



ΓΕΝΙΚΟ ΣΕΜΙΝΑΡΙΟ ΤΜΗΜΑΤΟΣ ΦΥΣΙΚΗΣ

PHYSICS COLLOQUIUM

Thursday, 24 March 2011

17:00 -18:00

3rd Floor Seminar Room

“String theory and the mysterious quantum matter of condensed matter physics”

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Abstract

The general nature of matter formed from fermions is mysterious. The established methods of many body quantum physics fail and empirically one finds that the phenomenological Fermi-liquid and BCS theories fail: non Fermi-liquid quantum critical metals are observed in heavy fermion systems and cuprate high T_c superconductors. Remarkably, it appears that the mathematics of string theory is capable of describing such states of fermion matter. The AdS/CFT correspondence translates this problem into an equivalent general-relativity problem involving the propagation of classical fields in an Anti-de-Sitter space-time with a black hole in its center. Triggered by the success of AdS/CFT predicting the low viscosity of the quark-gluon plasma, the focus shifted very recently to the fermions, creating much excitement. It appears that both emergent Fermi-liquids and non Fermi-liquids can be gravitationally encoded, as well as ‘holographic’ superconductors having suggestive traits in common with the real life high T_c variety.