

ICTP Colloquium on Molecular Motors and Switches at Surfaces

Petra Rudolf was born in Munich, Germany. She studied Physics at the La Sapienza, University of Rome, where she specialized in Solid State Physics. In 1987 she joined the National Surface Science laboratory TASC INFN in Trieste for the following five years, interrupted by two extended periods in 1989 and 1990/1991 at Bell Labs in the USA, where she started to work on the newly discovered fullerenes. In 1993 she moved to the University of Namur, Belgium where she received her PhD in 1995 and then quickly moved from postdoctoral researcher to lecturer and senior lecturer before taking up the Chair in Experimental Solid State Physics at the University in Groningen in 2003. Her principal research interests lie in the areas of condensed matter physics and surface science, particularly molecular motors, 2D solids, organic thin films and inorganic-organic hybrids. Dr. Rudolf is the President of the European Physical Society; she was the President of the Belgian Physical Society in 2000/2001 and was elected member of the German Academy of Science and Engineering, honorary member of the Italian Physical Society, Fellow of the Institute of Physics, "Lid van verdienst" of the Dutch Physical Society and Fellow of the American Physical Society. For her work on molecular motors she received the 2007 Descartes Prize of the European Commission. In 2013 she was appointed Officer of the Order of Orange Nassau by H.M. Queen Beatrix of the Netherlands.

Abstract: Nano-engines and molecular motors form the basis of nearly every important biological process. In contrast to this solution chosen by Nature for achieving complex tasks, all of mankind's present day technologies function exclusively through their static or equilibrium properties. One can therefore easily anticipate that the controlled movement of molecules or parts of molecules offers unprecedented technological possibilities for the future. In this presentation I shall illustrate how introducing new concepts like incorporating a ratchet mechanism, allows for the creation of molecular engines that transcend simple switches. I shall discuss how to build molecular engines that allow movements at the molecular level to be coupled to the macroscopic world, e.g., to transport macroscopic objects like drops of liquid over a surface. Another example are molecular systems that can be triggered to form spontaneously functional structures with a well-defined position on surfaces. I shall discuss molecular switches, which can be addressed with light and charge transfer and show that such systems can be employed for "read and write" functions.

The talk will be livestreamed from the ICTP website. Light refreshments will follow the event. The event is open to all those interested.