



EPP2010 Report

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May 16, 2005



EPP Decadal Survey

- U.S. National Academy of Science reviews each field of physics every ten years
- Most recent survey of Elementary Particle Physics was completed in 1998
- But since then, much has changed
 - Discovery of Dark Energy
 - Connections with Astronomy
 - Discovery of Neutrino Mass
 - Connections with Nuclear Physics
 - Precision Electroweak Measurements
 - World consensus on Linear Collider



EPP Decadal Survey

- A new Survey is needed to
 - Lay out the grand questions that drive the field
 - Find the opportunities that are ripe for discovery
 - Identify the tools to achieve the scientific goals
 - Articulate the connections to other sciences and to society at large
 - Foster collaborations with scientists around the globe
 - Recommend a realistic implementation plan



EPP2010 Charge

- The Committee is charged to
 - Identify, articulate, and prioritize the scientific questions and opportunities that define elementary particle physics
 - Recommend a 15-year implementation plan with realistic, ordered priorities to realize these opportunities
- Emphasis on ranking science priorities
 - For the Committee, the Linear Collider and support of LHC physics are dominant questions
 - What are the roles of neutrino physics, cosmology and astrophysics, underground laboratory?



Committee Members

- N. Augustine (Lockheed Martin)
- J. Bagger (JHU) BPA Liaison
- P. Burrows (London)
- S. Dawson (BNL) *Vice-Chair*
- S. Faber (UC Observatories)
- S. Freedman (UC Berkeley)
- J. Friedman (MIT)
- D. Gross (UC Santa Barbara)
- J. Hezir (EOP Group)
- N. Holtcamp (ORNL)
- T. Kajita (Tokyo)
- N. Lane (Rice)
- N. Lockyer (Penn)
- S. Nagel (Chicago)
- H. Quinn (SLAC)
- R. Patterson (Cornell)
- C. Shank (LBNL)
- H. Shapiro (Princeton) *Chair*
- P. Steinhardt (Princeton)
- H. Neal (Michigan)
- H. Varmus (MSK)
- E. Witten (IAS)



Not your Usual Committee

- Non-physicists
 - Strengthen our connections with society at large
 - Sharpen our physics questions
- Non-particle-physicists
 - Help us engage other scientific communities
- International representation
 - Place U.S. particle physics in an international context
- Overall goal: To present a compelling vision for our field and to create an action plan that will allow us to achieve our goals



Work Plan

- 1st meeting in Washington, Nov 30 - Dec 1, 2004
- 2nd Meeting at SLAC, Jan 30 - Feb 1, 2005
- 3rd Meeting at Fermilab, May 16 - 17, 2005
- 4th Meeting at Cornell, Aug 2 - 3, 2005
- Goal: Report by Dec, 2005

Also: Field trips to CERN, DESY, KEK, as well as letters to ACFA, ECFA and ICFA



Fermilab Meeting

- Fermilab
 - Accelerator-based program
 - R&D for the ILC and the path forward (Holmes)
 - Neutrinos at Accelerators (Feldman)
 - National Program (Witherell)
 - How to fit our aspirations in a modest budget



Fermilab Meeting

- Fermilab
 - International perspective: How to make national decisions in an international framework
 - Halliday (PPARC), Totsuka (KEK), Wagner (DESY)
 - Cosmology and Astrophysics (Kolb)
 - DPF Town Meeting



Cornell Meeting

- Cornell
 - Report from LHC/ILC Hepap subpanel
 - International perspective
 - CERN (Aymar)
 - GDE (Barrish)
 - DPF Town Meeting



Questions

- The Committee is posing questions to the community
 - First set: Linear Collider
 - Responses extremely useful: Questions are an effective tool
 - Answers from USLCSG, LHC/ILC study group, Grannis, Peskin...
 - LHC/ILC subpanel report will be important
 - Second set: Neutrinos, Astrophysics, Cosmology ...
- It invites written comments to epp2010@nas.edu
 - All communications are public. Click on
 - www.nationalacademies.org/bpa/EPP2010.html



ILC Questions: Physics Case

- How does a Linear Collider address the compelling questions of particle physics? Is a Linear Collider clearly the right machine to address these physics objectives?
- What physics does a 500 GeV Linear Collider address? What are the arguments for going to an energy scale of 1 TeV? How would results from the LHC change these arguments?
- What are the physics arguments for operating a Linear Collider during the same time frame as the LHC?
- How would the combination of the LHC and a Linear Collider answer questions that could not be addressed by either machine alone?
- What physics would a Linear Collider address that would be impossible to probe at the LHC?
- How would the physics discoveries from experiments at a Linear Collider be useful to other branches of science?



ILC Questions: R&D Plan

- What general R&D is required to arrive at a construction decision and about how much would it cost? What is the relative difference in R&D cost between a 500 GeV and a 1 TeV Linear Collider?
- What are the characteristic time frames and constraints for a R&D program that leads to a construction decision?
- What are the greatest technological risks?
- How would decisions about the necessity of different R&D paths be made?
- How could the R&D be useful even if the ILC did not proceed to implementation?
- Is it possible to give a reliable estimate of the overall cost of the project?
- Does the U.S. accelerator science community have the capacity and capability to do the work necessary to make a bid to host a Linear Collider?



ILC Questions: International Planning

- How would a Linear Collider be managed and operated in the context of an international laboratory?
- How can the U.S. funding mechanisms (with yearly budget decisions) connect with a long term international project?
- How would cost overruns be handled?
- What is the model for distributing the costs between the host country and other participants?
- What arguments can be made for hosting an International Linear Collider in the United States?



Questions, questions, questions

- More questions on neutrinos
- Cosmology, astrophysics
 - Science connections
 - Why should other fields care about high energy physics?



Final Report

- Aiming for December, 2005
- Roll-out at AAAS meeting in Feb, 2006
 - Plan to communicate our vision to physics community, government....
- Focus is on SCIENCE CASE for our future