U.S. DEPARTMENT OF ENERGY

OFFICE OF SCIENCE

Office of High Energy Physics Report to HEPAP

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Cosmic Frontier - NOBEL PRIZE

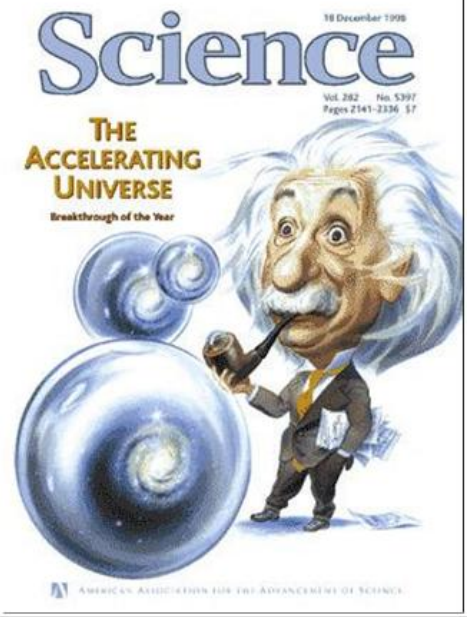
Congratulations to:

Saul Perlmutter

Adam Riess

Brian Schmidt

…on their 2011 Nobel Prize in Physics "for the discovery of the accelerating expansion of the Universe through observations of distant supernovae."



Perlmutter led an international collaboration on the Supernova Cosmology Project which discovered the acceleration of the expansion of the universe after 10 years of work.

DOE has supported Saul's research at LBNL since the early 1980s. We continue to support his research, as well as a program of dark energy experiments.

DOE labs and the HEP program have a tradition of funding high-risk research that may yield high pay-offs and providing ongoing support needed to accomplish the large experiments. Some of the strengths of the program that make science like this possible include instrumentation, computing resources and large scientific collaborations.

Outline

- **Personal Comments**
- **Status of the Three Frontiers**
- **Budget News**
- **Program Activities**

Personal Comments

- 'Listening Tour' to assess community opinions

- Initial focus:
  - Congressional direction on Accelerator R&D
  - Congressional direction on the Intensity Frontier
    - Task forces, workshops to help formulate OHEP response

- Synoptic look at the program, trying to suppress any pre-conceived notions I might have

- Take a long-term view and develop a strategic vision over the next 12-18 months, based on and extending existing plans (P5, PASAG, NWNH, etc. etc.).
  - Need to maintain diversity in the Frontiers and overall HEP

Congressional Language – Accelerator R&D

The Committee understands that powerful new accelerator technologies created for basic science and developed by industry will produce particle accelerators with the potential to address key economic and societal issues confronting our Nation. However, the Committee is concerned with the divide that exists in translating breakthroughs in accelerator science and technology into applications that benefit the marketplace and American competitiveness**. The Committee directs the Department to submit a 10-year strategic plan by June 1, 2012 for accelerator technology research and development to advance accelerator applications in energy and the environment, medicine, industry, national security, and discovery science.** The strategic plan should be based on the results of the Department's 2010 workshop study, Accelerators for America's Future , that identified the opportunities and research challenges for next-generation accelerators and how to improve coordination between basic and applied accelerator research. The strategic plan should also identify the potential need for demonstration and development facilities to help bridge the gap between development and deployment.

Congressional Language – Intensity Frontier

...the Committee understands that the United States has an opportunity to lead in the intensity frontier. Specifically, the United States has unique capabilities that should be exploited to develop a world-leading program of neutrino science to understand the role neutrinos play in the evolution of the universe and design new particle beams and highly sensitive detectors to advance this area of science. The Committee directs the Office of Science to submit a report not later than 180 days of enactment that lays out

