

2023

IMPACT REPORT



**PACKARD
CENTER**

ALS Research at Johns Hopkins

www.packardcenter.org

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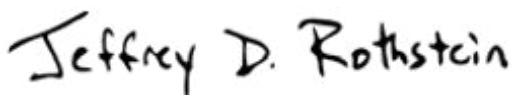
DEAR FRIENDS,

From the beginning, the Robert Packard Center for ALS Research at Johns Hopkins has believed that the key to identifying meaningful therapies for people living with ALS lies in synergistic and collaborative research. Our scientists and research partners, scattered across the globe, work tirelessly on promising fronts to unravel the biology underlying ALS. We know from a long history in medicine that the best therapies ultimately come from understanding the root causes of a disease - that is the focus of the Packard Center research program. The Packard Center remains steadfast in its dual-role as a catalyst for groundbreaking advancements and a convener of the global ALS research community.

For the past 24 years, the Packard Center has grown from a handful of ALS researchers into a global force, a self-supporting entity that has propelled the understanding of ALS to unprecedented heights. Almost all of the known disease pathways and model systems developed to uncover why ALS occurs have been supported by the Packard Center, in one way or another. The Packard Center has become synonymous with high-quality fundamental research. Through catalyst funding and collaboration, our journey has been marked by one relentless pursuit and fueled by the passion of those who refuse to accept the status quo. The annual symposium, monthly investigator meetings, grant funding, and other strategic initiatives all serve to empower our collective commitment to the early-stage, foundational research that is needed to guide future therapies and biomarkers for people living with ALS.

As we stand on the cusp of our 25th anniversary, we extend our deepest gratitude to you - our esteemed collaborators. Your unwavering support and refusal to slow down have been instrumental in our shared journey - and makes the difference to the larger ALS community. The hope we carry today is not just a scientific aspiration; it is a testament to the collective efforts of all.

The hope is in the science.



Jeffrey D. Rothstein, MD, PhD
Executive Director and Founder



Christine Vande Velde, PhD
Scientific Director





ABOUT THE PACKARD CENTER

The Robert Packard Center for ALS Research is an international consortium of researchers committed to facilitating collaboration and advancing our understanding of ALS. The Center has established an aggressive, multidisciplinary approach to unlocking the disease through a unique model for inter-institutional cooperation, engaging leaders of the global scientific community to accelerate research of the highest quality. Through cutting-edge science, education, and robust partnerships, Packard researchers work together to accelerate discovery and move basic/fundamental research towards treatments for ALS.

VISION

To significantly alter the course of ALS giving those diagnosed the opportunity to live long and healthy lives.

MISSION

To empower collaborative and breakthrough research that advances our fundamental understanding of ALS by engaging and supporting the global research community.

FOUR PILLARS OF THE PACKARD CENTER



FUNDING RESEARCH GRANTS



**MONTHLY INVESTIGATOR
MEETINGS**



**ANNUAL RESEARCH
SYMPOSIUM**



**STRATEGIC INITIATIVES, INCLUDING
SUPPORT OF THE NEXT GENERATION
OF RESEARCHERS**

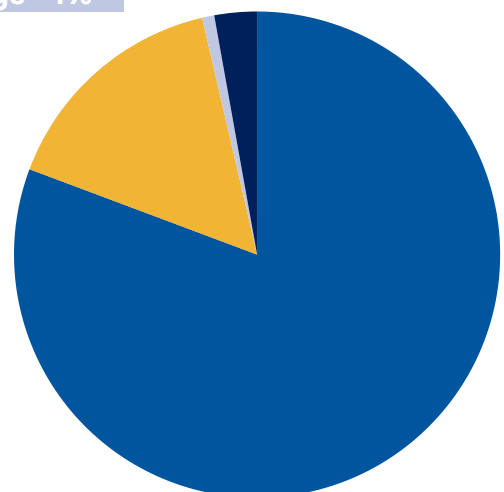
**Packard Research
Support by Pillar**

Annual Symposium - 15%

Monthly Meetings - 1%

Strategic Initiatives - 3%

Grant Program - 81%



KEY MILESTONES IN THE ADVANCEMENT OF UNDERSTANDING ALS

PACKARD CONTRIBUTIONS

1992: Identification of excitotoxicity (excess glutamate) as a possible pathway in sporadic ALS (Packard Center founder, Dr. Jeffrey Rothstein “Excitotoxicity Hypothesis”). This pathway discovery ultimately led to the successful trial of Riluzole in 1995.

