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Electronic coherence in electronic energy transfer despite fast dephasing

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Förster resonance energy transfer (FRET) is a common and fundamental photophysical process in life and materials sciences. FRET is an interchromophore relaxation process that transmits the electronic excitation from an initially excited donor to a ground state acceptor chromophore (light-absorbing moleule). FRET is used, for example, to harvest light in photosynthesis, measure distances in proteins, and it accelerates the photodegradation of polymers. In recent years attention has turned to the study of FRET in complex assemblies of molecules. While Förster theory has enabled the efficiency of FRET to be predicted and analyzed in numerous and diverse areas of study, recent work has aimed to discover ways beyond the Föster mechanism by which electronic energy can be transferred. The talk will compare and contrast theoretical and experimental studies of excitation relaxation in photosynthetic antenna systems with the conjugated polymer poly[2-methoxy,5-(2'-ethyl-hexoxy)-1,4-phenylenevinylene] (MEH-PPV). I will report new work where we have used a new anisotropy experiment to examine coherent energy transfer and a complementary technique using two-dimensional electronic spectroscopy expose the role of coherence transfer in the fastest time dynamics. We find that coherent energy transfer occurs for many tens of femtoseconds, even at room temperature. That leads us to examine the nature and implications of the so-called intermediate coupling regime for EET.