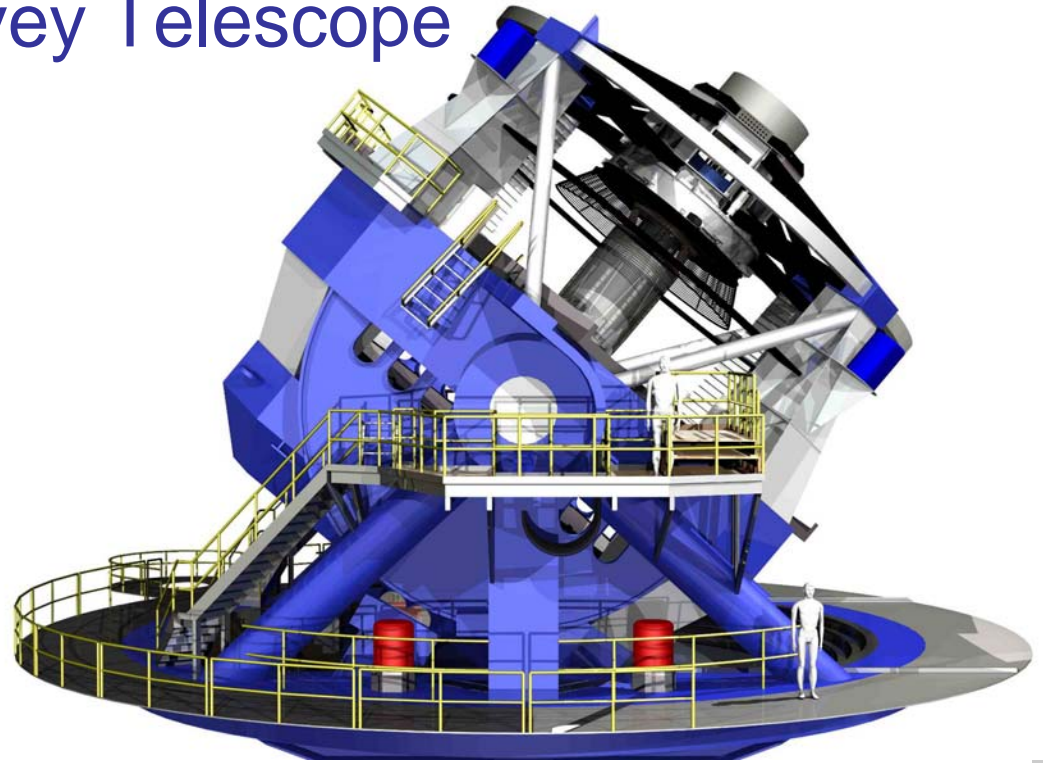
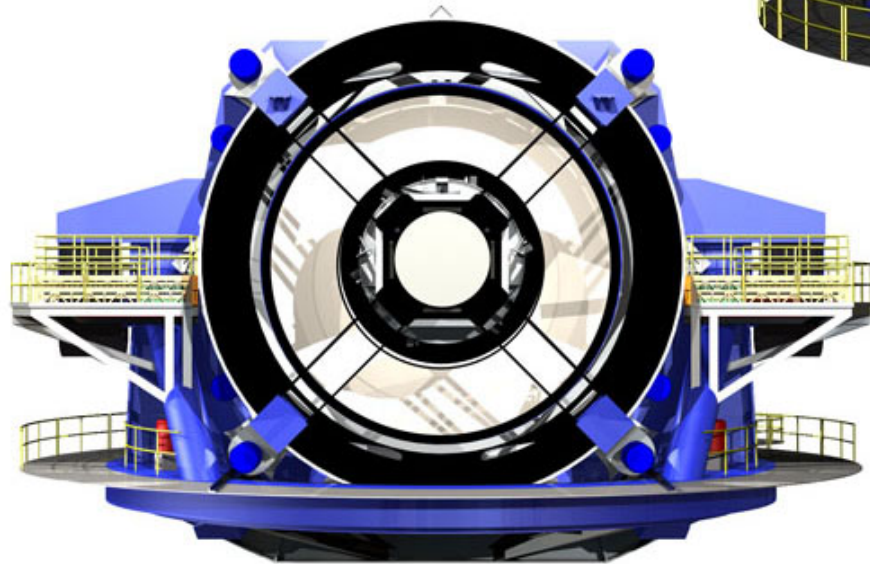




