

# BRAIN & BEHAVIOR RESEARCH FOUNDATION

Research for Better Treatments and Cures

ANNUAL REPORT 2014



## Our Vision

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To dramatically improve the lives of those with mental illness and ultimately enable people to live full, happy and productive lives.

## Our History / Who We Are

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The Foundation began as a family movement and has become the world's leading private funder of mental health research grants. The Foundation funds the most innovative ideas in neuroscience and psychiatry to better understand the causes and develop new ways to effectively treat brain and behavior disorders. These disorders include depression, bipolar disorder, schizophrenia, autism, attention-deficit hyperactivity disorder, anxiety, borderline personality disorder, obsessive-compulsive disorder and post-traumatic stress disorder.

The first NARSAD Grants were awarded in 1987. Since then the Foundation has awarded more than \$324 million to fund more than 4,800 grants to more than 3,800 leading scientists around the world. This has led to over \$3 billion in additional funding for these scientists.



## How We Do It

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100% of dollars raised for research are invested in grants leading to advances and breakthroughs in brain and behavior research.

Our grants support a broad range of the best ideas in brain research. Funding for our grants is focused on three priority areas to better understand and treat mental illness, aiming toward prevention and ultimately cures:

**Basic Research** to understand what happens in the brain to cause mental illness

**New Technologies** to advance or create new ways of studying and understanding the brain

**Next Generation Therapies** to reduce symptoms of mental illness and ultimately cure and prevent brain and behavior disorders

## Scientific Council

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Led by Dr. Herbert Pardes, the founding President of our Scientific Council, the Council reviews and selects the most promising research ideas with the greatest potential to lead to breakthroughs. The Council is composed of 150 world-renowned scientists including 2 Nobel Prize winners, 4 former directors of The National Institute of Mental Health, 4 recipients of the National Medal of Science, 13 members of the National Academy of Sciences, 21 chairs of psychiatric departments, and 47 members of the Institute of Medicine.

## Our Values

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- We believe better treatments and breakthroughs come from scientific discovery.
- We fund only those scientists whose research is reviewed and recommended by our world-renowned Scientific Council.
- 100% of contributions for research go directly to research. Costs for administration and fundraising are underwritten by two family foundations.
- Our financial operations are transparent. Those who manage our Foundation are committed to honesty and integrity.

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The Brain & Behavior  
 Research Foundation is the  
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## Dear Foundation Supporters,

The year 2014 was one of outstanding advances in the field of brain and behavior research thanks to you and the many others who generously support the Brain & Behavior Research Foundation.

The Foundation increased its commitments to alleviating the suffering of mental illness by awarding grants that will lead to further advances and breakthroughs in scientific research. Since 1987, we have awarded more than \$324 million to fund more than 4,800 grants to more than 3,800 leading scientists around the world who are researching the causes of and new and better ways to treat brain and behavior disorders. Our seed money has led to over \$3 billion in additional funding for these scientists. These disorders include depression, bipolar disorder, schizophrenia, autism, attention-deficit hyperactivity disorder, anxiety, borderline personality disorder, obsessive compulsive disorder and post-traumatic stress disorder.

Our NARSAD grants are one of the most vital supports for mental health research in the world, focused on three priority areas:

**Basic Research** to understand what happens in the brain to cause mental illness

**New Technologies** to advance or create new ways of studying and understanding the brain

**Next Generation Therapies** to reduce symptoms of mental illness and ultimately cure and prevent brain and behavior disorders

The research community can no longer rely as it has in past years on ample government funding with reasonable annual increases. Because of the decrease in government funding for young scientists, we are at great risk of losing an entire generation of scientists. We must now look to the private sector for leadership and innovation.

This past year we granted a total of \$18 million to our 200 Young Investigator Grantees, 40 Independent Investigator Grantees and 15 Distinguished Investigator Grantees. We expect they will make exciting discoveries over the next few years.

Some of the major discoveries made by our grantees in 2014 are highlighted in this report. They include findings that identify a new brain biomarker for depression risk in young children; the capability of a fast acting antidepressant to quickly restore the ability to experience pleasure in people with bipolar disorder; a comprehensive study of rare autism mutations; a potential method for predicting suicide risk with a blood test; and the largest study to date of common gene disruptions in schizophrenia.

We are pleased to report that the Foundation has initiated an annual prize to honor humanitarian leaders worldwide who enhance the life of persons impacted by mental illness—The Pardes Prize. The first prize was named for and awarded to Dr. Herbert Pardes in recognition of his more than 50 year achievements in pioneering better treatments and organizational structures to bring better and more hopeful lives for those impacted by mental illness. We honored all of his achievements, from his earliest medical and psychiatric work, to his service as U.S. Assistant Surgeon General and Director of the National Institute of Mental Health, Presidency of the American Psychiatric Association, Vice Presidency for Health Sciences for Columbia University and Dean of the Faculty of Medicine of Columbia's College of Physicians and Surgeons and his leadership as President and CEO of the Columbia Presbyterian Medical System, as well as his volunteer achievements in initiating and leading the Scientific Council of this organization for the past 28 years. The award will be one of the very few renowned international prizes for humanitarian achievement.

In our selection of prize winners we honored the unique achievements of 14 distinguished scientists and researchers. One example of the caliber of our prizewinners includes a physician who serves both as a professor at the Karolinska Institutet in Sweden and at the University of North Carolina in the United States - Dr. Patrick F. Sullivan. Dr. Sullivan received the Lieber Prize for outstanding achievement in schizophrenia research as a leader in the important movement in psychiatric genomics—the study of genes linked to mental disorders. In a remarkable achievement which broadens the research field, he and a few colleagues cofounded the Psychiatric Genomics Consortium in 2007, which

now includes some 800 scientists from more than 90 research institutions in 25 countries. They have amassed samples from 60,000 patients suffering from schizophrenia and estimate that the total number of samples across psychiatric illnesses could reach 400,000 people. Dr. Sullivan received a NARSAD grant as a Distinguished Investigator in 2010.

Research shows anywhere from 25 percent of Americans will experience a mental illness during their lifetime. One of the saddest aspects of mental illness is that it often strikes people at a very young age. Psychiatric conditions such as schizophrenia, bipolar disorder, depression, and chemical dependence all begin to surface in adolescence and young adulthood. For the parents and siblings of young people diagnosed with psychiatric disorders, it can be frightening, bewildering, and frustrating. Where do they turn for help? As part of our focus, information that can be of practical use to families coping with the diagnosis of a behavioral disorder or mental illness will now be featured in our

*Quarterly* publications which will have guidance and advice from Scientific Council members and recipients of NARSAD research grants who are leaders in the field of pediatric psychiatry.

As science continues to unlock the complex brain and behavior disorder puzzle, we will continue to find new and better ways to prevent, treat and hopefully cure these devastating diseases. Without your support we would not have the funding to meet our essential research goals to dramatically improve the lives of those with mental illness, and ultimately, enable people to live full, happy and productive lives. It is a privilege to report that 100% of the dollars we raise for research are invested into our grants leading to advances and breakthroughs in brain and behavior research because our operating expenses are covered by two family foundations. And while we are pleased with our progress over the past 28 years, we know that we cannot sit back and rest because finding the cures for brain and behavior disorders is one of our society's greatest challenges.

With sincere thanks and regards,



**JEFFREY BORENSTEIN, M.D.**  
President & C.E.O.



**STEPHEN A. LIEBER**  
Chair, Board of Directors



**HERBERT PARDES, M.D.**  
President, Scientific Council



# Newest Scientific Council

Led by Dr. Herbert Pardes, the founding President of our Scientific Council, the all-volunteer group of leading mental health researchers reviews and selects the most promising research ideas with the greatest potential to lead to breakthroughs.

The Council is composed of 150 world-renowned scientists including 2 Nobel Prize winners, 4 former directors of The National Institute of Mental Health, 4 recipients of the National Medal of Science, 13 members of the National Academy of Sciences, 21 chairs of psychiatric departments, and 47 members of the Institute of Medicine.

The Scientific Council guides the Foundation to fund creative and impactful research proposals relevant to the whole spectrum of mental health.

We welcome our newest members.



#### **P. JEFFREY CONN, PH.D.**

Lee E. Limbird Professor of Pharmacology  
Director, Vanderbilt Center for  
Neuroscience Drug Discovery  
*Vanderbilt University*

Dr. Conn's translational research, for which he has won numerous awards, focuses on schizophrenia, depression, and other brain disorders. With his colleagues, Dr. Conn's efforts include discovery of a fundamentally new mechanism for targeting specific neurotransmitter receptors that show promise as drug targets. As Director of the Vanderbilt Center for Neuroscience Drug Discovery, he has pioneered a new model by which universities can actively take part in drug discovery research and novel approaches for treatment of major brain disorders. This work has generated multiple drug candidates now being advanced in partnership with foundations and pharmaceutical companies.



#### **JAY N. GIEDD, M.D.**

Child and Adolescent Psychiatrist  
Chief, Brain Imaging in the  
Child Psychiatry Branch  
National Institute of Mental Health  
National Institutes of Health

Since 1991, Dr. Giedd has been conducting large-scale longitudinal studies on autism, attention-deficit hyperactivity disorder, and childhood-onset schizophrenia. His research has led to over 200 papers covering a wide range of topics and helped advance neurodevelopmental hypotheses of psychiatric disorders that remain the focus of several ongoing investigations throughout the world. Dr. Giedd's current focus is on application of the brain development insights obtained to guide interventions and improve the lives of young people and their families.

# ncil Members



## **PAMELA SKLAR, M.D., PH.D.**

Chief, Division of Psychiatric Genomics  
Professor of Psychiatry,  
Neuroscience and Genetic and  
Genomic Sciences  
*Icahn School of Medicine at Mount Sinai*

Dr. Sklar has been engaged in genetic research on causes of schizophrenia and bipolar disorder for the past 15 years. Her research utilizes both family and population-based approaches, with linkage as well as association studies. Currently, she is the Principal Investigator on three National Institutes of Health grants on the genetics of schizophrenia and bipolar disorder. Dr. Sklar is also the founder of the International Schizophrenia Consortium; co-chair of the bipolar disorder working group and coordinating committee member for the Psychiatric Genome-Wide Association Study (GWAS) Consortium; member of the schizophrenia working group for the Psychiatric GWAS Consortium; manuscript writing team member; and is on the editorial boards of *Neuropsychiatric Genetics and Psychiatric Genetics*.

## **MURRAY B. STEIN, M.D., M.P.H.**

Distinguished Professor of Psychiatry  
and Family & Preventive Medicine  
Vice Chair, Clinical Research in Psychiatry  
Director, Anxiety & Traumatic Stress  
Disorders Program  
*University of California, San Diego*

Dr. Stein's research interests include the epidemiology, neurobiology, and treatment of anxiety disorders especially social phobia, panic disorder, and post-traumatic stress disorder. His research studies include interventions for anxiety disorders in primary care, pharmacological approaches to treatment-resistant anxiety disorders, and functional neuroimaging research in anxiety and trauma-related disorders. He has written or co-written more than 500 peer-reviewed scientific articles on these topics. Dr. Stein is coeditor, with Martin Antony Ph.D., of the *Oxford Handbook of Anxiety and Related Disorders* (2009). In addition to his posts at UCSD, he is also a Staff Psychiatrist at the VA San Diego Healthcare System.

## **JIM VAN OS, M.D., PH.D., MRCPSYCH**

Professor and Chairman, Department of  
Psychiatry and Psychology  
Maastricht University Medical Centre,  
The Netherlands

As Director of Psychiatric Services at Maastricht University Medical Centre, Dr. van Os runs a service for treatment-resistant depression and first episode psychosis. He serves as coordinator of a project on gene environment interactions in schizophrenia, and is active in clinical gene-environment interaction research in depression and bipolar disorder. In 2011, he was elected member of the Royal Netherlands Academy of Arts and Sciences and serves on the editorial boards of several psychiatric journals such as *Psychological Medicine*, *Schizophrenia Research*, *Schizophrenia Bulletin*, *Early Intervention in Psychiatry*, *Epidemiology and Psychiatric Sciences*, *Psychosis Journal*, *The Journal of Mental Health* and the *Journal of Psychiatry and Neurological Sciences*. He is an Academic Editor at PLOS ONE. Dr. van Os is also a Visiting Professor of Psychiatric Epidemiology at the Institute of Psychiatry, London, UK.

