

# Nano-Electro-Mechanical Devices for Integrated Sensing and Switching

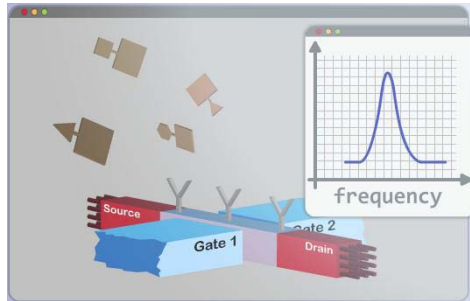
Satellite workshop to ESSDERC/ESSCIRC 2010

Date: September 17<sup>th</sup>, 2010.

<http://www.nemsic.org/>

## Technical program co-chairs:

D. Tsamados & A.M. Ionescu,  
Fédérale de Lausanne,  
H. Mizuta, University of



Ecole Polytechnique  
Switzerland  
Southampton, UK.

## Administrative contacts and organization:

Karin Jaymes & Isabelle Buzzi, Ecole polytechnique Fédérale de Lausanne  
[karin.jaymes@epfl.ch](mailto:karin.jaymes@epfl.ch), [isabelle.buzzi@epfl.ch](mailto:isabelle.buzzi@epfl.ch)

## Abstract:

This Workshop is supported by the NEMSIC FP7 STREP funded by the European Commission, see:

<http://www.nemsic.org/>

To detect a carcinogen, a pharmaceutically active compound or toxic gases in the environment within seconds thanks to a handheld device on an electronic chip: such a revolution that may be made possible through the integration of so-called NEMS, miniaturized electromechanical structures in which at least one dimension is of nanometre scale.

The devices targeted in the framework of the FP7 STREP project NEMSIC at the heart of the "intelligent sensor system" are suspended nanowires excited to vibrate at their resonance frequencies. The wire is chemically or biologically functionalized to make it selective for target molecules like carcinogens. Binding of target molecules leads to an increase in the mass of the wire which in turn will change its resonance frequency and vibrate at a lower frequency (think of a violin: the thicker the string the lower the tone).

The workshop will include state-of-the-art progress reports on NEMS devices and applications, with invited keynotes from USA and Japan and the detailed technical reports on the status of NEMSIC research.

## Programme

**8.45 – 9.00:** A.M. Ionescu, Ecole Polytechnique Fédérale de Lausanne, Switzerland

*“Opening and short overview of NEMSIC project”*

**9.00 – 9.30: Keynote 1:** S. Bhave, Cornell University, USA

*“Hybrid NEMS Resonators”*

**9.30 – 10.00:** Y. Tsuchiya<sup>1</sup>, F. Arab Hassani<sup>1</sup>, M. A. Ghiass<sup>1</sup>, Z. Mektadir<sup>1</sup>, H. Mizuta<sup>1</sup> Silvia Armini<sup>2</sup>, M. Carli<sup>2</sup>, A. Maestre Caro<sup>2</sup>, V. Cherman<sup>2</sup> <sup>1</sup>University of Southampton, UK <sup>2</sup>IMEC, Belgium

*“Suspended silicon nanowire sensing based on conductance and mass detection”*

**10.00 – 10.30:** Coffee Break

**10.30 – 11.00:** E. Ollier, CEA-LETI, France

*“Towards integration of Nanowires with FDSOI transistors: from design to technology”*

**11.00 – 11.30:** D. Grogg, S. Bartch, D. Tsamados, A.M. Ionescu  
Ecole Polytechnique Fédérale de Lausanne, Switzerland

*“Resonant body FinFETs”*

**11.30 – 12.00:** V. Petrescu, IMEC. The Netherlands

*“Circuit design for NEMS/MEMS resonator gas sensors”*

**12.00 – 13.00:** Lunch

**13.00 – 13.30: Keynote 2:** Shunri Oda, Tokyo Institute of Technology, Japan.

*“NEMS Scaled silicon NEM hybrid devices”*

**13.30 – 13.50:** B. Serban and C. Cobianu

ACS Sensors & Wireless Laboratory Bucharest, Honeywell Romania SRL

*“Novel concepts for NO<sub>2</sub> detection by differential resonant nanosensing”*

**13.50 – 14.10:** D. Bertrand

Dpt of Neuroscience, Medical Faculty & HiQscreen, Switzerland

*“NEMS in biological applications”*

**14.10 – 14.30:** D. Tsamados

Ecole Polytechnique Fédérale de Lausanne, Switzerland.

*“Modeling and simulation tools for the development of nanoscale suspended-gate MOSFETs (NEMFET) and Vibrating-body FETs (VBFET) for bulk-Si and SOI technologies”*

**14.30-14.50:** Coffee break

**14.50 – 15.20: Keynote 3:** Dr. August. B. Smit

Dept. of Molecular & Cellular Neurobiology, Center for Neurogenomics & Cognitive Research, VU University Amsterdam, The Netherlands

*“Acetylcholine binding proteins: structural models of the extracellular domain of the nicotinic receptors”*

**15:20- 15.40** S. Armini<sup>1</sup>, M. Carli<sup>1, 2</sup>, V. Cherman<sup>1</sup>, A. Maestre Caro<sup>1, 3</sup>, J. Moonens<sup>1</sup>,  
P. Neutens<sup>1</sup>, J. Ogi<sup>4</sup>, S. Oda<sup>4</sup>, Y. Tsuchiyas<sup>5</sup>, H. Mizuta<sup>5</sup>

<sup>1</sup> IMEC, Kapeldreef 75, B-3001 Heverlee, Leuven, Belgium

<sup>2</sup> LaNN Laboratory for Nanofabrication of Nanodevices, Padova, 35127, Italy

<sup>3</sup> Katholieke Universiteit Leuven, Dept. Chemistry, B-3001 Heverlee, Belgium

<sup>4</sup> Tokyo Institute of Technology, Tokyo, Japan

<sup>5</sup> University of Southampton, SO17 1BJ, Southampton, United Kingdom

***“Nanoscale Silicon Nanowires Surface Functionalization and Characterization for Sensing Applications”***

**15.40 – 16.00:** M. Enachescu and S. Cotofana

Computer Engineering Laboratory, Faculty of Electrical Engineering, Mathematics  
and Computer Science, Delft University of Technology, the Netherlands.

***“Suspended Gate -Field Effect Transistor (SG-FET) Based Advanced Power Management in CMOS ICs”***

**16.00 – 16.20:** A. Magrez

Ecole Polytechnique Fédérale de Lausanne, Switzerland

***“New developments in carbon nanotubes synthesis for NEMs application”.***

**16.20 – 16.40:** D. Aquaviva

Ecole Polytechnique Fédérale de Lausanne, Switzerland

***“CNT NEM switches for RF applications”.***

**16.40: Closing**