DOE/NSF Programs



Large Synoptic Survey Telescope



Design and Development Funding Summary

Design and Development Funding:

NSF	
AST D&D grant AST	\$14.4M
NOAO/NCSA in kind	\$6.5M
Total	\$20.9M

DOE R&D	~\$11.0M
Total	\$31.9M

Private for R&D	\$20.2M
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Total R&D	\$52.1M
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Private for Optics	\$27.0M
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Non-Federal Funding:

Founding Universities	\$3.0
Research Corp	\$5.5
Keck Foundation	\$1.5
Members dues to date	\$2.0
Private Donor #1	\$0.1
Private Donor #2	\$2.0
Private Donor #3	\$1.5
Wayne Rosing	\$1.6
C. Simonyi/B. Gates	\$30M

Total	\$47.2M
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Total investment to date: approximately \$80M

LSST Project Status:

Construction cost is proposed to be borne by NSF and DOE HEP.

Estimated total cost: \$390M (\$290M from NSF; \$100M from DOE HEP)

Coordination of reviews, funding is challenging.

Conceptual Design Review held in late 2007 with DOE HEP present.

Review panel report gives a strong recommendation to proceed.

HEPAP P5 subpanel report (May 2008) recommended “DOE support for the ground-based Large Synoptic Survey Telescope program in coordination with NSF at a level that depends on the overall program budget.”

Both NSF and DOE decisions to recommend advancement to construction pending recommendation of next Decadal Survey. This paces our planning. We are jointly discussing upcoming review plans.

Project marching costs \$3-4M per year from AST.

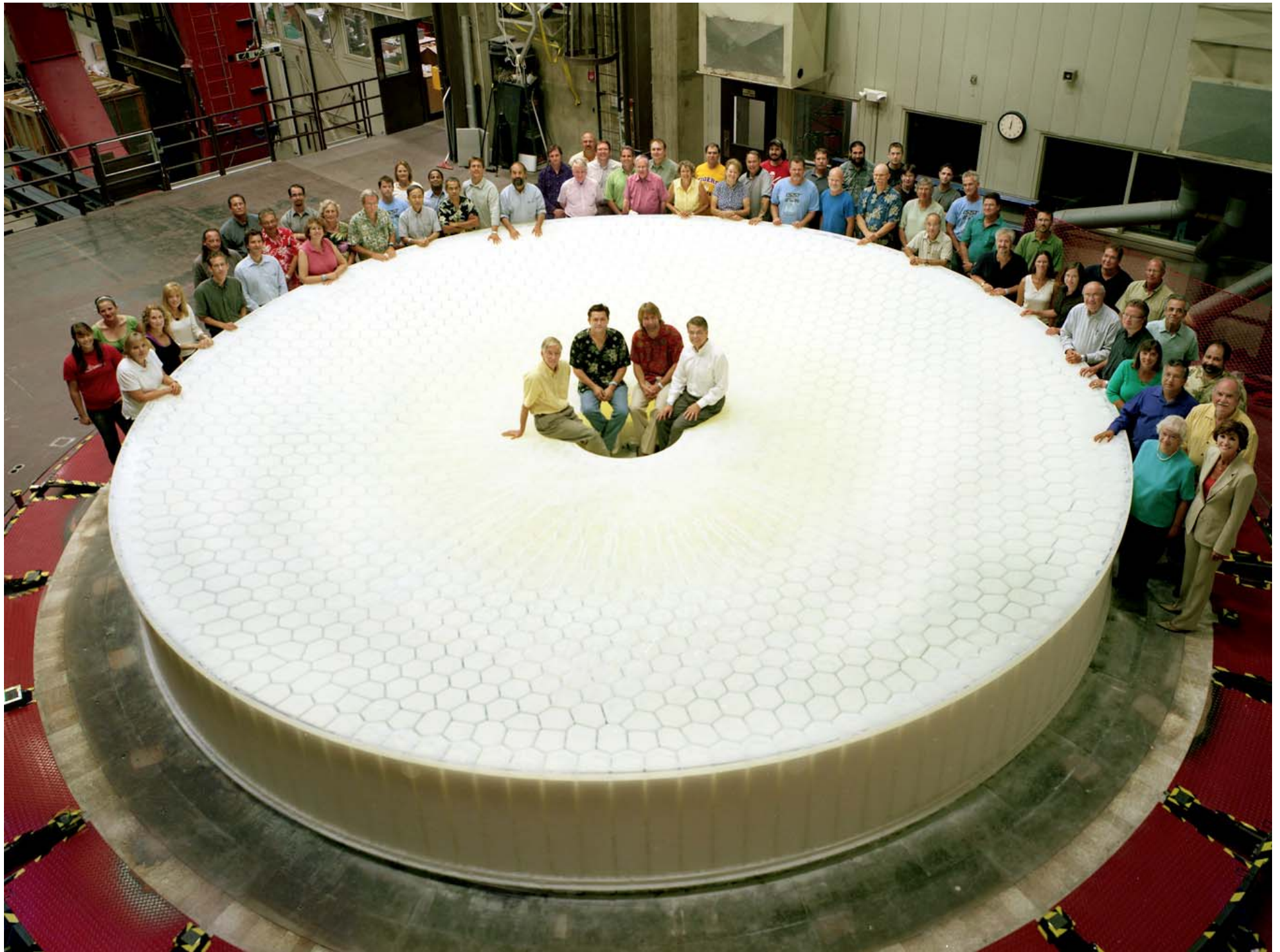
LSST Project Status (cont.):

