# Frontiers in ion channels and nanopores: theory, experiments and simulation

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**Ion channels** are fundamental biological devices that act as gates in order to ensure selective ion transport across cellular membranes; their operation constitutes the molecular mechanism through which basic biological functions, such as nerve signal transmission and muscle contraction, are carried out.

Nowadays **biological nanopores** can be inserted in lipid bilayers and reproducibly prepared allowing several applications in nanobiotechnology such as single molecule detection and manipulation. The power of these tools is exemplified by the ultra-fast DNA sequencing technique based on the alpha-hemolysine channel. Ion channels are, however, extremely sensitive to the external environment and once they are extracted from their biological setting, they tend to lose their unique properties. This has prompted massive research efforts in order to produce **synthetic nanopores** in solid-state materials; these artificial nanopores, however, still do not fully replicate the properties of ion channels. Indeed, a number of stimulating challenges are ahead, such as combining the exquisite selectivity of **biological pores** with the robustness of synthetic ones.

From a more general perspective the study of biological ion channels enshrines the possibility to identify the design principles for biomimetic nanopores, and as such it is of great interest not only for the biophysical, but also for the nanotech community.

This workshop brings together **leading and emerging scientists** in the field of ion channels and nanopores covering theoretical advances, state-of-the-art simulation approaches, and frontline experimental techniques. The speakers are selected among renowned experimentalists, theoreticians, simulators and technologists. The informal atmosphere is intended to promote the interaction of young researchers with leading scientists.

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