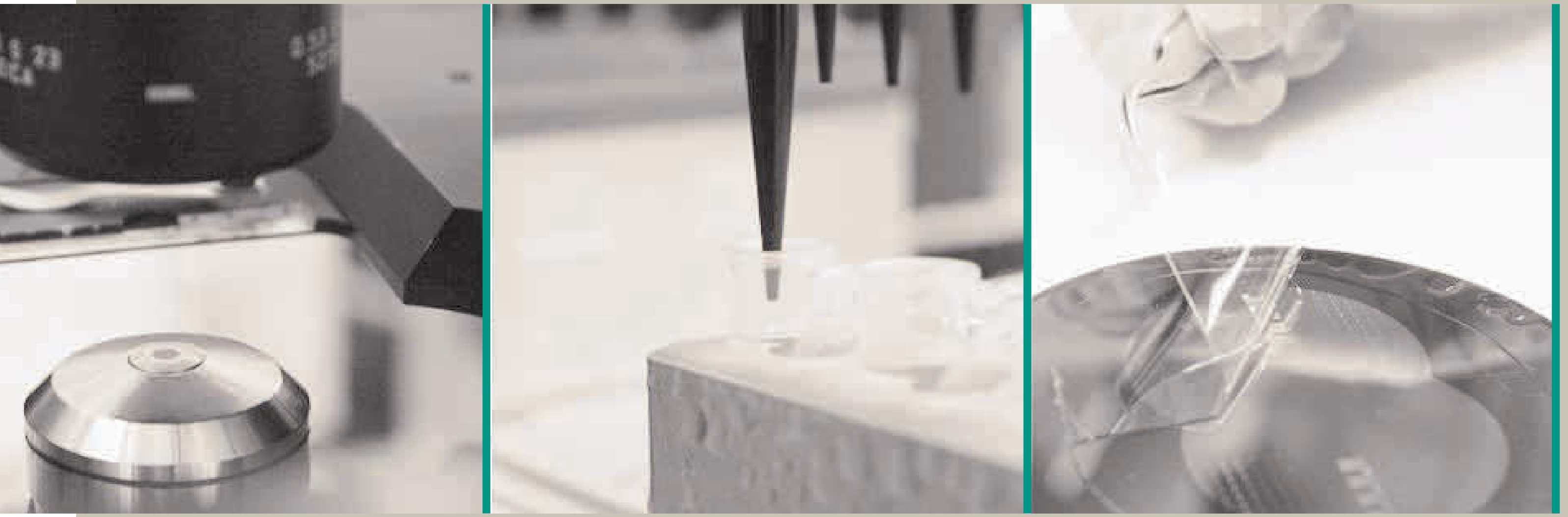
PREVIOUS WINNERS



2015 Prof. RE'EM SARI
Racah Institute of Physics, Faculty of Science
Understanding Our Universe

2014 Prof. MICHAL BIRAN
Departments of Asian Studies, and Islamic and Middle Eastern Studies, Institute of Asian and African Studies
Faculty of Humanities
Inner Asian history: Mobility Empire and Cross-Cultural Contacts in Mongol Eurasia

2013 Prof. ROI BAER
Institute of Chemistry and Fritz Haber Minerva Research Center for Molecular Dynamics, Faculty of Science
Developing New Theoretical and Computational Techniques that Enable Determination of the Energy Levels of Charge Carriers in Large Molecular Systems and Nanocrystals

2012 Dr. ERAN MESHORER
Department of Genetics, Silberman Institute of Life Sciences, Faculty of Science
Using Genome-Wide Approaches and Sophisticated Imaging Techniques to Understand Genome Plasticity in Stem Cells

2011 Prof. DAVID WEISBURD
Institute of Criminology, Faculty of Law
Pioneering Research on White Collar Crime, Policing and Crime Prevention

