Science & SciLifeLab PRIZE

For Young Scientists

2022

sciencepriz.scilifelab.se

ABOUT THE PRIZE

The *Science* & SciLifeLab Prize for Young Scientists is aimed at young scientists at the very start of their careers. The categories for this year's prize are: Cell and Molecular Biology; Genomics, Proteomics and Systems Biology Approaches; Ecology and Environment; and Molecular Medicine.

Each of the candidates submitted a thousand-word essay describing their PhD thesis work. The essays were judged by an independent editorial team organized by *Science*.

The total prize money of USD 60,000 recognizes the brightest and the best new ideas in science. The grand prize-winning essay has recently been published in an issue of the journal *Science* and the essays of the three category winners have been published in *Science* online.

GRAND PRIZE WINNER

FLORIAN SCHMIDT

Category: Genomics, Proteomics and Systems Biology Approaches
Titel of essay: Autobiography of a gut bacterium: Recordings of transient transcriptional events shed light on the gut microbiome

Bio

Florian Schmidt received undergraduate degrees from the University of Heidelberg and a PhD from ETH Zürich. His research focuses on the development of technologies in the fields of genome engineering, transcriptional recording, and gene therapy.

Abstract

The interactions of the gut microbiota with the host are complex and the capacity to investigate them is pivotal to our ability to understand human health and disease. As microorganisms traverse the intestine, they continuously adapt their gene expression to changes in their environment such as the availability of nutrients. The short-lived nature of these transcriptional events renders RNA-sequencing of fecal bacteria largely uninformative. We leverage transcriptional recording by CRISPR spacer acquisition from RNA to create bacterial sentinel cells as a tool to investigate intestinal and microbial physiology. We demonstrate that these microbial sentinels can traverse the gastrointestinal tract and record the transcriptional response to a plethora of interactions with the host, the diet, and other microbiota into DNA, which can be recovered non-invasively by deep sequencing from the feces.

CATEGORY PRIZE WINNER

STEFANY MORENO-GÁMEZ

Category: Ecology and Environment
Titel of essay: How bacteria navigate varying environments: Collective sensing and phenotypic diversification aid response to environmental fluctuations

Bio
Stefany Moreno-Gámez received an undergraduate degree from Universidad de los Andes and a PhD from the University of Groningen and ETH Zürich. She is currently a postdoctoral fellow at the Massachusetts Institute of Technology. Her research focuses on how dietary and host-derived glycans shape ecological and evolutionary dynamics in the gut microbiome.

Abstract
From variations in resource availability to the appearance of stressors like antibiotics, in nature bacteria are continuously navigating dynamic environments. While bacteria can rapidly adapt by genetic mutation, sometimes fluctuations occur over very short time scales that require alternative adaptive strategies. I found that bacteria can cope with rapid change by collectively sensing the environment through the secretion of autoinducers that accumulate at different rates dependent on how cells perceive their surroundings and average out the noise inherent to individual sensing. In addition, bacteria can also adapt to fluctuations by diversifying phenotypically in a way that guarantees that some individuals will always survive even if the environment changes in an unpredictable manner.

CELL AND MOLECULAR BIOLOGY

CATEGORY PRIZE WINNER

JAMES L. DALY

Category: Cell and Molecular Biology
Titel of essay: Endosomes, receptors, and viruses: Mechanisms of infection are deciphered at the host-pathogen interface

Bio
James Daly received undergraduate and PhD degrees from the University of Bristol. After completing his studies, he received a Wellcome Early Career Award fellowship and moved to the Department of Infectious Diseases, King's College London. His current research continues to explore the molecular interface between neuropilin receptors and viruses and the potential for antiviral inhibition of this process.

Abstract
Eukaryotic cells are compartmentalized into a dynamic series of membranes that provide spatiotemporal control over how proteins are processed, activated, and degraded. In particular, the endosomal network maintains a delicate balance between protein recycling and turnover, an essential process which is exploited by invading intracellular pathogens. I utilized proteomics to profile transmembrane protein sorting through the endosomal network and highlight its protective role in cellular homeostasis. I identified Neuropilin-1 (NRP1) as a key receptor that is directly recognized and recycled from endosomes to the trans-Golgi network. Following the emergence of the COVID-19 pandemic, our collaborative team demonstrated that NRP1 directly binds the Spike protein of the causative virus, SARS-CoV-2, to enhance infection. This research opens avenues for exploring the role of neuropilins in viral infections.

