

# DOE News and Plans

**HEPAP Meeting**  
**November 13, 2008**  
**Washington, D.C.**

**Dennis Kovar**  
**Associate Director of the Office of Science**  
**for High Energy Physics**

# One Slide Status of DOE HEP

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It has been an “interesting” year for DOE HEP program

- **Dealt with the largest funding reduction in recent history (-8.4%)**
  - **Most serious impacts were mitigated**
  - **Productive year (given the context)**
  - **Poised to deliver outstanding science in the near term**
  
- **With the help of the community developed a new strategic plan for U.S. HEP**
  - **Particle physics at three scientific frontiers**
  - **A U.S. role that will deliver significant outcomes**
  - **Realistic and robust to funding/scientific discoveries**
  
- **Reorganized the Office of HEP and how it does business**
  - **Funding is directed to achieve strategic goals**
  - **Funding is managed to optimized performance and deliverables**
  - **An office staff that can effectively manage the program**

**FY 2009 Budget Request (\$805M → +\$115M over FY 2008 (\$689M))**

- **However, expectation of six month Continuing Resolution (CR)**
  - **Tevatron plans to run six months into FY 2009**
  - **LHC program will be supported (but no growth)**
  - **Some projects will be delayed**
  - **Still plan to proceed with JDEM selection**
  - **Continue discussions on participation in LHC Phase I upgrade**
  - **APAF project will be delayed**
  - **Across program – the higher priority programs are supported**
- **If year-long CR the impacts will be significant**
  - **RIFs of 175-200 at labs and ~80 (PhDs/students) at universities**
  - **Tevatron Operations will be terminated at end of six months**
  - **NOvA project would be cancelled and other projects delayed or canceled**
- **FY 2009 Appropriation is pivotal !**
  - **Future of HEP Program will depend upon level of FY 2009 Appropriation**
  - **HEPAP (P5) Report is viewed as important for determining funding level**

- **FY 2010 Request to be submitted by new administration**
- **Transition documentation has been prepared**
  
- **DOE has been developing plans at different funding levels**
- **OHEP using P5 findings and recommendations in it plans**

**We live in interesting times!**

# A Reminder:

## HEPAP (P5) Report Major Findings

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- **Progress in achieving the goals of particle physics requires advancements at the:**
  - **Energy Frontier**
  - **Intensity (or precision) Frontier**
  - **Cosmic (or particle astrophysics) Frontier**(each provides a unique window for insight about the fundamental forces/particles of nature)
- **LHC offers an outstanding opportunity for discoveries at the Energy Frontier**
  - Resources will be needed to support the extraction of the science by U.S. scientists
  - Resources will be needed for planned accelerator and detector upgrades
- **An opportunity exists for the U.S. to become a world leader at the Intensity Frontier**
  - Central is an intense neutrino beam and large underground long-based line detector
  - Building on infrastructure at Fermilab and partnering with NSF
  - Develops infrastructure that positions the U.S. to regain Energy Frontier (Muon Collider)
- **Promising opportunities for advancing particle physics identified at Cosmic Frontier**
  - Requires partnering with NASA, NSF, others
- **HEP at its core is an accelerator based experimental science**
  - Accelerator R&D develops technologies needed by the field and that benefit the nation

# A Reminder:

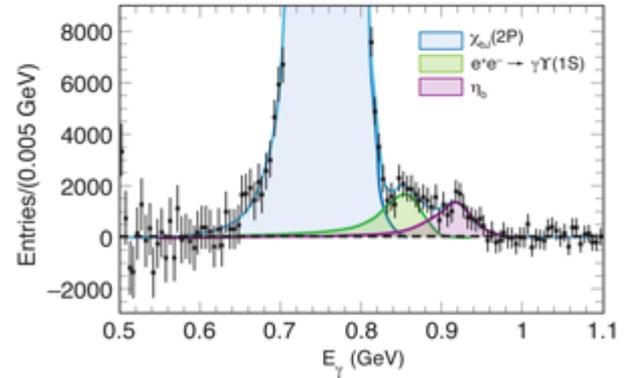
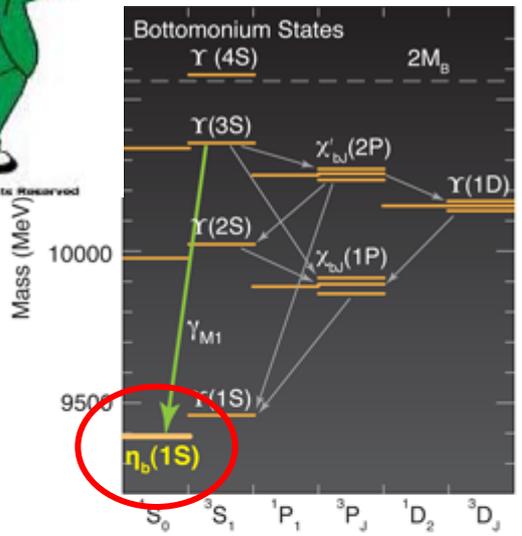
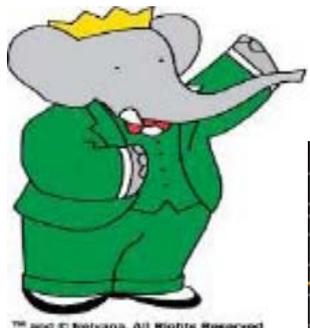
## P5 Major Recommendations