2010 Prof. MERAV AHISSAR
Department of Psychology and Program in Cognitive Sciences, Faculty of Social Sciences
The Neuro-Cognitive Basis of Reading Disability - The "Anchoring-Deficit" Hypothesis

2009 Prof. ISAIAH TUVIA (SHY) ARKIN
Department of Biological Chemistry, Silberman Institute of Life Sciences, Faculty of Science
Structural Biology of Membrane Proteins, Focusing on Pathogen's Ion Channels and Ion Pumps

2008 Prof. URI BANIN
Institute of Chemistry and the Center for Nanoscience & Nanotechnology, Faculty of Science
Major Advancements in the Science and Technology of Nanocrystals and the Development of Hybrid Multifunctional Nanoparticles

2007 Prof. HOWARD (CHAIM) CEDAR
Department of Developmental Biology and Cancer Research, Institute for Medical Research Israel-Canada, Faculty of Medicine
Establishing the Cornerstone of Epigenetics and Its Role in Human Development

The Hebrew University of Jerusalem
The Authority for Research and Development
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June 2016

The Authority for Research and Development
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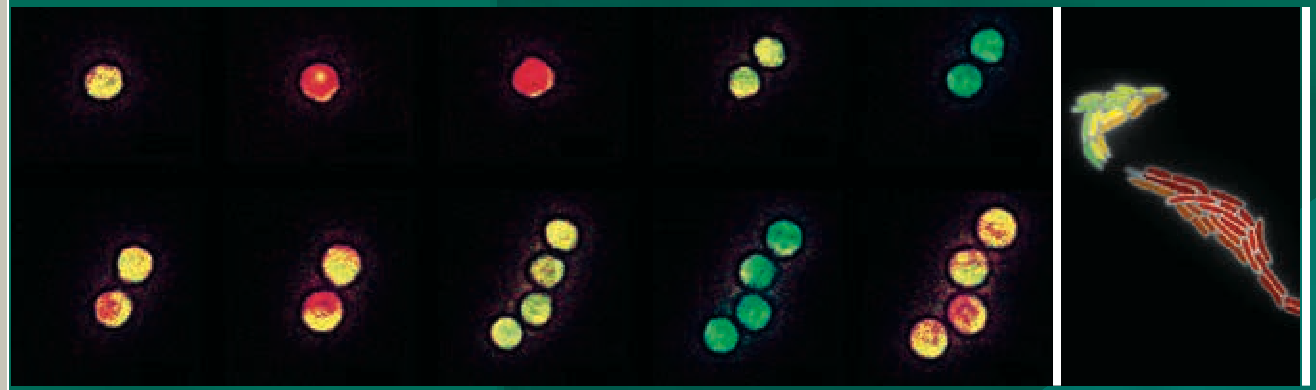
Project editor: Shoshana Glatzer
Project coordinator: Ayelet Sagiv

THE HEBREW UNIVERSITY OF JERUSALEM

THE KLACHKY PRIZE

FOR THE ADVANCEMENT OF THE FRONTIERS OF SCIENCE

AT THE HEBREW UNIVERSITY OF JERUSALEM



תשע"ו 2016

KLACHKY PRIZE

for the Advancement of the Frontiers of Science

The Klachky Prize for the Advancement of the Frontiers of Science is an annual prize founded by the late Ms. Rachel Klachky. The prize is given to Hebrew University faculty members or academic units for their achievements in:

- The Advancement of Science
- The Advancement of Scientific Research
- The Advancement of Scientific Knowledge
- The Advancement of the Frontiers of Science
- New Academic Developments
- Academic Ventures

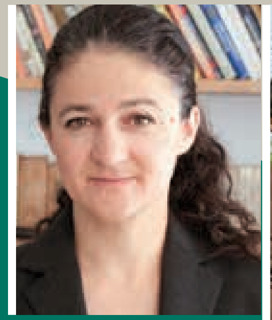
The Donor

Rachel Klachky (1925-2001) was born in Mexico. Married to the late Engineer Manuel Klachky, she was a central figure in the Jewish Community of Mexico, and was one of the founding members of the Mexican Friends of the Hebrew University.

