Le vendredi 16 novembre à 14h,
Nano-Innov, Building 862, Amphi 34

Memory effects in nanoscale systems: fundamentals and applications

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Abstract

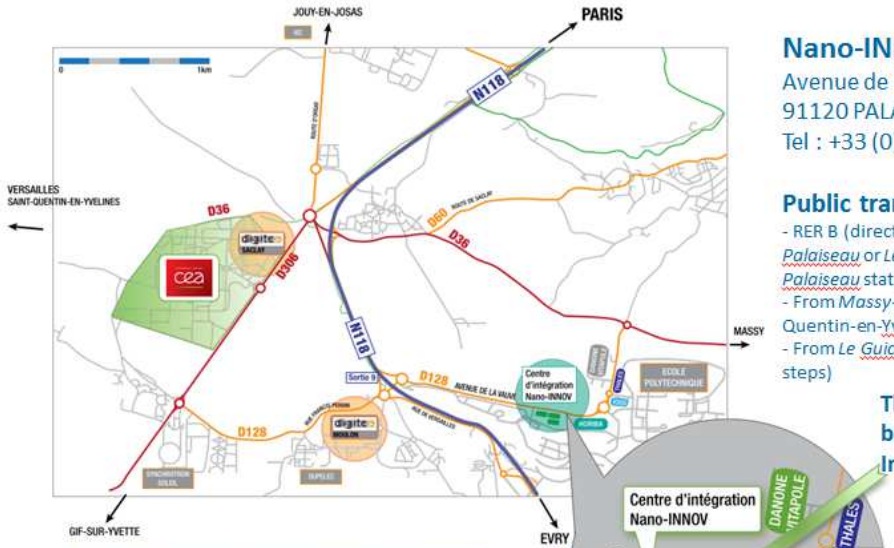
Memory emerges quite naturally in systems of nanoscale dimensions: the change of state of electrons and ions is not instantaneous if probed at specific time scales, and it generally depends on the past dynamics [1]. This means that the resistive, capacitive and/or inductive properties of these systems generally show interesting time-dependent (memory) features when subject to time-dependent perturbations. In other words, nanoscale systems behave as a combination of (or simply as) memristors, memcapacitors or meminductors, namely circuit elements whose resistance, capacitance and inductance, respectively, depends on the past states through which the system has evolved. After an introduction to the theory and properties of memristors, memcapacitors and meminductors, I will discuss several memory phenomena in nanostructures associated to charge, ion and spin dynamics and their far-reaching applications ranging from information storage to computation to biologically-inspired systems.

[1] Y.V. Pershin and M. Di Ventra, "Memory effects in complex materials and nanoscale systems", Adv. Phys. 60, 145 (2011).

Biography

Massimiliano Di Ventra obtained his undergraduate degree in Physics summa cum laude from the University of Trieste (Italy) in 1991 and did his PhD studies at the Ecole Polytechnique Federale de Lausanne (Switzerland) in 1993-1997. He has been Research Assistant Professor at Vanderbilt University and Visiting Scientist at IBM T.J. Watson Research Center before joining the Physics Department of Virginia Tech in 2000 as Assistant Professor. He was promoted to Associate Professor in 2003 and moved to the Physics Department of the University of California, San Diego, in 2004 where he was promoted to Full Professor in 2006. Di Ventra's expertise is in the theory of electronic and transport properties of nanoscale systems, and he has been invited to deliver more than 160 invited talks worldwide on these topics. He serves on the editorial board of several scientific journals and has won numerous awards and honors, including the NSF Early CAREER Award, the Ralph E. Powe Junior Faculty Enhancement Award, and fellowship in the Institute of Physics. He has published more than 140 papers in refereed journals (12 of these are listed as ISI Essential Science Indicators highly-cited papers of the period 2002-2012), co-edited the textbook "Introduction to Nanoscale Science and Technology" (Springer, 2004) for undergraduate students, and he is single author of the graduate-level textbook "Electrical Transport in Nanoscale Systems" (Cambridge University Press, 2008).

Nano-Innov access (GPS N 48°42,736' - E 02°11,708')



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- RER B (direction: Saint-Remy-les-Chevreuse) : *Massy-Palaiseau* or *Le Guichet* stations, RER C or TGV : *Massy-Palaiseau* station
- From *Massy-Palaiseau*, bus line 91.06 (Massy ←→ Saint-Quentin-en-Yvelines) *Thomson-Corbeville* stop.
- From *Le Guichet* : pedestrian itinerary ≈ 15 minutes (300 steps)

The amphitheater is located in N2 building,
In front of the reception desk.