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- **Energy Frontier**
  - Continued support for the Tevatron Collider program for next 1-2 years
  - LHC program has the highest priority, including US involvement in the planned detector and accelerator upgrades
  - Accelerator and detector R&D program for lepton colliders
- **Intensity Frontier**
  - Recommends a world class neutrino program as core component
  - Long term vision and R&D for a large detector at DUSEL and high-intensity neutrino source at Fermilab.
  - Program of rare decays (e.g;. muon to electron conversion)
- **Cosmic Frontier**
  - Emphasis on dark matter and energy
    - JDEM in collaboration with NASA
    - LSST in collaboration with NSF
    - Direct dark matter search experiments with NSF
- **HEP at its core is an accelerator based experimental science.**
  - Support accelerator R&D to develop technologies:
    - that are needed by the field
    - that benefit the nation

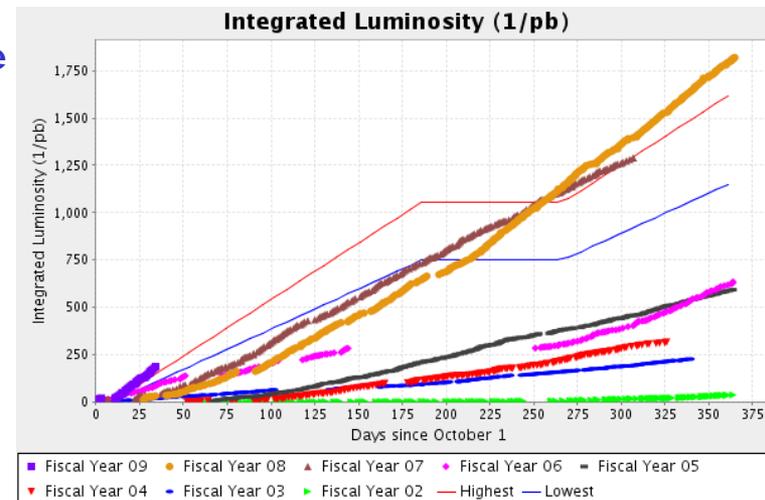
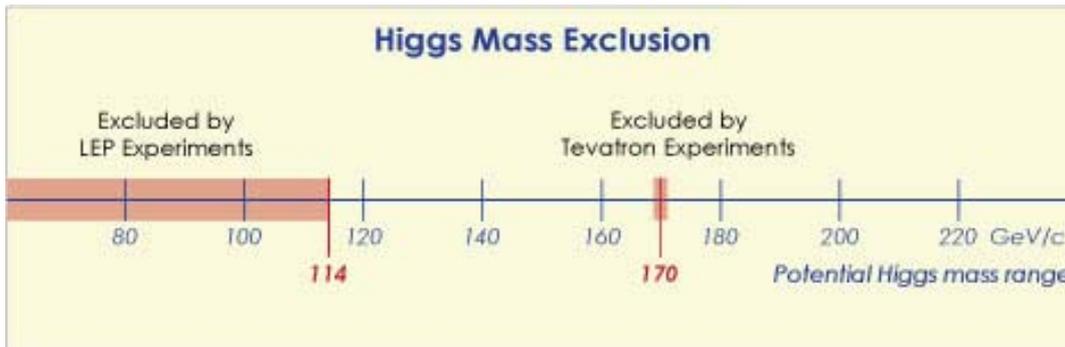
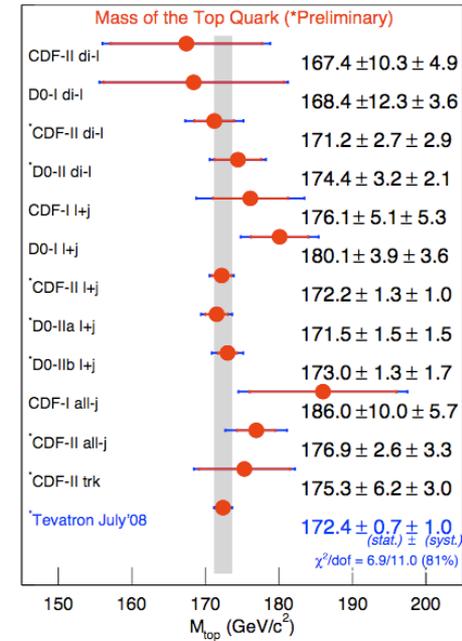
# B Factory & BaBar

