GLOSSARY: QUANTUM TERMINOLOGY

The world at the scale of spinning atoms and subatomic particles is governed by the probabilistic rules of quantum mechanics, which often produce effects that seem counterintuitive to organisms living in a world usually described perfectly well by more-standard physics. These effects have been harnessed for multiple technological applications, and the possible role of quantum phenomena in several biological systems is now being explored.

ENTANGLEMENT: Two particles are said to be quantumly entangled if their states are interdependent, regardless of the distance separating them. In the classic example of entanglement two entangled electrons, when measured, will have opposite spins.
Important for: Quantum computing, quantum cryptography
Studied in: Photosynthesis, magnetoreception, human consciousness

TUNNELING: Particles at the quantum scale have wave-like properties, and their exact location at any moment is described by a probabilistic wave function. As a result, particles such as electrons can, with certain probabilities, traverse—or tunnel through—apparently impermeable energy barriers.
Important for: Thermonuclear fusion, scanning tunneling microscopy
Studied in: Enzyme catalysis, photosynthesis, olfaction, DNA mutation

QUBITS: These units of information are the quantum equivalent of standard binary digits or bits. While a bit can have a state of 0 or 1, qubits can have multiple states simultaneously, and may be entangled with other qubits to perform parallel computations. Qubits can be encoded in the spin states of electrons and other subatomic particles.
Important for: Quantum computing
Studied in: Human consciousness

COHERENCE: Because quantum objects can behave like waves, they can exhibit a property of waves called coherence when they are in a particular rhythm with one another. Quantum coherence underlies several effects observed by quantum physicists, including entanglement as well as interference patterns manifested as so-called quantum beating. Loss of coherence has traditionally been thought to happen very quickly in the molecular bustle of ambient- temperature environments.
Important for: Lasers, superconductors, quantum computing
Studied in: Photosynthesis, magnetoreception, vision, respiration

THE SCIENTIST STAFF