BRAIN&BEHAVIOR RESEARCH FOUNDATION

2020 ANNUAL REPORT

Awarding research grants to develop improved treatments, cures, and methods of prevention for mental illness.



BBRF is the world's largest private funder of mental health research grants, supporting transformative discoveries in order to develop improved treatments, cures, and methods of prevention for our loved ones.

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.

Vision

To dramatically improve the lives of those living with mental illness, ultimately enabling them to live full, happy, and productive lives.

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What We Support

BBRF funds research in the following areas: Addiction, ADHD, Anxiety, Autism, Bipolar Disorder, Borderline Personality Disorder, Depression, Eating Disorders, OCD, PTSD, Schizophrenia, and Suicide Prevention.

Our Scientific Council

The high quality of the research we fund is made possible by the BBRF Scientific Council. This group of 183 prominent mental health researchers, led by Dr. Herbert Pardes, reviews each grant application and selects the most promising ideas with the greatest potential to lead to breakthroughs. The Scientific Council guides the Foundation to fund creative and impactful basic, translational, and clinical research relevant to the whole spectrum of mental health.

"Together we can dramatically improve the lives of those living with mental illness and enable more people to live full, happy, and productive lives."

Jeffrey Borenstein, M.D. BBRF President & CEO

Our operating expenses are covered by separate foundation grants.

Research for Recovery

30+ years

For more than 30 years the Brain & Behavior Research Foundation has fostered new research pathways and transformative breakthroughs.

70k+
donors

Our 70,000 donors have joined together in the great challenge of modern medical science — overcoming mental illness.



Since 1987 the Foundation has awarded more than \$418 million to fund more than 6,000 grants.



Grants have been given to more than 5,000 leading scientists around the world.



Jeffrey Borenstein, M.D. President & CEO



Herbert Pardes, M.D.President, Scientific Council



Geoffrey SimonChair, Board of Directors

The COVID-19 pandemic has touched all our lives— especially people with psychiatric conditions. They've had significantly higher rates of COVID-19 infection and worse outcomes.

According to the Centers for Disease Control and Prevention (CDC), the number of adults experiencing depression and anxiety has quadrupled in the past year. The long-term effects of COVID-19 on the brain are just starting to come to light. Particularly troubling is evidence that there may be mild—but very real—brain damage that occurs in many survivors. This is leading to cognitive, behavioral, and psychological problems.

One of the bright spots in a very difficult year is scientific research. It was research and development that brought us the vaccines now combating the COVID-19 pandemic. The ability of research scientists to create and bring multiple vaccines to market within months, not years, underscores the real power of scientific research, built on years of diligent work by scientists around the world.

Although research scientists have developed vaccines and therapies to control the pandemic, they haven't found instant solutions to the mental health and behavioral problems that are on the rise, particularly post-pandemic. For that we still need research—now more than ever.

The Brain & Behavior Research Foundation (BBRF) is funding that research. BBRF supports brain research from the very beginning of a research scientist's career, from his or her first novel idea. Our Young Investigator grants provide the seed funding young researchers need to pursue their hypotheses, concepts, and strategies that our independent Scientific Council believe have the

greatest chance of advancing the field and paving the way for better treatments, cures, and methods of prevention.

BBRF is a collaboration—between generous donors and dedicated scientists—and the research we fund together has been innovative, visionary, and transformative.

To date, BBRF has provided more than \$418 million in research grants to more than 5,000 scientists around the world. We are proud to report that in 2020 BBRF funded more than \$18 million in research grants across a broad spectrum of brain illnesses including: Addiction, ADHD, Anxiety, Autism, Bipolar Disorder, Borderline Personality Disorder, Depression, Eating Disorders, OCD, Psychosis, PTSD, Schizophrenia, as well as Suicide Prevention.

One reason that research funded by BBRF has such great impact is because we do not limit our focus to one illness or condition. Another reason is because **100% of every dollar donated for research is invested in our research grants**. We can do this because our operating expenses are covered by separate foundation grants. This means that when you donate a dollar for research that dollar goes directly to the scientist.

BBRF grantees are chosen by our world-renowned Scientific Council. Led by Dr. Herbert Pardes, the Council is comprised of 183 scientists who rigorously evaluate every grant application, identifying the most promising, high-quality science. Research proposals are submitted from around the world. The Council carefully selects those with the greatest potential for significant breakthroughs. This past year the Council evaluated more than 1,000 grant proposals and awarded 150 Young Investigator two-year research grants for \$35,000 per year.

Over the past 30+ years, BBRF grants have been the springboard for young scientists to get new ideas off the ground, create improved treatments and new methods of prevention. This crucial funding generates preliminary data that often leads to additional funding from the National Institutes of Health (NIH). BBRF grantees usually then go on to receive sustained grant support from other sources (bother federal and private) that on average has equaled 10 times the original research grant amount. This "multiplier effect" is a vital part of what makes BBRF the largest private funder of mental health research grants.

Innovative

research.

scientists. Novel

ideas. Cutting edge

BBRF research is playing a vital role in some of the most important advances impacting people with mental illness and their families right now. These include: Rapid-acting antidepressants; Non-invasive brain stimulation to treat depression, OCD and PTSD; Computer-guided cognitive remediation for enhanced recovery in schizophrenia; and potentially lowering a child's mental

illness risk via maternal choline supplements. These are transformative developments that brain science has achieved over the past 20 years.

Many significant BBRF-funded research results were published in papers in leading psychiatric and medical journals during 2020. This annual report features our "Top 10" Leading Research Achievements by BBRF grantees, prizewinners & Scientific Council members in the past year. This illustrates a cross-section of the remarkable progress being made by investigators we have funded. These important advancements, as well as other scientific discoveries, reflect how BBRF helps people who live with mental illness.

This year BBRF awarded its Outstanding Achievement Prizes in Mental Health to seven scientists for their extraordinary work in advancing psychiatric research. The Prizewinners were featured presenters at BBRF's 2020 International Mental Health Virtual Symposium.

Our annual Pardes Humanitarian Prizewinners in Mental Health were Myrna Weisman, Ph.D. and Sir Michael Rutter, FRS, while E. Fuller Torrey, M.D., received an honorary tribute. The BBRF International Mental Health Virtual Symposium is available to watch free on-demand at www.bbrfoundation.org/event/international-mental-health-research-symposium.

The Brain & Behavior Magazine continues to inform readers of the most important advancements in scientific research. This is supplemented by eNews, a weekly email newsletter that features the research of BBRF grantees, prizewinners, and Scientific Council members. Through these and other efforts, we aim to share information with you as often as possible about what is happening in the labs, and about work that is carrying new knowledge and insights from bench to bedside.

BBRF also produces the public television series, "Healthy Minds," which is broadcast on public television stations

around the nation and can be viewed online at www.bbrfoundation.org/ healthy-minds-tv. The series aims to decrease stigma and prejudice by providing useful information to the public about psychiatric conditions and treatments as well as cutting-edge research advancements.

At the heart of the Brain & Behavior Research Foundation's unprecedented success funding innovative and impactful research is collaboration. Our shared

goal of a world free from debilitating mental illnesses relies first and foremost upon you, our donors—in partnership with the scientists chosen by the BBRF Scientific Council—who transform support into improved treatments, cures, and methods of prevention for our loved ones.

Working alongside the BBRF Board, Scientific Council, and our donors is an honor, and we thank you for your dedication to our mission. We continue to be inspired by the magnitude and scope of the discoveries that are being made by the scientists we fund together and appreciate your ongoing generous support.

Sincerely,

Jeffrey Borenstein, M.D.

President and CEO

Herbert Pardes, M.D.
President, Scientific Council

Geoffrey Simon

Chair, Board of Directors

BBRF Grants Are Making a Difference

Research supported by BBRF grants is playing a vital role on some of the most important fronts in the fight against mental illness.

The First Rapid-Acting Antidepressants

In 2019, the FDA approved esketamine, the first-ever rapid-acting antidepressant for patients with treatment-resistant depression, and brexanolone, which can lift postpartum depression within 48 hours. 90 BBRF grants over 20 years helped build the foundation for these long-sought advances.

Non-Invasive Brain Stimulation to Treat Depression, OCD, PTSD

BBRF grants seeded research which led to FDA approval in 2008 of rTMS (repetitive transcranial magnetic stimulation) for treatment-resistant major depression. BBRF grantees are now testing more powerful and faster-acting brain-stimulation technologies with a wide range of potential applications.

Computer-Guided Cognitive Remediation for Enhanced Recovery in Schizophrenia

Recovery may be possible for more people with schizophrenia and other disorders in which cognitive function is impaired, including bipolar disorder and depression. Recently, BBRF-funded scientists have clinically validated computer-guided methods of enhancing verbal and auditory learning capacity, processing speed, working memory, and recall ability in chronic schizophrenia patients.



Lowering the Child's Mental Illness Risk via Maternal Choline Supplements

BBRF grantees have pioneered choline supplementation in the diet of pregnant women to reduce the risk of mental illness in children.
Today, the American Medical Association recommends including choline in prenatal vitamin supplements.

Harnessing Stem Cell Technology to Study Autism, Schizophrenia

BBRF grantees have pioneered the use of stem-cell technologies to create functioning brain "organoids"—living test-beds that can be used to assess new drug candidates as well as reveal how genetic variations cause pathologies in the fetal brain as it develops. This research is especially pertinent in autism, schizophrenia and other disorders with developmental roots.

Computer-Guided Early Diagnosis of Mental Illness

BBRF-funded investigators are training machines that, in turn, train themselves—ultimately, to a level of precision not possible in humans—to recognize potentially diagnostic patterns of clinical data or biological markers in schizophrenia, first-episode psychosis, major depression, and bipolar disorder.

