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Dr. Robin Staffin
Associate Director
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Office of Science
Department of Energy

Dr. Tony Chan
Assistant Director for Mathematical and Physical Sciences
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Dear Robin and Tony:

I am writing to summarize the meeting of the High Energy Physics Advisory Panel (HEPAP) held in Washington on February 22-23. We heard status reports on a number of studies currently being carried out as well as three presentations on space-based stage-IV dark-energy experiments. An important agenda item was the International Linear Collider (ILC) Reference Design Report (RDR).

We first heard from Joe Dehmer, who reviewed the successes of the past year, including CLEO, ICE CUBE, progress on DUSEL, the LHC experiments, and LIGO. HEPAP was pleased to hear about the significant increases in the NSF Physics Division budgets in both FY07 and FY08, including increased funding of theory.

Tony Chan made his first presentation to HEPAP since becoming NSF Assistant Director for Mathematical and Physical Sciences. We are delighted by the proposed 8% increase in the MPS budget in FY08. Of particular note is the start for Advanced LIGO. Site selection for DUSEL is currently being carried out by the S3 committee. HEPAP supports the DUSEL planning but is concerned about the MPS budget having to absorb DUSEL operating costs. We hope that the NSF Director can increase the budget to help cover operations because of the scientific promise of the DUSEL experiments. We also recommend that the site selection committee work with Fermilab to understand the feasibility of aiming a high-intensity neutrino beam from Fermilab to each of the proposed DUSEL sites, and that the committee learn from NUSAG whether there are significant differences in the neutrino physics capabilities of the candidate sites.

Robin Staffin reported on the President's FY08 budget for the DOE Office of High Energy Physics. When the Basic Energy Sciences (BES) support for the SLAC linac is included, the increase compared to the proposed FY07 budget is 3.5%. However the FY07 continuing resolution provides only \$3.8B for the Office of Science, down from the proposed \$4.1B. The impact of this on the OHEP budget is not yet clear. In FY08, ILC R&D moves to a project management structure with individual leaders for each of 11 WBS categories. In addition to ILC R&D, there is support of generic superconducting RF R&D in recognition of the broad applicability of this technology. Robin compared the P5 recommendations to the FY08 budget that was assembled before the P5 submission.

The agreement is very good, with increased FY08 funding for the energy-frontier projects, starts for NOvA, Daya Bay, and DES, and a CDMS upgrade being considered for FY09. In response to a question, Robin reported that the Daya Bay review committee concluded that the experimental goals could be reached.

Ray Orbach reported that as a result of the President's American Competitiveness Initiative, there is a large increase in the budget of the Office of Science for FY08, 7.2% compared to the proposed FY07 budget. Moreover, the core research budget is beginning to return to the desired 50% level. Ray then addressed the long-term health of the HEP program. He noted the completion of the Tevatron and PEP-II programs in the next few years, the opening of the Terascale at the LHC, and the release of the GDE's Reference Design Report. The ILC has great scientific promise, but the date it would start operation is uncertain. It is thus imperative that the rest of the program be optimally designed. Following Ray's remarks, Abe Seiden reviewed the P5 recommendations and their relation to a specific ILC start date.

HEPAP reiterates its support of the scientific program outlined in the P5 report, which gives high priority to ILC R&D and recommends a broad program of experiments to answer many of the most important questions in the field. It suggests dates for program reviews when we expect to have significant new information, the first of these to be held two to three years from now. It is important that the R&D and planning necessary for effective reviews be carried out. The program recommended by P5 will yield important scientific results about the energy frontier, dark energy, dark matter, and neutrino properties through at least 2020. We note that the success of the P5 program depends on significant budget increases in FY10 and FY11. The same total investment, with growth coming steadily rather than abruptly, would yield a stronger program. HEPAP looks forward to continue working with the agencies on the best strategy for a healthy elementary particle physics program.

