PHYSICAL MATHEMATICS SEMINAR

Is Planck's Constant ħ a 'Quantum' Constant? An Alternative Classical Interpretation

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ABSTRACT:

Although Planck's constant ħ is currently regarded as the elementary quantum of action appearing in quantum theory, it can also be interpreted as the multiplicative scale factor setting the scale of classical zero-point radiation appearing in classical electromagnetic theory. Classical zero-point radiation is the unique Lorentz-invariant and scale-invariant spectrum of random classical radiation. Relativistic classical electron theory with classical electromagnetic zero-point radiation provides classical explanations of Casimir forces, van der Waals forces, diamagnetism, and the ground state of hydrogen. It is pointed out that relativistic analysis eliminates certain familiar ideas, including plunging orbits in a Coulomb potential, energy equipartition, and scattering toward the Rayleigh-Jeans spectrum. In analogy with Boltzmann's derivation of Maxwell's velocity distribution by the use of gravity, it is possible to derive the Planck spectrum from zero-point radiation using symmetry considerations involving time-dilating conformal transformations in a relativistic accelerating frame, a Rindler frame. Thus the Planck spectrum follows from the structure of relativistic space-time. Within an accelerating frame, the classical analysis presented here suggests experimental predictions different from those of the Unruh effect of relativistic quantum field theory.

TUESDAY, September 25, 2012
2:30 PM
Building 4, Room 145

Reception at 3:30 PM in Building 2, Room 290
(Math Dept. Common Room)

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