# 10 Major Discoveries of 2014

- A Brain Biomarker That Can Predict Recurrent Major Depression in Toddlers
- Our Clearest Glimpses So Far of the Complex Genetics Underlying Autism
- Ketamine Restores the Ability to Experience Pleasure in Bipolar Depression
- Novel Marker in Brain Scans Reveals Patient-Specific PTSD Brain Dysfunction
- Research Shows Too Many Synaptic Connections in Brains of Children with Autism
- Foundation-Supported Study Identifies Potential Method for Predicting Suicide Risk with a Blood Test
- Largest Schizophrenia Genetics Study Confirms Role of Common Gene Disruptions
- Sophisticated Stem Cell Technology Enables Team To Trace Gene-Induced Pathologies Implicated in Schizophrenia
- A Drug That Blocks Formation and Recall of Fear Memories in Mice Could Be Used in PTSD
- Scalp EEG Test Could Be Used to Predict Future Psychosis



## A Brain Biomarker That Can Predict Recurrent Major Depression in Toddlers

A team that included three past recipients of NARSAD Grants—nine grants in all, spanning the period 1995 to 2013—reported the first-ever structural brain biomarker that predicts a small child’s risk of having recurrent major depressive disorder (MDD).

The researchers used MRI scans to measure the volume of a brain area called the anterior insula (AI). They found that in children at high risk for recurrent MDD, the volume of the AI was smaller than in children not at risk for depression or other psychiatric disorders. The AI is a part of the brain that is engaged when we process self-conscious emotions, including guilt.

The result, published in *JAMA Psychiatry* November 12th, was made possible by careful follow-up of a large group of children over a 10-year period. Over 300 children aged 3 to 5 were initially recruited for the study. Of these, 145 were found after examination to have already suffered a depressive episode or were deemed at risk of becoming depressed. Although depression, like other disorders, is sometimes hard to diagnose in small children, the team knew that one of the most consistent and robust correlates of preschool-onset depression has been the tendency for pathological guilt. Examples of such guilt include fixation on feeling bad about a minor misbehavior; feeling like “a bad kid” without objective reason, or taking blame for things without warrant. In children under 3 who experience such feelings, risk of having MDD by age 5 has been estimated at 10 times the norm.

Thus, the team’s discovery of a correlation between small AI volume and MDD risk is a significant advance, making possible improved diagnosis and estimation of prognosis. The next question to be addressed concerns causality: does the AI shrink in response to pathological guilt feelings? Or does a smaller than normal AI dispose a child to have such feelings?

### **DEANNA M. BARCH, PH.D.**

Chair, Department of Psychology  
Professor of Psychology  
and Radiology  
*Washington University  
School of Medicine, St. Louis*

### **JOAN L. LUBY, M.D.**

Samuel and Mae S. Ludwig  
Professor of Child Psychiatry  
Director, Early Emotional  
Development Program  
*Washington University  
School of Medicine, St. Louis*

### **KELLY N. BOTTERON, M.D.**

Professor of Psychiatry  
(Child) and Radiology  
*Washington University  
School of Medicine, St. Louis*



## Our Clearest Glimpses So Far of the Complex Genetics Underlying Autism

### JOSEPH BUXBAUM, PH.D.

Professor of Psychiatry, Neuroscience, and Genetics and Genomic Sciences  
*Icahn School of Medicine  
at Mount Sinai*

### PAMELA SKLAR, M.D., PH.D.

Professor of Psychiatry, Neuroscience, and Genetics and Genomic Sciences  
*Icahn School of Medicine  
at Mount Sinai*

### MATTHEW STATE, M.D., PH.D.

Oberndorf Family Distinguished Professor Chair, Department of Psychiatry Director, Langley Porter Psychiatric Institute and Hospital  
*University of California, San Francisco*

Also contributing to these studies:

#### CHRISTIAN MARSHALL, PH.D.

(2007 YI\*),

#### MICHAEL OWENS, M.D., PH.D.

(two-time NARSAD Grantee),

#### SHAUN MATTHEW PURCELL, PH.D.

(2006 YI),

#### ABRAHAM REICHENBERG, PH.D.

(2004 YI),

#### LAUREN WEISS, PH.D.

(2010 YI),

#### CHRISTOPHER WALSH, M.D., PH.D.

(two-time NARSAD Grantee).

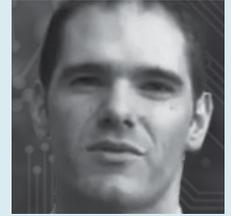
\*YI-NARSAD Young Investigator Grantee

Two studies of DNA sampled from families with one child diagnosed with autism spectrum disorder (ASD)—the largest such studies published to date—have provided our most vivid picture of autism’s vexing genetic complexity. Together, the studies identified dozens of genes not previously linked with autism. They also predict that advances in technology will make possible the discovery of hundreds of additional autism-risk genes.

Both studies were published online in *Nature* on October 29th. Six former recipients of NARSAD Grant awards, two members of the Foundation’s Scientific Council (Dr. Sklar and Dr. Buxbaum), and the 2012 winner of the Foundation’s Ruane Prize for Outstanding Achievement in Child and Adolescent Psychiatric Research (Dr. State), were among the authors of the two papers, along with colleagues working at 50 labs across the U.S. and overseas.

Much of autism risk will ultimately be traced to mutations inherited by a child from a parent. The new studies focused on another contributor to total risk, stemming from mutations that are seen in a child with ASD but not in either parent. These “spontaneous” mutations, which are the result of errors in DNA copying when sperm and egg combine to form a unique individual, are called *de novo*, or new mutations.

Some *de novo* mutations are harmless—they occur in places in the chromosomes where they do not interfere with the operation of important genes. Others, occurring in critical spots, can disrupt the action of key genes and can be devastating. Twenty-seven such “likely gene-disrupting” (LGD) mutations were closely examined in one of the two papers. The other study scrutinized 107 mutated risk genes “enriched” in a sample of 3,871 ASD patients. In both studies, many of the affected genes are known to be activated at the dawn of life, when the brain is building neural networks. Among the specific functions impacted are the formation of synapses, or communications junctions between nerve cells; transcription, the process by which a class of regulatory genes encodes proteins to regulate the expression of other genes; and the bundling of DNA in the cell nucleus in packages called chromatin, which helps determine when specific genes can be activated.



## Ketamine Restores the Ability to Experience Pleasure in Bipolar Depression

Many psychiatric patients lose interest in simple activities that once they may have enjoyed. It's a condition known medically as anhedonia, and now there is hope for relief, thanks to the work of two Foundation-funded researchers—Carlos Zarate, Jr., M.D and Jonathan Paul Roiser, Ph.D., both former recipients of NARSAD Independent Investigator Awards.

For the first time, their work reveals that, in patients with bipolar depression, the experimental drug ketamine can help quickly reduce feelings of disinterest when other treatments have failed. Approved by the FDA decades ago as an anesthetic and known to have hallucinogenic side effects—particularly when abused as a recreational drug—ketamine has been the subject of intensive clinical research. Dr. Zarate and other investigators (including Foundation Scientific Council members Dennis Charney, M.D., and John Krystal, M.D.) have previously shown that controlled administration of ketamine can quickly relieve general symptoms in people with treatment-resistant major depression. Only recently has ketamine's effects on anhedonia specifically been explored.

As Drs. Zarate, Roiser, and colleagues reported on October 14th in *Translational Psychiatry*, 36 people with treatment-resistant bipolar depression received a dose of ketamine or a placebo on two test dates, two weeks apart. Patients who were given a single dose of ketamine reported a reduction in their levels of anhedonia in as little as 40 minutes. This improvement lasted for as long as two weeks in some patients and occurred independently of reductions in other depression symptoms. The results now need to be reproduced in larger studies. They lend support to continuing efforts to develop ketamine analogs with reduced side-effects.

### **CARLOS A. ZARATE, JR., M.D.**

Chief, Section on the Neurobiology and Treatment of Mood Disorders  
Chief, Experimental Therapeutics and Pathophysiology Branch  
National Institute of Mental Health  
Clinical Professor, Psychiatry and Behavioral Sciences  
*George Washington University*

### **JONATHAN PAUL ROISER, PH.D.**

Associate Professor  
*University College London*



## Novel Marker in Brain Scans Reveals Patient-Specific PTSD Brain Dysfunction

### ALEXANDER NEUMEISTER, M.D.

Director, Molecular Imaging  
Program for Mood and  
Anxiety Disorders  
Professor, Departments of  
Psychiatry and Radiology  
New York University  
Langone Medical Center

People with post-traumatic stress disorder (PTSD) experience a variety of symptoms, two of which can be listlessness and emotional detachment. New research using high-resolution positron emission tomography (PET) brain imaging now links these symptoms to specific abnormalities in brain function. This raises the prospect that treatments for PTSD, like those for, say, cancer or heart disease, might be adjusted to fit an individual's specific case, an example of "precision medicine."

Published in *JAMA Psychiatry* on September 17th, 2007 NARSAD Independent Investigator grantee Alexander Neumeister, M.D., and colleagues reported using a new, harmless radioactive tracer in concert with PET scanning to look at parts of the brain presumed to be associated with PTSD symptoms. The tracer binds to a class of natural opioid receptors in the brain known as kappa opioid receptors (KORs). The tracer's use is an example of how basic research findings build, one upon the next, to generate progress. Prior work in animals had established a link between KORs and dynorphin, a naturally occurring opioid released in response to stress.

Dr. Neumeister and colleagues found that after exposure to trauma, a low availability of KOR in the brain's amygdala (a processor of emotion) is associated with heightened symptoms of listlessness and detachment—but not other PTSD symptoms such as anxious arousal or hypervigilance. Further research will test the hypothesis that reduced KOR levels may be linked to PTSD symptoms in concert with lower levels of the stress hormone cortisol, suggesting a potentially new role for cortisol as a biomarker of certain types of PTSD symptoms.



## Research Shows Too Many Synaptic Connections in Brains of Children with Autism

Early in its development the brain generates a vast number of neurons. In accordance with a developmental program inscribed in our genes, these neurons forge networks of connections with other neurons, near and far. The ultimate result is the astonishingly complex adult brain. But long before we reach maturity, our brain crucially embarks on a process of “pruning” the dense tangle of connections made across tiny gaps called synapses between cells. It has been proposed that this pruning process is disrupted in people with autism spectrum disorder (ASD).

Research published August 21st in *Neuron* by a team of researchers led by David Sulzer, Ph.D., a two-time NARSAD grantee, and 2010 NARSAD Distinguished Investigator Grantee Bradley S. Peterson, M.D., Ph.D., and including four other former NARSAD Grantees, demonstrated that there is indeed an over-abundance of synapses in the brains of young people with ASD.

The researchers tested the theory by comparing postmortem brains donated by families of children who had been diagnosed with ASD with those of children without ASD: 13 from children with ASD aged 2 to 9; 13 from children with ASD aged 13 to 20; and 22 from children without ASD (“controls”). The team discovered that by late childhood, synaptic density was more than 50 percent higher in children with ASD vs. those with typically developing brains, and sometimes as much as two-thirds greater.

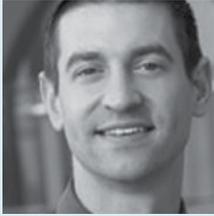
This deficit in pruning synapses may contribute to abnormalities in cognitive functions that humans acquire in their late childhood, teenage or early adult years, such as the acquisition of executive skill such as reasoning, motivation, judgment, language and abstract thought, the researchers reported. Many children diagnosed with autism spectrum disorders reach adolescence and adulthood with functional disability in these skills.

