

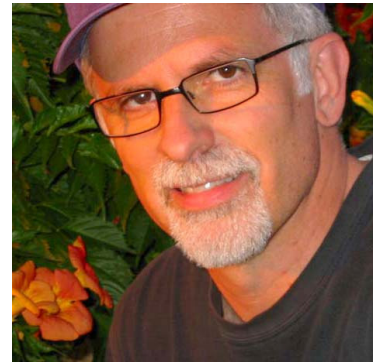


***Les Séminaires de la Fondation
“Nanosciences aux limites de la Nanoélectronique”***

**Jeudi 26 mars 2009
à 16 h00**

Michael ROUKES

Co-Director, Kavli Nanoscience Institute
Professor of Physics, Applied Physics, and Bioengineering
California Institute of Technology
Chair of Excellence of the Foundation Nanosciences



présentera un séminaire intitulé :

**Complexity and Nanosystems:
From "Craft" – to Technology – to New Frontiers**

Vous êtes tous cordialement invités au pot qui suivra la présentation.

Amphithéâtre 15 de l'école PHELMA
(anciennement ENSERG)
23 rue des Martyrs – 38000 Grenoble

Complexity and Nanosystems: From "Craft" – to Technology – to New Frontiers

Transitioning nanoscale devices from the realm of one-of-a-kind feats into robust and reproducible nanosystems is a monumental challenge that transcends the capabilities of any one lab. Some of the first steps have now been taken towards this end, and such efforts are critical for realizing the promise of "active" nanotechnology (powered systems). Amongst the most important potential applications of active nanosystems are realizing advanced tools for complex medical and biological research.

At least two essential elements must be in place to realize the vast applications potential that awaits. First, an unfamiliar fusion of technologies is required; one that melds techniques from traditionally-separate disciplines with an appropriate scale of approach. Second, robust methods for biological large-scale-integration are required, and these must engender routes to production *en masse*.

The kind of disciplined assemblage of disparate technologies required is, perhaps, more familiar within the commercial sector than academia. But it is now essential, whether for pursuing fundamental research in medicine and the life sciences or, subsequently, for the development of future biomedical technology.

To illustrate the emerging potential of nanosystems I will describe advances in nanoscale mechanical devices that now allow us to envisage unprecedented measurements at the level of single cells and molecules. Three examples among such opportunities are mapping the forces generated by living cells in real time, ultimately with piconewton-scale, single-molecule resolution; performing mass spectrometry on *all* of the proteins within an individual cell; and monitoring the metabolic processes of individual cells in real time.

To illustrate progress toward the vision of active nanosystems, I will describe ongoing work within the Alliance for Nanosystems VLSI, which started as a close partnership between Caltech's Kavli Nanoscience Institute in Pasadena and CEA/LETI-MINATEC in Grenoble – but is now increasing to become a truly global network.

Biography

MICHAEL LEE ROUKES is Professor of Physics, Applied Physics, and Bioengineering at the California Institute of Technology in Pasadena, CA. Roukes was founding Director of Caltech's Kavli Nanoscience Institute from 2003-2006, and now serves as its Co-Director, along with his long-time collaborator and friend, Professor Axel Scherer . Roukes also is the co-founder and co-director of the *Alliance for Nanosystems VLSI* (very-large-scale integration), a close and vital international collaboration led by Caltech's KNI and scientists & engineers at the CEA/LETI-Minatec in Grenoble (www.nanovlsi.org). Concurrently, he holds a Chaire d'Excellence in Nanoscience in Grenoble, France from the *Réseau Thématique de Recherche Avancée* (RTRA).

Roukes completed undergraduate majors in both physics and chemistry at the University of California Santa Cruz. Thereafter he earned a Ph.D. in physics at Cornell University, focusing upon electron transport in microstructures at ultralow temperatures under Nobel Laureate, Robert. C. Richardson. Subsequently, he joined Bell Communications Research as a Member of Technical Staff / Principal Investigator in the (then-new) Quantum Structures Research Group, where he carried out some of the earliest explorations of the physics of nanoelectronic devices. In 1992 he joined the tenured faculty at the California Institute of Technology, where he has since built nanofabrication and research facilities and established a large nanoscience research group, now heavily involved in cross-disciplinary collaborations.

Roukes' scientific interests range from quantum measurement to applied biotechnology – with a unifying theme of the development, application, and very-large-scale integration of complex nanostructures. He has published and written extensively on nanoscience and nanotechnology, has lectured at most major research centers world-wide, and is active on many national and international committees promoting this field.

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