PROOF THAT THE B850 / B875 PHOTOSYNETHETIC COMPLEX IS COHERENT

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Abstract

After a purple bacterial B850 / B875 photosynthetic (PS) light-harvesting complex absorbs a photon, the energy transfer to a charge separation (CS) complex some distance away is nearly perfect, i.e. coherent at room temperature (RT). Coherent exciton hopping has been suggested, but recent studies of the possibility of coherence by excitons in semiconductor quantum wells has been limited to temperatures less than 10K [1]. We suggest that this bacterial complex is coherent in the ground state and offer a proof based on well-established theory. Assuming our proof is correct, many of the experimental observations such as energy "backflow" from a lower state to a higher state, and efficient transfer across the entire complex can be explained. Further, the excited state offers a mechanism for storage of energy by combining a photosynthetic exciton with incoming photons that reduces the mass and thereby permits a polariton [2, 3, 4] condensate to form at RT [5]. Details of these processes will be provided.

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