coccaro: Well if you are a translational investigator like myself, it would be imaging – and the marriage of imaging to genetics and psychopharmacology. In basic science research, it's sitting in pieces of each of the departments. But, if you're in translational research, it's really happening in psychiatry and maybe human genetics.

Gilliam: My bias is going to be neurogenetics and computational neuroscience. I guess I am naming areas that are ready for growth and where I think we can build in a short amount of time.

Sherman: There is a lot of promising research, but it comes from a lot of individuals. I think that cortex is the top area I want to build in. Our department is going to be hiring in that area. Another one is represented by what Sam Sisodia [professor, Department of Neurobiology, Pharmacology & Physiology] does because it's a great example of first rate research that is translational.

T. Conrad Gilliam, Ph.D.

PROFESSOR AND CHAIRMAN OF HUMAN GENETICS

Dr. Gilliam came to The University of Chicago from Columbia University, where he was the John E. Borne professor of genetics and development, director of the Columbia Genome Center, adjunct professor of biomedical informatics, and co-director of the Joint Centers for Systems Biology.

Dr. Gilliam received his B.S. and M.S. in biochemistry from Clemson University and his Ph.D. in biochemistry from the University of Missouri–Columbia. He then completed a two-year postdoctoral fellowship as a Cystic Fibrosis Research fellow in molecular genetics at the University of London, followed by a second postdoctoral fellowship in molecular genetics at Harvard University. Following a one-year instructorship at Harvard University, Gilliam was appointed assistant professor of neurogenetics in the departments of psychiatry; neurology; and genetics & development in the College of Physicians and Surgeons, Columbia University.

Area of Research: Dr. Gilliam studies the genetic determinants of common heritable disorders, including anxiety disorder, autism, bipolar disorder, schizophrenia, and cardiovascular disease using novel genomic and bioinformatic approaches.

In what direction is neuroscience headed in the near future at U of C?

Cocarro: I think the imaging center is a good thing to talk about because it could bring lots of people together. And the basic science can then be translated in the human being and investigated in the MR [magnetic resonance] scanner. From a translational point of view, that is the direction I would really like to see us going. You want to understand the mechanisms behind behavioral disorders — [with imaging] you can see how treatments affect the brain and how you can devise better treatments.

Sherman: I think we need a department of neuroscience. We need a department that represents a focus, but it's important to have significant strength outside the department as well as spread throughout campus. To support that, you need to have a central center for neuroscience. I think the places that work best are the places where the molecular people talk to the cognitive people and everyone in between.

More specifically, what role is your department playing in shaping neuroscience?

Coccaro: Our department is playing a role by doing a lot of the fundamental MR [magnetic resonance] scanning in psychiatric patients with illnesses like mood disorders, aggression disorders, and psychotic disorders.

Gilliam: [Human genetics] will help influence the way genetics approaches are worked into neuropsychiatric and neurological heritable diseases. I think we can also bring some genomic strategies to that field, helping to put individual candidate genes — identified by leading research groups on this campus — in the context of their molecular partners within a cell. We can move from single candidates to systems of interacting genes. That may allow us in the near future to look at biology and biomedicine with a little more complexity.

Sherman: I think that it is going to be really important that there is a department of neuroscience. NPP [Neurobiology, Pharmacology & Physiology] would play a central role. And again, if you look across the country at the top places, they all have a department of neuroscience or neurobiology. It's not just to strengthen scientific programs and collaboration, but the impression this gives to the outside world is important to recruit graduate students and post doctoral fellows.

S. Murray Sherman, Ph.D.

PROFESSOR AND CHAIRMAN OF NEUROBIOLOGY, PHARMACOLOGY & PHYSIOLOGY

Dr. Sherman came to The University of Chicago from the State University of New York at Stony Brook, where he was a professor of neurobiology and anatomy.

Dr. Sherman received his B.S. in biology from the California Institute of Technology in 1965 and his Ph.D. in anatomy from the University of Pennsylvania in 1969. He completed a two-year postdoctoral fellowship with the department of physiology at the Australian National University. He was appointed assistant professor of physiology at the University of Virginia in 1972, associate professor in 1975 and professor in 1978. In 1979, he joined SUNY at Stony Brook, where he became a leading professor in 1990.

Area of Research: Dr. Sherman's research focuses on how the brain processes information from the central visual pathways, and the role of the thalamus in relaying information from the retina to the cortex.

What do you think are the biggest obstacles that will be faced?

Gilliam: I think for neurogenetics and neurogenomics, it's resources. The infrastructures of both are relatively expensive compared to other areas of science. Some of the genomic resources (microarray resources or even some of the new technology that allows one to look at interacting pathways) are not yet established on campus, and I think they will play a role in moving neuroscience further along. Also, there seems to be a cap on the growth of animal behavior studies, which I think will be key for the neurosciences, so that needs to be dealt with.

Sherman: The biggest one is the NIH (National Institutes of Health) budget because we are building up the program in the face of what could be devastating problems in funding. The other is that Chicago prides itself on being small but agile. I think we are going to have to go against that concept. We are going to have to grow in size in neuroscience.

Where should future funding be directed?

Coccaro: Faculty recruitment.

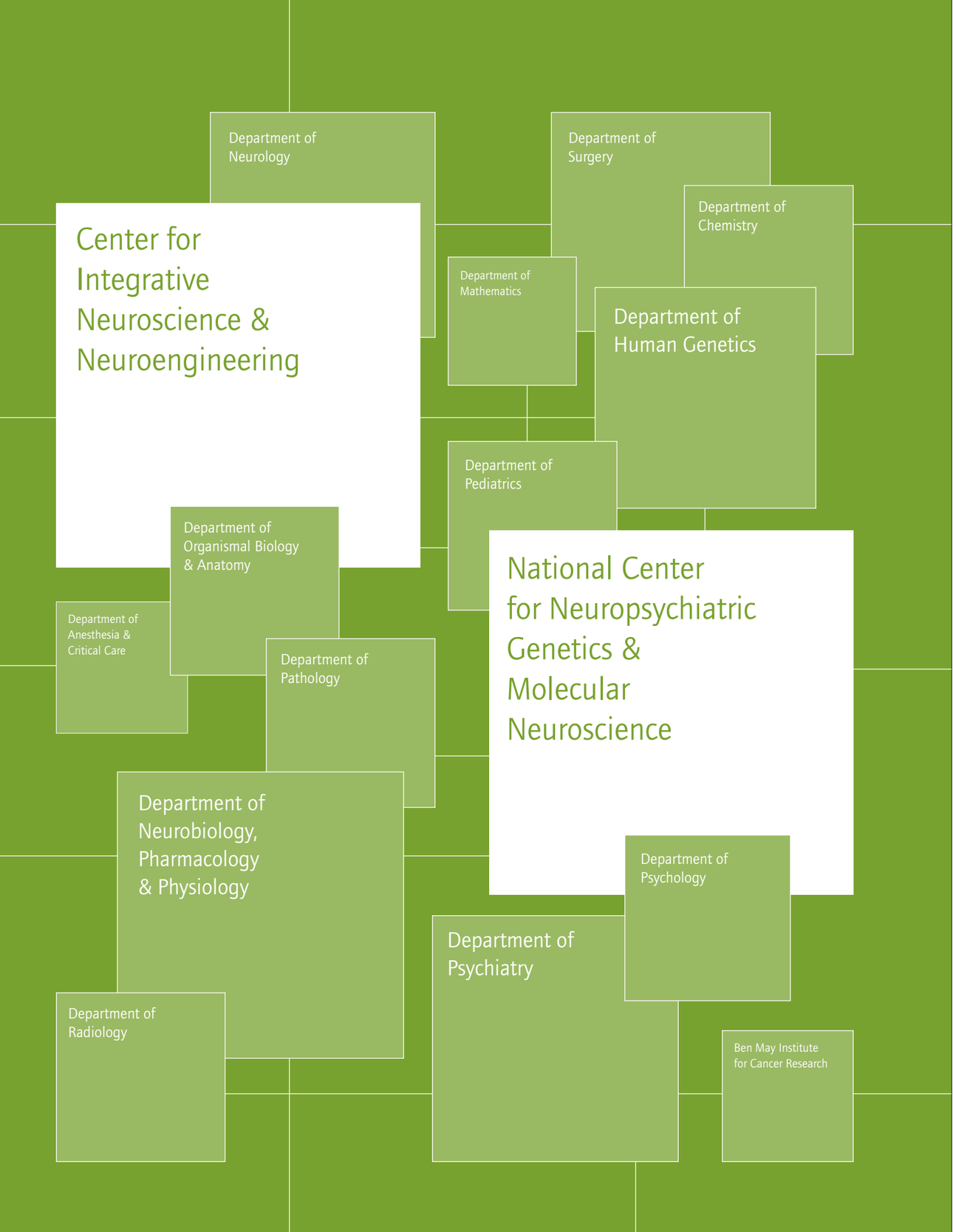
Gilliam: In addition to the seed grants, I think you might ask the individual Brain Research Institute members to think of ways that some sort of common resources (equipment, facilities, etc.) could give back. What sort of experimental or computational resources or mouse facility, that sort of thing, could go furthest because resources are limited.

