Brain Research Foundation
2002–2003 Annual Report

It's the year

2053

Many genetic diseases are corrected using gene therapy in utero.

80% of all medications are tailored for a specific disorder, such as schizophrenia, and have no side effects.

Surgical robotic arms are able to precisely remove a brain tumor, increasing rate of survival to 90%.

Brain Research Foundation raises more than $1 billion, funding more than 2,000 scientists and clinicians committed to brain research.

Watson and Crick decode the mystery of deoxyribonucleic acid (DNA).

In addition to surgery and electro-shock therapy, antipsychotic drugs are introduced as treatment for schizophrenia.

Argonne Cancer Research Hospital at the University of Chicago is the first facility dedicated to the study of radiation therapy for cancer, an outgrowth of the Manhattan Project.

A unique and innovative organization that supports brain research is formed: Brain Research Foundation.

It's the year

1953

1953
Brain Research Foundation is established and incorporated as a not-for-profit organization

1958
Brain Research Foundation sponsors its first scientific conference

1963
Women's Council of the Brain Research Foundation is formed

1964
Brain Research Foundation partners with the University of Chicago to establish the Brain Research Institute

Fifty years. Depending upon one's perspective, it's either a lifetime or barely an instant in the broad sweep of time. That's true whether one is looking forward or backward.

To a modern society that craves scientific "miracles" and overnight breakthroughs, 50 years seems like an eternity. We're impatient and sometimes even uncomfortable with the uncertainty of looking forward.

Yet, when one takes a look back 50 years, the progress the scientific community has made is awesome in the truest sense of that overused word. Scientific understanding we take for granted today might have been deemed science fiction in 1953. That year, Francis Crick and James Watson discovered the double helical structure of DNA (deoxyribonucleic acid). Fifty years later, scientists have mapped the entire human genome, throwing open immense new genetic universes to explore. Is the question what took them so long, or how did they do that so fast? Human nature asks both.

Advances in brain research over the past 50 years generate the same kind of wonder.

No one can say today where the journey across the scientific frontier will lead us. But we do know that scientific curiosity will not abate.

And, the need for funding for leading-edge research is constant. Each seed grant the Foundation makes and every new piece of equipment purchased with the Foundation's help takes us a step forward.

Those who contribute to and participate in the work of the Brain Research Foundation can be optimistic. Fifty years from now–when it's time to take the 100-year look back–the research projects that Foundation-supported scientists are doing today will have had a profound influence on scientific advances that affect the quality of human life.

It's the year
2003

In April 2003, the International Human Genome Sequencing Consortium announces the successful completion of the human genetic sequence.

Researchers at the University of Chicago utilize the new Core Genetics Research Facility to investigate fundamental questions relating to a variety of disorders, including cancer and Parkinson's disease.

Researchers use new DNA array technology to begin to track the genetic cause of schizophrenia.

Brain Research Foundation's total contributions toward the advancement of brain research are $25 million, including support for more than 400 young scientists and clinicians through its seed grant program.

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1977
More than $3 million is raised by the Brain Research Foundation for the building of the William E. Fay, Jr. and Margaret Hoover Fay Surgery Brain Research Pavilion at the University of Chicago

1981
Brain Research Foundation funds the Positron Emission Tomography (PET) Center

1988–1991
BRAIN/1990 capital campaign raises $4.6 million for the Brain Research Institute

1989
Fay/Frank Seed Grant Endowment is created

1993
Brain Research Foundation raises $3 million to fund construction of Center for Molecular Neurobiology at the University of Chicago

1999
Brain Research Foundation and the University of Chicago launch the Committed to Discovery campaign to raise $25 million

2002
First Women's Council Seed Grant is awarded

2003
Brain Research Foundation celebrates 50 years of supporting the neurosciences

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

We are pleased to bring you the 2002–2003 Brain Research Foundation Annual Report. We hope you will find it inspiring to read about how your contributions have advanced neurosciences in the Brain Research Institute at the University of Chicago.

As 2003 marks the 50th anniversary of the Brain Research Foundation, it is a good time to reaffirm the Foundation's original vision, to celebrate all that has been accomplished and to consider future goals and plans. The Foundation's longevity is due to the dedication of a group of individuals who grasped the importance of brain research before such research was considered possible. They understood the advantage of creating an institute made up of scientists who focused on uncovering the mysteries of the brain. That is why, in 1964, the Brain Research Foundation partnered with the University of Chicago to create the Brain Research Institute.

Thomas A. Reynolds III, *President* and Terre A. Sharma, Ph.D., *Executive Director*

The Brain Research Institute at the University of Chicago has been described as an "institute without walls," but it is so much more.

The Institute exemplifies how scientists with diverse backgrounds and research interests come together with a primary focus of understanding the brain.

It is the Foundation's goal to champion these various innovative research interests, always striving to move the boundary of science closer to the edge of knowledge. In this annual report, we hope to elucidate how much closer we have moved to understanding, yet realizing how much more there is to learn.

When you think about it, understanding the brain is an extremely lofty goal. The brain controls our breathing, our movement, our vision, our thoughts, our everything. Why are scientists pursuing such a daunting task? The reason is simple: every answer to an experiment leads them closer to understanding the whole. They are able to focus on the "big picture" while striving to reach the first plateau. They are optimists. Yet, they realize this is not accomplished without interacting with other colleagues who approach questions from different perspectives.

One miraculous day, a scientist may find the cure for Alzheimer's disease, or another devastating disease; but that discovery is built upon many experiments and years of support through organizations like the Brain Research Foundation. The Foundation and its supporters will be able to say that we played a role in making this breakthrough happen—and hopefully an important role in curing the neurological disorders of today, tomorrow.

As we embark upon a new era for the Foundation, we hope you join us in laying the stepping-stones to the next 50 years, and continue on an exciting path of discovery.

The future seems limitless with your help and encouragement.

Sincerely,

Terre A. Sharma, Ph.D.
Executive Director

Thomas A. Reynolds III
President

Letter from the Director of the Brain Research Institute

This year has been an exciting year for the Brain Research Institute as well as the Brain Research Foundation. The Brain Research Foundation proudly celebrated its 50th year of supporting brain research with a gala in May 2003. This wonderful evening celebrated the unwavering commitment of the William E. Fay, Jr. and Clinton E. Frank families to the Foundation with the establishment of a new annual seed grant specifically for research directed toward the understanding and treatment of epilepsy. The Foundation has demonstrated strong commitment to seizure research for 50 years, and the advances in diagnosis and treatment of this disorder are a living testament to this commitment.

In his 1881 textbook entitled *Epilepsy and other Chronic Convulsive Diseases,* Sir William R. Gowers discussed his treatment options for epilepsy. These treatments included everything from opium to castration! Fifty years ago, the mainstay of pharmacologic treatment had progressed to the usually effective Phenobarbital, with treatments such as high dose ACTH being investigated. Since then, continuing and expanding research has tremendously helped our understanding of the various types of epilepsy and its multiple structural and biochemical etiologies. Continued progress in diagnosis and in pharmacological and surgical treatments has made most seizure disorders controllable, and often curable. The establishment of this annual seed grant will further reinforce the Foundation and Institute's commitment to extending our understanding of epilepsy, and our ability to effectively treat individuals with this disorder.

Just as research evolves over time, so do institutes and foundations, and both the Brain Research Foundation and Brain Research Institute are under new leadership. Terre Sharma was appointed executive director of the Foundation in July 2002. Along with my appointment as chief of Neurosurgery in September 2002, I also assumed directorship of the Institute at that time. More recently, the Foundation relocated from downtown Chicago to the Surgery Brain Research Institute at the University of Chicago. This combination of new leadership and close proximity has promise of yielding even closer collaboration between these allied organizations. If, as predicted, the prevalence of neurologic diseases increases over the next several decades, the importance of this facilitated communication to our future success can't be overstated.

