NSF Portfolio for FY07

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Outline

- Maintaining diversity
- EPP & PNA goals, portfolio
- Recent-year funding breakdown
- ILC specifics, FY07 outlook
- Closing remarks

EPP = Experimental Particle Physics program
PNA = Particle & Nuclear Astrophysics program

EPP 2010 on Diversity

"Particle physics, like all of other elements of the scientific enterprise, explores the unknown, and this inevitably requires shouldering some uncertainty. Thus, it is important to maintain a diverse and comprehensive portfolio of research activities – from theory to accelerator R&D to the construction of new experimental facilities to efforts to probe entirely new areas."

From Findings and Recommendations: "In particular, it is important to recall the strategic necessity of mounting, regardless of budgetary constraints, a comprehensive program that reflects a diversity of scientific opportunities and approaches to the scientific challenges facing particle physics. Under no circumstances, therefore, should the committee's top two or three priorities be permitted to exhaust the entire available budget. Indeed, in the most pessimistic budget scenario…the level of resources invested in the priorities outlined below would need to be modified, but the need for pursuing a diversified research portfolio would be unchanged."

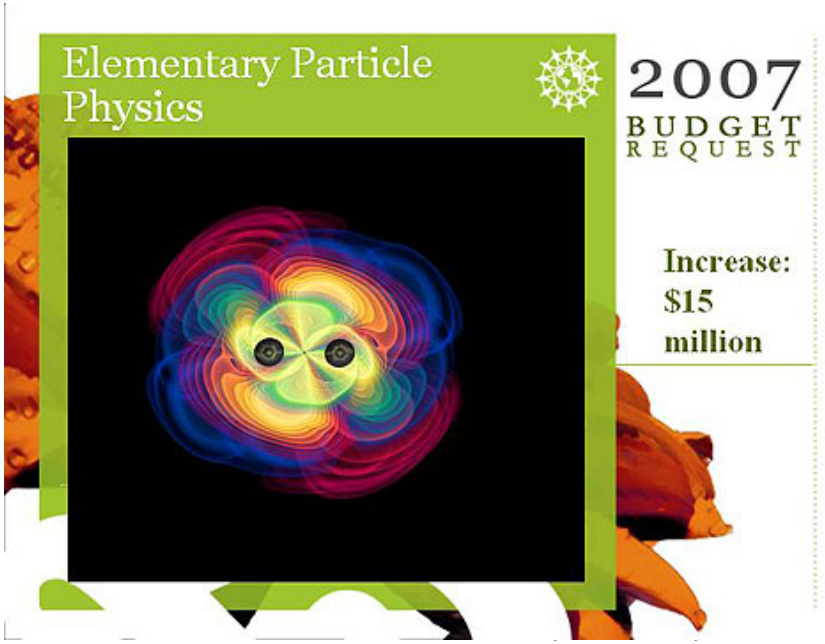
We listen…

The Emerging Landscape

- Discovery potential never greater – new chapter
- LHC will dominate accelerator-based HEP in the near future, other US HEP accelerators phasing out
- Next generation frontier accelerator requires multibillion-$ investment, international cooperation
- Vision for field's transition is taking shape, but not yet fully formed (EPP 2010, HEPAP, subpanels)
- Intellectual breadth of NSF program reaches beyond energy frontier, and accelerators in general
- NSF supports ~10% of US program, ~40% of university activities
- DOE is primary steward of national accelerator complex and will lead the ILC campaign
- NSF will increase investment to broaden field, e.g. DUSEL, while supporting university groups across frontiers

NSF FY07 Priorities

- From Feb 06 talk by M. Turner on FY07 Rollout:
  - Advancing the Frontier (grant support)
  - Facility Stewardship, Instrumentation and CyberInfrastructure
  - Broadening Participation
  - Education and Workforce Development



$15M increase for EPP in FY07 budget request

Advancing the Frontier

- *Elementary Particle Physics (EPP),* fundamental research across
  - the energy frontier – the attempt to discover new fundamental particles and laws of physics by studying collisions at the highest energies achievable with current and future accelerators;
  - the neutrino frontier – exploration of the properties of the neutrino, a particle now known to carry mass and believed to be fundamental to understanding the developing universe; and
  - the cosmic frontier – the study of dark matter and dark energy.

- *Physics of the universe (POU),* a set of activities carried out in partnership with DOE and NASA for exploring
  - the mysteries of dark matter and dark energy;
  - the earliest phases in development of the universe;
  - the fundamental nature of time, matter and space; and
  - the role of gravitation.

