Appendix A: Charge Letter from Jim Decker

Department of Energy

Washington, DC 20585

June 13, 2000

Professor Frederick J. Gilman
Department of Physics
Carnegie Mellon University
Pittsburgh, PA 15213

Dear Professor Gilman:

In 1998, the High Energy Physics Advisory Panel unanimously endorsed the report of its Subpanel on *Planning for the Future of U.S. High-Energy Physics*. The plan for the next decade that was set forth in this report has provided the guiding principles and detailed recommendations that the Department of Energy (DOE) has been using in its planning of the program. The report strongly endorsed U.S. participation in the Large Hadron Collider at CERN under joint support and collaboration by DOE and the National Science Foundation (NSF).

Since the 1998 Subpanel Report was prepared, many events have occurred that affect the guidance provided. The Main Injector at Fermilab and the B-factory at the Stanford Linear Accelerator Center have been completed and successfully commissioned, the Cornell Electron Storage Ring upgrade is essentially complete, and significant further R&D has been completed on possible future machines at the energy frontier. Important physics developments have occurred, including evidence that neutrinos have mass. In addition, there have been two fiscal years where the DOE high-energy physics budget has been below the constant-level-of-effort scenario under which the 1998 plan was prepared.

The purpose of this letter is to request that the High Energy Physics Advisory Panel (HEPAP) give the DOE and NSF additional guidance that takes into account these developments and to propose a step-by-step process that will culminate by the end of 2001 in a comprehensive planning document. This study is to be conducted with the full participation of the NSF and to receive broad input from the high-energy physics community.

I envision a two-step process to reach the goal of a comprehensive plan:

Step I:

HEPAP should proceed to produce a White Paper that updates the 1998 Subpanel Report and provides important input for Step II below. The White Paper should in particular: (1) examine the issues of the discovery potential and optimum utilization of the facilities that have now been completed and upon which the Subpanel placed its highest priority; (2) identify the major scientific issues confronting high-energy physics worldwide, and outline a timeline for R&D, design, and possible decision points on the future frontier facilities that will be capable of addressing those scientific issues; and (3) indicate the appropriate next steps for each of these facilities.

It would be helpful if this White Paper could be approved by HEPAP at its fall 2000 meeting.

Step II:

In early 2001, a formal HEPAP Subpanel should be constituted, in concert with the NSF, with membership commensurate to its demanding charge. This future Subpanel, which would include international participants, would use the information generated in Step I, plus additional information gathered from the U.S. high-energy physics community as well as various sources outside the U.S., to formulate a comprehensive long-range plan for the field. An integral component of this input will be a Snowmass type workshop, currently under consideration by the American Physical Society Division of Particles and Fields, or its equivalent. Such a workshop is scheduled for the summer of 2001. It will allow the high-energy physics community to study in depth the physics possibilities, goals, and technical issues of new large facilities, and to make a broad assessment of the field of particle physics as a whole. Since this workshop will provide a solid technical and physics basis for planning, it should be attended by appropriate Subpanel members as part of the extensive data gathering process that the Subpanel will necessarily have to conduct to fulfill its charge. To receive maximum benefit a few members should attend the entire workshop.

A complete charge letter for this second step of the process will be sent to HEPAP later this year. We envision the Subpanel's long-range plan would be submitted to DOE and NSF by fall of 2001.

If you have any questions about this charge, please feel free to contact Peter Rosen, Joe Dehmer, their staffs, or me. The advice of HEPAP is essential to maintaining a world class high-energy physics program, and the agencies very much appreciate your efforts.

I wish to report to you that DOE and NSF are seriously discussing joint agency sponsorship of HEPAP. It may well be that the formal charge to the Subpanel will come from both agencies jointly. Although this possible change is not directly relevant to the work of the Subpanel, we will keep HEPAP and the Subpanel fully informed.

Sincerely,

James F. Decker
Acting Director
Office of Science

cc:
Joseph L. Dehmer, NSF
Marvin Goldberg, NSF
John R. O'Fallon, DOE
S. Peter Rosen, DOE

Appendix B: Letter to the Community from Fred Gilman

Message to members of the American Physical Society's Division of Particles and Fields, authorized by Catherine Newman-Holmes, Secretary/Treasurer, DPF.

