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## **Thermodynamics at small scales: A snapshot at the present state and those distressing troubles hunting theory and experiment**

With this talk I attempt to give an overview of the present state of thermodynamics/statistical mechanics of systems of finite size and/or small scales where quantum features matter. I will survey the present state of what I think is more or less settled and what are the main (open) problems and issues that still hunt this timely area of research on a classical level – and even more intriguing – on a quantum level. Even at manifest thermal equilibrium, these thermodynamic notions become surprisingly tricky when strong system-bath interactions are at work. This being in distinct contrast to what one might hypothesize. Consequently: If anything can be said at all – it should be stated most clearly (Ludwig Wittgenstein, 1889-1951).

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