Our Scientific Council

- **180** Scientific Council Members (18 Emeritus)
- **51** Members of the National Academy of Medicine
- **32** Chairs of Psychiatry & Neuroscience Departments
- **16** National Institute of Health Chiefs & Directors
- **10** Members of the National Academy of Sciences
- **3** Recipients of the National Medal of Science
- 2 Former Directors of the National Institute of Mental Health and the current Director
- 1 Nobel Prize Winner

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Herbert Pardes, M.D.

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Our New Scientific Council Members

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

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

We welcome our 10 newest members.



"At its very core BBRF strives to find the dynamic path forward. Scientists who have received a BBRF grant have generated seminal ideas, launched discoveries that have changed the direction of research, and helped foster the development and testing of novel therapies offering new and better therapeutic options to patients. The Scientific Council is working hard to find and support those early-career scientists who are on the path to solving the most intricate and complicated of illnesses—mental illness."

- Herbert Pardes, M.D.



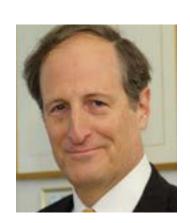
NII ADDY, Ph.D.Associate Professor of Psychiatry *Yale University School of Medicine*



CHRIS COWAN, Ph.D.
Professor, Departments of
Neuroscience and Psychiatry
William E. Murray SmartState
Endowed Chair of Excellence in
Neuroscience
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The Medical University of
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KAFUI DZIRASA, M.D., Ph.D.
Assistant Professor, Psychiatry & Behavioral Sciences and Biomedical Engineering
Associate Professor, Neurobiology and Neurosurgery Investigator in the Duke Institute for Brain Sciences
Duke University
2013 BBRF Sidney R. Baer, Jr. Prize for Outstanding Achievement in Schizophrenia Research



RENÉ KAHN, M.D., Ph.D. Esther and Joseph Klingenstein Professor & Chair, Department of Psychiatry and Behavioral Health System

Icahn School of Medicine at Mount Sinai

Director, VISN 2 Mental Illness Research, Education and Clinical Center (MIRECC)

James J. Peters Veterans Affairs Medical Center

Our New Scientific Council Members (continued)



SARAH LISANBY, M.D. Director, Division of Translational Research National Institute of Mental Health 2010 BBRF Distinguished Investigator 2003 BBRF Independent Investigator 2001 BBRF Klerman Prize for Exceptional Clinical Research 1996 BBRF Young Investigator



CARLA MAZEFSKY, Ph.D. Associate Professor of Psychiatry and Psychology University of Pittsburgh Medical Center



COLLEEN MCCLUNG, M.D., Ph.D. Professor of Psychiatry and Clinical and Translational Science University of Pittsburgh School of Medicine 2016 BBRF Independent Investigator 2007, 2005 BBRF Young Investigator



PETER PENZES, Ph.D. Director, Center for Autism and Neurodevelopment Ruth and Evelyn Dunbar Professor of Psychiatry and Behavioral Sciences Professor of Physiology, Pharmacology and Psychiatry and Behavioral Sciences Northwestern University 2007, 2003 BBRF Young Investigator



CAROLYN RODRIGUEZ, M.D., Ph.D. Assistant Professor, Department of Psychiatry and Behavioral Sciences Director, Translational OCD Research Program Stanford University School of Medicine 2014, 2009 BBRF Young Investigator



DAVID SILBERSWEIG, Chairman, Department of Psychiatry Co-Director, Center for the Neurosciences Brigham and Women's Hospital Stanley Cobb Professor of Psychiatry Harvard Medical School 1996 BBRF Young Investigator

2020 Leading Research Achievements by Foundation Grantees, Prize Winners, & Scientific Council Members

NEXT-GENERATION THERAPIES: Anxiety Disorders

Inhibiting the Threat Response in the Presence of a "Safety" Signal



Dylan Gee, Ph.D. Yale University 2015 BBRF Young Investigator Proceedings of the National Academy of Sciences, December 2019

Researchers identified a neural circuit projecting from a part of the brain's hippocampus that enables people to inhibit their response to a perceived threat in the presence of a learned "safety" signal. Targeting this circuit could lead to a new therapeutic approach to fear-related anxiety. The pathway the researchers discovered diverges from the circuitry involved in "extinction learning" which is central in cognitive behavioral therapy (CBT) often prescribed to reduce fear- and stressrelated anxiety.

The research team included: Francis Lee, M.D., Ph.D., BBRF Scientific Council, 2011 BBRF Independent Investigator, 2005 and 2002 Young Investigator; Conor Liston M.D., Ph.D., 2013 BBRF Young Investigator.

NEXT-GENERATION THERAPIES: Addiction, Substance-Use Disorders

In 2 Trials, Ketamine Added to Behavioral Therapy Helped People with Cocaine and **Alcohol Dependencies to Abstain**



Frances R. Levin, M.D. Columbia University 2000 BBRF Independent Investigator American Journal of Psychiatry, February 2020

In separate randomized clinical trials published in February 2020 and November 2019, a research team at Columbia University and the New York Psychiatric Institute reported success in combining existing forms of behavioral-modification therapy and a single infusion of the drug ketamine (at a sub-anesthetic dose) to enable people with alcohol and cocaine dependencies to maintain abstinence. In the cocaine trial, ketamine was combined with mindfulness-based behavioral training; in the alcohol trial, it was paired with motivational enhancement therapy. Ketamine provided protection against a lapse in abstinence evolving into continued use—i.e., relapse—or into a dropout from treatment. The team suggests that ketamine may affect brain biology in ways that make the behavioral therapy component more effective than when given alone, a concept to be tested in larger trials.

Dr. Levin was a senior member of the teams in both trials. The team in the cocaine trial included Sanjay Mathew, M.D., 2009 BBRF Independent Investigator, 2006 and 2001 BBRF Young Investigator. Both trials were led by Elias Dakwar, M.D., and Edward Nunes, M.D., of Columbia University.

BASIC RESEARCH: Depression, Anxiety Disorders

Mechanism in Brain's Blood-Vessel Cells That Promotes Stress Resilience



Caroline Ménard, Ph.D.

Laval University / CERVO Brain Research Centre, Canada

2016 BBRF Young Investigator

Proceedings of the National Academy of Sciences, February 2020

Researchers discovered molecular mechanisms in blood-vessel cells that form the blood-brain barrier (BBB) which may protect the brain against stress and depression, and which might be targeted in future therapies. The BBB selectively allows certain nutrients and other essential factors in the blood to pass into brain tissue, while keeping out pathogens, pro-inflammatory immune signals and other harmful elements. Dr. Ménard's team explored mechanisms that give rise to leaks in the bloodbrain barrier, promoting depression, and identified several potentially targetable immune pathways that help keep the BBB strong amid challenges like stress or inflammation.

The research team included: Carol Tamminga, M.D., BBRF Scientific Council, 2011 BBRF Lieber Prize, 2010 and 1988 BBRF Distinguished Investigator; Gustavo Turecki, M.D., Ph.D., 2020 BBRF Colvin Prize, 2016 BBRF Distinguished Investigator, 2008 BBRF Independent Investigator, 2000 BBRF Young Investigator; Scott Russo, Ph.D., 2008 and 2006 BBRF Young Investigator; Sam Golden, Ph.D., 2018 BBRF Young Investigator.

NEXT-GENERATION THERAPIES: Depression, PTSD

Discovery of a Way to Potentially Extend Ketamine's Antidepressant Effects



Chadi G. Abdallah, M.D.

Yale University / VA National Center for PTSD

2014 and 2012 BBRF Young Investigator

Neuropsychopharmacology, February 2020

Pre-treating refractory depression patients with the FDA-approved antibiotic drug rapamycin before giving them a ketamine infusion was found in a clinical trial to extend ketamine's antidepressant effects. When patients took rapamycin prior to receiving ketamine, 41% still showed a clinical antidepressant response after two weeks, with 29% in full remission. This compared with 13% response and 7% remission when placebo was given prior to ketamine instead of rapamycin. In most patients, when ketamine is given alone, its effects are robust for several days and fade after about a week. The researchers note that rapamycin is a potent suppressor of inflammation, which has often been suspected of involvement in the biology of depression. They speculate that the anti-inflammatory effects of rapamycin may protect new or restored synaptic connections between neurons in the cortex that are forged after a ketamine infusion.

The research team included: John H. Krystal, M.D., BBRF Scientific Council, 2006 and 2000 BBRF Distinguished Investigator, 1997 BBRF Independent Investigator; Gerard Sanacora, M.D., Ph.D., BBRF Scientific Council, 2014 BBRF Distinguished Investigator, 2007 BBRF Independent Investigator, 2001 and 1999 BBRF Young Investigator; the late Ronald S. Duman, Ph.D., 2005 BBRF Distinguished Investigator, 2002 Falcone Prize, 1997 BBRF Independent Investigator and 1989 BBRF Young Investigator; Deepak Cyril D'Souza, M.D., 2013 BBRF Independent Investigator; Kyung-Heup Ahn, M.D., 2009 BBRF Young Investigator; Mohini Ranqanathan, M.D., 2007 BBRF Young Investigator; Lynette Averill, Ph.D., 2015 BBRF Young Investigator.

NEW TECHNOLOGIES, BASIC RESEARCH: Schizophrenia, Autism, Developmental Disorders

Integrating Stem-Cell Technology and CRISPR Gene Editing Makes New Insights Possible on Disruptions in Brain Development



Kristen Brennand, Ph.D.

