NSF AST Programs and Budget Update

AAAC Meeting

November 13, 2013

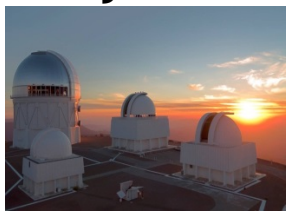
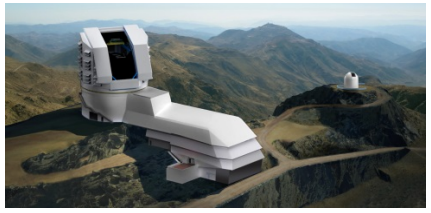
Jim Ulvestad, NSF MPS/AST

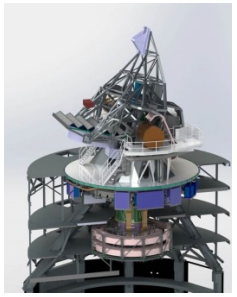
Outline

- Key Events Since March 2013
- Responses to 2013 AAAC Recommendations
- AST News and Key Interagency Activities
- FY 2013 Operating Plan/Budget
- Impacts of Lapse in Federal Appropriations
- FY 2014 Budget Outlook
- Portfolio Review and Decadal Survey Status

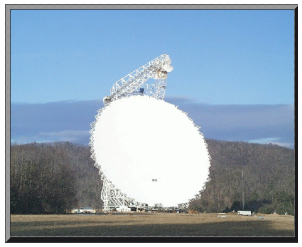
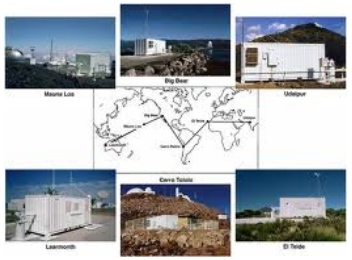
AST Strategy to 2020 and Beyond

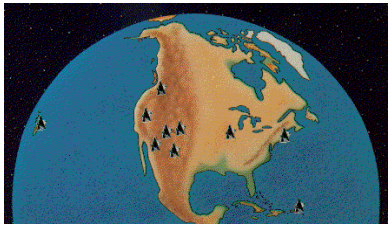
Major Facilities

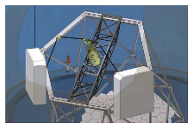


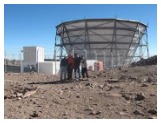
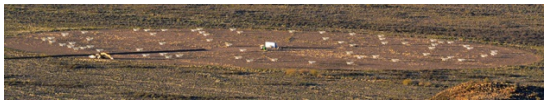
Divestment/ Partnership

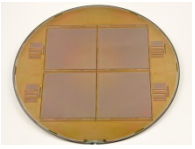


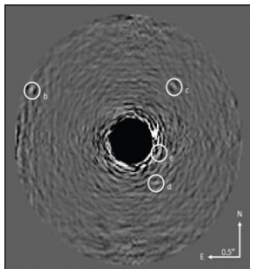
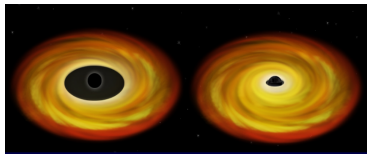
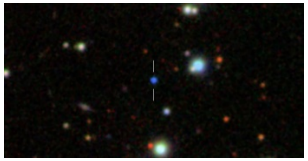
Mid-Scale Innovations



Individual Investigators



Key AST Events Since May 2013

- June: Mid-Scale Innovations Program (MSIP) solicitation released
- June: NSF FY 2013 Operating Plan approved
- July: Dr. France Cordova named new NSF director
  - Confirmation still pending
- July: NSF TCAN awards made
- August: ATST rebaseline approved by NSB
  - Increased cost due to 30-month delay in site access
- August: Dark Energy Survey began
- August/Sept: ALMA Chilean employees strike/settled
- September: Last ALMA antenna accepted
- October: Federal government lapse in appropriations
- November: GPI first light

