



University of Miami, Physics Department Colloquium

Date: Wednesday, September 13, 2023

Time: 4:00 pm – 5:00 pm

Zoom link: <https://miami.zoom.us/j/97078462534?pwd=ckhnL0p2N1Q0UWkrMTZ1TFFOYkILdz09>

“Quantum Biology”: how nature harnesses quantum processes to function optimally, and how might we control such quantum processes to therapeutic advantage.

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Abstract

Imagine driving cell activities to treat cancer simply by using tailored magnetic fields. Many relevant physiological processes, such as: the regulation of production of reactive oxygen species; the up- and down-regulation of cell proliferation; stem-cell regeneration; cell motility; microtubule polymerization; cell glycolysis; phosphorylation; methylation; ion channel functioning; wound healing; DNA repair; and cellular respiration were all demonstrated to be controlled by weak magnetic fields (with a strength on the order of that produced by your cell phone), very likely via the electron quantum property of “spin”. Research has not been able to track spin states to manipulate physiological outcomes *in vivo* and in real time, without which the potential game-changing clinical benefits of “Quantum Biology” cannot be realized.

With novel quantum instrumentation, we are learning to control spin states in cells and tissues, having as a goal to write the “codebook” on how to deterministically alter physiology with weak magnetic fields to therapeutic advantage. In the long-term, the electromagnetic fine-tuning of endogenous quantum properties of biomatter will enable the development of therapeutic devices that could heal the human body — in a way that doesn’t require genetic engineering, is non-invasive, remotely actuated, and easily accessible by anyone with a mobile phone.



Biography: Clarice D. Aiello is a quantum engineer interested in how quantum physics informs biology at the nanoscale. She is an expert on nanosensors harnessing room-temperature quantum effects in noisy environments. Born and raised in sunny Brazil, Clarice received her B.S. in Physics from the Ecole Polytechnique; her M.Phil. in Physics from the University of Cambridge, Trinity College; and her Ph.D. from MIT in Electrical Engineering. She also held postdoctoral appointments in Bioengineering at Stanford, and in Chemistry at Berkeley. Two months before the pandemic, she joined UCLA, where she leads the Quantum Biology Tech (QuBiT) Lab.