1994: Development of Transgenic ALS Mouse Models. Packard Researchers, including Scientific Advisory Board members Drs. Phil Wong, Lucie Bruijn, Don Cleveland, and Sam Sisodia, create the first transgenic mice with SOD1 mutations, allowing scientists to study ALS progression in a living organism and test potential treatments.

2000: Robert Packard Center for ALS Research is founded. The Center is organized as an international collaboration of scientists and is formally named for Robert Packard in 2002.

1993: Identification of SOD1 Gene Mutation. Future Packard Center Science Advisory Board member, Dr. Robert Brown, and his team discover mutations in the superoxide dismutase 1 (SOD1) gene in familial ALS patients. This marked a crucial breakthrough, providing a genetic link to the disease.

1995: FDA Approval of Riluzole, the first drug that slows ALS, based on the excitotoxicity hypothesis discovered 3 years earlier.

2003–2009: Motor neuron loss in ALS is recognized as non-cell autonomous (meaning other cell types actively participate in both disease onset and progression).

2006: Idea of neurofilaments as a biomarker emerges, an idea that would become relevant as a key point in the Tofersen trial.

2008 Onward: Advancements in Stem Cell Research. Stem cell technologies have been explored for their potential in modeling ALS and developing cell-based therapies. Induced pluripotent stem cells (iPSCs) derived from ALS patients' cells enable researchers to study the disease in a dish.

2006 - 2008: Elucidation of TDP-43 and FUS Proteins and mutations. Identification of abnormal protein aggregates of TDP-43 and FUS in those with ALS provides insights into the pathology of the disease, driving intense work on RNA metabolism defects in the disease and leads to new avenues for research and drug development.

2010–Present: Comprehensive understanding of the biology of TDP-43 and FUS unraveled by Packard Researchers.



2010s: Expansion of Genetic Discoveries

and generation of mouse models based on these genes (e.g. Ubiquilin 2, TDP-43, KIF5a, etc.). Continued genetic studies have identified additional genes associated with ALS, broadening the understanding of its genetic basis.

Almost every human mutation discovered in ALS has been recapitulated by a mouse model created by Packard Center researchers.

2013: First-in-human trials

completed using antisense oligonucleotides targeting SOD1 by Packard Center Researchers.

2014: The Ice Bucket Challenge

launches a global, viral social media campaign that raises significant awareness and funding for ALS research.

2011: C9orf72 Gene Discovery.

The identification by Packard Center investigators Drs. Bryan Traynor and Rosa Rademakers of the hexanucleotide repeat expansion in the C9orf72 gene as a common genetic cause of both familial and sporadic ALS opens new avenues for understanding the molecular mechanisms underlying ALS.

2013 - : The Answer ALS Research

Program, the world's largest & most comprehensive ALS research project, is launched. Inspired by the ALS Team Gleason Summit, the Packard Center worked together with collaborators to develop the Answer ALS Research Program and strategic plan: >1,000 participants and iPS cell lines, 6 billion data points, shared freely worldwide.

2017: Edaravone approved for

ALS. Edaravone provides an additional treatment option, presumably by reducing oxidative stress.

2019: Advances in RNA-Targeted Therapies.

Antisense oligonucleotide (ASO) therapies, which target specific RNA sequences, have shown promise in preclinical studies and clinical trials for treating specific forms of ALS.

2022: ASO for FUS.

First n of 1 trial suggesting that lowering FUS levels could be beneficial.