Icahn School of Medicine at Mount Sinai / Yale University

BBRF Scientific Council, 2018 BBRF Maltz Prize, 2016 BBRF Independent Investigator, 2012 BBRF Young Investigator



Schahram Akbarian, M.D., Ph.D.

Icahn School of Medicine at Mount Sinai

BBRF Scientific Council, 2018 BBRF Lieber Prize, 2012 BBRF Distinguished Investigator, 2000, 1995, 1993 BBRF Young Investigator, 1997 BBRF Klerman Prize

Schizophrenia Research, March 2020

Researchers harnessed the power of a gene-editing technology called CRISPR to make stem cell-based studies of psychiatric disorders much more powerful. Skin and blood cells sampled from patients can be reprogrammed to revert to a stem cell-like state and then be directed to redevelop as immature brain cells which can reveal pathologies caused by the patient's genetic variations. Using CRISPR to create "isogenic" cell lines enables researchers to distinguish the specific biological changes associated with a single "risk gene" or combinations of them, irrespective of DNA differences between cell donors. Drs. Brennand and Akbarian are pioneers in "integrating" the two technologies, thus helping to enhance the collective power of the field to explore causation and identify new treatments, especially for disorders such as schizophrenia and autism with strong genetic roots whose pathologies may begin early in brain development.

NEXT-GENERATION THERAPIES: Depression

Remarkable Remission Rate Reported in Patients Who Received SAINT, a Non-Invasive **Brain-Stimulation Treatment for Refractory Depression**



Nolan Williams, M.D.

Stanford University

2019 BBRF Klerman Prize, 2018, 2016 BBRF Young Investigator

American Journal of Psychiatry, April 2020

In a pilot trial involving 21 patients who had not responded to previous depression therapies, researchers employed a form of non-invasive brain stimulation treatment called iTBS (intermittent theta-burst stimulation). In this test, five times as much total stimulation was delivered over a 5-day period than currently FDA-approved depression treatments for iTBS and rTMS deliver in 6 weeks. After 5 days of treatments 90% of the participants achieved remission of their depression symptoms. One month later, 70% of patients continued to experience an antidepressant "response"—a reduction in initial symptoms of at least 50%. A larger trial is now in progress to confirm the rapid anti-depressant effects seen in the pilot trial.

The research team included Alan Schatzberg, M.D., BBRF Scientific Council, 2005 BBRF Falcone Prize.

NEXT-GENERATION THERAPIES: Bipolar Disorder

Study Finds Important Changes in the Treatment of Bipolar Disorder Over 20 Years



Samuel Wilkinson, M.D. Yale University 2016 BBRF Young Investigator American Journal of Psychiatry, April 2020

Based on outpatient treatment records, researchers found that compared with 20 years ago, bipolar disorder outpatients today are much more likely to be prescribed an antipsychotic and/or an antidepressant medication rather than a mood stabilizer like lithium. Second-generation antipsychotics have in large measure replaced lithium and other mood stabilizers, the team noted, in the absence of any comparative effectiveness data that would indicate superior outcomes for patients. The researchers also noted a consistent lack of evidence for the efficacy of antidepressants in outpatients with bipolar disorder. In view of the trends they identified, the team strongly recommended initiating comparative effectiveness studies for mood stabilizers vs. second-generation antipsychotics, as well as efficacy studies for antidepressants in bipolar disorder outpatients.

The research team included: **Andrew Nierenberg, M.D.**, BBRF Scientific Council, 2013 BBRF Colvin Prize, 2013 BBRF Distinguished Investigator, 2003 and 2000 BBRF Independent Investigator; Mark Olfson, M.D., 2005 BBRF Distinguished Investigator.

DIAGNOSTIC TOOLS/EARLY INTERVENTION: Psychosis, Schizophrenia, Developmental Disorders In Pregnant Women with COVID-19, Higher Choline Levels May Protect Fetal **Brain Development**



Robert R. Freedman, M.D.

University of Colorado Denver School of Medicine

BBRF Scientific Council, 2015 BBRF Lieber Prize, 2006 and 1999 BBRF Distinguished Investigator



M. Camille Hoffman, M.D.

University of Colorado Denver School of Medicine

2015 BBRF Baer Prize

Journal of Psychiatric Research, May 2020

New research suggests that having higher levels of the nutrient choline via diet or supplements may protect brain development of the fetus in pregnant women who develop COVID-19 infection by early in the 2nd trimester. When faced with an infection, the mother's body mounts an immune response, which poses a potential health risk to the fetus. The team drew upon data collected in their prior studies of women who developed bacterial and viral infections during the first 16 weeks of pregnancy—the point at which the fetus is most vulnerable to maternal inflammation. The data indicated that higher choline levels obtained through diet or supplements may protect fetal development and support early behavioral development even if the mother contracts a viral infection in early gestation when the brain is first being formed. Choline levels, they note, are most important early in pregnancy—levels beginning at 22 weeks were not observed to affect infant outcomes.

The research team included: Amanda Law, Ph.D., BBRF Scientific Council, 2011 Baer Prize, 2009 BBRF Distinguished Investigator, 2006 BBRF Young Investigator; Sharon Hunter, Ph.D., 2003 BBRF Young Investigator.

BASIC RESEARCH: Schizophrenia, Depression, Epilepsy, Alzheimer's

Researchers Discover a Role for Immune Cells Called Microglia in Inhibiting Brain Activity and Regulating Behavior



Anne Schaefer, M.D., Ph.D. Icahn School of Medicine at Mount Sinai 2010 BBRF Young Investigator Nature, September 2020

Researchers discovered a new way in which the brain keeps neural activation within normal bounds: immune cells specific to the brain, called microglia, sense neural activity and respond by locally inhibiting it. Failure of this mechanism may be involved in illnesses ranging from Alzheimer's and epilepsy to depression and schizophrenia. The study puts a fresh spotlight on these cells as partners of neurons in the regulation of neuronal activity and behavior. When inflammation is present, Dr. Schaefer explains, or in neurodegenerative diseases like Alzheimer's, microglia lose their ability to regulate neural activity perhaps a factor in the pathology associated with these conditions. Since dysregulated neuronal activity is part of the pathology of an illness like Alzheimer's, it means the regulatory role played by microglia also has an impact, indirectly, on behavior—something not previously

The research team included: **Paul Kenny, Ph.D.**, 2015 BBRF Distinguished Investigator, 2004 BBRF Young Investigator; Erin Calipari, Ph.D., 2018 BBRF Young Investigator; James Surmeier, Ph.D., 1996 BBRF Distinguished Investigator; Munir Gunes Kutlu, Ph.D., 2019 BBRF Young Investigator; Pinar Ayata, Ph.D., 2016 BBRF Young Investigator.

NEXT-GENERATION THERAPIES: Bipolar Disorder

Psychotherapy in Addition to Medication Helps Bipolar Disorder Patients Avoid Relapse and Manage Their Symptoms, Study Reveals



David Miklowitz, Ph.D.

University of California, Los Angeles

2011 BBRF Colvin Prize, 2001 BBRF Distinguished Investigator, 1987 BBRF Young Investigator

JAMA Psychiatry, October 2020

An analysis of 39 randomized clinical trials involving 3,863 individuals diagnosed with bipolar disorder concluded that when medication is supplemented with various forms of psychotherapy, the rate of recurrence in the next 12 months declines, and symptoms are better managed. The study found that psychoeducation with "guided practice" of illness management skills" was superior when delivered in a family format (i.e., patients with their caregivers) or a group format (patients with other patients) than when delivered in an individual (one-on-one) format. Patients were more likely to stick with their combined treatment regimens over a year's time when they received therapy in family or group formats, or when they received brief psychoeducation as opposed to more formalized versions of psychoeducation given individually. The team also concluded that medication combined with cognitive behavioral therapy (CBT), and with lesser certainty, family therapy or interpersonal therapy (IPT), was more effective than medication with "treatment as usual" in stabilizing depressive symptoms in patients.

BBRF Grants Pave the Way to Improved Treatments, Cures, and Methods of Prevention

SINCE 1987





BBRF grant recipients have gone on to receive an estimated \$4 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.

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, aiming toward prevention and cures:

Research Categories

Basic Research

To understand what happens in the brain to cause mental illness

Diagnostic Tools/Early Intervention

To recognize early signs of mental illness and treat as early as possible

Mew Technologies

To advance or create new ways of studying and understanding the brain

IDUM Next-Generation Therapies

To reduce symptoms of mental illness and ultimately cure and prevent brains and behavior disorders

The path to being awarded a BBRF grant starts with an application. Applicants for grants describe why they think their project could help lead to new insights and advances in brain and behavior disorders and represent the best and the brightest talent from world-class institutions

The BBRF's Scientific Council, which is made up of 183 preeminent mental health researchers and led by Dr. Herbert Pardes, volunteer their time to review and evaluate applications. The Scientific Council not only looks for projects with the greatest potential for immediate breakthroughs in neurobiological and psychiatric research, but also for projects which can yield additional benefits for many years to come.

This venture capital-like approach to research funding has had tremendous success in advancing the field and helping more people live full, happy, and productive lives.

"We are very proud that BBRF supports individuals from across a wide range of disciplines—neurologists, psychologists, sociologists, pharmacologists, biochemists—from all over the world. BBRF Grants foster a large scale, open, collaborative research effort with as many people as possible to help find better treatments and cures for mental illness."

Herbert Pardes, M.D.

President, BBRF Scientific Council

BBRF Young Investigator Grants in 2020







BBRF Young Investigator grants give early-career scientists the initial funding they need to begin to test their ideas and solidify their academic research careers. Young Investigator grants provide scientists with \$35,000/year for two years, totaling \$70,000. This seed money enables them to generate the preliminary data, or "proof of concept" that they need to compete for larger grants from other funding sources like the National Institutes of Health.