Sherman: If we are going to increase the number of faculty, the problem is going to be endowment.

Finally, why should donors keep funding brain research?

Coccaro: Because, from a psychiatry point of view, behavioral disorders are extraordinarily common and largely brain based. If we are ever going to relieve the burden of mental illness, and there are many forms, we are going to need to understand the mechanisms of the disorders. Only when you know the mechanisms can you come up with strategies for intervention that could possibly be effective. The brain is the last frontier. We know less about the brain than anything else.

Gilliam: Technology has brought us to the brink of understanding behavior and treatment of complex behaviors. We are now able to deal with the source of complexities that involve not just single genes and single cells, but interactions between proteins and communications between cells and systems. Being able to deal with this complexity, we can now really start to understand some of the basic outcomes of the nervous system. Autism, a devastating disorder, is a perfect example of how a wide range scientists — from cognitive to behavioral neuroscientists to geneticists — are working together to make great strides. They are doing this in ways that I think wouldn't have been imaginable even five years ago. We are now starting to look at the genetic basis of individuals to quickly recognize emotional content in a face and relate that to neuropathology of autism. I think some of the integrated interdisciplinary approaches to neuroscience are breathtaking.



Brain Research Foundation Seed Grant Program

One of the most important and productive things the Brain Research Foundation does is to support promising investigative leads. This is accomplished through the Foundation's annual Seed Grant Program. The program was initiated in 1981 to fund small seed grants for young neuroscientists at the Brain Research Institute of The University of Chicago. The program provides start-up money for innovative projects that have the potential of obtaining funding from the National Institutes of Health or other outside sources. Since the program's inception, the Foundation has awarded over $6.1 million in seed grants.

A committee, which includes Brain Research Institute Fellows and Foundation representatives, meets each year to review numerous grant applications submitted by members of the Brain Research Institute. The Committee is comprised of senior scientists representing the various departments in the Brain Research Institute: Human Genetics; Neurology; Neurobiology, Pharmacology & Physiology; Neurosurgery; Psychiatry; and Psychology. The basic philosophy of the Committee has been to fund only those projects which they consider to be of the highest scientific merit.

Over the past two years, the Foundation has awarded seed grants to 32 researchers, totaling $800,000. The following recipients illustrate the variety of neuroscience research being conducted at the Brain Research Institute.

2004–2005 Seed Grant Recipients

Sean P. Cook, Ph.D.
Department of Anesthesia & Critical Care
A novel ion channel target for the sensation of pain

Daniel J. Curry, M.D.
Department of Surgery
The ultrastructural effect and distribution of intrathecal and intravenous poloxamer 188 in the rat model of excitotoxic brain injury

Glyn Dawson, Ph.D.
Department of Pediatrics
OxPC and RAGE in MS brain

Jay M. Goldberg, Ph.D.
Department of Neurobiology, Pharmacology & Physiology
A pharmacological dissection of the mammalian efferent vest

Morris B. Goldman, M.D.
Department of Psychiatry
Identifying novel therapeutic targets in an alternative phenotype of schizophrenia

Jackie K. Gollan, Ph.D.
Department of Psychiatry
Early life stress and emotion and stress regulation in depression

Naoum P. Issa, M.D., Ph.D.
Department of Neurobiology, Pharmacology & Physiology
Cortical limits on dynamic visual acuity

Leslie M. Kay, Ph.D.
Department of Psychology
Quantitative analysis of odor mixture perception

Andrea C. King, Ph.D.
Department of Psychiatry
Functional MRI of alcohol-induced urge to smoke

Maciej Lesniak, M.D.
Department of Surgery
2004 – Preclinical evaluation of cytoryn (ReGel/IL-2) in malignant glioma
2005 – Development of chimeric adenoviruses for malignant glioma

Chunyu Liu, Ph.D.
Department of Psychiatry
Neurogenesis and plasticity in bipolar disorder

R. Loch Macdonald, M.D., Ph.D.
Department of Surgery
Role of ephrins in brain arteriovenous malformations

Charles J. Marcuccilli, M.D., Ph.D.
Department of Pediatrics
Electrophysiological characterization of pediatric neocortical neurons

James A. Mastrianni, M.D., Ph.D.
Department of Neurology
The role of the proteasome degradative pathway in prion disease

Michael S. McCloskey, Ph.D.
Department of Psychiatry
Functional magnetic resonance imaging of aggression in subjects with and without intermittent explosive disorder

K. Luan Phan, M.D.
Department of Psychiatry
Neural substrates of interpreting emotional ambiguity in social phobia: a trial-related functional magnetic resonance imaging study

Clifton W. Ragsdale, Ph.D.
Department of Neurobiology, Pharmacology & Physiology
Signaling molecules and the development of the visual cortex

Kourosh Rezania, M.D.
Department of Neurology
Impaired glucose tolerance in idiopathic neuropathy

Axel Rosengart, M.D., Ph.D.
Department of Neurology
Targeted drug delivery based on a novel vascular stent in medicated magnetic carriers

Nancy B. Schwartz, Ph.D.
Department of Pediatrics
Glial precursor migration and differentiation during brain development and injury: role of aggrecan

Kamal Sharma, Ph.D.
Department of Neurobiology, Pharmacology & Physiology
2004 – The role of SMN protein in determination of motor neuron subtype identity
2005 – Specification and maturation of spinal interneurons

Ya-Ping Tang, Ph.D.
Department of Psychiatry
Neurobiological and behavioral traits associated with expression of G72/G30 gene complex in the mouse

Vernon Leo Towle, Ph.D.
Department of Neurology
Identification of cortical language areas from EcoG recordings without electrical stimulation of the brain

Avery Tung, Ph.D.
Department of Anesthesia & Critical Care
The effect of anesthetics on cell proliferation in the dentate gyrus of the adult rat

Paul R. Vezina, Ph.D.
Department of Psychiatry
Calcium-mediated second messengers and enhanced self-administration of amphetamine

Zheng Xie, M.D., Ph.D.
Department of Anesthesia & Critical Care
Molecular mechanisms for catecholamine release by anesthetics

Bakhtiar Yamini, M.D.
Department of Surgery
Evaluation of the mechanism of interaction between temozolomide and TNFα in the induction of apoptosis

Xiaoxi Zhuang, Ph.D.
Department of Neurobiology, Pharmacology & Physiology
Role of Pink1 in Parkinson's disease

Yimin Zou, Ph.D.
Department of Neurobiology, Pharmacology & Physiology
2004 – Guidance of corticospinal cord axons in the spinal cord
2005 – Molecular and cellular mechanisms of neuronal migration and corticogenesis

Women's Council Seed Grant

Angèle Parent, Ph.D. (2004)
Department of Neurobiology, Pharmacology & Physiology
Presenilin regulates nicotinic and glutamatergic receptors: potential therapeutic target for Alzheimer's

Orly Lazarov, Ph.D. (2005)
Department of Neurobiology, Pharmacology & Physiology
The physiological parameters and behavioral outcomes associated with environmental enrichment-induced reduction in Aβ peptide levels and deposition in FAD transgenic mice

Identifying the Genetic Origin of Schizophrenia

Ya-Ping Tang, Ph.D., Seed Grant Recipient

Schizophrenia is a chronic, severe and disabling psychiatric disorder that affects approximately 1% of the population worldwide. More than 2 million Americans suffer from the illness in a given year. Despite extensive studies, the causes of schizophrenia have yet to be determined.