- As result of FY08 funding the B factory program was terminated early
- SLAC/Babar put together a plan to run on the 2S and 3S states and support was provided for a four month run
- A plan that has already led to physics
  - ICHEP announcement of the discovery of the bottomonium ground state!
  - 90 abstracts submitted to ICHEP (also shows program vitality)
- Plans
  - Support continued analysis of data
  - Detector decommissioning underway

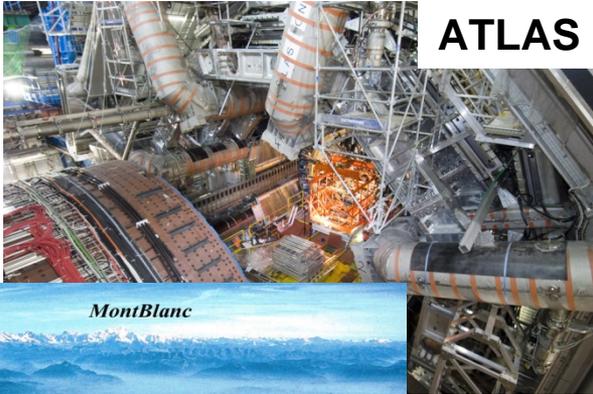


# Energy Frontier Tevatron

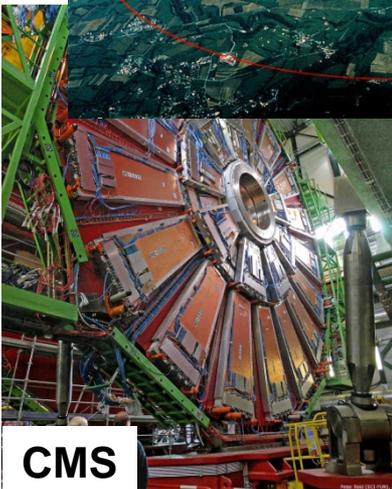
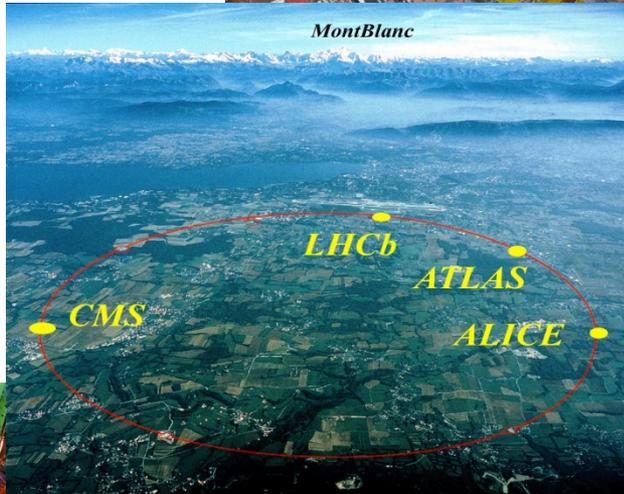
- **Running extremely well**
  - 2008 Luminosity  $\sim 1800 \text{ pb}^{-1}$
  - Detectors 90-95% efficient
- **Recent Results**
  - $\sim 150$  abstracts submitted to ICHEP08
  - **Highlights:**
    - Top mass accurate to 0.7%
    - All di-boson final states observed
    - 1<sup>st</sup> Higgs exclusion
- **Plans**
  - Run in 2009, with no long shutdown
  - Run in 2010, if funds and personnel are available