Many of the new 2020 projects focus on brain biology underlying a range of psychiatric disorders—for example, imbalances between excitation and inhibition in the brain; or brain circuitry that is engaged when we form memories, including fear memories when we are exposed to threats or trauma. A number of grantees are exploring tiny changes in the way the vast human genome is densely packaged in the nucleus of each cell—changes that can alter the expression of genes thought to contribute to illnesses such as schizophrenia and autism.

Several projects seek to grasp how immune cells in the brain called glia and microglia, as well as microbes living in the human gut, may be contributing to vulnerability to mental illnesses, notably depression and stress-related disorders.

Other 2020 grantees are trying to understand the mystery behind gender differences in susceptibility to depression and anxiety disorders, as well as ADHD and autism. These are just a few highlights of the many exciting new projects that BBRF grantees will be working on. It's an exciting and very promising time in brain research that we hope will lead to improved treatments in the years to come.

Co-Chairs of the Young Investigator Grant Selection Committee



Judy M. Ford, Ph.D. Professor, Department of Psychiatry University of California, San Francisco BBRF Scientific Council Member 2003 BBRF Independent Investigator



Suzanne N. Haber, Ph.D. Professor, Department of Pharmacology and Physiology University of Rochester School of Medicine and Dentistry BBRF Scientific Council Member 2011 BBRF Distinguished Investigator

"I had been in a lab for about two years. My whole scientific career depended on a \$60,000 piece of equipment and then all of sudden I was cut off. It was only because I received the BBRF Young Investigator grant at this time that I was able to buy the equipment to do the project I needed to do. That got me my next BBRF Young Investigator award and then a K Award from the NIMH. I really doubt I'd be standing here as the director of the NIMH if I hadn't been able to jumpstart my career with the help of the BBRF."

Joshua Gordon, M.D., Ph.D.

Director of the National Institute of Mental Health (NIMH) BBRF Scientific Council Member 2003, 2001 BBRF Young Investigator Grant

2020 BBRF Young Investigator Grants by Illness

Some grantees are listed under multiple categories as their grant projects are relevant to more than one illness.

ADDICTION / SUBSTANCE-USE DISORDERS

Aaron Bornstein, Ph.D.

Basic Research

Suheyla Cetin Karayumak, Ph.D.

Basic Research

Ana Covelo, Ph.D.

Basic Research

Giordano de Guglielmo, Ph.D.

Basic Research

Lauren DePoy, Ph.D.

Basic Research

Atsushi Fujimoto, M.D., Ph.D.

Basic Research

Gil Hoftman, M.D., Ph.D.

Basic Research

Emma Johnson, Ph.D.

Basic Research

Anne Marije Kaag, Ph.D.

Basic Research

Budhachandra Khundrakpam, Ph.D

■ Basic Research

Sophie Laguesse, Ph.D.

Basic Research

David Lydon, Ph.D.

Basic Research

Rajtarun Madangopal, Ph.D.

Basic Research

Zayra Millan, Ph.D.

Basic Research

Ali Mohebi, Ph.D.

Basic Research

Takashi Sato, Ph.D.

Basic Research

Jennifer Tuscher, Ph.D.

Basic Research

Marco Venniro, Ph.D.

Basic Research

ATTENTION-DEFICIT HYPERACTIVITY DISORDER (ADHD)

Vincent Breton-Provencher, Ph.D.

Basic Research

lessica Dennis, Ph.D.

Basic Research

Shulamite Green, Ph.D.

IDMIN Next-Generation Therapies

Simone Haller, Ph.D.

Basic Research

Henry Hallock, Ph.D.

Basic Research

Ansel Hillmer, Ph.D.

Basic Research

Douglas Leffa, M.D., Ph.D.

Next-Generation Therapies

Behrang Mahjani, Ph.D.

Basic Research

Diagnostic Tools/Early Intervention

Anna-Sophie Rommel, Ph.D.

Basic Research

Diego Rovaris, Ph.D.

Basic Research

Takashi Sato, Ph.D.

Basic Research

ANXIETY DISORDERS

Matthew Albaugh, Ph.D.

Basic Research

Christoph Anacker, Ph.D.

Basic Research

Karmel Choi, Ph.D.

Diagnostic Tools/Early Intervention

Hong-yuan Chu, Ph.D.

Basic Research

Brian Corbett, Ph.D.

■ Basic Research

Giannina Descalzi, Ph.D.

Basic Research

Christian Ebbesen, Ph.D.

Basic Research

Janos Fuzik, Ph.D.

Basic Research

Kirsten Gilbert, Ph.D.

Basic Research

Shulamite Green, Ph.D.

Next-Generation Therapies

Simone Haller, Ph.D.

Basic Research

Keith Hengen, Ph.D.

Basic Research

Kathryn Humphreys, Ph.D.

Basic Research

Jing Jiang, Ph.D.

Basic Research

Jonathan Kao, Ph.D.

Basic Research

Florence Kermen, Ph.D.

Basic Research

Erica Korb, Ph.D.

Basic Research

Andrew Lee, M.D., Ph.D.

■ Basic Research

Jonathan Levy, Ph.D.

Basic Research

Behrang Mahjani, Ph.D.

Basic Research

Diagnostic Tools/Early Intervention

Sarah Moore, Ph.D.

Basic Research

Carole Morel, Ph.D.

Basic Research

Megan Mueller, Ph.D.

IDMIN Next-Generation Therapies

Tiago Oliveira, M.D., Ph.D.

Basic Research

David Omer, Ph.D.

Basic Research

Maya Opendak, Ph.D.

IDUIL Next-Generation Therapies

Mario Penzo, Ph.D.

Basic Research

Abha Rajbhandari, Ph.D.

Basic Research

Luis Rosas-Vidal, M.D., Ph.D.

Basic Research

Benjamin Scott, Ph.D.

Basic Research

Joel Stoddard, M.D.

Basic Research

Hugo Tejeda, Ph.D.

Basic Research

Gergely Turi, Ph.D.

Basic Research

Gisella Vetere, Ph.D.

Basic Research

Frank Wolters, M.D., Ph.D.

Basic Research

AUTISM SPECTRUM DISORDER (ASD)

Paul Anastasiades, Ph.D.

Basic Research

Madeline Andrews, Ph.D.

Basic Research

Melody Atkins, Ph.D.

Basic Research

Melissa Caras, Ph.D.

Basic Research

Ritchie Chen. Ph.D.

IDMI Next-Generation Therapies

Arthur de Jong, Ph.D.

Basic Research

Jessica Dennis, Ph.D.

Basic Research

Christian Ebbesen, Ph.D.

Basic Research

Shulamite Green, Ph.D.

IDUIL Next-Generation Therapies

Parthiv Haldipur, Ph.D.

Basic Research

David Hildebrand, Ph.D.

Basic Research

Sarah Hopp, Ph.D.

Basic Research

Helen Hou, Ph.D.

Basic Research

Wei-Hsiang Huang, Ph.D.

Basic Research

Juhyun Kim, Ph.D.

Basic Research

Chang Hoon Lee, Ph.D.

Basic Research

Yun Li, Ph.D.

Basic Research

Behrang Mahjani, Ph.D.

Basic Research

Diagnostic Tools/Early Intervention

Moritz Mall, Ph.D.

Basic Research

Robert McCutcheon, M.D., Ph.D.

Basic Research

David Omer. Ph.D.

Basic Research

Rachel Reetzke, Ph.D.

Basic Research

Sara Sanchez-Alonso, Ph.D.

Basic Research

Isabelle St-Amour, Ph.D.

Basic Research

Mew Technologies

Lu Sun, Ph.D.

Basic Research

Summer Thyme, Ph.D.

Basic Research

Celia van der Merwe, Ph.D.

Diagnostic Tools/Early Intervention

Basic Research

Gordon Wang, Ph.D.

Basic Research

Shuyu Wang, M.D., Ph.D.

Basic Research

BIPOLAR DISORDER

Masoumeh Dehghani, Ph.D.

Basic Research

Ionathan Hess. Ph.D.

Basic Research

Sarah Hopp, Ph.D.

Basic Research

Tierney Lorenz, Ph.D.

Basic Research

Katherine Musliner, Ph.D.

Diagnostic Tools/Early Intervention

Gijsje Snijders, M.D.

Basic Research

Jacob Taylor, M.D.

Diagnostic Tools/Early Intervention

Summer Thyme, Ph.D.

Basic Research

Frank Wolters, M.D., Ph.D.

Basic Research

BORDERLINE PERSONALITY DISORDER

Christian Ebbesen, Ph.D.

Basic Research

Ionathan Kao, Ph.D.

Basic Research

Takashi Sato, Ph.D.

Basic Research

Ioel Stoddard, M.D., Ph.D.

Basic Research

DEPRESSION

Christoph Anacker, Ph.D.

Basic Research

John Anderson, Ph.D.

Mext-Generation Therapies

Yuen Siang Ang, Ph.D.

Basic Research

Diagnostic Tools/Early Intervention

Pragathi Priyadharsini Balasubramani, Ph.D.

Mext-Generation Therapies

Robin Cash, Ph.D.

Mext-Generation Therapies

Flurin Cathomas, M.D.

Basic Research

Hong-yuan Chu, Ph.D.

■ Basic Research

Brian Corbett, Ph.D.

Basic Research

Giannina Descalzi, Ph.D.

Basic Research

Jennifer Dwyer, M.D., Ph.D.