Dr. Ya-Ping Tang, an assistant professor of psychiatry at The University of Chicago, strives to create a schizophrenia genetic animal model that will be an extremely valuable tool in developing novel preventive and therapeutic strategies for patients suffering from schizophrenia.

It has long been known that schizophrenia runs in families. People who have a close relative with schizophrenia have a higher risk of developing the disorder. This increased risk led scientists to uncover genetic factors. More specifically, genetic association studies have identified susceptibility or candidate genes for schizophrenia by looking for differences between people who have the disease and those who don't.

Dr. Tang is focusing on a gene complex that was recently reported to be associated with schizophrenia, G72/G30. G72 and G30 are expressed only in primates, with no counterpart in mice. They have no established function. In order to study their functions, Dr. Tang will generate two genetic mouse models. One model will express normal G72/G30 gene complex and the other will express variant G72/G30 derived from schizophrenia patients. The animal models will be extensively characterized at molecular, histological, and cellular levels.

Dr. Tang hypothesizes that the variant G72/G30 gene complex derived from schizophrenic patients may exhibit schizophrenia-like traits in the mice. He will determine if the animals exhibit the manifestation of hallmark symptoms of schizophrenia. Although some symptoms such as delusions and hallucinations cannot be observed in animals, many other behavioral deficits can be evaluated.

One of the most apparent symptoms for schizophrenia is a deficit in social behaviors. Behaviors such as gesturing and vocalizing are enhanced in schizophrenia patients. Dr. Tang expects to see similar enhancements of social behaviors in the mice with schizophrenia-based G72/G30 gene complex.

Another behavior is a startle response. Unexpected stimuli elicit startle responses from animals and humans. However, this startle response can be dramatically attenuated if the unexpected stimuli are preceded by a weak stimulus. This phenomenon is called pre-pulse inhibition (PPI). Studies have shown that PPI in schizophrenia patients is greatly impaired. Therefore, when schizophrenia-based G72/G30 gene complex mice are studied, the outcome should also show impairment.

Dr. Tang hopes that this study may validate a schizophrenic mouse model that will be an extremely valuable tool in developing novel preventive and therapeutic strategies for patients suffering from schizophrenia.

National Center for Neuropsychiatric Genetics and Molecular Neuroscience: New Insight into Psychiatric Disorders

Over 20 million adults in the United States are disabled by a psychiatric disorder. Coping with the daily physical and emotional consequences can be difficult for individuals and their families – not to mention battling the societal stigma accompanying mental illness. Although advances in treatment have occurred over the past fifty years, little is known about the causes of these disorders.

Recently, specific genes have been identified as associated with particular mental illnesses. However, these diseases are complicated, and caused not by a single gene, but rather by disruption of a network of genes in a complex architecture that scientists have only just begun to understand.

The University of Chicago has launched a focused research center to study safer and more effective individualized treatments of neuropsychiatric disorders and related basic sciences – the National Center for Neuropsychiatric Genetics and Molecular Neuroscience. Under the leadership of renowned psychiatrist and genetics researcher Elliot S. Gershon, M.D., the Center presents an opportunity for strategic growth and formalized collaboration among a multidisciplinary team of researchers. Most notably, he has been joined by T. Conrad Gilliam, Ph.D., Professor and Chair of the Department of Human Genetics. Dr. Gilliam is internationally known as a pioneer and innovator in the development of novel genetic, genomic, and bioinformatics strategies to identify the genetic determinants of neuropsychiatric disorders.

The team of leading investigators includes experts in genetics, transgenics, bioinformatics, neurobiology, and statistics. It will examine function of genes in the mammalian brain in various models, including behavior, cell biology, and transgenic mice. With the shared objective of developing new treatments for psychiatric disorders, the convergence of these disciplines will stimulate progress and new insight into psychiatric disorders and other malfunctions of the brain. Discoveries like these will offer hope to millions of individuals and families affected by mental illness, and move researchers closer to the ultimate goal of deciphering the human brain.

Physiology of Motion Perception

Naoum P. Issa, M.D., Ph.D., Seed Grant Recipient

The great Boston Red Sox hitter Ted Williams' secret weapon was not his strength or his speed – it was his dynamic acuity. Williams' eyesight was so sharp, he was able to read the label stamped on a baseball as it was hurtling toward him.

Dr. Naoum P. Issa, an assistant professor of neurobiology, pharmacology & physiology, is interested in understanding how the brain interprets the moving images we see. When we look at a stationary train, we can see each window and the numbers on the train clearly. When the train is in motion, the windows and writing on the train blur. So why do we see less detail when the train is moving?

It is known from previous studies that the neurons in our eyes can follow very rapid changes in a scene, but when the images get to the brain they blur together. Dr. Issa's goal is to understand which part of the brain limits our ability to see detail in moving images and how this happens. To carry out this study, his lab uses a brain-imaging technique to follow activity in the different areas of the brain that process visual images.

In previous studies, Dr. Issa found that fine details of an image are processed in a different region of visual cortex than are large-scale features. In the current experiments, he is studying how the representation of fine detail changes with image motion.

Dr. Issa has uncovered two main findings so far. First, the brain actively inhibits itself when images are moving. When images are moving slowly, the regions of the brain sensitive to fine details inhibit the regions sensitive to large-scale features. So at slow image speeds, the brain makes itself more sensitive to fine details.

His second finding is that as the speed of an image increases, the activity of the brain shifts from regions that process fine detail to regions that encode large-scale image features. Even though the eyes are encoding the details in the quickly moving image, the brain only responds to the "big picture," ignoring small details.

Dr. Issa's plan for the future is to understand how these mechanisms are disrupted in a visual pathology known as amblyopia. Amblyopia is a disorder of the visual cortex caused by eye problems during childhood. It afflicts about 1 – 2% of children and adults, and results in poor vision even after the optics of the eye are corrected. The origin of amblyopia seems to be an abnormality in how different regions of the brain inhibit each other. Because Dr. Issa can now determine some patterns of inhibition within the brain, he hopes to see how amblyopia changes these structures.

Ultimately, Dr. Issa hopes to help prevent vision loss from amblyopia – for future little-leaguers and others – and perhaps even restore visual acuity.

National Center for Neuropsychiatric Genetics and Molecular Neuroscience: New Insight into Psychiatric Disorders

Until recently, neurobiologists have been largely limited to recording electrical activity from one neuron at a time. However, most behaviors involve populations of neurons interacting with each other, each carrying an individual portion of the overall message. Recent technology advancements have made it possible to simultaneously record or image the activity of hundreds of neurons, offering insights into how human brains work.

Researchers in the Center for Integrative Neuroscience and Neuroengineering have focused their attention on uncovering the complexities of the brain. The Center is dedicated to understanding how the brain encodes and processes information, and how the knowledge of neural coding can be used to develop devices that remedy human disease.

The knowledge and technical skills required to decode neurons is so diverse that no scientist will be able to meet the challenge alone. That is why the Center involves faculty and students at The University of Chicago and the Illinois Institute of Technology, and provides an environment that fosters collaboration between research teams.

