

Technical Endnotes Quantum Coherence in Photosynthesis: The initial ~95% efficiency refers to energy transfer within the Fenna-Matthews-Olson (FMO) complex in green sulfur bacteria, as demonstrated by two-dimensional electronic spectroscopy experiments revealing long-lived (~500 fs) quantum beats at cryogenic and room temperatures (Engel et al., *Nature* 2007, 446, 782-786). This suggests a coherent quantum walk rather than a classical random hop. Radical Pair Mechanism: The model proposes that cryptochrome proteins host light-induced radical pairs (e.g., FADo- Trpo+). The interconversion between singlet and triplet spin states of these entangled pairs is influenced by the Zeeman effect from Earth's magnetic field (~50 uT), altering downstream signaling pathways (Hore & Mouritsen, *Annual Review of Biophysics* 2016, 45, 299-344). Decoherence Suppression: The protein environment is not a passive disruptor but can actively suppress decoherence through ordered structures and non-Markovian vibrational dynamics, creating a "quiet" quantum corridor for energy transfer (Collini & Scholes, *Science* 2009, 323, 5910, 369-373). NV Center Sensing: Nitrogen-vacancy (NV) centers in diamond are atomic-scale quantum sensors. Their electron spin state, readable optically, is exquisitely sensitive to local magnetic and electric fields, enabling the potential to detect nanoscale nuclear spin environments and quantum correlations within single biomolecules in vitro and eventually in vivo (Granger et al., *Annual Review of Physical Chemistry* 2021, 72, 315-337).