



Workshop on Signatures of Nonequilibrium Fluctuations in Life (smr 3835) ICTP, Trieste, Italy 15-19 May 2023

<https://indico.ictp.it/event/10169/>

Outcome of the workshop

Our Ref: 3835

6 June 2023

A. Brief description of the event and the science covered

The event brought together a diverse group of scientists from around the world to think about the role energy and fluctuations play in the functioning of life. Talks from Biologists, Physicists, and Mathematicians synthesized current thinking on the topic bringing their own points of view from their disciplines and pointed to potential future problems of interdisciplinary collaboration.

The aim was to create common language and personal connections between the two communities, since we believe that the overlap between the fields contains many important open questions. The program was composed from many excellent speakers who tried to present their research in a way that is accessible to researchers from the other field. From the biological side topics presented includes the dynamics of hair cell bundles, many aspects related to molecular motors, as well as the dynamics of cell division. Nonequilibrium topics included models of learning and adaptation, aspects of nonequilibrium fluctuations, as well as discussion of thermodynamical inference from observed data.

Special attention was dedicated to discussion sessions which gave priority to questions from students coming from developing countries. Many of them got their first exposure to world experts in frontier topics in biophysics and nonequilibrium physics.

In addition, experimentalists working on diverse aspects of quantitative cell biology shared their research and the touched upon ability of these questions to be tackled theoretically. The topics discussed included mitotic spindle assembly and kinetochore capture (Iva Tolic), bacterial DNA damage repair mechanisms (Anjana Badrinarayanan), and transport of cargo within neuronal axons (Sandhya Koushika).

B. Impact of the meeting

The meeting helped foster an international community of scientists thinking deeply about how tools from nonequilibrium physics can help us understand the functioning of life, and how experiments in Biology can lead to new physical insights.

The meeting is a first attempt at fostering cooperation between two different research fields. We believe that this has been a success. Researchers from the two fields were interested in learning about current research performed in the other field, and how it may connect to their own work.

Participants, both speakers and attendees, highly benefitted from the complementary nature of experimentalists and theorists sharing their research on non-equilibrium fluctuations in life. Several potential collaborations have been set up as a result of this meeting.

C. Potential research collaborations

Many of the talks were followed by lively discussions. We organised two poster sessions (2h each) where students and young researchers exchanged ideas for future collaborations. Some areas of potential collaborations (e.g. inference of motor step size) were identified. However, fostering true collaborations between researchers from the two communities will require more than one meeting of this type. The success of this workshop is motivating us to organise follow-up meetings in the future.