—the expected benefits of intensity frontier science,

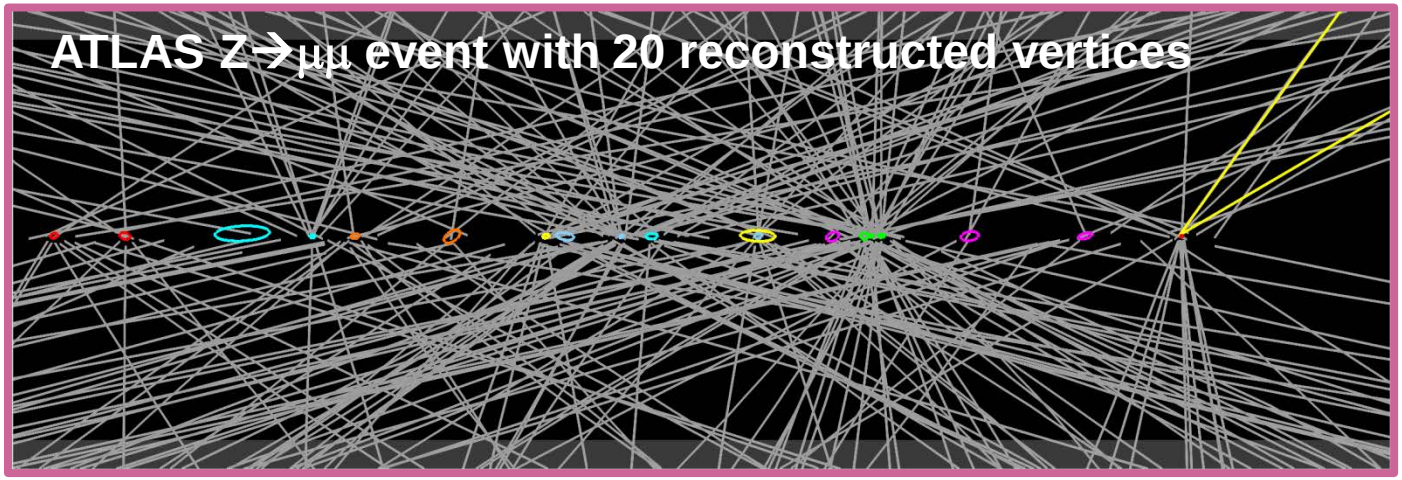
—a strategy for maintaining the U.S. lead, and

—the funding needs over the next 10 years, including construction activities, of implementing the proposed strategy.

STATUS OF THE 3 FRONTIERS

Energy Frontier

- **Tevatron shut down on September 30, 2011 after 28 years of service**
  - Delivered ~12/fb to D0 and CDF
- **CDF and D-Zero analyses will continue for the next few years**
  - Focused on legacy analyses, including Higgs
- **The LHC has delivered over 5/fb of integrated luminosity**
  - New luminosity regime, new challenges



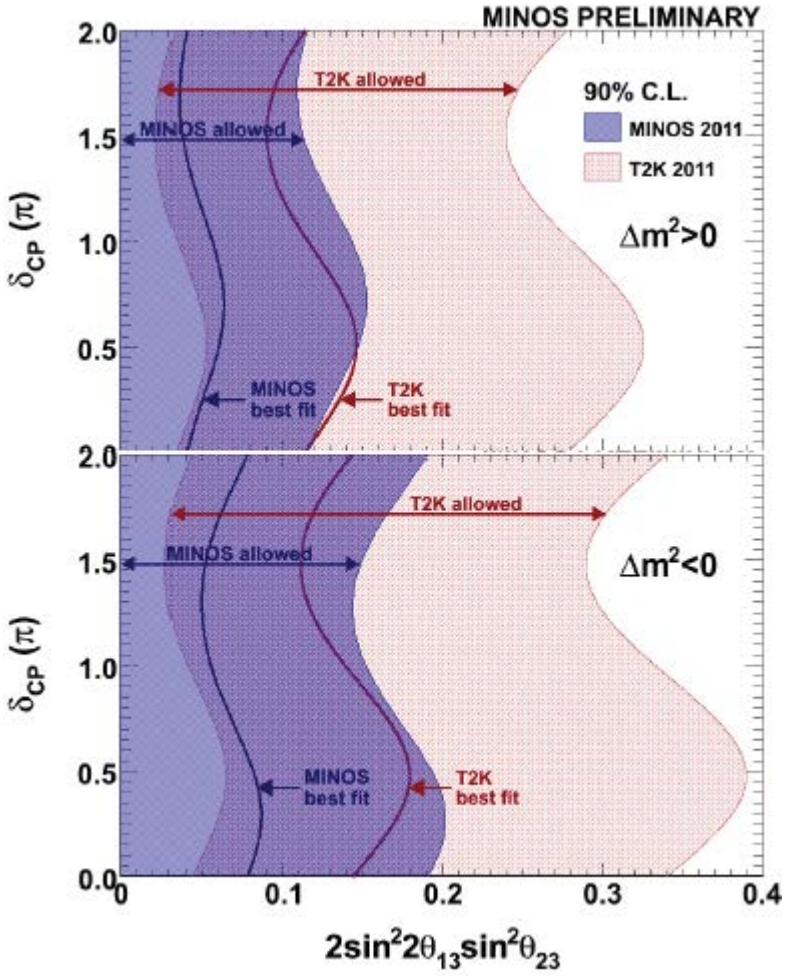
US engaged and having an impact on the Energy Frontier