# Energy Frontier LHC and Upgrades



**ATLAS**



**CMS**

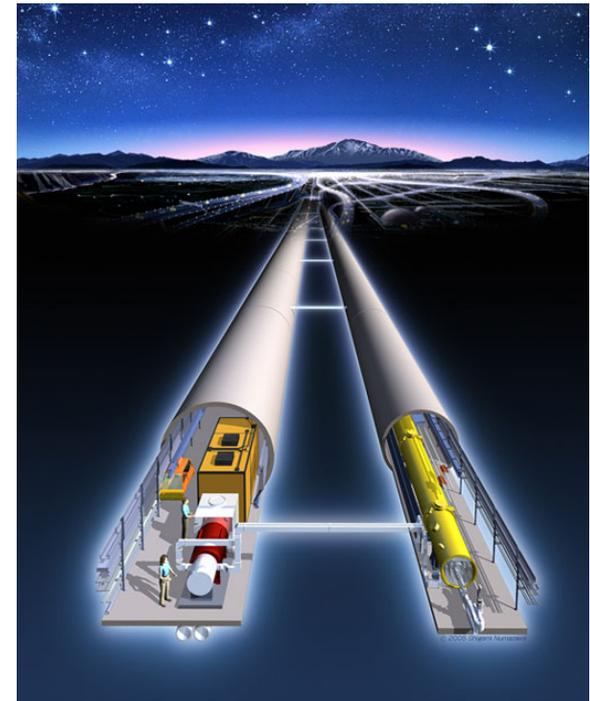
- Officially completed \$450M DOE LHC detector and accelerator projects.
- Support of US experimentalists and accelerator physicists is a program priority.
- Begun planning for contributions to
  - Accelerator upgrades
  - R&D for detector upgrade

# Energy Frontier

## The ILC

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- Continue support for a U.S. role in the global ILC R&D effort through 2012 at ~\$35M level/yr
  - Contributions to the Global Design Effort common fund
  - Focused on areas where the U.S. has well developed expertise
    - Damping Rings
    - Beam Delivery
    - RF technology including modulators and klystrons
- Will support generic detector studies related to lepton colliders
- Will also continue to develop SRF technology at \$25M/yr with an emphasis on
  - High gradient
  - Cryomodule development



# Intensity Frontier Neutrino Physics

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- **Goals for the next phases of the experimental program in neutrino oscillations:**
  - The mixing angles
  - The ordering of the neutrino mass states.
  - The extent of CP violation in neutrino sector.
- **A worldwide effort has led to an ambitious program that can do this – subject to the values of the unknown parameters.**

## DOE Program:

- **Fermilab:**
  - **Running: MiniBooNe, Minos** - accelerator neutrino oscillation
  - **Under construction: Minerva, Nova** - accelerator neutrino oscillation
  - **In planning stages: Long Baseline Exp.** - accelerator neutrino oscillation
- **Elsewhere:**
  - **Daya Bay Reactor Neutrino Detector (China)** - reactor neutrino oscillation
  - **Double Chooz (France)** - reactor neutrino oscillation
  - **Tokai-to-Kamioka (T2K/Japan)** - accelerator neutrino oscillation
  - **Enriched Xenon experiment (EXO/U.S.)** - double beta decay

# Intensity Frontier Fermilab Neutrino Program



# Intensity Frontier

## Accelerator Based Neutrino Program

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- DOE OHEP proceeding to develop a conceptual design for an accelerator long-baseline neutrino experiment
- Planning to get CD-0 approval by the end of CY 2008
  - Fermilab will have overall project management
  - Brookhaven will have responsibility for detector
- Expectation is that detector will be located at DUSEL and the beam line at Fermilab.
- Complete CD-1 by late 2009/early 2010.
  - Explore alternatives for detector (technology, size, location)
  - Explore alternatives for beamline (power, location)
  - Cost/benefit analysis - scientific reaches, cost ranges, etc.
- DOE OHEP & ONP collaborating with NSF
  - On Detector R&D
  - On development of a MOU for collaboration on nuclear and particle physics experiments.
  - First Joint Oversight Group (JOG) meeting scheduled for Dec 10<sup>th</sup>

