

Coherence effects in DNA Electron Transfer

David N. Beratan
Department of Chemistry
Duke University
Durham, NC 27708 USA

Charge-transfer mechanisms in biomolecules are rich and varied. I will describe a conceptual framework to describe charge transport in the soft-wet environment associated with DNA. Particular attention will be paid to transient resonance channels, which are believed to be particularly significant because energy fluctuations of the nearby pi-stacked bases are correlated. The theoretical framework is used to analyze resistance oscillations in break-junction measurements on DNA, to design novel sequences that test our predictions. The findings of our studies indicate that orbital symmetry and the properties of correlated structural fluctuations may be used to engage coherent transport on the multiple nanometer length scale in soft-matter assemblies, dimensions comparable to those of small proteins. I will also describe studies of how transient infra-red excitation may be used to manipulate charge flow through electron donor-bridge-acceptor structures consisting of nucleic acid bridges.