

FRANCE – HONG KONG
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LECTURE SERIES

*A series of high-profile lectures
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Date: 11 April 2018 (Wednesday)

Time: 4:30 pm

Venue: Connie Fan Multi-media
Conference Room
4/F, Cheng Yick-chi Building
City University of Hong Kong

Enquiries: Miss Mandy Chan
Tel: 3442 4666
Fax: 3442 0322
Email: vprrdl@cityu.edu.hk

Molecular Machines in Biology and in Chemistry

by
Professor Jean-Pierre Sauvage

*Professor at the University of Strasbourg
Member of the French Academy of Sciences
Member of the European Academy of Sciences
Nobel Prize in Chemistry (2016)*



Abstract:

This lecture will provide an historical perspective of the field known as "chemical topology". The link between catenanes or rotaxanes and molecular machines will also be stressed.

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). These compounds have always been associated to catenanes although, strictly speaking, their molecular graphs are planar. 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. The synthesis of such compounds relies on templates (transition metals or organic assemblies). 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". Promising materials have also been elaborated which contain interlocking ring compounds. A few examples will be discussed.

Separately, the research 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 acting as switchable systems or molecular machines. Particularly significant examples include "molecular shuttles" as well as multi-rotaxanes reminiscent of muscles or able to act as molecular compressors or 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.



Online registration:
<http://www.cityu.edu.hk/vprt/france-hk/enroll.htm>

All are Welcome