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Influence of thermal light correlations on photosynthetic structures[1] ADRIANA DE MENDOZA, Departamento de Física, Universidad de los Andes, AA 4976, Bogotá, Colombia, PEDRO MANRIQUE, Department of Physics, University of Miami, Coral Gables, Miami, FL 33124, USA, FELIPE CAYCEDO-SOLER, Institute of Theoretical Physics, Universitt Ulm, 89069 Ulm, Germany, NEIL F. JOHNSON, Department of Physics, University of Miami, Coral Gables, Miami, FL 33124, USA, FERNEY J. RODRíGUEZ, LUIS QUIROGA, Departamento de Física, Universidad de los Andes, AA 4976, Bogotá, Colombia — The thermal light from the sun is characterized by both classical and quantum mechanical correlations. These correlations have left a fingerprint on the natural harvesting structures developed through five billion years of evolutionary pressure, specially in photosynthetic organisms [1]. In this work, based upon previous extensive studies of spatio-temporal correlations of light fields, we hypothesize that structures involving photosensitive pigments like those present in purple bacteria vesicles emerge as an evolutionary response to the different properties of incident light. By using burstiness and memory as measures that quantify higher moments of the photon arrival statistics, we generate photon-time traces. They are used to simulate absorption on detectors spatially extended over regions comparable to these light fields coherence length. Finally, we provide some insights into the connection between these photostatistical features with the photosynthetic membrane architecture and the lights' spatial correlation.

[1] N. Johnson et al. "Extreme alien light allows survival of terrestrial bacteria," Nature Scientific Reports 3, 2198 (2013) doi:10.1038/srep02198.

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