Bridging length scales in the theory of nucleation

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First order phase transitions take place by means of the occurrence of small volumes of the new phase due to thermal fluctuations at molecular length scales. In contrast, the dominant paradigm in the field of nucleation is based on mesoscopic concepts and assumptions that can only be valid for macroscopically large clusters. The subject of this talk is a theoretical framework for bridging the gap between these two levels of description based on fluctuating hydrodynamics and finite temperature density functional theory. The theory gives a surprisingly rich - and non-classical - picture of even the simplest nucleation processes. The current state of support for this theory from computer simulations will also be discussed.

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