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Thermodynamics for Finite-Size and Time-Dependent Behavior: Small Systems, Fluctuations, Correlations, and Internal Heterogeneity

Guest Editor:

Prof. Dr. Ralph V. Chamberlin
Department of Physics, Arizona State University, Tempe, AZ, USA

Deadline for manuscript submissions:
closed (15 November 2022)

Message from the Guest Editor

Dear Colleagues,

Standard thermodynamics was originally developed to describe the thermal properties of large systems with slow cycles, such as steam engines and power plants. Recently, progress has been made to extend the laws of thermodynamics to small systems and short times, thereby allowing theoretical studies to include conservation of energy and maximum entropy for fast fluctuations on length scales of nanometers. Here we seek to bring together various views on how best to adapt standard thermodynamics to accurately describe finite-size and time-dependent behavior. A crucial consideration is how nanoscale effects that arise in thermodynamics may influence standard statistical mechanics. Applications include the study of complex biological molecules, living systems, nanofabricated devices, and symmetry in nanostructured materials. Fundamental interest comes from thermal heterogeneity and statistical symmetry that occur inside bulk systems. Additional interest comes from studying temporal asymmetry in non-equilibrium thermodynamics.

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Special Issue

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Editor-in-Chief

Prof. Dr. Sergei D. Odintsov
1. Institució Catalana de Recerca i Estudis Avançats (ICREA), Passeig Luis Companys, 23, 08010 Barcelona, Spain
2. Institute of Space Sciences (ICE-CSIC), C. Can Magrans s/n, 08193 Barcelona, Spain

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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Symmetry Editorial Office
MDPI, St. Alban-Anlage 66
4052 Basel, Switzerland

Tel: +41 61 683 77 34
www.mdpi.com

mdpi.com/journal/symmetry
symmetry@mdpi.com
𝕏@Symmetry_MDPI