Responses to AAAC Recommendations

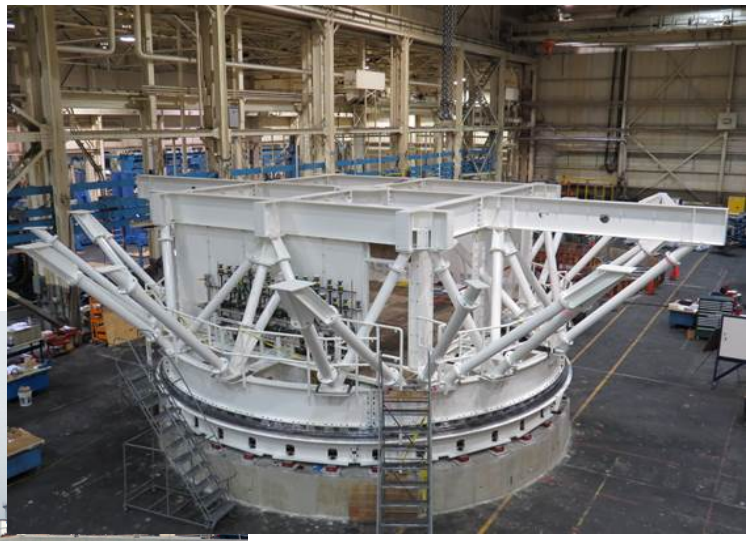
- Funding Coordination
  - Frequent NSF/DOE discussions on LSST & DESI, plus semi-annual LSST meetings with OMB and OSTP
  - TCAN, VAO funding coordinated with NASA
- Merit review process for decadal priorities in diminished funding environment
  - Next stage in portfolio review response in December 2013
  - MSIP program: will consider proposals from NWNH recommendations that cannot be supported as strategic activities
- Continue LSST development as highest priority
  - In President's FY 2014 budget request
- Support Mid-Scale Innovations Program
  - Funding requested in FY 2014, solicitation released, total funds available dependent on budget outcome

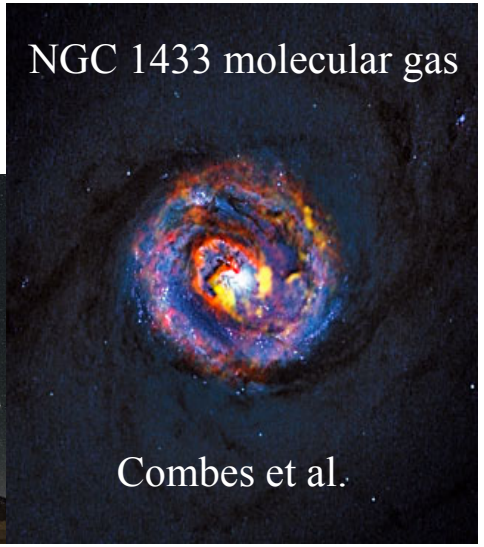
Responses to AAAC-2

- Flexible open-skies policy
  - Multi-agency principles to be discussed in later agenda item
- Agencies coordinate early in development process
  - Occurring for DESI, ongoing for LSST
- Balance among small, medium, and large programs, facilities and individual investigator awards
  - Depends on ability to implement response to portfolio review recommendations
- Request CAA study on OIR system
  - Recent convergence with CAA and NRC; proposal under review
- Mid-decadal survey and ongoing review/advisory committees
  - Not yet ready to commission mid-decadal survey
  - Met with CAA last week, continued AAAC activities