Over the past several years, Dr. Philip Ulinski and his colleagues have assembled the elements needed to create a comprehensive research center that can move towards discovering how the brain functions as a whole. One very important component is the ability to expose a new generation of scientists to a wide variety of approaches to neuroscience. The University of Chicago established the Committee on Computational Neuroscience – an interdepartmental committee designed to provide training and instruction for students interested in research topics related to how brains process information. The Committee is comprised of 30 faculty from 12 academic departments at the University. These faculty have research interests that range from developing mathematical methods that predict epileptic seizures to creating prosthetic devices for paralyzed patients.

Concepts and technologies developed during the second half of the 20th century provide the tools to understand how neurons communicate with each other, supplying information to help victims of brain damage and disease. The scientists and engineers within the Center for Integrative Neuroscience and Neuroengineering are ready for that 21st century challenge.

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Johns Hopkins University School of Medicine

Nicholas Zervas, M.D.
Higgins Distinguished Professor of Neurosurgery
Harvard University Medical School

Fellows of the Brain Research Institute Univeristy of Chicago

Anesthesia & Critical Care

Sean P. Cook, Ph.D.*
Assistant Professor
Area of Research: Peripheral mechanisms of pain transmission, electrophysiology of purinergic receptors, & nociception

Khaled M. Houamed, Ph.D.*
Assistant Professor
Area of Research: Basic brain mechanisms, cellular & molecular basis of brain disease

Daniel S. McGehee, Ph.D.
Associate Professor
Area of Research: Neuronal nicotinic receptors & synaptic transmission

Jonathan Moss, M.D., Ph.D.
Professor
Area of Research: Anesthesia, autonomic & histamine pharmacology

Avery Tung, M.D.
Associate Professor
Area of Research: Regulatory interactions between general anesthesia & naturally occurring sleep

Zheng (Jimmy) Xie, M.D., Ph.D.
Assistant Professor
Area of Research: Molecular mechanisms underlying the effects of anesthetics on catecholamine secretion

Chun-Su Yuan, M.D. Ph.D.
Cyrus Tang Professor
Area of Research: Gut & brain neurochemical interactions, pain

Ben May Institute For Cancer Research

Marsha R. Rosner, Ph.D.
Charles B. Huggins Professor & Director – Ben May Institute for Cancer Research
Professor – Department of Neurobiology, Pharmacology & Physiology
Area of Research: Signal transduction in the brain leading to neuronal growth & development

Wei-Jen Tang, Ph.D.
Associate Professor
Area of Research: Cell signaling in the brain

Chemistry

Philippe Guyot-Sionnest, Ph.D.
Professor – Departments of Chemistry and Physics
Area of Research: Laser studies of surfaces, quantum confined semiconductors, molecular electronics

Human Genetics

William B. Dobyns, M.D.
Professor – Departments of Human Genetics, Neurology and Pediatrics
Area of Research: Developmental neurogenetics, brain malformations, genetic basis of normal brain development, mental retardation, epilepsy

T. Conrad Gilliam, Ph.D.
Marjorie I. and Bernard A. Mitchell Professor and Chairman
Area of Research: Genetic determinants of common heritable disorders including schizophrenia, autism, anxiety disorder, bipolar disorder, and cardiovascular disease using novel genomic and bioinformatics approaches

Bruce T. Lahn, Ph.D.
Assistant Professor
Area of Research: Mouse genetics, evolutionary genetics, stem cell biology

Kathleen J. Millen, Ph.D.
Assistant Professor
Area of Research: Developmental neurogenetics, brain malformations, genetic basis of normal brain development

Mathematics

Jack D. Cowan, Ph.D.
Professor
Area of Research: Basic brain mechanisms

Neurobiology, Pharmacology & Physiology

Aaron P. Fox, Ph.D.
Professor
Area of Research: Basic brain mechanisms

Harry A. Fozzard, M.D.
Otho S.A. Sprague Distinguished Service Professor of Medical Sciences
Area of Research: Cellular & single-channel electrophysiology of cardiac muscle

Jay M. Goldberg, Ph.D.
Professor
Area of Research: Afferent and efferent mechanisms in the vestibular end organs

William N. Green, Ph.D.
Associate Professor
Area of Research: Neurotransmitter receptor expression

Elizabeth A. Grove, Ph.D.
Associate Professor
Area of Research: Brain development

Alfred Heller, M.D., Ph.D.
Professor
Area of Research: Development of specific central neuronal systems

Philip C. Hoffmann, Ph.D.
Professor Emeritus
Area of Research: Neuropharmacology

Naoum P. Issa, M.D., Ph.D.
Assistant Professor
Area of Research: Development & function of sensory cortex

Philip E. Lloyd, Ph.D.
Associate Professor
Area of Research: Physiological & behavioral role of neuropeptides in aplysia

Peggy Mason, Ph.D.
Professor
Area of Research: Pain modulation

Robert A. McCrea, Ph.D.
Professor
Area of Research: Context dependant sensory processing, central nervous system neurophysiology, eye & head movement control systems

Deborah J. Nelson, Ph.D.
Professor
Area of Research: Basic brain mechanisms, ion channels

Clifton W. Ragsdale, Ph.D.
Associate Professor
Area of Research: Molecular & cellular mechanisms of brain development

Eric A. Schwartz, M.D.
Professor
Area of Research: Synaptic transmission in the vertebrate retina

*No longer with BRI

Lewis S. Seiden, Ph.D.
Professor
Area of Research: Interrelations among psychotrophic drugs, transmitters, genetics & behavior

Kamal Sharma, Ph.D.
Assistant Professor
Area of Research: Spinal cord development & motor circuits

S. Murray Sherman, Ph.D.
Maurice Goldblatt Professor & Pritzker Scholar and Chairman
Area of Research: Functional organization of thalamus and thalamocortical relationships, synaptic & local circuit properties

Sangram S. Sisodia, Ph.D.
Thomas Reynolds Sr. Family Professor of Neurosciences
Director – Center for Molecular Neurobiology
Area of Research: Alzheimer's disease

Gopal Thinakaran, Ph.D.
Associate Professor
Area of Research: Alzheimer's disease, cellular stress related gene expression

Xiaoxi Zhuang, Ph.D.
Assistant Professor
Area of Research: Genetic & behavioral dissection of reward & dopamine system dysfunction

Yimin Zou, Ph.D.
Assistant Professor
Area of Research: Axon guidance & nervous system wiring

Neurology

Barry G.W. Arnason, M.D.
James Nelson & Anna Louise Raymond Professor
Area of Research: Multiple sclerosis

James R. Brorson, M.D.
Associate Professor
Area of Research: Mechanisms of neurodegeneration, stroke

Ewa Chelmicka Schorr, M.D.
Professor
Co-Director – Muscular Dystrophy Association Clinic
Area of Research: Neural control of immune response

John S. Ebersole, M.D.
Professor
Director – Adult Epilepsy Service
Director – Clinical Neurophysiology Laboratories
Area of Research: Epilepsy, EEG, source modeling, functional imaging

Jeffrey I. Frank, M.D.
Professor – Departments of Neurology and Surgery (Neurosurgery)
Director – Neuromedical/Neurosurgical Intensive Care & Stroke
Area of Research: Cerebral edema, stroke, intracranial hemorrhage; neurological prognostication & brain death

Fernando D. Goldenberg, M.D.
Assistant Professor
Area of Research: Simulation in medicine & intracerebral hemorrhage

Un Jung Kang, M.D.
Associate Professor-Departments of Neurology and Neurobiology, Pharmacology, & Physiology
Co-Director – Center for Parkinson's Disease & Movement Disorders
Area of Research: Molecular & cellular mechanisms of neurodegenerative disorders