### **DAVID SULZER, PH.D.**

Professor, Clinical Neurology,  
Pharmacology and Psychiatry  
Research Laboratories for  
Parkinson’s Disease  
Professor, Departments of  
Neurology and Psychiatry  
*Columbia University*

### **BRADLEY S. PETERSON, M.D., PH.D.**

Director, Institute for the  
Developing Mind Children’s Hospital  
Los Angeles  
Director, Division of  
Child and Adolescent Psychiatry  
*Keck School of Medicine  
University of Southern California*



## Foundation-Supported Study Identifies Potential Method for Predicting Suicide Risk with a Blood Test

### ZACHARY AARON KAMINSKY, PH.D.

Assistant Professor  
Department of Psychiatry  
and Behavioral Sciences  
Johns Hopkins University  
School of Medicine

Zachary Kaminsky, Ph.D., used his 2010 NARSAD Young Investigator grant to perform basic research that led in 2014 to the identification of a method that could predict with 80% to 96% accuracy, who, within a group of psychiatric patients, had experienced suicidal thoughts or had attempted suicide.

The study first focused on a mutation in a gene called SKA2—involving in the brain's response to stress hormones—in brain samples from control subjects and from people with mental illness. From this analysis, researchers including former NARSAD Young Investigator Grantees Jennifer Payne, M.D., and Holly Wilcox, Ph.D., noticed that in samples from brains of people who had died by suicide, levels of SKA2 were significantly reduced. They discovered, within the common mutation of this gene, that in some subjects an attachment of a particular chemical group to the DNA—called an epigenetic modification—altered the way the SKA2 gene functioned. A more significant level of this modification was found in the subjects who had died by suicide.

In another part of the study, blood samples from living participants were tested. From the largest sample (325 participants), the researchers found similar epigenetic changes to the SKA2 gene in participants with suicidal thoughts or attempts. From this data, they were able to create a model that predicted which of the participants were experiencing suicidal thoughts or had attempted suicide with 80% to 96% certainty, based on the results of a blood test. The results were published in *The American Journal of Psychiatry* on July 30th.

It is thought SKA2 may be linked to inhibition of negative thoughts and controlling impulsive behavior. The researchers reason that if there isn't enough SKA2 protein, or if it is altered in some way, stress hormone receptors are unable to suppress the release of cortisol, a stress hormone, throughout the brain. Previous research has shown that such cortisol release is abnormal in people who attempt or die by suicide.



## Largest Schizophrenia Genetics Study Confirms Role of Common Gene Disruptions

Some questions in science are solved by a few pioneers toiling in their laboratories, but others depend on huge international teams. In the past several years, “Big Science” has come to schizophrenia research in the form of large genome-wide association studies (GWAS). In the latest news from this effort, published July 22nd in *Nature*, more than 100 regions of the genome show association with schizophrenia, the genetic version of smoke indicating the strong likelihood of fire. In genetic terms, the smoke could signal a genetic variation that changes a person’s odds of developing schizophrenia.

More than 80 institutions participating in the Psychiatric Genomics Consortium (PGC) contributed blood samples from nearly 37,000 people with schizophrenia and more than 113,000 control subjects without mental illness, making this one of the largest biomedical experiments ever, and certainly the largest in mental illness. “The fact that we were able to detect genetic risk factors on this massive scale shows that schizophrenia can be tackled by the same approaches that have already transformed our understanding of other diseases,” said the paper’s senior author and 2012 Foundation Lieber Prizewinner for Outstanding Achievement in Schizophrenia Research Michael O’Donovan, M.D., Ph.D. The success of the massive Consortium was due in no small part to its co-founder Patrick Sullivan, M.D., recipient of a 2010 NARSAD Distinguished Investigator grant and the winner of the Foundation’s Lieber Prize in 2014.

The international research team identified 128 independent genetic associations spanning 108 different “loci,” or areas of the genome where variations in sequence were associated with schizophrenia. Eighty three of these loci had not been previously identified. Greater association was found with genes that are expressed in the brain, and also among genes with important roles in the functioning of the immune system. This work confirms some previous hypotheses about genetic associations and also offers some entirely new insights.

### **PATRICK SULLIVAN, M.D.**

Professor, Karolinska Institutet  
M. Hayworth & Family  
Distinguished Professor  
of Psychiatry  
Professor of Genetics &  
Psychiatry Director,  
*Center for Psychiatric Genomics*  
*University of North Carolina,*  
*Chapel Hill*

### **MICHAEL O'DONOVAN, M.D., PH.D.**

Deputy Director, Institute of  
Psychological Medicine and  
Clinical Neurosciences  
Deputy Director,  
MRC Centre for Neuropsychiatric  
Genetics & Genomics  
*Cardiff University School of Medicine*

A number of other NARSAD Grantees and Foundation Scientific Council Members were involved in this large study.



## Sophisticated Stem Cell Technology Enables Team To Trace Gene-Induced Pathologies Implicated in Schizophrenia

### **GUO-LI MING, M.D., PH.D.**

Professor of Neurology  
and Neuroscience  
*Institute for Cell Engineering*  
*Johns Hopkins University*

### **HONGJUN SONG, PH.D.**

Professor of Neurology  
Director, Stem Cell Program  
*Institute for Cell Engineering*  
*Johns Hopkins University*

Other NARSAD Grantees  
involved in the study:

### **KIMBERLY M. CHRISTIAN, PH.D.,**

2012 Young Investigator Grant;

### **THOMAS M. HYDE, M.D., PH.D.,**

1989 Young Investigator Grant;

### **DAN RUJESCU, M.D., PH.D.,**

2006 Independent Investigator Grant

A remarkable new technology that enables the reprogramming of patients' skin cells so that they develop into other types of cells, including neural precursors and neurons, has enabled a team of researchers to gain new insight into what brain mechanisms can cause schizophrenia to develop.

Working with this stem cell technology, the team was able to reprogram human skin cells from people who had a genetic mutation in a region on chromosome 15 called 15q11.2—a region known to be irregular in schizophrenia, autism spectrum disorder and intellectual disability. The cells were reprogrammed to form neural progenitor cells (precursor cells for neurons) in a laboratory dish. The team, led by the wife-and-husband team of Guo-li Ming, M.D., Ph.D., and Hongjun Song, Ph.D., 2010 and 2008 NARSAD Independent Investigator Grantees, respectively, reported July 3rd in the journal *Cell* that they identified a particular gene whose loss in these patients altered typical developmental brain processes.

Each of the patients' cell samples was missing one of the normal two copies of a gene called CYFIP1. The experiments showed that loss of this gene altered the skeletons of developing brain cells, which in turn disrupted the orderly layers those cells would normally form in the brain. The researchers then worked with animal models to alter the genomes in mouse embryos so that they made less of the protein created by CYFIP1. The brain cells in these mice turned out to have similar defects in structure compared to those in the dish-grown human cells. Having less CYFIP1 protein also caused some neurons in the developing mice to end up in the wrong layer within the brain.

The researchers also found that CYFIP1 is part of a complex of proteins called WAVE, which has also been linked to schizophrenia pathology. This angle was studied with 2013 NARSAD Distinguished Investigator Grantee Joel E. Kleinman, M.D., Ph.D., Daniel R. Weinberger, M.D., 1990 and 2000 NARSAD Distinguished Investigator Grantee, and others. The work broadly illustrates the potential of using human induced pluripotent stem cells—iPSCs—as a discovery tool in tackling the mystery not only in schizophrenia pathology but also that of other complex psychiatric disorders.



## A Drug That Blocks Formation and Recall of Fear Memories in Mice Could Be Used in PTSD

A research team led by two-time NARSAD Grantee and Foundation Scientific Council member Kerry Ressler, M.D., Ph.D., reported in the June 26th issue of *Neuron* that a medication called osanetant, already known to be safe for use in humans, shows potential to treat the symptoms of post-traumatic stress disorder (PTSD) before they become disabling.

Dr. Ressler and colleagues focused their efforts on examining the activity of a pair of genes active in the brain's amygdala region—involved in the processing of emotions and fear. These genes that had been linked in earlier studies to the formation, retention and recall of traumatic memories. Traumatic memories that get retriggered persistently and cannot be “extinguished” are the primary symptom of PTSD, and can play a role in panic disorder and many phobias.

The genes in question are called Tac1 and Tac2, and while previous research had attempted to treat the formation of fear memories by intervening with the mechanisms set in motion by Tac1, the experiments had not proven successful in treating PTSD-like symptoms. Dr. Ressler and team, however, showed promising results by focusing on intervening with mechanisms set in motion by activation of the Tac2 gene.

The researchers found that drugs acting on cells in which Tac2 is active could be used to block fear memory consolidation shortly after exposure to a trauma. Mice given osanetant shortly after a “trauma” (a sound paired with a shock) could still learn to become afraid but the mice did not freeze as much in response to the sound a day later, even if the medication was given up to an hour after training. Further studies will determine if the desired effect is achieved and maintained in human patients.

**KERRY RESSLER, M.D., PH.D.**

Professor

Psychiatry and Behavioral Sciences  
Emory University School of Medicine



## Scalp EEG Test Could Be Used to Predict Future Psychosis

### **DANIEL MATHALON, M.D., PH.D.**

Professor in Residence  
Co-director of Research Track  
Co-director, Brain Imaging  
and EEG Laboratory  
*University of California,  
San Francisco*  
Staff Physician,  
*Mental Health Service  
San Francisco VA Medical Center*

The clinical symptoms currently used to predict a patient's risk of future psychosis fail two-thirds of the time. Only one in three people identified by clinical criteria as being at risk actually developed a psychotic disorder in a three-year follow-up study. This makes the decision to prescribe, or to take, antipsychotic medications as an early preventive intervention extremely difficult since these medications carry risk of serious side effects.

The need for an accurate biomarker—a biological predictor—of psychosis is critical. Two-time NARSAD Grantee Daniel Mathalon, M.D., Ph.D., and colleagues, reported March 15th in *Biological Psychiatry* that they may have found such a biomarker in a brain event called mismatch negativity.

Detected in scalp electroencephalography (EEG) recordings, mismatch negativity is an EEG signal that is automatically elicited from the auditory cortex and frontal lobe of the brain in response to hearing sounds that deviate from preceding sounds. The response occurs even when we are not paying attention to the sounds. Believed to reflect the ability to form short-term memory, mismatch negativity has been shown to be deficient in patients with schizophrenia.

Dr. Mathalon and team assessed mismatch negativity in three groups: patients with schizophrenia, patients clinically assessed to be at high risk for psychosis, and healthy controls. Mismatch negativity was seen in schizophrenia patients, as expected, but also in the high-risk individuals. Observed over a 12-month period, mismatch negativity was significantly reduced in those who ultimately developed a psychotic disorder. This result demonstrated that mismatch negativity deficits precede the onset of psychosis in clinical high-risk individuals, and that the larger the deficit, the more imminent the risk for conversion to a psychotic disorder.

# 2014 Investments in Research Grants

The Brain & Behavior Research Foundation is committed to alleviating the suffering caused by mental illness by awarding grants that will lead to advances and breakthroughs in scientific research.

## The Foundation's Grant Program

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Since 1987 the Foundation has awarded more than \$324 million to fund more than 4,800 grants to more than 3,800 leading scientists around the world.

### NARSAD DISTINGUISHED INVESTIGATOR GRANTS

Initiated in 1988—enable outstanding scientists to pursue new, cutting-edge ideas with the greatest potential for breakthroughs.

### NARSAD INDEPENDENT INVESTIGATOR GRANTS

Initiated in 1995—support mid-career scientists during the critical period between initiation of research and receipt of sustained funding.