Intensity Frontier

- Double Chooz is operating well with the far detector since April 2011. Have collected several times the Chooz data. No formal result yet but the plan is to "open the box" very soon. Near detector installation is expected by the end of 2012.
- NOvA completed the far detector building at Ash River in June 2011. Module production for the 14,000-ton far detector begins next month.
- MicroBooNE received CD-2/3a status in September 2011.
- EXO announced the first observation of two-neutrino double beta decay in Xenon 136 in August 2011.

Intensity Frontier

- MINOS
  - World's best measurement of Δm^2_{32}
  - Indications (with T2K) that $\theta_{13} > 0$!
  - FTL neutrinos? MINOs paper (2007), now OPERA's puzzling results. Task force was formed 1) to look at existing data and 2) to make new measurements with new GPS, etc.
- Daya Bay started taking data with the first two antineutrino detectors in the Daya Bay Near Hall in July 2011.
- New g-2 experiment at FNAL is working towards CD-0.



Intensity Frontier Workshop

- As part of our response to Congress, The Office needs to identify with community input the full scope of science opportunities on the Intensity Frontier.
  - The ENTIRE community needs to be engaged in defining the Intensity Frontier program.
  - The agencies expect good representation from the community at the workshop, and good dissemination of the results to the community. We expect discussion and feedback from the community in the spring, in time to influence the Intensity Plan due to Congress.
- Community consensus will be reached, or more workshops will follow…
- **Nov 30 – Dec 2, Rockville Hilton**, www.intensityfrontier.org.
  - **Registration deadline extended to Nov 14!**

Cosmic Frontier – Recent DOE Highlights

- AMS was launched on the space shuttle on May 16, 2011 and installed on the International Space Station. It is performing as expected and has collected more than 6 billion cosmic ray events

- The DES imager is complete and will be shipped to NOAO in Nov. 2011. DOE deliverables for CD-4 on schedule for completion by January 2012

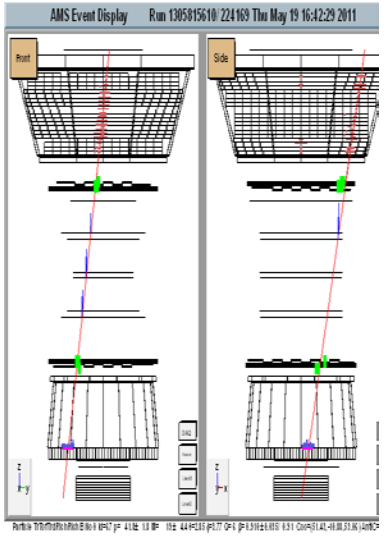
- BOSS has completed 2 of 5 years of operations. Dark Energy results are planned to be shown at the AAS in January 2012 (Austin) – using spectroscopy measurements of galaxies and quasars

- The Mission Need and CD-0 approval for a new ground based dark energy experiment was signed in June 2011.

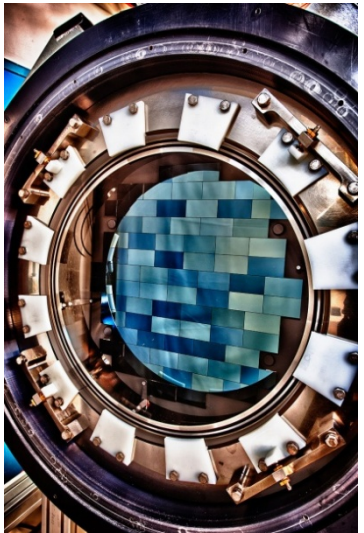
- We are funding a number of Generation-1 direct-detection dark matter experiments: ADMX-2a, COUPP-60, DarkSide, LUX, SuperCDMS-Soudan

- See K. Turner talk tomorrow for more details.