Telescopes and Science

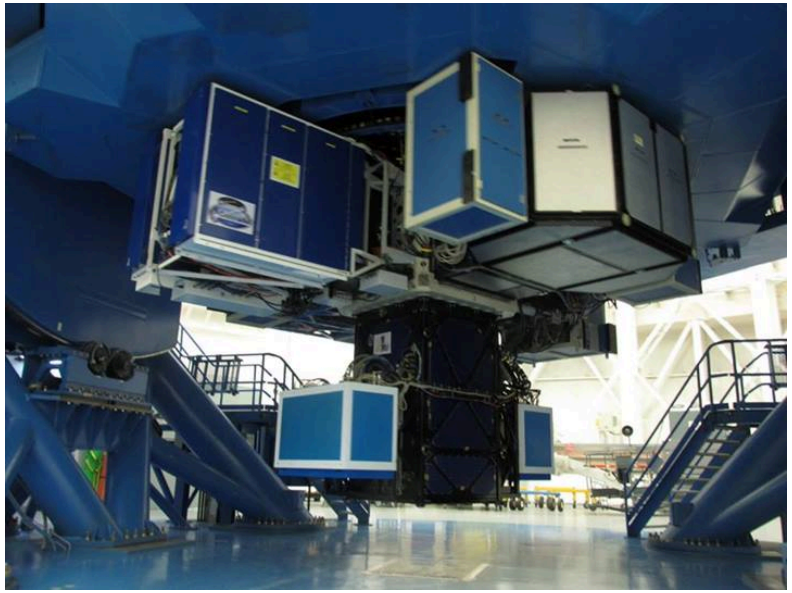
Coude lab rotator assembly, in Rockford, IL



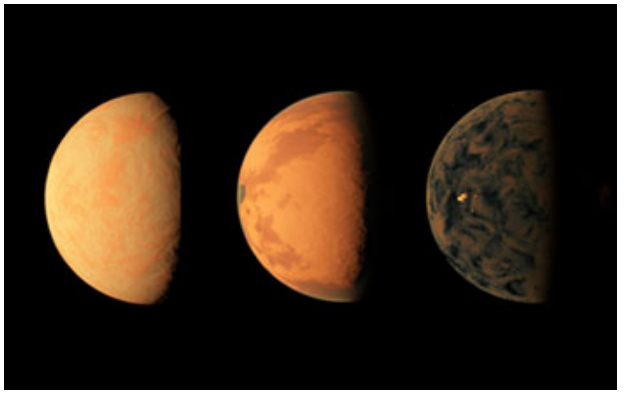


Gemini Planet Imager (GPI)

- GPI shipped to Chile, installed on Gemini-South in August
  - First light occurred on night of November 11/12
  - Public availability expected in 2014



Three Super-Earths in Habitable Zone



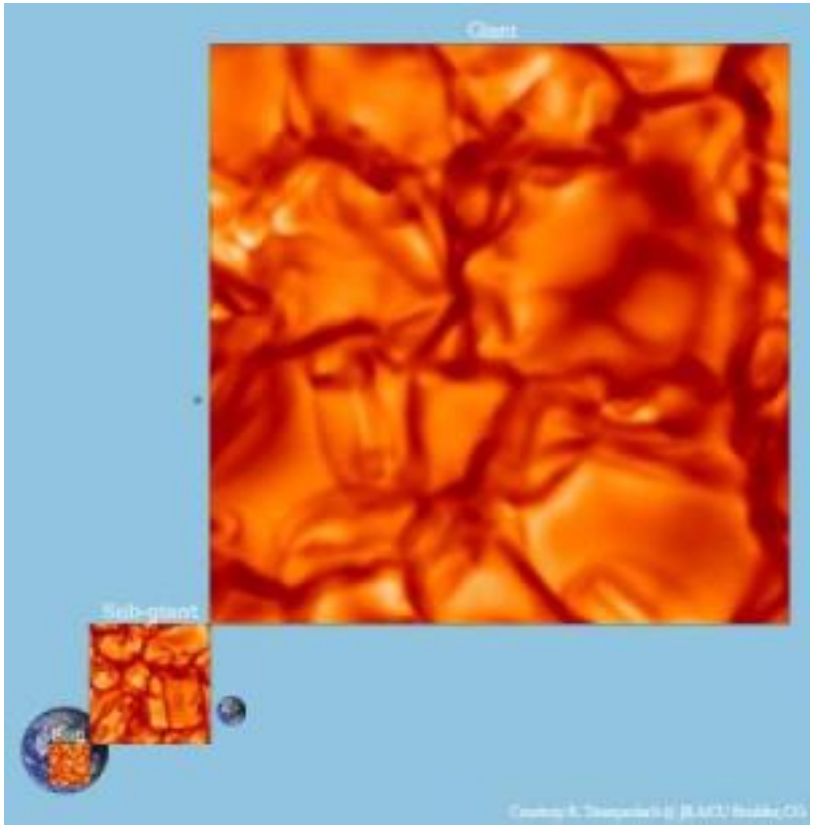
Sky around the star triple star system, GJ 667, (blue, near center of image) containing the super-Earths orbiting in GJ 667c's Habitable Zone. The system is only 22 lightyears away.