Diagnostic Tools/Early Intervention

Christian Ebbesen, Ph.D.

Basic Research

Manoela Fogaça, Ph.D.

IDMI Next-Generation Therapies

Fabiano Gomes, M.D., Ph.D.

IDMII Next-Generation Therapies

Henry Hallock, Ph.D.

Basic Research

Keith Hengen, Ph.D.

Basic Research

Jonathan Hess, Ph.D.

■ Basic Research

Frankie Heyward, Ph.D.

Basic Research

Sarah Hopp, Ph.D.

Basic Research

Jing Jiang, Ph.D.

Basic Research

Bashkim Kadriu, M.D.

Next-Generation Therapies

Allan Kalungi, Ph.D.

Basic Research

Florence Kermen, Ph.D.

Basic Research

Amber Leaver, Ph.D.

IDMI Next-Generation Therapies

Yadong Li, Ph.D.

IDMI Next-Generation Therapies

Behrang Mahjani, Ph.D.

Basic Research

Diagnostic Tools/Early Intervention

Sarah Moore, Ph.D.

Basic Research

Carole Morel, Ph.D.

Basic Research

Tiago Oliveira, M.D., Ph.D.

Basic Research

Massimiliano Orri, Ph.D.

Diagnostic Tools/Early Intervention

Santosh Pothula, Ph.D.

Next-Generation Therapies

Andrea Reiter, Ph.D.

IDUIL Next-Generation Therapies

Matthew Sacchet, Ph.D.

Basic Research

Gijsje Snijders, M.D.

Basic Research

Joel Stoddard, M.D.

Basic Research

Hugo Tejeda, Ph.D.

Basic Research

Caroline Trumpff, Ph.D.

Basic Research

Frank Wolters, M.D., Ph.D.

Basic Research

EATING DISORDERS

Laura Berner, Ph.D.

Basic Research

Kirsten Gilbert, Ph.D.

Basic Research

Travis Goode, Ph.D.

Basic Research

Hakan Kucukdereli, Ph.D.

Basic Research

Trevor Steward, Ph.D.

Basic Research

OBSESSIVE-COMPULSIVE DISORDER (OCD)

Kirsten Gilbert, Ph.D.

Basic Research

Behrang Mahjani, Ph.D.

■ Basic Research

Diagnostic Tools/Early Intervention

PSYCHOSIS

Sonia Bansal, Ph.D.

■ Basic Research

Suheyla Cetin Karayumak, Ph.D.

Basic Research

Xi Chen, Ph.D.

Basic Research

Oliver Harschnitz, M.D., Ph.D.

Basic Research

Gil Hoftman, M.D., Ph.D.

■ Basic Research

James Marshel, Ph.D.

Basic Research

Juan Molina, M.D.

Mext-Generation Therapies

Werner Surbeck, M.D., Ph.D.

Basic Research

Jacob Taylor, M.D.

Diagnostic Tools/Early Intervention

Eric Trautmann, Ph.D.

Basic Research

POST-TRAUMATIC STRESS DISORDER (PTSD)

Karmel Choi, Ph.D.

Diagnostic Tools/Early Intervention

Brian Corbett, Ph.D.

■ Basic Research

Jing Jiang, Ph.D.

Basic Research

Jonathan Kao, Ph.D.

Basic Research

Florence Kermen, Ph.D.

■ Basic Research

Erica Korb, Ph.D.

Basic Research

Jonathan Levy, Ph.D.

Basic Research

Sarah Moore, Ph.D.

Basic Research

Tiago Oliveira, M.D., Ph.D.

Basic Research

Maya Opendak, Ph.D.

Next-Generation Therapies

Abha Rajbhandari, Ph.D.

Basic Research

Luis Rosas-Vidal, M.D., Ph.D.

Basic Research

Benjamin Scott, Ph.D.

Basic Research

Hugo Tejeda, Ph.D.

Basic Research

Gergely Turi, Ph.D.

Basic Research

Gisella Vetere, Ph.D.

Basic Research

Frank Wolters, M.D., Ph.D.

Basic Research

SCHIZOPHRENIA

Gulcan Akgul, Ph.D.

Basic Research

Melody Atkins, Ph.D.

Basic Research

Sonia Bansal, Ph.D.

Basic Research

Renata Batista-Brito, Ph.D.

Basic Research

Ren-Chao Chen, Ph.D.

Basic Research

Xi Chen, Ph.D.

Basic Research

Pengfei Dong, Ph.D.

Basic Research

Shulamite Green, Ph.D.

IDUIL Next-Generation Therapies

Henry Hallock, Ph.D.

Basic Research

Jonathan Hess, Ph.D.

Basic Research

David Hildebrand, Ph.D.

Basic Research

Sarah Hopp, Ph.D.

Basic Research

Wei-Hsiang Huang, Ph.D.

Basic Research

Sweyta Lohani, Ph.D.

Basic Research

James Marshel, Ph.D.

Basic Research

Robert McCutcheon, M.D., Ph.D.

■ Basic Research

Juan Molina, M.D.

IDMI Next-Generation Therapies

Keely Muscatell, Ph.D.

Basic Research

Nicholas Neufeld, M.D.

Next-Generation Therapies

Diagnostic Tools/Early Intervention

Azahara Oliva, Ph.D.

Basic Research

Lindsay Oliver, Ph.D.

Next-Generation Therapies

Alan Park, Ph.D.

Diagnostic Tools/Early Intervention

Linden Parkes, Ph.D.

Diagnostic Tools/Early Intervention

Takashi Sato, Ph.D.

Basic Research

Gijsje Snijders, M.D.

Basic Research

Isabelle St-Amour, Ph.D.

Basic Research

Mew Technologies

Werner Surbeck, M.D., Ph.D.

Basic Research

Jacob Taylor, M.D.

Diagnostic Tools/Early Intervention

Summer Thyme, Ph.D.

Basic Research

Eric Trautmann, Ph.D.

Basic Research

Justin Trotter, Ph.D.

Basic Research

SUICIDE PREVENTION

Juliet Edgcomb, M.D., Ph.D.

Diagnostic Tools/Early Intervention

Niamh Mullins, Ph.D.

Basic Research

Alexandre Paim Diaz, M.D., Ph.D.

Mext-Generation Therapies

Georgios Voloudakis, M.D., Ph.D.

Basic Research

BIOLOGY OF THE BRAIN

(These projects focus on how the brain works)

Yuan-Hsin Chao, Ph.D.

(Cerebellum Circuitry)

Basic Research

Coco Chu, Ph.D.

(Microbes and Microglia)

Basic Research

Neir Eshel, M.D., Ph.D.

(Aggression)

■ Basic Research

Daniel Fuerth, Ph.D.

(Molecular Basis of Memory)

De Basic Research

Andrea Gomez, Ph.D.

(Alternative Splicing and Synapses)

Basic Research

James Heys, Ph.D.

Basic Research

(Temporal Encoding)

Jing Ren, Ph.D.

(Serotonin System)

■ Basic Research

Katlin Silm, Ph.D.

(Dopamine Regulation)

Basic Research

Hansem Sohn, Ph.D.

(Cognitive Control)

Basic Research

ALL DISORDERS

(These projects pertain broadly to all disorders)

Min Jee Jang, Ph.D.

(Genetic Screening)

Marie Screening)

New Technologies

Pietro Giuseppe Mazzara, Ph.D.

(Cell Reprogramming)

Mew Technologies

Karly Murphy, M.D.

(Stigma)

Basic Research

Donna Werling, Ph.D.

(Gender Differences)

Basic Research

OTHER DISORDERS

Alzheimer's Disease

Kiryl Piatkevich, Ph.D.

Basic Research

Encephalitis

Oliver Harschnitz, M.D., Ph.D.

Basic Research

Enilonsy

Summer Thyme, Ph.D.

Basic Research

Parkinson's Disease

Hong-yuan Chu, Ph.D.

Basic Research

Cesar de la Fuente, Ph.D.

Basic Research

Eric Trautmann, Ph.D.

Basic Research

2020 Young Investigators Institutional Affiliation at the Time of the Grant

(in alphabetical order)

Aarhus University, Denmark

Albert Einstein College of Medicine

Beth Israel Deaconess Medical Center

Boston Children's Hospital

Boston University

Broad Institute of MIT and Harvard

CERVO Brain Research Center, Canada,

Cold Spring Harbor Laboratory

Columbia University (7)

Douglas Mental Health University Institute, Canada

Erasmus University Medical Center,

the Netherlands

ESPCI (Ecole Superieure de Physique et Chimie

Industrielles), France

Federal University of Rio Grande do Sul, Brazil

German Cancer Research Center, Germany

Harvard University/Beth Israel Deaconess

Medical Center

Harvard University/Brigham and Women's

Hospital (2)

Harvard University/Massachusetts General

Hospital (2)

Harvard University/McLean Hospital (3)

Haskins Laboratories

Hebrew University of Jerusalem, Israel

Icahn School of Medicine at Mount Sinai (10)

Interdisciplinary Center, Herzliya, Israel

INSERM, France (2)

Institute of Psychiatry/ King's College London, UK

Johns Hopkins University/Lieber Institute for Brain

Development

Johns Hopkins University School of Medicine (2)

Karolinska Institute, Sweden

Memorial Sloan-Kettering Cancer Center

Makerere University, Uganda

Massachusetts Institute of Technology (2)

McGill University, Canada

McGill University Health Center Research Institute,

Canada

Medical University of South Carolina

Moser Research Institute/Johns Hopkins University

Max Planck UCL Centre for Computational

Psychiatry and Ageing Research, UK

Medical Research Council Laboratory of

Molecular Biology, UK

Montreal Neurological Institute/McGill University,

Canada

National Institute of Mental Health (NIH) (4)