### NARSAD YOUNG INVESTIGATOR GRANTS

Initiated in 1987—help researchers launch careers in neuroscience and psychiatry and gather pilot data to apply for larger federal and university grants.

# Distinguished Investigators

The Distinguished Investigators' projects demonstrate the variety of ways in which our knowledge about mental illness and brain and behavior disorders is advancing. Some of these studies represent collaborations of disciplines, while others took a deep look using a single discipline.

"The most striking conclusion is that a number of these projects, although labeled in terms of one or another syndrome, actually have relevance for several. The underlying fundamental neurobiology and psychobiology are beginning to come together in ways that suggest the emergence of a new integrative science for dealing with mental illness and addictive states. The result of this work will be better understanding of mental disorders and more personalized care."

**JACK D. BARCHAS, M.D.**

Chair and Barklie McKee Henry Professor of Psychiatry  
Weill Cornell Medical College  
Psychiatrist-in-Chief, Weill Cornell Medical Center  
New York-Presbyterian Hospital and Payne Whitney Clinic Chair  
Distinguished Investigator Grant Selection Committee  
Founding Member, Foundation Scientific Council

104  
Applications

15  
Grants

\$1.5M  
Awarded

## Basic Research

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### AUTISM SPECTRUM DISORDER

**Karen Faith Berman, M.D.**  
National Institute of Mental Health,  
National Institutes of Health

### DEPRESSION

**Gerard Sanacora, M.D., Ph.D.**  
Yale University

### MULTIPLE DISORDERS

**Jill M. Goldstein, Ph.D.**  
Brigham and Women's Hospital,  
Harvard University

**Robert D. Hawkins, Ph.D.**  
Columbia University

**Tracey J. Shors, Ph.D.**  
Rutgers University

**Claes Wahlestedt, M.D., Ph.D.**  
University of Miami

### SCHIZOPHRENIA

**Angelique Bordey, Ph.D.**  
Yale University

**Jane R. Taylor, Ph.D.**  
Yale University

**Suzanne Zukin, Ph.D.**  
Albert Einstein College of Medicine  
of Yeshiva University

### FEAR-RELATED LEARNING AND MEMORY

**Yi E. Sun, Ph.D.**  
University of California, Los Angeles

## New Technologies

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### ADDICTION

**Harry A. Lester, Ph.D.**  
California Institute of Technology

## Next Generation Therapies

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### ANXIETY

**David Eldon Clapham, M.D., Ph.D.**  
Harvard University

### DEPRESSION

**Lee Stuart Cohen, M.D.**  
Massachusetts General Hospital,  
Harvard University

### Lisa M. Monteggia, Ph.D.

University of Texas Southwestern  
Medical Center at Dallas

### SCHIZOPHRENIA

**Paul F. Worley, M.D.**  
Johns Hopkins University

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"The Brain & Behavior Research Foundation was able to build a platform for recruiting new people as well as supporting accomplished people already in the field. This has made an enormous impact in our collective attempt to discover the biological basis of psychiatric disorders."

### ERIC R. KANDEL, M.D.

Nobel Prize Winner  
Columbia University University Professor  
Fred Kavli Professor and Director, Kavli Institute for Brain Science  
Foundation Scientific Council Member

# Independent Investigators

Hailing from seven countries and 32 institutions, 40 mid-career scientists are applying powerful new technologies and new insights to study mental illnesses such as anxiety, autism spectrum disorder, bipolar disorder, depression and schizophrenia.

Noting that almost half of these men and women received NARSAD Young Investigator Grant support early in their careers, Dr. Post stated: "All of these investigations made possible with the support of NARSAD Grants are cumulatively and exponentially advancing what is known about the brain and how to treat its illnesses. By expanding our knowledge of genetics and epigenetics, brain circuitry, neural pathways and how these impact behavior, we are steadily increasing the possibilities for those with mental illness to live full and productive lives."

**ROBERT M. POST, M.D.**

Head, Bipolar Collaborative Network

*George Washington University*

Chair, Independent Investigator Grant Selection Committee

Foundation Scientific Council Member

347  
Applications

40  
Grants

\$4M  
Awarded

## Basic Research

### ANXIETY

**Garret D. Stuber, Ph.D.**  
University of North Carolina at Chapel Hill

### BIPOLAR DISORDER

**Benjamin I. Goldstein, M.D., Ph.D.**  
Sunnybrook Health Sciences Centre,  
University of Toronto, Canada

**Tracey L. Petryshen, Ph.D.**  
Massachusetts General Hospital,  
Harvard University

### DEPRESSION

**Maura Boldrini, M.D., Ph.D.**  
Columbia University

**Kathryn L. Evans, Ph.D.**  
University of Edinburgh, Scotland

**Erika E. Forbes, Ph.D.**  
University of Pittsburgh

**Roxann Roberson-Nay, Ph.D.**  
Virginia Commonwealth University

**Daniel J. Smith, M.B., Ch.B., M.D.**  
University of Glasgow, Scotland

### MULTIPLE DISORDERS

**Kathryn Grace Commons, Ph.D.**  
Children's Hospital, Boston

**Alysson Renato Muotri, Ph.D.**  
University of California, San Diego

**Anju Vasudevan, Ph.D.**  
McLean Hospital,  
Harvard University

### SCHIZOPHRENIA

**Alberto Bacci, Ph.D.**  
Brain and Spine Institute, Paris

**Oleg V. Evgrafov, Ph.D., D.Sc.**  
University of Southern California

**David C. Glahn, Ph.D.**  
Yale University

### EATING DISORDERS

**Benjamin R. Arenkiel, Ph.D.**  
Baylor College of Medicine

## New Technologies

### BIPOLAR DISORDER

**Benicio N. Frey, M.D., Ms.C., Ph.D.**  
McMaster University, Canada

**Vincent A. Magnotta, Ph.D.**  
University of Iowa

**Dimitri Van De Ville, Ph.D.**  
Ecole Polytechnique Federale de  
Lausanne, Switzerland

### MULTIPLE DISORDERS

**Adam G. Carter, Ph.D.**  
New York University

**David J. Foster, Ph.D.**  
Johns Hopkins University

**John M. Hettema, M.D., Ph.D.**  
Virginia Commonwealth University

### SCHIZOPHRENIA

**Romina Mizrahi, M.D., Ph.D.**  
Centre for Addiction and Mental Health,  
University of Toronto, Canada

### ADDICTION

**Sheena A. Josselyn, Ph.D.**  
Hospital for Sick Children,  
University of Toronto, Canada

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"Before I joined the National Institute of Mental Health, I reviewed NARSAD Grant applications. In every case, the discussion went in exactly the opposite direction. We would ask, 'Has somebody done this before?' Then we shouldn't fund it as a NARSAD Grant. 'Are we going to find out something we know already?' Then it's not a NARSAD Grant. 'Is this truly innovative? Is this cutting edge? Is this something that no one has tried to do before?' If so, then this is a NARSAD Grant."

### THOMAS R. INSEL, M.D.

Director, National Institute of Mental Health  
Former Foundation Scientific Council Member

## Next Generation Therapies

### ANXIETY

**Rajeshwar Awatramani, Ph.D.**  
Northwestern University

**Thomas L. Kash, Ph.D.**  
University of North Carolina Chapel Hill

### DEPRESSION

**Rodrigo A. Cunha, Ph.D.**  
University of Coimbra, Portugal

**Flavio Frohlich, Ph.D.**  
University of North Carolina, Chapel Hill

**Dimitris N. Kiosses, Ph.D.**  
Weill Cornell Medical College, Cornell  
University

### SCHIZOPHRENIA

**Katherine E. Burdick, Ph.D.**  
Icahn School of Medicine at Mount Sinai

**Erika Jääskeläinen, M.D., Ph.D.**  
University of Oulu, Finland

**Einat Liebenthal, D.Sc.**  
Brigham & Women's Hospital,  
Harvard Medical School

**Steffen Moritz, Ph.D.**  
University Hospital Hamburg-Eppendorf,  
Germany

**Yuri Rassovsky, Ph.D.**  
University of California, Los Angeles

**Joshua L. Roffman M.D., M.MSc.**  
Massachusetts General Hospital

**Jason Tregellas, Ph.D.**  
University of Colorado  
Anschutz Medical Campus

**Aristotle N. Voineskos, M.D., Ph.D.**  
Centre for Addiction and Mental Health,  
University of Toronto, Canada

### MULTIPLE DISORDERS

**Angel Barco, Ph.D.**  
Institute of Molecular Biology of Barcelona,  
Spanish Research Council, Spain

**Benjamin N.R. Cheyette, M.D., Ph.D.**  
University of California, San Francisco

**Allison D. Redlich, Ph.D.**  
State University of New York, Albany

# Young Investigators

Covering a broad spectrum of mental illnesses, these Young Investigator Grants function as catalysts to get new ideas off the ground that may not otherwise be supported. The Foundation is very grateful to all of our donors for making these awards possible.

“In addition to a significant base of grants for basic brain research to understand what happens in the brain to cause mental illness, we also see an uptick in the number of grants focused on the development of next generation treatments and therapies. There is also an increasing trend in the number of investigators utilizing cutting-edge technologies to better study the brain.”

**HERBERT Y. MELTZER, M.D.**

Northwestern University

Feinberg School of Medicine

Chair, Young Investigator Grant Selection Committee

Founding Member, Foundation Scientific Council

**PLEASE CONSIDER INVESTING IN A RESEARCH  
PARTNERSHIP WITH OUR NEW INVESTIGATORS.**

For more information, visit [bbrfoundation.org/research-partner](http://bbrfoundation.org/research-partner)

