Pathways to the Future

INVEST IN MENTAL HEALTH

ANNUAL REPORT 2016

BRAIN & BEHAVIOR
RESEARCH FOUNDATION

Awarding **NARSAD** Grants

Dear Brain & Behavior Research Foundation Supporters:

From mental illness to mental health–30 years of achievements by over 4,000 research scientists, 168 scientific leaders and 60,000 donors. We are proud to present you with our 2016 annual report and invite you to invest in mental health.

Since 1987, the Brain & Behavior Research Foundation has invested in the future. We support the innovative brain and behavior research today which will lead to new treatments and eventual cures in the future.

2016 was a highly productive year for the Foundation and the critical role we play as the venture capitalists of neuroscience.

- In 2016, we funded more than $19 million in grants divided between 15 Distinguished Investigator Grantees, 80 Independent Investigator Grantees, and 400 Young Investigator Grantees.
- We continued to ensure that every dollar donated for research is invested in our grants to scientists thanks to the generous support of two family foundations which cover our operating expenses.
- This year marks the achievement of awarding more than $360 million, (since our inception), to fund more than 4,000 leading scientists around the world which has led to more than $3.5 billion in additional funding for these scientists.

This annual report highlights remarkable research that has been funded through Foundation Grants this past year. Some of the major discoveries made by our Grantees in 2016 are discoveries in basic research, new technologies, next-generation treatments, early intervention and diagnostic tools, which ranged from new experiments that reveal the brain circuitry behind the inability to experience pleasure, a milestone in the search for the cause of schizophrenia, and findings that explain how ketamine exerts its rapid antidepressant effects. The 2016 Top 10 advancements were selected because of their significant contributions to our understanding of brain and behavior disorders as well as potential new treatments.

We are proud that our Grants support a broad range of the best ideas in brain research and that our grantees have taken substantial steps forward on the path to developing new treatments and finding cures for mental illness.

Unfortunately, this year we also lost our beloved President Emeritus, Constance E. Lieber, a global champion of psychiatric research. Connie passionately believed in the need to seed the field of neuropsychiatric research with as many talented scientists as possible to make a substantive impact on the broad spectrum of mental health research, which she fervently understood holds our best hope for ending the immense suffering caused by mental illness. Connie was a deeply caring and visionary philanthropist, who has had a tremendous impact on psychiatric research and treatment. Connie was our leader and guiding light, providing inspiration and motivation to all who ever had the honor and privilege of knowing and working with her. She will be dearly missed by us all. But her legacy continues with each new scientist which we support and each new discovery which improves people's lives.

While we are proud of our accomplishments, there is still much more to be done. More than ever, private funding of brain and behavior research is vital to jumpstart pilot research projects that will advance our understanding of mental illness. While the federal government is the largest funder of scientific research, its budget is still less than needed. The recent federal budget administrative proposal calls for an 18% cut in spending for biomedical research. It undermines key research programs, particularly in mental health.

Any reduction in federal funding would be devastating to the work and careers of brain and behavior researchers nationwide, but this is especially true for young scientists who wish to pursue careers in brain research. Scarce resources mean even more competition for federal grants and greater difficulty in pursuing scientific careers. Because of these decreases in government funding, we are at great risk of losing an entire generation of scientists.

To keep neuroscience flourishing and momentum in the field, sustained and accelerated support are required to continue to advance.

THIRTY YEARS OF GRANTS: BREAKTHROUGHS AND MOMENTUM

Starting with ten grants in 1987, by year's end 2016 we had awarded $360 million in more than 4,000 grants in the U.S. and 34 other countries. In thirty years of funding research, we have helped psychiatry and neuroscience advance significantly and have established great momentum in the field.

Innovation and advances, involve taking a chance on a vision for the future. All Foundation Grant projects are selected by our all-volunteer Scientific Council, comprised of leading neuroscientists across disciplines in brain and behavior research, including two Nobel Laureates and four former and the current director of the National Institute of Mental Health. These distinguished leaders are uniquely qualified to identify new research projects that may be unproven but offer potential for significant breakthroughs. They select the most promising ideas in which to invest, whether proposed by budding early career neuroscientists or by established scientists seeking to explore new paths.

One such grantee selected by our Scientific Council, whose research in next generation treatment for depression made our list of 2016 Top 10 Advancements and Breakthroughs, was Dr. Lisa Pan. Dr. Pan and her colleagues have discovered that treating metabolic problems improves symptoms of some patients with refractory depression. In a study of patients with treatment-resistant depression, about two thirds had metabolic deficiencies that affect the brain's ability to produce neurotransmitters. Dr. Pan's research found that patients' depression symptoms declined significantly when their metabolic problems were treated. Some of the patients even reached remission. The most common of the deficiencies observed in the participants was in levels of cerebral folate, which is treatable with folinic acid.

THE INVESTMENT CONTINUES—LOOKING FORWARD

In 2016 the Scientific Council reviewed 761 project proposals for Young Investigator Grants and noted the exceptional quality of a large majority of the applicants' proposals. Ultimately 198 projects were funded at $70,000 each for a two year period. The Independent Investigator Grants were awarded to 40 exceptional researchers with a variety of new approaches to understand and treat mental illness and were selected from 326 applicants. Independent Investigators are funded with $100,000 over two years. For our 2016 Distinguished Investigator Grants, 151 applications were received and 15 outstanding one-year research projects were selected for funding at $100,000 each.

This year also saw the publication of a research paper by a 2009 and 2014 Young Investigator Carolyn I. Rodriguez, M.D., Ph.D., of Stanford University School of Medicine. Results of the small proof-of-concept study reported December 1, 2016 in *The American Journal of Psychiatry*, found that rapastinel, an experimental drug currently being evaluated for the treatment for major depression, may relieve the symptoms of obsessive compulsive disorder (OCD) rapidly and with few side effects. Dr. Rodriguez and her colleagues are investigating rapastinel because they previously found that some OCD patients receive rapid relief from their symptoms when treated with ketamine. Hoping to find a treatment that reduces patients' obsessions and compulsions quickly without dissociative side effects, Dr. Rodriguez turned to rapastinel because it, like ketamine, is a drug that modulates the action of NMDA receptors in the brain – docking ports for the neurotransmitter glutamate and important in learning, memory and synaptic plasticity and thought to play a role in OCD. But rapastinel works differently than ketamine and has a lower risk of causing dissociative side effects, the researchers say.

As 2016 came to a close we began to celebrate our 30th anniversary. Of course, the longevity and impact the Foundation has had, and continues to have, is only possible because of each and every one of you who support our mission and understand that investing in mental health neuroscience research will bring us closer to the day when better treatments and even cures are possible.

The Foundation is proud of our accomplishments in 2016 and we are excited to focus on the promising path of discovery. With your sustained commitment, we will accelerate the funding of our Grants and continue to lead the field with breakthroughs that improve the lives of those living with mental illness. Thank you for continuing the journey with us.

Sincerely,

JEFFREY BORENSTEIN, M.D.
President and CEO

STEPHEN A. LIEBER
Chair, Board of Directors

HERBERT PARDES, M.D.
President, Scientific Council

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PUBLICATION CREDITS

WRITERS
Peter Tarr, Ph.D.
Becky Ham

EDITOR
Lauren Duran

DESIGN
Jenny Reed

OUR GLOBAL FOOTPRINT

TOTAL AMOUNT AWARDED SINCE 1987

MORE THAN $360M

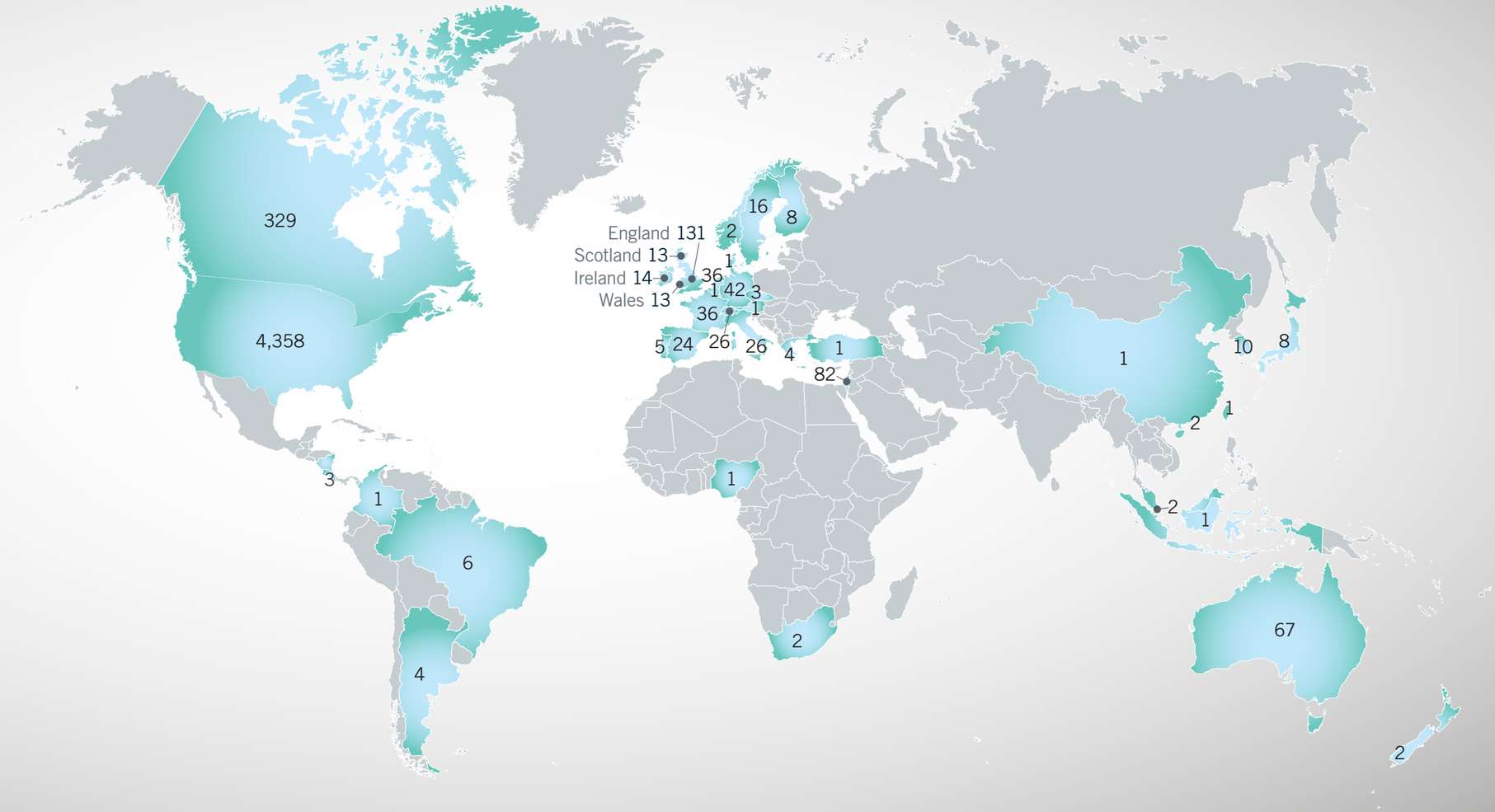
TOTAL NUMBER OF COUNTRIES

35

TOTAL GRANTS AWARDED

5,200+ In total
4,300+ In the U.S.
900+ Outside the U.S.

4,086 Young Investigator Grants
788 Independent Investigator Grants
409 Distinguished Investigator Grants



2016 GRANT STATISTICS

YOUNG INVESTIGATORS

763 Applications
198 Awarded
185 New Grantees
13 Prior Grantees

INDEPENDENT INVESTIGATORS

152 Applications
15 Awarded
4 New Grantees
11 Prior Grantees

DISTINGUISHED INVESTIGATORS

326 Applications
40 Awarded
20 New Grantees
20 Prior Grantees

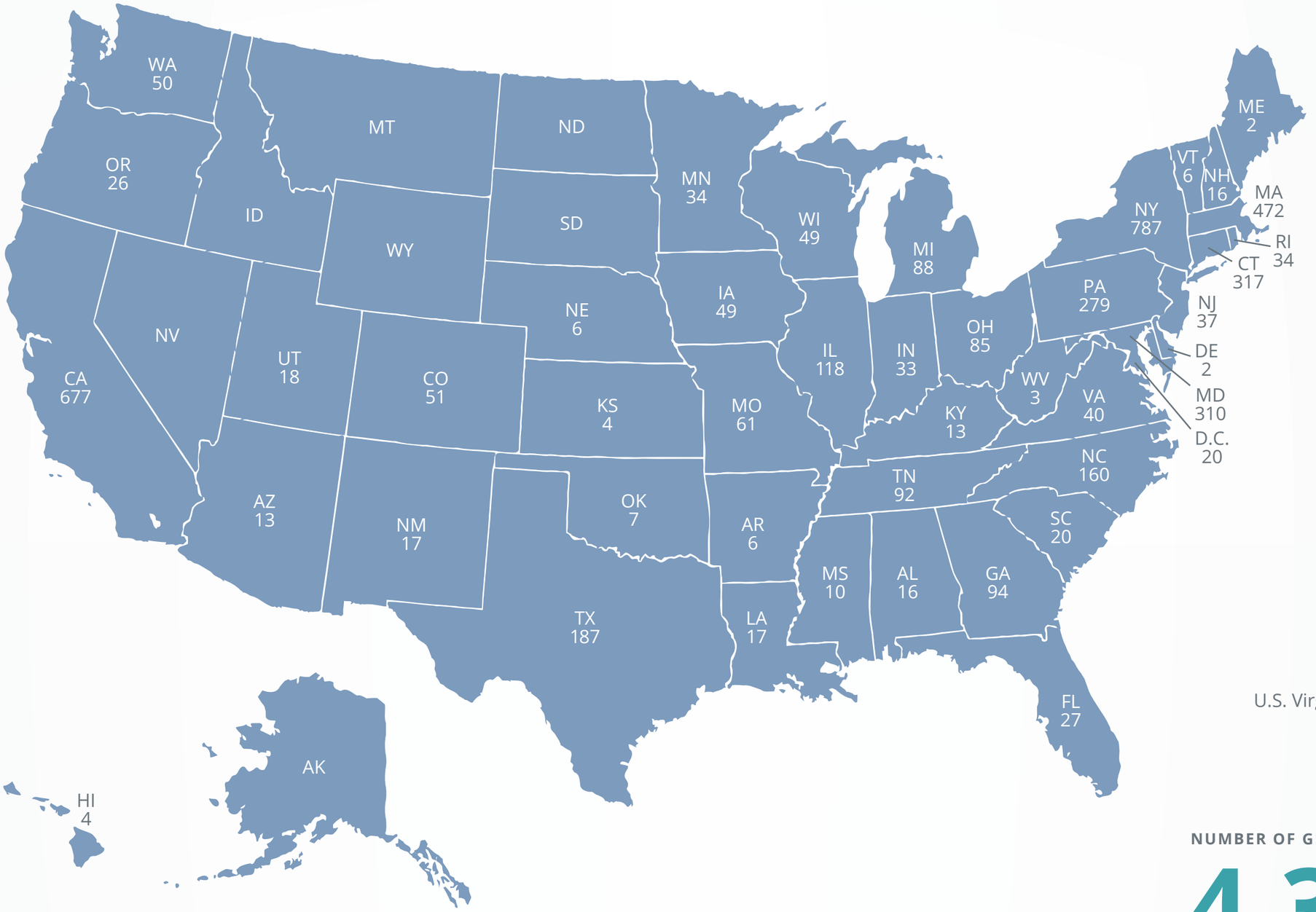
2016 GRANTS

U.S. $14,280,000 | FOREIGN $4,820,000 | TOTAL $19,100,000

GLOBAL INSTITUTIONS

U.S. 332 | FOREIGN 215 | TOTAL 547

NUMBER OF GRANTS BY STATE FROM 1987–2016



U.S. Virgin Islands 1

TOTAL NUMBER OF STATES WITH GRANTS IN THE U.S.