National Institute on Drug Abuse (NIH)

New York University School of Medicine

Norwegian University of Science and Technology,

Norway

Northwestern University

Queen's University, Australia

Research Foundation for Mental Hygiene, Inc Nathan S. Kline Institute for Psychiatric Research

Rockefeller University

Seattle Children's Research Institute

SickKids Research Institute, Toronto, Canada

Stanford University (6)

State University of New York, Upstate Medical

University

Tufts University

University of Alabama at Birmingham (2)

University of Bristol, UK

University of British Columbia, Canada (2)

University of Connecticut

University of California, Berkeley

University of California, Irvine

University of California, Los Angeles (4)

University of California, San Diego (3)

University of California, San Francisco (5)

University of Colorado, Denver

University of Guelph, Canada

University of Liège, Belgium

University of Maryland (3)

University of Melbourne, Australia (2)

University of Minho, Portugal

University of Minnesota Duluth School of Medicine

University of Nebraska-Lincoln

University of New South Wales School of

Psychology, Australia

University of North Carolina at Chapel Hill (2)

University of Pennsylvania (3)

University of Pennsylvania/ Children's Hospital of

Philadelphia

University of Pittsburgh

University of São Paulo, Brazil

University of Texas Health Science Center at San

Antonio

University of Texas Health Science Center at

Houston

University of Texas Southwestern Medical Center

at Dallas (2)

University of Toronto/Centre for Addiction and

Mental Health, Canada (3)

University of Utah School of Medicine

Utrecht University, the Netherlands (2)

University of Vermont

University of Wisconsin-Madison

University of Zurich/Zurich University Hospital of

Psychiatry, Switzerland

Van Andel Research Institute

Vanderbilt University (2)

Vrije Universiteit Amsterdam, the Netherlands

Washington University, St. Louis (3)

Weill Cornell Medical College

Westlake University, People's Republic of China

Yale University (5)

The Klerman & Freedman Awards



The Brain & Behavior Research Foundation honored and recognized the exceptional work of six outstanding young researchers who have previously received awards through the BBRF's Young Investigator Grant program with its annual Klerman & Freedman Prizes for exceptional clinical and basic research in mental illness.

The Klerman and Freedman prizes recognize innovative thinking and remarkable talent across the field of neuropsychiatry. These prizes pay tribute to Drs. Gerald L. Klerman and Daniel X. Freedman, whose legacies as researchers, teachers, physicians and administrators have indelibly influenced neuropsychiatry.

Their outstanding contributions to the field of brain and behavior research continue to inspire scientists who knew them, as well as those who are just entering the field.

The prizewinners were selected by committees of the Foundation's Scientific Council.

ANNUAL KLERMAN PRIZE FOR EXCEPTIONAL CLINICAL RESEARCH



Ellen Lee, M.D. University of California San Diego; VA San Diego Healthcare System

ANNUAL FREEDMAN PRIZE FOR EXCEPTIONAL BASIC RESEARCH



Cody A. Siciliano, Ph.D. Vanderbilt University, Department of Pharmacology, Vanderbilt Center for Addiction Research

HONORABLE MENTIONS



Soonjo Hwang, M.D. University of Nebraska Medical Center/Nebraska Medicine

HONORABLE MENTIONS



Kevin Beier, Ph.D. University of California, Irvine Departments of Physiology & Biophysics, Neurobiology and Behavior, Biomedical Engineering, Pharmaceutical Sciences



Hadar Ben-Yoav, M.Sc., Ph.D. Ben-Gurion University of the Negev, Israel, Department of Biomedical Engineering and Ilse Katz *Institute for Nanoscale Science* and Technology



Lorna A. Farrelly, Ph.D. Icahn School of Medicine at Mount Sinai, Nash Family Department of Neuroscience, Friedman Brain Institute



Scientist Spotlight with:

Ellen Lee, M.D.

2020 BBRF Klerman Prize for Exceptional Basic Research 2017 BBRF Young Investigator Award

Dr. Ellen E. Lee is an Assistant Professor of Psychiatry at the University of California San Diego and Staff Psychiatrist at the VA San Diego Healthcare System. She is board-certified in Psychiatry and Geriatric Psychiatry. Dr. Lee's research focuses on biological and psychosocial aging in persons with schizophrenia and healthy aging populations, specifically the links between inflammation, sleep disturbances, cognitive and cardiometabolic health. Dr. Lee's lab employs blood-based biomarkers, wearable sensors, qualitative interviews, and artificial intelligence technologies.

What is the current state of your BBRF-funded research?

My 2017 BBRF Young Investigator Award project that examined novel metabolic biomarkers in schizophrenia is coming to a close this summer. This project was expanded to also study the mechanistic relationships of sleep with cognitive and cardiometabolic outcomes in persons aging in schizophrenia, using objective assessments of sleep and vertically integrated experiments (from the genomic to cellular level) of inflammation. I am in the second year of a K23 career development award from the National Institute of Mental Health that will continue this work on aging in schizophrenia.

How do your interactions with people living with mental illness affect your research and vice-versa?

My passion for working with people aging with serious mental illnesses has always driven my research. In my first year of residency at the Maryland Psychiatric Research Center I was inspired by the treatment of patients who struggled with severe symptoms and adverse social circumstances, who were cared for as if they were family. To this day, my clinical work helps to inform my research questions and focuses on the outcomes that are most meaningful to patients and their families. In turn, my research helps me to innovate my clinical practices and integrate novel ways to support healthy aging for all my patients.

What has BBRF support meant to your career?

The BBRF funding has been instrumental in launching my research career—leading to my K23 award from the National Institute of Mental Health and expanding my research focus to examine sleep disturbances. I am fortunate to have been mentored by several members of the BBRF Scientific Council, including Dr. Dilip Jeste. Throughout my career, the BBRF has connected me with so many incredibly accomplished scientists in the field as well as opportunities for collaboration and mentorship.

In the best possible scenario, how would your work impact the people living with mental illness and their families?

Ideally, my research would improve well-being and quality of life for people aging with mental illness. The growing aging population presents a challenge for the capacity of our healthcare system, and we will need innovative approaches for improving mental health. Through clarifying the mechanisms of biological and psychosocial aging, I hope to develop interventions to improve sleep and loneliness, and thus, cardiometabolic and cognitive outcomes.

"I am incredibly honored to receive the Klerman Prize from the BBRF, an organization that has connected me to so many opportunities and mentors in my career. The BBRF Young **Investigator Award was instrumental** in launching my research career. With its generous support, I was able to establish my independent program of research and expand the focus of my work to the effects of sleep on aging in schizophrenia."

Scientist Spotlight with: Cody A. Siciliano, Ph.D.

2020 BBRF Freedman Prize for Exceptional Basic Research 2017 BBRF Young Investigator Award

Dr. Cody Siciliano is an Assistant Professor in the Department of Pharmacology at Vanderbilt University. His lab, part of the Vanderbilt Center for Addiction Research, investigates the circuits and receptors in the brain that control decision making, and how their function is altered in neuropsychiatric disorders. Disrupted decision making processes are a hallmark of many disorders such as depression and addiction. The lab seeks to understand how experiences can cause these deficits to occur, and how to intervene. A major focus of Dr. Siciliano's work has been to determine the neurobiological factors that produce vulnerability or resilience to drug and alcohol addiction.

What is the current state of your BBRF-funded research?

It has branched in many directions and formed the basis of virtually all the ongoing projects in my lab. Using the approaches we developed during the funding period, we're now investigating the cellular and circuit basis of vulnerability and resilience to a number of neuropsychiatric disorders, including alcohol-use disorder, cocaine-use disorder, and post-traumatic stress disorder. The approaches developed with BRRF support have also opened new avenues of research into psychiatric disorders outside of my group.

How do your interactions with people living with mental illness affect your research and vice-versa?

My interactions with patients inform my scientific questions and approach. They are the reason that I come to work every day, and why I have dedicated my career to understanding and treating these disorders. I hope that our work helps them to understand the origins of these disorders and gives them hope that research provides an avenue toward improved conditions for themselves and others.

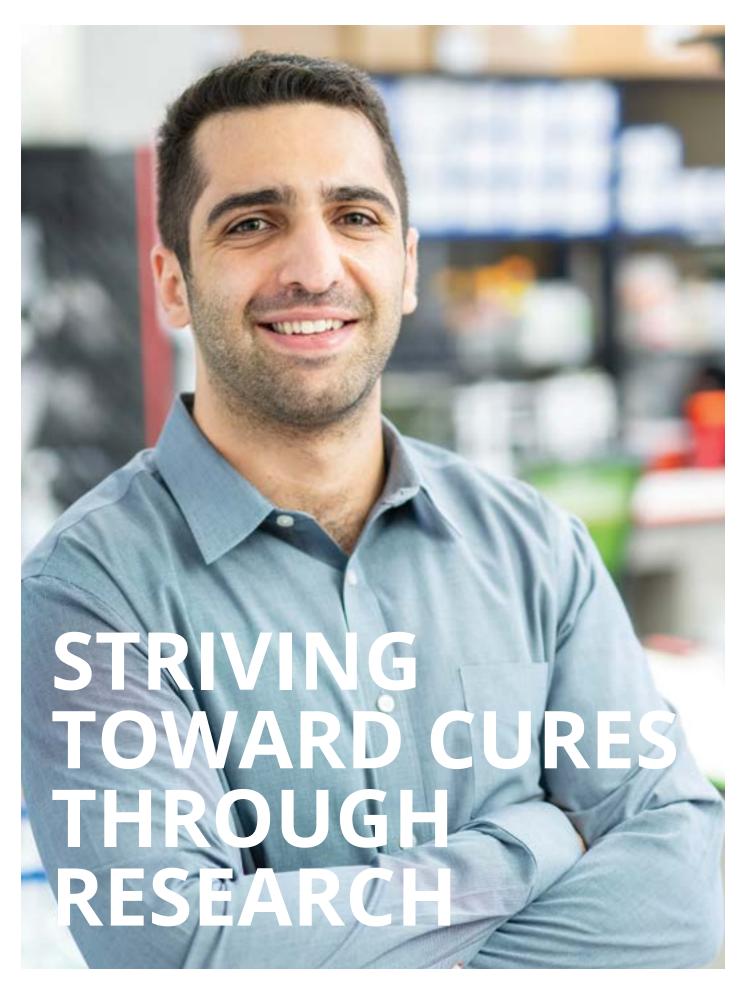
"My BBRF-funded work has formed the basis of virtually all the ongoing projects in my lab. We are now investigating the cellular and circuit basis of vulnerability and resilience to alcohol-use disorder, cocaine-use disorder, and post-traumatic stress disorder. Approaches developed with BRRF support have opened new avenues of research outside of my group as well, as these approaches have begun to be utilized by other labs in field."

