Introduction to the Snowmass on the Pacific Meeting

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Welcome to the Snowmass on the Pacific meeting at the KITP.

The organizers thank Lars Bildsten and the KITP staff for giving us this opportunity to step out of the scientific program of the KITP for three days to talk about the future of High-Energy Physics.

High-Energy Physics is at a crossroads today:

We have seen:

- precise confirmation of the CKM model
- precise confirmation of the ΛCDM model
- discovery of the Higgs boson
- discovery of a large value of θ_{13}
- completion of Run 1 of the LHC

What comes next ?

Major planning exercises are now going on around the world:

Japan : Subcommittee on Future Projects in HEP
Europe : European Strategy for Particle Physics

In the US, there are two stages to our exercise:

Snowmass 2013 : organized by the APS DPF

community study, elucidation of physics opportunities

P5 Panel : organized by DOE and NSF

government panel, prioritization of projects

Here in the US, we are particularly challenged:

The major US-based collider experiments BaBar, CDF, DO have ended. The natural successors to these projects are based at accelerators overseas.

The US now has one national lab devoted to HEP. Its main resource is an intense proton source. What is this good for?

Hubble, Chandra, Fermi, and WMAP gave the US a strong presence in astrophysics and cosmology. What will replace them?

The physics event of 2012 was the discovery of the Higgs boson. Is the US in the game ?

In my personal opinion, these questions are part of a larger question:

Should we look at the US program in HEP as a national program or as a component of a global program ?

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It is often said that the answer to this question determines our priorities.

But, in fact, it is the other way around.

We must ask how to use our limited resources to best address the most pressing issues in physics.

The Snowmass process is about physics opportunities.

That is, physics goals come first.

Theorists claim to have a broad view of HEP, and to understand the goals of HEP from a high level.

To the extent that this is true, they should have an important role to play in formulating the results of the Snowmass study.

The organizers have tried to design this conference to channel information and opinions from theorists into the addressing the issues of Snowmass.

We have structured the meetings around classes of new physics models. For each class of models, we would like to ask:

What are the major open questions ?

How will experiments at each Frontier address these questions?

Many of the Snowmass conveners are here and will reflect the discussion at this conference in their reports. KITP will also record the talks and discussions.

We have also scheduled two broader discussion sections:

A discussion of "Theory Community Issues" - funding, grant evaluation, etc. - with Michael Dine, Simona Rolli and Keith Dienes. Michael chairs a panel devoted to these questions that will report to the APS DPF later this year.

A "Town Meeting" discussion of priorities for HEP. The organizers have invited Andre de Gouvea, Xerxes Tata, Mihoko Nojiri, and Lars Bergstrom to initiate the discussion. We would also appreciate your opinion as to the "Big Questions" that the field should address, and how to answer them.

Finally, I would like to describe the structure of the Energy Frontier study for Snowmass.

The physics topics for the study are divided among six working groups:

1. The Higgs Boson
2. Precision Study of Electroweak Interactions
3. Fully Understanding the Top Quark
4. The Path Beyond the Standard Model - New Particles, Forces, and Dimensions
5. Quantum Chromodynamics and the Strong Force
6. Flavor Mixing and CP Violation at High Energy

Many of the conveners of these groups are here.

The full set of conveners, and the lists of questions that they plan to address, can be found at:

http://www.snowmass2013.org/

click on “Energy Frontier”

Chip Brock and I have asked all of the groups to address the following broad questions:

I. What scientific targets can be achieved before 2018 ?

II. What are the science cases that motivate the High Luminosity LHC ?

III. Is there a scientific necessity for a "Higgs Factory" ?

IV. Is there a scientific case today for experiments at higher energies beyond 2030 ?

We all recognize that another, larger, question stands behind these.

Most theorists feel that the Standard Model is incomplete. But it works very well. Many searches for new particles and interactions, both a high and at low energies, have been conducted, with negative results.

So, where is the new physics ?

What have we learned from the LHC ? What is the best strategy now in the light of the LHC results ? How does the big discovery of the LHC, the Higgs boson, illuminate this story ?

Physics comes first; the strategy for the US program in high-energy physics should follow.

What strategy is called for by our understanding of the physics ?

I hope that it will be stimulating to debate this question over the next three days.