Preface

The physics of self-organization, originally proposed by Erwin Schrödinger 70 years ago for the case of the living cell, covers a broad spectrum of complex nonlinear phenomena, ranging from self-assembly under conditions near thermodynamical equilibrium to dissipative structure formation far from equilibrium. Their mutual interplay can give rise to increasing degrees of hierarchical order. Both, concepts and methods of the above research area have been efficiently applied to a huge variety of scientific disciplines (for example, physics, chemistry, biology, biomedicine), since universal features emerge from theory and experiments that are characteristic for self-organized spatio-temporal patterns as well as the underlying elementary mechanisms.

In the present volume, we look at the crucial role of spatial and temporal order during employment of principles developed on macroscopic and mesoscopic scales to structure formation occurring on nanoscales, which occupies the focus of interest in the frontiers of science. In case of mesoscopically ordered soft matter, exhibiting intriguing novel properties as compared to the single building blocks, often called bottom-up approach for nanolithography, particular emphasis will be put to distinguish between ordering processes under nonequilibrium conditions and those arising under situations close to equilibrium. Prototypical examples of such a material class are discussed to some extent, taking into account both fundamental and application relevant aspects. We point out analogies and characterize differences, hence, efforts made to disclose common features in the mechanistic description of these phenomena. This may slightly narrow the large gap between nature and the present status of omnipresent nanotechnology.

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Principles and Prototypical Examples of Recent Advances

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