In the past two years, there have been several other important new developments. The first-ever collaborative fundraising effort between the Brain Research Foundation and the University of Chicago, the Committed to Discovery Campaign, was successfully completed in 2002, exceeding the original $25 million capital funds goal. These additional funds provide an assurance of continued support for neuroscience research that will lead us to treatments and cures for many diseases that have previously eluded our grasp.

Seed grants funded this year will allow bright, young physicians and scientists to begin innovative investigations into the molecular genetics of neurodegenerative diseases such as Alzheimer's disease, multiple sclerosis and Parkinson's disease. Support of these exciting new research directions will lead to larger grant applications from the National Institutes of Health, and these further advancements in our knowledge will keep the University of Chicago on the forefront of neuroscience.

Richard G. Fessler, M.D., Ph.D., *Director*

We are proud of this year's accomplishments of the members of the Brain Research Institute, and are excited about the prospects of even more exciting discoveries next year and in the years to come.

Sincerely,

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

Planting Seeds For Future Breakthroughs

History will never know how many scientific breakthroughs grew from a young researcher's educated guess, a spark of the imagination or a hunch that began with the words, "If only…" or "I wonder if…"

Yet it is just that type of promising–sometimes untested and daring–hypothesis that the Brain Research Foundation's Fay/Frank Seed Grant Program was designed to fund. The Foundation's leaders, William E. Fay, Jr. and Clinton E. Frank, established the program in 1981 for the sole purpose of supporting groundbreaking research in neuroscience. Each year, the program awards start-up grants for clinicians and scientists at the University of Chicago's Brain Research Institute.

Since its inception, the Seed Grant Program has distributed $5.3 million to neuroscientists who are in the early years of their careers. The Foundation is pleased to be able to increase the amount of disbursement at regular intervals. The 2003 Seed Grant Program allocated $400,000 to 16 scientists chosen by a group of their peers. In 2002, the Foundation awarded $350,000 to 14 scientists. Seed grants provide $25,000 for innovative studies that have the potential to develop into comprehensive research projects suitable for larger grant proposals.

As envisioned by the Brain Research Foundation founders, the seed grants have brought greater funding to the scientists who have received them. More than 70 percent of seed grant recipients succeed in obtaining additional dollars to continue their research. For every $1 the Foundation has invested in new ideas, researchers have attracted $20 in additional funding from the National Institutes of Health and other outside sources.

The six seed grant recipients who we've profiled in this report exemplify the Brain Research Foundation's investment in the future. Some are developing methodologies that could open new venues for research. In other cases, scientists and clinicians are working together to unlock genetic secrets of disease. Many hope their work in the laboratory will someday result in better patient diagnosis and treatment in the physician's office. All of them are inspiring.

2002–2003 Seed Grant Recipients

Sean P. Cook, Ph.D.
Department of Anesthesia & Critical Care
Identification of a novel sensory receptor that mediates pain.

Morris B. Goldman, M.D.
Department of Psychiatry
Functional neuroarchitecture of prepulse inhibition.

Melina E. Hale, Ph.D.
Department of Organismal Biology & Anatomy
The roles of reticulospinal interneurons in model motor control circuits.

Nicholas G. Hatsopoulos, Ph.D.
Department of Organismal Biology & Anatomy
Encoding of action in primary motor and premotor cortical ensembles.

Naoum P. Issa, M.D., Ph.D.
Department of Neurobiology, Pharmacology & Physiology
The functional organization of visual cortex underlying high-acuity vision.

Leslie M. Kay, Ph.D.
Department of Psychology
The role of natural behavior in olfactory-hippocampal dynamics.

Royce J. Lee, M.D.
Department of Psychiatry
Benzodiazepine receptor sensitivity and childhood trauma in personality disorder: a functional magnetic resonance imaging pilot study.

Kathleen J. Millen, Ph.D.
Department of Human Genetics
Identification of an autism gene on human chromosome 3.

John G. Milton, M.D., Ph.D.
Department of Neurology
Expert motor skill acquisition: from stick balancing and golf to neurorehabilitation.

Clifton W. Ragsdale, Ph.D.
Department of Neurobiology, Pharmacology & Physiology
Molecular control of pineal gland development.

Anthony T. Reder, M.D.
Department of Neurology
Mechanism of low levels of interferon signaling in active multiple sclerosis.

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

Ya-Ping Tang, M.D., Ph.D.
Department of Psychiatry
Genetic studies of NMDA receptor function in the cerebellar-regulated cognitions.

James X. Tao, M.D., Ph.D.
Department of Neurology
The validity of functional MRI for language mapping in epilepsy surgery.

Avery Tung, M.D.
Department of Anesthesia & Critical Care
Effect of lesions of the ventrolateral preoptic area on the relationship between sleep deprivation and anesthetic potency.

Manuel F. Utset, M.D., Ph.D.
Department of Pathology
A transgenic mouse model of medulloblastoma.

Bakhtiar Yamini, M.D.
Department of Surgery, Section of Neurosurgery
Combined radiation and adeno-TNF therapy of intracranial gliobastoma in nude mice.

Xiaoxi Zhuang, Ph.D.
Department of Neurobiology, Pharmacology & Physiology
Motor habit and Tourette Syndrome-like behavior.

Yimin Zou, Ph.D.
Department of Neurobiology, Pharmacology & Physiology
Guidance of neuronal migration in vertebrate CNS development.

Alschuler Scholar

This grant was made possible by the Leonore and Ernest Alschuler Fund.

James A. Mastrianni, M.D., Ph.D.
Department of Neurology
The role of glycosylation in the trafficking of PrP and its degradation by the proteasome.

First Pediatric Epilepsy Grant

To mark its 50th anniversary in 2003, the Brain Research Foundation honored the families behind its success by establishing an annual Fay & Frank Pediatric Epilepsy Seed Grant.

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

Women's Council Seed Grants

Hayley Foo, Ph.D. (2002)
Department of Neurobiology, Pharmacology & Physiology
Activity of brainstem pain modulatory neurons during sleep, ingestion, excretion and non-contact penile erection.

Ana Solodkin, Ph.D. (2003)
Department of Neurology
Pilot study on the early detection of Alzheimer's disease by diffusion tensor imaging.