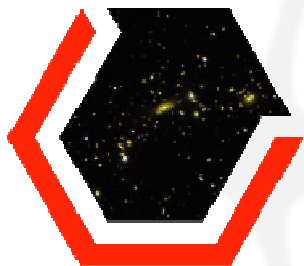
- Preliminary operating cost (\$FY06): \$37M/year. Has not been scrubbed. Proposed split is one-third from NSF; one-third from DOE; one-third TBD.
- Construction timeline spans 5.5 years with full operation beginning after year 6.
- Operational lifetime planned for 10 years. Potentially Hazardous Asteroid search, if funded by NASA, could extend this by ~10% as a result of the modification to the observing cadence required for orbit characterization.

LSST Recent Milestones



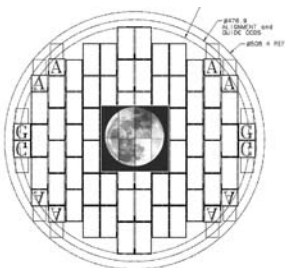
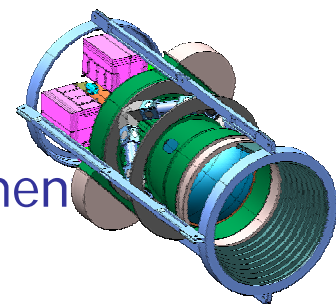
- On December 1, 2009 the Chilean Regional Authority of the Environmental Protection Agency (COREMA) unanimously approved the LSST environmental impact statement, thereby granting the permits for LSST construction and operation on Cerro Pachón.





Dark Energy Survey (DES)

- Stage III project as defined by DETF: significant progress on DE parameters, valuable support data for Stage IV experiments
- 12 institutions, >100 participants
- Major direct investment by DOE - Dark Energy Camera (DECam) – Total Project Cost ~ \$35M.
- Major indirect investment by NSF - CTIO involvement and telescope time - 525 nights, 2011-2016



- Minor direct investment by NSF - DES Data Management system (DESDM) - large field of view
- Regular joint review, most recently September 2008: next planned for July 8-9, 2009
- DECam received CD3b (start of construction) approval October 2008: project on time, on budget; complex, but has good resolution procedures

Baryon Oscillation Spectroscopic Survey

- NSF/AST is funding SDSS-III at \$9M total for 6 years starting FY09
- Within the 4-survey portfolio of SDSS-III, AST has directed that the highest priority for our funding is BOSS.
- BOSS Schedule:
 - FY09 – commission spectrographs and start operations
 - FY10 – full operations begin (5 years planned)
- DOE/HEP is a funding partner on BOSS. Funding for R&D and the upgrade was provided by the DOE dark energy grants program in FY07 & FY08 (\$1.059M). Current planned funding for operations is \$300K/year but will be revisited once the FY09 budget is passed.
- The Sloan Foundation is another funding partner at a level of about \$7M.
- The institutional partners in the SDSS-III collaboration contribute a significant fraction of the total funding from their own resources.

