

HEPAP meeting summary EPP2010 report March 3,4 2006

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Guy Wormser , HEPP EPS board, May 19
2006

Talk outline

- What is HEPAP
- Report of HEPAP session of March 3-4
- EPP2010 report
- Some suggestions
- Conclusions



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Reminder : What is HEPAP?

- Scientific committee advisory to DoE and NSF, ie US Government
- Ruled by very formal guidelines applying to experts committees reporting to US government (formal swear-in of US members, only open sessions...)
- The importance of This March 3,4 session
 - First session of the new committee after 1 year
 - New chair : Melvin Shochet (Fermilab)
 - 20 members including 1 European and 1 Japanese member (acting as full members)
 - " You will be asked to represent the views and perspectives of European Countries with significant involvement in High energy physics research based upon your past knowledge of, affiliations with, or research activities with these entities"
- How does HEPAP function
 - Many subcommittees(P5, NUSAG, Dark energy,..) (that are entitled to closed sessions)
 - HEPAP endorses (or not) their reports and transmits them with recommendations to DoE and to NSF



HEPAP March 3-4 Meeting

- <http://www.science.doe.gov/hep/agendamarch2006.shtm>
- Exceptionnal participation of :
 - Ray Orbach, Jack Marburger, A. Bement
- Many interesting reports of direct interest to particle physicists in Europe
 - P5 (BABAR, D0)
 - Physicist ressources (LHC/CDF/D0)
 - NUSAG (Double Chooz, Nova)
 - ILC/LHC
 - Dark matter (SNAP)



Agenda

- Remarks from the Director, DOE Office of Science [R. Orbach](#)
- Remarks from the Director, President's Office of Science and Technology Policy [J. Marburger](#)
- Remarks from the Director, National Science Foundation [A. Bement](#)
- ILC/LHC Report [H. Murayama](#)
- DOE FY 2007 Budget [R. Staffin](#)
- NSF FY 2007 Budget [J. Dehmer](#)
- NuSAG Report [P. Meyers](#)
- Presentation by U.S. Double-Chooz Collaboration [R. Svoboda](#)
- P5 Report [A. Seiden](#)
- Physicist Resources Report [J. Whitmore](#)
- Fermilab response to Physicist Resources Report [J. Butler](#)
- P5, NuSAG, and Dark Matter charges [M. Shochet](#)
- Dark Energy Task Force [R. Cahn & G. Bernstein](#)



American Competitiveness initiative

- Announced by President Bush during his main speech in February 2006
- <http://www.whitehouse.gov/stateoftheunion/2006/aci/aci06-booklet.pdf>
- Promotes American competitiveness thru **development of physical sciences**
- **DOUBLES DoE Office of Science and NSF budget over next 10 years.**





This \$5.9 billion ACI includes \$1.3 billion in new Federal funding and an additional \$4.6 b in R&D tax incentives. Specifically, the ACI:

- *Doubles*, over 10 years, funding for innovation-enabling research at key Federal ag that support high-leverage fields of physical science and engineering: the National Science Foundation, the Department of Energy's Office of Science, and the Nation Institute for Standards and Technology within the Department of Commerce;

Ray Orbach, very supportive of ILC

- US wants « order of magnitude leadership »
- « ITER, template for the future »:
« Snowmass/ Physag/Academy of Science/Lehman review, exemplary process »
- « US expresses interest to host ILC in the US »