Richard P. Kraig, Ph.D., M.D.
William D. Mabie Professor in the Neurosciences
Departments of Neurology and Neurobiology, Pharmacology & Physiology
Area of Research: Basic brain mechanisms for the pathogenesis of migraine, stroke, epilepsy & cognitive decline from aging plus the means by which brain develops resistance against these disorders

James A. Mastrianni, M.D., Ph.D.
Associate Professor
Area of Research: Rare transmissible neurodegenerative diseases, Alzheimer's disease, neurodegeneration

John G. Milton, Ph.D., M.D.*
Associate Professor
Co-Director – Clinical Neurophysiology Laboratory
Area of Research: Basic brain mechanisms, brain computation & reflexes

Avertano Noronha, M.D., Ph.D.
Professor
Area of Research: Multiple sclerosis

Brian Popko, Ph.D.
Jack Miller Professor in Neurological Diseases
Director – Jack Miller Center for Peripheral Neuropathy
Associate Chair for Research – Department of Neurology
Area of Research: Disorders of glial cells & the myelin sheath; mouse models of peripheral neuropathy & multiple sclerosis

Anthony T. Reder, M.D.
Associate Professor
Area of Research: Multiple sclerosis

Kourosh Rezania, M.D.
Assistant Professor
Area of Research: Neuropathy, amyotrophic lateral sclerosis, & diabetes

Raymond P. Roos, M.D.
Marjorie & Robert E. Straus Professor in Neurological Science
Area of Research: Neurodegenerative diseases (amyotrophic lateral sclerosis, multiple sclerosis), viral diseases of the central nervous system, neuropathy

Axel J. Rosengart, M.D., Ph.D.
Assistant Professor – Departments of Neurology and Surgery (Neurosurgery)
Assistant Director – Neuromedical/ Neurosurgical Intensive Care
Area of Research: CNS monitoring, brain cooling, applied nanoscale technology for noninvasive drug delivery & toxin removal

Steven L. Small, M.D., Ph.D.
Professor – Departments of Neurology, Radiology and Psychology
Co-Director – Brain Research Imaging Center
Area of Research: Brain mechanisms of language & thought, organization of human cerebral cortex, aphasia, stroke recovery, brain plasticity & rehabilitation

Betty C. Soliven, M.D.
Associate Professor
Director – Electrodiagnostic Laboratory for Neuromuscular Diseases
Co-Director – ALS/Muscular Dystrophy Clinic
Area of Research: Neuromuscular diseases, multiple sclerosis

Jean-Paul Spire, M.D.
Professor – Department of Neurology and Surgery
Director – Sleep Disorders Center
Area of Research: Neurology of sleep, epilepsy

Sara Szuchet, D.Phil.
Professor
Area of Research: Basic mechanisms of brain development pertaining to myelinogenesis and regeneration, multiple sclerosis

James X. Tao, M.D., Ph.D.
Assistant Professor
Area of Research: Epilepsy clinical research

Vernon Leo Towle, Ph.D.
Professor and Interim Chairman
Area of Research: Clinical neurophysiology, computational neuroscience

Neurosurgery–Surgery

Frederick D. Brown, M.D.
Associate Professor
Area of Research: Pain, spinal diseases

Daniel J. Curry, M.D.
Assistant Professor – Department of Surgery (Neurosurgery), Pediatric Surgery
Area of Research: Neuronal membrane repair, neuroprosthesis, hydrocephalus

Vijay S. Dayal, M.D.
Professor – Department of Surgery (Otolaryngology – Head & Neck)
Area of Research: Dizziness, deafness

George J. Dohrmann III, M.D., Ph.D.
Associate Professor
Area of Research: Neurosurgical use of ultrasound, molecular biology of brain tumors

Robert K. Erickson, M.D.
Associate Professor
Area of Research: Brain tumors, epilepsy, spinal diseases

Richard G. Fessler, M.D., Ph.D.
John Harper Seeley Professor
Chief – Section of Neurosurgery
Director – Brain Research Institute
Area of Research: Spinal cord transplantation for spinal cord injury; technique development for minimal access spinal surgery; spinal biomechanics

David M. Frim, M.D., Ph.D.
Associate Professor – Departments of Surgery and Pediatrics
Chief – Pediatric Neurosurgery
Area of Research: Hydrocephalus & congenital anomalies of the nervous system, neuroprotection & molecular repair, pediatric neurosurgery & neurodevelopment

Javad Hekmatpanah, M.D.
Professor – Departments of Surgery (Neurosurgery), Neurology, and Cancer Research
Area of Research: Neurosurgery, brain tumors, spinal disease, microvessels in brain injuries

Maciej S. Lesniak, M.D.
Assistant Professor
Area of Research: Brain tumors, gene therapy, immunotherapy

R. Loch Macdonald, M.D., Ph.D.
Professor – Departments of Surgery and Radiation & Cellular Oncology
Area of Research: Stroke, brain aneurysms, vasospasm of brain arteries

John (Sean) F. Mullan, M.D., D.Sc.
Professor Emeritus

Richard D. Penn, M.D.
Professor
Area of Research: Movement disorders, pain & hydrocephalus

Bryce Weir, M.D.
Professor Emeritus

Bakhtiar Yamini, M.D.
Assistant Professor
Area of Research: Gene therapy of malignant brain tumors

Organismal Biology & Anatomy

Melina E. Hale, Ph.D.
Assistant Professor
Area of Research: Motor control & movement, development of movement systems & neural circuit organization & function in brainstem & spinal cord

Nicholas Hatsopoulos, Ph.D.
Assistant Professor
Area of Research: Neural ensemble encoding of movement in motor cortex/ development of brain-machine interfaces for motor disabled patients

Daniel Margoliash, Ph.D.
Professor – Departments of Organismal Biology & Anatomy and Psychology
Area of Research: Developmental mechanisms of learning & memory, neurochemical control of learning, mechanisms of perception, human and songbird vocal learning & perception

Victoria E. Prince, Ph.D.
Associate Professor
Area of Research: Developmental neurobiology

Jan-Marino Ramirez, Ph.D.
Professor
Area of Research: Neuronal control of breathing & epileptic activity

*No longer with BRI

Brain Research Institute Fellows, continued

Philip S. Ulinski, Ph.D.
Professor
Area of Research: Computational neurobiology

Pathology

Godfrey S. Getz, MBBCh, D.Phil.
Donald N. Pritzker Distinguished Service Professor
Area of Research: Alzheimer's disease, brain lipoproteins

Manuel F. Utset, M.D., Ph.D.
Assistant Professor
Area of Research: Pathology of the brain, brain tumors, influence of genetics on brain development

Robert L. Wollmann, M.D., Ph.D.
Professor – Departments of Pathology and Neurology
Area of Research: Neuropathology (neuromuscular junction pathology)

Pediatrics

Glyn Dawson, Ph.D.
Professor
Area of Research: Inherited metabolic diseases of the brain, mechanisms of neurodegeneration

Kurt E. Hecox, M.D., Ph.D.*
Associate Professor – Departments of Pediatrics and Neurology
Director – Comprehensive Epilepsy Center
Chief – Pediatric Neurology
Area of Research: Computational neurobiology, depression in patients with temporal lobe epilepsy, pain control methods

Peter R. Huttenlocher, M.D.
Professor – Departments of Pediatrics and Neurology
Area of Research: Pediatric neurology, brain development

Charles J. Marcuccilli, Ph.D., M.D.*
Assistant Professor
Area of Research: Pediatric neurology

Jeremy D. Marks, Ph.D., M.D.
Associate Professor
Area of Research: Cellular mechanisms of neurodegeneration, neuroprotection, Parkinson's disease

Robert L. Perlman, M.D., Ph.D.
Professor – Departments of Pediatrics and Neurobiology, Pharmacology & Physiology
Area of Research: Signal transduction mechanisms in neurons