700  
Applications

200  
Grants

\$12.5M  
Awarded

## Basic Research

### ANXIETY

**Andrew L. Eagle, Ph.D.**  
Michigan State University

### ATTENTION-DEFICIT HYPERACTIVITY

**Marta Ribases, Ph.D.**  
Vall d'Hebron Research Institute VHIR, Spain

### AUTISM SPECTRUM DISORDER

**Elise Brooks Robinson, SC.D., M.P.H.**  
Massachusetts  
General Hospital, Harvard University

**Yijing Su, Ph.D.**  
Johns Hopkins University

**Simone Tomasi, M.D., Ph.D.**  
Yale University

**Ryan K.C. Yuen, Ph.D.**  
The Hospital for Sick Children,  
University of Toronto, Canada

### BIPOLAR DISORDER

**Seth A. Ament, Ph.D.**  
Institute for Systems Biology

**Jacob C. Garza, Ph.D.**  
Massachusetts General Hospital,  
Harvard University

**Marla Kay Perna, Ph.D.**  
Vanderbilt University

**Diana I. Simeonova,  
Dipl.-Psych., Ph.D.**  
Emory University School of Medicine

**Abdullah Cagri Yuksel, M.D.**  
McLean Hospital, Harvard University

### DEPRESSION

**Anita Ellen Autry, Ph.D.**  
Harvard University

**Mounira Banasr, Ph.D.**  
Yale University

**Joanna M. Chango, Ph.D.**  
McLean Hospital, Harvard University

**Itzamarie Chevere-Torres, Ph.D.**  
Rutgers University

**Hyong Jin Cho, M.D., Ph.D.**  
University of California, Los Angeles

**Victoria Stephanie Dalton, B.Sc., Ph.D.**  
Trinity College Dublin, Ireland

**Simone de Jong, Ph.D.**  
Institute of Psychiatry, King's College London,  
University of London, England

**Susanne Rosalie de Rooij, Ph.D.**  
University of Amsterdam, The Netherlands

**Dani Dumitriu, M.D., Ph.D.**  
Icahn School of Medicine at Mount Sinai

**Carrie R. Ferrario, Ph.D.**  
University of Michigan

**Peter Matthew Kaskan, Ph.D.**  
National Institute of Mental Health,  
National Institutes of Health

**Ian Sutherland Maze, Ph.D.**  
The Rockefeller University

**Divya Deepak Mehta, Ph.D.**  
University of Queensland, Australia

**Therese Marion Murphy, Ph.D.**  
University of Exeter, England

**Thalia K. Robakis, M.D., Ph.D.**  
Stanford University

**Marianne Louise Seney, Ph.D.**  
University of Pittsburgh

**William Kyle Simmons, Ph.D.**  
Laureate Institute for Brain Research

**Nicholas Stavropoulos, Ph.D.**  
New York University School of Medicine

**Marcus Stephenson-Jones, Ph.D.**  
Cold Spring Harbor Laboratory

**Makoto Taniguchi, Ph.D.**  
McLean Hospital, Harvard University

**Eva Haimo Telzer, Ph.D.**  
University of Illinois at Urbana-Champaign

**Junqian Xu, Ph.D.**  
Icahn School of Medicine at Mount Sinai

### MULTIPLE DISORDERS

**Monica Aas, Ph.D.**  
University of Oslo, Norway

**Simona L. Buetti, Ph.D.**  
University of Illinois at Urbana-Champaign

**Sebastien Delcasso, Ph.D.**  
Massachusetts Institute of Technology

**Santhosh Girirajan, M.B.B.S., Ph.D.**  
Lehigh Valley Hospital  
Medical Center, Pennsylvania State University

**Brad Alan Grueter, Ph.D.**  
Vanderbilt University

**Matthew C. Judson, Ph.D.**  
University of North Carolina at Chapel Hill

**Marija Kundakovic, Ph.D.**  
Columbia University

**Julien Muffat, Ph.D.**  
Whitehead Institute for Biomedical Research

**Shraddha Pai, Ph.D.**  
Centre for Addiction and Mental Health,  
University of Toronto, Canada

**Kanaka Rajan, Ph.D.**  
Princeton University

**Alma I. Rodenas-Ruano, Ph.D.**  
Albert Einstein College of Medicine  
of Yeshiva University

**Laura J. Sittig, Ph.D.**  
University of Chicago

**Karin Johanna Hendrika Verweij, Ph.D.**  
VU Medisch Centrum, Vrije Universiteit  
Amsterdam, The Netherlands

**Melanie von Schimmelmann, Ph.D.**  
Icahn School of Medicine at Mount Sinai

### POST-TRAUMATIC STRESS DISORDER

**Joanna Izabella Giza, Ph.D.**  
Cornell University

**Stephanie Sillivan, Ph.D.**  
The Scripps Research Institute

### SCHIZOPHRENIA

**Jessica A. Bernard, Ph.D.**  
University of Colorado, Boulder

**Hong Goo Chae, Ph.D.**  
Cold Spring Harbor Laboratory

**Joshua J. Chiappelli, M.D.**  
Maryland Psychiatric Research Center,  
University of Maryland

**Yongku P. Cho, Ph.D.**  
Hartford Hospital, University of Connecticut

**Lot de Witte, M.D., Ph.D.**  
University Hospital Utrecht, Utrecht University,  
The Netherlands

## Basic Research CONTINUED

### Laurie R. Earls, Ph.D.

*St. Jude Children's Research Hospital*

### Suleyman I. Gulsuner, M.D., Ph.D.

*University of Washington*

### Libi Hertzberg, M.D., Ph.D.

*Tel Aviv University, Israel*

### Sehba Husain-Krautter, M.B.B.S., Ph.D.

*Zucker Hillside Hospital,  
The Feinstein Institute for Medical Research*

### Aaron R. Jeffries, Ph.D.

*University of Exeter, England*

### Eunchai Kang, Ph.D.

*Johns Hopkins University School of Medicine*

### Yongsung Kim, Ph.D.

*Salk Institute for Biological Studies*

### Ada Ledonne, Ph.D.

*IRCCS Fondazione Santa Lucia, Italy*

### Matthew Luke MacDonald, Ph.D.

*University of Pittsburgh*

### Jacob J. Michaelson, Ph.D.

*University of Iowa*

### Simon Trent, Ph.D.

*Cardiff University, Wales*

### Brooke Viertel, Ph.D.

*University Medical Center Hamburg-Eppendorf, University of Hamburg, Germany*

### Guangying K. Wu, Ph.D.

*George Washington University*

### Wenchi Zhang, Ph.D.

*Johns Hopkins University*

### EATING DISORDERS

#### Sindy Cole, Ph.D.

*Boston College*

#### Marcelo Dietrich, M.D., Ph.D.

*Yale University*

### EPILEPSY

#### Seung Tae Baek, Ph.D.

*University of California, San Diego*

#### Ramon Y. Birnbaum, Ph.D.

*Ben-Gurion University of the Negev, Israel*

### PANIC DISORDER

#### Justin S. Feinstein, Ph.D.

*Laureate Institute for Brain Research*

### RETT SYNDROME

#### Hao Wu, Ph.D.

*Johns Hopkins University School of Medicine*

## New Technologies

### ANXIETY

#### Avishek Adhikari, Ph.D.

*Stanford University*

#### Johanna Molly Jarcho, Ph.D.

*National Institute of Mental Health,  
National Institutes of Health*

#### Dilja Krueger, Ph.D.

*Max-Planck-Institute for  
Experimental Medicine/ Max-Planck Society,  
Max Planck Institutes, Germany*

### ATTENTION-DEFICIT HYPERACTIVITY DISORDER

#### Nikola Todorov Markov, Ph.D.

*Princeton University*

#### Redmond O'Connell, Ph.D.

*Trinity College Dublin, Ireland*

### AUTISM SPECTRUM DISORDER

#### Brenda L. Bloodgood, Ph.D.

*University of California, San Diego*

#### Denis Jabaudon, M.D., Ph.D.

*University of Geneva, Switzerland*

#### Brian J. O'Roak, Ph.D.

*Oregon Health and Science University*

#### Kaustubh Satyendra Supekar, Ph.D.

*Stanford University*

#### Lucina Q. Uddin, Ph.D.

*University of Miami*

#### Nan Yang, Ph.D.

*Stanford University*

### BIPOLAR DISORDER

#### Danai Dima, Ph.D.

*Institute of Psychiatry, King's College London,  
University of London, England*

#### Luciano Minuzzi, M.D., Ph.D.

*St. Joseph's Hospital, McMaster University*

### DEPRESSION

#### Jessica Andrews-Hanna, Ph.D.

*University of Colorado, Boulder*

#### Rosemary Bagot, Ph.D.

*Icahn School of Medicine at Mount Sinai*

#### Chun-hui Chang, Ph.D.

*University of Pittsburgh*

#### Jonathan J. Nassi, Ph.D.

*Salk Institute for Biological Studies*

#### Karen Ryan, Ph.D.

*Trinity College Dublin, Ireland*

#### Jennifer Tropp Sneider, Ph.D.

*McLean Hospital, Harvard University*

#### Brendon Omar Watson, M.D., Ph.D.

*Weill Cornell Medical College*

### MULTIPLE DISORDERS

#### Cendra Agulhon, Ph.D.

*Université René Descartes, France*

#### Philip G. Browning, Ph.D.

*Icahn School of Medicine at Mount Sinai*

#### Jeremiah Yaacov Cohen, Ph.D.

*Johns Hopkins University School of Medicine*

#### Lauren Celia Faget, Ph.D.

*University of California, San Diego*

#### Jennifer H. Foss-Feig, Ph.D.

*Connecticut Mental Health Center,  
Yale University*

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"NARSAD Young Investigator Grants are the backbone of the effort and the most important philanthropic program for supporting the early careers of young investigators interested in mental illness research."

#### DANIEL R. WEINBERGER, M.D.

CEO, Lieber Institute for Brain Development  
Foundation Scientific Council Member

**Virginia Garcia-Marin, Ph.D.**  
New York University

**Ozgun Gokce, Ph.D.**  
Stanford University  
Ian Cameron Gould, D. Phil. University of  
New South Wales, Australia

**R. Matthew Hutchison, Ph.D.**  
Harvard University

**Roozbeh Kiani, M.D., Ph.D.**  
New York University

**Markita Patricia Landry, Ph.D.**  
Massachusetts Institute of Technology

**Elena Michaelovsky, Ph.D.**  
Tel Aviv University, Israel

**Jacqueline Morris, Ph.D.**  
University of Pennsylvania

**Alexandre Mourot, Ph.D.**  
University Pierre and Marie Curie, France

**Ligia Assumpcao Papale, Ph.D.**  
University of Wisconsin-Madison

**OBSESSIVE-COMPULSIVE DISORDER**  
**Yen-Yu Ian Shih, Ph.D.**  
University of North Carolina at Chapel Hill

**POST-TRAUMATIC STRESS DISORDER**  
**Chadi Abdallah, M.D.**  
Yale University

**Joshua Cisler, Ph.D.**  
University of Arkansas for Medical Sciences

**Jonathan Richard Epp, Ph.D.**  
The Hospital for Sick Children,  
University of Toronto, Canada

**Jonathan Paul Fadok, Ph.D.**  
Friedrich Miescher Institute, Switzerland

**Léma Massi, Ph.D.**  
Friedrich Miescher Institute, Switzerland

**SCHIZOPHRENIA**  
**Joshua W. Cordeira, Ph.D.**  
Harvard Medical School, Harvard University

**Fei Du, Ph.D.**  
Harvard Medical School,  
Harvard University

**Colin Shaun Hawco, Ph.D.**  
Centre for Addiction and Mental Health,  
University of Toronto, Canada

**Conrad Lyegbe, Ph.D.**  
Institute of Psychiatry, King's College London,  
University of London, England

**Youngcho Kim, Ph.D.**  
University of Iowa

**Felice Reddy, Ph.D.**  
VA Greater Los Angeles Healthcare System  
West Los Angeles, University of California,  
Los Angeles

**Yuri B. Saalman, Ph.D.**  
University of Wisconsin-Madison

**Peter Savadjiev, Ph.D.**  
Brigham and Women's Hospital,  
Harvard University

**Ilana Witten, Ph.D.**  
Princeton University

**Tracy L. Young-Pearse, Ph.D.**  
Brigham and Women's Hospital,  
Harvard University

**ADDICTION**  
**Kevin Wang, Ph.D.**  
Oregon Health and Science University

**BORDERLINE PERSONALITY DISORDER**  
**Sarah Kathryn Fineberg, M.D., Ph.D.**  
Yale University

**FRAGILE X SYNDROME**  
**Emma Puighermanal, Ph.D.**  
INSERM, France

**TOURETTE SYNDROME**  
**Deanna Jacquelyn Greene, Ph.D.**  
Washington University School of Medicine

## Next Generation Therapies

**ANXIETY**  
**Christine Elizabeth Gould, Ph.D.**  
VA Palo Alto  
Health Care System, Stanford University

**Tija Carey Jacob, Ph.D.**  
University of Pittsburgh

**Ting Lu, Ph.D.**  
University of Illinois at Urbana-Champaign

**ATTENTION-DEFICIT HYPERACTIVITY  
DISORDER**  
**Agatha Lenartowicz, Ph.D.**  
University of California, Los Angeles

**Stephanie Dunkel Smith, Ph.D.**  
Yale Child Study Center, Yale University

**AUTISM SPECTRUM DISORDER**  
**Lior Brimberg, Ph.D.**  
Zucker Hillside Hospital Campus of The  
Feinstein Institute for Medical Research