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Dear Colleagues,

It is essential that the high-energy physics community continue to provide a clear, well-formulated vision of its present and future to the Executive Branch, the Congress, and the general public. Since the report of the HEPAP Subpanel, "Planning for the Future of U.S. High-Energy Physics," was presented and unanimously adopted by HEPAP in 1998, a good deal has happened. The Main Injector at Fermilab and the B-Factory at SLAC have been completed and very successfully commissioned, and the Cornell Electron Storage Ring upgrade is essentially complete. Important physics discoveries have been made and significant R&D and other studies have been done on future facilities at the energy frontier. Last, but not least, we have had two fiscal years where the DOE high-energy physics budget was below the constant-level-of-effort scenario under which the 1998 plan was prepared.

At the HEPAP meeting in March at Fermilab, Peter Rosen, Associate Director for High Energy and Nuclear Physics of the DOE Office of Science, asked that HEPAP provide intermediate-term guidance in the form of a White Paper, based on the plan for the field contained in the report of the Subpanel. I have now received a letter from James Decker, acting Director of the DOE Office of Science, containing the charge to HEPAP. It places the White Paper in a significantly larger context.

First, the NSF is now a partner in the process. More generally, there is support at high levels in the DOE and NSF for having HEPAP itself report to both agencies, and discussions have begun about how this might be implemented. Joint support by the DOE and NSF was very important in obtaining U.S. participation in the LHC. I believe that it is critical to support for the field in the longer run to have both the DOE and NSF standing together with regard to the importance of our science and in planning its future.

Second, the White Paper is but one step in a comprehensive planning process that would receive broad input from the high-energy physics

community. Information gathered in the process of developing the White Paper, along with Snowmass 2001, will be part of the input to a HEPAP subpanel planned to be formed in early 2001. The White Paper itself is aimed at updating the 1998 Subpanel Report and in particular to "(1) examine the issues of the discovery potential and optimum utilization of the facilities that have now been completed and upon which the Subpanel placed its highest priority; (2) identify the major scientific issues confronting high-energy physics worldwide, and outline a timeline for R&D, design, and possible decision points on the future frontier facilities that will be capable of addressing those scientific issues; and (3) indicate the appropriate next steps for each of these facilities." It is hoped that the White Paper could be approved by HEPAP at its fall 2000 meeting.

Therefore, I have asked a subset of the people who were on the last Subpanel to join me as a "writing group" to produce a draft of the White Paper. They are Sekhar Chivukula, Gerry Dugan, Paul Grannis, Steve Holmes, Ewan Paterson, Abe Seiden, and Marjorie Shapiro. The members of this group aim to attend the sessions being organized to discuss the White Paper issues. They will also gather additional input through documents that are submitted to them and invited presentations.

We want to get as much input from the community as possible in this process. This can be done by letter (to me at the Department of Physics, Carnegie Mellon University, Pittsburgh, PA 15213) or by email (to gilman@cmuhep2.phys.cmu.edu) on the issues facing us. In addition, we plan to have sessions organized at the Fermilab Users meeting in the afternoon of June 27th, at the SLAC Users Meeting in the afternoon of July 7th, and at the DPF Meeting at Ohio State University on August 9th, where the status and future of the field can be presented and discussed.

The organizers of the Users meetings are soliciting short presentations from their members.

I look forward to hearing from you.

Regards,

Fred Gilman
Chair, HEPAP

Appendix C: Agenda for the Fermilab Users Meeting

The Annual Fermilab Users Meeting 2000
June 27, 2000
The HEPAP White Paper Session

2:05 p.m.	Fred Gilman (Carnegie Mellon/HEPAP Chair)	Introduction
2:15 p.m.	Rick Van Kooten (Indiana)	Physics at a Linear Collider
2:45 p.m.	Debbie Harris (Fermilab)	Physics at a Muon Storage Ring/Neutrino Source
3:15 p.m.	Break	
3:30 p.m.	Frank Paige (Brookhaven)	Physics at VLHC
4:10 p.m.	Bill Foster (Fermilab)	5 Minute Presentations from Users-Input to HEPAP
	Alvin Tollestrup (Fermilab)	
	Regina Demina (Kansas State)	
	John Womersley (Fermilab)	
	Tacy Joffe-Minor (Argonne)	
	Mike Albrow (Fermilab)	
	Dick Gustafson (Michigan)	
	John Krane (Iowa)	
	Riuji Yamada (Fermilab)	
5:05 p.m.	C. Quigg (Fermilab)	Snowmass 2001

Appendix D: Agenda for the SLAC Users Meeting

The Stanford Linear Accelerators Centers Users Organization Annual Meeting
July 7, 2000
The HEPAP White Paper Session

