C2N General Seminar

Friday October 15th 2021- 10h 00

"Lessons in Nanotechnology from the ribosome"

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Link: **:** https://us02web.zoom.us/j/86277738532

Biological nervous systems have been a source of inspiration for realizing new computing paradigms in electronics and optical systems for decades. While the single operation of current traditional CMOS technologies is approaching the energy consumption (~1 pW) of the most basic operation in biological nervous systems, an action potential, the action potential is far from being the most fundamental operation in a living cell. At the heart of molecular biology is the *central dogma*, which describes how genetic information is sequentially transferred from DNA into RNA into proteins that are used for all cellular life. The nano-machine that translates mRNA into proteins is the ribosome and in the past twenty years there have been enormous developments in understanding its biological functionality. Its energy consumption is ~5 orders of magnitude smaller than an action potential and approaches the Landauer limit of computation, but its use as an inspiration for new computing paradigms is still in its infancy. This is most likely because an understanding of how energy is used to realize translation is still not well understood. In this talk, I present an alternative way to model the dynamics of the ribosome using network theory. This concise representation can be used to track dynamic changes in different ribosomal states and understand its global dynamical nature. I describe some of the differences between ribosome functionality and artificially realized nano-machines.

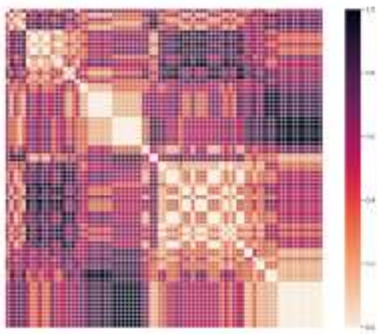

Figure: Heatmap of correlations between the interactions in 6 different files. (perfect correlation/decorrelation = 0/1).

Laurie E. Calvet is a CNRS researcher at the Center for Nanoscience and Nanotechnology, Université Paris-Saclay, Palaiseau, France. Her current research explores how biology can inspire new computing concepts using nano-devices and novel materials. He received the B.S. degree in applied physics from Columbia University, New York, NY, USA, in 1995, and the Ph.D. degree from Yale University, New Haven, CT, USA, in 2001.