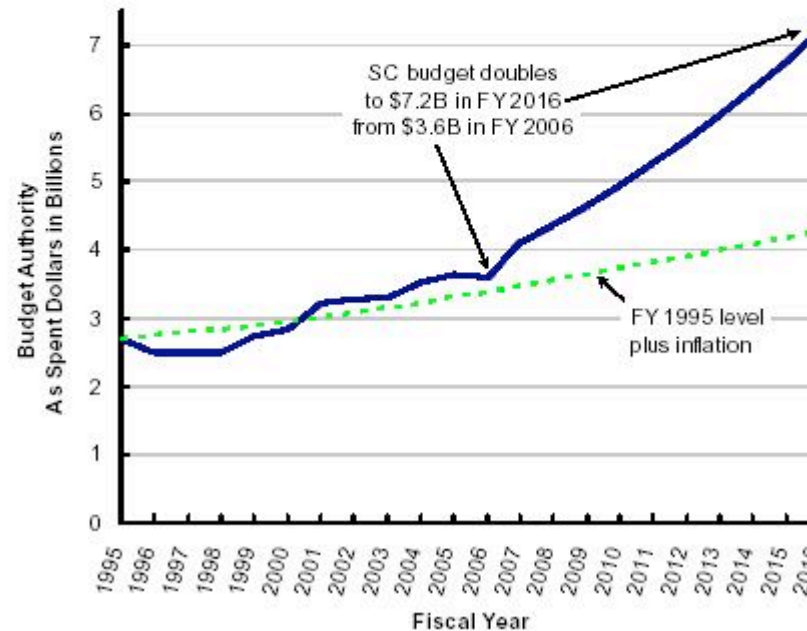


Office of Science

The FY 2007 President's Request for SC funding is a 14.1% increase and sets SC on a path to doubling by 2016

An historic opportunity for our country – a renaissance for U.S. science and continued global competitiveness.

**Office of Science Budget
Doubling from FY 2006 to FY 2016**



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Office of Science +14%, HEP +7,8%

U.S. Department of Energy



Office of Science

Office of Science FY 2007 Congressional Budget Request

	(dollars in thousands)			
	FY 2005 Approp.	FY 2006 Approp.	FY 2007 President's Request	FY 2007 vs. FY 2006
Basic Energy Sciences.....	1,083,616	1,134,557	1,420,980	+286,423
Advanced Scientific Computing Research.....	226,180	234,684	318,654	+83,970
Biological and Environmental Research				
Base program.....	487,474	451,131	510,263	+59,132
Congressionally-directed projects.....	79,123	128,700	—	-128,700
Total, Biological and Environmental Research.....	566,597	579,831	510,263	-69,568
High Energy Physics.....	722,906	716,694	775,099	+58,405
Nuclear Physics.....	394,549	367,034	454,060	+87,026
Fusion Energy Sciences.....	266,947	287,644	318,950	+31,306
Science Laboratories Infrastructure.....	37,498	41,684	50,888	+9,204
Science Program Direction.....	154,031	159,118	170,877	+11,759
Workforce Development for Teachers and Scientists.....	7,599	7,120	10,952	+3,832
Small Business Innovation Research/Technology Transfer.....	113,621	—	—	—
Safeguards and Security.....	67,168	68,025	70,987	+2,962
Subtotal, Science.....	3,640,712	3,596,391	4,101,710	+505,319
Use of prior year balances.....	-5,062	—	—	—
Total, Science.....	3,635,650	3,596,391	4,101,710	+505,319*

J. Marburger's talk

- « Time to correct the growing imbalance between biology and physical science »

The ACI improves conditions for many if not all areas of physical science, but emphasizes fields likely to produce economically important technologies in the future. These are not difficult to identify, and all developed countries recognize their importance. Chief among them is the continued exploitation of our recent ability to image, analyze, and manipulate matter at the atomic scale. New technologies can be expected to spring from improved atomic-level understanding of materials and their functional properties in organic as well as inorganic systems. Physicists see exciting prospects for technologies based on quantum coherence. Chemists envision industry-transforming catalysts and



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Marburger (suite)

diminished budgets for the next few years. In my view the U.S. is devoting a very healthy budget to space science, and with 56 space science missions currently flying it would be hard to argue that our international leadership in this area is in jeopardy. But ACI does signal an intention to fund the machinery of science in a way that ensures continued leadership in fields likely to have the greatest impact on future technology and innovation. In particular, although ACI will relieve some budget pressure on DOE high energy and nuclear physics, its priority thrust is toward the cluster of facilities and programs within Basic Energy Sciences (BES).

