

Title: Effect of System-Bath Interactions on Energy Transport

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Natural photosynthetic systems utilize both coherent and incoherent exciton transport to funnel solar energy from light absorbing pigments to reaction centers with near-perfect efficiency. The ability of biological systems to access and regulate both transport mechanisms arises, in part, through its interaction with the external environment, e.g. the bath. We do not yet understand how these system-bath interactions influence exciton lifetimes, transport, and relaxation. In this LUCI program, Dr. Cunningham seeks to utilize DNA nanotechnology as a molecular breadboard on which properties can be controlled and hypotheses can be tested in a way that is not possible in natural systems. The goal will be to tune system-bath interactions within DNA-organized dye networks developed at U.S. NRL and examine the effects using spectroscopic techniques developed by Dr. Schlau-Cohen at MIT in order to gain an understanding of how environmental factors shape energy transport. By developing structure-property relationships we will establish a set of design principles for synthetic materials that emulate the efficiency of biological systems on a platform that is adaptable to technological needs.