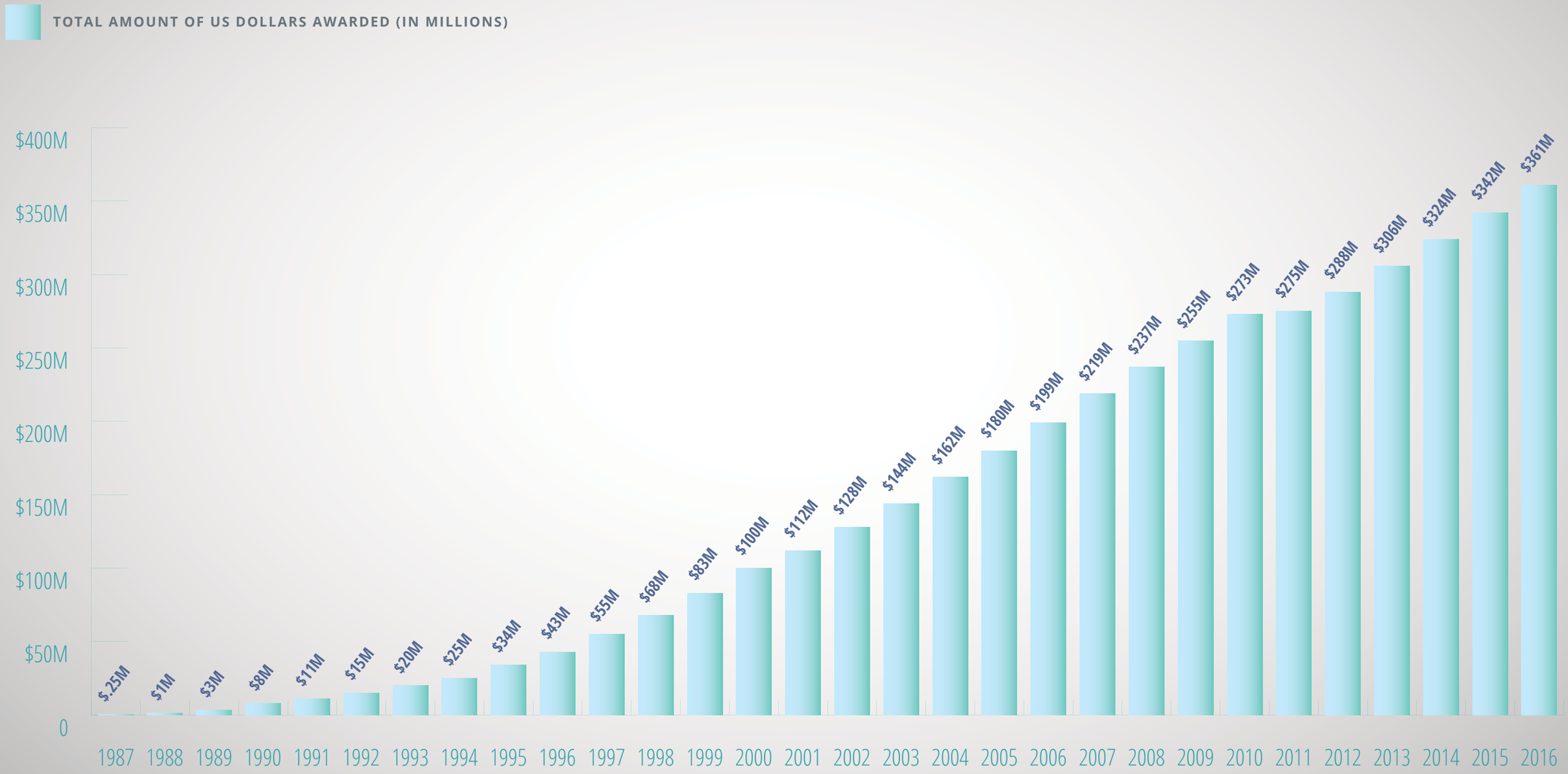
43

PLUS THE DISTRICT OF COLUMBIA AND THE U.S. VIRGIN ISLANDS

NUMBER OF GRANTS BY STATE

4,358

TOTAL AMOUNT AWARDED SINCE 1987



TOP 10 ADVANCEMENTS & BREAKTHROUGHS

by Foundation Grantees in 2016

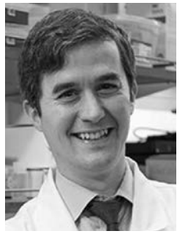
"The top 10 discoveries were selected because of their significant contributions to our understanding of brain and behavior disorders as well as potential new treatments. We are proud to be able to say that NARSAD Grants support a broad range of the best ideas in brain research and that our grantees have taken substantial steps forward on the path to developing new treatments and finding cures for mental illness."

—Jeffrey Borenstein, M.D.

1. New Experiments Reveal Brain Circuitry Behind Inability to Experience Pleasure
2. A Milestone in the Search for Schizophrenia's Causes
3. Genetic Anomalies Frequently Associated with Neurodevelopmental Disorders Can Now Be Efficiently Recreated in the Lab
4. Opioid Medication Combo Helps Patients Who Don't Respond to Antidepressants
5. Important Discovery by Foundation-Supported Researchers Explains How Ketamine Exerts its Rapid Antidepressant Effects
6. Treatment with Immune-Regulating Gut Bacteria May Boost Immune System Against Stress
7. Brief Course of Psychotherapy Benefits Moms with Major Depression and Their Children
8. New Tool Calculates Patients' Personal Psychosis Risk
9. Treating Metabolic Problems Improves Symptoms of Some Patients with Refractory Depression
10. Researchers Catalog Subtle but Widespread Schizophrenia-Associated Differences in Gene Activity

Listed in Order of Publication

1



Journal: *Science*—January 1, 2016

CONOR LISTON, M.D., PH.D.
Weill Cornell Medical College
2016 Freedman Prize Honorable Mention
2013 NARSAD Young Investigator Grant

KARL DEISSEROTH, M.D., PH.D.
Stanford University School of Medicine
Scientific Council Member
2013 Goldman–Rakic Prizewinner
2005 NARSAD Young Investigator Grant

Basic Research: Depression, Schizophrenia

NEW EXPERIMENTS REVEAL BRAIN CIRCUITRY BEHIND INABILITY TO EXPERIENCE PLEASURE

Anhedonia, or the inability to feel pleasure or enjoyment, is a key symptom in several mental illnesses including major depression and schizophrenia. This sense of pleasure is generated in part by the brain's neural pathways involved in seeking and experiencing reward. In a new study by led by Karl Deisseroth, M.D., Ph.D., of Stanford University, researchers have now identified in rodents some of the neural circuitry that appears to regulate reward behavior across different sections of the brain.

By controlling the activity of dopamine neurons in a part of the brain called the medial prefrontal cortex, Deisseroth, a Scientific Council member and 2005 and 2007 Young Investigator, and his colleagues reported in the January 1 issue of Science that they can produce symptoms of anhedonia in rodents. Hyperactivity in the medial prefrontal cortex in humans has been associated with anhedonia in patients with depression. In rats, stimulating activity in that part of the brain caused the animals to avoid their preferred sugar water and shy away from socializing with their cage-mates.

The scientists used a combination of functional magnetic resonance imaging and optogenetics (a technique that uses pulses of light to control specific brain cells) to observe how the activity in the reward circuitry in the medial prefrontal cortex can suppress activity in other parts of the brain, such as the striatum, that are involved in reward-seeking behavior. Together, these findings provide a much clearer picture of how reward-seeking pathways operate in the brain, and may help scientsits learn more about how these pathways relate to anhedonia.

2

Journal: *Nature*—January 27, 2016

PATRICK F. SULLIVAN, M.D., FRANZCP
University of North Carolina at Chapel Hill
2014 Lieber Prizewinner
2010 NARSAD Distinguished Investigator Grant

MICHAEL O'DONOVAN, M.D., PH.D.
Cardiff University
2012 Lieber Prizewinner

Basic Research: Schizophrenia

A MILESTONE IN THE SEARCH FOR SCHIZOPHRENIA'S CAUSES

Research, reported in *Nature* and featured in the *New York Times*, by a large international team that included Drs. Sullivan and O'Donovan, who are leaders of the Psychiatric Genomics Consortium, points to one of the likely causes of schizophrenia in some people: overactive pruning of synapses–connections between nerve cells–in the brain's prefrontal cortex during the early years of life. The team focused on variation in genes giving rise to a vital group of proteins called the major histocompatibility complex (MHC). MHC proteins are part of the mechanism used by the immune system to fight off foreign invaders. The team found that variations in the expression of genes known as complement component 4 (C4) genes specifically impacted neuronal synapses, dendrites, axons, and cell bodies. In mice, C4 mediated synapse elimination during postnatal development. Excessive C4 activity may help explain the reduced numbers of synapses in the brains of individuals with schizophrenia.

3

Journal: *Nature Neuroscience*—February 1, 2016

JAMES F. GUSELLA, PH.D.
Harvard University/Massachusetts General Hospital
2007 NARSAD Distinguished Investigator Grant

MICHAEL E. TALKOWSKI, PH.D.
Harvard University/Massachusetts General Hospital
2012 NARSAD Young Investigator Grant

New Technology: Autism, Schizophrenia, Intellectual Disability

GENETIC ANOMALIES FREQUENTLY ASSOCIATED WITH NEURODEVELOPMENTAL DISORDERS CAN NOW BE EFFICIENTLY RECREATED IN THE LAB

A new method for recreating large-scale genetic anomalies known as copy number variations will make it easier for scientists to study the effects of those mutations, many of which have been linked to autism and other neurodevelopmental disorders. Scientists have already used the approach to create human cells that carry too many or two few copies of chromosomal regions known as 15q13.3 and 16p11.2 – copy number variations associated with a range of disorders including autism, schizophrenia, and intellectual disability. The achievement paves the way for studying exactly what goes wrong in cells that carry the defect, and could help researchers find ways to correct those problems.

The new method is an important new application of CRISPR, a research tool that is changing the way scientists "edit" genomes in the lab. Based on the cutting action of an enzyme found in bacteria, CRISPR enables researchers to cut and paste DNA in a manner not unlike that of adding and deleting letters in a word processor. It is much easier and more precise than prior genome modification methods.

James F. Gusella, Ph.D. and Michael E. Talkowski, Ph.D., both of Harvard University and Massachusetts General Hospital, led the development of the new CRISPR-based technique, which they call SCORE. Their study was reported February 1 in the journal *Nature Neuroscience*.

Copy number variations, in which segments of DNA that can span dozens of genes have been deleted or duplicated, lead to abnormal levels of gene activity. The alterations are thought to be one of most common causes of neurodevelopmental and psychiatric disorders, but teasing out their precise effects has been difficult. SCORE offers researchers an efficient way to modify the DNA in lab-grown cells to introduce duplications or deletions that precisely match those that occur in individuals with a particular disorder.

The research team demonstrated their technique by replicating two specific copy number variations implicated in psychiatric disorders, but the approach can be readily applied to produce other mutations of the same type. That means researchers can explore the effects of any copy number variation by engineering cells that carry the mutation and comparing them to cells that lack the mutation, but are otherwise genetically identical—a strategy scientists hope will help illuminate what goes wrong in a wide range of disorders.

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Journal: *American Journal of Psychiatry*—February 12, 2016

Maurizio Fava, M.D.

Harvard University/ Massachusetts General Hospital

1994 NARSAD Young Investigator Grant

*Team included: 2002 Independent Investigator and 1992 Young Investigator Madhukar H. Trivedi M.D.

Next-Generation Treatments: Depression

OPIOID MEDICATION COMBO HELPS PATIENTS WHO DON'T RESPOND TO ANTIDEPRESSANTS

Reviving an old treatment for mood problems, researchers find that adding certain opioid medications to depression treatment can help patients who don't respond well to conventional antidepressants. In a new study published February 12, 2016 in the *American Journal of Psychiatry*, patients who received a combination of opioid medication and antidepressants saw greater improvements than their peers who received only antidepressants.

About 60 to 70 percent of patients do not respond to their initial treatment with antidepressants. After switching to a different type of antidepressant, still about 40 percent of patients do not see any or enough improvement in their depression symptoms.

In trying to develop new treatments for patients with difficult-to-treat depression, some researchers have turned to drugs that act on different systems of the brain.

One such class of drugs is opioids, which affect the brain's opioid system and have been used to treat mood problems for centuries, before being displaced in the 1950s by the first generation of modern antidepressants. Although recent research has reopened the investigation on opioids, showing the brain's opioid system is involved in mood disorders, the use of opioid medications is limited because they are addictive and may be abused.

In the new study, researchers developed an opioid drug combination made of buprenorphine, an opioid medication, and samidorphan, which was included to block those effects of buprenorphine that are associated with its addictive potential. The research team led by Maurizio Fava, M.D., at Massachusetts General Hospital and Harvard Medical School, and also included Madhukar H. Trivedi M.D. at UT Southwestern Medical Center.

More than 140 people with major depression who had not responded well to one or two courses of antidepressant treatment participated in the study. Participants were randomly assigned to either a group that had buprenorphine/samidorphan added to the antidepressant treatment or a group that received only antidepressant and placebo.

After four weeks of treatment, those participants who had received the additional treatment with buprenorphine/samidorphan showed greater improvements than the patients in the placebo group. Overall, the drug combination was well tolerated and the participants didn't show symptoms of opioid withdrawal after finishing the treatment course, the researchers found.

The findings suggest that the buprenorphine/samidorphan combination is a promising candidate for treatment of major depressive disorder in patients who have an inadequate response to standard antidepressants, the scientists say, adding that future research with larger groups of patients is needed to confirm the results.

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Journal: *Nature*—May 4, 2016

Todd Denton Gould, M.D.

National Institute of Mental Health (NIMH/NIH)

2013 Independent Investigator Grant

2010 & 2004 Young Investigator Grant

Carlos A. Zarate, M.D.

National Institute of Mental Health (NIMH/NIH)

2011 Foundation Bipolar & Mood Disorder Research Prizewinner
2005 Independent Investigator Grant

1996 Young Investigator Grant

Next-Generation Treatments: Suicide, Depression

IMPORTANT DISCOVERY BY FOUNDATION-SUPPORTED RESEARCHERS EXPLAINS HOW KETAMINE EXERTS ITS RAPID ANTIDEPRESSANT EFFECTS

Foundation-supported scientists have just solved an important mystery. They have determined how ketamine, a drug approved long ago as an anesthetic but used recently on an experimental basis in treating major depression, exerts its beneficial antidepressant effect.

Low doses of the drug rapidly alleviate symptoms of depression, including major depression that has resisted other forms of treatment. Studies have found patients with depression experience dramatic improvement within hours of treatment with ketamine, whereas traditional antidepressants can take weeks to take effect. But serious side effects, including hallucinations and the feeling of being outside one's own body (dissociation), as well as a potential for abuse, have limited ketamine's potential for clinical use in treating depression.

The new research suggests it may be possible to separate ketamine's benefits from its unwanted effects. Inside the body, ketamine is broken down, forming several new compounds, called metabolites. The team discovered that one of these metabolites—a molecule called hydroxynorketamine (HNK)—is responsible for ketamine's antidepressant effects. In mice, HNK reduces depression-associated behaviors as well as ketamine, but does not cause ketamine's side effects.

The findings were reported May 4 in the journal *Nature*. Further studies will be needed to determine whether HNK has the same effect in patients. But the researchers, led by Todd Denton Gould, M.D. at the University of Maryland School of Medicine and Carlos A. Zarate, M.D. at the National Institute of Mental Health, say their discovery has already provided a new understanding of how ketamine acts on the brain to exert its antidepressant effects.

Unlike commonly used "SSRI"-class antidepressants (such as Paxil, Lexapro, Celexa, Prozac), ketamine's mechanism of action does not primarily rely on altering brain levels of the neurotransmitters serotonin or norepinephrine. It does, however, block signaling from a nerve cell receptor called the NMDA receptor—this is how it acts as an anesthetic, and also why it causes its most significant side effects. Researchers had thought ketamine's antidepressant effects might also be due to inhibition of the NMDA receptor, but the team's studies of HNK showed this is not the case.

Dr. Gould and his colleagues found that HNK reduces depression-like behaviors in mice without inhibiting NMDA receptors, instead activating molecules called AMPA receptors. The finding could help researchers design a new generation of antidepressants.

6

Journal: *Proceedings of the National Academy of Sciences*—May 31, 2016

Christopher A. Lowry, Ph.D.

University of Colorado, Boulder

2010 & 2007 NARSAD Young Investigator Grant

*Team included: 2005 Independent Investigator Monika Fleshner, Ph.D. and 2013 NARSAD Independent Investigator Charles L. Raison, M.D.

Next-Generation Treatments: Multiple Illnesses

TREATMENT WITH IMMUNE-REGULATING GUT BACTERIA MAY BOOST IMMUNE SYSTEM AGAINST STRESS

Exposing mice to bacteria that help regulate the immune system can help to prevent stress from causing harmful inflammation, and in some cases, illness, reports a scientific team in the May 31, 2016 issue of *Proceedings of the National Academy of Sciences*.

The findings support the idea that "reintroducing" humans to certain bacteria may promote health and wellness, the researchers said.

Previous research shows that inflammatory diseases such as inflammatory bowel disease and colitis are becoming increasingly more common in modern societies. According to "the hygiene hypothesis," increased levels of cleanliness in our urban lives have made us lose touch with the good microbes in the environment, "the old friends" we've evolved with, and as a result, we are less able to rely on our immune system to protect us against inflammatory diseases.

Risk for psychiatric disorders ranging from depression to PTSD to schizophrenia is thought by some scientists to be linked to elevated levels of inflammation.

In the new study, researchers investigated how stress acts on the normal relationship between the body and the microbial community occupying the body, which is collectively called the microbiota. They showed that stress disrupts this relationship, resulting in elevated inflammation.

The researchers injected mice with a bacterium called Mycobacterium vaccae, which is abundant in soil and has immune system-regulating effects. (Immunoregulation is the control of specific immune responses and interactions between immune cells, particularly those resulting in a balanced production of different classes of T cells that promote and suppress inflammation.) The bacteria were prepared in a way that made it impossible for them to proliferate in the body and thereby infect the animals, but could still, nevertheless, affect the immune system.

This prevented mice from getting colitis when put in highly stressful situations. In stressed mice, the treatment had anti-anxiety and fear-reducing effects, the researchers found. In mice that had inflammatory bowel disease, the bacterial treatment prevented stress-induced aggravation of colitis.

Together, these findings can help researchers develop microbiome- and immunoregulation-based strategies to prevent disorders related to stress, the researchers said.

7

Journal: *Journal of the American Academy of Child & Adolescent Psychiatry*—June 2016

Holly A. Swartz, M.D.

University of Pittsburgh

2006 NARSAD Young Investigator Grant

*Team included: 2006 Ruane Prizewinner and 2001 Distinguished Investigator David A. Brent, M.D.; 1998 Distinguished Investigator Ellen Frank, Ph.D.; and 2002 Independent Investigator John C. Markowitz, M.D., Pharm.D.

Next-Generation Treatments: Depression

BRIEF COURSE OF PSYCHOTHERAPY BENEFITS MOMS WITH MAJOR DEPRESSION AND THEIR CHILDREN

When mothers who suffer from major depression undergo a brief period of psychotherapy, they and their children both benefit, according to research reported this month in the *Journal of the American Academy of Child & Adolescent Psychiatry*. Children whose mothers have depression are more likely than others to develop childhood psychiatric illnesses. Researchers have found that these children do better when mothers are treated for their depression and their symptoms improve—but until now such studies had involved women whose depression was treated with medication, not psychotherapy.

The new study, led by Holly A. Swartz, M.D. and Ellen Frank, Ph.D., both at the University of Pittsburgh, investigated the impact of a brief period of psychotherapy on both mothers and children.

The study included 168 women with major depressive disorder and their children, who were between the ages of 7 and 18 and had themselves been diagnosed with mood or anxiety disorders. Mothers participated in nine 45-minute psychotherapy sessions over three months. For one group of women, this therapy was focused on the mother's relationship with her child. A second group of women underwent a more general form of therapy.

The symptoms of depression declined quickly for all of the women in the study, and three to six months after the mothers improved, their children's symptoms improved as well. This was true regardless of which form of therapy the mothers received.