Studying Rodent Brains Could Help Detect Alzheimer's

Leslie Kay, Ph.D., Seed Grant Recipient

Goal: to increase understanding of the interaction between the olfactory system and hippocampus and determine why these areas are affected in many cognitive disorders

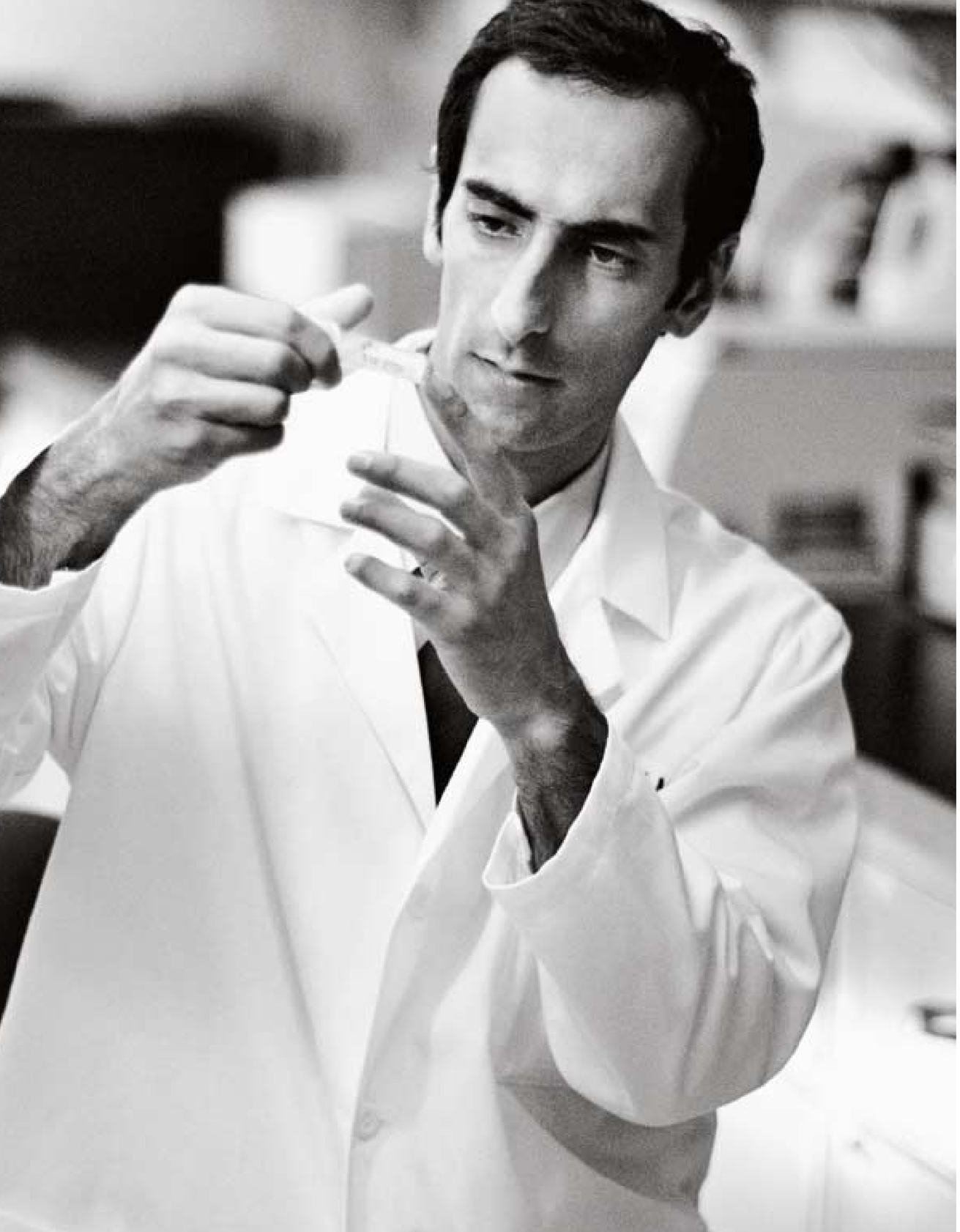
"While mainstream science accepts that smell affects behavior, I want to figure out how it happens," said Dr. Leslie Kay, an assistant professor of psychology and a member of the Institute for Mind & Biology at the University of Chicago. "If odors didn't change behavior or emotions, all the perfume companies would be out of business," she said.

With her Brain Research Foundation seed grant, Dr. Kay will study the brain activity of rats to understand the connection between the olfactory system—which controls the sense of smell—and the hippocampus—which plays a role in emotion, attention and memory processing—when responding to various odors.

When a rat is aroused or attentive to an odor, it will sniff faster, causing a respiratory change. Dr. Kay believes this is a behavioral result of a hippocampal (attentive) response to the odor, and each exposure will result in reproducible odor-specific behaviors. Her experiment will induce this behavior by exposing the rats to a series of relevant odors, such as those of predators and food. Dr. Kay will look for changes in electrical activity (oscillations) of a large population of neurons in the olfactory bulb and hippocampal region of the rats, measured by electrodes implanted in their brains.

By observing how smell and behavior are cognitively linked, Dr. Kay will then measure the oscillations on a deeper level. She will again expose the rats to odors, and will record oscillations simultaneously at different depths in the brain. The study will look at the role that respiratory changes induced by attention and arousal play in each case. It also will observe and record the abnormal seizure-like dynamics produced during exposure to noxious odors.

Dr. Kay's experiments will not only increase understanding of the interaction between the olfactory system and hippocampus, but could ultimately determine why these areas are affected in many cognitive disorders. An early symptom in Alzheimer's and Parkinson's diseases, and other disorders that affect cognitive processing, is a decreased ability or inability to recognize odors because of degeneration of the olfactory and hippocampal systems. Dr. Kay predicts a day when Alzheimer's or Parkinson's disease could be diagnosed through a more finely tuned series of smell tests than those in use today.



Applying Genetic Therapy to Brain Tumors

Bakhtiar Yamini, M.D., Seed Grant Recipient

Goal: to monitor the brain looking for molecular and metabolic changes that are "pre-cancerous," perhaps in a similar way one can see a tumor with an MRI now, and treat the tumor before it forms

Could the survival rate for patients with malignant gliomas—the most common and deadly brain tumors—be improved by combining conventional treatment with newer genetic techniques? Adding gene therapy—the use of specific genes that suppress and kill cancer cells, targeted to tumors and delivered by viruses—to the current treatment strategy of radiation therapy may have a significant impact on this devastating form of cancer.

On the long journey toward answering that question, Dr. Bakhtiar Yamini, an assistant professor in the University of Chicago's Department of Surgery, Section of Neurosurgery, plans a Brain Research Foundation-funded study on mice with brain tumors. Dr. Yamini will inject a virus carrying a protein called TNF—a tumor necrosis factor, which kills tumors—directly into the malignant gliomas in the mouse brains, and follow that treatment with radiation. He'll then use magnetic resonance imaging (MRI) to measure the effects of the TNF on the tumors in the mice. The radiation acts as an inducer to "turn on" the gene for the TNF. His hypothesis is that this combination approach of radiation and TNF gene therapy will be "synergistic," resulting in longer mouse survival rates than those from either therapy alone. He hopes to collect enough initial data to obtain funding for more extensive study.

How might this research be applied to humans? The current treatment for malignant gliomas in human patients is surgery to remove as much of the tumor as possible, followed by radiation and chemotherapy. While gene therapy treatment of human tumors is in its infancy, Dr. Yamini believes that ultimately genetic treatment could improve patients' overall response to the radiation, resulting in better survival rates. Today, the median survival rate for human patients is seven months to one year, with an overall five-year survival rate of about 5 percent.

Dr. Yamini imagines a day when physicians can detect and treat tumors extremely early in their development on the molecular level. "Instead of trying to treat the actual tumor when it's large, we'll be able to monitor the brain, looking for molecular and metabolic changes that are 'pre-cancerous,' perhaps in a similar way you can see a tumor with an MRI now, and treat the tumor before it forms," he said.

A New Pre-Surgical Approach for Epilepsy Patients

James Tao, M.D., Ph.D., Seed Grant Recipient

Goal: for fMRI to become a standard pre-surgical procedure, so physicians can avoid current invasive pre-surgical procedures

Dr. James Tao, a neurology instructor in the University of Chicago's Comprehensive Epilepsy Center, hopes his seed grant study on the pre-surgical evaluation of patients with temporal lobe epilepsy will be the first step toward someday replacing a currently painful surgical procedure and an uncomfortable five- to seven-day hospital stay with a non-invasive, two-hour functional magnetic resonance imaging (fMRI) procedure.