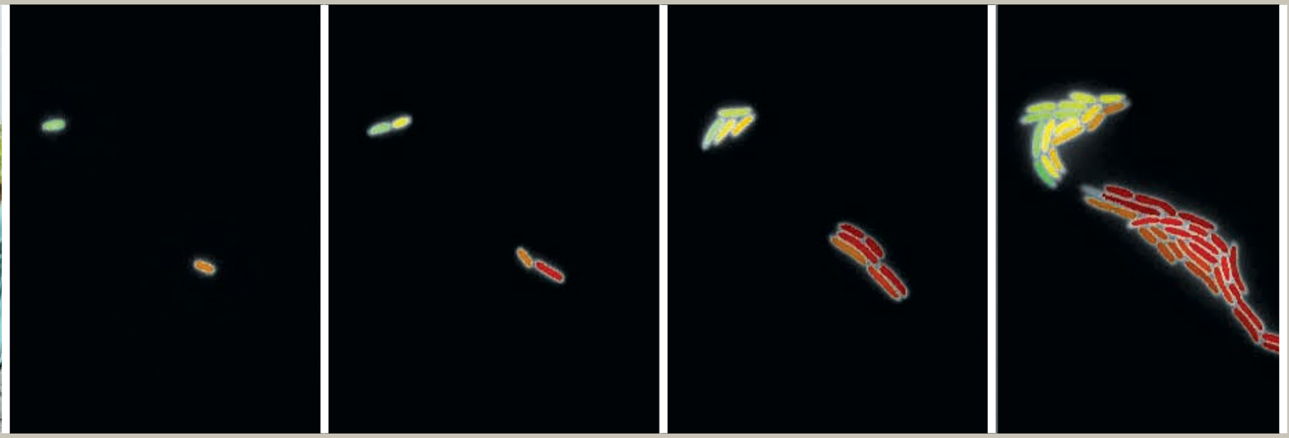
In 1997, she received an Honorary Fellowship from the Hebrew University for her outstanding contributions to the State of Israel and the Hebrew University of Jerusalem. She wholeheartedly supported worthy causes, including the absorption of new immigrants, scholarships for students, and support of various scientific research projects, and studies on superconductivity at the Hebrew University.

After she passed away, her sons, Roberto and Leopoldo, continued her legacy of support to the Hebrew University of Jerusalem. The Klachky Prize has been awarded since 2003.

