2nd Annual Carol and Gene Ludwig Center for Research on Neurodegeneration Symposium

Symposium theme:

GENETICS AND BIOLOGY OF RESILIENCE AND RESISTANCE TO ALZHEIMER'S DISEASE

"Our goal is to bring new perspectives and novel approaches to neurodegenerative disease research."

Carol Ludwig, MD, co-founder and president of the Carol and Gene Ludwig Family Foundation

Thursday, October 9th, 2025
Time: 8:00 AM – 6:30 PM

Location: Mortimer B. Zuckerman Mind Brain Behavior Institute, Jerome L. Greene Science Center, 3227 Broadway, NYC 10027

Department of Neurology, Columbia University Irving Medical Center
710 West 168th Street, New York, NY 10032

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Time	Event	Speaker
8:00 AM	**Registration and Welcome Coffee**	
8:50 AM	**Opening Remarks and Introduction**	Peter St George-Hyslop and Elizabeth Bradshaw
	SESSION 1: Moderated by Tal Nuriel	
9:00 AM	*Deconstructing the Complexity of AD/ADRD: From Translational Epidemiology to Precision Medicine "Charting a path to precision medicine for brain diseases"*	David Bennett
9:50 AM	*Homeostatic Synapse Plasticity as a Mechanistic Target for Cognitive Resilience*	Swati Gupta
10:25 AM	*The Neural Implementation of Cognitive Reserve*	Yaakov Stern
11:00 AM	*Proteostasis Failure as a Driver of Alzheimer's Disease and Beyond*	Natura Myeku
11:35 AM	**Q&A, Panel Discussion, and Group Photo**	

Time	Topic	Speaker
12:00 PM	**Lunch Break and Round Table Discussion: Concepts in Neurodegeneration**	Serge Przedborski, Lauren Sansing, Jennifer Manly, and James Goldman
SESSION 2: Moderated by Jennifer Manly		
1:10 PM	*Cell Type-Specific Signatures Associated with Cognitive Resilience to AD Pathology*	Vilas Menon
1:45 PM	*Mechanisms of Human Longevity and Cognitive Resilience*	Yousin Suh
2:20 PM	*Genetics of Healthy Aging in a High-Risk Population: What can we Learn from Down Syndrome?*	Laura Xicota Vila
2:55 PM	**Q&A and Panel Discussion**	
3:25 PM	Special Presentation by ONT Nanopore	Netha Ulahannan
3:45 PM	**Coffee Break**	
SESSION 3: Moderated by Clarissa Waites		
4:00 PM	*Using Integrative Functional Genomics to Decode the Mechanisms of Neurodegeneration*	Towfique Raj
4:35 PM	*Integrative Multi-Omics to Identity Resilience Pathways in AD*	Badri Vardarajan
5:10 PM	*Risk and Protective Loci in Admixed Populations with Alzheimer's and Related Dementia*	Giuseppe Tosto
5:45 PM	**Q&A, Panel Discussion, and Closing Remarks**	

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Speakers

Opening Remarks

- **Dr. Elizabeth Bradshaw** is a Co-Director of the Carol and Gene Ludwig Center for Research on Neurodegeneration and an Adler Assistant Professor of Neurological Sciences in Neurology, the Taub Institute, and the Institute for Genomic Medicine. Dr. Bradshaw joined the faculty at Columbia in 2017 as the Adler Assistant Professor in the Department of Neurology to focus on the role of the immune system in neurodegenerative disease. She is a faculty member of both The Taub Institute for Research on Alzheimer's Disease and the Aging Brain and the Division of Translational Neurobiology Research. She was recently appointed the Co-Director of The Carol and Gene Ludwig Center for Research on Neurodegeneration. Her research is focused on understanding the role of the innate immune system, including microglia, monocytes and macrophages, in complex neurodegenerative diseases. There is a fundamental need to better understand the molecular function of microglia and other innate immune cells and to try and target them therapeutically.

- **Dr. Peter St George-Hyslop** is a Co-Director of the Carol and Gene Ludwig Center for Research on Neurodegeneration and a Belle and Murray Nathan Professor of Neurology in the Taub Institute for Research on Alzheimer's Disease and the Aging Brain. Dr. St George-Hyslop received MD from the University of Ottawa, Ottawa, Ontario Canda and FRCPC degrees. His interests and research focus in past years has primarily been in functional genomics and biophysics of neurodegenerative disease.

Session 1: Moderated by Dr. Tal Nuriel

1. **Dr. David Bennett, MD,** is director of the RUSH Alzheimer's Disease Center and the Robert C. Borwell Professor of Neurological Sciences.