While approximately 70 percent of patients with uncontrolled temporal lobe epilepsy can be cured by brain surgery, the pre-surgical evaluation to map the brain's language and speech center is now a painfully invasive procedure. Mapping the location of language-associated cortex enables surgeons to remove as much seizure-causing tissue as possible during the actual surgery while avoiding damage to critical language, memory and motor functions.

In his Brain Research Foundation-funded study, Dr. Tao will conduct pre-surgical evaluations for temporal lobe epilepsy patients using fMRI. Each patient will be asked to read, review pictures and answer questions as brain activity is mapped. He will then compare each patient's fMRI report with the results of the traditional invasive mapping procedure in which electrodes are implanted in the brain and the patient is monitored over several days in the hospital. This pilot study is the first time fMRI will be used in language mapping. Dr. Tao hopes to gather enough data to build a reliable set of standards for future research. He believes this brain imaging could be a breakthrough use of fMRI as a clinical tool for mapping the language center.

Dr. Tao's long-term aim is for fMRI to become the standard pre-surgical procedure, so physicians can avoid invasive pre-surgical procedures, thus preventing such related negative outcomes as bleeding and blood clots. He also wants to help alleviate the "tremendous suffering" patients currently endure while preparing for surgery on the brain's dominant side.

"We have seen the suffering of patients in the hospital. First they have surgery to implant the electrodes. Then they're lying in bed for days with wires in their head, attached to a machine. It's very painful," he said.

Dr. Tao will use the University of Chicago's Brain Research Imaging Center and collaborate with Dr. Steven L. Small, Associate Professor of Neurology, Radiology and Psychology at the University of Chicago, and co-director of the Brain Research Imaging Center. Dr. Tao's study also will build on collaborative work with Dr. John Ebersole of the University of Chicago's Adult Epilepsy Center.

One Step Closer to Understanding Autism

Kathleen Millen, Ph.D., Seed Grant Recipient

Goal: to identify evidence that developmental abnormalities of the cerebellum contribute to emotional disturbances in children

The Brain Research Foundation seed grant that will fund the work of Dr. Kathleen Millen exemplifies how the Foundation fosters innovative collaboration among scientists.

Dr. Millen, an assistant professor in the University of Chicago's Department of Human Genetics, has spent most of her career studying the genetics of brain development in the mouse. Yet her seed grant will fund research to identify a genetic susceptibility to autism in humans. Dr. Millen, a basic scientist, is collaborating with Dr. William Dobyns of the Department of Human Genetics and Dr. Edwin Cook of the Department of Psychiatry at the University of Chicago. Both are also members of the Brain Research Institute and are world experts in children's brain malformations and autism genetics respectively.

Dr. Millen's work will test evidence that developmental abnormalities of the cerebellum—the large region of the brain located in the back of the skull—contribute to profound emotional disturbances in children, including autism. In mice, Dr. Millen has identified several genes which cause cerebellar malformations. These malformations are similar to those seen in children with Dandy Walker Malformation (DWM). Patients with DWM can have a variety of problems including mental retardation and even autism. Because the mouse and human genomes are over 90 percent identical, Dr. Millen's mouse data is directly applicable to human genetic research. Together with Dr. Dobyns and Ph.D. student Inessa Grinberg, Dr. Millen has identified genes that cause DWM.

Using the seed grant, Dr. Millen is testing the hypothesis that these newly identified DWM genes also contribute to autism susceptibility. This is based on the observation that many children with autism have mild cerebellar malformations. Autism affects an estimated 1.5 million Americans. Being able to identify specific genes related to autism will help doctors diagnose and begin treating autism earlier. Today, most children aren't diagnosed with autism until they are 18 to 24 months old. Research indicates that early diagnosis and intervention can dramatically improve their quality of life. Dr. Millen cautions, however, that because there are likely 20 or more genes associated with autism, this study is just a tiny step forward.

The seed grant allows her to apply her knowledge of mouse development and genetics to a significant human problem. "Because my background is primarily in mouse genetics, it is difficult to obtain funding to work on problems in human genetics. My current work on human cerebellar malformations and autism is only possible because the Brain Research Foundation was willing to make that leap of faith," she said.

How Does Early Childhood Trauma Affect Adult Brains?

Royce Lee, M.D., Seed Grant Recipient

Goal: to understand the biological mechanism of childhood trauma and its effect on patients with personality disorders

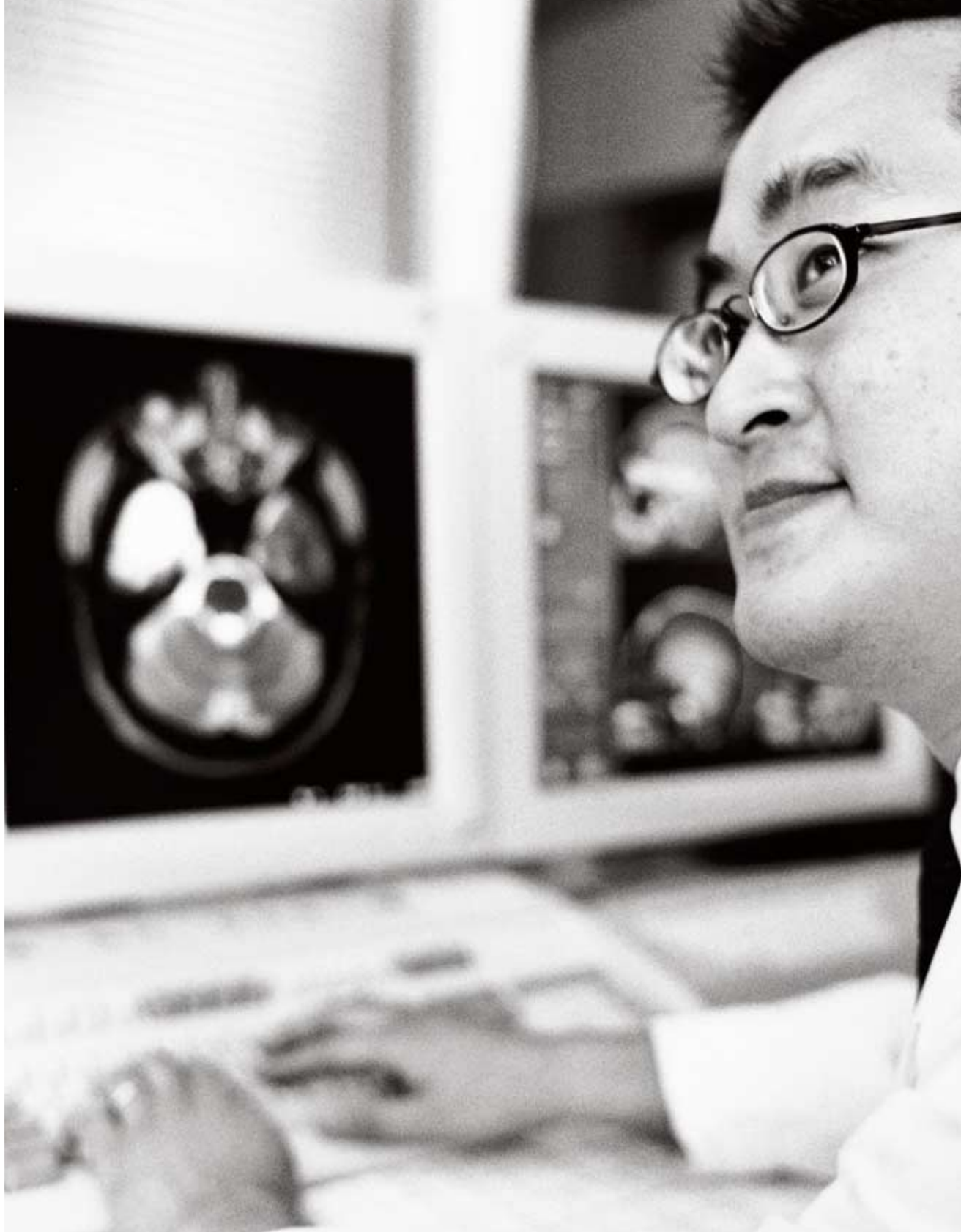
Dr. Royce Lee plans to investigate the effect of childhood trauma on adults with personality disorder. Specifically, Lee hopes to establish a methodology for studying GABA receptors, which are important in helping people process emotion. Lee's hypothesis is that early life trauma alters GABA receptor function in the brain, which contribute to personality psychopathology.