Children whose mothers underwent the relationship-focused therapy, however, had fewer mental health visits and were prescribed fewer antidepressant medications during the study than children whose mothers underwent the general therapy. The relationship-focused therapy may equip mothers to help their children improve with fewer medications and psychiatric services, the researchers say.

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Journal: *American Journal of Psychiatry*—July 1, 2016 [both papers]

Tyrone D. Cannon, Ph.D.

Yale University

2006 Distinguished Investigator Grant

1997 Independent Investigator Grant

Ricardo E. Carrión, Ph.D.

Zucker Hillside Hospital Campus of the Feinstein Institute for Medical Research

2012 Young Investigator Grant

Early Intervention/Diagnostic Tools: Psychosis

NEW TOOL CALCULATES PATIENTS' PERSONAL PSYCHOSIS RISK

Most people who develop schizophrenia and other disorders involving psychosis (including some cases of bipolar disorder and depression) experience subtle changes in belief, thought, and perception that precede the onset of full psychosis. But fewer than 35 percent of people whose symptoms indicate they are at high risk actually develop full psychosis within three years of the time they are first identified by a doctor as being "at risk."

Now, clinicians can use a new risk calculator to determine the personal risk of psychosis for any individual in this high-risk group. According to the researchers who developed and tested it, their risk calculator is about as accurate as those that are now available for cardiovascular disease and cancer.

A team of scientists* led by Tyrone D. Cannon, Ph.D. at Yale University developed the risk calculator using data from 596 high-risk individuals, 16 percent of whom developed psychosis during a two-year study period. Another team of scientists led by Ricardo E. Carrión, Ph.D., at the Feinstein Institute for Medical Research, validated the risk calculator in a separate group of 210 high-risk individuals. Both studies were reported July 1 in the *American Journal of Psychiatry*.

To develop the risk calculator, Dr. Cannon and his colleagues considered a range of clinical, cognitive, and demographic risk factors for psychosis. By analyzing data from their study group, the team found that experiencing warning symptoms at a young age were the strongest indicators that a clinically high-risk individual would develop full psychosis within two years. Those warning symptoms include: having higher levels of unusual thought content and suspiciousness, as compared with others, as well as lower verbal learning and memory capacity, slower cognitive processing, and greater decline in social functioning.

The researchers incorporated these factors into the calculator, as well as a few others that they found had a smaller impact: family history of schizophrenia and the experience of stressful or traumatic events.

Dr. Carrión and his team used the calculator to assess the personal risk of another 210 individuals in the high-risk category, and found that it was able to distinguish individuals who developed psychosis from those who did not with about the same degree of accuracy as in the original study led by Dr. Cannon.

The personal risk calculator, which is available online to clinicians and researchers, will allow doctors to better communicate individual risk to patients and their families. The researchers say it will also be valuable in identifying the best candidates for clinical trials evaluating the effectiveness of interventions that aim to prevent psychosis.

*More than a dozen NARSAD grantees helped develop and validate the risk calculator. Dr. Cannon's team included: 2005 & 2003 Young Investigator Carrie E. Bearden, Ph.D.; 1999 & 1992 Young Investigator Kristin Cadenhead, M.D.; 1990 Young Investigator Robert Heinssen, Ph.D.; Scientific Council Member, 2007 Independent Investigator & 2001 Young Investigator Daniel H. Mathalon, M.D., Ph.D.; 1997 Distinguished Investigator Thomas H. McGlashan, M.D.; 2004 & 1998 Independent Investigator Larry J. Seidman, Ph.D.; Scientific Council Member, 2010 Lieber Prizewinner and 1998 Distinguished Investigator Ming T. Tsuang,M.D., Ph.D., D.Sc.; 1989 Distinguished Investigator Elaine F. Walker, Ph.D.; and 2005 Distinguished Investigator and 1998 Independent Investigator Scott W. Woods, M.D.

Dr. Carrión's team included 2004 Young Investigator Andrea Auther, Ph.D.;Scientific Council Member, 2001 Klerman Prizewinner, 2007 Distinguished Investigator, 1997 & 1994 Young Investigator, Cameron S. Carter, M.D.; 2012 Young Investigator Tara A. Niendam, Ph.D.; and 1996 Young Investigator Stephan F. Taylor, M.D.

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Journal: *American Journal of Psychiatry*—August 13, 2016

Lisa A. Pan, M.D.

University of Pittsburgh School of Medicine

2012 Young Investigator Grant

*Team included: 2006 Ruane Prizewinner and 2001 Distinguished Investigator David A. Brent, M.D.

Next-Generation Treatments: Depression

TREATING METABOLIC PROBLEMS IMPROVES SYMPTOMS OF SOME PATIENTS WITH REFRACTORY DEPRESSION

Researchers have discovered that some people who suffer from major depression may benefit from the diagnosis and treatment of metabolic deficiencies.

Metabolic deficiencies refer to abnormal levels of the byproducts of basic bodily and cellular functions, in this case as detected in the blood, plasma, urine, and cerebrospinal fluid (which circulates in the spinal cord and brain).

In a study involving 33 patients with treatment-resistant depression, reported August 13 in the *American Journal of Psychiatry*, investigators found that about two-thirds of those patients had metabolic deficiencies that affect the brain's ability to produce neurotransmitters. Patients' depression symptoms declined significantly when these metabolic problems were treated. For some individuals, depression reached remission.

A team of researchers led by Lisa A. Pan, M.D. at the University of Pittsburgh School of Medicine, undertook the study after seeing one 19-year-old man's unrelenting depression go away when he was treated for a metabolic abnormality. Pan and her colleagues wondered whether such problems might be common among depression patients.

This provided a basis for their newly reported study, in which the 33 enrollees suffered from treatment-resistant depression. All affected individuals in the study were between the ages of 14 and 40, and most had begun experiencing depressive episodes as children or adolescents. All had failed to respond to at least three different antidepressant medications. Sixteen healthy subjects were also included in the study, to serve as controls.

For each patient, the researchers analyzed samples of blood, urine, and spinal fluid. The spinal fluid samples revealed metabolic abnormalities in 21 of the 33 study participants with depression. No metabolic abnormalities were found in the healthy subjects.

The research team found several different metabolic abnormalities among the study participants with major depression. The most common was a deficiency in cerebral folate, a condition that can be treated with folinic acid. Twelve of the patients with treat-resistant depression were found to have this condition, and all those who received folinic acid treatment experienced reductions in their depression symptoms. "The remarkably high incidence of actionable abnormalities and some evidence of symptom improvement with treatment strongly support the need for larger studies," the researchers conclude.

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Journal: *Nature Neuroscience*—September, 2016

Pamela B. Sklar, M.D., Ph.D.
Icahn School of Medicine at Mount Sinai
Scientific Council Member
2016 Colvin Prizewinner
2006 Independent Investigator Grant
1998 & 1995 Young Investigator Grant

Basic Research: Schizophrenia

RESEARCHERS CATALOG SUBTLE BUT WIDESPREAD SCHIZOPHRENIA-ASSOCIATED DIFFERENCES IN GENE ACTIVITY

Researchers have identified nearly 700 genes whose activity levels differ in the brains of people with schizophrenia compared to individuals without the disorder. Most of the differences they found were subtle, consistent with the idea that variations in many genes contribute to the risk of schizophrenia, each alone having a small effect.

Many of the genes identified in the analysis fall within DNA regions that were associated with schizophrenia in a large genome-wide association study reported in 2014. Such studies look for genetic variations seen frequently across large numbers of people, both healthy people and those diagnosed with a particular illness.

The new findings, published September 26 in the journal *Nature Neuroscience*, report the largest catalogue of genetic influences on brain gene expression and begin to illuminate the biological consequences such genetic variations associated with schizophrenia. This publicly available catalogue will markedly facilitate understanding functional effects and underlying mechanisms across many brain disorders.

Major clues into the genetic origins of the schizophrenia came in 2014, when a team of scientists from the Psychiatric Genomics Consortium analyzed the DNA of more than 140,000 people, including 37,000 with the disorder. That study associated DNA variation at 108 regions in the genome to schizophrenia although it could not pinpoint specific genes.

In the new study, a team of researchers led by Pamela B. Sklar, M.D., Ph.D., took a complementary approach to understanding the origins of the disorder. Instead of comparing DNA sequences in people with and without the mental illness, the team examined in people with and without schizophrenia the activity of genes within the brain.

Their experiments compared levels of gene activity in the brains of 258 people with schizophrenia to that of 279 people without the illness, using tissue samples collected after patients' deaths. The analysis identified 693 genes whose activity was different in the two groups. The differences were subtle, consisting of gains or losses of up to about 33 percent of activity.

Notably, Dr. Sklar and her colleagues used their well-powered catalogue to identify the likely genes responsible for the associations with schizophrenia in 19 of the 108 genome locations found in the 2014 study. These genes are particularly likely to be relevant to schizophrenia's effects on brain function, the researchers say.

Dr. Sklar and her colleagues used their data to identify several genes for follow-up studies in animals. They manipulated the activity of five of the schizophrenia-linked genes in zebrafish (a "model organism" often used for genetics experiments), and found three genes whose alteration disrupted brain development. Other researchers can now extend the team's findings by further exploring genes on the list to begin teasing out the molecular basis of schizophrenia.

Dr. Jeffrey Borenstein hosts the "Meet the Scientist" webinar series where leading mental health researchers discuss and answer questions about the latest research findings in new technologies, early intervention strategies and next-generation therapies for mental illness. These popular webinars offer the general public access to some of the world's top scientists who discuss their cutting-edge research that could lead to breakthroughs to alleviate the suffering caused by mental illness. Webinars can be seen at *bbrfoundation.org/webinar*.

February 9, 2016
EARLY EMERGENCE OF DEPRESSION: UNDERSTANDING RISK FACTORS AND TREATMENT
Deanna Barch, Ph.D.
Washington University in St. Louis
Foundation Scientific Council Member
2013 Distinguished Investigator
2006 Independent Investigator
2000, 1995 Young Investigator

March 15, 2016
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David J. Miklowitz, Ph.D.
UCLA Semel Institute
2011 Colvin Prizewinner for Outstanding Achievement in Mood Disorder Research
2001 Distinguished Investigator
1987 Young Investigator

April 12, 2016
LEVERAGING NOVEL CONCEPTS OF RECEPTOR BIOLOGY TOWARD A BETTER TREATMENT FOR SCHIZOPHRENIA
Marc G. Caron, Ph.D.
Duke University Medical Center
Scientific Council Member

May 10, 2016
PRIMARY PREVENTION IN CHILD PSYCHIATRY: THE TRANSFORMATIVE POWER OF CHILDREN AND FAMILIES
James F. Leckman, M.D.
Yale University School of Medicine
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June 14, 2016
SOCIAL LEARNING IN BORDERLINE PERSONALITY DISORDER
Sarah Kathryn Fineberg, M.D., Ph.D.
Yale University
Scientific Council Member
2014 Young Investigator

July 12, 2016
LIFE ELEVATED: EXAMINING ALTITUDE-RELATED EFFECTS ON MENTAL ILLNESS
Perry F. Renshaw, M.D., Ph.D.
University of Utah
Scientific Council Member
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1996, 1993 Young Investigator

August 9, 2016
AUTISM: UNDERSTANDING THE CAUSES AND DEVELOPING EFFECTIVE TREATMENTS
Jacqueline N. Crawley, Ph.D.
University of California Davis School of Medicine, Sacramento
Scientific Council Member

September 13, 2016
LIVING WELL WITH ADHD: SCIENTIFIC GUIDEPOSTS TO IMPROVED OUTCOMES
F. Xavier Castellanos, M.D.
NYU Child Study Center
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2005 Distinguished Investigator

October 18, 2016
A BEAUTIFUL MIND: JOHN NASH, SCHIZOPHRENIA, GAME THEORY AND RECOVERY FROM SCHIZOPHRENIA WITH AND WITHOUT MEDICATION
Herbert Y. Meltzer, M.D.
Northwestern University Feinberg School of Medicine
Scientific Council Member
2007, 2000, 1994 & 1998 Distinguished Investigator
1992 Lieber Prizewinner for Outstanding Achievement in Schizophrenia Research

November 8, 2016
COULD WE SOMEDAY PREVENT SCHIZOPHRENIA LIKE WE PREVENT CLEFT PALATE?
Robert R. Freedman, M.D.
University of Colorado School of Medicine
Foundation Scientific Council Member
2015 Lieber Prizewinner for Outstanding Achievement in Schizophrenia Research
1999, 2006 Distinguished Investigator

December 13, 2016
NEUROINFLAMMATORY HYPOTHESES OF DEPRESSION
Yvette I. Sheline, M.D.
University of Pennsylvania Perelman School of Medicine
Foundation Scientific Council Member
2005, 2002 Independent Investigator
1998 Young Investigator

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Led by **Dr. Herbert Pardes**, the founding President of our Scientific Council, the all-volunteer group of pre-eminent mental health researchers review more than 1,200 Grant applications each year and select the most promising research ideas with the greatest potential to lead to breakthroughs.

The Scientific Council guides the Foundation to fund creative and impactful research relevant to the whole spectrum of mental health. We welcome our newest members.

Deanna M. Barch, Ph.D. is the Gregory B. Couch Professor of Psychiatry and the Chair of the Department of Psychological & Brain Sciences at *Washington University* in Saint Louis, MO. She was the Editor of *Cognitive, Affective and Behavioral Neuroscience*, is currently Deputy Editor at Biological Psychiatry and is on the Editorial Boards of *Schizophrenia Bulletin*, *Current Directions in Psychological Science*, *Journal of Abnormal Psychology*, and *Clinical Psychological Science*. Dr. Barch is immediate past President of the Society for Research in Psychopathology, is on the DSM-V Revision Committee, is on the Steering committee for the NIMH Research Domain Criteria initiative, and is a member of the NIMH Scientific Council. Her research is focused on understanding the interplay among cognition, emotion, and brain function to better understand the deficits in behavior and cognition found in illnesses such as schizophrenia and depression. She uses functional MRI, structural MRI, and cognitive neuroscience methods to examine neural basis of disturbances in cognitive control and emotional processing in individuals with schizophrenia and those at risk for the development of schizophrenia, as well as in individuals with mood disorders.

- 2013 Distinguished Investigator
- 2006 Independent Investigator
- 2000 & 1995 Young Investigator

Hilary Blumberg, M.D. is the John and Hope Furth Professor of Psychiatric Neuroscience, Professor of Psychiatry, Diagnostic Radiology and in the Child Center, and Director of the Mood Disorders Research Program, at the Yale School of Medicine. Her research is devoted to understanding brain circuitry differences that underlie mood disorders and the associated high risk of suicide, and circuitry changes in mood disorders across the lifespan. She brings together a multi-disciplinary group of scientists to study the genetic, developmental and environmental factors that cause mood disorders to develop new methods for early detection, more effective interventions, and prevention. Dr. Blumberg studied neuroscience as an undergraduate at Harvard University and completed her medical degree, psychiatry training and specialty training in neuroimaging at Cornell University Medical College prior to joining the Yale faculty in 1998.

- 2006 Klerman Prize for Exceptional Clinical Research by a Young Investigator
- 2006 Independent Investigator
- 2002 Young Investigator

William Carlezon, Ph.D. is Professor of Psychiatry at the Behavioral Genetics Lab at *McLean Hospital* and also serves as chief of McLean's Division of Basic Neuroscience and a professor of psychiatry at Harvard Medical School. Dr. Carlezon is known for his work on the neurobiology of depression and addiction. His lab has been at the forefront of studying the role of dynorphin, the endogenous opioid, and its brain receptor (kappa-opioid receptors) in motivation and emotion. He is currently editor-in-chief of Neuropsychopharmacology. Dr. Carlezon has received several awards for his research, including the Presidential Early Career Award for Scientists and Engineers from George W. Bush, the Jacob P. Waletzky Award for Innovative Research in Drug Addiction and Alcoholism from the Society for Neuroscience, and the Daniel H. Efron Award from the *American College of Neuropsychopharmacology*.

- 2007 & 2005 Independent Investigator
- 1999 Young Investigator

Rui M. Costa, Ph.D. is a Principal Investigator of the Neurobiology of *Action Laboratory at Champalimaud Research* (CR) in Portugal. Dr. Costa received his D.V.M. from the Technical University of Lisbon in 1996. He entered the GABBA graduate program from University of Porto in 1997, and performed his Ph.D. studies at UCLA from 1998 to 2002 followed by postdoctoral work at Duke University. Dr. Costa became a Section Chief at the National Institutes of Health in 2006 and in 2009 became an Investigator of the Champalimaud Neuroscience Program. He is the President of the American-Portuguese Biomedical Research Fund and Vice-President of the Portuguese Society for Neuroscience. His laboratory studies the neurobiology of action in health and disease. To study actions is to study the way we do things, which is different than studying how to remember stimuli, or facts and events. Some actions are innate or prewired (such as swallowing or breathing), but most are learned anew throughout life, likely through a process of trial and feedback. Dr. Costa's laboratory uses genetic, electrophysiological, optical, and behavioral approaches to investigate the mechanisms underlying the generation and learning of novel actions.

Dilip Jeste, M.D. is the Associate Dean for Healthy Aging and Senior Care, the Estelle and Edgar Levi Chair in Aging, the Distinguished Chair of Psychiatry and Neurosciences, and the Director, Sam and Rose Stein Institute for Research on Aging at the *University of California San Diego*. Dr. Jeste is a geriatric neuropsychiatrist, who specializes in successful aging, neurobiology of wisdom as well as schizophrenia and other psychotic disorders in older adults. He is the Senior Associate Dean for Healthy Aging and Senior Care at the University of California, San Diego. He has published over 600 articles in peer-reviewed journals and 12 books, including *Successful Cognitive and Emotional Aging* (2009), *Prevention in Mental Health* (2011), and *Positive Psychiatry* (2015). He was listed in "The Best Doctors in America" and in the Institute for Scientific Information's list of the "world's most cited authors." His work has been featured in *The New York Times*, *The Washington Post*, *The Wall Street Journal*, *The Atlantic Monthly*, *Time*, National Public Radio, PBS, Public Radio International, *London Times*, and the Colbert Report, among others. Dr. Jeste obtained his medical education in Pune and Mumbai, India. In the USA, he completed psychiatry residency at Cornell University, and Neurology residency at George Washington University. He was a researcher at National Institute of Mental Health before joining UCSD. He is a member of several prestigious professional organizations, including the Institute of Medicine. He also serves as the Editor-in-Chief of the *American Journal of Geriatric Psychiatry*.

