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Broken Symmetries, Hydrodynamics and Rare Fluctuations

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Message from the Guest Editors

Dear Colleagues,

Unravelling the role of fluctuations is a major problem in statistical mechanics, mainly in nonequilibrium states. Indeed, fluctuations encode relevant information and become large and prominent when the system is “small”. Here, small means that the number of degrees of freedom is large, but much smaller than Avogadro’s, as is the case in granular systems or many biological systems. In fact, thanks to the development of new high-resolution experimental techniques, the study of fluctuations in microscopic biological systems constitutes a main research field in this direction.

In addition, understanding the emergent macroscopic behavior of nonequilibrium systems (i.e., the hydrodynamic or thermodynamic description) from the underlying microscopic dynamics is a topical subject both in classical and quantum systems. In this regard, unveiling critical phenomena in the fluctuations of many-body driven systems, such as dynamical phase transitions (DPTs) accompanied by spontaneous symmetry breaking, is one of the current challenges in theoretical physics.

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Message from the Editor-in-Chief

Symmetry is ultimately the most important concept in natural sciences. It is not surprising then that very basic and fundamental research achievements are related to symmetry. For instance, the Nobel Prize in Physics 1979 (Glashow, Salam, Weinberg) was received for a unified symmetry description of electromagnetic and weak interactions, while the Nobel Prize in Physics 2008 (Nambu, Kobayashi, Maskawa) was received for the discovery of the mechanism of spontaneous breaking of symmetry, including CP symmetry. Our journal is named *Symmetry* and it manifests its fundamental role in nature.

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