**Latha Soorya, Ph.D.**  
Rush University

**Brittany Gail Travers, Ph.D.**  
University of Wisconsin

**BIPOLAR DISORDER**  
**Nao Jennifer Gamo, Ph.D.**  
Johns Hopkins University

**DEPRESSION**  
**Alison R. Berent-Spillson, Ph.D.**  
University of Michigan

**Becky Catherine Carlyle, Ph.D.**  
Yale University

**Shun-Chiao Chang, Sc.D.**  
Brigham and Women's Hospital,  
Harvard University

**Dipesh Chaudhury, Ph.D.**  
Icahn School of Medicine at Mount Sinai

**Sharon Dekel, Ph.D.**  
Massachusetts General Hospital,  
Harvard University

**Christine Ann Denny, M.S., Ph.D.**  
Columbia University

**Faranak Farzan, Ph.D.**  
Centre for Addiction and Mental Health,  
University of Toronto, Canada

**Jennifer C. Felger, Ph.D.**  
Emory Clinic, Emory University

**Allyson Kimberly Friedman, Ph.D.**  
Icahn School of Medicine at Mount Sinai

**Miguel Angel Garcia-Cabezas,  
M.D., Ph.D.**  
Boston University

**Stefan Goetz, Ph.D.**  
Duke University Medical Center,  
Duke University

## Next Generation Therapies CONTINUED

### **Mira Alexandra Jakovcevski, Ph.D.**

*Max-Planck Institute for Psychiatry,  
Max-Planck Society, Max Planck Institutes,  
Germany*

### **Chung Sub Kim, Ph.D.**

*University of Texas at Austin*

### **Yevgenia Kozorovitskiy, Ph.D.**

*Northwestern University*

### **Chun Hay Alex Kwan, Ph.D.**

*Yale University*

### **Benjamin Bruce Land, Ph.D.**

*Yale University*

### **Joelle LeMoult, Ph.D.**

*Stanford University*

### **Margarita Rivera, Ph.D.**

*Hospital Universitario San Cecilio, Spain*

### **Benjamin A. Samuels, Ph.D.**

*Research Foundation for Mental Hygiene, Inc.,  
New York State Psychiatric Institute,  
Columbia University*

### **Marina Lopez Sola, Ph.D.**

*University of Colorado, Denver*

### **Giulia Treccani, Ph.D.**

*University of Milano Bicocca, Italy*

### **Hongyu Yang, Ph.D.**

*University of California, Los Angeles*

### **Kymerly D. Young, Ph.D.**

*Laureate Institute for Brain Research*

### **MULTIPLE DISORDERS**

#### **Wesley Brian Asher, Ph.D.**

*Columbia University*

#### **Valeria Gazzola, Ph.D.**

*Netherlands Institute for Neuroscience,  
The Netherlands*

#### **Lior Greenbaum, M.D.**

*Chaim Sheba Medical Center,  
Tel Aviv University, Israel*

#### **Michy Kelly, Ph.D.**

*University of South Carolina*

#### **Shalini Lal, Ph.D.**

*Douglas Mental Health  
University Institute,  
McGill University, Canada*

### **Benjamin C. Nephew, Ph.D.**

*Tufts University*

### **Stephanie Perreau-Lenz, Ph.D.**

*SRI International*

### **Ann Polcari, Ph.D.**

*Northeastern University*

### **Seethalakshmi Ramanathan, M.D.**

*Hutchings Psychiatric Center*

### **Alessandra Raudino, Ph.D.**

*University of New South Wales, Australia*

### **Ling Shan, Ph.D.**

*University of California, Los Angeles*

### **Sonal G. Thakar, Ph.D.**

*University of California, San Diego*

### **OBSESSIVE-COMPULSIVE DISORDER**

#### **Carolyn I. Rodriguez, M.D., Ph.D.**

*Research Foundation for Mental Hygiene, Inc.,  
New York State Psychiatric Institute,  
Columbia University*

### **POST-TRAUMATIC STRESS DISORDER**

#### **Antoine Besnard, Ph.D.**

*Massachusetts General Hospital,  
Harvard University*

#### **Lorenzo Diaz-Mataix, Ph.D.**

*New York University*

#### **Raül Andero Galí, Ph.D.**

*Emory University*

#### **Linda Isaac, Ph.D.**

*Stanford University*

#### **Sandra Jurado, Ph.D.**

*University of Maryland School of Medicine*

#### **Imanuel Ruvín Lerman, M.D., M.S.**

*University of California, San Diego*

#### **Alik Sunil Widge, M.D., Ph.D.**

*Massachusetts General Hospital,  
Harvard University*

### **SCHIZOPHRENIA**

#### **John Daniel Cahill, M.B.B.S**

*Yale University*

#### **Hsun-Hua Chou, M.D., Ph.D.**

*University of California, San Diego*

#### **Charmaine Demanuele, Ph.D.**

*Massachusetts General Hospital,  
Harvard University*

### **Anna Rose Docherty, Ph.D.**

*Virginia Institute for Psychiatric and  
Behavioral Genetics,  
Virginia Commonwealth University*

### **Paolo Fusar-Poli, Ph.D.**

*Institute of Psychiatry, King's College London,  
University of London, England*

### **Rachel A. Hill, Ph.D.**

*University of Melbourne, Australia*

### **Dennis Kaetzel, Ph.D.**

*Institute of Neurology/ University College  
London, University of London, England*

### **Sarah Christine McEwen, Ph.D.**

*Neuropsychiatric Institute and Hospital,  
University of California, Los Angeles*

### **Brent Gregory Nelson, M.D.**

*University of Minnesota*

### **Nichole Marie Neugebauer, Ph.D.**

*Northwestern University*

### **Maria V. Puig, Ph.D.**

*Massachusetts Institute of Technology*

### **Jianping Zhang, M.D., Ph.D.**

*Zucker Hillside Hospital  
Campus of The  
Feinstein Institute for Medical Research*

### **ADDICTION**

#### **Carmelo Mario Vicario, Ph.D.**

*Bangor University, United Kingdom*

### **ALZHEIMER'S DISEASE**

#### **Sanjeev Kumar, M.D.**

*Centre for Addiction and Mental Health,  
University of Toronto, Canada*

### **BORDERLINE**

#### **PERSONALITY**

#### **DISORDER & SUICIDE**

#### **Anthony Charles Ruocco, Ph.D.**

*Centre for Addiction and Mental Health,  
University of Toronto, Canada*

### **RETT SYNDROME**

#### **Hyeong-Min Lee, Ph.D.**

*University of North Carolina at Chapel Hill*

# Community Events

When you hold a fundraiser, you play a key role in helping us fund better prevention and treatment protocols. With the support of family, friends and your community, you can make a difference in the fight against mental illness and the stigma it bears.

## HIKE for Mental Health, Various Dates

HIKE for Mental Health was born of a single vision: a world in which everyone, including those who suffer from mental illness, can find the simple joy of living. Joining a hike helps raise awareness and money for mental health research.



## Team Daniel: Running to Support Brain & Behavior Research Foundation, Year Round

Team Daniel consists of members of the Laitman family including Daniel who lives a productive life with schizophrenia and his parents, Rob and Ann. They run the Walt Disney World Half-Marathon every year as well as other races across the country in an effort to raise money for schizophrenia research.

# Foundation Events



## NY Symposium, October 24, 2014

**Above, From left to right:**

Jack D. Barchas, M.D., Scientific Council

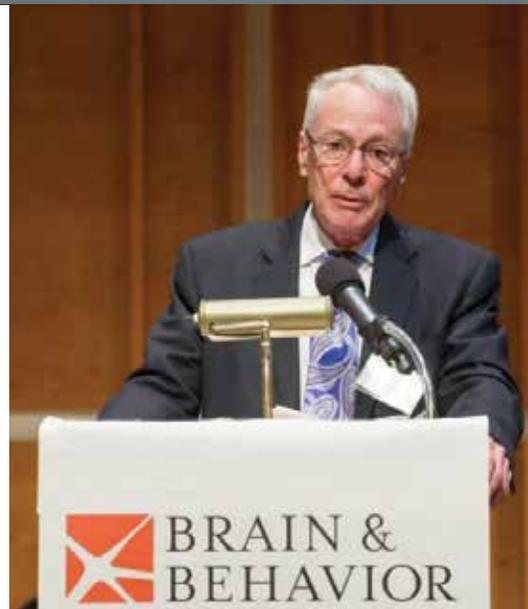
Anita Thapar, M.D., Ph.D.

David L. Braff, M.D.

Kay Redfield Jamison, Ph.D.

Robert M.A. Hirschfeld, M.D., Scientific Council

Patrick F. Sullivan, M.D.



## Klerman Freedman Awards Dinner, July 25, 2014

**From left to right:**

Daniel R. Weinberger, M.D., Scientific Council  
Stephen and Connie Lieber, Chairman of the Board and President Emerita  
BJ Casey, Ph.D., Scientific Council

## Annual Dinner, October 24, 2014

**Above, From left to right:**

Eric R. Kandel, M.D., Scientific Council, Jeffrey Borenstein, M.D., President & CEO, Mehmet Oz, M.D., Herbert Pardes, M.D., President, Scientific Council, Nancy Wexler, M.D., Bob Wright  
 Dr. Oz gives the inaugural Pardes Prize to Dr. Herbert Pardes  
 Board Members and Annual Dinner Co-Chairs, Suzanne Golden and Virginia Silver



## Productive Lives Awards, April 30, 2014

**From left to right:**

Tom Insel, M.D., Judy Collins, Francis S. Collins, M.D., Ph.D., and Board Member Susan Lasker Brody  
 Dr. Tom Insel and Dr. Jeffrey Borenstein  
 Bruce Cohen, Gabe Catone and Mark B. Porter  
 Jeffrey Borenstein, M.D. and Dr. Francis Collins



# Discovery to Recovery Conference, Washington, D.C., September 16, 2014

**Below, From Left to Right:**

Jeffrey Borenstein, M.D. and Congressman Tim Murphy, Ph.D.

Keith O'Neil, Former NFL Super Bowl Champion



# Meet the Scientists

## Webinar Series

Join us the second Tuesday of each month for our Meet the Scientist Webinar Series hosted by Foundation President & CEO, Jeffrey Borenstein, M.D.

Hear the world's leading mental health researchers and members of our Scientific Council present the latest in new technologies, diagnostic tools, early intervention strategies and next-generation therapies for mental illness.

## Upcoming Events



### **BORDERLINE PERSONALITY DISORDER**

D. Bradford Reich, M.D.  
Tuesday, July 14, 2015,  
2:00 p.m.–3:00 p.m. EST



### **ADDICTION**

Nora D. Volkow, M.D.  
Wednesday,  
August 19, 2015,  
2:00 p.m.–3:00 p.m. EST



### **NEW APPROACHES IN TREATING DEPRESSION**

Fritz A. Henn, M.D., Ph.D.  
Tuesday, September 8, 2015,  
2:00 p.m.–3:00 p.m. EST



### **MOOD DISORDERS**

Carrie E. Bearden, Ph.D.  
Tuesday, October 13, 2015,  
2:00 p.m.–3:00 p.m. EST



### **SCHIZOPHRENIA**

Carol A. Tamminga, M.D.  
Tuesday, November 10, 2015,  
2:00 p.m.–3:00 p.m. EST



### **AUTISM AND NEW FINDINGS**

Joseph Buxbaum, Ph.D.  
Tuesday, December 15, 2015,  
2:00 p.m.–3:00 p.m. EST

# Stories of Productive Lives

People living with mental illness often face numerous challenges in managing their day to day life. Inspired by their unique stories of grace and determination we acknowledge these challenges and recognize the capacity for families and individuals to persevere and often live productive lives with the help of both science and the support of family and friends which in turn gives voice to often silent, closeted and misunderstood illnesses of the brain.

## Pride in a Son's Courage

Through the Foundation, Martha Atherton says she has a better understanding of mental illness and a strong conviction that research will alleviate the suffering caused by mental illness.

John Atherton is a 53-year-old electronics whiz and inventor living in Portland, Oregon. He also lives with schizophrenia and Asperger's syndrome. His mother, Martha Atherton, explains that it took years for John to get the right combination of medications to alleviate his debilitating symptoms. She has been his unwavering supporter and a trusted companion during many dark periods when John questioned whether his life was worth living.

Martha and her late husband Robert Atherton had three sons, and lost two of them to cystic fibrosis. John, the middle son, began showing signs of psychiatric illness in his teens.

