Monday – September 29, 2014
4:00 PM
Kolker Room (26-414)
(refreshments served at 3:30 PM)

**Modern Lattice QCD: Progress & Prospects**

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Abstract: Numerical lattice-QCD simulations enable the determination of hadronic matrix elements and parameters of the QCD Lagrangian with controlled uncertainties that are systematically improvable. In the past few years, lattice methodology has been validated by comparison with a broad array of measured quantities, including some that were not yet well measured in experiment when the first good lattice calculation became available. In the coming years, numerical lattice-QCD calculations will be needed throughout the experimental high-energy physics program. After briefly introducing numerical lattice QCD, I present recent results for the hadron spectrum, quark masses, and strong coupling that demonstrate the reliability of modern lattice calculations. Next I discuss the role of lattice QCD in quark-flavor physics, for which lattice QCD is already a mature tool. I show recent results for decay constants, form factors, and mixing parameters needed to test the Standard-Model CKM framework and look for evidence of new physics in rare kaon and B decays. I finish by discussing prospects for lattice calculations needed to interpret future measurements as Standard-Model tests and new-physics searches, focusing on three key examples: the muon anomalous magnetic moment, neutrino oscillation parameters, and precision Higgs-boson couplings.