

THE PUZZLING BEHAVIOR OF LIQUID WATER: SOME CLUES FROM THE NANOSCALE

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Abstract

Despite decades of research water's puzzling properties are not understood and 63 anomalies that distinguish water from other liquids remain unsolved. We introduce some of these unsolved mysteries, and demonstrate recent progress in solving them. We present recent evidence from experiments and computer simulations on bulk and on nanoconfined water supporting the hypothesis that water displays a special transition point (which is not unlike the “tipping point” immortalized by Malcolm Gladwell). The general idea is that when the liquid is near this “tipping point,” it suddenly separates into two distinct liquid phases. This concept of a new critical point is finding application to other liquids as well as water, such as silicon and silica. We also discuss related puzzles, such as the mysterious behavior of water near a protein.