

Theory Panel Comments - Eichten (Fermilab)

- Role of Theory: New Ideas, Resolve Mysteries, Detailed Predictions, Formal Developments, Training the New Generation of Physicists, ...
 - Much has changed in theory in the last 40 years. But theorists have adapted well.
 - Traditional role remains strong - Theorists look at the weakness of existing theory and propose new ideas to extend applicability or resolve problems.
 - Anticipatory phenomenology - Conceiving an experimental program and its possible implications in advance of the experiments or even the machines.
 - Rise of programmatic efforts in theory. Lattice, PQCD and Monte Carlo's. Absolutely essential to our field.
 - Lattice QCD - α_S , m_b , m_c essential to Higgs factories; CKM parameters, m_u and chiral symmetries.
 - Perturbative QCD and Monte Carlo's -- Modern collider searches for new physics depend critically on accurate SM predictions.
 - Physics of the Planck Scale. (Beyond the reach of colliders)
 - Gravity - String Theory
 - Cosmology and Early Universe
 - Dark matter and Energy
 - Help train the next generation of theorists/experimentalist

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- **Facilities - Universities, Labs, Centers:**

- Universities - Centers of learning. Spread the culture of particle physics not only by the courses taught but also by the intellectual energy brought to the departments and campuses. Research can interface with other areas of physics, mathematics, ...
- Labs - day to day interactions with experimentalists; large pools of postdocs and variety of interests -> continue the training of theorists. Programmatic areas have been centered at labs.
- Centers - NSF centers, KITP, ...: focussed extended workshops.

- **Issues:**

- Both lab and university have suffered budget cuts. For Fermilab - reduced postdocs, travel and seriously curtailed the visitor program.
- Redistribution of funds within DOE from research to projects (2+% per year) can't be recovered for theorist.
- For certain critical areas - (e.g. Lattice, IF, ...) The universities are not hiring enough young faculty and so the next generation of such theorists in doubt.