VERITAS

- VERITAS construction: a three way partnership -- NSF/AST (lead), NSF/PHY, and DOE/HEP, with contributions from Smithsonian Institution
- VERITAS operations: the partnership is NSF/PHY, DOE/HEP and Smithsonian Institution
- Although VERITAS has been in full operation for two years (since Spring 2007), the construction phase is not complete. They plan to move Telescope #1 to better location at Whipple and also build a central control building. Hence, AST remains involved while the project completes the effort of making the Whipple base camp the permanent site for VERITAS.

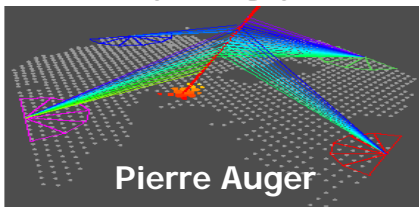


DOE HEP is involved in on-going, planned and proposed Particle Astrophysics experiments

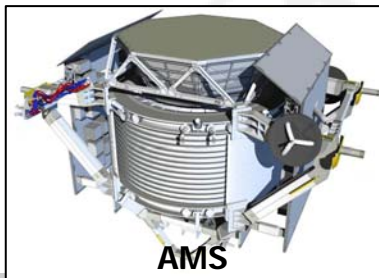
Gamma-ray Astrophysics



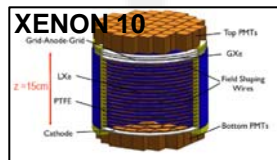
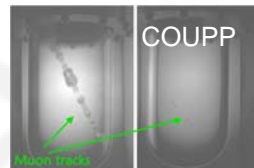
Cosmic Ray Astrophysics



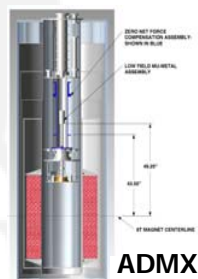
Anti-matter, Dark Matter



Dark Matter (WIMPs)



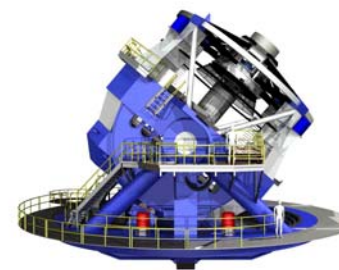
Dark Matter (axions)



Dark Energy Ground-based



(LSST)



Dark Energy Space-based



Dark Matter Searches

Cryogenic Dark Matter Search (CDMS-II)

w/NSF

- 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

w/NSF

- 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)

w/NSF

- 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 our Dark Matter Science Assessment Group (DMSAG)





NASA/NSF Programs



Virtual Astronomical Observatory

- Move beyond the very successful NVO (international standards, software, data mining support, user interfaces, etc.) to a real astronomical observatory
- “Just another observatory” where a wealth of detail is covered (hidden?) by the word “just”
- NSF/NASA MoU (8/07); solicitation, deadline 4/22/08; proposal received
- Review essentially complete; inter-agency discussions detailed and continuing; cooperative agreement drafted
- Discussion started with project (yesterday!)
- Funding ‘soon’, dependent on working out the details of the agreement between the agencies and the project



NRC-Conducted Review of Near-Earth Object Surveys and Hazard Mitigation Strategies

- Kicked off December 9, 2008; will report by December 31, 2010.
- Chair: Irwin Shapiro; Vice Chairs: Faith Vilas and Mike A'Hearn.
- Task 1: NEO Surveys
What is the optimal approach to completing the NEO census called for in the George E. Brown, Jr. Near-Earth Object Survey section of the 2005 NASA Authorization Act to detect, track, catalogue and characterize the physical characteristics of at least 90% of potentially hazardous NEOs larger than 140 meters in diameter by the end of year 2020?
- *What role could be played by the National Science Foundation's Arecibo Observatory in characterizing these objects?*
- *What are possible roles of other ground- and space-based facilities in addressing survey goals, e.g., potential contributions of the Large Synoptic Survey Telescope (LSST) and the Panoramic Survey Telescope and Rapid Response System (Pan STARRS)?*

Planetary Science Decadal Survey

- Planetary Sciences Decadal Survey is just getting started.
- NASA is the lead in sponsoring this survey; NSF/AST is a co-sponsor.
- A statement of task is with the NRC.
- The survey will be formally kicked-off by about July 1, 2009.