

SLAC HEP Retreat
Discussion of
Future e^+e^- Colliders:
Introduction

M. E. Peskin
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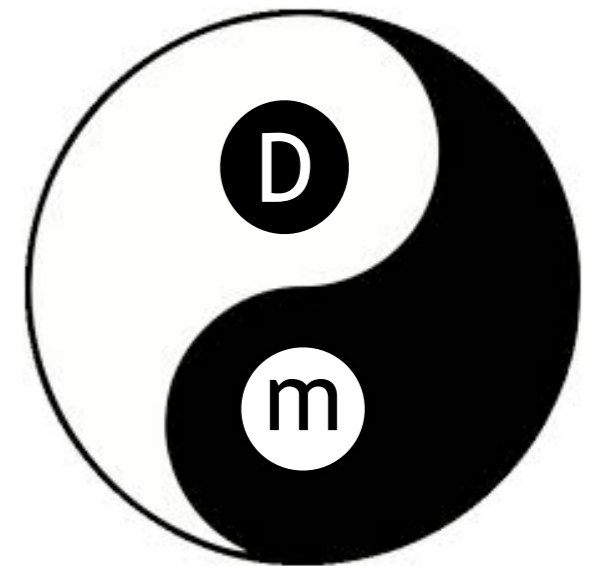
The Standard Model has two aspects: its **gauge symmetry** and the **symmetry breaking** due to the Higgs field.

Gauge symmetry is responsible for the successes of the SM throughout particle physics.

The mysteries of the SM

the spectrum of fermion masses
the origin of neutrino masses
the origin of CP violation

all are due to our lack of understanding of the Higgs field.



Okun (1981):
“Question #1”

We can directly attack this problem by measuring the couplings of the Higgs boson with high precision. With measurements of precision $< 1\%$, we can prove that the picture of the Higgs field in the SM is too simplistic, and we can gain clues as to its true origin.

This is the best opportunity to discover physics beyond the SM – and one that we have not started yet.

2020 update of the European Strategy for Particle Physics:

“An electron-positron Higgs factory is the highest-priority next collider.”

An e^+e^- collider to fully probe the Higgs boson will be built as a global project, with a cost similar to that of the LHC. Most likely, it will not be located in the US.

Still, this project would be a tremendous opportunity for SLAC.

We are the world leader in the technology and control of electron accelerators.

We are the world leader in detectors and experimentation at e^+e^- colliders.

If the e^+e^- Higgs factory goes forward, SLAC should lead the US effort – unless we drop the ball.

Plans for a global e^+e^- Higgs factory are very uncertain. There are different contending proposals. It is easy for multi-billion-\$ projects to be rejected.

We need a plan that manages this uncertainty.

- * Engage SLAC in a central way in the various global efforts
- * Scale up deliberately, allowing for options and off-ramps

Our plan can be grounded in the strong SLAC efforts in **ATLAS** and **LCLS-II**.

This plan will be the subject of this HEP retreat.

One more point:

To make any such plan possible, it is important that SLAC coherently support the US participation in a Higgs factory as a top priority at Snowmass.