Nancy B. Schwartz, Ph.D.
Professor
Director – Kennedy Mental Retardation Center
Area of Research: Developmental neurobiology, extracellular matrix

James H. Tonsgard, M.D.
Associate Professor – Departments of Pediatrics and Neurology
Director – University of Chicago Ambulatory Program for Neurofibromatosis
Area of Research: Metabolic disease, particularly mitochondrial disorders & neurofibromatosis

Psychiatry

Judith Ann Badner, M.D., Ph.D.
Associate Professor
Area of Research: Statistical issues in complex genetic traits

Maria T. Caserta, M.D., Ph.D.
Associate Professor
Associate Director – The Center for Comprehensive Care & Research in Memory Disorders
Area of Research: Alzheimer's disease & imaging, bipolar disorder family studies

Emil F. Coccaro, M.D.
Ellen C. Manning Professor and Chairman
Area of Research: Neuroscience of impulsive aggression

Edwin H. Cook, Jr., M.D.*
Professor – Departments of Psychiatry, Pediatrics and Human Genetics
Area of Research: Molecular genetics & clinical pharmacology of childhood onset neuropsychiatric illness (autism, obsessive-compulsive disorder, attention deficit hyperactivity disorder, childhood onset bipolar mood disorder)

Patrick W. Corrigan, Psy.D.*
Professor
Executive Director – Center for Psychiatric Rehabilitation
Area of Research: Social aspects of psychiatric illness including stigma

Harriet de Wit, Ph.D.
Associate Professor
Director – Human Behavioral Pharmacology Research Laboratory
Area of Research: Addiction

Stephen H. Dinwiddie, M.D.
Professor
Area of Research: Electroconvulsive therapy, behavioral genetics, postpartum depression

Elliot S. Gershon, M.D.
Foundations Fund Professor – Department of Psychiatry and Human Genetics
Area of Research: Genetics of mental disorders & common diseases

Richard M. Glass, M.D.
Clinical Professor
Area of Research: Psychiatric illness, biomedical publications

Morris B. Goldman, M.D.
Associate Professor
Area of Research: Schizophrenia, water intoxication, neuroendocrinology, stress, hippocampus & schizophrenia

Jackie K. Gollan, Ph.D.
Assistant Professor
Area of Research: Major depression, stress and depression (SAD program), psychotherapy efficacy

Andrea King, Ph.D.
Associate Professor
Area of research: Etiology & treatment of addictions; smoking cessation; binge drinking

Royce Lee, M.D.
Assistant Professor
Area of Research: Neurobiology of impulsive aggression & borderline personality disorder, neurobiological effect of childhood trauma

Bennett L. Leventhal, M.D.*
Irving B. Harris Professor of Child & Adolescent Psychiatry
Departments of Psychiatry and Pediatrics
Director – Sonia Shankman Orthogenic School
Area of Research: Autism, ADHD & other disruptive behavior disorders, child & adolescent psychopathology, psychopharmacology, early onset child psychiatric disorders, genetics, & juvenile justice

Chunyu Liu, Ph.D.
Assistant Professor
Area of Research: Genetics & molecular biology of mood disorder, bioinformatics

Daniel J. Luchins, M.D.
Associate Professor
Chief – Public Psychiatry
Area of Research: Geriatric psychiatry, Alzheimer's disease

Michael S. McCloskey, Ph.D.
Instructor
Area of Research: Cognitive neuroscience of impulsive aggression & self-aggression, treatment of impulsive aggression

K. Luan Phan, M.D.
Assistant Professor
Area of Research: Social & affective neuroscience of anxiety disorders, functional brain imaging

Alan R. Sanders, M.D.*
Assistant Professor
Area of Research: Schizophrenia

Edward C. Senay, M.D.
Professor Emeritus

Ya-Ping Tang, Ph.D.
Assistant Professor
Area of Research: Genetic, molecular & neuronal bases for learning & memory

Paul Vezina, Ph.D.
Associate Professor
Director – NIDA Training Program
Area of Research: Basic brain mechanisms, addiction, behavioral neuroscience

Psychology

David C. Bradley, Ph.D.
Assistant Professor
Area of Research: Brain stimulation for vision replacement

John T. Cacioppo, Ph.D.
Tiffany & Margaret Blake Distinguished Service Professor of Psychology
Area of Research: Social neuroscience; affect, emotion, & social prejudice; social isolation, cognitive & biological mechanisms & health

Leslie M. Kay, Ph.D.
Assistant Professor
Area of Research: Olfactory-limbic neurodynamics & the roles of meaning & behavioral state in sensory perception

Susan C. Levine, Ph.D.
Professor
Area of Research: Developmental psychology, brain damage & development

Jerre Levy, Ph.D.
Professor
Area of Research: Cognitive neuroscience, higher brain functions

Martha K. McClintock, Ph.D.
David Lee Shillinglaw Distinguished Service Professor in Psychology
Director – Institute for the Mind & Biology
Area of Research: Pheromones, olfaction, emotions & psychoneuroimmunology

Brian J. Prendergast, Ph.D.
Assistant Professor
Area of Research: Neural & endocrine aspects of circadian & seasonal rhythms, neural-immune interactions

Radiology

Chin-Tu Chen, Ph.D.
Associate Professor
Area of Research: Biomedical imaging

Chien-Min Kao, Ph.D.
Assistant Professor
Area of Research: Positron emission tomography instrumentation, imaging & data analysis, small-animal PET & molecular imaging

David N. Levin, M.D., Ph.D.
Professor
Co-Director – Brain Research Imaging Center
Area of Research: 3D imaging of brain structure & function, image reconstruction, image processing

Xiaochuan Pan, Ph.D.
Associate Professor
Area of Research: Nuclear medicine including single photon emission computed tomography, PET imaging & CT

*No longer with BRI

Independent Auditor's Report

Board of Directors
Brain Research Foundation
Chicago, Illinois

We have audited the accompanying statement of financial position of Brain Research Foundation as of June 30, 2005, and the related statements of activities and cash flows for the year then ended. These financial statements are the responsibility of the Foundation's management. Our responsibility is to express an opinion on these financial statements based on our audit. The prior year summarized comparative information has been derived from the Foundation's 2004 financial statements and, in our report dated September 2, 2004, we expressed an unqualified opinion on those financial statements.

We conducted our audit in accordance with auditing standards generally accepted in the United States of America. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the financial statements are free of material misstatement. An audit includes examining, on a test basis, evidence supporting the amounts and disclosures in the financial statements. An audit also includes assessing the accounting principles used and significant estimates made by management, as well as evaluating the overall financial statement presentation. We believe that our audit provides a reasonable basis for our opinion.

In our opinion, the financial statements referred to above present fairly, in all material respects, the financial position of Brain Research Foundation as of June 30, 2005, and the changes in its net assets and its cash flows for the year then ended in conformity with accounting principles generally accepted in the United States of America.

Blackman Kallick Bartelstein, LLP

Blackman Kallick Bartelstein, LLP
August 10, 2005

Financial Statements

Statements of Financial Position

June 30, 2005 (with comparative totals as of June 30, 2004)

Assets	2005			2004
	Unrestricted	Temporarily Restricted	Total	Total
Current Assets				
Cash and Cash Equivalents	$ 285,653	$ 230,206	$ 515,859	$ 299,444
Contributions Receivable	–	207,105	207,105	92,450
Investments	6,490,724	3,282,094	9,772,818	9,792,322
Total Current Assets	**6,776,377**	**3,719,405**	**10,495,782**	**10,184,216**
Property and Equipment				
Leasehold Improvements	128,935	–	128,935	128,935
Furniture and Equipment	59,645	–	59,645	59,645
Software	23,759	–	23,759	23,759
Less Accumulated Depreciation	(77,250)	–	(77,250)	(65,554)
Net Property and Equipment	**135,089**	**–**	**135,089**	**146,785**
Noncurrent Assets				
Security Deposits	75	–	75	75
Contributions Receivable	–	–	–	185,695
Total Noncurrent Assets	**75**	**–**	**75**	**185,770**
Total Assets	**$ 6,911,541**	**$ 3,719,405**	**$ 10,630,946**	**$ 10,516,771**

The accompanying notes are an integral part of the financial statements.