# Intensity Frontier

## International Experiments

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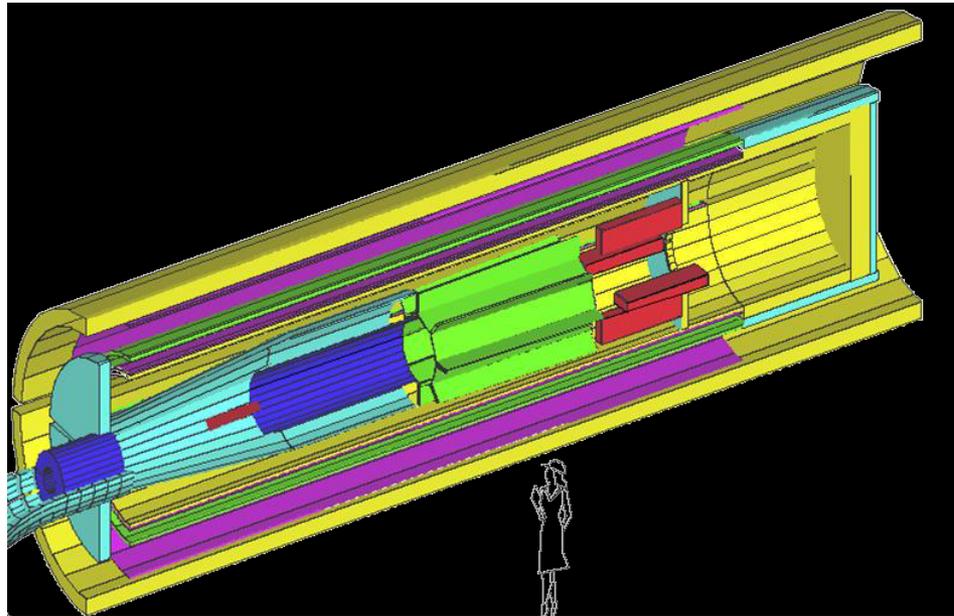
- **Daya Bay Reactor Neutrino Detector**
  - Neutrino-oscillation experiment designed to measure the mixing angle  $\sin^2 2\theta_{13}$  using reactor anti-neutrinos
  - High priority partnership with China
  - Full operations expected in 2011
  
- **Double Chooz**
  - Neutrino-oscillation experiment designed to measure the mixing angle  $\sin^2 2\theta_{13}$  using reactor anti-neutrinos
  - Proposal driven - plan to support continued involvement
  - Data taking in FY 2010
  
- **Tokai-to-Kamioka (T2K)**
  - Long baseline neutrino oscillations to search for  $\nu_m \rightarrow \nu_e$  appearance using high intensity beam in Japan
  - DOE working on 280m detector and other instrumentation
  - Data taking in 2010

# Intensity Frontier

## $\mu \rightarrow e$ Conversion

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- Recommended by P5 in all scenarios
- Sensitive search for charged lepton flavor violation by looking for muon to electron conversion in the field of a nucleus
- OHEP supporting R&D



# Cosmic Frontier

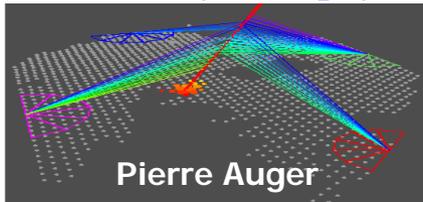
## Existing and proposed experiments

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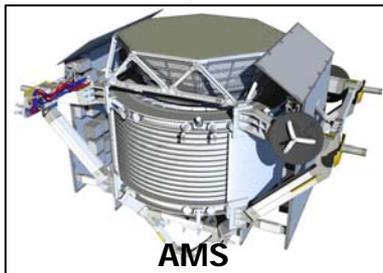
### Gamma-ray Astrophysics



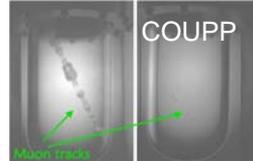
### Cosmic Ray Astrophysics



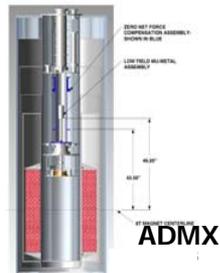
### Anti-matter, Dark Matter



### Dark Matter (WIMPs)



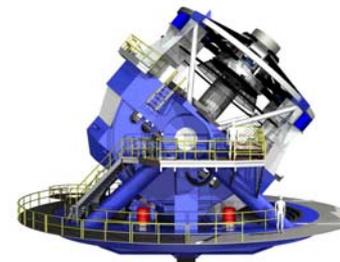
### Dark Matter (axions)



### Dark Energy Ground-based



### (LSST)



### Dark Energy Space-based



# Cosmic Frontier

## Dark Energy

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### Operating experiments (Stage II):

- **Supernova Cosmology Project, Nearby Supernova Factory, SDSS-II**

### Under Construction and/or Review (Stage III)

- **Dark Energy Survey (DES) – under construction**
- **Baryon Oscillation Spectroscopic Survey (BOSS) on SDSS-III**

### Providing R&D funds for large-scale experiments (Stage IV):

- **Large Synoptic Survey Telescope (LSST) - ground**
- **Joint Dark Energy Mission (JDEM) - space**

## Joint Dark Energy Mission(JDEM)

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DOE, NASA and Office of Science and Technology Policy (OSTP) have been meeting regularly to lay out the plan for a JDEM mission

The JDEM website with our plan was made public on September 12, 2008 →  
<http://jdem.gsfc.nasa.gov>

