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# "Quantum Biology: how nature harnesses quantum processes to function optimally, and how might we control such quantum processes to therapeutic and tech advantage"

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**Abstract:** Imagine driving cell activities to treat injuries and disease simply by using tailored magnetic fields. Many relevant physiological processes, such as: the regulation of oxidative stress, proliferation, and respiration rates in cells; wound healing; ion channel functioning; and DNA repair were all demonstrated to be controlled by weak magnetic fields (with a strength on the order of that produced by your cell phone). Such macroscopic physiological responses to magnetic fields are consistent with being driven by chemical reactions that depend on the electron quantum property of spin. In the long-term, the electromagnetic fine-tuning of endogenous "quantum knobs" existing in nature could enable the development of drugs and therapeutic devices that could heal the human body — in a way that is non-invasive, remotely actuated, and easily accessible by anyone with a mobile phone. However, whereas spin-dependent chemical reactions have been unambiguously established for test-tube chemistry (bearing uncanny similarities with what physicists call "spin quantum sensing"), current research has not been able to deterministically link spin states to physiological outcomes *in vivo* and in real time. **With novel quantum instrumentation, we are learning to control spin states within cells and tissues, having as a goal to write the "codebook" on how to deterministically alter physiology with weak magnetic fields to therapeutic and technological advantage**.

***Bio:*** Dr. 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. 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 led the Quantum Biology Tech (QuBiT) Lab. Since Nov 2023, she is the CEO of a startup unsurprisingly named Quantum Biology Tech (QuBiT) Lab, and is writing the first-ever textbook about Quantum Biology.