

MRSEC SEMINAR SERIES

“Linking room temperature quantum devices to electronic circuitry using organic molecules”



A century ago quantum mechanics created a conceptual revolution whose fruits are now seen in almost any aspect of our day-to-day life. Lasers, transistors and other solid state and optical devices represent the core technology of current computers, memory devices and communication systems. However, all these examples do not exploit fully the quantum revolution, as they do not take advantage of the coherent wave-like properties of the quantum wave function. The traditional paradigm for quantum information processing relies on arrays of pure, isolated qubits and their coherent interactions to manipulate quantum superpositions and entangled qubit states. This approach has so far proved to be very difficult to realize due to the detrimental effects of environmental noise, which destroys quantum resources like superpositions and entanglement. However, recently the role of noise as a potential enhancer, rather than destroyer, of quantum information processing, is being reconsidered in various scenarios, ranging from quantum simulations and complexity theory to the emerging field of quantum biology.

We are developing a novel nano toolbox with controls coupling between the quantum states and the environment. This toolbox, which combines nano particles with organic molecules, enables the integration of quantum properties with the classical existing devices at ambient temperatures. In the talk I will present our the nano toolbox and show studies of charge transfer, spin transfer and energy transfer in the hybrid layers as well as collective transfer phenomena. These enable the realization of room temperature operating quantum electro optical devices. For example I will present in details, our recent development of a new type of chiral molecules based magnet-less universal memory exploiting selective spin transfer.

Prof. Yossi Paltiel

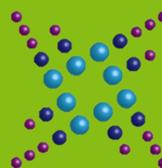
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