

Preface

This book is the fifth volume of the Springer Series “Advances in Atom and Single Molecule Machines”. It compiles a selection of contributions presented during the international symposium “Single Molecular Machines and Motors” organized at CEMES-CNRS in Toulouse (France) during 19–20 June 2013. It was the first symposium of the kind, involving a large number of laboratories from academics to high-tech companies from all around the world working on that particularly original aspect of single molecular machines and motors.

The fields of molecular machines are currently very active because of their long-term potential. The expected advantages of these bottom-up approaches are now well known: ultimate size, possibility to design finely-tuned molecular devices and their low energy consumption. In the constant quest for the miniaturization of machines and functional molecular devices, single molecules are expected to play a major role since multistep chemical synthesis allows chemists to prepare tailor-made compounds with predetermined shape, movement or functions. This has stimulated the design and synthesis of a variety of compounds that resemble macroscopic machinery. However, the ultimate miniaturization of mechanical devices is reached only when addressing one single molecule and not a population of molecules in solution or on a surface. Artificial nanomachines have emerged as a new multidisciplinary field combining analytical techniques such as near-field microscopy, which allows to image a single molecule with intramolecular contrast, to study its motions and to manipulate it, but also multistep organic synthesis and theoretical chemistry to name a few. The molecule-surface symbiosis enables us to study how to guide and trigger complex molecular motions.

This symposium brought together researchers working on different strategies to synthesize and study single molecules displaying original mechanical properties at the nanometre and at the atomic scale. The main goal was to gather scientists from different communities (physics, chemistry and theory) in order to steer discussions and gather the main challenges using different techniques and approaches involved in the most recent developments in all aspects of this field but also to foster young Ph.D. and post-docs researchers towards this multidisciplinary approach.

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