Liabilities and Net Assets	2005			2004
	Unrestricted	Temporarily Restricted	Total	Total
Current Liabilities				
Accounts Payable and Accrued Expenses	$ 697	$ –	$ 697	$ 1,928
Discovery Campaign Payable	–	324,893	324,893	608,793
Neuroscience Professorship Payable – Current Portion	400,000	–	400,000	400,000
Total Current Liabilities	**400,697**	**324,893**	**725,590**	**1,010,721**
Neuroscience Professorship				
Payable (Net of Portion Included in Current Liabilities)	1,111,752	–	1,111,752	1,427,053
Total Liabilities	**1,512,449**	**324,893**	**1,837,342**	**2,437,774**
Net Assets				
Unrestricted	5,399,092	–	5,399,092	4,737,048
Temporarily Restricted	–	3,394,512	3,394,512	3,341,949
Total Net Assets	**5,399,092**	**3,394,512**	**8,793,604**	**8,078,997**
Total Liabilities and Net Assets	**$ 6,911,541**	**$ 3,719,405**	**$ 10,630,946**	**$ 10,516,771**

Statements of Activities

Year Ended June 30, 2005 (with comparative totals for the year ended June 30, 2004)

	2005			2004
	Unrestricted	Temporarily Restricted	Total	Total
Revenues				
Support				
Contributions	$ 977,070	$ 610,997	$ 1,588,067	$ 629,606
Fundraising Event Revenue (Net of Expenses of $75,448)	10,037	–	10,037	11,100
Total Support Revenue	**987,107**	**610,997**	**1,598,104**	**640,706**
Income (Loss) from Investing Activities				
Interest and Dividends	161,184	131,236	292,420	295,008
Net Realized Loss on Sale of Investments	(28,505)	(31,381)	(59,886)	(52,284)
Net Unrealized Gain on Investments	233,432	234,953	468,385	721,430
Total Income from Investing Activities	**366,111**	**334,808**	**700,919**	**964,154**
Net Assets Released from Restriction	893,242	(893,242)	–	–
Total Revenues	**$ 2,246,460**	**$ 52,563**	**$ 2,299,023**	**$ 1,604,860**
Expenses				
Program Services				
Fay/Frank Seed Grant Fund	419,485	–	419,485	454,970
Discovery Campaign	7,451	–	7,451	18,496
Special Fund	526,909	–	526,909	484,869
Neuroscience Professorship (Note 5)	84,699	–	84,699	1,827,053
Public Information, Health and Education	189,533	–	189,533	249,226
Total Program Services	**1,228,077**	**–**	**1,228,077**	**3,034,614**
Supporting Services				
General Administration	191,468	–	191,468	192,767
Fundraising Expenses	164,871	–	164,871	154,723
Total Supporting Services	**356,339**	**–**	**356,339**	**347,490**
Loss on Disposal of Assets	–	–	–	(154)
Total Expenses	**$ 1,584,416**	**–**	**$ 1,584,416**	**$ 3,381,950**
Change in Net Assets	**662,044**	**52,563**	**714,607**	**(1,777,090)**
Net Assets, Beginning of Year	**4,737,048**	**3,341,949**	**8,078,997**	**9,856,087**
Net Assets, End of Year	**$ 5,399,092**	**$ 3,394,512**	**$ 8,793,604**	**$ 8,078,997**

The accompanying notes are an integral part of the financial statements.

Financial Statements, continued

Statements of Cash Flows
Years Ended June 30, 2005 and June 30, 2004

	2005	2004
Cash Flows from Operating Activities		
Change in Net Assets	$ 714,607	$ (1,777,090)
Adjustments to Reconcile Change in Net Assets to Net Cash Used in Operating Activities		
Depreciation	11,696	14,406
Net Realized Loss on Sale of Investments	59,886	52,284
Net Unrealized Gain on Investments	(468,385)	(721,430)
Donated Stock	(205,518)	(36,726)
Loss on Disposal of Assets	–	(154)
(Increase) Decrease in:		
Contributions Receivable	71,040	421,141
Prepaid Expenses and Other	–	4,245
Increase (Decrease) in:		
Accounts Payable and Accrued Expenses	(1,231)	(492)
Discovery Campaign Payable	(283,900)	(412,141)
Neuroscience Professorship Liability	(315,301)	1,827,053
Net Cash Used in Operating Activities	**(417,106)**	**(628,904)**
Cash Flows from Investing Activities		
Capital Expenditures	–	(18,722)
Sale of Investment Securities	4,168,495	4,294,228
Purchase of Investment Securities	(3,534,974)	(3,907,272)
Net Cash Provided by Investing Activities	633,521	368,234
Net Increase (Decrease) in Cash and Cash Equivalents	216,415	(260,670)
Cash and Cash Equivalents, Beginning of Year	299,444	560,114
Cash and Cash Equivalents, End of Year	**$ 515,859**	**$ 299,444**

The accompanying notes are an integral part of the financial statements.

Notes to Financial Statements

Year Ended June 30, 2005 and 2004

Note 1–Summary of Significant Accounting Policies

Organization
The Brain Research Foundation (the Foundation) is a corporation organized under the Illinois Not-for-Profit Corporation Act. The Brain Research Foundation is committed to promoting basic research and knowledge concerning the human brain.

Significant accounting policies consistently followed by the Foundation are summarized below:

Basis of Presentation
These financial statements have been prepared on the accrual basis of accounting and report amounts separately by class of net assets, which are defined as follows:

Unrestricted – Amounts that are currently available for use in the Foundation's operations and for the acquisition of equipment.

Temporarily Restricted – Amounts that are stipulated by donors for specific operating purposes, restricted by time or purpose.

Support and Expenses
Contributions received and unconditional promises to give are measured at their fair values and are reported as an increase in net assets. The Foundation reports gifts of cash and other assets as restricted support if they are received with donor stipulations that limit the use of the donated assets, or if they are designated as support for future periods. When a donor restriction expires, that is, when a stipulated time restriction ends or purpose restriction is accomplished, temporarily restricted net assets are reclassified to unrestricted net assets and reported in the statement of activities as net assets released from restriction. For the years ended June 30, 2005 and 2004, all donor-restricted contributions are reported as temporarily restricted support, and all restrictions that were met during the period are shown as releases from restriction.

Expenses are recorded when incurred in accordance with the accrual basis of accounting.

Cash Equivalents
For purposes of the statements of cash flows, the Foundation considers investments in money market accounts to be cash equivalents. The carrying value of cash equivalents approximates fair value as of June 30, 2005 and 2004.

The accompanying notes are an integral part of the financial statements.

Pledge Commitments
Unconditional promises to give that are expected to be collected within one year are recorded at net realizable value. Unconditional promises to give that are expected to be collected in future years are recorded at the present value of their estimated future cash flows. The discounts on those amounts are computed using interest rates based on the long-term federal rate applicable to the years in which the promises are received. Amortization of the discounts is included in contribution revenue. Conditional promises to give are not included as support until the conditions are substantially met.

Investments
Investments are recorded at market value. Contributions of marketable securities are recorded at fair market value as of the date of the gift. It is the Foundation's policy to sell such gifts of securities as soon as it is practical to allow for an orderly disposition. The realized gains and losses on investments sold are computed using the specific recorded cost of each security.

The Foundation's investments are exposed to various risks, such as interest rate, credit and overall market volatility. Due to these risk factors, it is reasonably possible that changes in the value of investments will occur in the near term and could materially affect the amounts reported in the statements of financial position. The Foundation places its cash, cash equivalents and marketable securities with high-quality institutions and, accordingly, limits its credit exposure.