2:40 p.m.	Fred Gilman (Carnegie Mellon/HEPAP Chair)	The HEPAP White Paper Process
3:00 p.m.	Rick Van Kooten (Indiana)	Physics at a Linear Collider
3:45 p.m.	Debbie Harris (Fermilab)	Physics at a Muon Storage Ring/ Neutrino Source
4:15 p.m.	Frank Paige (Brookhaven)	Physics at a VLHC
4:45 p.m.	Questions & Answers	
5:00 p.m.	Michael Peskin (SLAC)	5 Minute Presentations from Users-Input to HEPAP
	Homer Neal (Yale)	
	Steve Rock (SLAC)	
	Uriel Nauenberg (Colorado)	
	Jim Brau (Oregon)	
	Phil Burrows (Univ. of Oxford)	
	Nan Phinney (SLAC)	

5:00 p.m.	Tor Raubenheimer (SLAC)
	Tracy Usher (SLAC)
	Mike Woods (SLAC)
	Stan Hertzbach (Massachusetts)
	Valery Telnov (DESY)

Appendix E: Writing Group Agenda at UCLA

"White Paper" Writing Group
18-20 July 2000
UCLA Faculty Center
Tentative Agenda

Tuesday July 18

4:30pm	Prospects for Cosmology/Astroparticle Physics	J. Siegrist
5:30	Adjourn	

Wednesday July 19

9:00am	Introduction	F. Gilman
9:10	Prospects for New Particles and Interactions	B. Dobrescu
9:40	Prospects for SUSY	J. Bagger
10:10	Break	
10:30	Prospects for CP Violation and Rare Decays	M. Neubert
11:30	Prospects for Neutrinos	R. Shrock
12:30	Lunch	
1:30pm	Progress and Plans for VLHC R&D	P. Limon
2:15	Discussion	
2:30	Progress and Plans for Linear Collider R&D	D. Burke
3:15	Discussion	
3:30	Break	
3:45	Progress and Plans for Muon SR/Collider R&D	A. Sessler M. Zisman
4:30	Discussion	
6:00	Dinner	TBA

Thursday July 20

9:00 am	Prospects for Electroweak Physics (incl. Higgs)	W. Marciano
10:00	Executive Session	
12:00	Lunch	
1:00 pm	Executive Session	
4:00	Adjourn	

Appendix F: Agenda for the DPF Town Meeting

Town Meeting
Wednesday, August 9 at 7:30 p.m.
McPherson Lab, Room 1000
Ohio State University
Columbus, Ohio

15’	Fred Gilman (Carnegie Mellon)	HEPAP Planning Process
15’	Mike Turner (Chicago)	NRC Committee on Physics of the Universe
15’	Jonathan Dorfan (SLAC)	Perspectives on the Future of HEP
15’	Maury Tigner (Cornell)	Perspectives on the Future of HEP
15’	Mike Witherell (Fermilab)	Perspectives on the Future of HEP
5’	Gail G. Hanson (Indiana)	5 Minute Presentations from Users-Input to HEPAP
5’	Tor Raubenheimer (SLAC)	
5’	John Krane (Iowa State)	
	Open Discuss	

Appendix G: Writing Group Agenda at the DPF Meeting

Wednesday, August 9th
Smith Lab 4079
Ohio State University
Columbus, Ohio

3:00 p.m.	Organization and Review	Gilman
3:30 p.m.	Perspectives on the Future of HEP	Witherell
4:00 p.m.	Perspectives on the Future of HEP	Tigner
4:30 p.m.	Physics of the Universe	Turner
5:00 p.m.	Discussion	
6:00 p.m.	Adjourn	
7:30 p.m.	Town Meeting (in McPherson Lab 1000)	

Thursday, August 10th
Smith Lab 4079

8:30 a.m.	Executive Session	
9:00 a.m.	Perspectives on the Future of HEP	Dorfan
9:30 a.m.	Discussion: UCLA synopsis and "convergence"	Gilman
10:00 a.m.	Break	
10:15 a.m.	Writing Assignments Format of White Paper Schedule	Gilman
12:00	Adjourn	

Appendix H: Implementation of Other 1998 Subpanel Recommendations

The 1998 HEPAP Subpanel formulated its plan for the future of U.S. high-energy physics primarily in the form of a series of recommendations. The highest priority recommendation concerning utilization of the facilities then being built was discussed in Section III; the recommendation on funding university research was reviewed in Section IV; and the recommendation concerning R&D for future frontier facilities was re-evaluated in Section V. Many of the other recommendations of the 1998 report have been, or are being, implemented as part of that plan and are discussed in this appendix.