In his experiment, Dr. Lee, an assistant professor in the University of Chicago's Department of Psychiatry, will study eight individuals with personality disorder, four with a high instance of childhood trauma. Patients will be asked to review photos of facial expressions and other emotionally evocative images to activate emotional processing centers of their brains. Their brain activity will be monitored with functional magnetic resonance imaging (fMRI). Brain activity of the subjects will also be measured while they are medicated with benzodiazepine, an anti-anxiety drug. Dr. Lee hypothesizes that patients with a high instance of childhood trauma will show less regional and functional sensitivity to these drugs, which act on GABA receptors in specific brain regions.

Dr. Lee believes this Brain Research Foundation-funded study will represent a significant step forward in understanding better the effect of childhood trauma on the brain and its impact on abnormal behavior. In the long term, this ability to measure GABA receptor function could lead to the identification of at-risk individuals who might benefit from drug and psychosocial therapies. A history of childhood abuse is a risk factor for a range of psychopathological issues in adulthood, including depression, substance abuse, post-traumatic stress disorder and personality disorder.

By studying the effect GABA receptors play in emotional information processing, Dr. Lee's study could conceivably lead to a biological model for diagnosis of personality disorder that could result in more focused treatments. Current drugs that target GABA receptors, such as anti-anxiety drugs, are limited by their nonspecific effects on brain function, tolerance, addictive potential and toxicity. Psychosocial treatments, including psychotherapy, while shown to be effective, are based on behavioral, not biological, symptoms.

"This seed grant will have a tremendous impact on my future work because it allows me to test this methodology," Dr. Lee said. His experiment represents the first time persons with personality disorder will be studied with fMRI while completing these specific tasks and while medicated with this particular anti-anxiety drug. "If the methodology is sound, I hope it will help me obtain funding for future study in this area," he said.



Studying Pain on the Molecular Level

Sean Cook, Ph.D., Seed Grant Recipient

Goal: to identify a new pain receptor and provide relief to millions of patients that are currently inadequately treated

A person steps on a tack. In a fraction of a second, the peripheral nervous system relays an electrical message telling the brain there is cell and tissue damage. The person feels pain and reacts.

How that electrical messaging works on the cellular level—specifically, how pain-sensing neurons (nociceptors) signal the detection of tissue injury—is the focus of research by Dr. Sean Cook, an assistant professor in the University of Chicago's Department of Anesthesia and Critical Care.

Dr. Cook's grant from the Brain Research Foundation will allow him to study a specific ATP (adenosine triphosphate) receptor, identified as P2Y2. Evidence indicates that ATP, found in every cell, is released with cell damage. The P2Y2 receptor, which lies on the surface of nociceptors, reacts immediately to the ATP release, triggering an electrical message that the nervous system interprets as pain. Dr. Cook's goal is to learn how the P2Y2 receptor works—to uncover its molecular mechanisms that cause the nociceptors to fire.

"Our goal is to prove to the community that this receptor is an important mediator of pain," Dr. Cook said of P2Y2. "We want to look at what starts and stops the signal, because our hypothesis is that if you can stop the firing of the receptor, you can stop the pain."

Many current therapies for pain management cause harmful side effects or are not as effective as desired. For example, opiates, including morphine, are extremely effective, but often addictive and with dangerous side effects, including respiratory depression.

Dr. Cook's research could provide molecular knowledge that someday leads to new and better pain management strategies. He envisions a day when the millions of people who suffer from long-term, chronic pain—such as that from arthritis, diabetes and cancer—would be helped by drugs that prevent nociceptors from firing, thereby blocking pain at its source.

Dr. Cook cautioned that new pain therapies based on blocking receptors are a long way off. His seed grant experiment represents the first basic, academic science look at the P2Y2 receptor's role in pain.

Funding the Present to Enhance the Future

In 1953, Neurologist Dr. Frederic Gibbs organized a group of doctors to form the beginnings of what is known as the Brain Research Foundation. His vision was to create a "brain institute" for unified research, treatment and training of experts in disorders of the brain. Nowhere in the world was there a place where the best and brightest scientists joined forces to foster leading edge research for studying the brain.

The William E. Fay, Jr. family first met Dr. Gibbs as they sought help for their daughter, who suffered from epilepsy. Fay realized the importance of a foundation that solely supported brain research. He then enlisted the help of Clinton E. Frank, who also had a daughter with seizures. With the business and financial savvy of Fay and Frank, the Foundation began a well-organized fundraising drive in 1957 toward the creation of a brain institute. This initial collaboration paved the way for a Foundation whose support of revolutionary ideas is not just the norm, but the catalyst for future discoveries. Over the past 50 years, the Foundation has contributed $25 million to fund basic scientific research.

For almost 40 years, the Foundation and the University of Chicago have continued to forge a long and successful relationship. In 1964, the Foundation and the University established the Brain Research Institute, a leading center for world-class research and treatment that today boasts membership of more than 100 scientists and clinicians.

Committed to Discovery, the Foundation's latest fundraising campaign—the first in conjunction with the University of Chicago—raised more than $25 million during a three-year period ending in 2002. As a result, innovative research that normally might not be conducted without support and state-of-the-art equipment now has a chance to flourish.

Some of the beneficiaries of the Committed to Discovery Campaign and the trailblazing work that have been funded include:

Brain Research Imaging Center. Researchers now have another tool for studying life-threatening brain disorders, thanks to the purchase of functional magnetic resonance imaging (fMRI) equipment, funded in part by the Campaign. Subjects undergoing fMRI scans can be presented with visual and auditory stimuli and their verbal and tactile responses can be recorded. This is useful to scientists interested in such disorders as stroke, epilepsy, Alzheimer's disease and many other disorders.

The Memory Center. The Center for Comprehensive Care and Research on Memory Disorders at the University of Chicago fills a critical need for the appropriate evaluation of patients with dementia. Because of the tremendous call for these services, the Center's budget has had to expand accordingly. Thanks to partial funding from the Foundation, the Center is able to more easily expand its clinical and educational services for its growing patient base.

The Center for Early Childhood Research. With the help of a Foundation grant, Drs. Peter Huttenlocher, Susan Levine and Steven Small are continuing to study how language development is affected in children with brain injuries. They are examining whether development is more dependent on home environment or brain lesion size or location.

Falk Center for Advanced Study and Care of Pediatric Epilepsy. With a gift from the Ralph and Marian Falk Medical Research Trust, the Foundation has helped establish the Falk Center. It is one of the largest clinical and basic science research programs in the United States committed to improving the lives of children suffering from intractable epilepsy.

Core Genetics Research Facility. Scientists now have the chance to further their research by studying genetically altered mice. The Foundation was instrumental in purchasing several pieces of high-tech equipment for the University's recently renovated transgenic core facility.

