



*U.S. Department of Energy  
and the  
National Science Foundation*



March 21, 2005

Professor Frederick Gilman  
Chair, HEPAP  
Carnegie-Mellon University  
5000 Forbes Avenue  
Pittsburgh, Pennsylvania 15213

Dear Professor Gilman:

We wish to congratulate you on the widely successful *Quantum Universe* report that with clarity and elegance expresses the great discovery opportunities in particle physics today. It has made a positive impact in Washington, DC, in the Nation, and abroad in conveying the drivers of the coming scientific revolution. As funding agencies and advisors of the Nation's research portfolio in this field, our ability to bring clarity and focus to outstanding scientific issues is an important responsibility. You have succeeded well with *Quantum Universe*.

This brings us to the following. The successful outcome of the International Technology Recommendation Panel, in coming to a clear technology recommendation, was a significant step toward a future Linear Collider. We now ask for your help in addressing another important issue in program planning and public communication. We need to explain clearly to the broad non-scientific community the need for a second large particle accelerator in addition to the Large Hadron Collider (LHC). Inevitably, the question arises as to how a less energetic electron accelerator would work in tandem with a higher energy proton machine in exploring the energy frontier. How would these two accelerators complement one another? What crucial scientific discoveries might not be made without the LC?

To educate us and the public, and to clarify the matter more generally, we would like HEPAP to form a committee to write a document that addresses the following:

- In the context of already known physics, i.e. our current understanding of the electroweak symmetry breaking sector, what are the synergies and complementarities of these two machines? How would an LC be utilized in understanding a Standard Model Higgs, or whatever fulfills its role in the electroweak interaction?
- In the context of physics discoveries beyond the Standard Model (supersymmetry, extra dimensions or other new physics) that are assumed to be made at the Tevatron or early at the LHC, what would be the role of a TeV Linear Collider in making additional and unique contributions to these discoveries, in distinguishing between models, and in establishing connections to cosmological observations?

You may assume that the LHC will be operating over a 15-20 year timeframe with likely upgrades.

We are not asking for any new physics or simulation studies. As you know, there is by now a rather large body of work on this subject. Rather, we are asking for your help in distilling this body of work into a crisp, accessible, and persuasive case. The deliverable should be a short document (10 pages), accessible to knowledgeable non-experts (e.g., members of the EPP2010 Study, OSTP/OMB staff and ourselves). We ask that the report be completed as soon as practical but no later than summer 2005.

Finally, to further educate us as well as giving us an opportunity to refine the charge in conjunction with the committee that you appoint, we would suggest a half-day session at an upcoming HEPAP meeting devoted to this topic.

Sincerely,



Robin Staffin  
Associate Director  
Office of High Energy Physics  
Office of Science  
U.S. Department of Energy



Michael Turner  
Assistant Director  
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