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Anti-Correlated Pigment Fluctuations of Allophycocyanin for Highly Efficient Photosynthetic Light Harvesting in Cyanobacteria ANDREW MORAN, University of North Carolina, RENE NOME, NORBERT SCHERER, University of Chicago — The phycobiliprotein, allophycocyanin (APC), is an excellent model system for the study of light harvesting pigment interactions with a protein bath. This work investigates the relaxation of electronic excitations in APC with electric field-resolved transient grating and photon echo spectroscopies. Transient grating experiments observe a 35 fs internal conversion process between single exciton levels. Most importantly, our analysis shows that anti-correlated phycocyanobilin pigment energy level fluctuations cause the anti-diagonal orientation of the node in the measured dispersive photon echo spectrum. We believe this novel observation to reflect concerted protein bath fluctuations over the 2 nm length scale that separates the pigments. Consideration of the Forster energy transfer rate theory suggests that APC has evolved with this property to enhance its photosynthetic light harvesting efficiency.

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