Endnotes Operational criterion for quantum advantage. The proposed definition parallels ideas from quantum computing, where an algorithm is deemed "quantum-advantaged" if it achieves a demonstrable performance gain over classical analogues. Here, performance refers to efficiency, speed, or fidelity of biological processes, with benchmarks derived from the best-fitting classical stochastic or semiclassical models. Photosynthetic coherence. Experimental evidence: 2D electronic spectroscopy (Engel et al., Nature, 2007) revealed oscillatory signals consistent with long-lived electronic coherence in the Fenna-Matthews-Olson (FMO) complex. Debate persists about whether these signals reflect electronic or vibronic coherence; see Panitchayangkoon et al., PNAS, 2010; Duan et al., PNAS, 2017. The proposed perturbation experiments would distinguish functional coherence from incidental coherence. Radical-pair mechanism in magnetoreception. Seminal models: Ritz et al., Biophysical Journal, 2000. Behavioral disruption by RF fields (Wiltschko & Wiltschko, Journal of Comparative Physiology A, 2005) suggests a quantum spin-coherence basis. Recent spectroscopy of cryptochrome radicals (Maeda et al., Nature, 2008) supports this mechanistic hypothesis. Controlled isotopic substitutions (hydrogen/deuterium exchange) can systematically tune hyperfine couplings. Proton/electron tunnelling in enzymatic reactions. Classic treatments: Klinman & Kohen, Annual Review of Biochemistry, 2013. Deviations from Arrhenius behavior and kinetic isotope effects exceeding semiclassical expectations strongly suggest tunnelling contributions. DNA base-pair tautomerization studies (Wang & Pollak, J. Am. Chem. Soc., 2020) provide quantum-chemistry evidence for tunnelling-enabled mutagenesis. Metrics. Coherence witness (Cw): Based on the magnitude of off-diagonal density matrix elements reconstructed from ultrafast spectroscopic observables. Entanglement proxy (Ep): Following Vedral et al., entanglement witnesses adapted for open systems; measurable via correlated spin or fluorescence signals. Quantum thermodynamic advantage (Qt): Inspired by the framework of quantum resource theories; see Lostaglio, Reports on Progress in Physics, 2019. Synthetic biomimetic scaffolds. Use of artificial chromophore networks (Coles et al., Nature Communications, 2017) or engineered radical-pair systems provides tunable testbeds for isolating quantum effects from complex biological regulation.