2023: Tofersen is approved for

those with familial ALS who have SOD1 mutations (2023): FDA granted accelerated approval of QALSODY based on a reduction of neurofilament, a marker of neurodegeneration.

2022: FDA approves Relyvrio for the treatment of

ALS. Developed by Amylyx Pharmaceuticals, Relyvrio (AMX0035) is a combination of two drugs, sodium phenylbutyrate (PB) and taurursodiol (TURSO), designed to target multiple mechanisms that may be involved in ALS progression, including oxidative stress and endoplasmic reticulum (ER) stress.

2024: Development of first TDP-43

loss of function biomarkers for sporadic ALS.

THE HOPE IS IN THE SCIENCE.

ALS has been studied for more than 150 years, yet most of the progress we’ve made in understanding and treating the disease has only materialized in the last 30 years. The advances of each successive decade have built on those of the previous in both frequency and impact.

Since 2000, the Packard Center has been a significant player in advancing ALS research. Important areas of focus and contributions to the field include:



Genetic Discoveries	Contributing to identifying and understanding genetic mutations associated with the disease, including mutations in genes such as SOD1 and C9orf72.
Translational Research	Bridging the gap between basic scientific discoveries and the development of new therapies, together with efforts to translate laboratory findings into potential treatments for ALS.
Preclinical Studies	Conducting preclinical studies, often using animal models, to test potential therapeutic interventions and gain insights into the underlying mechanisms of ALS.
Drug Development	Leading efforts in developing and testing potential drug candidates for ALS treatment, as well as collaborations with pharmaceutical companies and other research institutions to advance promising therapies.
Biomarker Advancement	Identifying and validating biomarkers associated with ALS. Biomarkers are crucial for early diagnosis and monitoring disease progression.
Stem Cell Research	Supporting research related to induced pluripotent stem cells (iPSCs) and their application in ALS research. The use of stem cells in understanding ALS pathology and developing potential treatments remains an area of importance in ALS research.
Global Collaborations	Fostering partnerships among researchers, clinicians, and organizations worldwide, the collaborative approach of the Packard Center enhances the collective global understanding of ALS and accelerates the development of effective treatments.

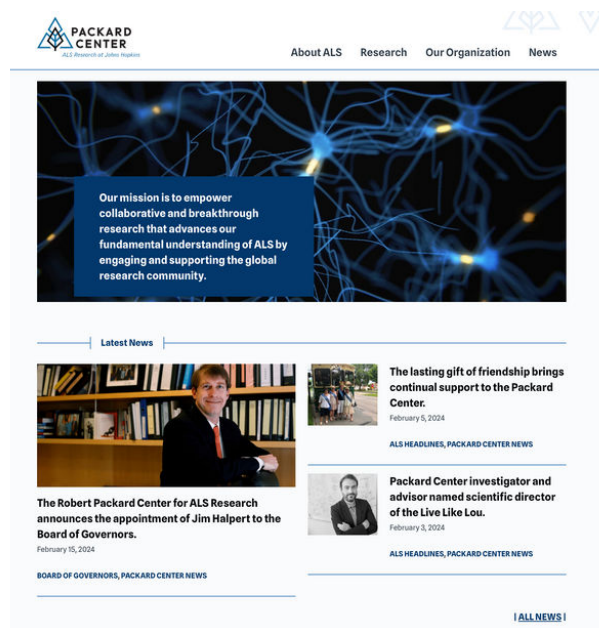
2023

A YEAR OF CONTINUED PROGRESS

Launch of New Website

In September 2023, we launched a new Packard Center website with improved functionality. Here you can read about our latest research grants, learn more about ALS and advances in research, find important resources and make a donation to support our efforts.

Check it out: www.packardcenter.org



Proposal Central: A New Tool

Research grant programs play a vital role in advancing knowledge, fostering innovation, and supporting the growth of the scientific community.