Barry Barish described the RDR process which started from the science requirements and then produced a reference design that determines the cost scale of the project. The RDR will enable a careful prioritization of the R&D program. Barry described the great physics reach of the ILC and presented the cost estimate, which has now been vetted twice. The GDE used 6 months to do a thorough cost-performance optimization which resulted in a 25% reduction in cost while retaining the full physics reach. The next steps are an international cost review and continued R&D and engineering design in which further cost reductions are possible.

HEPAP is very impressed by the Reference Design Report. It is a major step toward realizing the ILC with its enormous scientific promise. It is imperative that the R&D and engineering be carried out as effectively and efficiently as possible. Toward this end, HEPAP encourages the GDE to establish a coordinated international R&D program based on international agreements to provide an engineering design by 2010. HEPAP urges DOE and NSF to aid in this by working together with laboratories and sister agencies in potential ILC partner countries. Success in realizing this intermediate objective will be a major step toward the needed full internationalization of the construction project.

Usha Mallik described the demography survey that has been in place for a number of years to determine trends in the career paths of young particle physicists. There has been a significant increase in the survey response rate since the funding agencies started sending out an annual request for this information. An important change underway is adding identifiers in the data base so that individual careers can be tracked. HEPAP appreciates the importance of regular and accurate demographic information.

Since the study of dark energy is becoming an increasingly important element of the HEP program, we have begun a series of educational presentations on possible stage-IV projects. At this meeting, we heard from the three JDEM mission concepts. The presentations were excellent scientific primers. For all dark-energy experiments, control of systematic uncertainties is critical. We heard how each team will address these issues. The Dark Energy Task Force stressed the importance of using multiple techniques to minimize the overall systematic uncertainty. Each of the three proposals employs at least two.

Saul Perlmutter described the SNAP detector which would observe approximately 2000 type Ia supernovas out to a redshift of 1.7 and study weak lensing with a 4000 square degree survey. Charles Bennett described the capabilities of the ADEPT experiment which would study baryon acoustic oscillations with a survey of 100M galaxies with redshift between 1 and 2, and approximately 1000 type Ia supernovas with redshift between 0.8 and 1.3. Dominic Benford presented the DESTINY concept, a near-infrared detector designed to carry out a supernova survey over 3 square degrees and a 1000 square-degree weak lensing survey.

Bill Molzon presented HEPAP's midterm assessment of the DOE long-range goals. The report, which was transmitted to the agency in December, concluded that excellent progress is being made toward almost all of the goals. The exception is the confirmation or exclusion of the LSND neutrino result. It is not yet clear whether the MiniBooNE experiment will have sufficient sensitivity.

We heard status reports from three ongoing HEPAP subpanels. Jon Bagger reported on the work of the University Research Subpanel. Its written report will be ready for HEPAP review prior to the next meeting. Steve Elliott reviewed the science and draft conclusions of the Dark Matter Scientific Advisory Group. The comments of HEPAP members, all relatively minor, had been forwarded to the committee prior to this meeting. At the suggestion of the Astronomy and Astrophysics Advisory Committee, the next step will be an external review. If the revised report has no substantive changes, we will vote on approval via email. If there are substantive changes, a presentation will be made at the July HEPAP meeting.

The last report, given by Peter Meyers, described the ongoing work of the Neutrino Scientific Advisory Group (NUSAG). Peter gave a pedagogical description of the signal and background processes for both the off-angle and wideband options. Needed sensitivity information from the BNL/Fermilab Study Group will be available shortly, after which the NUSAG draft report will be completed. HEPAP will consider it at its summer meeting.

The next HEPAP meeting will occur on July 13-14. At that time we will have the final reports from NUSAG and the University Research Subpanel. I also expect presentations on the DUSEL site selection, ILC R&D and engineering, and ground-based stage-IV dark-energy experiments.

Sincerely,



Melvyn J. Shochet
Chair, High Energy Physics Advisory Panel