- **NASA will be the lead agency, responsible for the overall mission. The JDEM Project Office has been assigned to Goddard Space Flight Center.**
- **JDEM will be a medium-class, strategic mission, with competitively selected PI-led dark energy science investigations. The selected PI's will not provide the flight hardware.**
- **Both DOE and NASA will develop scientific instrumentation and participate in science operations and data analysis.**
- **NASA will provide the mission-level items: telescope, spacecraft bus, launch.**
- **The agencies will follow their usual means for assigning their agreed-upon work. DOE will set up a DOE-JDEM Project Office soon.**
- **DOE plans to provide ~ \$200M (FY 2008 \$) for JDEM**

DOE and NASA signed an MOU in October.

# Cosmic Frontier

## Large Synoptic Survey Telescope (LSST)

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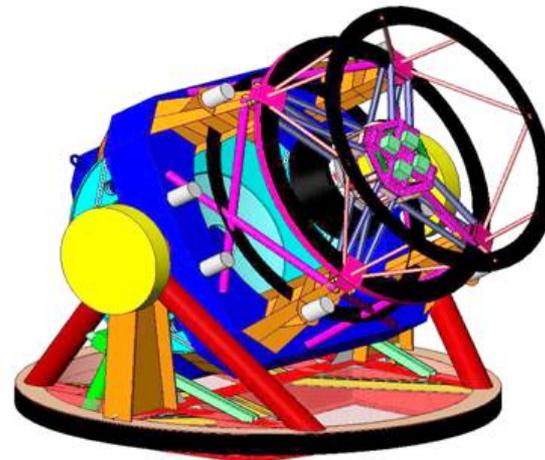
Experiment to study dark energy, near earth objects, plus many other astronomical measurements

- NSF is the lead agency
- DOE's interest is in dark energy measurements

LSST collaboration is proposing that DOE fund the camera construction, led by SLAC. Also contributions from IN2P3 and private sources

- DOE has been supporting R&D for the camera through SLAC

LSST is among the projects being evaluated in the Astronomy/Astrophysics Decadal Survey underway by the National Academy



# Cosmic Frontier Dark Matter Searches

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## Cryogenic Dark Matter Search (CDMS-II)

- Direct detection of WIMPs with ultracold Ge in Soudan Mine
- Data-taking: Full operations with 5 towers (~5kg active mass)
- New proposal for a next generation experiment is expected soon

## Axion Dark Matter Search (ADMX) experiment

- At Lawrence Livermore National Lab
- Phase I upgrade completed in 2008 – using SQUID amplifiers
- Data taking in 2008 – 2009; upgrade proposal expected

## Large Underground Xenon (LUX) dark matter experiment

- Two phase 100 kg. fiducial liquid-gas Xenon time projection chamber
- In SUSEL underground lab – delayed by water in Homestake Mine
- Data taking expected in 2009 (WIMP search)

## Chicagoland Observatory for Underground Particle Physics (COUPP)

- 2 kg refrigerant bubble chamber to detect low energy nuclear recoils
- currently being upgraded to 60kg (WIMP search)

## Evaluating other technologies for future as recommended by

- the Dark Matter Science Assessment Group (DMSAG)

