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Transport and Diffusion in Quantum Complex Systems

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Message from the Guest Editors

Our understanding of the transport of energy, mass, charge, or information in complex quantum systems plays a key role from both a fundamental and technological point of view. As such, it is triggering a large amount of theoretical and experimental research that aims to understand and exploit quantum coherent phenomena for the development of quantum devices that may outperform their classical counterparts.

Quantum interference is the origin of a number of peculiar effects, such as ballistic transport along lattices and resonant tunneling. On the other hand, the presence of unavoidable interactions with the surrounding environment typically leads to a loss of coherence and to the emergence of a diffusive behavior, closer to the classical scenario, that, in some cases, enhances the transport efficiency. The control of such phenomena, together with our understanding of the transition from microscopic to macroscopic or from single-particle to few- or many-particle systems, is of utmost importance for the successful build-out of quantum technologies, and constitutes the focus of this Special Issue.



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Special Issue



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Message from the Editor-in-Chief

The concept of entropy is traditionally a quantity in physics that has to do with temperature. However, it is now clear that entropy is deeply related to information theory and the process of inference. As such, entropic techniques have found broad application in the sciences.

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