- 2002 Distinguished Investigator

Ned H. Kalin, M.D., is Chairman of the Department of Psychiatry at the *University of Wisconsin-Madison*, where he is the Director of the Health Emotions Research Institute and Lane Neuroimaging Laboratory. He has made significant advances in uncovering basic brain and molecular mechanisms that cause children to be vulnerable to develop anxiety and depressive disorders. He serves as the principal investigator for several ongoing NIH funded research projects and has published widely on the adaptive and maladaptive expression of emotion and anxiety. He is Co-Editor of the *Journal of Psychoneuroendocrinology*. In addition to his research activities, he treats patients who suffer from anxiety and depression who are refractory to standard treatment. Dr. Kalin is board certified by the American Board of Psychiatry and Neurology. He has been recognized for numerous awards including, most recently, being elected to the National Academy of Medicine and becoming a Distinguished Fellow of the American Psychiatric Association.

Dan Mathalon, Ph.D., M.D. is co-director of the Brain Imaging and EEG Laboratory at *University of California, San Francisco (UCSF).* He also directs the Early Psychosis Program at UCSF, overseeing research and treatment of patients who are in the early phases of psychosis or who are exhibiting prodromal symptoms indicative of increased clinical risk for psychosis. Dr. Mathalon received his B.A. from UC Berkeley and his Ph.D. in Clinical Psychology from Indiana University. He subsequently obtained his M.D. from Stanford University, where he also completed his psychiatric residency training and a research fellowship in psychophysiology. In 2000, Dr. Mathalon joined the faculty of the Department of Psychiatry at Yale University. In 2007, he moved to San Francisco, establishing the Brain Imaging and EEG Laboratory at UCSF. Dr. Mathalon has extensive expertise in electroencephalographic (EEG) and functional magnetic resonance imaging (fMRI) methods, and he has used these methods to study the temporal and anatomical organization of functional brain activity underlying sensory, perceptual, and cognitive processes and their dysfunction in neuropsychiatric disorders. Much of his prior research has focused on studying the pathophysiological mechanisms underlying the symptoms and course of schizophrenia, and a major focus of his current research is on the prodromal period preceding the onset of psychosis. Ultimately, his work aims to use neurophysiological biomarkers to enhance the accuracy of psychosis risk prediction, providing a stronger justification for early interventions with individuals at clinical high risk for psychosis.

- 2007 Independent Investigator
- 2001 Young Investigator

Mary L. Philips, M.D. is the Pittsburgh Foundation-Emmerling Endowed Chair in Psychotic Disorders, and Professor in Psychiatry and Clinical and Translational Science at the *University of Pittsburgh*. In addition, she heads the Clinical and Translational Affective Neuroscience Program in the Department of Psychiatry. Dr. Phillips' research focuses on using multimodal neuroimaging techniques to elucidate functional and structural abnormalities in emotion processing, reward processing and emotional regulation circuitries that are associated with specific psychiatric disorders and symptom dimensions, in individuals with mood and anxiety disorders. Her research also focuses on identifying the neurodevelopmental trajectories in these circuitries that are associated with the development of such disorders in youth, and the extent to which these neuroimaging techniques can identify biomarkers reflecting underlying pathophysiologic processes that denote future risk for these disorders in as yet unaffected youth. She works in collaboration with basic neuroscientists in translational studies of neural circuitry abnormalities in these disorders.

- 2005 Independent Investigator

Kay Tye, Ph.D. is an Assistant Professor of Neuroscience at The Picower Institute for Learning and Memory in the Department of Brain and Cognitive Sciences at the *Massachusetts Institute of Technology.* Dr. Tye ultimately seeks to crack the neural code of anxiety and gain new insight towards effectively treating these disorders. Dr. Tye's research focuses on understanding the neural circuits important for processing positive and negative emotional valence and how this gives rise to motivated behaviors. Dr. Tye received her bachelor's degree in Brain and Cognitive Sciences from MIT in 2003 and earned her Ph.D. in 2008 at the University of California, San Francisco. Her thesis work was supported by the National Science Foundation and recognized with the Lindsley Prize in Behavioral Neuroscience as well as the Weintraub Award in Biosciences. She completed her postdoctoral training with fellow Council member, Dr. Karl Deisseroth at Stanford University in 2011, with support from an NRSA from NIMH. She has been recognized with the NIH Director's New Innovator Award, Technology Review's Top 35 Innovators under 35, and has been named a Whitehall, Klingenstein and Sloan Foundation Fellow.

- 2016 Freedman Prize for Exceptional Basic Research by a Young Investigator
- 2013 Young Investigator

Marina Wolf, Ph.D. is Professor and Chair of the Department of Neuroscience at the *Chicago Medical School of Rosalind Franklin University of Medicine and Science*. She has been a pioneer in studying the role of neuronal plasticity in drug addiction. Dr. Wolf received her Ph.D. in Pharmacology in 1986 from Yale University. From 1987-1990, she trained as a Postdoctoral Fellow at the Center for Cell Biology at Sinai Hospital of Detroit. After completing her postdoctoral training, Dr. Wolf was Assistant Professor of Psychiatry at Wayne State University until moving in 1992 to the Chicago Medical School. Dr. Wolf has served as a member of the NIDA Advisory Council and the NIH Council of Councils. She presently serves as Chair of a National Institute of Health study section, as well as on the National Institute of Drug Abuse Board of Scientific Counselors and the Council of the American *College of Neuropsychopharmacology.*

- 2006 Distinguished Investigator
- 1999 Independent Investigator
- 1990 Young Investigator

BY THE NUMBERS SINCE 1987

As of December 2016

AWARDED TO SCIENTISTS

$360+ MILLION

GRANTS

5,000+

The breakdown of our grantees since 1987

4,086 Young Investigators
788 Independent Investigators
409 Distinguished Investigators

UNIVERSITIES & MEDICAL CENTERS

541

COUNTRIES, INCLUDING THE U.S.

35

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The all-volunteer *Foundation Scientific Council* is composed of 168 leading experts across disciplines in brain & behavior research who review grant applications and recommend the most promising ideas to fund.

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26 Chairs of Psychiatry & Neuroscience Departments
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2 Nobel Prize Winners

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SINCE 1987, THE FOUNDATION HAS AWARDED MORE THAN $360 MILLION TO FUND MORE THAN 5,000 GRANTS TO MORE THAN 4,000 LEADING SCIENTISTS AROUND THE WORLD.

Our Grants support a broad range of the best ideas in brain research. Funding is focused on four priority areas to better understand and treat mental illness:

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.

DIAGNOSTIC TOOLS/EARLY INTERVENTION
To recognize early signs of mental illness and treat as early as possible.

NEXT GENERATION THERAPIES
To reduce symptoms of mental illness and retrain the brain.

DISTINGUISHED INVESTIGATOR GRANTS
- Initiated in 1988.
- Enable outstanding scientists to pursue new, cutting edge ideas with the greatest potential for breakthroughs.
- $100,000 for one year.
- More than $39 million funded.

INDEPENDENT INVESTIGATOR GRANTS
- Initiated in 1995.
- Support mid-career scientists during the critical period between initiation of research and receipt of sustained funding.
- Up to $100,000 for two years.
- More than $77 million funded.

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.
- Up to $70,000 for two years.
- More than $243 million funded.

In 1987 the Foundation awarded $250,000 in Young Investigator Grants to its first 10 early career scientists at $25,000 each to fund their promising research ideas.

Foundation grant recipients have gone on to receive more than $3.5 billion in additional research funding in next stage NIMH and NIH grants.

No other organization outside of the federal government has funded the number of mental health research grants that the Foundation has—or been responsible for more breakthroughs in the field.

An independent measure of the success of our grants is in a recent RAND Europe analysis of the global mental health research funding landscape over the past five years. This report found that we are the top non-government mental health research funder mentioned in published articles.

DISTINGUISHED INVESTIGATORS

152 Applications | 15 Grants | $1,500,000 Awarded

The Distinguished Investigator Grants provide support for experienced investigators (full professor or equivalent) conducting neurobiological and behavioral research. One-year grants of $100,000 each are provided for established scientists pursuing particularly innovative project ideas.

Distinguished Investigator Grants fund talented, established scientists with a record of outstanding research accomplishments. These research projects might provide new approaches to understanding or treating severe mental illness. If successful, the grants could result in later funding from other sources. These grants are among the most competitive in mental health research and demonstrate the power investigator-initiated research for bringing out new and creative ideas.

"The Brain & Behavior Research Foundation's Grants are remarkable because they serve as seed capital for new approaches that might otherwise go unfunded. This year, we received a large number of outstanding proposals with the potential to inform several illnesses, reveal new neurobiological or behavioral targets for potential treatment, explore exciting new basic science, pursue translational scholarship and multidisciplinary collaborations, and conduct new early treatment trials that center on new approaches or ways to combine treatment."

JACK D. BARCHAS, M.D.

Chair, Distinguished Investigator Selection Committee

Founding Member of the Foundation's Scientific Council

Chair and Barklie McKee Henry Professor of Psychiatry
Weill Cornell Medical College

Psychiatrist-in-Chief
Weill Cornell Medical Center, NewYork-Presbyterian Hospital and *Payne Whitney Clinic*

INDEPENDENT INVESTIGATORS

326 Applications | 40 Grants | $3,900,000 Funded

Ground-breaking scientists already proven in their field receive the Independent Investigator Grant. These scientists seek to produce experimental results that will put them in a position to initiate major research programs. This support comes at the critical middle period in the investigators' careers–the phase between the initiation of research and the receipt of sustained funding. With proven success as highly productive scientists, they seek to make clinically relevant advances in the study and treatment of a range of brain and behavior disorders.

Independent Investigator Grants provide each scientist with $50,000 per year for up to two years to support their work during the critical period between the start of the research and the receipt of sustained funding.

This year's 40 Independent Investigator grantees represent an exciting group of basic and clinical proposals which should make major contributions to the better understanding and treatment of serious psychiatric illness. 326 grants were reviewed by 60 members of the Scientific Council.

"The Independent Investigator Grants provide outstanding basic and clinical scientists with unique opportunities to conduct important, novel, and clinically relevant studies. These studies are not being funded through the traditional NIMH mechanisms because of a shortage of money, and in some cases risk aversion. I believe that many of these grants will help open new vistas in treating major psychiatric illnesses and understanding them better. The Foundation has been heroic in raising the funds for so many extraordinary grants each year, so it is gratifying for me and an honor to help distribute these funds in the best way possible."

ROBERT M. POST, M.D., PH.D.

Chair, Independent Investigator Selection Committee Foundation

Scientific Council Member

Head, Bipolar Collaborative Network

Professor of Psychiatry
George Washington School of Medicine

YOUNG INVESTIGATORS

761 Applications | 198 Grants | $13,700,000 Funded

Young Investigator Grants cover a broad spectrum of mental illnesses and serve as catalysts for additional funding, providing researchers with "proof of concept" for their work. The Foundation awarded a total of $13.7 million to its 2016 Young Investigators, strengthening its investment in the most promising ideas to lead advancements in understanding and treating brain and behavior disorders.

Young Investigator Grants provide each scientist with $35,000 per year for two years totaling $70,000 to enable promising investigators to either extend research fellowship training or begin careers as independent research faculty.

"Young Investigator Grants have led to groundbreaking and important new research that has improved the lives of people living with mental illness, through enhanced treatments and therapies, and a better understanding of the causes of mental illness. These early career scientists are making great strides in basic research, new technologies, next generation therapies and early intervention techniques. This is the kind of out of the box research that will offer the best hope for change."

—Herbert Pardes, M.D.
President of the Scientific Council
Executive Vice Chairman of the Board of Trustees, NewYork-Presbyterian Hospital

JUDY M. FORD, PH.D.

Co-Chair of the Young Investigator Grant Selection Committee

Foundation Scientific Council Member

2003 Independent Investigator

Professor, Department of Psychiatry
University of California, San Francisco

SUZANNE N. HABER, PH.D.

Co-Chair of the Young Investigator Grant Selection Committee

Foundation Scientific Council Member

2011 Distinguished Investigator

Professor, Department of Pharmacology and Physiology
University of Rochester Medical Center

2016 GRANTS BY ILLNESS

ADDICTION

Foundation grantees are among the pioneers in understanding addiction's roots in biology–how the brain's reward circuitry is modified by exposure to addictive substances, and how risk of becoming addicted varies among individuals, partly as a function of biological differences.

Long-lasting cocaine-induced changes in neural network function and behaviors have been shown by grantees to change patterns of gene expression, as well as patterns of epigenetic regulation of genes. Gene products and epigenetic marks are therefore potential targets for future treatments.

Rigorous study by grantees of the long-term effects of marijuana on the brain have identified changes in grey matter volume and connectivity in white matter; launched pioneering studies of the danger of heavy or chronic marijuana use by young people at risk of psychosis; and studies of how the brain changes following cessation of addictive drug use. Grantees have studied the causes of nicotine addiction among people with schizophrenia.

Adolescent alcohol misuse has been associated by grantees with a variety of brain structure and function anomalies, e.g., loss of frontal cortex neurons and disruptions in hippocampal plasticity.

One grantee is using imaging in a longitudinal study to compare the brains of identical twins who differ on alcohol use/abuse, to discover whether brain anomalies are the cause or consequence of alcohol abuse. A grantee is now studying the efficacy of ketamine in specifically treating depression among individuals with a family history of alcohol abuse. Another grant seeks to improve treatment of veterans who consume alcohol at hazardous levels.

Rachel Alison Adcock, M.D., Ph.D.
Duke University
Independent Investigator Grant–Next Generation Therapies

Pinar Ayata, Ph.D.
Icahn School of Medicine at Mount Sinai
Young Investigator Grant–Basic Research

Paul Leon Brown, Ph.D.
University of Maryland
Young Investigator Grant–Basic Research

Silvia De Santis, Ph.D.
Cardiff University, UK
Young Investigator Grant–New Technologies

Maged Harraz, Ph.D.
Johns Hopkins University
Young Investigator Grant–Basic Research

Anna B. Konova, Ph.D.
New York University
Young Investigator Grant–Basic Research

Vivek Kumar, Ph.D.
The Jackson Laboratory
Young Investigator Grant–Basic Research

Yao-Ying Ma, M.d., Ph.D.
State University of New York, Binghamton
Young Investigator Grant–Basic Research

Mary-Louise Risher, Ph.D.
Duke University Medical Center
Young Investigator Grant–Basic Research

Dorothy Jean Yamamoto, Ph.D.
University of Colorado, Denver
Young Investigator Grant–Basic Research

Yingjie Zhu, Ph.D.
Stanford University
Young Investigator Grant–Basic Research

ANXIETY

Discoveries by Foundation grantees have demonstrated that the brain is much more resilient–"plastic"–than once believed, an important ray of hope for those living with anxiety disorders.

Grantee research has revealed what happens when stress, both traumatic and chronic, affects an individual at different times in life.

Early in life the brain is most plastic, but also most vulnerable. Stress can cause shrinkage in the hippocampus region, though the impact is not necessarily permanent, in part due to another breakthrough discovery by grantees, of the birth of new neurons in the hippocampus throughout the lifespan, a process called neurogenesis.

Anxiety disorders in young people have been a strong focus of grantee research. Grantees have helped prove the efficacy and safety of SSRI antidepressants in treating pediatric anxiety.

Grantees are now testing cutting-edge treatments in mice using gut bacteria to boost immune system and prevent abnormal sensitivity to stress, and hence development of anxiety symptoms.

Thackery Ian Brown, Ph.D.
Stanford University
Young Investigator Grant–Basic Research

Bridget Laura Callaghan, Ph.D.
Columbia University
Young Investigator Grant–Basic Research

Yoon-Hee Cha, M.D.
Laureate Institute for Brain Research
Young Investigator Grant–Next Generation Therapies

Johannes Gräff, Ph.D.
EPFL-École Polytechnique Fédérale de Lausanne, Switzerland
Independent Investigator Grant–Basic Research

Andrew Tapper, Ph.D.
University of Massachusetts
Independent Investigator Grant–Basic Research

ATTENTION–DEFICIT HYPERACTIVITY DISORDER (ADHD)

BBRF grantees led a historic longitudinal study following over 200 children with ADHD over more than 30 years, revealing adverse outcomes later in life of youth whose attention and conduct disorders are not recognized and treated.

Grantees helped to establish safety and treatment guidelines for the prescription of stimulants to treat ADHD. Grantees played an important role in the Multi-modal Treatment Study, the most comprehensive study to date of treatments for ADHD, which showed the superior effectiveness of medication combined with talk therapy versus either treatment alone.

Recently a grantee discovered that people diagnosed with ADHD as adults are rarely among those diagnosed during childhood, leading to new research aimed at distinguishing differences in the childhood and adult forms of the disorder.

Other funded research is pursuing genetic clues and evidence of strong biological and clinical overlap with other brain disorders that first show in childhood, such as autistic spectrum disorder, communication and learning difficulties.

Gustavo Adolfo Angarita, M.D.
Yale University
Young Investigator Grant–Next Generation Therapies

Jessica A. Church-Lang, Ph.D.
University of Texas, Austin
Young Investigator Grant–Basic Research

Pamela K. Douglas-Gutman, Ph.D.
University of California, Los Angeles
Young Investigator Grant–Basic Research

Yuwen Hung, Ph.D.
Massachusetts Institute of Technology
Young Investigator Grant–Basic Research

Matthew Lovett-Barron, Ph.D.
Stanford University
Young Investigator Grant–Basic Research

Kristina A. Neely, Ph.D.
Pennsylvania State University,
Young Investigator Grant–Basic Research

AUTISM

Foundation grantees have been prominent in the genetic analysis of autism and Autism Spectrum Disorder (ASD).

A recent landmark study identified over 300 rare, non-inherited gene mutations that play a major causative role in a subset of patients. Other analyses of much larger patient populations have attempted to identify commonly occurring mutations contributing to autism risk. Of genes implicated to date, some of the strongest candidates affect synapse formation and gene expression in the developing brain.