As is often the case in children with Asperger's, John was an outstanding student. Toward the end of high school, he says, "I began to unravel." John struggled through three years of electrical engineering studies at the University of Illinois, but could not complete his degree. By that time, he says, "I was down and out. I thought about suicide."

After a long and agonizing period marked by disappearances from home, hospitalizations and trial-and-error treatments, John finally found some relief with the antidepressant fluoxetine (Prozac). Today, he is stabilized on a combination of antipsychotic and antidepressant medications.

It is hard for Martha to articulate the pride she feels in her son's courage and the joy she shares in his success as an inventor. She and her late husband are longtime supporters of the Brain & Behavior Research Foundation, through which she says she has developed a better understanding of autism and schizophrenia and a strong conviction that research will eventually lead to the alleviation of suffering caused by mental illness.



John Atherton with one of several inventions he has patented—a hand-held voltage indicator that determines whether a power cord is live or dead.

## Staving Off “The Darkness”

Arthur Peck puts his faith in the promise of research if the day should come that more of his family members will need effective treatments to treat psychiatric illness.

The Peck siblings—Wendy, Amy, and Robert—have in common a history of clinical depression, something they shared with their late mother. Fortunately, they have all found treatments that worked, and they all also benefit from a Rock-of-Gibraltar father whom Amy says “has essentially saved each of us from the darkness, at some point.”

The Pecks are determined not to let mental illness upend their lives.

Eleven years ago, when Amy moved from Washington, D.C. to St. Louis for her husband’s new job, it triggered a deep depression. “Within a month of the move, I was in a bad way,” she recalls.

Amy called her father. Not knowing a soul in St. Louis, he in turn called the Brain & Behavior Research Foundation. Responding to Amy’s plight, the Foundation put Dr. Peck in touch with Herbert Pardes, M.D., President of the organization’s Scientific Council. “Dr. Pardes told me he’d make sure someone in St. Louis would see Amy that day,” Dr. Peck says, “And that’s exactly what happened.”

Psychiatrist Dan W. Haupt, M.D., diagnosed Amy with bipolar depression and prescribed the mood stabilizer lamotrigine (Lamictal), which successfully treated her. Amy also credits her recovery to Dr. Haupt’s astute assessment of the person inside her illness and his unpatronizing and reassuring approach to her care.

The Peck children now have grown children of their own, bright, independent and engaged in busy lives. Arthur Peck fervently hopes his grandchildren are spared the family’s struggles with depression. He crosses his fingers, saying “so far, so good” and puts his faith in the promise of research if the day should come that more of his family members will need effective treatments to treat psychiatric illness.



Robert Peck, Wendy Peck, Dr. Arthur Peck and Amy Peck Abraham

## Finding a Way to Help and Heal

An annual event commemorating the life of Jonathon Robbins raised \$27,000, all of which was donated to a Foundation Research Partner.

Toward the end of his freshman college year, Jonathon Robbins began to experience symptoms of schizophrenia. He didn't make it through his sophomore year.

"He went from being an outgoing, honor-roll student to a young man who didn't want to leave the house," says Kathy Robbins of her son. One night, after driving to Texas, presumably on the instruction of the voices he heard, he came back home after driving for 48 hours, and asked for help.

"When we took him to the hospital," Kathy says, "they told us he had caffeine-induced psychosis. I remember thinking, 'Well, I suppose there is such a thing.' But of course it was ridiculous." Jonathon's hallucinations and delusional thoughts began to worsen. Hospitalized once more, he finally received a definitive diagnosis. When the doctors thought Jonathon was stabilized, they released him. That day he went home and took his life. Jonathon was 22 years old.

"I kept wondering what would have helped Jonathon," Kathy says. She searched the Internet and discovered the Brain & Behavior Research Foundation. "I knew we had to raise money for their research." The Robbins are not wealthy people. But they are rich in relatives and friends, whom they counted on to pitch in when they came up with the idea of holding an annual walk/run event to raise money for the Foundation. The Robbins named the event "Let the Sun Shine," because, says Kathy, "Jonathon was the sunshine in our lives." In 2014, Let the Sun Shine raised \$27,000, all of which was donated to the Foundation's Research Partners Program.

Kathy says her consolation is the certainty that "Jonathon died knowing how much we loved him."



**Top:** Jonathon's younger brother Jordan, mom Kathy, younger sister Arianna and dad Curt at Arianna's graduation. Unable to take a family photo without Jonathon, their Jonathon bear wore a suit for the special occasion.

**Bottom:** A sea of people at the 2014 starting line of "Let the Sun Shine Run/Walk."

## An Agonizing Journey and a “Blessing”

“Seeing positive treatments that have come from research is a blessing.”

Janet and Donald Boardman, Sr. (a Foundation board member), remember with chilling clarity the last time their son Donald, Jr., had to be hospitalized against his will.

“When the sheriffs came,” Janet says, “he was in our back yard, very ill, very angry, and when he started walking away, one of the officers hit him with a billy stick. Then they pushed him down, put handcuffs on him and pepper-sprayed him.” As the spray drifted into the house, Mrs. Boardman, and her younger daughter, Kate, watched him being taken away—again.

For years the Boardmans, like many families in similar circumstances, lived with the anguish and frustration of trying to protect a loved one with schizophrenia, often from himself. Before lasting help finally came in the form of the antipsychotic medication clozapine (Clozaril), Donald, Jr., had gone through periods of homelessness, suicidal thoughts, 15 hospitalizations, and an arrest for assault. A sympathetic judge helped Donald Jr. focus on compliance with his treatment plan.

The Boardmans have supported the Brain & Behavior Research Foundation for the past 15 years. Their faith in research is understandable. Donald Jr.’s recovery was due in large measure to the work of Foundation Scientific Council Member Herbert Y. Meltzer, M.D., the principal investigator on the trials that led to the approval of the use of clozapine for treatment-resistant schizophrenia. With clozapine and supplemental antidepressant and anti-anxiety medication, the voices in Donald, Jr.’s head, while not completely gone, became controllable.

Today, Donald, Jr. lives on his own in Baltimore, near his doctors. He has a job, which he has held for 12 years, driving for a pharmacy. Says Donald, Sr., “Seeing positive treatments that have come from research is a blessing.”



**From top to bottom:**

Donald and his cat Homer; With his dad Donald, Sr.; With mom, Janet, on the golf course, Captiva Island, Florida

# Research Partners Program

Our Research Partners Program enables donors to select and support a scientist's project from amongst the most promising, cutting-edge proposals in mental illness research. Sponsoring one year of support for a Young Investigator is \$30,000 (now \$35,000 in 2015); an Independent Investigator, \$50,000; and a Distinguished Investigator, \$100,000.

We are deeply grateful to all Research Partners for their critical support and generosity.

## JAN AND STEFAN ABRAMS

Jan and Stefan Abrams Investigator

Young Investigator

**Yongsoo Kim, Ph.D.**

*Cold Spring Harbor Laboratory*

## ANNE AND RON ABRAMSON

Abramson Family Foundation Investigators

Distinguished Investigator

**John R. Kelsoe, M.D.**

*University of California, San Diego*

Young Investigator

**Sharmin Ghaznavi, M.D., Ph.D.**

*Massachusetts General Hospital  
Harvard University*

## ANONYMOUS

Distinguished Investigator

**Nenad Sestan, M.D., Ph.D.**

*Yale University School of Medicine  
Yale University*

Young Investigators

**Chadi Abdallah, M.D.**

*Yale University*

**Gianfilippo Coppola, Ph.D.**

*Yale University*

## ANONYMOUS

Haddie Investigators

Young Investigators

**Solange P. Brown, M.D., Ph.D.**

*Johns Hopkins University*

**Julie S. Haas, Ph.D.**

*Lehigh University*

**Theodoros Tsetsenis, Ph.D.**

*University of Pennsylvania*

## ATHERTON FOUNDATION

Atherton Investigators

Young Investigators

**Lior Brimberg, Ph.D.**

*The Feinstein Institute for  
Medical Research*

**Peter G. Enticott, Ph.D.**

*Monash University*

**Brian J. O'Roak, Ph.D.**

*Oregon Health and Science University*

**Latha Soorya, Ph.D.**

*Rush University*

**Kaustubh Satyendra Supekar, Ph.D.**

*Stanford University*

## DIANA AND DAN ATTIAS

Attias Family Foundation Investigators

Young Investigators

**Kelly Anne Barnes, Ph.D.**

*Baylor College of Medicine*

**Martin Debbané, Ph.D.**

*University of Geneva*

**Avniel S. Ghuman, Ph.D.**

*University of Pittsburgh*

**David L. Roberts, Ph.D.**

*University of Texas Health Science Center  
at San Antonio*

## SIDNEY R. BAER, JR. FOUNDATION

Sidney R. Baer, Jr. Investigators

Independent Investigator

**Stephen J. Glatt, Ph.D.**

*State University of New York,  
Upstate Medical University*

Young Investigators

**Brian P. Brennan, M.D.**

*McLean Hospital Harvard University*

**Mark Christian Eldaief, M.D.**

*Beth Israel Deaconess Medical Center  
Harvard University*

**Mei-Hua Hall, Ph.D.**

*Harvard Medical School Harvard University*

**Zhicheng Carl Lin, Ph.D.**

*McLean Hospital Harvard University*

**William B. Ruzicka, M.D., Ph.D.**  
McLean Hospital Harvard University

**Eli Ayumi Stahl, Ph.D.**  
Icahn School of Medicine at Mount Sinai

**Luke E. Stoeckel, Ph.D.**  
Massachusetts General Hospital  
Harvard University

**Gordana D. Vitaliano, M.D.**  
McLean Hospital Harvard University

**BARBARA AND MICHAEL BASS**  
Brian Bass Investigator

**Young Investigator**  
**Paul Ashwood, Ph.D.**  
University of California, Davis

**DONALD AND JANET BOARDMAN**  
Donald and Janet Boardman Investigator

**Young Investigator**  
**Jessica A. Bernard, Ph.D.**  
University of Colorado, Boulder

**MR. AND MRS. EVERETT DESCHNER**  
Katherine Deschner Family Investigator

**Young Investigator**  
**Shannon Leigh Gourley, Ph.D.**  
Emory University

**NARSAD RESEARCH FUND**  
Domenici Investigator

**Young Investigator**  
**Kelly Anne Aschbrenner, Ph.D.**  
Dartmouth College

**NARSAD RESEARCH FUND**  
Stephen G. Doochin Memorial Investigator

**Young Investigator**  
**Machteld Christa Marcelis, M.D., Ph.D.**  
Maastricht University

**TAKING STRIDES AGAINST  
MENTAL ILLNESS**  
Rebecca Ehrlich Taking Strides Against Mental  
Illness Investigator

**Young Investigator**  
**Sun-Hong Kim, Ph.D.**  
Johns Hopkins University

**MR. AND MRS. ROBERT ENGMAN**  
Engman Investigator

**Young Investigator**  
**Heather C. Brenhouse, Ph.D.**  
Northeastern University

**ESSEL FOUNDATION**  
Essel Investigators

**Independent Investigators**  
**Wen-Jun Gao, M.D., Ph.D.**  
Drexel University College of Medicine  
**Kirsty Millar, Ph.D.**  
University of Edinburgh

**Young Investigators**  
**Wesley Brian Asher, Ph.D.**  
Columbia University  
**Javier Contreras, M.D.**  
Universidad de Costa Rica  
**Santhosh Girirajan, M.B.B.S., Ph.D.**  
Pennsylvania State University  
**Laura M. Harrison, Ph.D.**  
Louisiana State University Health Sciences  
Center, Shreveport

