

## Plenary Presentation

### **The Secret Life of Water: $E = H_2O$ – Tutorial to Current Research on Interfacial Water**

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**ABSTRACT:** School children learn that water has three phases: solid, liquid and vapor. But we have recently uncovered what appears to be 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.

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 current. We found that light recharges this battery. Thus, water can receive and process electromagnetic energy drawn from the environment — much like plants. The absorbed light energy can then be exploited for performing work, including electrical and mechanical work. Recent experiments confirm the reality of such energy conversion.

The energy-conversion framework implied above 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 issues such as the origin of life, transport, osmosis, and behavior in porous media.

The lecture will present evidence for the presence of this novel phase of water, and will consider the potentially broad implications of this phase for physics, chemistry and biology, as well as some practical applications for engineering.