- Habitable Zone = region near star where temperature is right for liquid water to exist, hospitable for life. Super-Earth = planet with mass higher than Earth, but lower than Uranus.
- Planets are good candidates to have a solid surface and atmosphere, similar to that of Earth.
- The Planets have 3 suns and are tidally locked: one side is always illuminated, the other is always dark.
- Planets were discovered with combination of observational and theoretical studies, including new Bayesian statistical analysis techniques.

AST-1108882, 0307493 (Barnes, Vogt, Butler), Anglade-Escude' et al., Astronomy & Astrophysics, 2013, 556, 126.

New "Flicker Method to Measure Surface Gravity of Stars

- Measures short-term (<8 hours) brightness variations, or "flicker"
- High surface gravity = higher flicker frequency (finer granulation)
- Low surface gravity = lower frequency (coarser granulation)
- Simpler than photometry, spectroscopy, asteroseismology
- Combined with temperature measurements, will reduce uncertainties in stellar radii by factor of two
- Useful for testing stellar evolution models and deriving more accurate densities for hundreds of exoplanets
- Graduate student-led discovery (Fabienne Bastien, Vanderbilt)



Simulations of granulation patterns on the surface of the Sun, sub-giant and giant stars are shown. The scale of each simulation is proportional to the size of the blue image of earth next to it. (Credit: Courtesy of R. Trampedach, JILA/CU Boulder, CO)

Nature, 2013, 500, 427. Bastien, Stassun, Basri, Pepper. AST-0849736, AST-1009810 (PI=Stassun)