**Charles Albert Hoeffler, Ph.D.**  
University of Colorado, Boulder

**Tija Carey Jacob, Ph.D.**  
University of Pittsburgh

**Roozbeh Kiani, M.D., Ph.D.**  
New York University

**Markita Patricia Landry, Ph.D.**  
Massachusetts Institute of Technology

**David James Margolis, Ph.D.**  
Rutgers University

**Jacqueline Morris, Ph.D.**  
University of Pennsylvania

**Semanti Mukherjee, Ph.D.**  
Zucker Hillside Hospital  
Campus of The Feinstein  
Institute for Medical Research

**Todd F. Roberts, Ph.D.**  
University of Texas Southwestern Medical  
Center at Dallas

**FAMILY OF JOSEPH M. EVANS  
INVESTIGATORS**  
Family of Joseph M. Evans Investigators

**Independent Investigator**  
**Alessandro Bertolino, M.D., Ph.D.**  
University of Bari

**Young Investigators**  
**Eric A. Epping, M.D., Ph.D.**  
University of Iowa  
**David P. Gavin, M.D., M.Sc.**  
University of Illinois at Chicago

**Sebastien Parnauadeau, Ph.D.**  
Columbia University

**Sarah I. Tarbox, Ph.D.**  
Yale University School of Medicine  
Yale University

**FAMILIES FOR BORDERLINE  
PERSONALITY DISORDER RESEARCH**  
Families For Borderline Personality Disorder  
Research Investigators

**Young Investigators**  
**Sarah Kathryn Fineberg, M.D., Ph.D.**  
Yale University

**D. Bradford Reich, M.D.**  
McLean Hospital Harvard University

**Anthony Charles Ruocco, Ph.D.**  
Centre for Addiction and Mental Health  
University of Toronto

**Kate Eleanor Anne Saunders, B.M.,  
B.Ch., M.A.**  
University of Oxford

**Edward A. Selby, Ph.D.**  
Rutgers University

**LUISA FRANCOEUR**  
**FRANCOEUR INVESTIGATOR**

**Young Investigator**  
**Christopher P. Ford, Ph.D.**  
Case Western Reserve University

**NARSAD RESEARCH FUND**  
Daniel X. Freedman Investigator

**Young Investigator**  
**Junghee Lee, Ph.D.**  
University of California, Los Angeles

**SUZANNE AND JOHN GOLDEN**  
Suzanne and John Golden Investigator

**Independent Investigator**  
**Peng Jin, Ph.D.**  
Emory University

**BONNIE AND ALAN HAMMERSCHLAG  
PHILANTHROPIC FUND**  
Hammerschlag Family Investigator

**Young Investigator**  
**Shinichi Kano, M.D., Ph.D.**  
Johns Hopkins University

**JOHN KENNEDY HARRISON**  
John Kennedy Harrison Investigator

**Young Investigator**  
**Chung Sub Kim, Ph.D.**  
University of Texas at Austin

**HOFMANN TRUST**

Hofmann Trust Investigator

**Distinguished Investigator**

**Sohee Park, Ph.D.**

*Vanderbilt University*

**THE RONA JAFFE FOUNDATION**

The Rona Jaffe Foundation Investigator

**Young Investigator**

**June Gruber, Ph.D.**

*University of Colorado, Boulder*

**KAPLEN FOUNDATION**

Michael F. Kaplen Investigator

**Young Investigator**

**Mariana Pereira, Ph.D.**

*Rutgers University*

**MIRIAM KATOWITZ AND ARTHUR RADIN**

Katowitz/Radin Investigators

**Young Investigators**

**Ioana Carcea, M.D., Ph.D.**

*New York University School of Medicine  
New York University*

**Frederick Charles Nucifora, Ph.D., D.O., M.H.S.**

*Johns Hopkins University School of Medicine  
Johns Hopkins University*

**CAROLE AND MARVIN LEICHTUNG**

Leichtung Family Investigators

**Young Investigators**

**Fei Du, Ph.D.**

*McLean Hospital Harvard University*

**Joshua Hunsberger, Ph.D.**

*National Institute of Mental Health*

**Kanchna Ramchandran, Ph.D.**

*University of Iowa*

**MR AND MRS. CURT ROBBINS**

Let The Sun Shine Run Investigator

**Young Investigator**

**Ricardo E. Carrion, Ph.D.**

*Zucker Hillside Hospital, Feinstein Institute for Medical Research*

**LAUREN LEVINE**

Levine Investigator

**Young Investigator**

**Paul Siegel, Ph.D.**

*State University of New York, Purchase College*

**CONSTANCE AND STEPHEN LIEBER**

Lieber Investigators

**Distinguished Investigators**

**Claes Wahlestedt, M.D., Ph.D.**

*University of Miami*

**Suzanne Zukin, Ph.D.**

*Albert Einstein College of Medicine  
Yeshiva University*

**Independent Investigator**

**Stanislav S. Zakharenko, M.D., Ph.D.**

*St. Jude Children's Research Hospital*

**Young Investigators**

**Gemma Modinos, Ph.D.**

*King's College London, Institute of Psychiatry  
University of London*

**Jess Nithianantharajah, Ph.D.**

*Florey Neuroscience Institutes University  
of Melbourne*

**Edwin C. Oh, Ph.D.**

*Duke University*

**Krishnan Padmanabhan, Ph.D.**

*Salk Institute for Biological Studies*

**Krystal Lynn Parker, Ph.D.**

*University of Iowa*

**Marta Ribases, Ph.D.**

*Vall d'Hebron Research  
Institute VHIR*

**Panagiotis Roussos, M.D., Ph.D.**

*Icahn School of Medicine at Mount Sinai*

**Jingchun Sun, Ph.D.**

*University of Texas Health Science Center  
at Houston*

**Simon Trent, Ph.D.**

*Cardiff University*

**Carmen Varela, Ph.D.**

*Massachusetts Institute of Technology*

**Qi Wang, Ph.D.**

*Columbia University*

**Joshua Woolley, M.D., Ph.D.**

*University of California, San Francisco*

**Nan Yang, Ph.D.**

*Stanford University*

**Wenchi Zhang, Ph.D.**

*Johns Hopkins University*

**MILTON & TAMAR MALTZ FAMILY FOUNDATION**

Maltz Investigators

**Distinguished Investigator**

**Bruce M. Cohen, M.D., Ph.D.**

*Harvard University*

**Young Investigators**

**Antti S. Alaräsänen, M.D.**

*University of Oulu*

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 Brandon Dixon  
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 Monte, Reesa, Kenny, Gloria and  
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 Divito-Santana's  
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 SimSima, Kookz and Boodee  
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 Mary N. Thawley  
 Raynald A. Thibodeau  
 Levi Thomas  
 Camilla "Cammie" L. Thompson  
 Duane Thompson  
 Those Who Have Struggled /  
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 Howard Tommelein  
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 Morris Trager  
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 Naomi L. Tripp  
 Richard Trommer  
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 Mary Unours  
 Anish Vaishnav  
 Raul Valles  
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# Statement of Financial Position

## 2014 Financial Summary

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We are pleased to report on the financial position and results of the Brain & Behavior Research Foundation for 2014. We are appreciative and thankful for the commitment of Foundation leadership, dedicated staff, volunteers and our strong donor support base that allows the Foundation to perform its vital work. We remain indebted to the Foundation Scientific Council, our distinguished research leaders covering virtually every major discipline within brain and behavior science, who volunteer their expertise to select and recommend the most promising grant projects to fund.

Contributions increased in 2014 and we received major support from bequests for which we are deeply grateful for the generosity of the individuals and their families. We would like to acknowledge the extraordinary bequest from the late Oliver D. Colvin, Jr. that continues to support our efforts at the Foundation. Together, all these donations further the Foundation's mission to alleviate the suffering caused by mental illness by awarding grants that will lead to advances and breakthroughs in scientific research.

With our strengthened financial posture, we continue to aim for a future of accelerating research accomplishments to help those living with mental illness to live full and productive lives. In 2014, the Foundation awarded additional NARSAD Grants bringing the total investment in mental health research to more than \$324 million since inception.

With thanks to the generosity of two family foundations, all supporting services were once again underwritten in 2014. This allows for contributions targeted for research to go directly to funding NARSAD Grants. The financial report shown herein has been summarized from our 2014 audited financial statements. The Foundation's complete audited financial statements and our most recent IRS Form 990 are available online at [bbrfoundation.org](http://bbrfoundation.org) or contact our office at 800.829.8289 for copies of the material.

## Combined Statement of Financial Position

	DECEMBER 31, 2014	DECEMBER 31, 2013
<b>ASSETS</b>		
Cash and cash equivalents	\$22,350,676	\$9,825,107
Investments, at fair value	11,164,075	9,951,960
Contributions receivable	1,436,500	1,873,281
Other receivables	12,009	87,031
Pledges receivable, net	780,440	2,247,449
Prepaid expenses and other assets	21,415	19,868
Assets held in charitable remainder trusts	1,460,182	1,404,297
Fixed assets, net	81,617	101,242
Security deposits	77,110	77,110
	<b>\$37,384,024</b>	<b>\$25,587,345</b>
<b>LIABILITIES AND NET ASSETS</b>		
<b>Liabilities</b>		
Accounts payable and accrued expenses	\$209,211	\$269,558
Grants payable	20,093,716	12,578,705
Accrued compensation	50,295	42,426
Annuities payable	871,832	861,080
Charitable gift annuities payable	317,912	360,716
	<b>Total Liabilities</b>	<b>14,112,485</b>
<b>Net Assets</b>		
Unrestricted	(1,081,384)	2,142,098
Unrestricted - board designated endowment	11,509,262	4,509,262
	<b>Total Unrestricted</b>	<b>6,651,360</b>
Temporarily restricted	499,680	100,000
Permanently restricted	4,913,500	4,723,500
	<b>Total Net Assets</b>	<b>11,474,860</b>
	<b>\$37,384,024</b>	<b>\$25,587,345</b>

## Combined Statement of Activities

	YEAR ENDED DECEMBER 31, 2014	YEAR ENDED DECEMBER 31, 2013
<b>SUPPORT AND REVENUE</b>		
Contributions	\$7,816,588	\$6,509,363
Special Events, net	584,805	428,779
Contribution of services	1,389,537	1,310,739
Bequests	21,683,838	4,442,392
Net realized and unrealized gains on investments	1,184,440	697,782
Net appreciation of assets held in charitable remainder trusts	55,885	271,676
Dividend and interest income	322,676	344,568
	<b>Total Support and Revenue</b>	<b>33,037,769</b>
<b>EXPENSES</b>		
<b>Program Services</b>		
Research grants and awards	22,681,953	8,915,971
Scientific advancement	1,747,843	1,641,936
Program support	2,101,977	1,954,619
	<b>Total Program Services</b>	<b>26,531,773</b>
<b>Supporting Services</b>		
Fundraising*	793,219	877,139
Administration*	1,346,579	1,661,858
	<b>Total Supporting Services</b>	<b>2,139,798</b>
	<b>Total Expenses</b>	<b>28,671,571</b>
Change in Net Assets	4,366,198	(1,046,224)
Net Assets, beginning of year	11,474,860	12,521,084
	<b>NET ASSETS, END OF YEAR</b>	<b>\$15,841,058</b>

\*All fundraising and administration expenses are funded by specially designated grants.

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# Investing in Breakthroughs To Find a Cure

## OUR MISSION:

The Brain & Behavior Research Foundation is committed to alleviating the suffering caused by mental illness by awarding grants that will lead to advances and breakthroughs in scientific research.

## OUR VISION:

To bring the joy of living to those affected by mental illness—those who are ill and their loved ones.

## HOW WE DO IT:

100% of our donor contributions for research are invested in NARSAD Grants leading to discoveries in understanding causes and improving treatments of disorders in children and adults, such as depression, schizophrenia, anxiety, autism, and bipolar, attention-deficit hyperactivity, post-traumatic stress and obsessive-compulsive disorders.

## OUR CREDENTIALS

For more than a quarter of a century, we have awarded more than \$324 million to fund more than 4,800 grants to more than 3,800 scientists around the world.

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