

International conference honors pioneers in quantitative microbial physiology and ecology

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Microbial physiology is foundational to many exciting applications of modern microbial sciences including environmental remediation, synthetic biomanufacturing, and biomedicine, as well as to research and applications in microbial ecology. Studies in microbial physiology and ecology, which synergize from the power of quantitative measurements and theoretical analysis provided by a broad coalition of researchers with complementary expertise, established organizational principles of microbial systems that are unprecedented in the modern study of living systems, and serve as a model of how fundamental and applied research can be carried out in other fields of biology.

On 12–16 May 2025, the first Quantitative Microbial Physiology and Ecology (QMPE) Conference was held in Shenzhen, China. This event was hosted by the Shenzhen Institutes of Advanced Technology (SIAT), Chinese Academy of Sciences (CAS). It brought together leading scientists from 35 institutions across 10 countries, including China, France, India, Israel, Italy, Japan, the Netherlands, the United Kingdom, and the United States.

The conference featured four key topics central to microbial life: spatio-temporal coordination of chromosome replication, biomass growth, and cell division; coordination of physical processes underlying physiological integrity; adaptation of cells and communities

to changing environments; and ecology and evolution of interacting species.

Additionally, a special ceremony for the 2nd Charles E. Helmstetter Prize was held during the conference.

Charles E. Helmstetter, an Emeritus Professor at Florida Institute of Technology, is widely regarded as a pioneer who established the experimental and theoretical foundations of the bacterial cell cycle. His seminal work in the 1960s strongly shaped the development of research in bacterial cell physiology. The Charles E. Helmstetter Prize award was established in 2022 through the efforts of Vic Norris (University of Rouen, France), Arie Zaitzky (Ben-Gurion University of the Negev, Israel), and other specialists in the field. It aims to recognize and celebrate groundbreaking research that furthers our knowledge of the microbial physiology (<https://helmstetterprize.com/>).

During the prize ceremony, Arie Zaitzky said that this award stands as a lasting tribute to Helmstetter's revolutionary contributions to the study of the bacterial cell cycle; and Vic Norris shared that one of the Prize's values is to help foster the field, which has become increasingly interdisciplinary.

The Prize Committee largely overlaps with the QMPE organizing committee, including: Ariel Amir (Weizmann Institute of Science),

Johan Elf (Uppsala University), Marco Cosentino Lagomarsino (IFOM), Chenli Liu (SIAT, CAS), Wenying Shou (University College London), Jade Wang (University of Wisconsin-Madison), Jie Xiao (Johns Hopkins University), with Liu serving as chair of the Prize Committee.

This year's Helmstetter Prize honors two leading scientists for their groundbreaking contributions to the field of microbial physiology. The Lifetime Achievement Award goes to Nancy Kleckner (Harvard University, US) for her contribution in *E. coli* cell cycle, chromosome structure, and dynamics. The Innovation Breakthrough Award goes to Nathalie Balaban (Hebrew University of Jerusalem, Israel) for her contribution to understanding bacterial antibiotic persistence.

"The two awardees have advanced microbial physiology through interdisciplinary innovation, embodying Prof. Helmstetter's vision that 'fundamental research drives major breakthroughs.' The award not only recognizes outstanding scientific achievements but also honors and continues the legacy of pioneering scientists in the field," said Liu.

Nancy Kleckner is a member of the US National Academy of Sciences and is renowned for her pioneering research on dynamic chromosomal processes in *E. coli* and eukaryotic cells. She discovered SeqA, a protein crucial in DNA replication initiation, significantly

advancing the field of bacterial cell cycle research and broadening our understanding of chromosomal behavior across various organisms.

Nathalie Balaban is a renowned biophysicist and systems biologist. Using innovative biophysical approaches, she has uncovered bacterial response mechanisms under antibiotic stress, providing new insights into the dynamics of stress adaptation and offering potential strategies to address the global challenge of antimicrobial resistance.

During the conference, scientific presentations addressed foundational topics from cellular architecture and chromosome dynamics to metabolic and division mechanisms, extending to their influence on population-level physiology and community behavior. In addition, scholars showcased advances ranging from classical transcriptomics and proteomics to novel applications of single-cell imaging and microfluidic chip technologies. Furthermore, experts also discussed the translation of fundamental discoveries into applications for precision medicine and environmental bioremediation.

The first QMPE conference provided a unique and intimate platform for researchers in the fields of microbial physiology and ecology to exchange insights, foster collaborations, and explore future research directions. The 2nd QMPE will be held in 2027, with the aim of continuously strengthening the microbial physiology community.

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