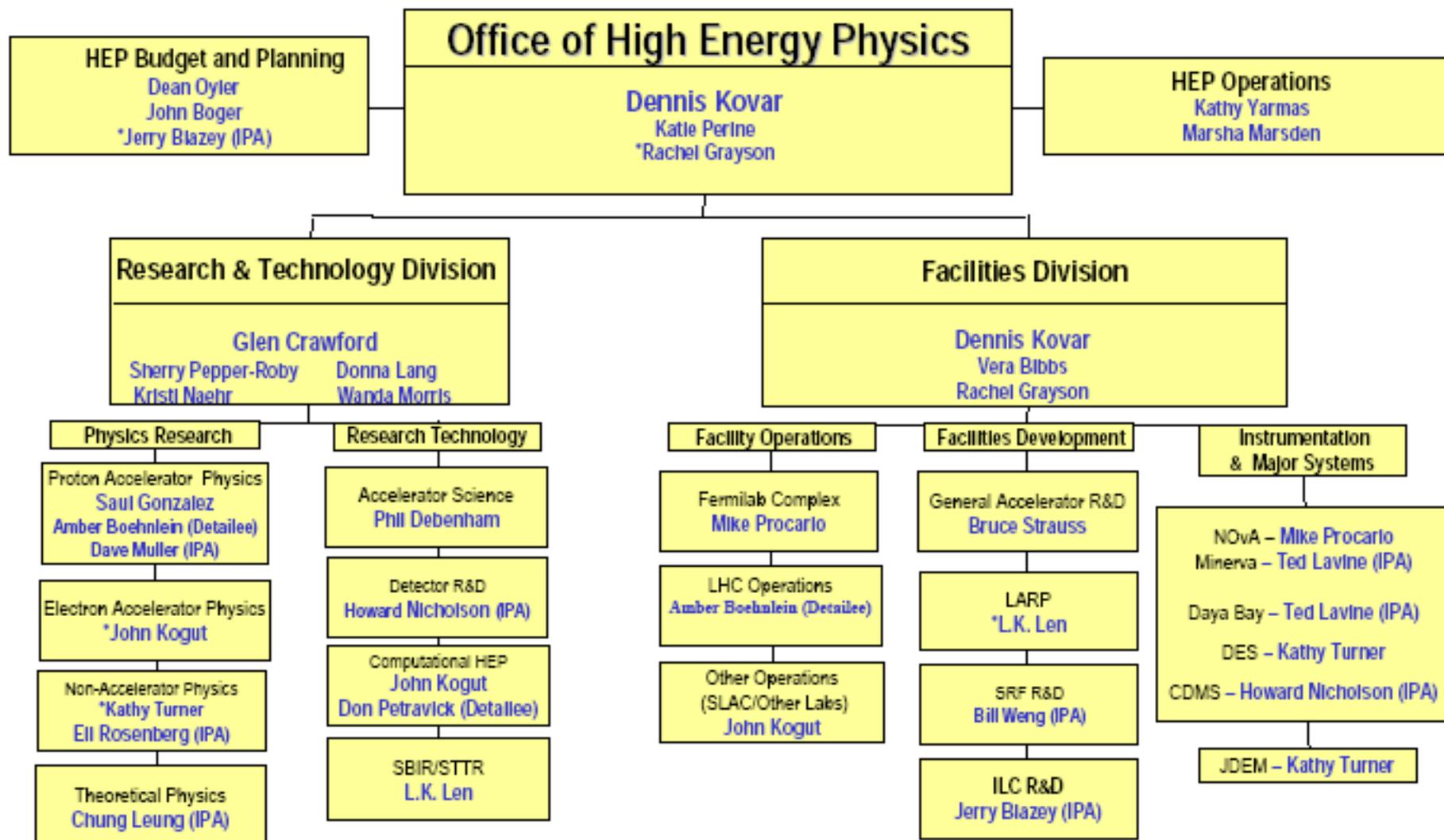


# Changes in DOE Office of High Energy Physics (OHEP)

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- Office of HEP has implemented a new organizational structure
  - Organized according to scientific and technical campaigns
  - Aligned with the Congressional Budget Request
  
- Office of HEP has implemented new review processes for laboratories
  - Laboratory research group Reviews (on a rotating basis)
    - FY 2008: theory and accelerator science subprograms
    - FY 2009 for the non-accelerator and detector R&D subprograms
    - FY 2010 for the proton-based and electron-based subprograms
  - Institutional Reviews on rotating basis (all except Fermilab)
  - Fermilab Science and Technology Review Annually
  
- Office of HEP obtained approval to fill/advertise positions
  - Twelve new permanent federal positions over next two years

# HEP Organization Chart



\*Denotes base position

# Changes in DOE HEP Office

## New Feds and IPAs/Detailees

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### New Positions

Facility Management Division Director  
Science /Technical/Planning Advisor  
Program Manager Proton (fixed target) Research  
Program Manager Non-Accelerator Research  
Program Manager Instrumentation  
Program Manager Theory

Selected: internal review  
John Boger: October 27  
Selected: internal review  
Advertised: closes Dec 20th  
Selected: awaiting decision  
Advertised: closes Jan 9th

### IPA/Detailees Arriving

Amber Boehnlein (FNAL)  
Don Petravick (FNAL)  
Ted Lavine (SLAC)  
David Muller (SLAC)  
Eli Rosenberg (Iowa State)

April  
April  
July  
July  
August

### IPAs/Detailees continuing

Gerald Blazey (Northern Illinois)  
Chung Leung (Delaware)  
Howard Nicholson (Mount Holyoke)  
Bill Wang (BNL)



# 2007 Committee of Visitors (COV)

## Recommendations

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*"The COV found the overall functioning of the OHEP office to be very professional and we are impressed with the responsible and excellent job that is done in soliciting and evaluating proposals, making grants and monitoring the funded programs. However, the COV did find some areas of concern."*

- The draft 2007 COV report has 18 specific recommendations relating primarily to staffing, grants review and processing, and project management.
- We have implemented some of the recommendations, particularly the staffing issues. We have completed six of the recommendations; seven recommendations are in-process; and five recommendations are on-going.

