ICFO Colloquium NIEK VAN HULST 'Discussion and Implications on the 2016 Nobel Prize in Chemistry'

NIEK VAN HULST

November 17, 2016

Thursday, November 17, 12:00, 2016 ICFO Auditorium

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ICFO-The Institute of Photonic Sciences

$$ICREA Prof at ICFO Niek van Hulst leads a research program at ICFO on Molecular Nanophotonics. He has led a Korber Foundation project directly connected to the 2016 Nobel Prizetopic in collaboration with one of the 2016 Nobel Laureates, Bernard L. Feringa.
The 2016 Nobel Prize in Chemistry has been awarded to Jean-Pierre Sauvage, Sir James Fraser Stoddart and Bernard L. Feringa "for the design and synthesis of molecular machines".

In his visionary 1959 talk Richard Feynman drew the attention to the possibility of building small machines from atoms, and to the challenge of, for example, making an infinitesimal

machine like an automobile. He discussed miniature ratchet and pawl devices, which inspired current design of molecular machinery. In the 70-80s Sauvage pioneered supramolecular chemistry, involving coordination chemistry and topological chemistry, to synthesize interlocked and reversible molecular shapes, enabling the first primitive molecular machinery. Stoddard realized the first molecular shuttle, able to move between the two molecular positions along an axis, culminating in the molecular elevator. In 1999 Feringa presented the first unidirectional rotation, controlled by light, followed by an electrically driven 4-wheeled molecular nanocar in 2011. Several groups are now competing on nanocar designs and the first "nanocar race" is planned for December 2016.

The developments, since the 80-90s, of STM and AFM have encouraged the visualization of molecules on surfaces and are used in the steering of the molecular machines. In parallel the optical single molecule detection has revealed a plethora of biological motors (kinesin, myosin, F1, etc.) all operating, often directive, performing complex tasks, in seemingly disordered environment at room temperature. The various biomolecular motor designs are inspiring current synthetic alternatives.

Sauvage, Stoddart and Feringa have been largely driven by academic challenges and curiosity to develop synthetic molecular machines. Now scientists are dreaming on molecular robotics with truly programmable machines, acting as nanosurgery molecular robots, switchable molecular drugs, etc. Future will tell.

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