What has BBRF support meant to your career?

My BBRF Young Investigator Award allowed me to take risks and pursue my most ambitious research questions. Not only were these funds critical for moving my science forward; support from BBRF also catalyzed my research during the critical transition period of starting my lab. BBRF's focus on bridging the gap between preclinical and clinical research to develop new approaches to psychiatric treatments is particularly important and unique among brain research funding.

In the best possible scenario, how would your work impact the people living with mental illness and their families?

Our ultimate goal is to improve the conditions of patients with psychiatric illness, through developing our understanding of the neurobiological basis of these disorders and through developing new approaches for treatment. A successful outcome of our research would lead to approaches for identifying individuals at a high risk for substance use disorders, which would allow for preventative measures to reduce the prevalence of these disorders. Further, it would lead to improved pharmacotherapeutic strategies for treating deficits associated with long-term drug or alcohol use, which would reduce relapse rates as well as facilitate patients' ability to return to their normal activities.



2020 International Mental Health Research Virtual Symposium

For the past 30 years BBRF has held its Symposium as a live event in New York City. This year because of the coronavirus pandemic we switched to a virtual event, which allowed us to reach a much broader audience.

This year's program was reflective of the greatly accelerating pace of discovery in mental health research as well as the range of studies the Brain & Behavior Research Foundation supports.

The seven BBRF 2020 Outstanding Achievement Award winners shared new breakthroughs and insights on schizophrenia, bipolar disorder, depression, autism, cognitive neuroscience, and childhood psychiatric disorders at this year's symposium.

An overview of the entire Symposium was provided by Dr. Robert Hirschfeld, a BBRF Scientific Council member who has served as the moderator at the in-person Symposium since its inception.

The symposium is available to watch free on-demand at

https://www.bbrfoundation.org/event/international-mental-health-researchsymposium

Presentations included:

Identifying A Genetic Subtype of Schizophrenia that is Clinically Relevant for Patients and Families

Anne S. Bassett, M.D., FRCPC

University of Toronto
BBRF LIEBER PRIZEWINNER FOR OUTSTANDING
ACHIEVEMENT IN SCHIZOPHRENIA RESEARCH

Dissecting the Role of Repetitive Regions of the Genome in Schizophrenia and Autism

Melissa Gymrek, Ph.D.

University of California San Diego BBRF MALTZ PRIZEWINNER FOR INNOVATIVE AND PROMISING SCHIZOPHRENIA RESEARCH

Thinking Rationally about the Treatment of Bipolar Disorder

Martin Alda, M.D., FRCPC

Dalhousie University
BBRF COLVIN PRIZEWINNER FOR OUTSTANDING
ACHIEVEMENT IN MOOD DISORDERS RESEARCH

How Pain Shapes the Brain: Impact of Childhood Trauma on Suicide Risk

Gustavo Turecki, M.D., Ph.D.

McGill University
BBRF COLVIN PRIZEWINNER FOR OUTSTANDING
ACHIEVEMENT IN MOOD DISORDERS RESEARCH

How Early Childhood Experiences Shape Brain Development and Influence Mental and Physical Health Trajectories

Joan L. Luby, M.D.

Washington University School of Medicine
BBRF RUANE PRIZEWINNER FOR OUTSTANDING
ACHIEVEMENT IN CHILD & ADOLESCENT PSYCHIATRIC
RFSFARCH

Prefrontal Circuits that Regulate Threat and Reward-Elicited Behaviors

Angela C. Roberts, Ph.D.

University of Cambridge
BBRF GOLDMAN-RAKIC PRIZEWINNER FOR
OUTSTANDING ACHIEVEMENT IN COGNITIVE
NEUROSCIENCE RESEARCH

A Causal Analysis of the Attentional Network

Robert Desimone, Ph.D.

Massachusetts Institute of Technology
BBRF GOLDMAN-RAKIC PRIZEWINNER FOR
OUTSTANDING ACHIEVEMENT IN COGNITIVE
NEUROSCIENCE RESEARCH

Thirty Years of Studying Families at Risk for Depression: What Have We Learned?

Myrna M. Weissman, Ph.D.

2020 PRIZEWINNER, BBRF PARDES HUMANITARIAN PRIZE IN MENTAL HEALTH

The Pardes Humanitarian Prize in Mental Health

Bestowed annually since 2014, the Pardes Prize recognizes a person(s) or organization whose humanitarian work is transformative and of great magnitude, changing the lives and bringing the joy of living to those facing challenges to mental health.

It was established to honor those who comprehensively care, teach, investigate, work, and passionately advocate for improving the mental health of society and have had a powerful impact on reducing the pain inflicted by psychiatric illness.

The recipient of the Pardes Humanitarian Prize in Mental Health is chosen by a distinguished international Selection Committee from nominations solicited worldwide. The Prize focuses public attention on the burden of mental illness on individuals and on society, and the urgent need to expand and enhance mental health services in the United States and globally.

Established in 2014, the Pardes Humanitarian Prize is named in honor of Dr. Herbert Pardes, the first recipient of the award.



Myrna M. Weissman, Ph.D.



Sir Michael Rutter, FRS



E. Fuller Torrey, M.D.



WINNERS

Myrna M. Weissman, Ph.D. & Sir Michael Rutter, FRS Honorary Tribute: E. Fuller Torrey, M.D.

William T. Carpenter, Jr., M.D. Honorary Tribute: Cynthia Germanotta & Born This Way Foundation

Judge Steven Leifman Honorary Tribute: Suzanne and Bob Wright

Doctors Without Borders/ Médecins Sans Frontières Honorary Tribute: Constance E. Lieber

Vikram Patel, Ph.D., F.Med.Sci. & Charles F. Reynolds, III, M.D. Honorary Tribute: Senator Edward M. Kennedy

Beatrix (Betty) A. Hamburg, M.D. and David A. Hamburg, M.D. Honorary Tribute: Rosalynn Carter

2014

Herbert Pardes, M.D.

In 2020 the Pardes Humanitarian Prize in Mental Health was sponsored in part by Janssen Research & Development, LLC, one of the Janssen Pharmaceutical Companies of Johnson & Johnson.

Webinar Series

Dr. Jeffrey Borenstein hosts the free monthly "Meet the Scientist" webinar series where leading brain and behavior researchers discuss their current work on the latest in new technologies, early intervention strategies and next-generation therapies for mental illness. Each hour-long webinar includes time for researchers to answer questions posed by the online participants. This popular series offers the public access to some of the world's top scientists who discuss their cutting-edge research.

All webinars are available for viewing on the BBRF website.

January 14, 2020

Using Tools of Neuroscience to Make Personalized Care a Reality in Schizophrenia

Gregory A. Light, Ph.D.

February 11, 2020

How Drug Dependence Impacts Decision Making

Christina Gremel, Ph.D.

March 10, 2020

Brain and Behavior Based Strategies in the Treatment of OCD Christopher Pittenger, M.D., Ph.D.

April 14, 2020

Can Traumatic Memories Be Erased?

Stephen Maren, Ph.D.

May 12, 2020

Using Neuroscience to Evaluate and Guide Treatment for Pediatric Mood Disorders

Manpreet Kaur Singh, M.D., M.S.

June 9, 2020

The Science of Parenting and Parent-Based Treatment for Childhood Anxiety Disorders Eli R. Lebowitz, Ph.D.

July 14, 2020

Widely Prescribed Stimulants and the Risk of Psychosis in Young People with ADHD

Lauren Moran, M.D.

August 11, 2020

An Update on Treatment of Bipolar Depression

Andrew A. Nierenberg, M.D.

September 8, 2020

Assessing and Managing Adolescent Suicidal Behavior: New Approaches

David A. Brent, M.D.

October 13, 2020

Why Did I Eat That? Obesity and the Neuroscience of Food Craving Carrie Ferrario, Ph.D.

November 10, 2020

Not Feeling It: Adolescent Depression and Reward Processing Gone Awry

Erika E. Forbes, Ph.D.

December 8, 2020

Using Genetic Maps of the Brain to Understand Autism & Related Psychiatric Illnesses

Daniel Geschwind, M.D., Ph.D.



Minority Issues in Mental Health Care Guest: Altha Steward, M.D.

"The goal of 'Healthy Minds' is to inspire conversations about mental illness and provide understandable information and resources for our viewers. People should not suffer in silence."