Other grantees, looking at brain anomalies in autism, have found significant overabundance of synapses in postmortem brains of young people diagnosed with autism. Pruning of synapses is a key event very early in life.

Children with ASD often start their lives with delayed language development; grantees have found a link between language development in affected children and the activity of certain brain regions. Brain scans and skills testing could help predict an autistic child's language development.

Other grantees have pioneered iPSC (induced pluripotent stem cell) technology, which has enabled the reprograming of skin cells sampled from autism patients. The cells redevelop as neurons, making possible a range of novel experiments showing what may be the earliest autism-related pathologies in nerve cells as the brain develops.

Also at the leading edge are grantees using the gene-editing tool CRISPR to modify genomes of cells to recreate copy number variations thought to contribute to or cause ASD; in separate studies, these cells can be transplanted in animals to observe impact on brain and nervous system development as well as behavior during adolescence and adulthood.

Anahita Amiri, Ph.D.
Yale University
Young Investigator Grant–Basic Research

Laura Christiana Andreae, Ph.D.
King's College London, UK
Young Investigator Grant–Basic Research

Abhishek Banerjee, Ph.D.
University Hospital Zurich, Switzerland
Young Investigator Grant–Basic Research

Helen S. Bateup, Ph.D.
University of California, Berkeley
Young Investigator Grant–Basic Research

Maria Chahrour, Ph.D.
University of Texas-Southwestern Medical Center at Dallas
Young Investigator Grant–Basic Research

Robert Wayne Emerson, Ph.D.
University of North Carolina, Chapel Hill
Young Investigator Grant–Diagnostic Tools/ Early Intervention

Peter Gregory Enticott, Ph.D.
Deakin University, Australia
Independent Investigator Grant–Next Generation Therapies

Harrison Wren Gabel, Ph.D.
Washington University
Young Investigator Grant–Basic Research

Christos G. Gkogkas, Ph.D.
University of Edinburgh, UK
Young Investigator Grant–New Technologies

Rocco George Gogliotti, Ph.D.
Vanderbilt University
Young Investigator Grant–Basic Research

Elizabeth Heron, Ph.D.
Trinity College Dublin, Ireland
Young Investigator Grant–Basic Research

Bruce e. Herring, Ph.D.
University of Southern California
Young Investigator Grant–Basic Research

Zhitao Hu, Ph.D.
University of Queensland, Australia
Young Investigator Grant–Basic Research

Michele Nerissa Insanally, Ph.D.
New York University
Young Investigator Grant–Basic Research

Matthew Daniel Lerner, Ph.D.
Stony Brook University School of Medicine
Young Investigator Grant–Basic Research

April Robyn Levin, M.D.
Children's Hospital in Boston
Young Investigator Grant–Diagnostic Tools/ Early Intervention

Harold Duncan Macgillavry, Ph.D.
Utrecht University, Netherlands
Young Investigator Grant–Basic Research

Jessica Mariani, Ph.D.
Yale University
Young Investigator Grant–Basic Research

Ligia Assumpcao Papale, Ph.D.
University of Wisconsin, Madison
Young Investigator Grant–Basic Research

Tiziano Pramparo, Ph.D.
University of California, San Diego
Young Investigator Grant–Diagnostic Tools/ Early Intervention

Zhenghan Qi, Ph.D.
Massachusetts Institute of Technology
Young Investigator Grant–Basic Research

Maximiliano Rapanelli, Ph.D.
Yale University
Young Investigator Grant–Basic Research

Krishanu Saha, Ph.D.
University of Wisconsin, Madison
Young Investigator Grant–New Technologies

Dorothy Schafer, Ph.D.
University of Massachusetts Medical School
Young Investigator Grant–Basic Research

Lukas Ian Schmitt, Ph.D.
New York University
Young Investigator Grant–Basic Research

Oleksandr (Alex) Shcheglovitov, Ph.D.
University of Utah
Young Investigator Grant–Basic Research

Stephen Edward Paucha Smith, Ph.D.
Seattle Children's Research Institute
Young Investigator Grant–Basic Research

Hume Akahori Stroud, Ph.D.
Harvard Medical School
Young Investigator Grant–Basic Research

Meagan Ruth Talbott, Ph.D.
University of California Davis Medical Center
Young Investigator Grant–Next Generation Therapies

Yesser Hadj Belgacem Tellier, Ph.D.
University of California, Davis
Young Investigator Grant–Basic Research

Ying Yang, Ph.D.
Stanford University
Young Investigator Grant–New Technologies

BIPOLAR DISORDER

Foundation Grantees have studied genetic liabilities in people with bipolar disorder, most closely in families that have been affected over multiple generations. Recently funded grantees have aimed to discover early neural system markers that will make it possible to differentiate bipolar disorder from schizophrenia; are investigating immunological abnormalities that may contribute to the mania and mood fluctuations characteristic of bipolar disorder; are studying the effects of bright light therapy to treat bipolar depression; evaluating how DNA oxidative damage can modify DNA methylation patterns in bipolar disorder and how that changes gene expression patterns; leveraging fMRI imaging studies showing that adults with bipolar disorder have altered neural activity and connectivity compared to healthy controls to compare brain-behavioral alterations in youths with bipolar disorder to those in adults with the illness; and are using advanced imaging to find underlying molecular and neural mechanisms that might allow early diagnosis, including identifying the biological hallmarks of hypomania–a weak form of mania that often precedes a first episode of full mania.

A recent grantee discovered the breast cancer drug tamoxifen can greatly reduce manic symptoms in bipolar disorder.

Grantees have performed some of the early demonstrations that the rapid-acting antidepressant ketamine can resolve treatment-resistant bipolar depression.

A recent grantee demonstrated that lithium use is linked to lower incidence of dementia is older people with bipolar disorder.

Ana Cristina Andreazza, Ph.D.
Centre for Addiction and Mental Health, *University of Toronto*, Canada
Independent Investigator Grant–Basic Research

Benedikt Lorenz Amann, M.D., Ph.D.
FIDMAG Research Foundation (Fundació per a la Investigació I la Docència Maria Angustias Giménez), Spain
Independent Investigator Grant–Next Generation Therapies

Alessandro Colasanti, M.D., Ph.D.
King's College London, UK
Young Investigator Grant–Basic Research

Peter L. Franzen, Ph.D.
University of Pittsburgh
Independent Investigator Grant–Next Generation Therapies

Keming Gao, M.d., Ph.D.
Case Western Reserve University
Independent Investigator Grant–Next Generation Therapies

Jasmin Lalonde, Ph.D.
Massachusetts General Hospital and Harvard University
Young Investigator Grant–Basic Research

Roel A. Ophoff, Ph.D.
University of California, Los Angeles
Distinguished Investigator Grant–Basic Research

Sergi Papiol, Ph.D.
Ludwig-Maximilians University, Munich, Germany
Young Investigator Grant–Diagnostic Tools/ Early Intervention

Manpreet Kaur Singh, M.D.
Stanford University
Independent Investigator Grant–Basic Research

Rupali Srivastava, Ph.D.
Johns Hopkins University
Young Investigator Grant–Basic Research

Laura Stertz, Ph.D.
University of Texas Health Science Center, Houston
Young Investigator Grant–Basic Research

Jun-Feng Wang, M.D., Ph.D.
University of Manitoba, Canada
Independent Investigator Grant–Basic Research

DEPRESSION

Foundation Scientific Council Members helped establish the prevalence and recurrent nature of depression, and Foundation grants have helped bring new treatments to patients, beginning with the validation of Interpersonal Psychotherapy (IPT).

A grantee developed and validated transcranial magnetic stimulation (TMS) for treatment of treatment-resistant depression, approved by the FDA in 2008. Another grantee has pioneered deep brain stimulations (DBS) for treatment of refractory depression.

Grantees were involved in a historic longitudinal study establishing the negative impact of depression in mothers on children's mental health, as well as on the greater risk of depression in women over the lifespan.

Grantees have sought new ways of recognizing and treating perinatal and perimenopausal depression. Grants helped make possible the discovery that thinning of the brain's right hemisphere correlates with elevated depression risk and supported the demonstration that reducing serotonin 1A receptors can sensitize SSRI non-responders to respond to these medications.

Grantees led the famous Great Smoky Mountain Study, establishing a link between low birthweight and post-puberty depression; led pathbreaking research into the identification of ketamine as a rapidly acting antidepressant, and are now leading trials demonstrating its utility in specific care contexts and patient subgroups.

Recently grantees identified a ketamine metabolite as a possibly safer substitute for the drug. A grantee demonstrated the effectiveness of brief course of psychotherapy in helping mothers with major depression, and leading to better mental health outcomes in their children. The ability to relieve refractory depression in patients with metabolic disorders has now been identified by grantees, via analysis of cerebrospinal fluid.

A grantee has established the efficacy of combined drug treatment in alleviating geriatric depression. Several grantees have studied the efficacy of omega-3 supplements in relieving depression, particularly in people with elevated levels of bodily inflammation.

A grantee recently has used PET imaging to identify brain activity that may predict whether patients with MDD will respond better to antidepressant drugs or psychotherapy.

Aaron Samuel Andalman, Ph.D.
Stanford University
Young Investigator Grant–Basic Research

Jay M. Baraban, M.D., Ph.D.
Johns Hopkins University School of Medicine
Distinguished Investigator Grant–Basic Research

Olivier Berton, Ph.D.
Icahn School of Medicine at Mount Sinai
Independent Investigator Grant–Next Generation Therapies

Clémentine Bosch-Bouju, Ph.D.
Universite Bordeaux II, France
Young Investigator Grant–Next Generation Therapies

Ki Sueng Choi, Ph.D.
Emory University
Young Investigator Grant–Diagnostic Tools/ Early Intervention

Ipek Yalcin Christmann, Ph.D., Pharm.D.
Centre National de la Recherche Scientifique (CNRS), *University Pierre & Marie Curie*, France
Young Investigator Grant–Basic Research

Christine Delorenzo, Ph.D.
Stony Brook University School of Medicine
Independent Investigator Grant–Basic Research

Kirsten A. Donald, M.D.
University of Cape Town, South Africa
Independent Investigator Grant–Basic Research

Vincent P. Ferrera, Ph.D.
Columbia University
Independent Investigator Grant–New Technologies

Sjoerd Jehannes Finnema, Ph.D., Pharm.D.
Yale University
Young Investigator Grant–Next Generation Therapies

Nils Christian Gassen, Ph.D.
Max-Planck Institute for Psychiatry, Germany
Young Investigator Grant–Basic Research

Albert Giralt, Ph.D.
French Institute of Health and Medical Research (INSERM), France
Young Investigator Grant–Basic Research

Ye Han, Ph.D.
Northwestern University
Young Investigator Grant–Next Generation Therapies

Xuejun Hao, Ph.D.
Columbia University
Young Investigator Grant–Diagnostic Tools/ Early Intervention

Elizabeth A. Heller, Ph.D.
University of Pennsylvania
Young Investigator Grant–Basic Research

Georgia Eve Hodes, Ph.D.
Icahn School of Medicine at Mount Sinai
Young Investigator Grant–Basic Research

Carrie Holmberg, M.D., Ph.D.
Stanford University
Young Investigator Grant–Basic Research

Paul Holtzheimer, M.D.
Dartmouth-Hitchcock Medical Center
Independent Investigator Grant–Next Generation Therapies

Hee-Dae Kim, Ph.D.
University of Arizona
Young Investigator Grant–New Technologies

Mary Claire Kimmel, M.D.
University of North Carolina at Chapel Hill
Young Investigator Grant–Basic Research

Brent Michael Kious, M.D., Ph.D.
University of Utah
Young Investigator Grant–Next Generation Therapies

Maria Lindskog, Ph.D.
Karolinska Institute, Sweden
Independent Investigator Grant–Next Generation Therapies

Jie Liu, Ph.D.
Columbia University
Young Investigator Grant–Basic Research

Jenna Ann Mchenry, Ph.D.
University of North Carolina at Chapel Hill
Young Investigator Grant–Basic Research

Caroline Menard, Ph.D.
Icahn School of Medicine at Mount Sinai
Young Investigator Grant–Basic Research

Janitza Liz Montalvo-Ortiz, Ph.D.
Yale University
Young Investigator Grant–Basic Research

David Elliot Moorman, Ph.D.
University of Massachusetts Medical School
Young Investigator Grant–Basic Research

Sho Moriguchi, M.D.
University of Toronto, Canada
Young Investigator Grant–Next Generation Therapies

Peter Nageleå, M.D.
Washington University, St. Louis
Independent Investigator Grant–Next Generation Therapies

Alexander R. Nectow, Ph.D.
Princeton University
Young Investigator Grant–Basic Research

Yuliya Nikolova, Ph.D.
Centre for Addiction and Mental Health, *University of Toronto*, Canada
Young Investigator Grant–Basic Research

Desmond Jay Oathes, Ph.D.
University of Pennsylvania
Young Investigator Grant–
Next Generation Therapies

Jocelien Danielle Attalie Olivier, Ph.D.
University of Groningen, Netherlands
Young Investigator Grant–Basic Research

Bin Pan, M.d., Ph.D.
Medical College of Wisconsin
Young Investigator Grant–Basic Research

Shenfeng Qiu, M.D., Ph.D.
University of Arizona
Young Investigator Grant–Basic Research

Karina Quevedo, Ph.D.
University of Minnesota
Young Investigator Grant–
Next Generation Therapies

Marcia J. Ramaker, Ph.D.
University of California, San Diego
Young Investigator Grant–Next
Generation Therapies

Matthew James Robson, Ph.D.
Florida Atlantic University
Young Investigator Grant–Basic Research

Uwe Rudolph, M.D.
McLean Hospital/*Harvard Medical School*
Distinguished Investigator Grant–
Basic Research

Julia Sacher, M.D., Ph.D.
Max-Planck Institute for Brain Research, Germany
Young Investigator Grant–Basic Research

Jaclyn Marie Schwarz, Ph.D.
University of Delaware
Young Investigator Grant–Basic Research

Etienne L. Sibille, Ph.D.
Centre for Addiction and Mental Health, Canada
Distinguished Investigator Grant–Basic
Research

Adam Philip Stern, M.D.
Harvard Medical School
Young Investigator Grant–
Next Generation Therapies

Maggie M. Sweitzer, Ph.D.
Duke University Medical Center
Young Investigator Grant–Basic Research

Samuel Wilkinson, M.D.
Yale University School of Medicine
Young Investigator Grant–
Next Generation Therapies

Nolan Ryan Williams, M.D.
Stanford University
Young Investigator Grant–
Next Generation Therapies

Eric Steven Wohleb, Ph.D.
Yale University School of Medicine
Young Investigator Grant–Basic Research

Bun Yamagata, M.D., Ph.D.
Keio University, Japan
Young Investigator Grant–Basic Research

Timothy York, Ph.D.
University of British Columbia, Canada
Independent Investigator
Grant–Basic Research

Roland Zahn, M.D., Ph.D.
Institute of Psychiatry/*King's College*
London, United Kingdom
Independent Investigator Grant–Next
Generation Therapies

EATING DISORDERS

A recent Foundation grantee is studying the use of intranasal oxytocin in the treatment of anorexia. Another recently demonstrated that women with anorexia have below-average activity in brain regions that help coordinate social behavior. She also showed that women with the disorder tended to blame themselves more than others for negative social interactions, thus highlighting social deficits as an important target for treating anorexia.

At a basic biological level, grantees have traced brain circuits involved in feeding behaviors, feelings of hunger and of fullness. These have led to promising targets to modify in the brain and body in order to alter eating behavior.

One grantee found that an enzyme called OGT is a critical regulator of the brain's hunger circuits. Another grantee discovered that neural circuits controlling hunger are in part controlled by the neurotransmitter acetylcholine. Receptors that brain cells use to recognize and respond to acetylcholine can also be activated by nicotine, suggesting that this brain circuit may also be involved in conveying nicotine's appetite-suppressing effects, and hinting at alternate ways to modify it.

Using optogenetics, a revolutionary technology invented by a grantee, another grantee shined laser light into the mouse brain to discover the involvement of neurons in the prefrontal cortex that have docking ports called D1 receptors on their surface; these neurons were connected with the amygdala, part of the brain involved in emotion and behavior. They were able to alter feeding behavior simply by manipulating axons in the amygdala, thus suggesting new targets for future therapeutic interventions.

Haijiang Cai, Ph.D.
University of Arizona
Young Investigator Grant–Basic Research

Frank Julius Meye, Ph.D.
Rudolf Magnus Institute of Neuroscience,
Utrecht University, Netherlands
Young Investigator Grant–Basic Research

Nadia Micali, M.D., Ph.D., M.Sc.
Icahn School of Medicine at Mount Sinai
Independent Investigator Grant–
New Technologies

Jessica Werthmann, Ph.D.
King's College London, UK
Young Investigator Grant–Basic Research

MENTAL ILLNESS– GENERAL/ MULTIPLE DISORDERS

Foundation grantees have identified shared susceptibility genes in bipolar disorder and schizophrenia, while other have found genetic abnormalities shared across five disorders (schizophrenia, bipolar disorder, autism, major depression and ADHD).

These genomic studies have identified risk variants for psychiatric disorders and broadly indicate that genetic risk does not obey diagnostic boundaries, with many risk variants instead increasing susceptibility across a range of disorders. Pathways of risk are beginning to emerge from these genomic findings.

A grantee made the breakthrough invention of optogenetics, a technology that revolutionized neuroscience and brain research across all illnesses, making it possible to switch neurons on and off using beams of colored laser light. A grantee pioneered the study of how epigenetic changes–chemical tags that attach to genes, affecting how they are regulated – are implicated across the genome in different mental illnesses.

A grantee helped confirm the link between elevated inflammation levels due to early-life stress and subsequent development of a range of mental illnesses, often post-puberty. Grantees have discovered circuitry responsible in depression and schizophrenia for the inability of patients to experience pleasure (anhedonia).

Grantees have re-programmed skin cells sampled from patients with various disorders to re-develop as neurons, making possible a wide variety of previously impossible experiments in autism, schizophrenia and other illnesses.

