



ΓΕΝΙΚΟ ΣΕΜΙΝΑΡΙΟ ΤΜΗΜΑΤΟΣ ΦΥΣΙΚΗΣ

PHYSICS COLLOQUIUM

Thursday, 11 December 2008
17:00-18:00

3rd Floor Seminar Room

“Planckian Dissipation”

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Abstract

We live in a dissipative world where the second law of thermodynamics insists that useful work has to turn into useless heat. Is it just the usual story about probabilities and the law of large numbers, or is there a deeper cause? I will report on a remarkable convergence that took place in physics in the last few years involving string theory, quantum gravity, high energy physics, and condensed matter physics. This revolves around the finite temperature hydrodynamics of quantum critical states of matter, caused by phase transitions taking place at zero temperature that are driven by quantum zero point motions. These fluids produce entropy in remarkably simple and universal ways, governed entirely by Planck's constant and temperature. Real life examples are the quark-gluon plasma, being the least viscous fluid in existence, and the metallic states of high T_c superconductors that are governed by 'Planckian' relaxation behavior. The deeper meanings of this wonder are revealed by the string-theoretical AdS/CFT correspondence, linking this Planckian dissipation phenomenon directly to the strange habits of quantum black holes.