Jean-Pierre SAUVAGE

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Biographie

Jean-Pierre Sauvage conducted his research at the CNRS from 1971 till 2014 at the University of Strasbourg, where is now Professeur Emérite. He defended his thesis in 1971, supervised by Jean-Marie Lehn, himself Nobel Prize in Chemistry in 1987. Joining the CNRS in 1971, he made his postdoc in Oxford from 1973 till 1974, became Directeur de Recherche in 1979, obtaining the silver medal of CNRS in 1988. Jean-Pierre Sauvage works in the Institut de Science et d'Ingénierie Supramoléculaires in Strasbourg.

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COLLÈGE DE FRANCE 1530

Mercredi 7 juin 2017 à 11 heures

Amphithéâtre Marguerite de Navarre

DE LA TOPOLOGIE CHIMIQUE AUX MACHINES MOLÉCULAIRES / FROM CHEMICAL TOPOLOGY TO MOLECULAR MACHINES

Abstract

The area named "Chemical Topology" is mostly concerned with molecules whose molecular graph is non planar, i.e. which can not be represented in a plane without crossing points. The most important family of such compounds is that of catenanes. The simplest catenane, a [2] catenane, consists of two interlocking rings. Rotaxanes consist of rings threaded by acyclic fragments (axes). The simplest rotaxane, a [2]rotaxane, contains two non-covalently connected components : a ring and an axis, the axis being end-functionalised by bulky groups preventing unthreading of the non cyclic fragment from the cycle. Interlocking ring compounds have attracted much interest in the molecular sciences, first as pure synthetic challenges and, more recently, as components of functional materials. In recent years, spectacular progress has been made. Highly functional and complex systems have been reported by several research teams, demonstrating the power of modern synthetic tools based on "template effects".

Separately, the field of artificial molecular machines has experienced a spectacular development, in relation to molecular devices at the nanometric level or mimics of biological motors. In biology, motor proteins are of the utmost importance in a large variety of processes essential to life (ATPase, a rotary motor, or the myosin-actin complex of striated muscles behaving as a linear motor responsible for contraction or elongation). A few recent examples are based on simple or more complex rotaxanes or catenanes molecular machines. Particularly significant examples include "molecular shuttles" as well as multi-rotaxanes reminiscent of muscles or able to act as switchable receptors. The molecules are set in motion using electrochemical, photonic or chemical signals. Examples will be given which cover the various approaches used for triggering the molecular motions implied in various synthetic molecular machine prototypes. Finally, potential applications of molecular machines will be discussed.

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