

# Preface

A concise definition of *complexity* might be: “The whole is more than the sum of its constituents”. Usually, chemistry is concerned with the interactions between individual atoms or molecules, and such interactions can lead to the formation of condensed matter with a high degree of the “dead” order at equilibrium. But the experience tells us that, in biological systems, quite different other processes of order formation may take place, prompting in the beginning of the twentieth century even to ask whether new physical laws had to be found in order to explain such “living” order. Since the lectures on “What is Life?” held by E. Schrödinger in 1943, one knows that this is not needed and that self-organization phenomena can also be observed in rather simple inorganic systems with only small reacting molecules if these systems are out of thermal equilibrium.

Our book intends to provide an outline of underlying theoretical concepts and their experimental verification, as they emerged in the middle of the twentieth century and evolved afterwards. In its style, the book can be regarded as a series of essays on selected topics. Their choice is determined by personal preferences of the authors and reflects their research interests. We do not aim to present a systematic introduction and to review the entire discipline. Particularly, the list of literature references is far from being complete. Since our focus is on the concepts, not methods, mathematical aspects are moreover only briefly touched.

Today, the field is in the state of intense research and much attention is paid to it, as evidenced, for instance, by the Nobel Prize in Chemistry of 2016 for studies of molecular machines. Some of the topics are rapidly developing and are vividly discussed. Nonetheless, we tried not to be biased towards them. In our opinion, it became important to look back and to analyze what has been done since E. Schrödinger has posed his question, and whether we already have an ultimate answer to it.

While finishing the book, we want to emphasize how much we owe to discussions and collaborations with our colleagues, and we would like to express our deep gratitude to all of them. The series of conferences on “Engineering of Chemical Complexity”, organized by the Berlin Center for Studies of Complex Chemical Systems, has contributed much to the present work.

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