- Dr. Jeffrey Borenstein

Healthy Minds with Dr. Jeffrey Borenstein aims to remove the stigma of mental illness and demonstrate that with help, there is hope. The series focuses on common psychiatric conditions through inspiring personal stories, as well as experts sharing cutting edge information about research and treatment.

The program is available to watch online at www.bbrfoundation.org/healthyminds-tv.



In 2019, the Moritz Hilder Innovative Brain Research Fund was established by the Trustee of the Jane Hilder Harris Trust with an endowment gift of \$3.5 million. It was created to preserve and honor the memory of Moritz Hilder, the father of the late Jane Hilder Harris.

This generous endowment will be held in perpetuity to advance medical research with the objective of gaining a basic understanding of post-traumatic stress disorder (PTSD) and its prevention, treatment and cure, with a primary emphasis to be given to research involving innovative concepts where, although there may be a high risk of failure, the rewards of success would be substantial, and that typically would not be in a position to secure funding from more traditional funding sources.

The Moritz Hilder Innovative Brain Research Fund is held in a professionally managed, separate endowment fund. On an annual basis, 5% of the endowment fund will be expended to support PTSD research. A special committee of the BBRF Scientific Council will select which BBRF Grants will be funded by this Endowment. In 2020, the Endowment provided \$175,000 for the first year of funding five PTSD research projects.

We are deeply honored to have received this generous and impactful gift.



Your support this year enabled us to fund more than \$18.6 million to leading scientists undertaking the challenges of brain and behavior research.

Since our founding in 1987, in partnership with donors around the world, BBRF has invested more than \$418 million and funded more than 6,000 grants to more than 5,000 scientists worldwide.

We deeply appreciate and are inspired by all of our donor's passion and commitment to advance psychiatric research.



Many BBRF donors have a very personal interest in brain and behavior research. They know from often difficult, first-hand experience the devastation mental illness can bring upon family and friends, and they know that research will ultimately bring about better understanding and treatments.

Our **Research Partners Program** offers donors the opportunity to personally select and support scientists based on various criteria, including, but not limited to, illness specialty area or specific institutions, or a combination of these. Researchers are selected by the donor (our Research Partner) after members of our all-volunteer Scientific Council have conducted an independent peer review of the submitted applications and have made their recommendations for grant awards.

The **Research Partners Program** enables donors to choose among the best and brightest scientists and the most promising, cutting-edge proposals in mental illness research.

The results from these studies often provide the pilot data needed to apply for much larger federally funded grants (from the National Institute of Mental Health and the N.I.H., for example).

To date the BBRF **Research Partners Program** has funded more than 1,500 research grants.

To learn more about the Research Partners Program, please contact us at **646-681-4889** or **researchpartner@bbrfoundation.org**.

Visit us at bbrfoundation.org/researchpartners.

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The Levy's granddaughter, Ella, on her 12th Birthday

Beth and Rob Elliott
The Elliott Family
David and Mary Jo Ellis
The Erb Family
Ashley Anne Ericksen

Sara Renee Angelina Erikson Erin Lynn Paul Estes

Everyone who is affected by depression, anxiety, or is/was a victim or survivor

of suicide.

Fae's brother

Everyone with kind intentions

Alexandra Famiglietti Esther Fein Max A. Feinstein

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and best friend

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Ali Jelveh

Jordan Jensen's best friend

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Keith Mirailh Duncan N. Mitchell Kyle I. Mitchell Linda Mitchell Betty May Miyagawa Linda M. Mogish Neil Molberger Gregory A. Monk

Juan (Joji) Maniguis Montelibano

leffrey D. Moon

Raymond J. Monnot

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Judith L. Murnan Jane A. Myrick-McMillan Seshavalli Nagavarapu

Wyatt L. Murchison

Marjorie Nagle

Rebekah Nahai The Nameless Sarah B. Nanves Adam Neely Connor D. Neely Barry I. Nelson

Carol A. Nelson's mother and brother

Ioel Nelson Jonathan Nelson Paul Nelson Priscilla Nelson Tamer Nemri's sister Dean A. Neubek Kirk D. Newell Rick Nicholson Nickolaus Rana F. Nicley Mengchen Nie Carol R. Nielsen Amanda Dianne Nolan

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Catherine (Cathy) D. Potter

Nicholas M. Pouh Pavel Pourmal Landen Powell

Suraj Pradhan's sister who passed away

five years ago Trisha A. Prante Veeva S. Presnell

Noosh Prljaca's loved one

Leighanne Pryor-Reynolds' loved one

Rehmat A. Qadir Dylan Quast Ramez E. Qureshi Arthur J. Radin, C.P.A. Ed Rafferty's mother Evelyn R. Rafferty

Lisa M. Raimondo-Nowell Sidharth Ramakrishnan Robert (Bob) I. Rand Michael Rangel Anthony F. Rankin

Margaret (Peg) Ransom

Sam Raskin Stephen Rather

Cassandra (Cassie) N. Ray Dr. Jacob P. Rayapati Anthony M. Razziano

John Reason Brian E. Reese Lester F. Reid

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Samuel (Sam) D. Rendall

Michael Reschke Chris Reuter

Maria de los Angeles Rey

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Edward A. Richards
Peter S. Richardson
Caasi A. Rich-Vogel
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Stephen L. Ritter III
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Maria Rivera

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Robert Robbins
Trandl Robbins
Sara E. Roberts
John Robina
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Tommy Rorick
Ira Rose

Jennifer, RN

Mary Rose

Sylvia Rose

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Ryan

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David E. Sainer-Frederick Marcia M. Salazar Martin Salazar-Vasquez Richard P. Salow Jennifer A. Salvito Catherine Sanacora Carol Sanchez

August Sancis Mary Sandoval-Rome

Sarah

Melissa L. Saunders Beulah A. Saxon Matthew T. Say Lisa M. Sbragia Charlie Scheid Wendy L. Schenck Scott W. Scheurer

Siegfried Schmidt-Gengenbach

Steven Schoolman
Lee R. Schoolmeesters
Fritz T. Schulte
Ellen Schusterman
Michael L. Schwartz
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Jacob E. Skoglund Robert Slater Earl Slusky

Alyssa Smith's loved one, Ali

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Edmund Smith
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Rain Smith
William H. Smith II
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Chris E. Sorensen
Kelly L. Sorensen
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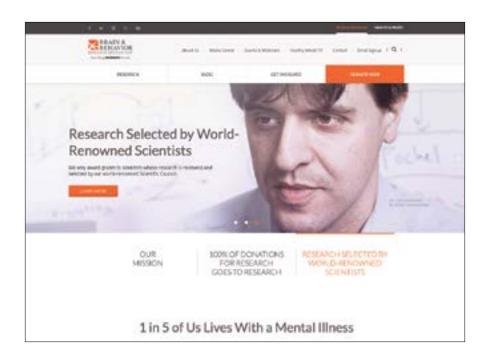


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569

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- 1 Nobel Prize Winner

Financial Summary*

Consolidated Statement of Financial Position

		DECEMBER 31, 2020	DECEMBER 31, 2019
ASSETS			
Cash and cash equivalents		\$19,030,200	\$8,063,589
Investments, at fair value, current portion		14,009,510	10,850,004
Contributions receivable		121,723	139,805
Pledges receivable, current portion		210,000	2,210,000
Prepaid expenses and other assets		85,114	72,644
	Total Current Assets	33,456,547	21,336,042
Assets held in charitable remainder trust		1,762,985	1,500,421
Fixed assets, net		18,376	25,053
Pledges receivable, net, less current portion		390,015	6,263,110
Investments, at fair value, less current portion		8,947,449	8,947,449
	Total Assets	\$44,575,372	\$38,072,075

LIABILITIES AND NET ASSETS			
Liabilities			
Accounts payable and accrued expenses		\$96,430	\$79,548
Grants payable		25,723,635	19,481,669
Accrued compensation		37,651	100,258
Annuities payable		871,385	767,679
Charitable gift annuities payable		159,481	172,450
	Total Liabilities	26,888,582	20,601,604
Net Assets			
Net assets without donor restrictions		8,075,882	8,410,779
Net assets with donor restrictions		9,610,908	9,059,692
	Total Net Assets	17,686,790	17,470,471
	Total Liabilities and Net Assets	\$44,575,372	\$38,072,075

^{*} The Foundation's complete audited financial statements are available on our website.

Consolidated Statement of Activities

	YEAR ENDED DECEMBER 31, 2020	YEAR ENDED DECEMBER 31, 2019
SUPPORT AND REVENUE		
Contributions	\$13,994,067	\$16,069,353
Special events, net	_	345,041
Contribution of services	2,182,688	1,977,786
Bequests	5,369,469	9,206,115
Net realized and unrealized gains on investments	3,381,571	3,668,483
Net appreciation of assets held in charitable remainder trusts	262,564	212,598
Dividend and interest income	242,860	239,655
Total Support and Revenue	25,433,219	31,719,031

EXPENSES			
Program Services			
Research grants and awards		18,628,508	14,797,331
Scientific advancement		2,192,755	2,268,335
Program support		2,101,324	2,487,570
	Total Program Services	22,922,587	19,553,236
Supporting Services			
Fundraising**		793,114	889,015
Administration**		1,501,199	1,677,204
	Total Supporting Services	2,294,313	2,566,219
	Total Expenses	25,216,900	22,119,455
Change in Net Assets		216,319	9,599,576
Net Assets, beginning of year		17,470,471	7,870,895
	Net Assets, end of year	\$17,686,790	\$17,470,471

^{**} All fundraising and administration expenses are funded by specially designated grants.



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