What does this mean for high energy physics? It means that the case for public funding for particle and nuclear physics is different from the case for lower energy physics. The particle physics community cannot rest in its pursuit of public support for its vision of exploring frontiers remote from socially important applications. In my view, the case made by HEPAP in the "*Quantum Universe*" reports sets the right tone for the campaign that must be pursued to achieve the necessary support for a new large accelerator. The International Linear Collider continues to be an important part of DOE's long term planning, but the ACI should not be interpreted as endorsing it as Administration policy. The American Competitiveness Initiative aims to strengthen fields more characteristic of Basic Energy Sciences, and is more or less neutral toward high energy or nuclear physics, which however will benefit from the initiative. BES is

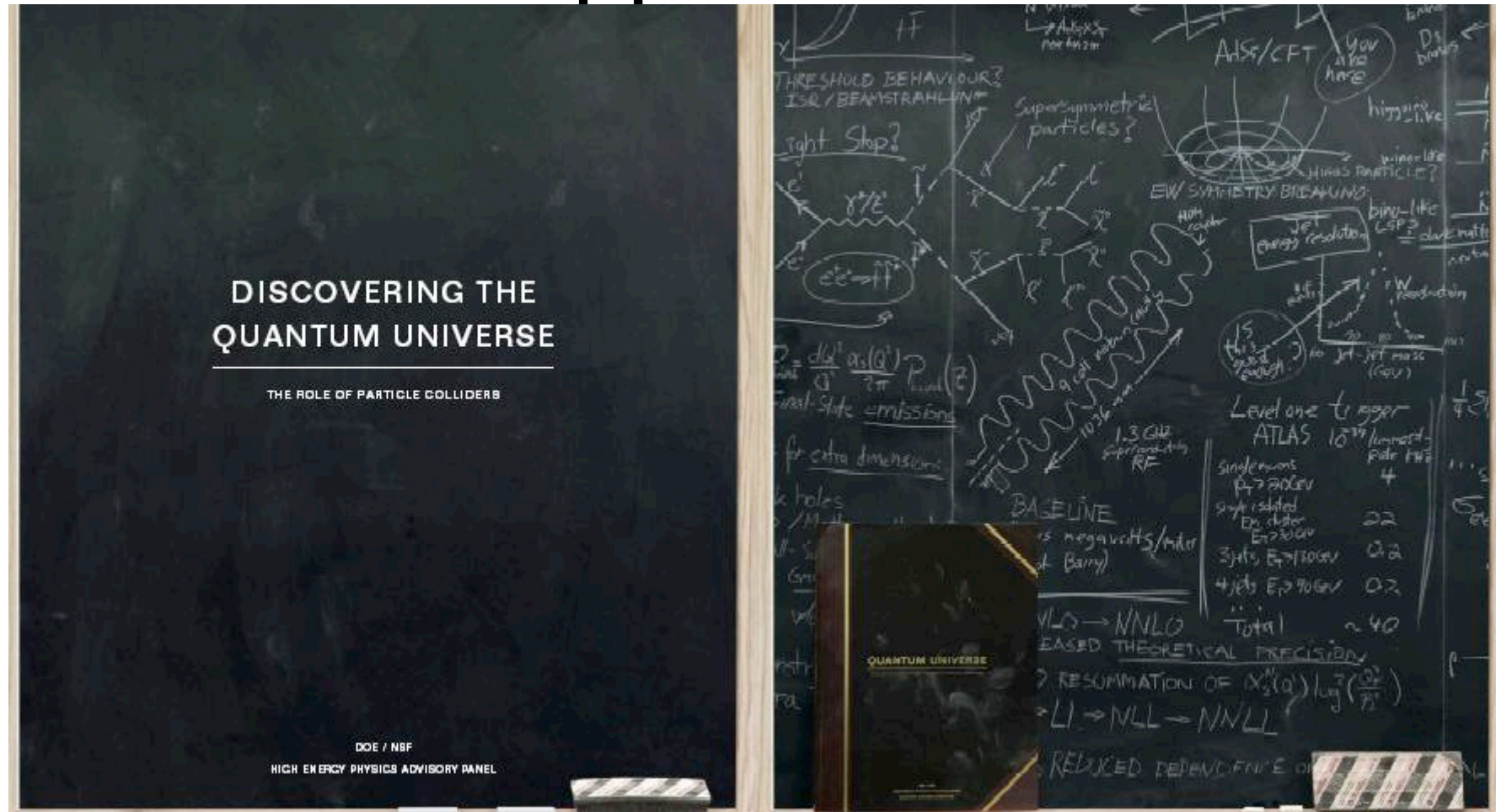


Marburger (II)

