

Many body entanglement, strange metals and black holes.

Jan Zaanen  
Instituut-Lorentz for Theoretical Physics  
Leiden University

It may well be that mankind has understood only the tip of the iceberg when it comes to the nature of matter. Densely many body entangled compressible states of matter may exist exhibiting entirely different physical behaviors compared to the "classical" short ranged entangled product state stuffs from the high energy- and condensed matter textbooks. Although not computable directly - a quantum computer is required - a remarkable confluence occurred in theoretical physics involving empirical notions from condensed matter physics merging with the holographic duality of string theory, and notions of quantum information. This theoretical development suggests universal principles of a new kind to be at work. As a common denominator, these suggest paradoxically that observable properties should be *unreasonably simple*. I will highlight the present efforts in the Netherlands aimed at finding out whether condensed matter experimentation in condensed matter systems (specifically the cuprate superconductors) may take the role of analogue quantum computer to shed light on these matters.