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Hugo J. Bellen awarded the \$500,000 Gruber Genetics Prize for pioneering work using *Drosophila* genetics to study human diseases

Hugo J. Bellen

January 17, 2024, New Haven, CT – The 2024 Gruber Genetics Prize is being awarded to geneticist Hugo J. Bellen, DVM, PhD, distinguished service professor and March of Dimes Chair in the Department of Molecular and Human Genetics at Baylor College of Medicine (BCM) and Investigator at the Jan and Dan Duncan Neurological Research Institute (Duncan NRI) of Texas Children’s Hospital, for his pioneering work in *Drosophila* genetics which has led to valuable insights into the mechanisms of human disease. Throughout his career Bellen has helped create genetic tools and resources widely used to manipulate *Drosophila* which he has generously shared to the great benefit of the *Drosophila* genetics community. His longstanding studies of the peripheral nervous system, synaptic transmission, and neurodegeneration led him to develop new ways to employ *Drosophila* as a model organism to identify and understand genes causing rare and novel human diseases. Studies of these rare conditions are providing insights into common neurodegenerative diseases including Alzheimer’s and Parkinson’s disease and multiple sclerosis.

The Genetics Prize, which includes a \$500,000 award, will be presented to Bellen at The Allied Genetics Conference in National Harbor, Maryland, on March 10.

Over the course of Bellen’s career, his work in *Drosophila* has led to the elucidation of the role of genes that play a key role in nervous system development and synaptic transmission. Given how highly conserved these pathways are, these discoveries have yielded significant insight into our understanding of the human nervous system.

Bellen has been a leader for more than three decades in method and resource development to study genes in *Drosophila*. These include the development of the enhancer trap method to detect expression patterns of genes; the construction of genomic libraries and chromosomal duplications; the identification of P transposable elements and Minos insertions in 70% of the ~15,000 fly genes; the development of multifaceted gene tagging strategies that create severe loss of function alleles, allow determination of the gene expression patterns and can be used to

create humanized fly models wherein the expression of the orthologous human gene can rescue the loss of the fly gene. He has been generous and open in sharing his work and reagents and has thereby empowered the work of hundreds of other researchers.

While pursuing these discoveries and creating these resources, Bellen established the Model Organism Screening Center, which is part of the Undiagnosed Diseases Network. His research group in collaboration with scientists at BCM and the NRI has discovered more than 40 genes that cause rare and novel human genetic diseases. This work is done in close collaboration with patients, their parents, and clinicians, and has helped lead a new era of model system genetics to diagnose and study human disease processes. In follow-up research, the Bellen lab has found that investigations into rare diseases can offer very valuable insights into mechanisms disrupted in common neurodegenerative diseases, including Alzheimer's and Parkinson's disease. This includes the discovery of new pathways wherein neurons transfer damaging lipids to glia and the glia degrade these lipids, effectively protecting the neurons and allowing them to continue to properly function.

"It is with great honor that we announce Hugo Bellen, DVM, PhD, as the 2024 recipient of the Gruber Genetics Prize," says Philip Hieter, Professor in the Michael Smith Laboratories at the University of British Columbia and a member of the Selection Advisory Board to the Prize. "Bellen's contributions to the field of genetics have been enormous and multifaceted. These include his creation of genetic reagents and bioinformatics tools, that he has freely shared with the research community, and which has led to a transformation of the field of *Drosophila* genetics; his work in ushering in a close collaboration between model organism geneticists, clinicians and patients; and for his research, which has furthered our understanding of dozens of rare undiagnosed human diseases, and broadened our understanding of neurodegenerative diseases such as Alzheimer's, Parkinson's and multiple sclerosis."

Additional Information

In addition to the cash award, the recipient will receive a gold laureate pin and a citation that reads:

The Gruber Foundation proudly presents the 2024 Genetics Prize to Hugo J. Bellen for ushering in a new era of model system genetics with direct impact on human disease.

*Bellen developed novel techniques that allow human proteins bearing patient mutations to be expressed under the normal regulation of their *Drosophila* orthologs. Working in close collaboration with clinicians and basic scientists, Bellen and his partners have elucidated dozens of rare undiagnosed neurodevelopmental and neurodegenerative syndromes, providing new examples of how rare diseases can illuminate underlying mechanisms of more widespread conditions.*

*Bellen exemplifies the highest standards of quality, collegiality and generosity in producing and widely sharing innovative genetic reagents and bioinformatic tools that have transformed *Drosophila* genetics.*

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The Genetics Prize is presented to a leading scientist, or up to three, in recognition of groundbreaking contributions to any realm of genetics research.