   The RUSH Alzheimer's Disease Center (RADC) is a large, free-standing multidisciplinary research and clinical center within RUSH Medical College that focuses on the prevention and treatment common neurologic diseases. He is principal investigator of the Religious Orders Study, the Rush Memory and Aging Project, and the Pathology, Alzheimer's and Related Dementias Study in Sao Paulo, Brazil. The RADC recently launched The Mexican Teachers Cohort Cognition study in Mexico. He also directs the Regional Alzheimer's Disease Assistance Center for Northern Illinois.

   He serves on numerous national and international advisory and editorial boards. He recently rotated off membership of the National Advisory Council on Aging for the National Institutes of Health. Dr. Bennett was the winner of the 2018 Potampkin Prize for research on dementia. He has more than 1,400 peer-reviewed manuscript publications, with more than 267,000 citations and an h-index (a scale measuring productivity and citation impact) of 242.

2. **Dr. Swati Gupta**, **PhD**, is an Instructor at the Icahn School of Medicine at Mount Sinai whose work explores how synaptic function in corticostriatal circuits supports cognition and how these processes are disrupted in Parkinson's disease. She earned her Ph.D. in Neuroscience from the University of Alabama at Birmingham, where she studied epigenetic mechanisms regulating memory consolidation, and completed postdoctoral training at University College London investigating how astrocytic glutamate transporters protect neurons from excitotoxicity. Her research integrates molecular, cellular, and circuit-level approaches to uncover mechanisms of cognitive decline, with the aim of identifying pathways that promote resilience. In addition to her scientific work, Dr. Gupta is a dedicated mentor and an advocate for diversity and inclusion in science.

3. **Dr. Yaakov Stern, MD,** is the Florence Irving Professor of Neuropsychology in the Departments of Neurology and Psychiatry, as well as the Taub Institute for the Research on Alzheimer's Disease and the Aging Brain, at Columbia University College of Physicians and Surgeons. He is chief of the Cognitive Neuroscience Division of the Department of Neurology.

   Dr. Stern's research approach includes classic neuropsychological and cognitive experimental techniques, with a strong focus on functional imaging. He focuses on cognition in normal aging and in diseases of aging, particularly Alzheimer's disease. One strong focus of his research is investigating the neural basis of cognitive reserve.

4. **Dr. Natura Myeku**, **PhD**, is an Associate Professor in the Department of Pathology and Cell Biology and the Taub Institute for Research on Alzheimer's Disease and the Aging Brain at CUIMC. Her research focuses on the molecular mechanisms underlying Alzheimer's disease, with an emphasis on how protein clearance pathways—particularly the ubiquitin-proteasome system—become impaired in neurodegeneration, and how restoring these pathways may offer therapeutic strategies for the disease.

   She earned her PhD at the Graduate Center of CUNY. She came to Columbia as a postdoctoral researcher in the laboratory of Dr. Karen Duff, where she spearheaded pioneering work on the role of the proteasome in tauopathy. Since establishing her independent laboratory, Dr. Myeku has received several awards from the NIH to advance her research program. Through her published work, Dr. Myeku has positioned her lab at the forefront of efforts to unravel the molecular basis of impaired protein homeostasis in Alzheimer's disease and to identify new therapeutic approaches aimed at preserving proteostasis in the aging brain.

Round Table "Concepts in Neurodegeneration: Moderated by Dr. Serge Przedborski, Dr. Lauren Sansing, Dr. Jennifer Manly and Dr. James Goldman

1. **Dr. Serge Przedborski, MD/PhD** is the Page and William Black Professor of Neurology at Columbia University, where he holds joint appointments in the Departments of Neurology, Pathology & Cell Biology, and Neuroscience. He serves as Senior Vice Chair of Research in the Department of Neurology, Chief of the Movement Disorders Division, Director of the Columbia Translational Neuroscience Initiative, and Co-Director of the Center for Motor Neuron Biology and Disease.

   Dr. Przedborski earned his MD and PhD from the Université Libre de Bruxelles in Belgium. He later completed a fellowship in Movement Disorders under Stanley Fahn at Columbia University, where he joined the faculty in 1991 as an Assistant Professor. Since then, he has risen through the academic ranks to become a tenured Professor.

   His research centers on the molecular and cellular biology of neurodegenerative diseases, particularly Parkinson's disease (PD) and Amyotrophic Lateral Sclerosis (ALS). The Przedborski lab focuses on understanding how both cell-autonomous and non-cell-autonomous mechanisms contribute to neurodegeneration, utilizing toxic and genetic models of PD and ALS. A significant area of their work explores how mitochondrial dysfunction, particularly in mitochondrial dynamics and mitophagy, leads to the degeneration of specific neuron populations. Another key research focus is investigating how non-neuronal cells, such as microglia and astrocytes, contribute to neuronal death in neurodegenerative diseases like PD and ALS.

