Toward molecule-machines at the nanoscale

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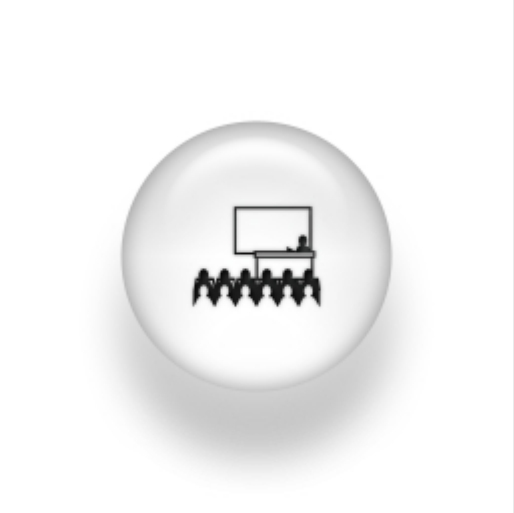

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There is no physical limitation for the miniaturization of a machine down to the scale of a single molecule or conversely, to monumentalize a molecule until it becomes a machine. A few prototypes of mechanical molecule-machine are already under testing like the molecule-wheelbarrow or the molecule-atom cleaner, a few others molecules have been designed and used as experimental nano-devices like a molecule-gear or the series of the Lander molecules to study an atomically clean electronic contact to a metallic pad. Other molecules are at their early design and synthesis stages like a motor- molecule-motor, a molecule equipped with four wheels or molecule-logic gates like a molecule-semi-classical OR gate or a molecule-quantum ½ digital adder.
Those examples will be illustrated because (1) they are also driving new challenges in the modeling of the behavior of a large molecule on a surface and (2) they are driving new instrumentation developments to exchange data, orders, synchronization signals or energy with a single (and always the same) molecule, just a nanometer in size.