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Transport Through A Molecule Or A Dot: Capacitance, Hysteresis, DNA And Switching

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Although simple tunneling transport through molecular wires has been extensively investigated, small modifications in the coupling conditions can lead to transport regimes that are (so far) only poorly understood. We will utilize a combination of non-equilibrium Greens functions and polaron theory to discuss hysteresis and switching in molecular current transport junctions, and simple capacitance models to discuss transport through gold quantum dots held in place with DNA. The effectiveness of relatively simple models in understanding (at least on a semi-quantitative basis) complex transport structures will be emphasized, and some conclusions will be drawn concerning the appropriate limits in which simple pictures can be recovered.