   Dr. Przedborski's research into neurodegenerative diseases such as PD and ALS is supported by federal funding from the National Institutes of Health (NIH) and the Department of Defense (DoD), as well as by private organizations like the Parkinson Foundation. He has held editorial roles, including serving as Senior Editor for the *Journal of Neuroscience* and Associate Editor for *Movement Disorders*, and is currently a Reviewing Editor for *eLife* and Associate Editor of NPJ Parkinson's disease. Additionally, he serves as a grant

reviewer for organizations such as the NIH, Veterans Administration, DoD, Canadian Medical Research Council, and medical journals including Science, Nature, Nature Neuroscience, Neuron, The New England Journal of Medicine, and Proceedings of the National Academy of Sciences USA.

2. **Dr. Lauren Sansing, MD, MS, FAHA, FANA**, is Professor of Neurology and Immunobiology and Vice Chari for Academic and Faculty Affairs in Neurology at Yale School of Medicine. She co-Directs the Carol & Gene Ludwig Program for the Study of Neuroimmune Interactions in Dementia at Yale. Her research has focused on the immune responses following acute and chronic cerebrovascular diseases, especially the role of innate immune cells like monocytes, macrophages, and microglia in the brain.

3. **Dr. Jennifer Manly, PhD,** is a Professor of Neuropsychology in the Department of Neurology at Columbia University Irving Medical Center. Her research focuses on mechanisms of inequalities in cognitive aging and Alzheimer's Disease. Her research team has partnered with the Black and Latinx communities in New York City and around the United States to design and carry out investigations of structural and social forces across the lifecourse, such as educational opportunities, discrimination, and socioeconomic inequality, and how these factors relate to cognition and brain health later in life. She is the MPI of the Columbia Interdisciplinary Research Center on Alzheimer's Disparities which focuses on mentoring early career scientists. Her research has been funded by the National Institutes of Health and the Alzheimer's Association, and she has authored over 300 peer-reviewed publications and 10 chapters. She was the 2014 recipient of the Tony Wong Diversity Award for Outstanding Mentorship, was the recipient of the Paul Satz-International Neuropsychological Society Career Mentoring Award in 2020, and was named the Irving Institute for Clinical and Translational Research Senior Mentor of the Year in 2022. Dr. Manly was elected to the National Academy of Medicine in 2021. She served on the HHS Advisory Council on Alzheimer's Research, Care and Services from 2011 – 2015 and is a current member of the NIH Council of Councils.

4. **Dr. James Goldman, MD/PhD,** received his MD/PhD from New York University and completed neuropathology residency at Albert Einstein College of Medicine. Currently Dr. Goldman is a Professor of Pathology and Cell Biology at Columbia University Irving Medical Center. He is a trained neuropathologist and neurobiologist. His current interests include amyloid protein accumulation in a non-Alzheimer's Disease context and the molecular pathology of neurodegenerative diseases. He is actively collaborating with colleagues using snRNA sequencing, histopathology, and spatial gene expression to explore neurodegenerative pathologies. His interests also include rare genetic disease tuberous sclerosis complex and autism disorders.

Session 2: Moderated by Dr. Jennifer Manly

1. **Dr. Vilas Menon, PhD,** is currently an Assistant Professor of Neurological Sciences in the Division of Neuroimmunology at Columbia University Irving Medical Center. His lab applies computational and experimental methods to generate and analyze large-scale molecular data in the context of neurological disease. His group investigates signatures of differential vulnerability and resistance at both the cell type and individual level in neurodegenerative diseases (including Alzheimer's and Parkinson's) and neuroimmune diseases (such as Multiple Sclerosis). He obtained his PhD in Applied Mathematics from Northwestern University, where he studied signal integration and information processing in neurons. Prior to joining Columbia, he spent several years as a scientist at the Allen Institute for Brain Science in Seattle, WA, and as a Fellow at the Howard Hughes Medical Institute's Janelia Research Campus, developing new analytical methods for large-scale single-cell and bulk molecular data analysis.