Depreciation
Property, plant and equipment are valued at cost or fair market value for donated items. The Foundation's policy is to capitalize items with a cost exceeding $500. Depreciation is provided on the straight-line method over the estimated useful lives of the assets.

	Years
Furniture and Equipment	3 – 7
Leasehold Improvements	39
Software	3

Seed Grants
The Fay/Frank Seed Grant has been temporarily restricted by donors for the purpose of funding Seed Grants for researchers at The University of Chicago and is not available for general operating expenses or other uses.

Notes to Financial Statements, continued

Note 1 – Summary of Significant Accounting Policies (Continued)

Committed to Discovery Campaign

The Committed to Discovery Campaign Fund (Discovery Campaign) has been temporarily restricted by donors for the purpose of funding the Committed to Discovery Campaign, a joint capital campaign with The University of Chicago to raise $25,000,000 for the Brain Research Institute. The campaign was to run from July 1, 1998 through June 30, 2001, but was extended until June 30, 2002 to reach the goal. As of June 30, 2005, the Foundation and The University of Chicago have received pledges of approximately $26 million and successfully met their joint goal. The campaign commitments may be paid until 2006.

Special Gifts

The Special Fund has been set up to collect various donations that have temporary donor restrictions but not a special program such as Seed Grants or the Discovery Campaign.

Functional Allocation of Expenses

The costs of providing the various programs, fundraising and other activities have been summarized on a functional basis in the schedule of functional expenses. Accordingly, certain costs have been allocated among the programs and fundraising activities benefited based on time studies.

Management Estimates

The preparation of financial statements in conformity with accounting principles generally accepted in the United States of America requires management to make estimates and assumptions that affect the reported amounts of assets and liabilities and disclosure of contingent assets and liabilities as of the date of the financial statements and the reported amounts of revenues and expenses during the reporting period. Actual results could differ from those estimates.

Note 2 – Tax-Exempt Status

The Foundation is a not-for-profit organization that is exempt from income taxes under Section 501(c)(3) of the Internal Revenue Code. Accordingly, the accompanying financial statements do not reflect income taxes.

Note 3 – Cash and Cash Equivalents

Cash and cash equivalents consist of the following:

	2005	2004
Cash	$ 81,690	$ 10,054
Money Market Funds	434,169	289,390
	$ 515,859	**$ 299,444**

The Foundation maintains cash and cash equivalents which, at times, may exceed federally insured limits. The Foundation has not experienced any losses in such accounts. The organization believes it is not exposed to any significant credit risk on cash and cash equivalents.

Note 4 – Investments

Investments are recorded at fair value. Investments consist of the following as of June 30, 2005 and 2004:

	2005	2004
Unrestricted Investments		
Common and Preferred Stock	$ 4,875,571	$ 4,983,939
Corporate Bonds	1,090,073	494,022
Government Bonds	525,080	793,048
Total	**$ 6,490,724**	**$ 6,271,009**
Temporarily Restricted Investments		
Common and Preferred Stock	$ 2,509,210	$ 2,522,927
Corporate Bonds	352,593	471,078
Government Bonds	420,291	527,308
Total	**$ 3,282,094**	**$ 3,521,313**
Total Investments	**$ 9,772,818**	**$ 9,792,322**

Note 5 – Neuroscience Professorship Payable

During May of 2004, the Foundation entered into a gift agreement with the Division of the Biological Sciences at The University of Chicago. Per the agreement, the Foundation pledged to give an aggregate amount of not less than $2,000,000 to the Division of the Biological Sciences at The University of Chicago to establish and endow the Brain Research Foundation Professorship. The pledge will be satisfied over a five-year period. The Foundation has properly recorded an expense for the entire payable, measured at present value.

Maturities on pledges payable as of June 30, 2005 are as follows:

Fiscal Year Ending:	
2006	$ 400,000
2007	400,000
2008	400,000
2009	400,000
	1,600,000
Less Amount Representing Interest	(88,248)
Present Value of Professorship Payable	**$ 1,511,752**

Maturities on pledges payable as of June 30, 2004 were as follows:

Fiscal Year Ending:	
2005	$ 400,000
2006	400,000
2007	400,000
2008	400,000
2009	400,000
	2,000,000
Less Amount Representing Interest	(172,947)
Present Value of Professorship Payable	**$ 1,827,053**

A discount rate of 3.85%, derived from the July 1, 2004 treasury note interest rate, with a five-year maturity, was used to calculate the present value of the pledge.

Note 6 – Temporarily Restricted Net Assets

The temporarily restricted fund represents contributions received by the Foundation where the donor has specified the purpose for which the contribution may be used plus the accumulated investment returns on the restricted contributions.

Temporarily restricted net assets are available for the following purposes as of June 30, 2005 and 2004:

	2005	2004
Fay/Frank Seed Grant Fund	$ 1,343,624	$ 1,561,459
Discovery Campaign	1,930,945	1,767,775
Special Fund	119,943	12,715
	$ 3,394,512	**$ 3,341,949**

Note 7 – Lease Commitments

Rent expense for 2005 and 2004 was $112,215 and $156,197, respectively.

In August 2002, the Foundation moved its office to The University of Chicago. The office is being leased under a noncancelable operating lease that expires on August 31, 2007. The fair market value to rent the office space is $111,132 and $102,384 for the years ended June 30, 2005 and 2004, respectively. The Foundation paid $10,529 and $10,394 for the years ended June 30, 2005 and 2004, respectively. Donated rent of $100,603 and $91,990 has been reflected in the financial statements as contributed revenue and related expense for the years ended June 30, 2005 and 2004, respectively.

Future minimum lease payments are as follows as of June 30, 2005:

Year Ending June 30:	
2006	$ 10,529
2007	10,529
Total Minimum Payments Required	**$ 21,058**

Note 8 – 401(k) Retirement Plan

The Foundation has a 401(k) Retirement Plan (the Plan). Substantially all of the employees are eligible to make contributions at their own discretion. Upon the date an employee commences employment, they are immediately eligible to make pre-tax contributions to the Plan. Employees may annually contribute up to 8% of their compensation on a pre-tax basis up to the limits imposed by the current IRS regulations.

All employees become eligible after one year of service to receive employer matching contributions equal to two dollars for every one dollar an employee defers. In addition, the Foundation may elect to make discretionary contributions to the Plan, as determined by the Board of Directors. Discretionary contributions are allocated only to the accounts of those eligible participants who worked at least 1,000 hours during the Plan year. Employees are 100% vested in all their accounts in the Plan.

The organization contributed $26,645 and $28,240 for the years ended June 30, 2005 and 2004, respectively.

Ways of Giving to the Brain Research Foundation

There are several ways in which donors can participate in the work of the Brain Research Foundation.

General Support: Unrestricted gifts are applied to the general work of the Foundation.

Restricted Gifts: Gifts designated for specific purposes established by the donor.

Stock: Gifts of stock may be given to the Brain Research Foundation.

Matching Gifts: You may be employed by one of the growing number of companies with a Matching Gift Program, so that the amount of your gift is multiplied. Please check with your Human Resources Office to see if your company offers this benefit.

Planned Giving: Long-range estate and financial planning can enable you to make a substantial contribution to the Brain Research Foundation. Some examples of planned gifts include bequests, life insurance policies, charitable remainder trusts, charitable lead trusts, and charitable gift annuities.

Memorial and Honorary Gifts: You may designate a donation in memory of someone, or give a gift in honor of a special person.

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The Brain Research Foundation supports basic scientific research and focuses public attention on the possibilities and problems of the human brain. The Foundation, launched in 1953, supports leading-edge scientific research of the brain, including significant grants to The University of Chicago's Brain Research Institute. The doctors at the Brain Research Institute are dedicated to discovering how the brain functions, how it is organized and how it can be repaired.