**Nonequilibrium quantum dynamics of biomolecular excitons - Are there nontrivial quantum effects in biology?**

Prof. Dr. Michael Thorwart

I. Institut für Theoretische Physik, Universität Hamburg, Jungiusstr. 9, 20355 Hamburg, Germany

The harvest of solar photon energy is at the heart of photosynthetic systems realized by nature in large biomolecular complexes or in man made solar cell devices. After a photon has transferred its energy to form an exciton, the nonequilibrium quantum dynamics of this quasiparticle delivers the stored energy to a reaction center where chemical reactions are triggered. These first steps of photosynthesis have moved again into the focus of physics, since recent advances in ultrafast optical spectroscopy can reveal femtosecond time scales. This has also challenged the traditional picture of an incoherent, hopping-like Förster transfer of the excitons between different molecular sites and a supportive role of quantum coherence for the transfer efficiency has been suggested, despite the ubiquitous "hot and wet" disturbing environment.

I will discuss physical circumstances of an incoherent environment under which the coherenr exciton dynamics evolves. In particular, the consequences of a strong coupling of the electronic to vibrational degrees of freedom of the photoactive molecule on the life time of quantum coherence are shown. It is revealed how nonequilibrium molecular vibrational modes can enhance the exciton transfer efficiency considerably. Yet, we will see that it remains questionable whether nature makes functional use of quantum coherence in photoactive biomolecular complexes under ambient conditions.

## References

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