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Holographic approach to condensed matter physics

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The holographic correspondence provides, among other things, a framework for studying certain strongly interacting field theories using a ‘dual’ classical theory of gravity in one higher dimension. The last couple of years has seen an explosion of interest in applying the techniques of this correspondence to strongly correlated electron systems in condensed matter physics. The hope of this research program is that specific behaviors of exotic electronic states, that defy conventional treatment, can be usefully tackled via this holographic approach. In this talk I will briefly outline the holographic methodology and emphasize the ease with which finite temperature and finite density response functions may be computed from black hole physics. I will discuss the onset of superconductivity within this framework as well as the appearance of theoretically controlled ‘non-Fermi’ liquids. A short introduction to this material can be found at <http://arXiv.org/abs/0909.3553> while a longer and slightly older discussion is <http://arXiv.org/abs/0903.3246>.