The campaign also provides funding for dramatic scientific study in more subtle ways. Finding the best array of genius to foster great research is just as important as the research itself. The Foundation is proud to support the following opportunities:

Faculty Recruitment. The Brain Research Foundation has actively supported the recruitment of new faculty in the neurosciences. We have been involved in underwriting start-up costs for new research appointments in areas such as psychiatry and neurobiology.

Thomas A. Reynolds Sr. Family Professor of Neurosciences. A generous gift from the Thomas A. Reynolds, Sr. family to the campaign has established the first Chair in Alzheimer's research. Dr. Sangram Sisodia was named to that Chair. This gift will have a lasting impact on one of the Foundation's major focal points: basic research.

The Edward Levi Fellowship Endowment. The Levi Fellowship Endowment, established to honor former University of Chicago President Edward Levi, encourages young scientists to pursue Alzheimer's research. Dr. Seong-Hun Kim is the first recipient of this fellowship.

Donors to the Committed to Discovery Campaign are helping to reveal the secrets of the brain for millions of people. The Foundation—and those committed individuals who support it—can be sure that their financial gifts are a sound investment in the future.

The Foundation is grateful to the many individuals who contributed to the Campaign.

Brain Research Institute Executive Committee

William B. Dobyns, M.D.
Professor – Department of Human Genetics

Richard G. Fessler, M.D., Ph.D.
Professor & Chief – Section of Neurosurgery
Director – Brain Research Institute

Elliot S. Gershon, M.D.
Professor & Chairman – Department of Psychiatry

Martha K. McClintock, Ph.D.
David Lee Shillinglaw Distinguished Service Professor in Psychology
Director – Institute for Mind & Biology

Raymond P. Roos, M.D.
Marjorie & Robert E. Straus Professor in Neurological Science & Chairman – Department of Neurology

Sangram S. Sisodia, Ph.D.
Thomas Reynolds Sr. Family Professor of Neurosciences – Department of Neurobiology, Pharmacology & Physiology
Director – The Center for Molecular Neurobiology

Brain Research Institute Board of Scientific Counselors

Paul Greengard, Ph.D.
Vincent Astor Professor and Nobel Prize Laureate, Laboratory of Molecular and Cellular Neuroscience
Rockefeller University

Joseph B. Martin, M.D., Ph.D.
Dean of the Faculty of Medicine
Caroline Shields Walker Professor of Clinical Neuroscience Harvard University Medical School

Guy M. McKhann, M.D.
Associate Director for Clinical Research National Institute of Neurological Disorders and Stroke

Richard A. Murphy, Ph.D.
President and Chief Executive Officer
Salk Institute for Biological Studies

Solomon H. Snyder, M.D. D. Sc., D. Phil.
Professor & Director of Neuroscience 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 University of Chicago

Anesthesia & Critical Care

Sean P. Cook, Ph.D.
Assistant Professor – Department of Anesthesia & Critical Care
Area of Research: Peripheral mechanisms of pain transmission, electrophysiology of purinergic receptors, & nociception

Khaled M. Houamed, Ph.D.
Assistant Professor – Department of Anesthesia & Critical Care
Area of Research: Basic brain mechanisms, cellular & molecular basis of brain disease

Daniel S. McGehee, Ph.D.
Assistant Professor – Department of Anesthesia & Critical Care
Area of Research: Neuronal nicotinic receptors & synaptic transmission

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

Avery Tung, M.D.
Assistant Professor – Department of Anesthesia & Critical Care
Area of Research: Effects of sedation & anesthesia on restorative sleep

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

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

Bruce T. Lahn, Ph.D.
Assistant Professor – Departments of Human Genetics and Molecular Genetics & Cell Biology
Area of Research: Mouse genetics

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

Mathematics

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

Pathology

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

Manuel F. Utset, M.D., Ph.D.
Assistant Professor – Department of Pathology
Area of Research: Pathology of the brain, 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)

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; Chairman – Cancer Biology
Area of Research: Signal transduction in the brain leading to neuronal growth & development

Wei-Jen Tang, Ph.D.
Associate Professor – Ben-May Institute for Cancer Research
Area of Research: Cell signaling in the brain

Chemistry

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

Neurology

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

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

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

John S. Ebersole, M.D.
Professor – Department of Neurology; Director – Adult Epilepsy Service; Co-Director – Comprehensive Epilepsy Center
Area of Research: Epilepsy, EEG, source modeling, functional imaging

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

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 stroke, epilepsy & cognitive decline from aging plus the means by which brain develops resistance against these disorders

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

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

Avertano Noronha, M.D.
Professor – Department of Neurology
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 – Department of Neurology
Area of Research: Multiple sclerosis

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

Raymond P. Roos, M.D.
Marjorie & Robert E. Straus Professor in Neurological Science; Chairman – Department of Neurology
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 of 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.
Associate 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 – Department of Neurology; 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 – Departments of Neurology and Surgery; Director – Sleep Disorders Center
Area of Research: Neurology of sleep, epilepsy

Sara Szuchet, D.Phil.
Professor – Department of Neurology
Area of Research: Basic mechanisms of brain regeneration, multiple sclerosis

James X. Tao, M.D., Ph.D.
Instructor – Department of Neurology
Area of Research: Epilepsy clinical research

Vernon Leo Towle, Ph.D.
Professor – Departments of Neurology, Surgery and Pediatrics
Area of Research: Clinical neurophysiology, computational neuroscience

Neurosurgery–Surgery

Frederick D. Brown, M.D.
Associate Professor – Department of Surgery; Chief – Section of Neurosurgery
Area of Research: Pain, spinal diseases

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 – Department of Surgery (Neurosurgery)
Area of Research: Neurosurgical use of ultrasound, molecular biology of brain tumors

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

Richard G. Fessler, M.D., Ph.D.
John Harper Seeley Professor – Department of Surgery; 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: Pediatric neurosurgery & neurodevelopment, neuroprotection & molecular repair, hydrocephalus & congenital anomalies of the nervous system

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

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., DSc
Professor Emeritus – Department of Surgery

Richard D. Penn, M.D.
Professor – Department of Surgery (Neurosurgery)
Area of Research: Movement disorders, pain & hydrocephalus

Bryce Weir, M.D.
Professor Emeritus – Department of Surgery (Neurosurgery)

Bakhtiar Yamini, M.D.
Assistant Professor Department of Surgery (Neurosurgery)
Area of Research: Gene therapy of malignant brain tumors

Organismal Biology & Anatomy

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

Nicholas Hatsopoulos, Ph.D.
Assistant Professor – Department of Organismal Biology & Anatomy
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 – Department of Organismal Biology & Anatomy
Area of Research: Basic brain mechanisms, learning & memory, sensory-motor interactions, animal behavior

Victoria E. Prince, Ph.D.
Assistant Professor – Department of Organismal Biology & Anatomy
Area of Research: Developmental neurobiology

Jan-Marino Ramirez, Ph.D.
Associate Professor – Department of Organismal Biology & Anatomy
Area of Research: Neuronal control of breathing & epileptic activity

Philip S. Ulinski, Ph.D.
Professor – Department of Organismal Biology & Anatomy
Area of Research: Computational neurobiology

Pediatrics

Glyn Dawson, Ph.D.
Professor – Department of Pediatrics
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.
Assistant Professor – Department of Pediatrics
Area of Research: Pediatric neurology, brain development

