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Quantum coherence, decoherence and entanglement in light harvesting complexes MARTIN PLENIO, FILIPPO CARUSO, Imperial College London, ALEX CHIN, University of Hertfordshire, ANIMESH DATTA, Imperial College London, SUSANA HUELGA, University of Hertfordshire — Transport phenomena in networks allow for information and energy to be exchanged between individual constituents of communication systems, networks or light-harvesting complexes. Environmental noise is generally expected to hinder transport. Here we show that transport of excitations across dissipative quantum networks can be enhanced by dephasing noise. We identify two key processes that underly this phenomenon and provide instructive examples of quantum networks for each. We argue that Nature may be routinely exploiting this effect by showing that exciton transport in light harvesting complexes and other networks benefits from noise and is remarkably robust against static disorder. These results point towards the possibility for designing optimized structures for transport, for example in artificial nano-structures, assisted by noise. Furthermore, we demonstrate that quantum entanglement may be present for short times in light-harvesting complexes. We describe how the presence of such entanglement may be verified without the need for full state tomography and with minimal model assumptions. This work is based on M.B. Plenio & S.F. Huelga, New J. Phys. 10, 113019 (2008) and F. Caruso, A. Chin, A. Datta, S.F. Huelga & M.B. Plenio, in preparation

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