# 2007 COV Recommendations

## Recommendation

## Status

1) An urgent effort be directed to filling all the vacant staff positions in the Office, and consider adding additional IPA positions.

**In process.** A staffing plan was developed that identified our office immediate staffing priorities. Recruitment efforts are at various stages to meet our needs. We are using both IPA's and detailees to help with the program workload; we currently utilize the expertise of seven IPA's and two detailees.

2) Documentation and access to program data continue to be improved and data be conveyed in electronic format where this is not yet the case.

**In process.** Data from grantees containing demographic information is being collected on physicist faculty, senior research scientists, postdocs, and graduate students.

3) The Office continue to work with P5 and HEPAP in evolving the medium term program.

**On-going.** P5 produced a report on the priorities for an optimal HEP program over the next ten years (2009-2018), under four funding profile scenarios which articulates the scientific opportunities which can and cannot be pursued; the overall level of support needed in the core research & advanced technology R&D programs; and the impacts.

4) OHEP decisions and the rationale behind them be effectively communicated to the community.

**On-going.** We have taken a more proactive posture regarding communicating with the community decisions made and the rationale behind them. The recent OHEP reorganization was presented to HEPAP and the new structure posted on the HEP website along with the rationale behind the decision.

5) The Office develop a process to globally optimize and comparatively review the balance of support for HEP research at Fermilab, the universities and the other laboratories in light of the evolving program.

**Complete.**

# 2007 COV Recommendations

## Recommendation

## Status

6) The office understand and communicate appropriate best practices for reviews and ensure they are followed.

**In progress.** We are working to streamline processes and make them as meaningful as possible.

7) The number of Outstanding Junior Investigator awards be increased by devoting more funds to this program.

**Complete.** In FY 2007, HEP granted six OJI awards; in FY 2008, HEP granted ten OJI awards.

8) New and renewal proposals be limited to a maximum of 10 pages per senior investigator.

**Complete.** Ten-page proposal limits have been put into effect. Proposal limits are included on the OHEP website as part of guidelines for applying for a grant.

9) Outside visiting consultants be used for 3-year renewals of large grants and eliminate site visits in continuation years unless some unusual circumstance warrants such a visit.

**On-going.** We continue to use consultants for renewals of large grants, and we have reduced the number of site visits in continuation years unless some unusual circumstance warrants such a visit.

10) OHEP consider providing a template to reviewers to provide guidance and greater uniformity of reviews.

**In-process.** We have not yet converged on a template for reviewers.

11) Each proposal jacket contain as the first page a brief summary sheet which shows a history of funding levels by task, current funding, and personnel supported by category.

**In progress.** Data exists which shows funding levels by task, current funding, and personnel supported by category, but the data is not organized in summary format.

# 2007 COV Recommendations

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## Recommendation

## Status

12) The Office establish a formal advisory mechanism to best optimize the split between ILC accelerator and ILC detector R&D funds.

**Complete.** The OHEP reorganization clearly defines the split between ILC accelerator and ILC detector R&D.

13) OHEP work with the community and the laboratories to formulate a plan for stewardship of accelerator science in the US during the coming transition to a period without an energy frontier machine.

**In-process.** The accelerator science review scheduled for Fall 2008 will be used as a vehicle to formulate a plan for stewardship of accelerator science in the US.

14) The peer-review process in accelerator research be expanded to cover mid-term accelerator research to provide comparative evaluation of the merit of different research efforts.

**Complete.** The new OHEP organization provides for general accelerator development and allows for peer-reviews and comparative evaluations.

15) The project initiation and management process continue to be closely aligned with the HEPAP/P5 prioritization process for HEP and the strategic goals of the Office of Science.

**On-going.** We are closely aligned with HEPAP/P5, and the recommendations of P5 are factored into our long-range planning.

16) Major projects for which the physics goals are well matched to the priorities in the field, and whose overall scope, cost estimate and funding requirements are consistent with each other be advanced to construction status.

**Complete.**

# 2007 COV Recommendations

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## Recommendation

## Status

17) The Office continue to pursue opportunities to support projects in collaboration with other agencies, both domestic and international.

**On-going.** To the greatest extent possible, we ensure that the projects that are promoted are consistent with priorities of the field and are consistent with our funding profile.

18) The Office add staff to the Facilities Division to provide sufficient project management oversight for upcoming major projects.

**In process.** A referral certificate has been issued for an Instrumentation program manager.

# 2007 COV Recommendations Demographics