- The 1994 HEPAP Subpanel recommended, and the 1998 Subpanel reaffirmed, that the U.S. should join with other nations in constructing the Large Hadron Collider (LHC) at CERN. It is encouraging to see this major Subpanel recommendation being successfully implemented. We are now in the middle of the LHC project, with the R&D phase finished. As we enter fully into the production phase, the U.S. LHC effort, which is integrated into a worldwide collaboration building the both major detectors ATLAS and CMS, and the accelerator, is staying within budget and retaining project contingencies. The U.S./CERN and NSF/DOE partnerships are working well.

U.S. participation in building some of the LHC superconducting magnets has not only given scientists and engineers in this country the opportunity to make crucial contributions to the LHC, but has enabled the U.S to develop the main enabling technology for future hadron colliders after the termination of the SSC. The physics case for the LHC remains strong. Further studies have refined and expanded the case that the LHC should be able to provide evidence as to the origin of the masses of the elementary particles (the nature of electroweak symmetry breaking). If they lie within its energy reach, the LHC should be able to discover and elucidate aspects of many other possibilities of physics that go beyond the Standard Model, such as supersymmetry.

- With the change in primary function of the AGS accelerator at BNL from supplying beams to high-energy experiments to being an injector into RHIC, the 1998 Subpanel was directly charged with making a recommendation on the future of the AGS fixed-target program. That recommendation, to curtail that program, with designated periods for finishing up the two flagship experiments, has been carried out by the DOE. The Subpanel also recommended that after that, "*the possibility be held open for running at most two concurrent experiments that compete within the national program and use the unique AGS beams to particular advantage*." This recommendation is also being implemented.

- One of the major discoveries in particle physics in the last few years has been the evidence from the SuperKamiokande experiment that neutrinos have mass and can oscillate from one type to another. The 1998 Subpanel's report, issued just before the first conclusive data were reported, and while endorsing the long-baseline neutrino oscillation program at Fermilab, asked for a careful evaluation of the "*configuration of*

the NUMI/MINOS facility at Fermilab in light of results becoming available" and that "*the role of the short-baseline COSMOS experiment be reviewed"*. After a review by the Fermilab management, the energy of the NUMI neutrino beam was changed to optimize the potential physics, given the SuperKamiokande results. The proposed COSMOS experiment was withdrawn. The MiniBooNE experiment has been approved to resolve the important question of possible oscillations of muon-type to electron-type neutrinos. As this report was being prepared, the DONUT experiment at Fermilab observed the tau neutrino, the last of the six quark and six lepton fundamental building blocks of the Standard Model to be found.

There has been a worldwide burst of activity in this area. Ideas for large future facilities are being envisaged in the U.S., such as a new deep-underground laboratory for neutrino (and other) experiments and muon storage rings (see Section V) that would be intense sources of neutrinos for third generation, very long-baseline experiments. The exploration and mapping of the set of possible future experiments and the physics promise that has emerged in the area of neutrino physics will likely be an important component of the Snowmass 2001 workshop.

- The 1998 Subpanel recommended a strengthened non-accelerator component in the U.S. high-energy physics program, and this has taken place. Indeed, the appreciation of the role of non-accelerator experiments has grown even since the Subpanel. Both members of the high-energy community and the general public are intrigued by questions at the interface of particle physics and cosmology, and many of them can be addressed by non-accelerator experiments. The effort that resulted in the *"Connections"* briefing document (http://www.quarkstothecosmos.org) that envisages a DOE, NSF, and NASA partnership in this area is an exciting and novel development, and we look forward to the report of the NRC committee chaired by Michael Turner that will follow along the same lines. Non-accelerator experiments form a broad and exciting area of continued growth, which would benefit from the collective work and wisdom of the community at Snowmass 2001.

Appendix I: DOE Funding for High Energy Physics

The Drell Subpanel report recommended a 'bump' in HEP funding for three years starting in FY1996 to implement a program that fully utilized domestic facilities, enabled U.S. participation in the LHC, and allowed the needed accelerator research and development to create a strong U.S. role in future facilities. Unfortunately, the 'Drell bump' was not realized. A strong commitment to the LHC program was achieved through major commitments by DOE and NSF, but this came in part through reductions in the support for the ongoing DOE domestic program.