Running a research grant program has wide-ranging benefits for the research community. In addition to building partnerships with the donors and collaborators who support the research through fundraising efforts, a tight grant administrative structure must be in place in order to support a successful program. In 2023, the Packard Center began utilizing the Proposal Central platform to manage Packard research proposals and grant applications. The affiliation has allowed for a more streamlined grant process for applicants, the Scientific Advisory Board, and the administrative team.

Governance of the Scientific Advisory Board

Led by the Scientific Director, the Packard Center Scientific Advisory Board (SAB) provides strategic advice to the Packard Center Leadership Team with respect to the research portfolio and other activities of the Packard Center. The SAB enables high impact ALS research and serves as a connection between the ALS research community and the Packard Center to promote the mission of the Center.

In 2023, the Packard Center SAB composition was revised to include 25 current, 4 emeritus, and 5 ex-officio members. Terms of office were put in place, with SAB members (other than ex-officio members) appointed for a four-year term, renewable once (upon review for interest and fit), for a maximum of eight continuous years.

Strategic and Operational Planning

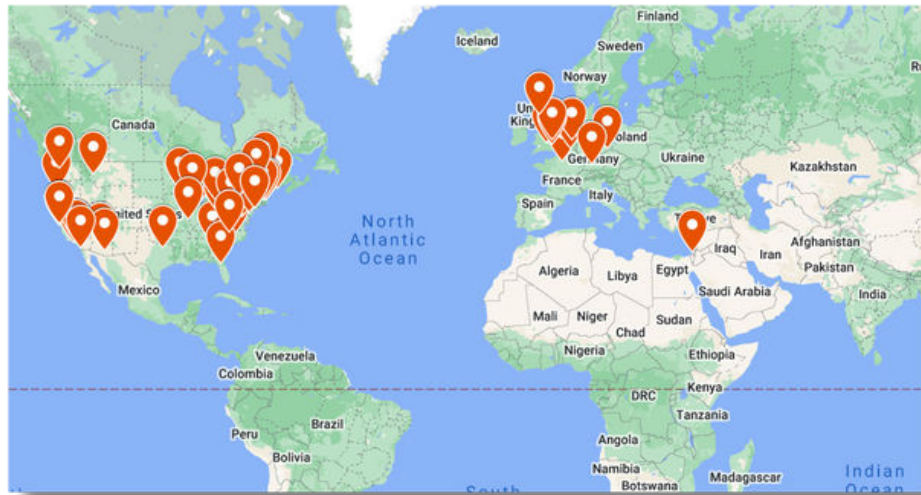
With support from the Board of Governors, the Packard Center has engaged the Milken Institute Science Philanthropy Accelerator for Research and Collaboration (SPARC) to help the Packard Center cultivate its strategic and operational plan for the next five years. The goal of the partnership is to obtain an outside perspective to help develop and enhance Packard's strategy to further support the organization's mission and increase its impact over the next five years.

Over the past year, SPARC has deployed a collaborative process to understand and evaluate the Packard Center's future priorities and position, set strategy, and provide operational guidance. SPARC has actively engaged the Packard Center leadership, administrative team, Board members, select partners, Scientific Advisory Board, past and present investigators, and targeted external stakeholders to chart a strategic course forward that enhances the organizational direction.



This initiative was made possible through a strategic gift to support the continued growth and impact of the Packard Center.

RECENT GRANTS



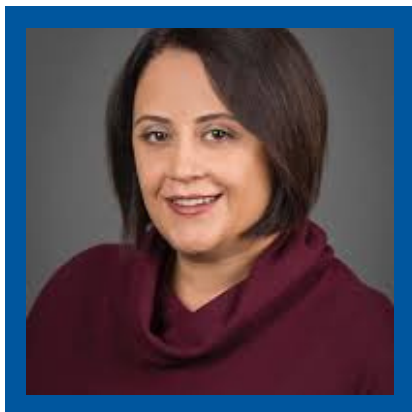
Packard Center research sites (2000-present)