2. **Dr. Yousin Suh, PhD,** is the Charles and Marie Robertson Professor of Reproductive Sciences in Obstetrics and Gynecology, Professor of Genetics and Development, and Director of Reproductive Aging in Obstetrics and Gynecology in the Vagelos College of Physicians and Surgeons at Columbia University. She investigates the (epi)genetic component that underlies the interface of intrinsic aging and disease based on the identification of (epi)genome sequence variants associated with age-related disease risk or its opposite, i.e., an unusual resistance to such disease. To investigate the functional impact of (epi)genetic variants, she applies specific functional tests, including *in silico* modeling, cell culture assays and mouse models. Her contributions in the field have been recognized by the Glenn Award for Research in Biological Mechanisms of Aging and has led to become the elected member of the Academy for Health and Lifespan Research, the first global non-profit group focused on accelerating breakthroughs in the expansion of the human health span, nominated and voted on by the world's leading geroscientists. She has organized numerous international symposiums on functional genomics of aging, is on the Editorial Boards of numerous Journals including PLoS Genetics

and Aging Cell as an Associate Editor, and participates in advisory committee members for several research institutions and companies.

3. **Dr. Laura Xicota Vila, PhD,** is an Associate Research Scientist at the Gertrude H. Sergievsky Center, where her research focuses on understanding the genetic basis of Alzheimer's disease (AD) variability in individuals with Down syndrome (DS). Dr. Xicota earned her PhD from Pompeu Fabra University in Barcelona, where she investigated efficacy biomarkers for clinical trial aimed at improving cognition in individuals with Down syndrome. Following her doctoral studies, she joined the Paris Brain Institute, where she explored the role of the endolysosomal system in cells derived from Alzheimer's disease patients. During her time in Paris, she also began investigating the genetics of AD in the general population, expanding her expertise in neurodegenerative disease research. Her move to the Gertrude H. Sergievsky Center marked a pivotal step in integrating her knowledge of Alzheimer's disease and Down syndrome. Through her interdisciplinary research, Dr. Xicota aims to contribute to the development of targeted interventions and improve our understanding of disease heterogeneity in vulnerable populations.

4. **ONT Nanopore - Dr. Netha Ulahannan, PhD -** Oxford Nanopore has developed DNA/RNA sequencing devices using nanopore technology, which allows real-time, scalable sequencing from pocket-sized to high-throughput systems. Oxford Nanopore, known for long-read sequencing, can also analyze DNA or RNA, Structural Variants, SNVs, Methylation and other modifications from the native strand.

Session 3: Moderated by *Dr. Clarissa Waites

1. **Dr. Towfique Raj, PhD** is a Professor in the Departments of Neuroscience and Genetics & Genomic Sciences and a core faculty member of the Ronald M. Loeb Center for Alzheimer's Disease at the Icahn School of Medicine at Mount Sinai in New York. He earned his Ph.D. in Genetics from the University of Cambridge and completed postdoctoral training at the Broad Institute. Before joining Mount Sinai, Dr. Raj was an Instructor of Neurology at Harvard Medical School and a Visiting Scholar at Stanford University. Dr. Raj's research aims to decipher the genetic basis of complex human traits, with a focus on neurodegenerative diseases. His group combines high-throughput functional genomics, genetic association studies, and advanced computational approaches—including large-scale data integration, machine learning, and statistical modeling—to identify genomic regions that influence cellular and molecular phenotypes. While rooted in computational biology, his work is highly collaborative with experimental groups. Dr. Raj has made notable contributions to understanding the role of RNA processing in neurodegeneration and has led large-scale multi-omic studies of peripheral blood and central nervous system cells, particularly microglia. He also holds leadership roles in several major research consortia, serving as Co-Chair of the Alzheimer's Disease Sequencing Project (ADSP) AI/ML Consortium, a member of the Accelerating Medicines Partnership for Parkinson's Disease (AMP-PD), and leader of the Genomics Core for the Center Without Walls on FTLD-TDP.

2. **Dr. Badri Vardarajan, PhD, MS,** is a bioinformatician specializing in the genetic underpinnings of Alzheimer's disease across diverse populations. His research group employs computational approaches for gene discovery and applies advanced pipelines to characterize complex structural variations in large-scale sequencing data. As a key contributor to multi-institutional initiatives including the Alzheimer's Disease Sequencing Project (ADSP), he leads multi-omics integration efforts that combine genetic, transcriptomic, proteomic, and metabolomics data in major cohorts such as EFIGA (Caribbean-Hispanic families) and

WHICAP (Washington Heights-Inwood Columbia Aging Project). His work focuses on identifying novel biomarkers and translating genetic discoveries into actionable therapeutic targets for Alzheimer's disease treatment and prevention.

3. **Dr. Giuseppe Tosto, MD/PhD** is an Assistant Professor of Neurology at the Gertrude H. Sergievsky Center and the Taub Institute for Research on Alzheimer's Disease and the Aging Brain at Columbia University. He is a neurologist and a genetic epidemiologist with NIH-funded grants recruiting participants in North, Central and South America. His other projects focus on polygenic risk scores and development of novel methods to identify genetic causes of Alzheimer's Disease.