



A Two-State Picture of Water and the Funnel of Life Lars G.M. Pettersson (Stockholm University, Sweden)

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Abstract: I will discuss recent experimental and simulation data of liquid water and the picture of fluctuations between high-density (HDL) and low-density (LDL) liquid this has led to [1,2]. The HDL would be a more close-packed form, favored by entropy and dominates at high temperature. Below about 50° C correlated fluctuations into tetrahedral (LDL) structures, favored by hydrogen-bonding (enthalpy), begin to appear and become increasingly important upon further cooling [3,4]. A coexistence line between the two liquid phases is hypothesized, but it must lie at high pressure and low temperature in the so-called “No-man’s land” where measurements are extremely challenging due to rapid crystallization [5,6]. If such a line exists, it may terminate in a critical point from which a funnel-like region of enhanced fluctuations between the two forms emanates. Indeed, in a very recent study the isothermal compressibility and correlation length were measured down to 227 K and shown to exhibit a maximum which can be viewed as a trace of a critical point[7]. Since these fluctuations are observed up to ambient conditions we may live in what could be called the “funnel of Life”. In light of this picture I will discuss some of the more important anomalous properties of water.

References:

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