A recent grantee used carbon dating to find the "birthdates" of cells in the brain's hippocampus, in turn revealing the strength of neurogenesis, or the birth of new neurons, throughout life – an important enabler of neural plasticity and a factor in resilience that is an important factor in recovery across disorders.

Bénédicte Amilhon, Ph.D.
Douglas Mental Health University Institute, *McGill University*, Canada
Young Investigator Grant–Basic Research

Jason Aoto, Ph.D.
University of Colorado, Denver
Young Investigator Grant–Basic Research

Raymundo Baez-Mendoza, Ph.D.
Massachusetts General Hospital and *Harvard University*
Young Investigator Grant–Basic Research

Rita Baldi, Ph.D.
Vanderbilt University
Young Investigator Grant–Basic Research

Tahsin Stefan Barakat, M.D., Ph.D.
University of Edinburgh, UK
Young Investigator Grant–Basic Research

Tracy Bedrosian, Ph.D.
Salk Institute for Biological Studies
Young Investigator Grant–Basic Research

Silvia Bernardi, M.D.
Columbia University
Young Investigator Grant–Basic Research

Erin Nicole Bobeck, Ph.D.
Icahn School of Medicine at Mount Sinai
Young Investigator Grant–Basic Research

Linda Booij, Ph.D.
Concordia University, Canada
Independent Investigator Grant–Basic Research

Erin S. Calipari, Ph.D.
Icahn School of Medicine at Mount Sinai
Young Investigator Grant–Basic Research

Donna J. Calu, Ph.D.
University of Maryland School of Medicine
Young Investigator Grant–Basic Research

Bo Cao, Ph.D.
University of Texas Health Science Center at Houston
Young Investigator Grant–Basic Research

Alexandre Charlet, Ph.D.
Centre National de la Recherche Scientifique (CNRS), *University Pierre & Marie Curie*, France
Young Investigator Grant–Basic Research

Jerry Lu Chen, Ph.D.
Boston University
Young Investigator Grant–Basic Research

Paula Louise Croxson, Ph.D.
Icahn School of Medicine, Mount Sinai
Young Investigator Grant–Basic Research

Joseph D. Dougherty, Ph.D.
Washington University School of Medicine
Independent Investigator Grant – Basic Research

Alexis Edwards, Ph.D.
Virginia Commonwealth University
Young Investigator Grant–Basic Research

Evan Feinberg, Ph.D.
University of California, San Francisco
Young Investigator Grant–Basic Research

Ozgun Gokce, Ph.D.
Ludwig-Maximilians University, Germany
Young Investigator Grant–Basic Research

Sarah A. O. Gray, Ph.D.
Tulane University
Young Investigator Grant–Basic Research

Brad Alan Grueter, Ph.D.
Vanderbilt University Medical Center
Young Investigator Grant–Basic Research

Casey Harrison Halpern, M.D.
Stanford University
Young Investigator Grant–
New Technologies

Kyung-An Han, Ph.D.
University of Texas at El Paso
Independent Investigator Grant–
Basic Research

Jakob Hartmann, Ph.D.
Harvard University and McLean Hospital
Young Investigator Grant–New
Technologies

Weizhe Hong, Ph.D.
University of California, Los Angeles
Young Investigator Grant–Basic Research

Mihaela D. Iordanova, Ph.D.
Concordia University
Young Investigator Grant–Basic Research

Lisanne Michelle Jenkins, Ph.D.
University of Illinois at Chicago
Young Investigator Grant–
Diagnostic Tools/Early Intervention

Richard Scott Jope, Ph.D.
University of Miami
Distinguished Investigator Grant–
Next Generation Therapies

Arie Kaffman, M.D., Ph.D.
Yale University
Independent Investigator Grant–
Basic Research

Roselinde Henderson Kaiser, Ph.D.
Harvard Medical School
Young Investigator Grant–Basic Research

Seung Suk Kang, Ph.D.
University of Minnesota
Young Investigator Grant–Basic Research

Caitlin Kantrowitz Rollins, M.D.
Children's Hospital, Boston
Young Investigator Grant–Basic Research

Il Hwan Kim, Ph.D.
Duke University Medical Center
Young Investigator Grant–Basic Research

Kwang-Soo Kim, Ph.D.
McLean Hospital/Harvard Medical School
Distinguished Investigator Grant–
Basic Research

Daniel Allen Lee, Ph.D.
California Institute of Technology
Young Investigator Grant–Basic Research

Marian Lee Logrip, Ph.D.
Indiana University
Young Investigator Grant–Basic Research

Andres V. Maricq, M.d., Ph.D.
University of Utah
Distinguished Investigator Grant–
Basic Research

Colleen Ann Mcclung, Ph.D.
University of Pittsburgh
Independent Investigator Grant–
Basic Research

Nikolaos Mellios, M.d., Ph.D.
University of New Mexico
Young Investigator Grant–Basic Research

Ian Mendez, Ph.D.
University of California, Los Angeles
Young Investigator Grant–Basic Research

Anna Victoria Rotberg Molofsky, M.D., Ph.D.
University of California, San Francisco
Young Investigator Grant–Basic Research

Sara Morrison, Ph.D.
University of Pittsburgh
Young Investigator Grant–Basic Research

Anirvan Nandy, Ph.D.
Salk Institute for Biological Studies
Young Investigator Grant–Basic Research

Pieter Naude, Ph.D.
University of Cape Town, South Africa
Young Investigator Grant–Basic Research

William Paul Nobis, M.D., Ph.D.
Northwestern University
Young Investigator Grant–Basic Research

Ashley Elizabeth Nordsletten, Ph.D.
Karolinska Institute, Sweden
Young Investigator Grant–Basic Research

Elizabeth A. Olson, Ph.D.
McLean Hospital and *Harvard University*
Young Investigator Grant–Basic Research

Angela Macia Ortega, Ph.D.
University of California, San Diego
Young Investigator Grant–Basic Research

Ina P. Pavlova, Ph.D.
Research Foundation for Mental Hygiene, Inc./
NYSPI at Columbia University
Young Investigator Grant–Basic Research

Hyun-Jae Pi, Ph.D.
Cold Spring Harbor Laboratory
Young Investigator Grant–Basic Research

Marina R. Picciotto, Ph.D.
Yale University
Distinguished Investigator
Grant–Basic Research

Nadine Provencal, Ph.D.
Max-Planck Institute for Psychiatry, Germany
Young Investigator Grant–Basic Research

Steve Ramirez, Ph.D.
Harvard University
Young Investigator Grant–Basic Research

Danielle Roubinov, Ph.D.
University of California, San Francisco
Young Investigator Grant – Basic Research

Esther Serrano Saiz, Ph.D.
Columbia University
Young Investigator Grant–Basic Research

Dongju Seo, Ph.D.
Yale University School of Medicine
Young Investigator Grant–Basic Research

Stephen Vincent Shepherd, Ph.D.
The Rockefeller University
Young Investigator Grant–Basic Research

Gleb P. Shumyatsky, Ph.D.
Rutgers University
Independent Investigator Grant–Basic
Research

Gek Ming Sia, Ph.D.
University of Texas Health Science Center
at San Antonio
Young Investigator Grant–Basic Research

Aline Silva De Miranda, Ph.D.
Federal University of Minas Gerais, Brazil
Young Investigator Grant–Basic Research

Philip Tovote, Ph.D.
Friedrich Miescher Institute, Switzerland
Young Investigator Grant–Basic Research

Ludovic Tricoire, Ph.D.
Centre National de la Recherche
Scientifique (CNRS), University Pierre &
Marie Curie, France
Young Investigator Grant–Basic Research

Gustavo X. Turecki, M.D., Ph.D.
McGill University, Canada
Distinguished Investigator Grant–
Basic Research

Stacy Tzoumakis, Ph.D.
University of New South Wales, Australia
Young Investigator Grant–
Diagnostic Tools/Early Intervention

Rudolf Uher, M.D., Ph.D.
Dalhousie University, Canada
Independent Investigator Grant–
Basic Research

Mirjam Van Zuiden, Ph.D.
University of Amsterdam, Netherlands
Young Investigator Grant–
Basic Research

Neide Vieira, Ph.D.
University of Minho, Portugal
Young Investigator Grant–Basic Research

Cheng Wang, M.D., Ph.D.
University of California, San Francisco
Young Investigator Grant–Basic Research

Minghui Wang, Ph.D.
Cold Spring Harbor Laboratory
Young Investigator Grant–Basic Research

Simon Keith Warfield, Ph.D.
Children's Hospital, Boston
Distinguished Investigator Grant–
New Technologies

Romy Wichmann, Ph.D.
Massachusetts Institute of Technology
Young Investigator Grant–Basic Research

Kai Xia, Ph.D.
University of North Carolina, Chapel Hill
Young Investigator Grant–Basic Research

Mingshan Xue, Ph.D.
Baylor College of Medicine
Young Investigator Grant–Basic Research

Guang Yang, Ph.D.
The Hospital for Sick Children,
University of Toronto, Canada
Young Investigator Grant–Basic Research

Gwyneth Zai, M.D., Ph.D.
University of Toronto, Canada
Young Investigator Grant–Basic Research

Alyson Kay Zalta, Ph.D.
Rush University Medical College
Young Investigator Grant–Diagnostic Tools/
Early Intervention

Tim Ziermans, Ph.D.
Leiden University, Netherlands
Young Investigator Grant–Basic Research

Larry S. Zweifel, Ph.D.
University of Washington
Independent Investigator Grant–
Basic Research

OBSESSIVE COMPULSIVE DISORDER

Recently, BBRF grantees discovered a network of related proteins that functions specifically in the striatum, a brain area that controls voluntary movements, especially for rewards. They showed that the proteins form a pathway that suppresses excessive grooming in mice, offering molecular insights into the mechanisms that may control repetitive behaviors in people as well. In other recent work, grantees confirmed evidence of white matter alterations in adults with OCD, and gave a more complete picture of where those alterations lie.

This research suggests that large-scale brain networks may be disrupted in the disorder, possibly affecting information flow between regions of the brain involved in learning and cognition, spatial working memory and attention, as well as areas more involved with motor control.

Using optogenetics to switch neurons off and on with beams of light, grantees showed that repeated stimulation of neural circuits linking the cortex and striatum produced progressive repetitive behavior that continued for up to two weeks after the stimulation ended.

It was possible to halt the behavior with an antidepressant, suggesting it may be possible to stop abnormal circuit changes before they become pathological in people at risk for OCD. Though medication is often prescribed for OCD, up to half of patients do not respond, including those who are most seriously impaired. Working as a pacemaker for the brain, deep brain stimulation (DBS), pioneered by a grantee, is now being used as an alternative treatment.

Stephanie Dulawa, Ph.D.
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Independent Investigator Grant–Basic Research

Daigo Homma, Ph.D.
Massachusetts Institute of Technology
Young Investigator Grant–Basic Research

Minseok Song, Ph.D.
Weill Cornell Medical College
Young Investigator Grant–Basic Research

POST-TRAUMATIC STRESS DISORDER (PTSD)

Among the symptoms experienced by people who develop PTSD is "anxious arousal"–feeling tense or easily startled. Foundation grantees were part of a team that links these symptoms to a reduction in the size of the amygdala, a brain structure associated with fear processing and emotion. In combat vets with the most severe anxious arousal symptoms, the right amygdala was smaller than in other people; it was smallest in vets who had seen the most severe combat.

A great deal of research by grantees has revealed circuitry in the brain that is involved in fear reactions; it is hoped these will present targets for future therapeutic interventions. Grantees recently found that both active and passive fear responses are controlled in the central amygdala, with distinct types of neurons involved in each reaction.

Other new research identifies molecular mechanisms that promote memory strengthening and at the same time prevent memories from fading. This work helps explain how some memories get stronger over time even in the absence of threatening experiences. How to extinguish fear memories is the subject of considerable attention.

One grantee has pioneered various potential drug interventions to this end. Testing with the corticosteroid drug dexamethasone showed that its administration prior to a traumatic event enabled mice to cope with stress and keep related fear extinguished 24 hours later–a normal fear response–suggesting a path toward novel therapeutics. Although it is counterintuitive, evidence suggests that by elevating the levels of stress hormone it might be able to reduce PTSD symptoms, on the theory that stress hormones may have protective effects that prevent accompanying changes in synaptic connectivity.

Other research has tested a drug called osanetant to alleviate PTSD symptoms before they become disabling; and novel drugs against so-called DREADD receptors–artificial docking ports on cells designed to engage with potent medicines–in order to impair the formation of fear memories.

Kelly Patricia Cosgrove, Ph.D.
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Rosalina Fonseca, M.D., Ph.D.
Gulbenkian Institute of Science, Portugal
Young Investigator Grant–Basic Research

Chuan Huang, Ph.D.
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Young Investigator Grant–Next Generation Therapies

Daniela Kaufer, Ph.D.
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Independent Investigator Grant–New Technologies

Benjamin Kelmendi, M.D.
Yale University
Young Investigator Grant–Next Generation Therapies

Justin Michael Moscarello, Ph.D.
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Isabelle Rosso, Ph.D.
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Independent Investigator Grant–Next Generation Therapies

Christine A. Rabinak, Ph.D.
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Stephanie Trouche, Ph.D.
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Rachel Yehuda, Ph.D.
Icahn School of Medicine at Mount Sinai
Distinguished Investigator Grant–Diagnostic Tools/Early Intervention

SCHIZOPHRENIA

Research by Foundation grantees has revealed a great deal about schizophrenia's complex genetic underpinnings, recently identifying 108 locations in the human genome where common gene variations have an impact on risk. Grantees have discovered the importance of large-scale gene copy-number variations in causing schizophrenia.

Grantees have also changed the way schizophrenia treated in most patients, and their basic and clinical research is leading to insights that will create the treatments of tomorrow, focusing especially on effective ways to reduce cognitive symptoms.

A Scientific Council Member was instrumental in developing and validating the effectiveness of 2nd-generation ("atypical") antipsychotic medicines.

Another Scientific Council pioneered the use of cognitive behavioral therapy (CBT), including its use in treating "negative" symptoms such as emotional flatness, lack of motivation, and social isolation.

Experiments by grantees with transcranial direct current stimulation (tDCS) brought brain wave anomalies into synchrony and improved cognitive symptoms in patients.

Grantees are working on alternative medications to antipsychotics, for instance small molecule drugs that influence the beta-arrestin communication pathway, which in mouse models reduced hyperactive movements, improved memory for novel stimuli and resulted in more social behavior. A grantee discovered that treatments with D-serine, an activator of the NMDA receptor, can reverse schizophrenia-like cognitive symptoms in mice. To prevent schizophrenia pathology in the earliest stages of life, grantees are investigating how to prevent these brain abnormalities from ever forming.

One approach now being tested involves giving expectant mothers choline supplements from the prenatal period to assure proper fetal brain development. In the clinic, an authoritative study led by two grantees has found that cognitive problems experienced by people with schizophrenia, such as problems with attention and memory, are present in the early stage of the disorder, before the onset of psychosis.

Assessing cognitive function early therefore could help clinicians identify people who are most likely to develop the disorder. Other research by grantees have established that the age of the father at time of conception is an important factor in child's schizophrenia risk; discovered the role of MHC proteins (vital in the immune system) in causing overpruning of neural synapses in the prefrontal cortex, early in life, a possible contributor to schizophrenia in some patients; and discovered that estrogen, which protects nerve cells in the brain, can improve cognition in some patients.

Atheir Ibrahim Abbas, M.D., Ph.D.
New York State Psychiatric Institute of Columbia University
Young Investigator Grant–Basic Research

Stewart Alan Anderson, M.D.
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Independent Investigator Grant–Basic Research

Andrew Wayne Bismark, Ph.D.
VA San Diego Healthcare System at the University of California, San Diego
Young Investigator Grant–Next Generation Therapies

Marta Busnelli, Ph.D.
Institute of Neuroscience of the National Research Council
Young Investigator Grant–Basic Research

Kristen Jennifer Brennand, Ph.D.
Icahn School of Medicine at Mount Sinai
Independent Investigator Grant–Basic Research

Wing Chung Chang, Fhkcpsych
Chinese University of Hong Kong
Young Investigator Grant–Next Generation Therapies

Eric Hau-Yun Chang, Ph.D.
Feinstein Institute for Medical Research
Young Investigator Grant–New Technologies

Kayla A. Chase, Ph.D.
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Young Investigator Grant–Basic Research

Youngsun Theresa Cho, M.D., Ph.D.
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Young Investigator Grant–Basic Research

Timothy Hanks, Ph.D.
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Young Investigator Grant–Basic Research

Beng-Choon Ho, M.D.
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Distinguished Investigator Grant–Diagnostic Tools/Early Intervention

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Young Investigator Grant–Next Generation Therapies

Britta Galling, M.D.
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Young Investigator Grant–Next Generation Therapies

Tonya Marie Gilbert, Ph.D.
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Elliot Hong, M.D.
Maryland Psychiatric Research Center
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Laurence Tudor Hunt, Ph.D.
University of London, UK
Young Investigator Grant–Basic Research

Jee-Yeon Hwang, Ph.D.
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Young Investigator Grant–Basic Research

Jason Karl Johannesen, Ph.D.
Yale University
Young Investigator Grant–Basic Research

Esther Soon Kim, Ph.D.
Columbia University
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Ethan Lippmann, Ph.D.
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Brian James Miller, M.D., Ph.D., M.P.H.
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Vishnu P. Murty, Ph.D.
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Young Investigator Grant–Basic Research

Dhakshin Ramanathan, M.D., Ph.D.
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Young Investigator Grant–Basic Research

Marta Rapado-Castro, Ph.D.
CIBERSAM- Centro de Investigación en Red de Salud Mental, Spain
Independent Investigator Grant–Next Generation Therapies

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University of Barcelona (Universitat de Barcelona), Spain
Independent Investigator Grant–Next Generation Therapies

Tade Souaiaia, Ph.D.
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Emma Sprooten, Ph.D.
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Toral S. Surti, M.D., Ph.D.
Yale University
Young Investigator Grant–Basic Research

Neal R. Swerdlow, M.D., Ph.D.
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Distinguished Investigator Grant–Next Generation Therapies

Ai-Hui Tang, Ph.D.
University of Maryland School of Medicine
Young Investigator Grant–Basic Research

Laura Magdalen Tully, Ph.D.
University of California Davis Medical Center
Young Investigator Grant–Next Generation Therapies

Remko Van Lutterveld, Ph.D.
University of Massachusetts Medical School
Young Investigator Grant–Next Generation Therapies

Dawn I. Velligan, Ph.D.
University of Texas Health Science Center at San Antonio
Distinguished Investigator Grant–Basic Research

Thomas Weickert, Ph.D.
University of New South Wales, Australia
Independent Investigator Grant–Next Generation Therapies

Mathieu Wolff, Ph.D.
Universite Bordeaux II, France
Independent Investigator Grant–Basic Research

Todd Woodward, Ph.D.
University of British Columbia, Canada
Independent Investigator Grant–Next Generation Therapies

John-Paul J. Yu, M.D., Ph.D.
University of Wisconsin
Young Investigator Grant–New Technologies

SUICIDE RESEARCH/ PREVENTION

BBRF grantees have helped to shape what we know about why certain people, and in particular young people, have suicidal thoughts and sometimes act on them.