AMS - 42 GeV/c Carbon



DES Imager



Cosmic Frontier - Program Planning

Community panels (P5, PASAG, Astro2010) have called for a balanced cosmic frontier program with:

- Priority for Dark Matter & Dark Energy
- Staged implementation
- Cooperative multi-agency development as necessary

Direct Detection Dark Matter Generation 2

- Anticipate Funding Opportunity Announcement (FOA) for second-generation dark matter experiments to be out shortly.
  - Proposals will be due 3-4 months after announcement; selections expected by late FY2012 for a FY2013 start.

Dark Matter – planning

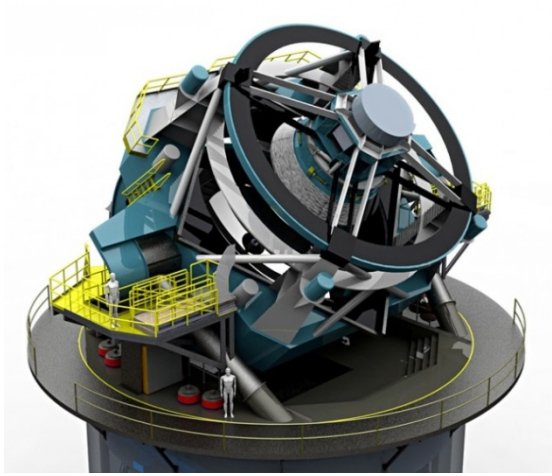
- HEP plans a coordinated strategy for dark matter research
  - including direct and indirect detection methods, theory and accelerator experiments
  - Investigating most effective and expedient strategy to get community input

Dark Energy – planning

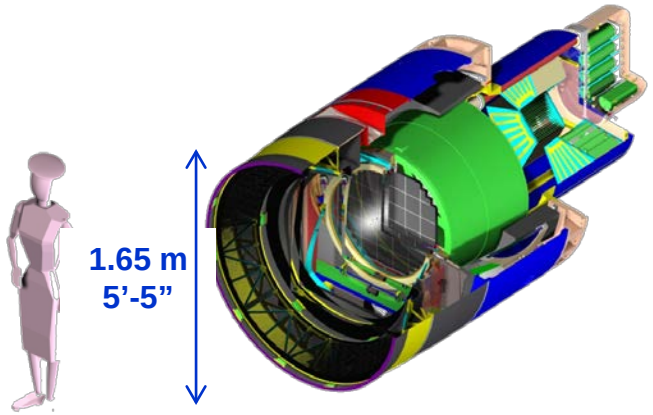
- LSST is our priority for the next experiment to be developed.
- Want to be pro-active in developing a robust dark energy program – need input
  - E.g., Near term and low cost options; What experiments require other agencies and at what level?

Cosmic Frontier - LSST

- Following top Astro2010 recommendation to participate on LSST with NSF - our projected funding profile supports this.
- NSF will lead the overall project and build the telescope/infrastructure and data management subsystems.
- DOE will be responsible for the camera and associated instrumentation. SLAC hosts the camera Project Office.
- Biweekly meetings of the DOE-NSF Joint Oversight Group are being held.
  - An MOU for the partnership should be completed soon.
  - We are working closely to line up our schedules and funding; our schedule assumes the NSF MREFC funding will start in FY 2014.



- August 2011 – NSF Preliminary Design Review (PDR) of the entire project was successful
- Nov. 2011 - Lehman review of LSST-Camera will be held at SLAC; required for CD-1 approval.



