

Thursday June 6<sup>th</sup> 2019 - 10h 00

Amphitheater of C2N

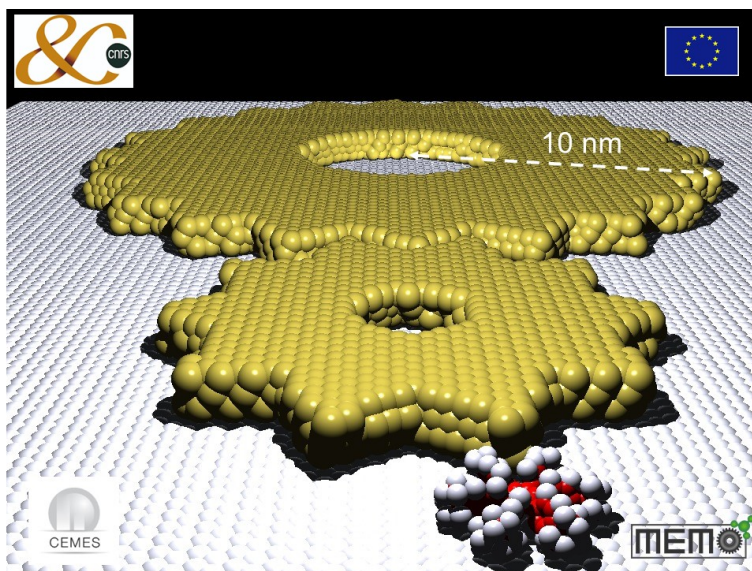
# Single molecule mechanics: gears, motors and cars

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After the bronze Antikythera calculator (200 BC), the B. Pascal wooden calculating clock (1642 AC) and the micro-fabricated machineries on a silicon surface (middle of the 1980's), it is now foreseen to miniaturise mechanical machineries down to the size of a single molecule.

We will present our molecular design and experiments starting from the random rotation of a single molecule-wheel [1] and the step by step controlled rotation of a single molecule gear 1.2 nm in diameter [2]. More complex molecular machineries will be presented like a rack & pinion mechanism [3], a molecule wheelbarrow [4] and a train of molecule-gears. To drive molecule-machineries, we are using the mechanical interaction with the tip apex end atom of an STM and/or the inelastic tunnel current effect as exemplify with our step by step controlled molecule-rotor [5]. In the prospect to measure the motive power of a single molecule [6] and to interconnect mechanically a single molecule to the mesoscale, nano-fabrication of solid state nano-gears down to 30 nm in diameter will be presented [7]. We will end by a little survey of the April 2017 1<sup>st</sup> International Nanocar race [8,9] and by announcing Nanocar race II under the European project MEMO (Mechanics with Molecule(s)) for 2021.



### References

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**Christian Joachim** is Director of Research (CNRS) at the Nanoscience group (Pico-Lab CEMES/CNRS) & adjunct Professor of Quantum Physics at Sup'Aero. He coordinated the European projects "Bottom-up Nanomachines", "Pico-Inside" and "AtMol" to construct the first ever molecular chip. He is now working on molecule machinery, experimenting single molecule logic gates and single molecule-motors to clarify the physics behind the quantum superposition principle, the elementary driving of those machinery.

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