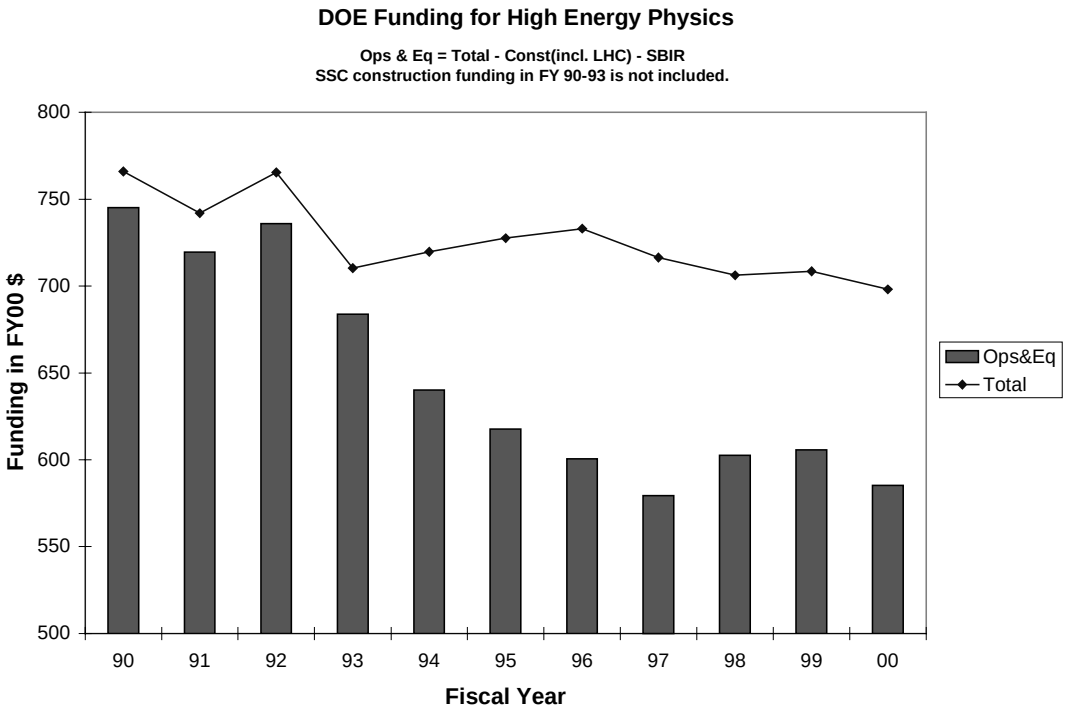

Figure 1

The Gilman Subpanel based its recommendations on a constant level of support, making room for new initiatives through curtailment of older parts of the program. Again, the reality has been different, as shown in Fig. 1. In this figure, both the Operations & Equipment expenditures and the total funding (including construction funds) are shown corrected for inflation; though the LHC funds are technically accounted for as Facility Operations, they have been included here as construction. The SSC funding in FY90 – FY93 has not been included, thus showing anomalously low construction funding in the early years. One sees a continual decline in the overall funding, by about 10% since 1992. The operations and equipment funding has declined in the same period by 25%. The impact of these reductions is exacerbated by the fact that market driven salaries of technical personnel at the laboratories have risen faster than overall U. S. inflation.

These declines have had a major impact upon the program. The PEP-II B-factory at SLAC and the Main Injector construction projects were completed in the past year, but without an increase in operating funds after the close of construction funds. There are insufficient funds to adequately exploit the new opportunities, or to retain the technical staffs needed to operate them. Since 1993, construction funds for new initiatives, including the LHC, have been wholly funded through reductions in the operating sector of the budget, at a yearly average level of about $100M per year. *The lack of funds to adequately operate the new facilities is the most serious present problem for the field.*

The U.S. funding for HEP can be compared with that in Europe, which has a comparable base of GNP and of scientists. The yearly funding level for the two major European HEP laboratories is roughly double that for the two major HEP laboratory programs in the U.S. Additional sources of funding in Europe from the agencies in each country outstrip the remainder of the U.S. program funding for the universities and other laboratories.

An important consequence of the declining DOE HEP budgets is that the U.S. funding for R&D on future accelerators that both seeds future projects in high energy physics and enables new initiatives in other areas of science and technology has been inadequate. This aspect of the budget is critical, since the future facilities are very large and innovative. Thus, cost-effective technologies must be developed. The portion of the U.S. HEP budget devoted to R&D on these enabling technologies is substantially below the level required for the U.S. to remain a world leader in the field. This issue is addressed in Section V.