The Klachky Prize for 2016

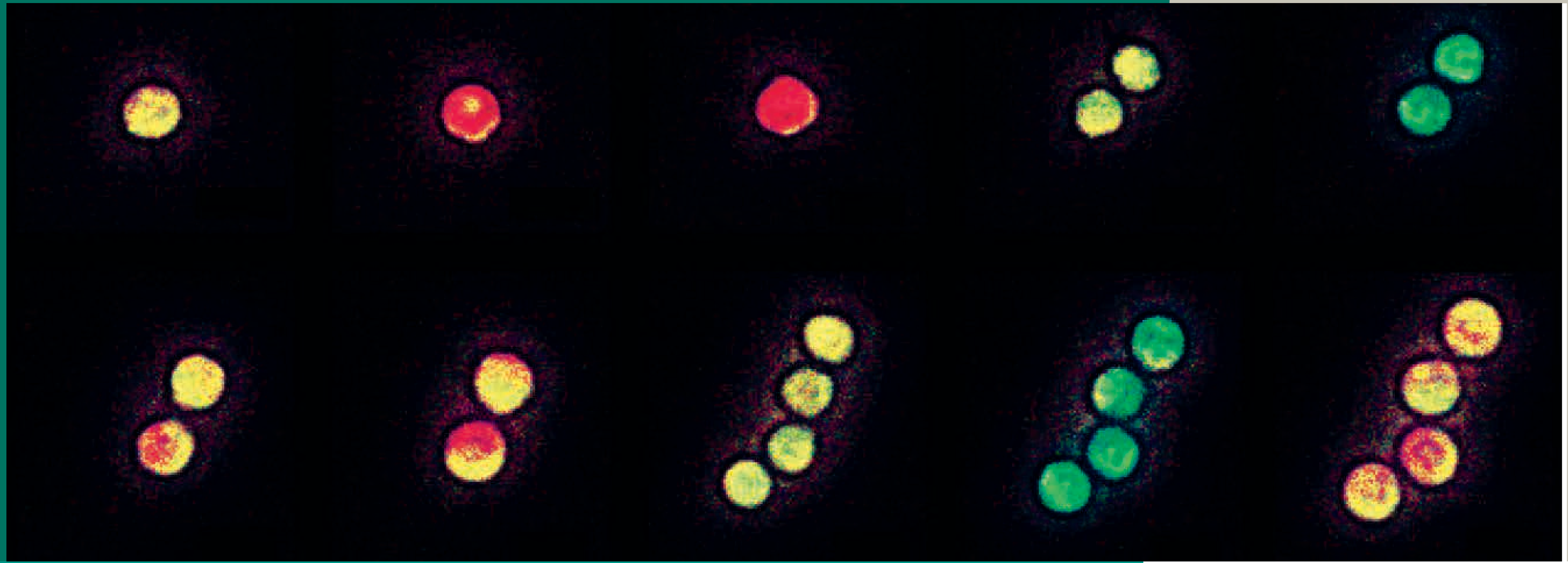


Prof. NATHALIE Q. BALABAN
Racah Institute of Physics
Faculty of Science



Nathalie Questembert Balaban did her undergraduate studies in Mathematics and Physics in the Hebrew University's Amirim honors program. After completing her Ph.D. in Condensed Matter Physics and post-doctoral studies in Biophysics, she joined the Hebrew University faculty, establishing the Biological Physics group at the Racah Institute of Physics in 2003. She has been awarded several prizes and fellowships, among them the Dicke Fellowship from Princeton University, the Krill Prize from the Wolf Foundation, and two ERC grant awards. She is currently the head of the Amirim program, the honors program for undergraduate students at the Hebrew University, and the co-founder of the Scholar-Teacher program for the advancement of science education in Jerusalem high schools.

Biological Physics of Self-Replication



The key process at the heart of biology is the process of self-replication. Self-replication can occur within 20 minutes in bacteria, within a day in our cells or be halted for thousands of years in spores. Our goal is to reach a deep understanding of the way physical, biochemical and evolutionary processes shape these time-scales.

We develop biophysical tools and approaches to study the statistics of self-replication in various systems, from bacteria to mammalian cells. Using this approach, we have uncovered the importance of the statistical properties of the self-replication process in single cells. First, it was shown that understanding the statistical properties of self-replication in bacteria has far reaching consequences for uncovering the reasons behind the failure of antibiotic treatments. Using specially conceived micro-fluidic devices, a sub-population of bacteria with very different statistical properties under antibiotic treatment was revealed and characterized, using quantitative measurements of the single bacteria metabolism. Furthermore, it was shown that a rapid evolutionary process is able to increase the number of recalcitrant bacteria, without developing resistance, by adapting the duration of the reduced metabolism to the duration of the antibiotic treatment. The results have consequences for the understanding of evolutionary processes in bacteria and for devising better treatment regimens in infections.

Extending this approach to the study of cancer cells has uncovered a different aspect of self-replication of single cells: instead of the prevalent view of biological systems as dominated by noise and therefore highly variable, it was shown that the apparent noisy variability was in fact directed by an underlying deterministic process that can be modeled using a non-linear map for describing coupled oscillators in physical systems. The results pave the way for further analysis of biological systems in the framework of non-linear discrete maps and deeper understanding of the general constraints imposed by the self-replication process.