CATEGORY PRIZE WINNER

DANIELE SIMONESCHI

Category: Molecular Medicine
Titel of essay: Uncovering the degrader of D-type cyclins: AMBRA1 is identified as the long-sought, major controller of D-type cyclins

Bio
Daniele Simoneschi received an undergraduate degree from Manhattanville College and MPhil and PhD degrees from the Vilcek Institute at New York University (NYU). He is a research assistant professor in the Department of Biochemistry and Molecular Pharmacology at NYU, where he explores molecular and cellular mechanisms by which cullin-RING ubiquitin ligases regulate cell cycle execution.

Abstract
D-type cyclins are fundamental to embryogenesis and score amongst the most frequently deregulated therapeutic targets in human cancer. Yet, decades after their discovery, the mechanisms regulating their turnover are still heavily debated. Using biochemical and somatic cell-genetics studies, we established CRL4AMBRA1 as the ubiquitin ligase of all three D-type cyclins, in both normal conditions and upon nutrient deprivation or genotoxic stress. We also found that, when we regulated the levels of D-type cyclins, AMBRA1 acts as a tumor suppressor in vivo, and its low mRNA levels are predictive of poor survival in cancer patients. Collectively, this work uncovers the molecular mechanism which controls D-type cyclins' stability during cell-cycle progression, in development and in human cancer, and implicates AMBRA1 as a critical regulator of the retinoblastoma pathway.

SPONSORS

SciLifeLab
As a national hub for molecular biosciences in Sweden, SciLifeLab develops and maintains unique research infrastructure, services and data resources for life science. SciLifeLab coordinates research communities in health and environmental sciences, fosters collaboration with industry, health care, public research organizations and international partners and recruit and train young scientists. The overall aim of SciLifeLab is to facilitate cutting-edge, multi-disciplinary life science research and promote its translation to the benefit of society.

SciLifeLab is jointly operated by its four founder universities: KTH Royal Institute of Technology, Karolinska Institutet, Stockholm University and Uppsala University. About 200 research groups, 1500 researchers and 40 national infrastructure units are associated with SciLifeLab. The two main research centers are located in Stockholm and Uppsala, but national SciLifeLab units exist at all major Swedish universities.

The AAAS and the *Science* family of journals
The American Association for the Advancement of Science (AAAS) is the world's largest general scientific society and publisher of the journal *Science*, as well as *Science* Translational Medicine; *Science* Signaling; a digital, open-access journal, *Science* Advances; *Science* Immunology; and *Science* Robotics.

AAAS was founded in 1848 and includes more than 250 affiliated societies and academies of science, serving 10 million individuals. The nonprofit AAAS is open to all and fulfills its mission to "advance science and serve society" through initiatives in science policy, international programs, science education, public engagement, and more. For additional information about AAAS, visit www.aaas.org.

Knut and Alice Wallenberg Foundation
The Knut and Alice Wallenberg Foundation is the largest private financier of research in Sweden and also one of Europe's largest. The Foundation primarily grants funding in natural sciences, technology and medicine. During the past five years the Foundation has granted a total of over SEK 9 billion for various projects, mainly at Swedish universities.

THANK YOU

We would like to say a special thank you to the independent scientific panel of judges for this year's prize. We would like to acknowledge the judges for their time, expertise and efforts in identifying this year's prize-winners.

2022 *Science* & SciLifeLab Prize Semi-Finalist Judges:
Dr. Orla Smith of Science Translational Medicine
Dr. Toren Finkel of University of Pittsburgh
Dr. Jay Shendure of University of Washington
Dr. Scott Edwards of Harvard University
Dr. Patrick Tan of Duke University
Dr. Daniel Pauly of University of British Columbia
Dr. Vanessa Ezenwa of Yale University
Dr. Laura Machesky of University of Glasgow
Dr. Erich Jarvis of Rockefeller University
Dr. Ibrahim Cisse of MIT
Dr. Jason Tylianakis of University of Canterbury
Dr. Valda Vinson, Executive Editor, Science

2022 Finalist Judges:
Dr. Holden Thorp, Editor-in-Chief, Science
Dr. Terrie Williams of University of California at Santa Cruz
Dr. Emilie Marcus, of UCLA

YOUR TURN NEXT YEAR?

APPLY BEFORE JULY 15, 2023

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Science &
SciLifeLab
PRIZE
For Young Scientists

The Science/AAAS and SciLifeLab Prize committee is looking forward towards reviewing the research findings from future entrants.

The prize is awarded annually to young scientists for outstanding life science research for which they were awarded a doctoral degree in the previous two years. The topic of the entrant's thesis research must be in one of the following categories:

- Cell and Molecular Biology
- Genomics, Proteomics, and Systems Biology Approaches
- Ecology and Environment
- Molecular Medicine

Eligible entrants must have been awarded their doctoral degree in 2021 or 2022, and the subject of their thesis should match one of the topics. The winners from each category will compete for the grand prize.

Questions? Please contact SciLifeLabPrize@aaas.org

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