- « Do not try to sell your spin-offs »
(oversold in the past)
- « What will do partners around the ILC table ? »



The rapport ILC-LHC



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Various scénarios

LHC and ILC	
If LHC discovers:	What ILC could do:
Higgs	discover why it exists, who its cousins are, effects of extraD, new source of matter anti-matter asymmetry
superpartner	detect symmetry of supersymmetry, reveal nature of dark matter, discover force unification and matter
extra dimensions	discover the number and shape, what particles travel there, their locations within them
missing energy	discovery its identity as dark matter, determine its fraction of dark matter
heavy "stable" charged particle	discover what they decay into, identify the "super-WIMPs" as dark matter
new force	discovery its origin, connect the force to the unification of quarks and neutrinos, Higgs, or extra
supersymmetry from supergravity	discover the telltale effects from the vibrations of superstrings



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The budget DoE 2007

- **Overall HEP budget and priorities in FY 2007:**
 - **Tevatron and B-factory supported for full scheduled operations**
 - **LHC Support (Operations and Computing) up 8% as construction completes**
 - **Core research program at the universities (6%) and laboratories (2%) increased**
 - **Initiatives for the future of HEP:**
 - **ILC R&D doubled (\$30M→\$60M)**
 - **Start of new neutrino initiatives**
 - Electron Neutrino Appearance Experiment (EvA)
 - Reactor Neutrino Detector
 - **Investment in long-term accelerator R&D increased \$28M→\$33M**
 - **Dark Energy R&D increased \$3M→\$13M**



High Energy Physics FY 2007 Budget

(\$M)

		FY05 Actual	FY06 Approp.	FY07 Request	FY07 - FY06
Facility ops	Tevatron	234	215	215	0
	B-factory	108	93	93	0
	LHC (construction+ops)	62	60	60	0
	LBNL and BNL infrastructure	6	6	6	0
Other Projects	Construction and non-LHC MIEs	17	2	13	11
Subtotal ops & projects		427	376	387	11
core research	University physics research	104	104	110	6
	Laboratory physics research	85	83	85	2
	Accelerator Science (univ + lab)	28	28	33	5
	SciDAC & Lattice QCD	7	7	7	0
Subtotal core research		224	222	235	13
	Accelerator Development	24	28	28	0
	Detector R&D	14	20	14	-6
	ILC R&D	24	30	60	30
	Dark Energy R&D	3	3	13	10
	Neutrino R&D	0	9	4	-5
Subtotal R&D and new initiatives		65	90	119	29
Others (incl. SBIR/STTR in 06 and 07)		7	29	34	5
Total as shown in FY07 budget		723	717	775	58
SBIR/STTR in FY 2005		17			
Grand Total incl SBIR/STTR		740	717	775	58



The NUSAG report

- Priority to
 - NoVA
 - A large reactor experiment (Braidwood ou DAHIA Bay)
 - Double Chooz OK but not first priority
- Reactions within HEPAP
 - Double Chooz is an opportunity that should be seized
 - Debate around a superbeam towards a large underground detector (BNL->DUSEL)
 - Nu factory or beta beams not mentioned
- Reactions from R. Staffin
 - Double Chooz money must be found as savings on the next reactor
- New study based on medium term launched



