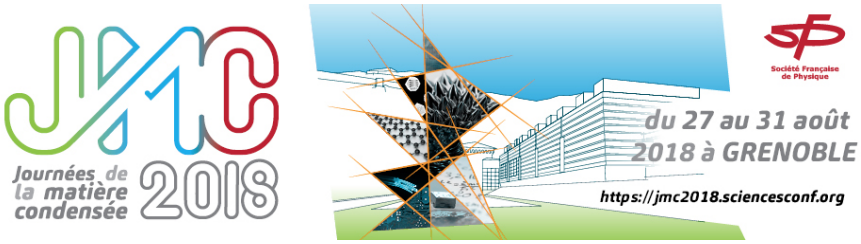

DNA and RNA: algorithmic materials for self-assembly and self-organization

Nucleic acid-based materials can be considered as algorithmic, or programmable, because one can design structures and dynamic function by combining bits of information. Fabrication of 100 nm-across structures with 2 nm resolution, or designing both digital and analogue chemical circuits, can be broken down into a combination of simple operations between nucleic acid strands: hybridization as well as strand displacement, extension, linking and breaking. Not only may nucleic acids be programmed to self-assemble a large variety of nanoscale shapes but their integration into networks of chemical reactions allows the design of nano-devices capable of processing information or behaving as synthetic molecular robots. Central to all systems based on nucleic acids is the control of the thermodynamic and kinetic parameters of each of the above operations.

This mini colloquium will provide a panorama of activity taking place in this growing field in France and provide an opportunity for researchers to meet and present their recent work, as well as explore new ideas. The committee encourages applications from 3rd year PhD students up to confirmed researchers and strongly advises presentation of unpublished work related to the design of original structures or functions, the description of computer aided software or methods that ease the design of novel materials, experimental and theoretical methods developed to characterize structure and assembly pathways.

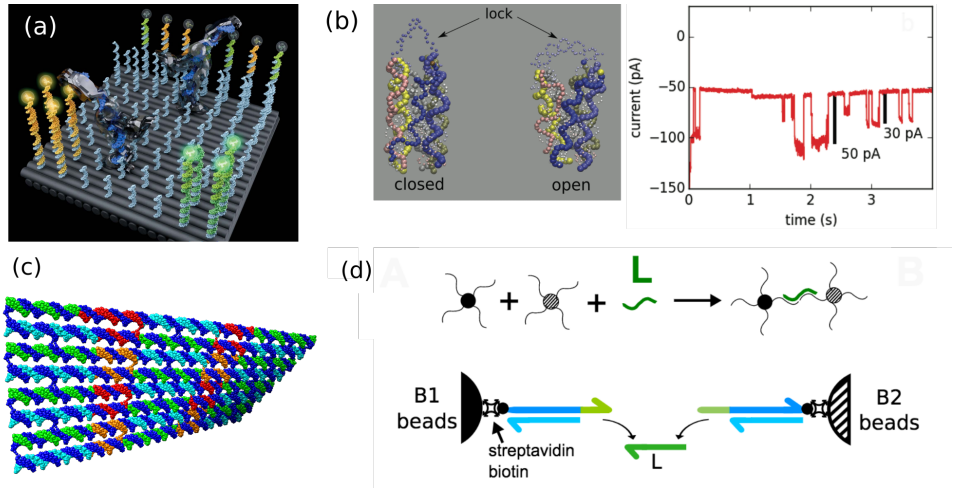

Illustration 1: DNA devices and nanostructures. (a) A cargo-sorting DNA robot, adapted from Science (2017); (b) a functional DNA nanopore adapted from Nanoscale (2017) ; (c) molecular model of a DNA origami; (d) principle a particle aggregation mediated by a DNA linker, adapted from Nature Chemistry (2017).

Keywords: DNA nanotechnology, DNA computation, synthetic biology, aptamers, quadruplexes, RNA folding, molecular programming, nucleic acids sensors.

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