Grants awarded
in 2023



Awarded in
grants from
2023-present



Bahareh Ajami, PhD*

Oregon Health & Science
University

*Microglia regulation of selective
neuronal vulnerability associated
with amyotrophic lateral
sclerosis (ALS)*



Daryl Bosco, PhD*

University of Massachusetts
Chan Medical School

*Investigating stress response
mechanisms in human ALS-TDP
neurons*



Michael Coleman, PhD*

University of Cambridge

*Compensatory effects
preventing SARM1-dependent
neuron and axon death*

**Funding Renewed*

RECENT GRANTS



Luc Dupuis, PhD
INSERM

Consequences of NUP50 mutation or loss of function in amyotrophic lateral sclerosis



Eran Hornstein, MD, PhD
Weizmann Institute of Science

Characterizing IL-18 Pathway Inhibitors as Therapeutics for ALS



Adrian Isaacs, PhD
University College London

Lipid desaturase overexpression to ameliorate neurodegeneration in C9orf72 repeat mice

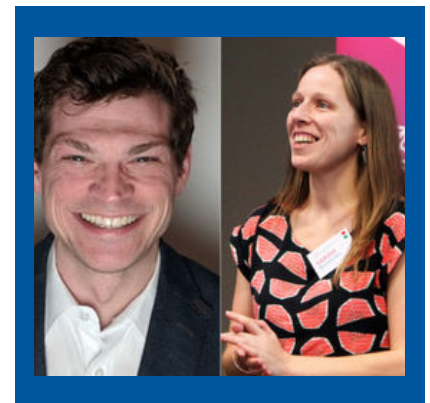


John Landers, PhD
University of Massachusetts Chan Medical School

Development of Mutant Specific ASOs for TDP-43 and KIF5A



Payam Mohassel, MD
Johns Hopkins University
Cellular and animal models of SPTLC1-related juvenile ALS



Marc-David Ruepp, PhD
Sarah Mizielska, PhD
King's College, London
Dissecting the Molecular Determinants of Cytoplasmic Gain of Function Pathomechanisms in TDP - 43 - linked Amyotrophic Lateral Sclerosis

PACKARD CENTER IN THE NEWS

*To read any of these news articles in full, please visit our website:
www.packardcenter.org/news*



Packard on the PBS News Hour

Packard Center founder and director, Dr. Jeffrey Rothstein, appeared with Judy Woodruff on the PBS News Hour in November 2023. Dr. Rothstein discussed the current state of ALS research as well as recent advances in the field.

New Co-Funded Grant Partnership

Packard Center and the Live Like Lou Foundation announced a joint grant to Payam Mohassel, MD (Johns Hopkins University) to study cellular and animal models of SPTLC1-related juvenile ALS.



23rd Annual Research Symposium

Over 300 researchers gathered in Baltimore in March for the 23rd Annual Packard Center Symposium. The meeting was a chance for researchers funded by Packard and others in the scientific world to come together and share their latest research to move the field forward as quickly as possible. More than just a research meeting, the annual symposium is a chance for scientists to share their victories and challenges with full transparency, so that we can work towards better therapies for ALS with greater speed and precision.

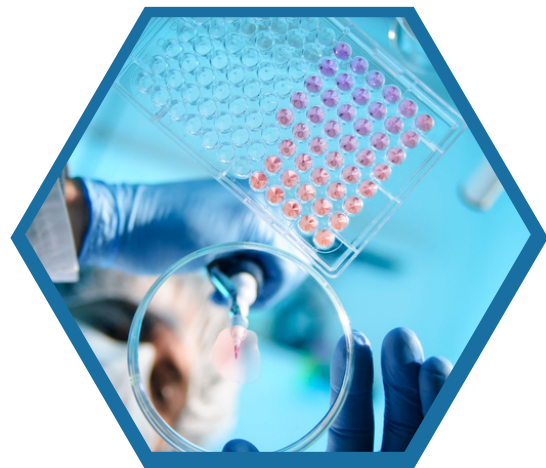
PACKARD CENTER IN THE NEWS

To read any of these news articles in full, please visit our website:
www.packardcenter.org/news

FDA Grants Accelerated Approval to Qalsody (toferson)

The Food and Drug Administration granted accelerated approval of the drug for the treatment of SOD1-ALS. Developed by Biogen and Ionis, it is an antisense oligonucleotide (ASO) that lowers SOD1 levels in the cell and, hopefully, can help to slow ALS progression.

