

Sommerfeld Theory Colloquium

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Fermilab and CERN

The Coming Revolutions in Particle Physics

Wonderful opportunities await particle physics over the next decade, with new instruments and experiments poised to explore the frontiers of high energy, infinitesimal distances, and exquisite rarity. I will review the insights of the decade just past and show how they lead us to the brink of a new period of rapid and profound discovery. We expect answer to questions that speak to our understanding of the everyday world: why are there atoms? why chemistry? why stable structures? and even what makes life possible? We are probing the meaning of identity for the fundamental particles: what makes an electron an electron, a neutrino a neutrino, and a top quark a top quark ? important clues, including the remarkable neutrality of atoms, lead us to investigate the unity of the two main classes of matter, the quarks and leptons. Gravity and particle physics, long separate disciplines, are enjoying a stimulating reunion, and we are learning how to investigate with-experiments-new conceptions of spacetime.

We look forward to the Large Hadron Collider at CERN to explore the new and critical energy scale of one trillion electron volts. If we are inventive enough, we may be able to follow the LHC' s rich menu with the physics opportunities offered by a linear electron-positron collider, a (muon storage ring) neutrino factory, and experiments that use natural sources. I expect a remarkable flowering of experimental particle physics, and of theoretical physics that engages with experiment.

Wednesday, 1th February 06, 11.15 h , Room 348 / 349, Theresienstr. 37 / III