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Genomics and epigenetics with 2D material nano-electronics

In this talk, I will review some basic properties of cell biology, and present a scenario that integrates biology with MOS nano-electronics for genomics and bio-medical applications. This scenario involves probing the electrical activity of biomolecules passing through a nanopore, in a semiconductor membrane. Among solid-state porous membranes the use of the single-atom thickness of graphene or novel 2D materials like MoS₂, are ideally suited for DNA, RNA or proteins sensing as they can scan molecules passing through a nanopore at high resolution. Additionally, unlike most biological membranes, these new materials are electrically active, which can be exploited to manipulate in addition to sense biomolecules. We will describe a membrane designed as a quantum point contact FET as a viable device for electronically and optically sensing bio-molecules for applications in genomics and cancer detection.

Biography

Jean Pierre Leburton has joined the University of Illinois in 1981 from Germany, where he has worked as a Research Scientist with the Siemens A G Research Laboratory in Munich. In 1992, he held the Hitachi LTD Chair on Quantum Materials at the University of Tokyo, and was a Visiting Professor in the Federal Polytechnic Institute in Lausanne, Switzerland in 2000. He is involved with research in nanostructures modeling and in quantum device simulation. His present research interest encompasses non-linear transport in quantum wires and carbon nanotubes, and molecular and bio-nanoelectronics. He is the author and co-author of more than 300 technical papers in international journals and books, and served in numerous conferences committees.

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