Deep Underground Science and Engineering Laboratory

- Broad, rich, multi-disciplinary scientific program
  - Biology, Engineering, Geosciences, Physics
- Excellent match to NSF goals, mission
- Intrinsically strong program for education/outreach
- Multi-purpose national laboratory that will serve variety of scientific communities over many decades
- Provides long-term, facility-based focus for diverse physics research program:
    - Dark matter, double-beta decay, solar neutrinos, low background counting, nuclear astrophysics, geoneutrinos, supernovae neutrinos, long baseline neutrino oscillations/proton decay ("megaton detector")
- Collaborative approach being sought with DOE from outset
- DUSEL is first priority for next new project start in Physics Division

Overall EPP/PNA Goals

- Empowering university-based investigators
- Adding value:
  - Partnerships
    - Building interdisciplinary collaboration
    - Increasingly relevant as scope of EPP/PNA broaden
  - Broadening Participation
    - Single investigators
    - Non-traditional, under-represented participants
    - Research in Undergraduate Institutions (RUIs)
  - Education and Outreach Activities
  - Above are among criteria for proposal review

EPP/PNA Portfolio

(in no particular order)

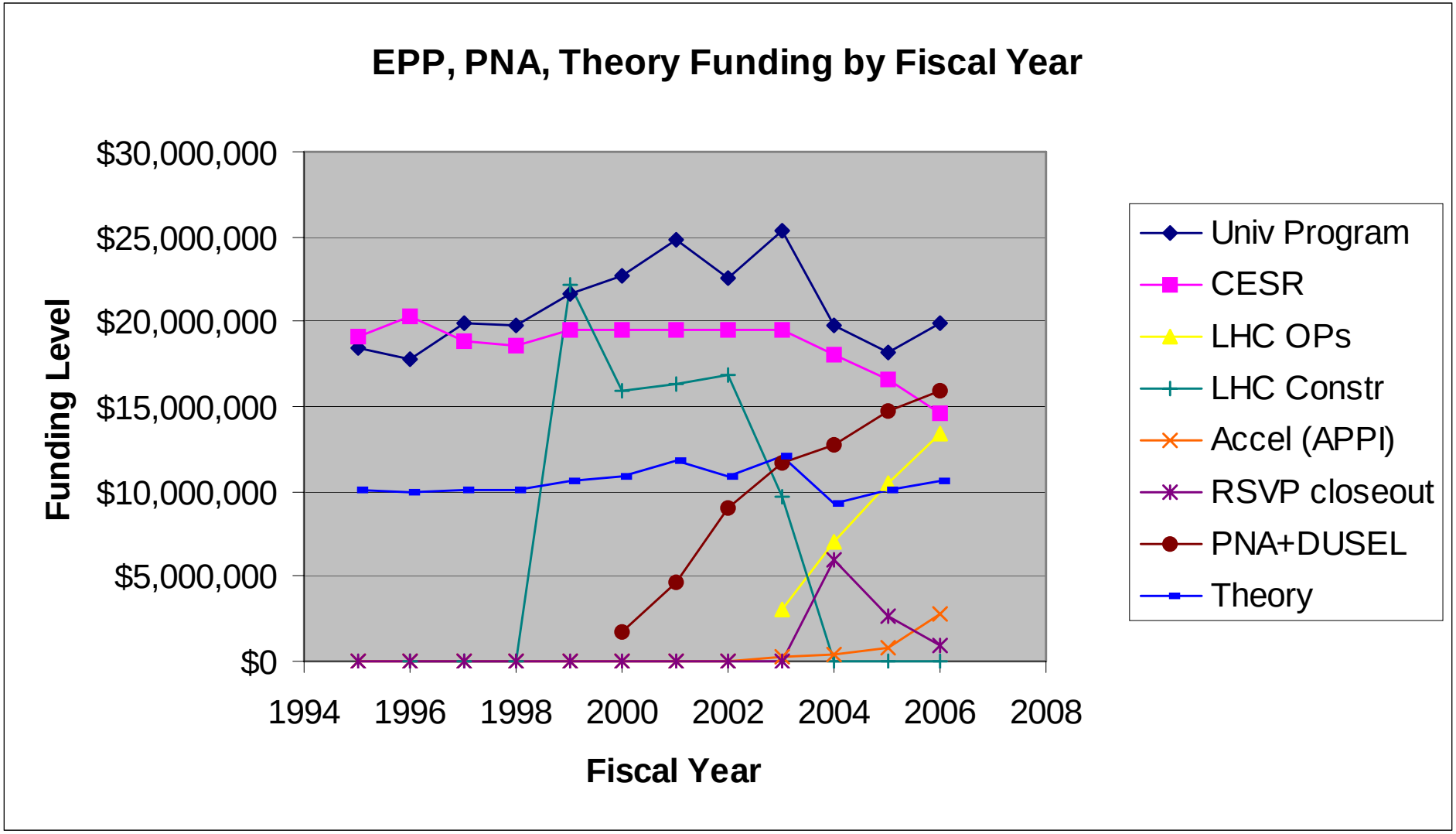
- University Program
  - Accelerator- and non-accelerator based physics (includes ILC)
  - Computational physics
- LHC Construction and Operations
- CESR/Cornell (includes ILC)
- DUSEL
- Accelerator and Detector R&D (APPI)
  - ILC-related, and other, support
- Coordination with related disciplines, groups
- Partnerships
- PNA plays central role in funding a number of projects:
  - HiRes, Veritas, Auger, CDMS, Xenon, WARP, PICASSO, DRIFT, Milagro, QUIET, STACEE,…

