



Princeton Center for Theoretical Science presents

Fourth Annual Visiting Lectureship Series, 2014

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Schedule of Events and Abstracts

**All events will be held in Room 407 Jadwin Hall,
PCTS Seminar Room, unless otherwise noted.**

Seminars:

1. *What is a "Composite Higgs" model?*
4 March; 2:00 pm
2. *Five-Dimensional Models with Composite Higgs*
7 March; 1:30 pm
3. *Composite Higgs and Naturalness*
10 March; 2:30 pm

Abstract:

The discovery of a light Higgs boson completes the Standard Model of particle physics and suggests a definite agent for the symmetry breaking that the model requires. However, the Standard Model has always seemed incomplete. The reality of the light Higgs boson tells us that we must take the conceptual gaps in this model much more seriously. One popular solution to the issues raised by the Standard Model is the assumption of supersymmetry at the TeV energy scale. This solution is still in play, but it is increasingly constrained by negative results of searches at the Large Hadron Collider.

It is thus important to note that there is a very different approach to the questions of the Standard Model based on the idea that the Higgs boson is the relic of new strong interactions at the 10 TeV energy scale. In these models, the Higgs boson is a pseudo-Goldstone boson or has some other, similarly cogent, reason to be a light scalar particle.

In these lectures, I will review the structure of these "Composite Higgs" models and discuss the properties of the most important new ingredients. I will also discuss the question of "naturalness" in these models and the related question of where the new particles that they predict should be found.

Lunch talk: March 6, 12:30 pm

“Precision Theory of the Decays of the Standard Model Higgs Boson”

How accurately can we predict the properties of the Higgs boson within the Standard Model? In this lecture, I will present the current status of the theory, review some of the methods used to obtain high-precision results, and project expected improvements in these predictions.

Physics Colloquium: March 6, 4:30 pm; Room A-10, Jadwin Hall

“Beyond the Higgs Boson: Further questions and expectations for the Large Hadron Collider”

The biggest recent news from particle physics is the discovery at the CERN Large Hadron Collider of a new particle with many properties of the long-sought Higgs Boson. The Higgs Boson had been predicted by the unified theory of weak and electromagnetic interactions. This discovery thus seems to fill a recognized gap in our understanding. But there are more mysteries about the weak interactions and physics at the 100 GeV - 1 TeV mass scale. About these, the LHC has also given us much information, but all of it negative, exclusions of previously possible solutions. In this lecture, I will give my best understanding of where we are in the search for new particles and forces related to the weak interactions. I will review the questions we are asking about physics in the hundred GeV region. I will discuss the power and also the difficulties of LHC measurements. There are many alternatives for the route forward. I will discuss some of these and their implications for the future program of physics at high-energy colliders.

Public Lecture: March 13, 8:00 pm; McDonnell Hall, Room A-02

“The Top Quark: subatomic Thor, or just another heavy?”

The top quark is the most massive elementary particle known today, with a mass almost 200 times that of the proton. This particle was discovered about twenty years ago at the Fermi National Accelerator Laboratory. Now it is being studied intensely at the CERN Large Hadron Collider. We still do not understand the role of this particle in nature. Is it just a supporting player, the big lug in the back of the bar? Does it stand above the laws of particle physics, aloof and magisterial? Does it have the power to hammer the universe apart? In this lecture, I will set out our questions about the top quark and discuss how we can find the answers.