

Black Holes, Holography and Quantum Photosynthesis

Igor Volovich

Steklov Mathematical Institute, Moscow
volovich@mi.ras.ru

Abstract

There are successful applications of the holographic anti-de Sitter/conformal field theory (AdS/CFT) correspondence to high energy and condensed matter physics. We apply the holographic approach to photosynthesis that is an important example of nontrivial quantum phenomena relevant for life which is being studied in the emerging field of quantum biology. We use the holographic approach to evaluate the time dependence of entanglement entropy and quantum mutual information in the Fenna-Matthews-Olson (FMO) light-harvesting complex in bacteria during the transfer of an excitation from a chlorosome antenna to a reaction center. We show that the time evolution of the mutual information simulating the Lindblad master equation in some cases can be obtained by means of a dual gravity describing black hole formation in the AdS-Vaidya spacetime.