Laureates of the Gruber Genetics Prize:

- **2023: Allan Jacobson and Lynne Maquat** for identifying and describing nonsense-mediated mRNA decay
- **2022: Ruth Lehmann, James Priess, and Geraldine Seydoux** for embryogenesis discoveries
- **2021: Stuart H. Orkin**, revolutionized our understanding of genetics of inherited blood disorders
- **2020: Bonnie Bassler**, for pioneering discoveries on bacterial communication
- **2019: Bert Vogelstein**, discoveries of new genetic pathways and processes contributing to cancer
- **2018: Joanne Chory and Elliot Meyerowitz**, for helping revolutionize plant molecular biology, with implications for global agriculture, the environment, and human health and disease
- **2017: Stephen Elledge**, for discovering and characterizing the molecular mechanisms of the DNA damage response pathway in eukaryotic cells
- **2016: Michael Grunstein and David Allis**, for the discovery of the role of histone proteins and their covalent modification in the regulation of eukaryotic gene expression
- **2015: Emmanuelle Charpentier and Jennifer Doudna**, for establishing a framework for universal genome editing
- **2014: Victor Ambros, David Baulcombe, and Gary Ruvkun**, for pioneering the study of small non-coding RNA's, molecules that are recognized as playing a critical role in regulating gene expression
- **2013: Svante Pääbo**, for pioneering the analysis of ancient DNA
- **2012: Douglas C. Wallace**, for his groundbreaking contributions to mitochondrial genetics
- **2011: Ronald Davis**, for pioneering development and application of recombinant-DNA techniques
- **2010: Gerald Fink**, whose work in yeast genetics advanced the field of molecular genetics
- **2009: Janet Davison Rowley**, for her seminal discoveries in molecular oncology
- **2008: Allan C. Spradling**, for his work on fly genomics
- **2007: Maynard V. Olson**, for his contributions to genome science
- **2006: Elizabeth H. Blackburn**, for studies of telomeres and telomerase, and her science advocacy
- **2005: Robert H. Waterston**, for his pivotal role in the Human Genome Project
- **2004: Mary-Claire King**, for three major findings in modern genetics: the similarity of the human and chimpanzee genomes, finding a gene that predisposes to breast cancer, and forensic genetics.
- **2003: David Botstein**, for establishing the ground rules for human genetic mapping
- **2002: H. Robert Horvitz**, who defined genetic pathways responsible for programmed cell death
- **2001: Rudolf Jaenisch**, who created the first transgenic mouse to study human disease

The Prize recipients are chosen by the Genetics Selection Advisory Board. Its members are:

Aravinda Chakravarti, New York University, School of Medicine; **Philip Hieter**, Michael Smith Laboratories at the University of British Columbia; **Jeannie T. Lee**, Harvard Medical School; **Denise Montell**, University of California, Santa Barbara; **Eric N. Olson**, The University of Texas Southwestern Medical Center; **Geraldine Seydoux**, Johns Hopkins University School of Medicine; **Allan Spradling**, Carnegie Institution for Science (Chair).

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The Gruber International Prize Program honors individuals in the fields of Cosmology, Genetics and Neuroscience, whose groundbreaking work provides new models that inspire and enable fundamental shifts in knowledge and culture. The Selection Advisory Boards choose individuals whose contributions in their respective fields advance our knowledge and potentially have a profound impact on our lives. The Genetics Society of America partners with the Foundation on the Genetics Prize, and nominates the members of the Genetics Selection Advisory Board.

The Gruber Foundation was established in 1993 by the late Peter Gruber and his wife Patricia Gruber. The Foundation began its International Prize Program in 2000, with the inaugural Cosmology Prize.

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For more information on the Gruber Prizes, visit www.gruber.yale.edu, e-mail info@gruber.yale.edu or contact A. Sarah Hreha at +1 (203) 432-6231. By mail: The Gruber Foundation, Yale University, Office of International Affairs, PO Box 208320, New Haven, CT 06520

Media materials and additional background information on the Gruber Prizes are in our online newsroom: www.gruber.yale.edu/news-media

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