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SEMINAR

«Nanodevices for Bio-inspired Computing»

Thursday 5 October 2017 – 11.00 am
Salle de séminaire CARNOY (seminar room)
Croix du Sud – Louvain-La-Neuve

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ABSTRACT

Dr. Julie GOLLIER, CNRS/Thales – Palaiseau (France).

In the last five years, Artificial Intelligence has made striking progress, and now defeating humans at subtle strategy games, such as Go, and even Poker. However, these algorithms are running on traditional processors which have a radically different architecture than the biological neural networks they are inspired from. This considerably slows them down and requires massive amounts of electrical power, more than ten thousand times what the brain typically need to function. This energy dissipation is not only becoming an environmental issue, but it also sets a limit to the size of neural networks that can be simulated. We are at a point where we need to rethink the way we compute, and build hardware chips directly inspired from the architecture of the brain. This is a challenge. Indeed, contrarily to current electronic systems, the brain is a huge parallel network closely entangling memory and processing.

In this talk, I will show that, for building the neuromorphic chips of the future, we will need to emulate functionalities of synapses and neurons at the nanoscale. I will review the recent developments of memristive nano-synapses and oscillating nano-neurons, the physical mechanisms at stake, and the challenges in terms of materials. Finally, I will present the first achievements of neuromorphic computing with novel nanodevices and the fascinating perspectives of this emerging field.

BIOGRAPHY

Julie Grollier received the Ph.D. degree from University Pierre et Marie Curie, Paris, France. Her Ph.D. thesis was dedicated to the study of a new effect in spintronics: the spin transfer torque. After two years of post-doc, first in Groningen University then in Institut d’ Electronique Fondamentale, she joined CNRS in 2005. Dr. Grollier is now a group leader in the CNRS/Thales lab in France. Her current research interests include spintronics (dynamics of nanomagnets under spin torque) and new nanodevices for cognitive computing. She is also chair of the interdisciplinary research network GDR BioComp coordinating national French efforts to progress toward the hardware realization of bioinspired systems.

Dr. Grollier is a Fellow of the American Physical Society, and was awarded the Jacques Herbrand prize of the French Academy of Science. She is the recipient of two European Research Council grants.

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