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Rotem Sorek

Sorek Awarded $500,000 Gruber Genetics Prize For Pioneering Discoveries In Bacterial Immune Systems

May 14, 2025, New Haven, CT – The 2025 Gruber Genetics Prize is being awarded to geneticist and molecular biologist Rotem Sorek, Ph.D., of the Weizmann Institute of Science, for his discoveries in the immune system of bacteria. Using a novel approach that combined computational approaches with an experimental system, Sorek and his colleagues conducted wide scale screens of tens of thousands of bacterial genomes, identifying an astounding number of defense systems used against infection by viruses called phages. This led to the discovery that parts of the human immune system originated as bacterial defense systems against phages.

The Gruber Genetics Prize, which includes a $500,000 award, will be presented to Sorek in a ceremony later this year.

“We are proud to announce Rotem Sorek as the 2025 recipient of the Gruber Genetics Prize,” says Geraldine Seydoux, the Huntington Sheldon Professor in Medical Discovery in the Department of Molecular Biology and Genetics at the Johns Hopkins School of Medicine and a member of the Selection Advisory Board. “Sorek’s work greatly expanded our understanding of how bacteria protect themselves from viruses, by systematically screening tens of thousands of microbial genomes and identifying dozens of previously unknown viral defense systems in bacteria. These discoveries have led to a better understanding of the human immune system, as well as identified a number of promising candidates for antiviral therapies.”

The discovery that bacteria have a diverse set of defense systems against phages came from a widescale screen that looked at the genomes of tens of thousands of bacteria, and identified a number of potential antiviral defense systems. This screen was combined with an experimental setup that tested out these candidate genes, for their ability to guard against phage infection. This approach was able to validate more than 50 viral defense systems, which opened up a whole new field of microbiology.

In follow-up experiments, Sorek and his colleagues were able to show that some of the defense mechanisms are used by the human immune system. In particular, the cGAS-STING antiviral pathway, which was originally found in animals, also defends against phage infection to bacteria. Some of the small molecule viral inhibitors they discovered are currently being investigated clinically as potential antiviral therapies.

"Sorek's discoveries have already had multiple impacts," says Allan Spradling, professor at the Carnegie Institution/HHMI and chair of the Selection Advisory Board. "His discoveries that bacterial immune defense systems are conserved in the human immune system has reshaped our understanding of human immunity. Meanwhile, his widescale approach to studying microbial defense systems has opened up new avenues for potential therapies."

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 2025 Genetics Prize to Rotem Sorek for his ground-breaking discoveries of scores of antiviral defense systems in bacteria and their evolutionary connections to our own innate immune system.

Sorek combines computational analyses of bacterial genomes and genetic methods to systematically discover novel genes and mechanisms used by bacteria to neutralize foreign genetic intruders. His approach identified dozens of defense pathways that detect phages and other DNA parasites to prevent their replication in bacteria.

The findings revealed unexpected similarities between bacterial antiviral systems and innate immunity mechanisms in animals and plants and opened the way for the development of new antiviral therapies.

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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:

- **2024: Hugo J Bellen** ushered in a new era of model system genetics with direct impact on human disease
- **2023: Allan Jacobson and Lynne Maquat** identified 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; **Stuart H. Orkin**, Harvard Medical School; **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.eduor 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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