A Scientific Council Member and Grantee led research establishing that most teen suicides occur in people with diagnosable mental illnesses.

Another Scientific Council Member created the TeenScreen, the tool used nationwide and globally as a standard diagnostic and screening tool.

Grantees involved in clinical research have conducted extensive testing of ketamine and ketamine substitutes in a variety of clinical settings to treat people who have just attempted suicide or are thought likely to be at high risk for making an attempt.

Grantees involved in basic research have discovered markers that can be seen in routine blood tests that predict with 80%-96% accuracy whether a person is having suicidal thoughts or has made a suicide attempt. Important research led by a grantee has revealed that the history of parents' suicide attempts predicts suicidal behavior in their children. Prediction is one of the ultimate goals of research--the ability not only to identify those at highest risk of thinking suicidally or even attempting suicide but in fact completing the act.

A grantee has developed two clinical questionnaires in the form of apps for prediction in men, instruments that other grantees have now tested and validated for use in women. In the meantime, the search continues, in the labs of many grantees, for genetic clues and markers in the human body that can provide insights and predictive clues to this most agonizing and tragic of human behaviors.

Jeremy Gordon Stewart, Ph.D.
McLean Hospital and *Harvard University*
Young Investigator Grant–Diagnostic Tools/ Early Intervention

OTHER DISORDERS

FRAGILE X SYNDROME

Manavi Chatterjee, Ph.D.
Yale University
Young Investigator Grant–Next Generation Therapies

Maria Soledad Esposito, Ph.D.
Friedrich Miescher Institute, Switzerland
Young Investigator Grant–Basic Research

PSYCHOSIS

Recent research by grantees has confirmed that young people with mild but clinically relevant symptoms are at increased risk for developing a psychotic disorder. Initial clinical trials suggest that treatment can reduce symptoms and progression to full psychosis.

A dozen grantees were involved in the North American Prodrome Longitudinal Study, an international effort to identify factors that contribute to the development of psychosis. They have demonstrated that a panel of blood markers could be used to identify those who are showing mild prodromal symptoms and are at highest risk of developing psychosis.

Grantees played a lead role in a landmark study demonstrating that early and coordinated team care after a first psychotic episode can make a positive difference in outcome. Best practices identified in the study included first-episode intervention using low-dose antipsychotic medications, cognitive behavioral therapy to support resilience and self-management skills, family psychoeducation and support, and supported education and employment opportunities. Data from 600 patients was used by a grantee to develop a new risk calculator that helps identify the one person in three at high-risk of psychosis who is likely to go on to develop full psychosis within 3 years.

Another study, involving 8 grantees, suggests that frequent in-person check-ins may help lower relapses in schizophrenia-related psychosis.

A grantee's 7-year study in people with early psychosis symptoms showed the possible effectiveness of PUFA (omega-3) supplements in preventing progression to full psychosis, perhaps by reducing inflammation in the brain and spurring the growth of new neurons. A grantee is testing scalp electroencephalogram (EEG) data to detect "mismatch negativity" and thus predict onset of psychosis in high-risk individuals.

David Reid Roalf, Ph.D.
University of Pennsylvania
Young Investigator Grant–New Technologies

Daniel Scott, Ph.D.
University of Texas Southwestern Medical Center at Dallas
Young Investigator Grant–Basic Research

Stefania Tognin, Ph.D.
Institute of Psychiatry
King's College London, UK
Young Investigator Grant–Basic Research

2016 FOUNDATION EVENTS

Dr. Jeffrey Borenstein, Dr. Vikram Patel, Dr. Herbert Pardes, Dr. Charles Reynolds and Patrick Kennedy, Pardes Humanitarian Prize and Honorary Prizewinners

International Awards Dinner

New York, October 28, 2016

The Foundation celebrated its 29th Annual International Awards Dinner at The Pierre Hotel in New York City. The evening's honorees included two remarkable humanitarians, one of the world's most prominent mental health advocates and nine exceptional scientists for their significant contributions to the advancement of our understanding of schizophrenia, mood disorders, child and adolescent psychiatry and cognitive neuroscience.

OUTSTANDING ACHIEVEMENT AWARDS

LIEBER PRIZE FOR SCHIZOPHRENIA RESEARCH
Michael F. Green, Ph.D.
Stephen R. Marder, M.D.

COLVIN PRIZE FOR MOOD DISORDERS RESEARCH
Francis J. McMahon, M.D.
Thomas G. Schulze, M.D.
Pamela Sklar, M.D., Ph.D.

RUANE PRIZE FOR CHILD & ADOLESCENT PSYCHIATRIC RESEARCH
John L. R. Rubenstein, M.D., Ph.D.

GOLDMAN-RAKIC PRIZE FOR OUTSTANDING ACHIEVEMENT IN COGNITIVE NEUROSCIENCE
Earl K. Miller, Ph.D.

MALTZ PRIZE FOR INNOVATIVE & PROMISING SCHIZOPHRENIA RESEARCH
William P. Horan, Ph.D.
Amanda McCleery, Ph.D.

PARDES HUMANITARIAN PRIZE IN MENTAL HEALTH

This international Prize recognizes a physician, scientist, public citizen, or organization whose extraordinary contribution has made a profound and lasting impact by improving the lives of people suffering from mental illness and by advancing the understanding of mental health.

HONOREES
Vikram Patel, Ph.D., F.Med.Sci.
Charles F. Reynolds III, M.D.

HONORARY TRIBUTE
Senator Edward M. Kennedy

Dr. Eric and Dr. Denise Kandel

Lieber & Maltz Prizewinners–Dr. William Horan, Dr. Amanda McCleery, Dr. Michael Green and Dr. Stephen Marder of UCLA

Klerman & Freedman Awards Dinner

New York, July 29, 2016

This very special evening celebrated the extraordinary life of a global champion of psychiatric research - Constance E. Lieber. Connie, along with her husband Steve, saw the need to nurture and encourage young scientists. For this reason, it was especially appropriate to also honor the hallmark program of the Brain & Behavior Research Foundation, the Young Investigator Grants, which enable aspiring young scientists with innovative ideas to garner pilot data and generate "proof of concept" for their work.

Six Young Investigator Grantees were honored for their outstanding contributions to mental health research at The Metropolitan Club in New York City. These researchers were chosen by a committee of the Foundation's Scientific Council for their exceptional grant projects in terms of insight and potential new approaches to the treatment of mental illness.

Each investigator has demonstrated exceptional promise in the pursuit of deeper understanding of the human brain to ultimately result in cures through research.

KLERMAN PRIZEWINNER

Katie A. McLaughlin, Ph.D. of the *University of Washington* for her work on "Child Maltreatment and Neural Networks Underlying Emotion Regulation: A Neurodevelopmental Pathway to Anxiety and Depression."

HONORABLE MENTIONS

Erin C. Dunn, Sc.D., M.P.H., of *Harvard Medical School* and *Massachusetts General Hospital* for her grant research project "Sensitive Periods Associated with the Development of Depression."

Avram J. Holmes, Ph.D. of *Yale University* for his work in "Identifying the Network-Level Fingerprints of Affective Illness and Associated Polygenic Vulnerability in the General Population."

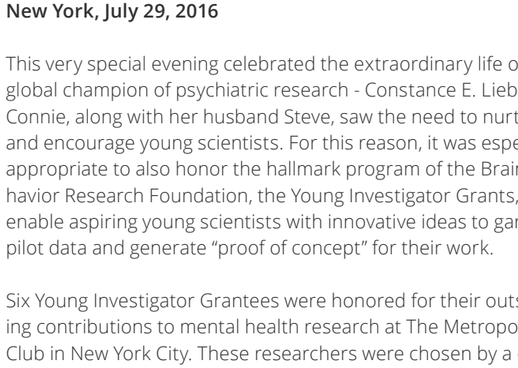
FREEDMAN PRIZEWINNER

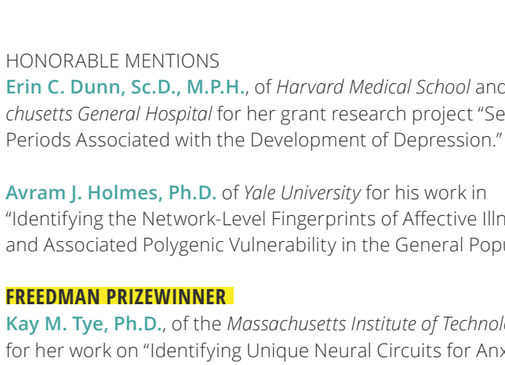
Kay M. Tye, Ph.D., of the *Massachusetts Institute of Technology* for her work on "Identifying Unique Neural Circuits for Anxiety Control."

HONORABLE MENTIONS

Kathleen Kyung Ah Cho, Ph.D., of the *University of California, San Francisco* for her grant project titled "Investigation of Interneuron and Circuit Dysfunction in a Mouse Model of Schizophrenia,"

Conor Liston, M.D., Ph.D., of *Weill Cornell Medical College* for his grant project, "Stress Effects on Connectivity in Developing Fronto-striatal Circuits,"





1. Dr. Jeffrey Borenstein honoring Connie Lieber
2. Dr. Avram Holmes and Dr. Herbert Pardes
3. Dr. Kay Tye and Dr. Herbert Pardes
4. Dr. Connor Liston and Dr. Herbert Pardes
5. Stephen Lieber & Miriam Katowitz, Dr. Joshua Gordon, Dr. James Frauenthal and Dr. Myrna Weissman
6. Barbara Toll, Ursula von Rydingsvard, Dr. Paul Greengard and Dr. Eric Kandel
7. Dr. Kathleen Cho and Dr. Herbert Pardes
8. Dr. Katie McLaughlin and Dr. Herbert Pardes
9. Dr. Erin Dunn and Dr. Herbert Pardes

Keynote Presenter Robert Boorstin

International Mental Health Research Symposium

New York, October 28, 2016

The 28th Annual New York Mental Health Research Symposium featured a keynote presentation and scientific presentations by the nine 2016 Outstanding Achievement Prizewinners and two exceptionally promising Young Investigator Grantees and was held at The Kaufman Music Center in New York City.

KEYNOTE SPEAKER: A SEARCH FOR BALANCE: PERSONAL & POLITICAL REFLECTIONS ON MENTAL HEALTH
Robert O. Boorstin

SEEING, FEELING, AND INFERRING THE SOCIAL WORLD IN SCHIZOPHRENIA
Michael F. Green, Ph.D.

NEUROPLASTICITY IN SCHIZOPHRENIA: HOW TO MEASURE IT, AND WHAT DOES IT MEAN?
Amanda McCleery, Ph.D.

IMPROVING FUNCTIONING IN PEOPLE WITH PSYCHOTIC ILLNESS: A NEW GOAL FOR TREATMENT RESEARCH
Stephen R. Marder, M.D.

DEVELOPING INTERVENTIONS TO ENHANCE SOCIAL COGNITION IN SCHIZOPHRENIA
William P. Horan, Ph.D.

EXPLORING THE PHENOTYPIC COMPLEXITY IN PSYCHIATRIC GENETICS: FROM PHARMACORESPONSE TO ILLNESS TRAJECTORIES
Thomas G. Schulze, M.D.

SEEING THE WORLD IN A GRAIN OF SAND: MAKING SENSE OF THE MANY GENES THAT UNDERLIE BIPOLAR DISORDER
Francis J. McMahon, M.D.

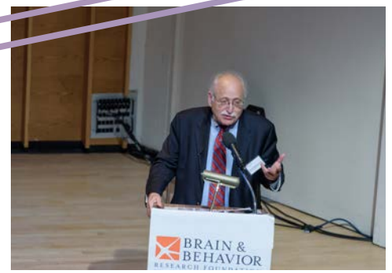
USING GENOMICS TO CHANGE OUR UNDERSTANDING OF MENTAL ILLNESS
Pamela Sklar, M.D., Ph.D.

COGNITION IS RHYTHMIC
Earl K. Miller, Ph.D.

GENETIC ANALYSES OF FOREBRAIN DEVELOPMENT GIVE INSIGHTS INTO ORIGINS OF NEUROPSYCHIATRIC DISORDERS
John L. R. Rubenstein, M.D., Ph.D.

ARE SOME MILITARY PERSONNEL DIAGNOSED WITH PTSD ACTUALLY SUFFERING FROM CHRONIC TRAUMATIC ENCEPHALOPATHY?
Tracy Butler, M.D.

NONINVASIVE NEUROMODULATION FOR CHRONIC PAIN
Timothy Mariano, M.D., Ph.D., MSc.



Symposium Commentator Dr. Alan Schatzberg

Dr. Michael Green

Dr. Stephen Marder

Dr. Amanda McCleery & Dr. William Horan

Dr. Thomas Schulze

Dr. Pamela Sklar

Dr. Francis McMahon

Dr. Earl Miller

Dr. John Rubenstein

Dr. Tracy Butler

Dr. Timothy Mariano

Symposium Moderator Dr. Robert Hirschfeld & Dr. Jeffrey Borenstein

PARENTING

For the families of young people diagnosed with psychiatric disorders, it can be frightening, bewildering, and frustrating. Where do they turn for help?

The Foundation's magazine now includes information that can be of practical use to families coping with the diagnosis of a behavioral disorder or mental illness. These articles can be found at *bbrfoundation.org/parenting*.

CARING FOR A CHILD WITH BIPOLAR DISORDER

Robert M.A. Hirschfeld, M.D.
Professor of Clinical Psychiatry
Weill Cornell Medical College

- Scientific Council Member
- 2003 Falcone Prize for Outstanding Achievement in Affective Disorders Research
- 2002 Distinguished Investigator Award

Bipolar illness was once referred to as "manic-depressive" illness, and is considered to be a lifelong disorder, said Robert M.A. Hirschfeld, M.D., a professor of clinical psychiatry at Weill Cornell Medical College. The disorder is characterized by episodes of abnormal, often persistent, highs and abnormal, often persistent lows. But the latest edition of the DSM-5, the manual that doctors use to diagnose psychiatric disorders, has made a major change in that it also considers a change in energy, as well as mood, to be essential to the disorder, Dr. Hirschfeld said.

"We've always seen this as part of the illness. But now it's understood as a necessary part," he noted. "If you simply have the mood disturbance and no change in energy, you do not get a diagnosis of bipolar disorder."

Dr. Hirschfeld said adolescents and their parents often have difficulties identifying bipolar disorder, or separating that from a diagnosis of major depression. In response, he and his colleagues developed the MDQ—the Mood Disorder Questionnaire. The 13-question test is available at many doctors' office, advocacy organizations, and online at sites such as *www.dbsalliance.org/pdfs/MDQ.pdf*.

It asks "...things about whether you've ever had times when you spent too much money, times when you had an abnormally high mood—it goes through a number of the symptoms of mania, and it takes about five minutes to fill out," Dr. Hirschfeld explained.

He stressed that the MDQ is a screening tool, and that a mental healthcare provider can help with a more comprehensive evaluation. In a study that Dr. Hirschfeld conducted with his colleagues, they found that the MDQ can help clarify a bipolar disorder diagnosis especially in cases where parents and children disagree on symptoms.

Many adolescents with bipolar disorder lack insight about their condition—for example, having no self-awareness of their manic episodes, said Dr. Hirschfeld. It may take several manic episodes "having devastating consequences" to family, career, and education before they recognize that they have a lifelong illness, he said. "They will deny, deny, deny—and it's very sad. I often see people in their 30s who are finally coming to terms with it and they have lost a decade of their life to the illness."

ENHANCING EARLY CHILDHOOD DEVELOPMENT

James F. Leckman, M.D., Ph.D.
Neison Harris Professor of Child Psychiatry, Psychiatry, Pediatrics and Psychology
Yale University

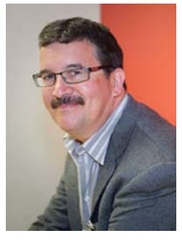
Intervening early in a child's development has many long-term benefits to both the individual and society, said James F. Leckman, M.D., Ph.D., Neison Harris Professor of Child Psychiatry, Psychiatry, Pediatrics, and Psychology at Yale University. At the level of the society, one of the biggest benefits is the savings on the costs associated with incarceration and with criminal behaviors, he said. "If you intervene early, the person has a greater likelihood of finishing high school, of going to college, and is less likely to be involved in criminal behavior."

Dr. Leckman said there is a greater risk of a child having a mental illness if his or her parents also have a mental illness, although it may be difficult to tell whether the parent's behavior, or his or her genes, or both may increase this risk. "The most important thing I would say to a parent with mental health issues is to help yourself deal with those issues. Reach out to a mental health professional—find someone who is really invested in addressing the problem," he said.

Dr. Leckman said that childhood exposure to trauma or violence, even during the prenatal period when the brain is developing, can mold how the brain is organized and have a major impact on how our genes are expressed. Brain imaging studies also show that traumatized children have different interconnections in their brain regions than those who were not exposed to violence. "If you've been exposed to violence," he said, "you're at an increased risk of being re-victimized."