The P5 report

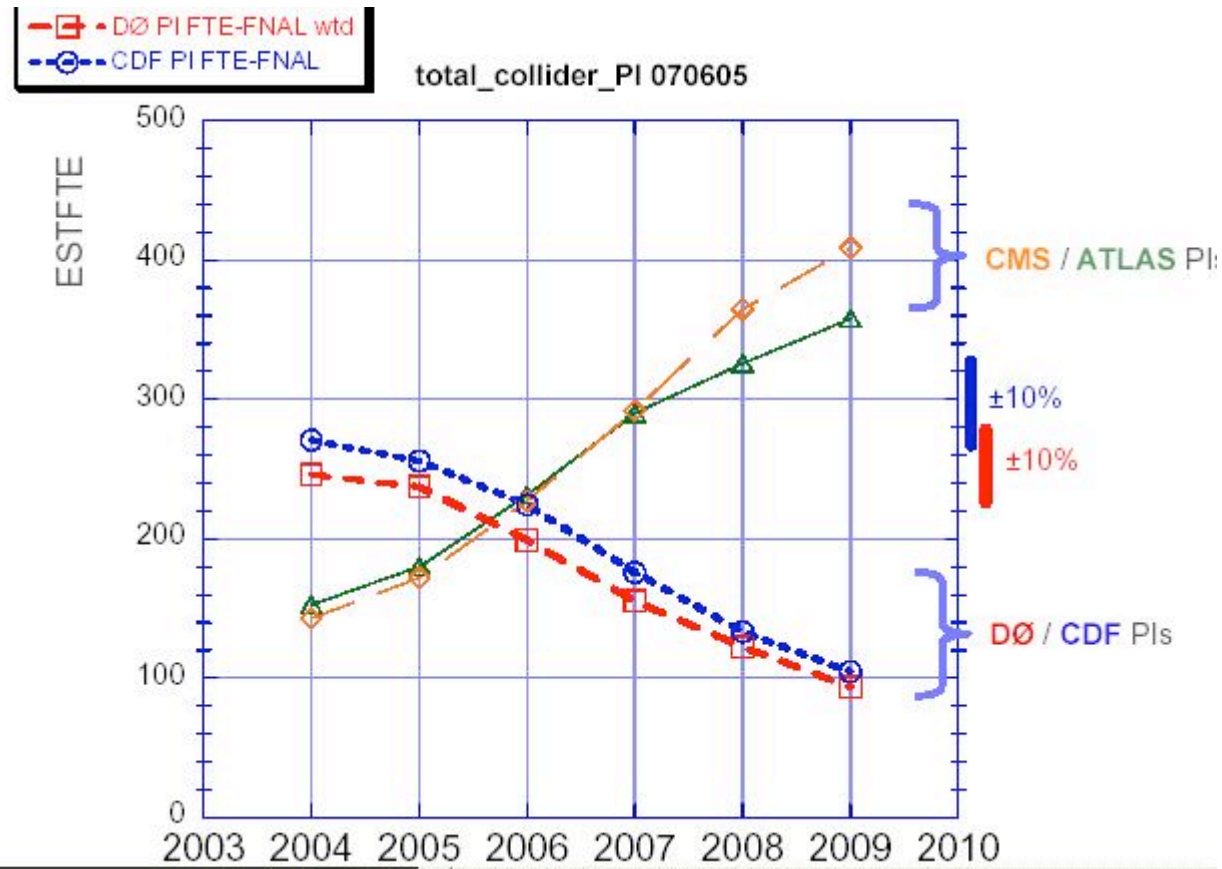
- Optimal date to stop BABAR and Tevatron?
- answer : at the foreseen date(End FY08 BABAR, End FY09 Tevatron)
- But answer revisited in the framework of the roadmap currently being prepared by P5
- Visit to SLAC mid April (answer already known),
à Fermilab spring 2007
- Roadmap this summer



The « Physicist resources » report

- Strong transfer of US physicists from Tevatron towards LHC . Will there be enough manpower to fully exploit Tevatron till the end
- Zero sum game
- Reanalysis by Fermilab : should be OK
- Fermilab will offer many PhD and post doc positions in the period 2007 à 2010





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TheDark Energy report

12. Four types of next-generation (Stage IV) projects have been considered:
- a. an optical Large Survey Telescope (LST), using one or more of the four techniques
 - b. an optical/NIR JDEM satellite, using one or more of four techniques
 - c. an x-ray JDEM satellite, which would study dark energy by the cluster technique
 - d. a Square Kilometer Array, which could probe dark energy by weak lensing and/or the BAO technique through a hemisphere-scale survey of 21-cm emission

Each of these projects is in the \$0.3-1B range, but dark energy is not the only (in some cases not even the primary) science that would be done by these projects.



