# Cells, Gels and the Engines of Life: A Fresh Physically Based Paradigm for Cell Function

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The cytoplasm is broadly acknowledged to be a gel. Textbook mechanisms nevertheless build on the presumption that it is an aqueous solution. Gels and aqueous solutions are quite different: Gels are polymer matrices to which water clings-that's why the cracked egg feels gooey, and why gelatin dessert does not shrivel up despite 95% water content. The concept of a gel-like cytoplasm is replete with power. Partitioning of ions between the inside and outside of the cell is directly explainable from the cytoplasm's gel-like character and the organization of its water molecules; such partitioning requires zero maintenance energy, unlike ion-pumping mechanisms. The cell's electrical potential is also explainable: substantial potentials are measured in gels, as well as in cells stripped of their membrane. Gels also undergo phase-transition-transformation of protein and water from one physical state to another. In so doing, the gels change volume, ion content, solvency, permeability, electrical characteristics, etc.- changes similar to those experienced by organelles within the functioning cell. Hence, the phase transition may have broad applicability for cell function. These ideas are explored in depth in a recent book (Pollack, "Cells, Gels and the Engines of Life," 2001, www.ebnerandsons.com), and will be presented at the meeting.