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Quantum environments in photosynthesis
光合成における量子環境

§1. 研究成果の概要

Understanding how light-harvesting in plants and bacteria works at the fastest possible time scales requires accurate theoretical models and techniques. Such models are particularly important in understanding how light-harvesting efficiency might be improved in artificial photosynthetic systems. Even more broadly, lessons learnt in this context can enable us to design more functional devices for single-molecule electronics and heat management in quantum computing devices.
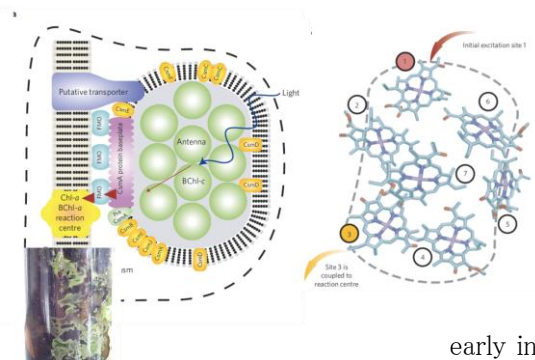
In 2019 I focused on expanding the functionality of my new approach to modeling light-harvesting processes, which includes interactions between electronic energy and vibrational environments in a clear and transparent way. My initial work on this was published in Nature Communications early in the year, but the methodology requires expanding to more general situations, and applying to specific problems in light-harvesting. In parallel I have been looking at how my methodology can be applied to circuits made from single molecules, and be used to enable digital quantum simulation of light-harvesting processes using quantum computers.