

量子技術を適用した生命科学基盤の創出
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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 the role of quantum coherence in biological processes is difficult because these processes contain many degrees of freedom, and are hard to model theoretically. My research is about developing new approaches to this modeling problem, with a focus on problems relevant optimal efficiency of energy transport in photosynthetic light-harvesting, and electron transport through molecules.

In 2020 I released an open-source software package, and I continued my development of pseudo-mode methods, with an emphasis on developing its ability to model fermionic systems, as required for studying electron transport through molecules. I am also working on its applications to abstract heat-engines, as such models are a good way to consider general principles for improving efficiency.

【代表的な原著論文情報】

- 1) “Modelling the ultra-strongly coupled spin-boson model with unphysical modes”, Lambert et al., Nature communications **10**, 3721, (2019).
- 2) “Beyond Marcus theory and the Landauer-Büttiker approach in molecular junctions. II. A self-consistent Born approach”. Sowa, Lambert, et al. The Journal of chemical physics, 152, 064103, (2020).
- 3) “BoFiN-HEOM: A bosonic and fermionic numerical hierarchical-equations-of-motion library with applications in light-harvesting, quantum control, and single-molecule electronics”, Lambert et al., arXiv preprint arXiv:2010.10806
- [4] “Experimental test of non-macrorealistic cat states in the cloud”, Chen, Lambert et al., npj Quantum Information, **6**, 77 (2020).