The development of tofersen stemmed, in part, from the early fundamental research by Packard investigators and members of the Center's scientific advisory board Don Cleveland, PhD and Timothy Miller, MD, PhD who made the critical discoveries and model systems necessary to develop this new therapy.



Packard Partners with AFTD for Scientific Workshop

The Association for Frontotemporal Degeneration and the Packard Center co-hosted a Scientific Meeting in April 2023 to highlight new collaborations and new approaches between the two diseases. This international collaboration featured 40 researchers from across the globe.



New Member of the Packard Center Board of Governors

Jim Halpert, a renowned privacy and cybersecurity lawyer, recently joined the Packard Center Board of Governors. Mr. Halpert is a passionate ALS advocate and currently serves as General Counsel for the White House Office of the National Cyber Director.



COLLABORATION IN ACTION

The Packard Center recognizes that collaboration is essential for maximizing impact, leveraging resources, fostering innovation, and addressing complex challenges in a more comprehensive and sustainable manner. It is crucial for nonprofits, enabling resource-sharing, increased impact, and the avoidance of duplication of efforts. By working together, organizations can leverage diverse expertise and knowledge, resulting in more effective programs and initiatives. Collaborative efforts enhance advocacy, influence, and community engagement, while also promoting adaptability and innovation. Ultimately, such partnerships contribute to the long-term sustainability of nonprofits by creating networks that share responsibilities, risks, and learning opportunities.

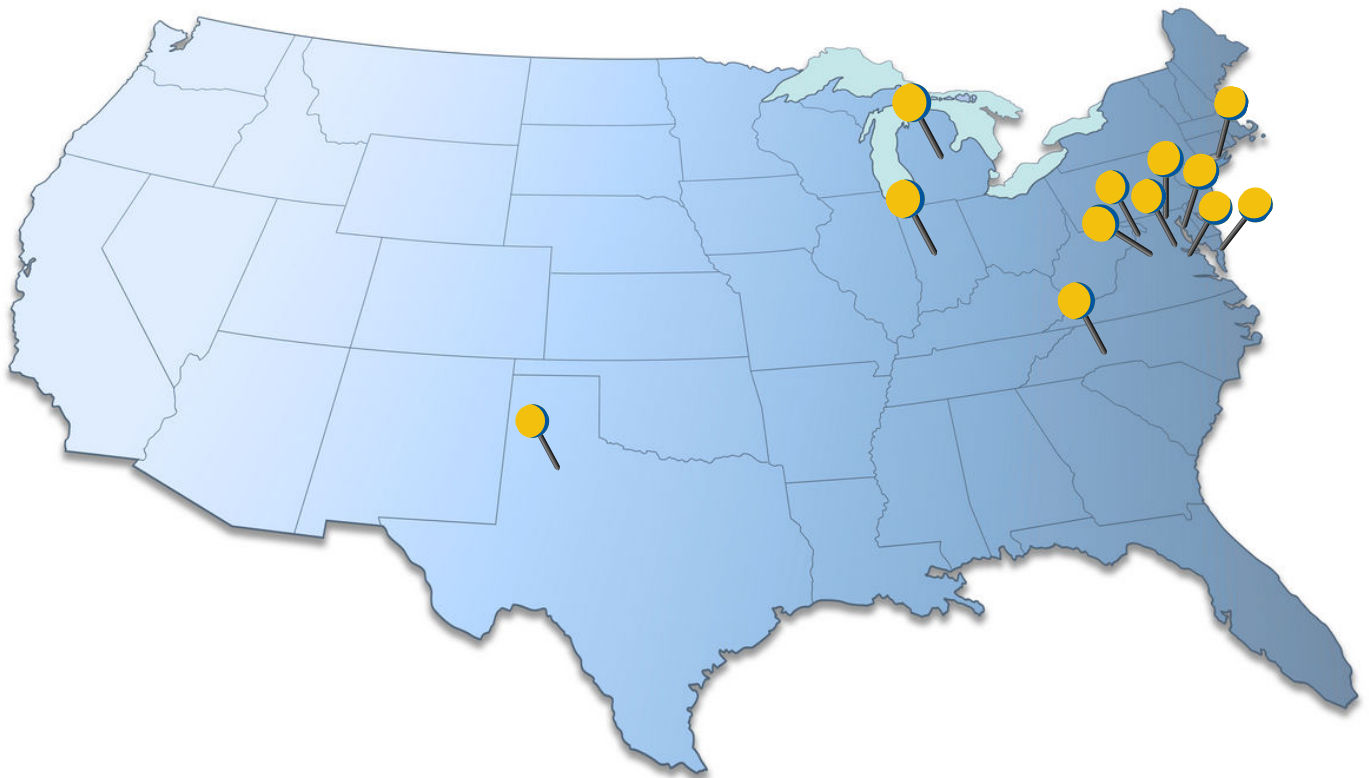
We're proud to have strengthened our relationships in 2023 with these partners and look forward to continuing to foster organizational growth and improvement in the research community.



