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A quantum landscape study of energy transfer efficiency in light-harvesting complexes ALIREZA SHABANI, Princeton, MASOUD MOHSENI, MIT, HERSCHEL RABITZ, Princeton, SETH LLOYD, MIT — Over billion years of evolution some photosynthetic complexes have turned into highly efficient light energy harvesting systems. In this work, we demonstrate optimality and robustness of energy transfer in the Fenna-Matthews-Olson (FMO) protein complex with respect to all the relevant parameters of system and environmental interactions. To this end we developed an efficient technique for studying the dynamics of energy transfer in a non-Markovian and non-perturbative regime. For the FMO protein of green sulfur bacteria we find that all the relevant natural parameters to lay within the optimal and robust regimes of energy transfer process. This suggests a peculiar interplay of internal and external forces in order to have a system that functions optimally while being robust under physiological conditions.

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