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The fourth phase of water: Beyond solid, liquid and vapor

School children learn that water has three phases: solid, liquid and vapor. But, we have recently uncovered a fourth phase. This phase occurs next to water-loving (hydrophilic) surfaces. It is surprisingly extensive, projecting out from the surface by up to millions of molecular layers. And, its properties differ markedly from those of bulk water. Of particular significance is the observation that this fourth phase is charged; and, the water just beyond is oppositely charged, creating a battery that can produce electrical current. We found that light charges this battery. Thus, water can receive and process electromagnetic energy drawn from the environment in much the same way as plants. Absorbed electromagnetic (light) energy can then be exploited for performing work, including electrical and mechanical work. Recent experiments confirm the reality of such energy conversion. This energy-conversion framework seems rich with implication. Not only does it provide an understanding of how water processes solar and other energies, but also it may provide a foundation for simpler understanding natural phenomena ranging from weather and green energy all the way to biological issues such as the origin of life, transport and osmosis. The talk will present evidence for the existence of this phase of water — how come nobody's seen it before? It will also consider the potentially broad implications of this phase for materials and health.

Biography

Gerald H Pollack received his PhD in Biomedical Engineering from the University of Pennsylvania in 1968. He then joined the University of Washington faculty and is now Professor of Bioengineering. For years, he had researched muscles and how they contract. It struck him as odd that the most common ideas about muscle contraction did not involve water; despite the fact muscle tissue consists of 99 percent water molecules.

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