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Quantum-Sequencing: Biophysics of quantum tunneling through nucleic acids JOSEP CASAMADA RIBOT, ANUSHREE CHATTERJEE, PRASHANT NAGPAL, Univ of Colorado - Boulder — Tunneling microscopy and spectroscopy has extensively been used in physical surface sciences to study quantum tunneling to measure electronic local density of states of nanomaterials and to characterize adsorbed species. Quantum-Sequencing (Q-Seq) is a new method based on tunneling microscopy for electronic sequencing of single molecule of nucleic acids. A major goal of third-generation sequencing technologies is to develop a fast, reliable, enzyme-free single-molecule sequencing method. Here, we present the unique "electronic fingerprints" for all nucleotides on DNA and RNA using Q-Seq along their intrinsic biophysical parameters. We have analyzed tunneling spectra for the nucleotides at different pH conditions and analyzed the HOMO, LUMO and energy gap for all of them. In addition we show a number of biophysical parameters to further characterize all nucleobases (electron and hole transition voltage and energy barriers). These results highlight the robustness of Q-Seq as a technique for next-generation sequencing.

Josep Casamada Ribot
Univ of Colorado - Boulder

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