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Thermodynamics and Entropy for Self-Assembly and Self-Organization

Guest Editor:

Prof. Dr. Jordi Faraudo
Materials Simulation and Theory Department Institut de Ciència de Materials de Barcelona (ICMAB-CSIC) Campus de la UAB, E-08193 Bellaterra, Spain

Deadline for manuscript submissions:
closed (15 September 2021)

Message from the Guest Editor

During the XXI century, the concepts of self-assembly and self-organization have flooded all branches of natural sciences, from biology to nanotechnology. Self-assembly consists in the emergence of order in a thermodynamic equilibrium state starting from a disordered state. Self-assembly is widely found in nature and it is of practical interest for an easy and reproducible bottom-up fabrication of materials from nanoscopic building blocks (molecules or nanoparticles). The self-assembly process requires the presence of noise (i.e., a thermal bath) and thus entropy plays an essential role. Self-organization is the formation of complex patterns and structures from a disordered state, which requires a nonequilibrium state (for example, a continuous supply of energy). Both processes are of key interest in science, but their quantitative prediction is still a challenge. Thermodynamics in general and its central concept of entropy, in particular, emerge as key actors to quantitatively understand self-assembly and self-organization. I, therefore, solicit contributions to this Special Issue emphasizing fundamental aspects of self-assembly and self-organization.

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Editor-in-Chief

Prof. Dr. Kevin H. Knuth
Department of Physics, University at Albany, 1400 Washington Avenue, Albany, NY 12222, USA

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

Tel: +41 61 683 77 34
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