CRETE CENTER FOR QUANTUM COMPLEXITY AND NANOTECHNOLOGY

UNIVERSITY OF CRETE
DEPARTMENT OF PHYSICS

CAPACITIES

ΓΕΝΙΚΟ ΣΕΜΙΝΑΡΙΟ ΤΜΗΜΑΤΟΣ ΦΥΣΙΚΗΣ

PHYSICS COLLOQUIUM

Thursday, 18 May 2017

17:00 -18:00

3rd Floor Seminar Room

" Recent progress in the new synthesis of "quantum" with "bio" "

Prof. Iannis Kominis

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Abstract

In recent years we pioneered a new interdisciplinary synthesis, quantum biology. This is about the study of quantum information in biological systems. Major drivers of quantum biology have been the study of coherent exciton transport in light-harvesting complexes of photosynthesis, and the radical-pair mechanism of avian magnetoreception. We will focus on the latter, although it will become evident that our work is directly relevant to photosynthesis, in particular the charge/spin transport in photosynthetic reaction centers. We will briefly introduce the radical-pair mechanism and summarize our previous work. We will then elaborate on recent work using quantum trajectories and entropy bounds to test the fundamental quantum dynamics of radical-pair reactions. We will demonstrate that the foundational theory of spin chemistry dating to the 1970s is an inadequate theory failing the above tests, while our recently developed approach based on quantum measurement theory passes them. We will further describe a new, recently established connection of quantum metrology/quantum parameter estimation with biological systems. We will finally touch upon future venues of research on quantum biology related to neuroscience.