COMMUNITY PARTNERS



We are grateful for the many partners who have devoted their time and energy to holding events that support the Packard Center. All of these events create awareness about ALS and raise needed funds for research.



2023 Community Events

- Cure ALS Golf Tournament (Dallas, TX)
- Delt Dunk 3v3 Basketball Tournament at Butler University (Indianapolis, IN)
- Get Tee'd Off Charity Golf Tournament (Westminster, MD)
- Gulls Way Campground JR Cropper ALS Memorial Event (Dagsboro, DE)
- Greater Baltimore Community Partners Golf Tournament (White Hall, MD)
- Jogger John's Run (OuterBanks, NC)
- Multi-Family/Ed Rapp Calendar Year-End Fundraising Match (Raleigh, NC)
- Phi Delta Theta Crab Feast at Washington College (Chestertown, MD)
- Saer Family Awareness Event (Greenwich, CT)
- SEI/Strayer University Team Brian 5K (Herndon, VA)
- Washington Suburban Sanitary Commission/Al's Pals Golf Tournament (Bowie, MD)
- Winter Meltdown Concert (Annapolis, MD)
- 4th of July Lemonade Stand (Ann Arbor, MI)

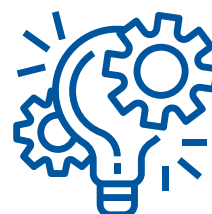
FUNDING OUR MISSION THROUGH PHILANTHROPY



**The Packard Center is 100% funded
through philanthropy**

*Donations to the Packard Center are used to
support research worldwide.*

Since 2000, 172 Research Projects



61 Institutions Across 9 Countries & 20 States

**23 Years of the Packard Center Annual ALS
Research Symposium**



**In 2023, gifts from individuals, foundations, and
corporations helped fund:**



9 Research Projects

HOW CAN YOU PARTNER WITH THE PACKARD CENTER?

By exploring the following options for giving, you can further the mission of the Packard Center in alignment with both your broader philanthropic, financial, and tax objectives:

Explore the following options for giving:



Will or Trust

Leave a legacy to the Packard Center and remain in control of your assets during your lifetime.



Gift of Art or Real Estate

Receive an income tax deduction for the appraised value of a donated item.



Donor Advised Fund

Receive a tax deduction and simplify your giving to the Packard Center.



Gift of Stock

Receive an immediate income tax deduction and avoid capital gains tax.