He encouraged people to think about how they were parented, especially if they are having problems in their relationship with their children. These parents may want to seek out programs to enhance and learn new positive parenting strategies. Some family-based early intervention programs that can help with this include Circle of Security, Triple P the Power of Positive Parenting, and Parenting Management Training.

A special ingredient in fostering resilience in children "is an understanding adult who in some way sees in you something special, in some way idealizes you and sees you as someone who is able to make a positive contribution," Dr. Leckman emphasized.



TYPICAL TEEN BEHAVIOR—OR SOMETHING ELSE?

David Miklowitz, Ph.D.
Professor, Division of Child and Adolescent Psychiatry
UCLA Semel Institute

- 2011 Colvin Prizewinner for Outstanding Achievement in Mood Disorder Research.
- 2001 Distinguished Investigator Award
- 1987 Young Investigator Award

About 1.8 percent of children under age 18 have some form of bipolar disorder, although the majority of cases emerge between ages 15 and 19, said David Miklowitz, Ph.D., a professor of child and adolescent psychiatry at the UCLA Semel Institute. Adolescents differ from adults with the disorder in that they tend to have longer periods of "subthreshold" or less than full-blown symptoms, more frequent switches between depression and mania, and more mixed episodes that combine mania and depression, he noted.

Bipolar disorder in younger children, ages four to six, is not very common. But Dr. Miklowitz said that young children with the disorder may have problems with sleep, increased activity, impulsiveness, and occasional signs of delusional thinking. "When we have a child who shows those signs, we often don't know whether it's bipolar or some other disorder, or even a developmental transition. Mania is often confused with attention deficit disorder, and both poles can have a significant anxiety component," he said.

Dr. Miklowitz said determining whether a teen's unstable moods or risky behavior is an expression of bipolar disorder or "typical teen behavior" can be "one of the toughest problems for parents. But the key is the clustering of unstable moods with other symptoms," he said. Watchful waiting may help parents decide whether medications or therapy are warranted, and keeping a record of behaviors is also important. However, "if your child has expressed any suicidal ideation and depression, get rid of any weapons in the house and make sure alcohol or prescription medication are not easily available," said Dr. Miklowitz.

Therapy for the parents, child, and sometimes siblings as well can be helpful for bipolar disorder. This family-focused treatment, said Dr. Miklowitz, could include psychoeducation, communication training, and problem-solving skills training. Children with bipolar disorder may also benefit from having an individualized educational program (IEP) at school. Dr. Miklowitz added that children should play a role in the negotiation of any medication and dosages, and that both parents "should be on the same page" about medications, to ensure that the child uses any medication properly.

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March 2, 1924–January 15, 2016

"There is one person who is the prototype of generosity, brilliance, compassion and who is the essence of selflessness. I know her, you know her, and the world has come to know her . . . that is Connie Lieber."

—Herbert Pardes, M.D.
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Constance Lieber transformed her family's experience with significant metal illness into a life filled with meaning, purpose, and extraordinary helpfulness. She and her husband Steve shared an enduring love for 70 years and the quest for intense intellectual insights to transform the field of basic and clinical research in schizophrenia and other mental illnesses into the hope of finding cures through research.

Connie, who served as President of the Brain & Behavior Research Foundation from 1989 to 2007, was a deeply caring and visionary philanthropist, who has had a tremendous impact on psychiatric research and treatment. In her role as President Emerita, she continued to offer her vision and guidance to the Foundation on a regular basis. She passionately believed in the need to seed the field of neuropsychiatric research with as many talented scientists as possible to make a substantive impact on the broad spectrum of mental health research, which she fervently understood holds our best hope for ending the immense suffering caused by mental illness.

Numerous scientists and clinicians share a feeling of attachment to Connie that goes far beyond her philanthropic commitments, because she became a part of their personal and professional lives. She and Steve transformed the private sector effort to enhance support of psychiatric research by awarding grants to scientists in all kinds of disciplines—including biochemistry, pharmacology, genetics, psychology, and psychiatry. The main criterion for receiving a grant was quality. They wanted the best research.

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Connie was our leader and guiding light, providing inspiration and motivation to all who ever had the honor and privilege of knowing and working with her.

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TEAM UP FOR RESEARCH

With the support of family, friends and community, everyone can make a difference in the fight against mental illness.

When you raise money to support BBRF, you not only fund the most innovative scientific research, you help alleviate suffering caused by the stigma attached to these illnesses. We are grateful to our generous donors who support Foundation-funded grantees in their search for better treatments and advances in brain and behavior research.

In 2016, community fundraising events raised more than **$218,000**.

EXAMPLES OF TEAM UP FUNDRAISING EVENTS

$10,000+

IRONMAN 70.3 TRIATHLON
Saint George, UT

Three years ago, San Francisco-based Adrian Hunter lost his younger brother, Dylan at the age of 22. He suffered from OCD and depression, and eventually succumbed to drug use. To raise awareness for the pervasiveness of mental illness around the world, Adrian partnered with his close friend Brian Litke to train for the 2016 Ironman 70.3 Triathlon. The grueling 4-month training resulted in an exciting finish and a generous donation given to the Brain & Behavior Research Foundation.

"Despite being a wonderful charming boy, my little brother Dylan never stood a chance. His mental disorders resulted in dangerous drug use which served as his escape from reality. Our society needs significant resources to help understand and find cures to help people free themselves from mental imprisonment. It requires innovative out-of-the box thinking, which is why I partnered with BBRF."

—Adrian Hunter, Dylan's Brother

$25,000+

LET THE SUN SHINE RUN/WALK
Cold Spring, MN

This event was created to honor the memory of Jonathan James Robbins. Jonathan was diagnosed with schizophrenia and depression and committed suicide on April 28, 2010 at the age of 22.

"This world WILL be a better place because of Jonathan's death; not for us who loved him, but for all those other families out there who still have hope that a cure or better faster-acting medicine can help their loved ones."

—Kathy Robbins, Jonathan's Mom

Save The Date
Friday, October 27, 2017

29TH ANNUAL

INTERNATIONAL MENTAL HEALTH RESEARCH SYMPOSIUM

Keynote talk and presentations on leading research discoveries across brain and behavior disorders by the Foundation's 2017 Outstanding Achievement Prizewinners and two specially selected Young Investigator Grantees.

30TH ANNIVERSARY

INTERNATIONAL AWARDS DINNER

Celebrating the exceptional contributions of this year's Pardes Humanitarian Prizewinner and Outstanding Achievement Prizewinners at **The Pierre**.

FOR MORE INFORMATION

events@bbrfoundation.org
646.681.4888

DONOR STORIES

People who support the Brain & Behavior Research Foundation impact the future of scientific achievement and moving the needle forward in the search for better treatments and cures for mental illness. While we are grateful for their generosity, we are even more appreciative of their personal belief in our mission to help alleviate the suffering caused by mental illness through research grants. This meaningful connection to our work can be best seen in their stories.

The unwavering support of family and friends for those living with mental illness sometimes transcends day-to-day support to become a force for many. Inspired and sometimes challenged by their loved ones, these are the stories of families who are determined to take the fight against silent, closeted, and misunderstood illnesses of the brain beyond their own homes and toward a future where all can lead healthy and productive lives.

Hike for Mental Health is a Trek Toward Treatment

At his Hike for Mental Health events, Leo Walker sometimes has fellow hikers approach him with a confession: "I have never told anybody this before, but I suffer from mental illness." Walker, a sales marketing, and operations consultant for companies that work with small businesses, is all too familiar with the stigma surrounding mental health issues. His mother lived with schizophrenia throughout her adult life.

He believes that she could have led a fuller, happier life, before passing away from cancer 15 years ago, if her schizophrenia had been better understood and treated. This is a big reason why he co-founded Hike for Mental Health in 2011 with partners Tom Kennedy and Nancy Kozanecki. They discovered that they all enjoyed the outdoors and had some connection to mental illness through family and friends.

Thus was born a nonprofit with a dual mission: foster an appreciation for wilderness trails through fundraising hikes, and direct those donations towards research into the causes and cures for brain and behavior disorders. Since 2011, the organization has grown into a nationwide movement, supporting hikes from New Hampshire to as far west as California. Donations come in through the online sponsorship pages set up by participants. This past year alone, Hike for Mental Health has arranged more than 20 different events around the country.

Hike for Mental Health's core team realized that if they raised money for direct care, it would help some people but "not on a very large scale and not necessarily in a lasting way," said Walker. The group wanted to make a bigger, longer-lasting impact by "funding research that would lead to breakthroughs in our understanding of the brain and behaviors that would lead to better treatments and eliminate the stigma," he said. He approached the Brain & Behavior Research Foundation with his first check for $6,187 in 2012 when Hike for Mental Health was a small grassroots organization. Since then, it has become a nonprofit 501c3 and the Brain & Behavior Research Foundation has received the majority of all funds raised by Hike for Mental Health, totaling almost $130,000.

"I am absolutely convinced that there is more pain caused by the stigma than by the disease. It's the stigma that prevents the disease from getting treated," Walker said. On trails, Walker often meets hikers who tell him that hiking has saved their life. *"They mean that literally. That's been one of the most heart-warming aspects of what we've done."*

Leo Walker and Dr. Jeffrey Borenstein

Chrissy's Wish Fulfills a Promise to a Beloved Daughter

In the week following his daughter's suicide, Mario Rossi discovered more than 150 medical books and journals scattered in the basement of her Queens, New York home. Twenty-six year-old Chrissy had been searching for answers in these books, scribbling notes, leaving Post-its and highlighting passages. But the answers she was looking for could not be found even in the most cutting-edge research.

Her mother, Linda, sat on the living room floor, the books in a circle around her. She realized that Chrissy had left them a quest. She made a promise to her daughter that her death would not be in vain. Linda would do something to find the answers her daughter was searching for.

Chrissy was first diagnosed with clinical depression when she was 14 years old, an active and athletic freshman in high school. Since the age of six, Chrissy had been a gifted gymnast, competing in high school-level events even while in elementary school.

For decades Chrissy drifted from doctor to doctor, therapist to therapist. She was hospitalized multiple times, once after a suicide attempt. Doctors placed her on various medications for her depression, and she often found herself in a whirlwind of severe side effects. Sometimes the drugs would work for a while, and then stop.

On July 21, 2006, Chrissy went over to her parents' home and stayed for an hour. She kissed them goodbye, and told them she loved them. At 10:30 that night, Linda called to check in. Chrissy told her that her friend Dave was coming later. "Momma, you have to let it go." Those were her last words to Linda.

Like Chrissy, 90 percent of those who die by suicide experience mental illness. Linda and Mario set up the "Chrissy's Wish Memorial Fund" as a way to fulfill the promise they made to their daughter. It is their hope that they will be able to help tear down the stigma of mental illness and bring awareness to mental health issues, as well as research on our understanding of the brain.

It has been 10 years since Chrissy has passed away. Through the Rossi's annual "Chrissy's Wish" fundraiser, with an attendance of 300 people, Linda and Mario have raised more than half a million dollars for brain and behavior research over the past nine years. The money has been donated entirely to the Brain & Behavior Research Foundation and its mission of funding mental health research.

"This is our cause, and one we share with literally millions of others," said Linda and Mario.

From Left to Right: Joe Rossi, Diana Rossi, Linda Rossi, Angela Rossi and Mario Rossi

2016 BRAIN & BEHAVIOR RESEARCH FOUNDATION PRIZEWINNERS

KLERMAN & FREEDMAN PRIZEWINNERS

The Annual Klerman and Freedman Prizes recognize exceptional clinical and basic research conducted by Young Investigator Grantees. The prizewinners are selected by committees of the Foundation's Scientific Council.

2016 KLERMAN PRIZEWINNER:
Katie A. McLaughlin, Ph.D.
University of Washington

HONORABLE MENTIONS:
Erin C. Dunn, Sc.D., MPH
Harvard Medical School and
Massachusetts General Hospital

Avram J. Holmes, Ph.D.
Yale University

2016 FREEDMAN PRIZEWINNER:
Kay M. Tye, Ph.D.
Massachusetts Institute of Technology

HONORABLE MENTIONS:
Kathleen Kyung Ah Cho, Ph.D.
University of California, San Francisco

Conor Liston, M.D., Ph.D.
Weill Cornell Medical College

OUTSTANDING ACHIEVEMENT AWARD PRIZEWINNERS

With its Outstanding Achievement Prizes, the Brain & Behavior Research Foundation recognizes outstanding research leadership and contributions to mental health research.

LIEBER PRIZE FOR OUTSTANDING ACHIEVEMENT IN SCHIZOPHRENIA RESEARCH
Michael F. Green, Ph.D. &
Stephen R. Marder, M.D.
University of California, Los Angeles

MALTZ PRIZE FOR OUTSTANDING ACHIEVEMENT IN SCHIZOPHRENIA RESEARCH
William P. Horan, Ph.D. &
Amanda McCleery, Ph.D.
University of California, Los Angeles

GOLDMAN-RAKIC PRIZE FOR OUTSTANDING ACHIEVEMENT IN COGNITIVE NEUROSCIENCE
Earl K. Miller, Ph.D.
Massachusetts Institute of Technology

COLVIN PRIZE FOR OUTSTANDING ACHIEVEMENT IN MOOD DISORDERS RESEARCH
Francis J. McMahon, M.D.
National Institute of Mental Health

Thomas G. Schulze, M.D.
Medical Center of the University of Munich

Pamela Sklar, M.D., Ph.D.
Icahn School of Medicine at Mount Sinai

RUANE PRIZE FOR OUTSTANDING ACHIEVEMENT IN CHILD AND ADOLESCENT PSYCHIATRIC RESEARCH
John L. R. Rubenstein, M.D., Ph.D.
University of California, San Francisco

THE PARDES HUMANITARIAN PRIZE IN MENTAL HEALTH

This international Prize recognizes a physician, scientist or public citizen whose extraordinary contribution has made a profound and lasting impact by improving the lives of people suffering from mental illness and by advancing the understanding of mental health. The Pardes Humanitarian Prize has been established to honor individuals, who comprehensively care, teach, investigate, work and passionately advocate for improving the mental health of society, and who have had a powerful impact on reducing the pain inflicted by psychiatric illness.

HONOREES:
Vikram Patel, Ph.D., F.Med.Sci. &
Charles F. Reynolds III, M.D.

HONORARY TRIBUTE:
Senator Edward M. Kennedy

2016 FINANCIAL SUMMARY

We are pleased to report on the financial position and results of the Brain & Behavior Research Foundation for 2016. We acknowledge, with great thanks and appreciation, the outstanding commitment of Foundation leadership, dedicated staff, volunteers and our donors that allow the Foundation to perform its vital work. We are 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 projects to fund.

In 2016, contributions remained strong and bequests continued to provide major support for which we are deeply grateful to all of our supporters for their generosity. We would like to again acknowledge the extraordinary bequest from the late Oliver D. Colvin, Jr. that continues to impact the work of 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 another strong year of results, we continue to move forward with our aim of accelerating research accomplishments to help those living with mental illness to live full and productive lives. During 2016, the Foundation awarded additional NARSAD Grants to bring the total investment in mental health research to more than $360 million since inception.

We remain very appreciative and thankful for the generosity of the two family foundations who have underwritten, once again, the Foundation's operating expenses. This allows for contributions targeted for research to go directly to funding NARSAD Grants. The financial report shown herein has been summarized from our 2016 audited financial statements. The Foundation's complete audited financial statements and our most recent IRS Form 990 are available online at bbrfoundation.org or contact our office at 800.829.8289 for copies of the material.

COMBINED STATEMENT OF FINANCIAL POSITION

	DECEMBER 31, 2016
ASSETS	
Cash and cash equivalents	$8,263,754
Investments, at fair value	20,579,851
Contributions receivable	75,121
Pledges receivable, net	216,298
Prepaid expenses and other assets	61,869
Assets held in charitable remainder trusts	1,310,542
Fixed assets, net	24,063
Security deposits	77,110
	$30,608,608
LIABILITIES AND NET ASSETS	
Liabilities	
Accounts payable and accrued expenses	$161,974
Grants payable	18,084,922
Accrued compensation	83,420
Annuities payable	737,604
Charitable gift annuities payable	284,323
Total Liabilities	**19,352,243**
Net Assets	
Unrestricted	6,342,865
Permanently restricted	4,913,500
Total Net Assets	**11,256,365**
	$30,608,608

COMBINED STATEMENT OF ACTIVITIES

	YEAR ENDED DECEMBER 31, 2016
SUPPORT AND REVENUE	
Contributions	$9,337,444
Special events, net	429,584
Contribution of services	1,886,697
Bequests	5,047,159
Net realized and unrealized gains on investments	893,702
Net depreciation of assets held in charitable remainder trusts	(52,927)
Dividend and interest income	514,565
Total Support and Revenue	**18,056,224**
EXPENSES	
Program Services	
Research grants and awards	11,932,235
Scientific advancement	2,256,076
Program support	2,814,906
Total Program Services	**17,003,217**
Supporting Services	
Fundraising*	930,447
Administration*	1,682,736
Total Supporting Services	**2,613,183**
Total Expenses	**19,616,400**
Change in Net Assets	(1,560,176)
Net Assets, beginning of year	12,816,541
Net Assets, end of year	**$11,256,365**

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

BRAIN & BEHAVIOR
RESEARCH FOUNDATION
Awarding **NARSAD** Grants

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New York, NY 10016—1301
646.681.4888 | 800.829.8289
info@bbrfoundation.org
bbrfoundation.org

Investing in Breakthroughs to Find a Cure

100% of donor contributions for research are invested in our grants leading to advances and breakthroughs in brain and behavior research. This is made possible by the generous support of two family foundations which cover our Foundation's operating expenses.

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.

HOW WE DO IT:

The Foundation funds the most innovative ideas in neuroscience and psychiatry to better understand the causes and develop new ways to treat brain and behavior disorders. These disorders include depression, bipolar disorder, schizophrenia, autism, attention-deficit hyperactivity disorder, anxiety, borderline personality disorder, chemical dependency, obsessive-compulsive disorder and post-traumatic stress disorders.

OUR CREDENTIALS:

Since 1987, we have awarded more than $360 million to fund more than 5,000 grants to more than 4,000 scientists around the world.

OUR VISION:

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

RESEARCH 19 30 87 years FOR CURES