Charles J. Marcuccilli, Ph.D., M.D.
Assistant Professor – Department of Pediatrics – Section of Neurology
Area of Research: Basic mechanisms of epileptogenesis in neocortical epilepsies, understanding a role for rational pharmacotherapy in the treatment of pediatric epilepsy

Jeremy D. Marks, Ph.D., M.D.
Associate Professor – Department of Pediatrics
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 – Department of Pediatrics; 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: Pediatric neurology

Neurobiology, Pharmacology & Physiology

Aaron P. Fox, Ph.D.
Professor – Department of Neurobiology, Pharmacology & Physiology
Area of Research: Basic brain mechanisms

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

Jay M. Goldberg, Ph.D.
Professor – Department of Neurobiology, Pharmacology & Physiology
Area of Research: Vestibular end organs & their central pathways in mammals

Brain Research Institute Fellows, continued

William N. Green, Ph.D.
Associate Professor – Department of Neurobiology, Pharmacology & Physiology
Area of Research: Neurotransmitter receptor expression

Elizabeth A. Grove, Ph.D.
Associate Professor – Department of Neurobiology, Pharmacology & Physiology
Area of Research: Brain development

Alfred Heller, M.D., Ph.D.
Professor – Department of Neurobiology, Pharmacology & Physiology
Area of Research: Development of specific central neuronal systems

Philip C. Hoffmann, M.D.
Professor Emeritus – Department of Neurobiology, Pharmacology & Physiology
Area of Research: Neuropharmacology

Naoum P. Issa, M.D., Ph.D.
Assistant Professor – Department of Neurobiology, Pharmacology & Physiology
Area of Research: Development & function of sensory cortex

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

Peggy Mason, Ph.D.
Associate Professor – Department of Neurobiology, Pharmacology & Physiology
Area of Research: Pain modulation

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

Deborah J. Nelson, Ph.D.
Professor – Department of Neurobiology, Pharmacology & Physiology
Area of Research: Basic brain mechanisms, ion channels

Clifton W. Ragsdale, Jr., Ph.D.
Associate Professor – Department of Neurobiology, Pharmacology & Physiology
Area of Research: Molecular & cellular mechanisms of brain development

Eric A. Schwartz, M.D.
Professor – Department of Neurobiology, Pharmacology & Physiology
Area of Research: Synaptic transmission in the vertebrae retina

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

Kamal Sharma, Ph.D.
Assistant Professor – Department of Neurobiology, Pharmacology & Physiology
Area of Research: Spinal cord development & motor circuits

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

Gopal Thinakaran, Ph.D.
Associate Professor – Department of Neurobiology, Pharmacology & Physiology
Area of Research: Alzheimer's disease, cellular stress related gene expression

Xiaoxi Zhuang, Ph.D.
Assistant Professor – Department of Neurobiology, Pharmacology & Physiology
Area of Research: Genetic & behavioral direction of reward & dopamine system dysfunction

Yimin Zou, Ph.D.
Assistant Professor – Department of Neurobiology, Pharmacology & Physiology
Area of Research: Axon guidance & the wiring of the central nervous system

Psychiatry

Judith Ann Badner, M.D., Ph.D.
Assistant Professor – Department of Psychiatry
Area of Research: Statistical issues in complex genetic traits

Maria T. Caserta, M.D., Ph.D.
Associate Professor – Department of Psychiatry; 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.
Professor – Department of Psychiatry; Director – Clinical Neuroscience & Psychopharmacology Research
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 – Department of Psychiatry; Executive Director – Center for Psychiatric Rehabilitation
Area of Research: Social aspects of psychiatric illness including stigma

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

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

Richard M. Glass, M.D.
Professor – Department of Psychiatry
Area of Research: Psychiatric illness, biomedical publications

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

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

Royce J. Lee, M.D.
Assistant Professor – Department of Psychiatry, Adult Section
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

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

Allan Rechtschaffen, Ph.D.
Professor Emeritus – Departments of Psychiatry and Psychology

Alan R. Sanders, M.D.
Assistant Professor – Department of Psychiatry
Area of Research: Schizophrenia

Edward C. Senay, M.D.
Professor Emeritus – Department of Psychiatry

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

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

Psychology

David C. Bradley, Ph.D.
Assistant Professor – Department of Psychology
Area of Research: Cortical mechanism of motion perception

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 – Departments of Psychology and Institute for Mind & Biology
Area of Research: Olfactory-limbic neurodynamics & the roles of meaning & behavioral state in sensory perception

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

Jerry Levy, Ph.D.
Professor – Department of Psychology
Area of Research: Cognitive neuroscience, higher brain functions

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

Radiology

Chin-Tu Chen, Ph.D.
Associate Professor – Department of Radiology
Area of Research: Medical imaging

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

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

Independent Auditor's Report

To the Board of Directors
Brain Research Foundation – Chicago, Illinois

We have audited the accompanying statements of financial position of Brain Research Foundation as of June 30, 2003, and the related statement of activities, schedule of functional expenses, and statement of 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 2002 financial statements and, in our report dated July 25, 2002, 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, 2003, and the results of its operations 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
July 18, 2003

Statements of Financial Position

June 30, 2003 (with comparative totals as of June 30, 2002)

Assets	Unrestricted	Temporarily Restricted	2003 Total	2002
Current Assets				
Cash and cash equivalents	$ 88,105	$ 472,009	$ 560,114	$ 482,999
Contributions receivable	—	542,307	542,307	610,091
Investments	6,245,342	3,227,949	9,473,291	9,776,433
Interest receivable	41	74	115	296
Prepaid expenses	—	—	—	550
Total Current Assets	**6,333,488**	**4,242,339**	**10,575,827**	**10,870,369**
Property and Equipment				
Leasehold improvements	125,000	—	125,000	8,554
Furniture and equipment	68,706	—	68,706	111,754
Software	23,759	—	23,759	23,759
Less accumulated depreciation	(75,150)	—	(75,150)	(94,936)
Net Property and Equipment	**142,315**	**—**	**142,315**	**49,131**
Noncurrent Assets				
Security deposits	4,320	—	4,320	4,245
Contributions receivable	—	156,979	156,979	554,694
Total Noncurrent Assets	**4,320**	**156,979**	**161,299**	**558,939**
Total Assets	**$ 6,480,123**	**$ 4,399,318**	**$ 10,879,441**	**$ 11,478,439**

Liabilities and Net Assets	Unrestricted	Temporarily Restricted	2003 Total	2002
Current Liabilities				
Grants payable	$ —	$ —	$ —	$ 130,000
Accounts payable and accrued expenses	2,420	—	2,420	4,572
Discovery Campaign payable	—	1,020,934	1,020,934	1,989,187
Total Current Liabilities	**2,420**	**1,020,934**	**1,023,354**	**2,123,759**
Net Assets				
Unrestricted	6,477,703	—	6,477,703	6,558,614
Temporarily restricted	—	3,378,384	3,378,384	2,796,066
Total Net Assets (Exhibit B)	**6,477,703**	**3,378,384**	**9,856,087**	**9,354,680**
Total Liabilities and Net Assets	**$ 6,480,123**	**$ 4,399,318**	**$ 10,879,441**	**$ 11,478,439**

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

Statements of Activities

Year Ended June 30, 2003 (with comparative totals for the year ended June 30, 2002)

