Contribution ID: **182** Type: **oral presentation**

Predictions of a fundamental statistical picture

Friday, 16 August 2013 16:30 (20 minutes)

The present talk is based on arXiv:1101.0586 [hep-th], with some clarifications and additions, and a greater emphasis on the connection to standard physics. There has always been a remarkably close relationship between the partition function of statistical physics and the path integral of field theory. Here we argue that this is no coincidence, and that nature can be interpreted as a statistical system described by a Euclidean path integral (partition function), but with an action (entropy or free energy) which has Lorentzian form to lowest order. One can then transform to a Lorentzian path integral, Lorentzian propagators, etc., and the fields, operators, classical equations of motion, quantum transition probabilities, propagation of particles, and meaning of time are the same in both formulations. A specific system will be discussed which implies the following: (1) Lorentz invariance is an extremely good approximation at normal energies, but is ultimately broken at high energy. (2) Supersymmetry is inescapable. In other words, the present theory cannot possibly be formulated without susy. (3) Higgs-like bosons are inescapable. (4) The fundamental gauge theory must be SO(N), with SO(10) giving neutrino masses plus the standard model. (5) The usual cosmological constant is zero, but there is a much weaker term involving a factor that is conventionally taken to be constant. (These two points were already made in an earlier version, hep-th/9612041, before the discovery of dark energy.) The fundamental formulation of the theory also accounts for the origin of boson and fermion fields, and of spacetime coordinates, with a gravitational metric necessarily having the form (-,+,+,+). In short, the present theory is far more ambitious than string theory, and also far closer to experiment. However, the deviations from standard physics are subtle and hard to test, and quantitative predictions will also be very difficult because they require a detailed treatment of symmetry-breakings in the early universe, and of the resulting very complex vacuum fields that determine, e.g., the gravitational and gauge coupling constants plus Yukawa couplings.

APS member ID

AL655226

Primary author: Prof. ALLEN, Roland (Department of Physics and Astronomy, Texas A&M University)

Presenter: Prof. ALLEN, Roland (Department of Physics and Astronomy, Texas A&M University)

Session Classification: Physics Beyond the Standard Model

Track Classification: Physics Beyond the Standard Model