Base and Allied Funding: EPP, PNA, Theory

	FY02	FY03	FY04	FY05	FY06
Base					
Accel Based	42.31	48.17	51.09	48.75	51.60
PA/NA/DUSEL	9.05	11.07	12.68	14.69	15.98
EP-Astro Theory	10.84	12.06	9.23	10.05	10.63
Total Base	62.2	71.93	73	73.5	78.22
Allied Funding					
PFC	4	4	7	7	
ITR/OCI/T2C	6	6.3	6.5	5.65	
MRI	3.2	1.7	0	0.75	
ESIE	0.7	0.7	0.29	0.55	
PIF					2.35
Total Allied	13.9	12.7	13.79	13.95	
MREFC					
LHC construction	16.9	9.69			
IceCube	15	24.54	41.75	47.62	49.85

← Includes ILC @ univ.

Funding History



Larger Award Types

- MREFC: Major Research Equipment and Facilities Construction
  - Awards for projects which exceed a minimum of $100M over the project life. Involves the National Science Board (NSB) directly. Timing depends upon Division, Directorate & NSF priority, project readiness, etc.
  - DUSEL, LIGO, LHC Construction, CLEO, IceCube
- MRI: Major Research Infrastructure
  - Awards for developing university scientific infrastructure. Proposal deadline is late January of a given year.
  - Two award maxima, by type ($800k, $2M)
  - Portions of the DØ Upgrade, MICE electronics development
- Both represent means by which funding of larger-scale initiatives is complemented (MRI) or realized (MREFC)

NSF ILC Support

- NSF support of ILC in FY05 ~ $0.75M in FY05
  - University research in detector & accelerator development ($0.25M)
    - Split ~ 50/50 detector/accelerator
  - Support of GDE personnel & activities ($0.5M)
- Support was doubled in FY06, total ~ $1.5M
  - University support: $300k detector, $235k accelerator
  - GDE ~ $1M
- All university support is partnership with DOE
- Support of ILC work at Cornell
  - Current activities: linac cavity development, damping ring design, tpc detector readout & design, GDE/LCSGA participation & leadership
  - Future activities under discussion: damping ring test facility, scrf development & processing, r&d and engineering on sc wigglers
- Cornell will be the coalescence point for NSF ILC participation as the project moves forward

Support of ILC Construction at NSF

- This month, MPS presented ILC to MREFC Panel requesting it be included in list of "horizon projects"
  - Form, scope of this MREFC to be determined
    - Placeholder – not required it be spelled out in detail at this time
  - Panel includes Directorate, Assistant Directors, Financial, others that oversees MREFC development, queuing, etc.
  - Under their consideration
- This will be the primary mechanism whereby ILC construction will be supported at NSF, should the project reach that phase

MPS = Directorate of Mathematical and Physical Sciences (includes Physics Division)

Two Large-Scale Commitments for FY07

- Highest Priority of EPP 2010 Report: "Fully exploit opportunities afforded by…LHC."
  - NSF National Science Board in May 2006 approved the proposals for $87M over 5 years, beginning in FY07, for ATLAS/CMS detector operations
- NSF Physics Division announced in March 2006 its intention to allocate $6-7M for DUSEL-related R&D and technical design in FY07.
  - Increasing recognition that early support of projects is essential
- Both LHC operations and DUSEL R&D will be supported through the Research & Related Activities (R&RA) budget, in accordance with current NSF guidelines

FY07 ILC Funding

- Despite anticipated budget increases (remains promising, but not final), the aforementioned commitments will make simply maintaining the current funding levels of other programs in FY07 a considerable challenge.
- Increases in FY07 to these programs have been, by necessity, all but ruled out.
- We hope (expect…?) the budgets in following years to provide some relief.
- We believe it our responsibility to present the situation realistically, without over-promising: FY07 will be one in which we will be attempting to hold the line on the major portion of the EPP program.

Closing Remarks

- Scientific opportunities as promising as ever
- Diverse array of exciting, fundamental questions to be answered
- NSF will continue to support the ILC, and looks forward to further collaboration with DOE as the campaign gains momentum
- We are committed to maintaining a balanced portfolio as we rise to meet the challenges ahead
- “We respond to proposals.”