	Unrestricted	Temporarily Restricted	2003 Total	2002
Revenues				
Support-Contributions	$ 310,217	$ 650,252	$ 960,469	$ 565,067
Fundraising event revenue	100,675	149,350	250,025	—
Total Support Revenue	**410,892**	**799,602**	**1,210,494**	**565,067**
Income (loss) from investing activities				
Interest and dividends	313,860	48,084	361,944	376,389
Net realized loss on sale of investments	(392,313)	(26,514)	(418,827)	(181,707)
Net unrealized gain (loss) on investments	375,384	171,932	547,316	(587,257)
Total income (loss) from investing activities	**296,931**	**193,502**	**490,433**	**(392,575)**
Net assets released from restriction	410,786	(410,786)	—	—
Total Revenues	**1,118,609**	**582,318**	**1,700,927**	**172,492**
Expenses				
Program services				
Fay/Frank Seed Grant Fund	166,323	—	166,323	154,203
Discovery Campaign	57,774	—	57,774	101,787
Special Fund	186,689	—	186,689	236,410
Public Information, Health and Education	404,629	—	404,629	381,000
Total Program Services	**815,415**	**—**	**815,415**	**873,400**
Supporting services				
General administration	121,976	—	121,976	252,962
Fundraising expenses	159,120	—	159,120	66,372
Fundraising event expenses	90,227	—	90,227	—
Total Supporting Services	**371,323**	**—**	**371,323**	**319,334**
Loss on disposal of assets	12,782	—	12,782	—
Total Expenses	**1,199,520**	**—**	**1,199,520**	**1,192,734**
Change in Net Assets	**(80,911)**	**582,318**	**501,407**	**(1,020,242)**
Net Assets, Beginning of Year	**6,558,614**	**2,796,066**	**9,354,680**	**10,374,922**
Net Assets, End of Year (Exhibit A)	**$ 6,477,703**	**$ 3,378,384**	**$ 9,856,087**	**$ 9,354,680**

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

Statements of Cash Flows

Year Ended June 30, 2003

	2003	2002
Cash Flows from Operating Activities		
Change in net assets	$ 501,407	$ (1,020,242)
Adjustments to reconcile change in net assets to net cash used in operating activities		
Depreciation	19,012	23,510
Loss on sale of investments	418,827	181,707
Unrealized (gain) loss on increase in market value of investments	(547,316)	587,257
Donated stock	(32,528)	(105,282)
Loss on sale of assets	12,782	—
Decrease in		
Contributions receivable	465,499	1,088,578
Prepaid expenses and other	656	1,177
Increase (decrease) in		
Accounts payable and accrued expenses	(2,152)	(4,406)
Discovery Campaign payable	(968,253)	(946,916)
Grant payable	(130,000)	30,000
Net Cash Used in Operating Activities	**(262,066)**	**(164,617)**
Cash Flows from Investing Activities		
Capital expenditures	(125,000)	—
Proceeds from sale of assets	22	—
Sale of investment securities	4,796,974	4,335,038
Purchase of investment securities	(4,332,815)	(4,376,050)
Net Cash Provided by (Used in) Investing Activities	339,181	(41,012)
Net Increase (Decrease) in Cash and Cash Equivalents	**77,115**	**(205,629)**
Cash and Cash Equivalents, Beginning of Year	**482,999**	**688,628**
Cash and Cash Equivalents, End of Year	**$ 560,114**	**$ 482,999**

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

Notes to Financial Statements

Year Ended June 30, 2003 and 2002

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. These financial statements report amounts separately by class of net assets. The separate classes of net assets 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 which 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, 2003 and 2002, 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 and certificates of deposit with a maturity of three months or less to be cash equivalents. The carrying value of cash equivalents approximates fair value as of June 30, 2003 and 2002.

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.

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 (three to seven years for furniture and equipment, thirty-nine years for leasehold improvements and three years for software).

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.

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, 2003, the Foundation and the University of Chicago have received pledges of approximately $26 million and successfully met its joint goal. The campaign commitments may be paid until 2005.

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.

Note 1 - Summary of Significant Accounting Policies, continued

Financial Instruments

Financial instruments, which potentially subject the organization to concentration of credit risk, consist principally of cash and cash equivalents and marketable securities. The organization places its cash, cash equivalents and marketable securities with high-quality institutions and, accordingly, limits its credit exposure.

Functional Allocation of Expenses

Expenses are charged to each program based on direct expenditures incurred. Certain indirect expenditures that benefit more than one program are allocated to the benefited programs based on allocation formulas developed in accordance with OMB Circular A-122, *Cost Principles for Non-profit Organizations.*

The Schedule of Functional Expenses will be provided upon request.

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 at 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.

Prior-Year Summarized Information

The financial statements include certain prior-year summarized comparative information in total but not by net asset class. Such information does not include sufficient detail to constitute a presentation in conformity with accounting principles generally accepted in the United States of America. Accordingly, such information should be read in conjunction with the Society's financial statements for the year ended June 30, 2002, from which the summarized information was derived.

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:

	2003	2002
Cash	$ 52,032	$ 80,094
Money market funds	508,082	402,905
	$ 560,114	**$ 482,999**

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 - Contributions Receivable

Maturities on contributions receivable as of June 30, 2003 are as follows:

Fiscal Year Ending:	
2004	$ 554,545
2005	76,833
2006	84,344
Less amount representing interest	(16,436)
Present Value of Contributions Receivable	**$ 699,286**

A discount rate of 1.75%, derived from the 7/1/03 treasury note interest rate with a 3-year maturity, was used to calculate the present value of contributions receivable.

Note 5 - Investments

Investments are recorded at fair value. Investments consist of the following as of June 30, 2003 and 2002:

	2003	2002
Unrestricted investments		
Common and preferred stock	$ 4,570,184	$ 4,287,982
Corporate bonds	515,623	683,890
Government bonds	1,159,535	1,414,981
Total	**$ 6,245,342**	**$ 6,386,853**
Temporarily restricted investments		
Common and preferred stock	$ 1,961,357	$ 1,492,776
Corporate bonds	607,006	731,197
Government bonds	659,586	1,165,607
Total	**$ 3,227,949**	**$ 3,389,580**

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.

Temporarily restricted net assets are available for the following purposes or periods:

	2003	2002
Fay/Frank Seed Grant Fund	$ 1,785,137	$ 1,267,232
Discovery Campaign	1,558,451	1,485,487
Special Fund	34,796	43,347
	$ 3,378,384	**$ 2,796,066**

Note 7 - Lease Commitments

Rent expense for 2003 and 2002 was $147,144 and $61,219, respectively.

The Foundation leases office space under a non-cancelable operating lease that expires on May 31, 2004. Lease payments for the office space are $32,221 for the year ending June 30, 2004. The office space had not been sub-leased in 2003.

In August 2002, the Foundation moved its office to the University of Chicago. The office is being leased under an additional non-cancelable operating lease that expires on August 31, 2007. The fair market value to rent the office space is $102,384 per year. The Foundation paid $9,526 for the year ended June 30, 2003. Donated rent of $84,325 has been reflected in the financial statements as contributed revenue and related expense.

Future minimum lease payments are as follows as of June 30, 2003:

Year Ending June 30:	
2004	$ 10,393
2005	10,393
2006	10,393
2007	10,393
Total Minimum Payments Required	**$ 41,572**

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. In any Plan year, a participant may not receive more than the lesser of 25% of compensation or $35,000 from all plans of the employer. Employees are 100% vested in all their accounts in the Plan.

The organization contributed $27,455 and $26,811 for the years ended June 30, 2003 and 2002, respectively.

Note 9 - Reclassification

For comparability, the 2002 financial statements reflect reclassifications where appropriate to conform to the financial statement presentation used in 2003.

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Brain Research Foundation

Brain Research Foundation
5812 S. Ellis Avenue, MC 7112
Room J-141
Chicago, Illinois 60637
tel 773.834.6750
fax 773.834.6751

Our Mission

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.