Russell Berrie Nanotechnology Institute
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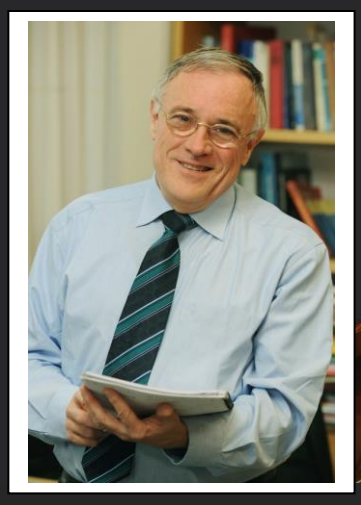

Prof. Dr. Klaus Müllen

Max Planck Institute for Polymer Research, Mainz, Germany

"A Polymer Chemistry of Graphenes and Graphene Nanoribbons"

Monday,
11th June, 2018

11:00 lecture
12:00 refreshments

Wang Auditorium
The Dalia Maydan Building
Faculty of Materials Science & Eng.

RBNI Monthly Seminar Series 2018

TECHNION
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Abstract:

Graphenes and graphene nanoribbons (GNRs), their geometrical cut-outs, are new additions to the carbon family which are widely praised as multifunctional wonder materials. Indeed, graphenes hold enormous promise for energy technologies. GNRs are regarded as a new generation of semiconductors superior to i) silicon in view of the required miniaturization of printed circuits and also to ii) classical conjugated polymers due to better band structure control. Above all, graphene as a two-dimensional polymer, their molecularly defined nanographenes and GNRs are true challenges for materials synthesis. Our “top-down” protocol toward graphenes uses electrochemical exfoliation. In our “bottom-up” synthesis of GNRs, repetitive Diels-Alder cycloaddition in solution is shown to afford branched polyphenylene polymers which serve as precursors for perfectly “graphitized”, solution-processable GNRs as long as 600 nm. An alternative on-surface synthesis utilizes immobilization of suitable monomers and in-situ STM-control of the polymerization to ensure structural perfection. It is thus a synthetic breakthrough which leads to new materials science and physics such as single-molecule field effect transistors from GNRs and even spintronics. Graphenes are thus made from twisted 3D-polyphenylene precursors which can also come as structurally perfect, shape-persistent dendrimers. Equipping their surfaces with polar and unipolar functions in a “patched” fashion renders them, both, water and alcohol soluble. This affords drug delivery vehicles passing the blood-brain barrier and dendrimer-virus assemblies allowing DNA transfection.