BUDGET NEWS

HEP Budget Status

	FY 2010 Actual	FY 2011 Actual	FY2012 Request
HEP	810,483	795,420	797,200
SC	4,789,288	4,842,700	5,416,114

- **The FY 2012 DOE Request has been passed by both House and Senate**
  - Overall SC funding approx. $4.8B
  - House provides HEP funding at Request level, -7% for projects (reductions restored in Research budgets to match Request)
  - Senate provides HEP funding at Request level but no funds for LBNE construction (-$17M) : “project is not mature enough”
- **However, currently under FY12 Continuing Resolution until Nov 18.**
  - No new starts for LBNE, Mu2e, and MicroBooNE.
  - Small amounts of funding were supplied to keep making progress towards CD-1 for LBNE and Mu2e and CD-2/3 for MicroBooNE.

FY 2012 Budget Impacts

- **Lack of conceptual design funding for LBNE is the most serious issue**
  - Will not impact technology downselect scheduled for December
  - However schedule for CD-1 is at risk if
    - FY 2012 CR is not lifted before calendar 2012, and/or
    - FY 2012 Senate language prevails in final Appropriation
- **Both House and Senate bills support DOE request for $15M to maintain de-watering and safe operations at Homestake Mine previously supported by NSF**
  - However under the FY12 CR this is also considered a "new start"
  - DOE and NSF are working together to keep minimal Homestake operations going during FY12 CR.
  - If supported in final FY12 Appropriation, DOE will take over support for minimal Homestake operations for the rest of FY2012, pending DOE decisions on cost-effective options for underground science.
- **FY12 CR has contributed to delay in processing of DOE grant actions, waiting for budget approval. Grants up for renewal are receiving priority.**

The FY 2012 HEP Budget Request

Description	FY 2010	FY 2011	FY 2012 Request	FY12 - FY11
Proton Accelerator-Based Physics	438,369	439,512	411,207	-28,305
Electron Accelerator-Based Physics	30,212	24,663	22,319	-2,344
Non-Accelerator Physics	97,469	87,657	81,852	-5,805
Theoretical Physics	68,414	68,261	68,914	653
Advanced Technology R&D	156,347*	175,327	171,908	15,561
Construction	0	0	41,000	41,000
Total, High Energy Physics	790,811	795,420	797,200	6,389

***Note: FY 2010 appropriation including SBIR/STTR was $810 million, so the total FY 2012 request is a reduction of $13 million from comparable FY 2010 funding**

PROGRAM ACTIVITIES

OHEP Activities

- HEP Comparative Laboratory Reviews in *Energy Frontier Research* and *Detector R&D* are planned for summer 2012.
  - This is the second time around for the lab comparative reviews.
  - We have re-diagonalized on the "frontiers" basis for reviews
- Have not yet scheduled the Comparative Laboratory Review in Accelerator Science.
  - Pending hire for Accelerator Science program manager
  - Strategic plan for Accelerator R&D has priority for now
- Will hold institutional review at SLAC and S&T review at FNAL in 2012.
- New solicitations:
  - HEP Comparative Review (see G. Crawford talk later today) **DUE Nov 15**
  - Early Career Research **DUE Nov 29**
  - Scientific Discovery through Advanced Computing (see next slide) **DUE Jan 9**
  - Next Generation Dark Matter (open soon)

Computational High Energy Physics

- **Scientific Discovery through Advanced Computing (SciDAC)**
  - Joint HEP-ASCR Funding Opportunity Announcement Posted Sept 2011
  - Research to advance the HEP mission by fully exploiting leadership class computing resources in the areas:
    - Cosmic Frontier Scientific Simulations, Lattice Gauge Theory Research, and Accelerator Science Modeling and Simulation
- **General HEP Computing**
  - Formulating budget structure to deal with these efforts more systematically
  - Using results from Feb 2011 Lab Computing Review to assess efforts
  - Addressing current community needs and looking to the future:
    - Event Generators, Data Tools, Distributed Computing, Networks, Software
    - Joint HEP-ASCR workshop on multicore architectures expected Spring 2012
  - See D. Hitchcock talk tomorrow for more details

Personnel, etc.

- We are in final stages of hiring a new program manager for accelerator science.
- Need additional help from IPAs and detailees
  - See Glen Crawford or Mike Procario if interested
- Fed travel budgets reduced approx. 25% from 2011
  - This was a Congressional action
  - Prioritized travel requests to emphasize HEP responsibilities for projects, international agreements, major reviews
  - Site visits reduced
  - Comparative reviews to replace on-site university panel reviews

Backup