EPP2010 report

- National Academies of Science report, sponsored by DoE and NSF
- http://www7.nationalacademies.org/bpa/EPP2010_Public_Release_Flyer.pdf
- Chart: Ordered list of priorities for the next 15 years in HEP and astroparticle physics
- Unusual committee: around 50% not HEP physicists, chaired by an economist, but very high level persons (several Nobel laureates)



H. Shapiro report presentation

- You can find a videostreaming of H. Shapiro presentation of the EPP2010 report during a SLUO meeting on May 5 at SLAC
- <http://today.slac.stanford.edu/a/2006/05-05.htm>
- Very interesting 50-minutes talk



7 Strategic Principles

- Particle physics is key priority within the physical sciences
- US HEP program should be committed to leadership within the global HEP enterprise
- Increase level of international planning
- To achieve Obj 2, long term vision, clear set of priorities, risk taking, joint ventures, flexibility and resiliency, consistent budget, diverse portfolio
- 10 to 15 year budget planning
- Strong Fermilab as a key role in US HEP
- National standing program committee



Alternative Scenarios

- Two scenarios were examined:
 - The one with major US involvement in the ILC
 - One without : offers the possibility to do many other things

The second one , although less risky, was rejected on the basis that it would not provide US with a leadership position



The ordered list of priorities

- 1) Full realization of LHC experimental program
- 2) The US should launch a major program of R&D, design and industrialization, management, financing studies of ILC accelerators and detectors
- 3) US should announce its strong intent to become the host country for the ILC and should undertake the necessary work to provide a viable site and mount a compelling bid
- 4) promote projects at the interface between particle physics, astrophysics and cosmology
- 5) Determine properties of neutrino through a well coordinated, staged program of experiments developed with international planning and cooperation
- 6) US participation to large scale high precision experiments should continue but the level of support will be very sensitive to the overall budget picture... participation in small scale, high precision measurements should be encouraged in any budget scenario.



Some quotes from EPP2010 report

- Whether particle physics was worth pursuing was not obvious from the start, not an easy matter
- Most sobering comment : present state of US particle physics , dangerous moment, looks like an exit strategy if no new initiative
- Not thought about ACI
- Giant elephant a priori skepticism
- Leadership role in a global programme
- Many risks involved with the proposed strategy but worthwhile to take!
 - LHC results non conclusive
 - Not enough international support
 - US finally not ready to commit at the end
- Enough money for priorities 2,3,4 (600 M\$ over 5 years)
- Special role for Fermilab : assume leadership: do not let Fermilab work on second class projects
- Key time for action: question of months!
- Make sure the bid is compelling
- Report transmitted to DoE secretary , well received



Some suggestions

- The ACI and EPP2010 main conclusions should be vigorously spread everywhere in Europe:
 - Science is important for society (old message already known)
 - Within science, physics must be pushed now (new message from ACI)
 - Within physics, HEP is a key priority (new message from EPP2010)
 - Within HEP, the US priority is preparation for an ILC bid as a global joint venture (new for EPP2010)
- Use this HEPAP membership as a two-way channel for communication
 - Report to ECFA
 - Zeuthen report to HEPAP?
- Offer reciprocity wrt participation to European committees (US has one european member with full rights on all its HEP committees: HEPAP, P5, EPP2010,..)



Conclusions

- HEPAP is a mine of informations
- Very large overlap between US and European long term priorities
- Let's import the new US priority of physics within sciences in Europe asap!
- Last minute information: House Appropriations committee fully passed DoE Office of sciences FY2007 budget



My personal history of US-Europe relationship

- 1979-1986: Worked at CERN on NA14 and NA14/2 experiment
- 1987-1988 : Post doc stay in MarkII/SLC and PEP at SLAC
- 1988-1994 : DELPHI experiment at CERN
- 1993-1999: BABAR collaboration at SLAC Member of BABAR Executive Board 1994-1997
- 1999-2003 IN2P3 deputy director in charge of high energy physics, computing and some aspects of accelerator R&D (IFC and RRB,..)
- 2000-2006 : French representative in DATAGRID/EGEE management Board
- 2005 LAL Director
- 2005- Selected as European HEPAP member by DoE



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