To make a gift: www.packardcenter.org/give



**What impact would you like to make through your philanthropy?
Please contact our development team to discuss.**

Meg B. Whiteford, JD

Senior Associate Director of Development
(410) 955-8684 or mwhiteford@jhmi.edu

Travis Smith

Senior Development Coordinator
(410) 955-8675 or tsmith@jhmi.edu

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MEET OUR TEAM



JEFFREY ROTHSTEIN, MD, PHD FOUNDER AND DIRECTOR

Packard Center founder Dr. Jeffrey Rothstein has been the Center's director since it opened in 2000. A respected neuroscientist, Rothstein is credited as being one of the world's top ALS researchers, especially in the field of glutamate excitotoxicity. Dr. Rothstein is a Professor of Neurology and Neuroscience and a faculty member of the graduate program in cellular and molecular medicine at the Johns Hopkins University. He co-directs the Johns Hopkins Multidisciplinary ALS Clinic, one of the largest of its kind in this country. Dr. Rothstein is Vice-Chairman for Research in the Department of Neurology. More recently, Dr. Rothstein has had a key role in shaping the Johns Hopkins Pedersen Brain Science Institute's translational neuroscience program, which brings an innovative collaboration with industry and academic medicine in order to hasten treatments for neurodegenerative diseases.



CHRISTINE VANDE VELDE, PHD SCIENTIFIC DIRECTOR

Dr. Christine Vande Velde is Full Professor in the Department of Neurosciences at the Université de Montréal and Université de Montréal Hospital Research Center (CRCHUM). Her research interests are centered on understanding the underlying pathological mechanisms that lead to the fatal neurodegenerative diseases amyotrophic lateral sclerosis (ALS) and frontotemporal dementia (FTD). She obtained her Ph.D. in Biochemistry from the University of Manitoba and subsequently pursued post-doctoral studies at the University of California, San Diego/Ludwig Institute where she developed an expertise in amyotrophic lateral sclerosis. Dr. Vande Velde serves on a number of grant review panels both nationally and internationally, has served as a Director of the Board of the ALS Society of Canada, and as Co-Chair of their Scientific and Medical Advisory Council. In her role at the Packard Center, she is responsible for charting the scientific direction of the Center.

MEET OUR TEAM



TARA LINCOLN, MS

DIRECTOR, OPERATIONS & ADMINISTRATION

Tara Lincoln oversees the operations of the Packard Center. She is responsible for guiding the strategic planning and implementation for the Center, leading the administrative team, and for the fiscal integrity of the Packard Center and its programs. She supports the Board of Governors and Answer ALS Advisory Board in reviewing overall program progress, sources of funding, public/external communications, and communications with donors.

Email: tlincol3@jh.edu



SUZANNE CONNELLY

DEPUTY DIRECTOR

Suzie Connelly has been with the Packard Center for fourteen years. Starting as a volunteer, she now serves as the Center's Deputy Director, responsible for communications, the Packard Center website, and social media platforms. Suzie also works closely with the Center's Scientific Director on the Center's research grant program and planning and execution of the monthly investigator meetings and the annual Symposium.

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MEG WHITEFORD, JD

SENIOR ASSOCIATE DIRECTOR OF DEVELOPMENT

Meg Whiteford is responsible for securing funds for Packard Center grants and the operation of the Center. She seeks to build enduring relationships that result in the philanthropic support and advocacy for the Packard Center. Meg works to develop strategies to secure an annual stream of funding and to grow the Packard Center endowment. She engages directly with donors and the Center's Board of Governors and collaborates with the administrative team.

Email: mwhiteford@jhmi.edu



TRAVIS SMITH

SENIOR DEVELOPMENT COORDINATOR

Travis Smith provides development-related administrative support and helps to manage the daily operations of the Packard Development team. He is responsible for gift processing and acknowledgment and reporting. He also assists with the execution of events and manages third-party crowdfunding efforts to support the Packard Center and works directly with the Senior Associate Director of Development.

Email: tsmith@jhmi.edu

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