

Quantum supreme matter and the strange metals.

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Quantum supreme matter refers to forms of matter that are densely many-body entangled with the ramification that the quantum supremacy of the quantum computer is required to enumerate the way it works. Prime candidates are the strange metals, in particular those observed in cuprates. I will present the case that holography yields a mathematical view on generic properties of such states of matter. In particular, it gives away a generalization of the universality principle associated with strongly interacting “stoquastic” quantum critical states to the realms of finite density fermion matter. This revolves around a “covariant” renormalization group flow revealed by holography showing how the Fermi-liquid generalizes into a densely many-body entangled affair [1], revealing the finite temperature physics through a “first principle” treatment of quantum thermalization. Guided by these insights, substantial progress has been made in recognizing various of these traits in experiments on the strange metal states of the high T_c superconductors.

References

[1]. J. Zaanen, arXiv:2110.00961 (2021).