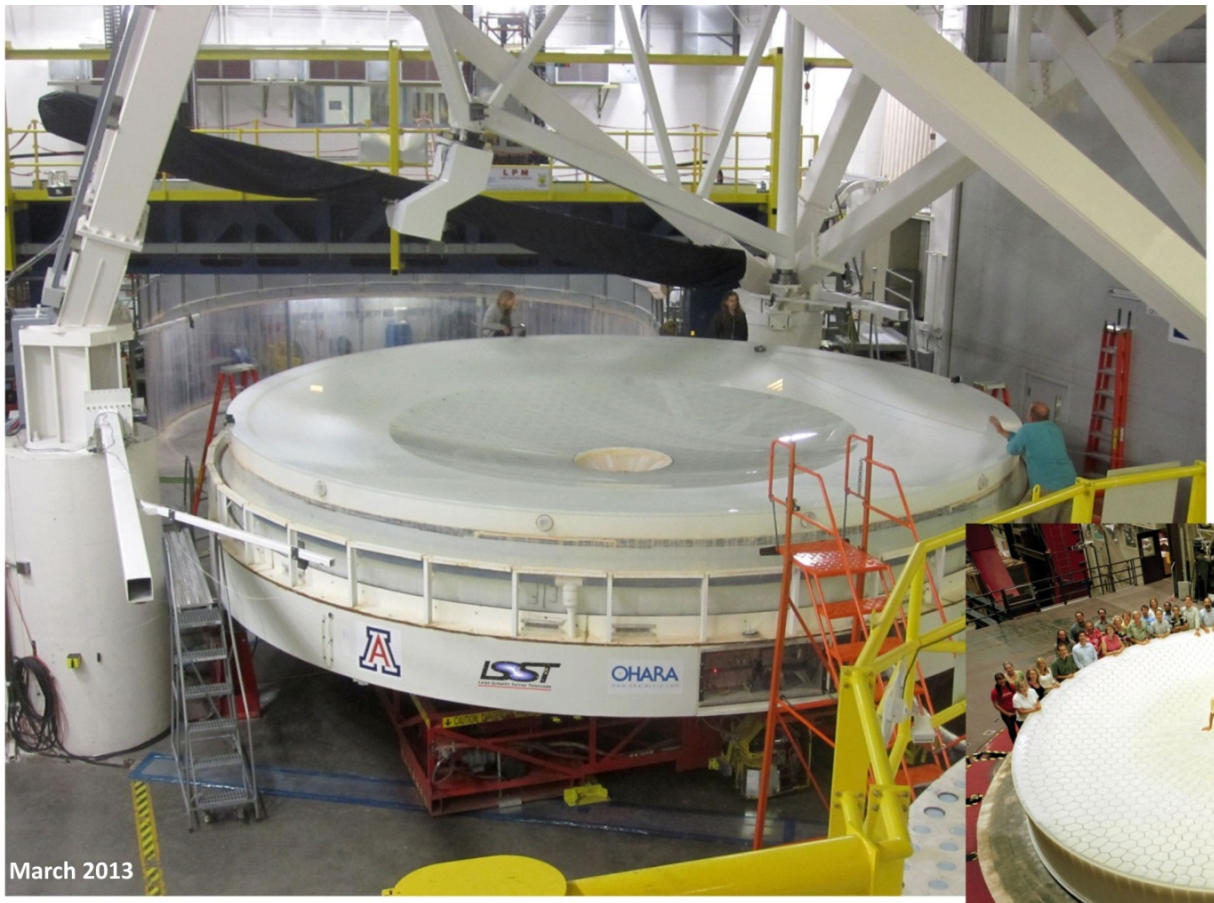
LSST

- Joint NSF/DOE project
  - NSF: Telescope, site, data management
  - DOE: Large-format camera
- In President's MREFC budget request for FY 2014
  - Goal of starting NSF construction in July 2014
  - DOE camera could not start in FY 2013 due to Continuing Resolution, but is in FY 2014 Budget Request
- NSF Final Design Review planned for December 2-6
  - Aiming at possible approval of construction award at National Science Board meeting in May 2014
    - Delayed from February 2014 due to lapse in appropriations

LSST Recent Progress-1

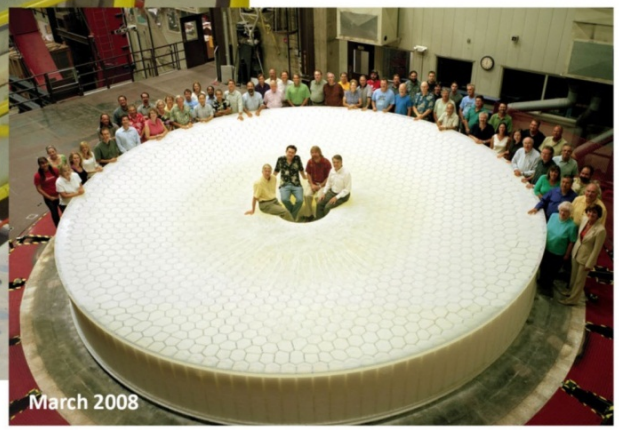
Good progress continues on Primary-Tertiary Mirror

Secondary mirror contract in place: ITT/Exelis (design, option to build)



Telescope Mount Assembly bids in hand; review and site visits starting

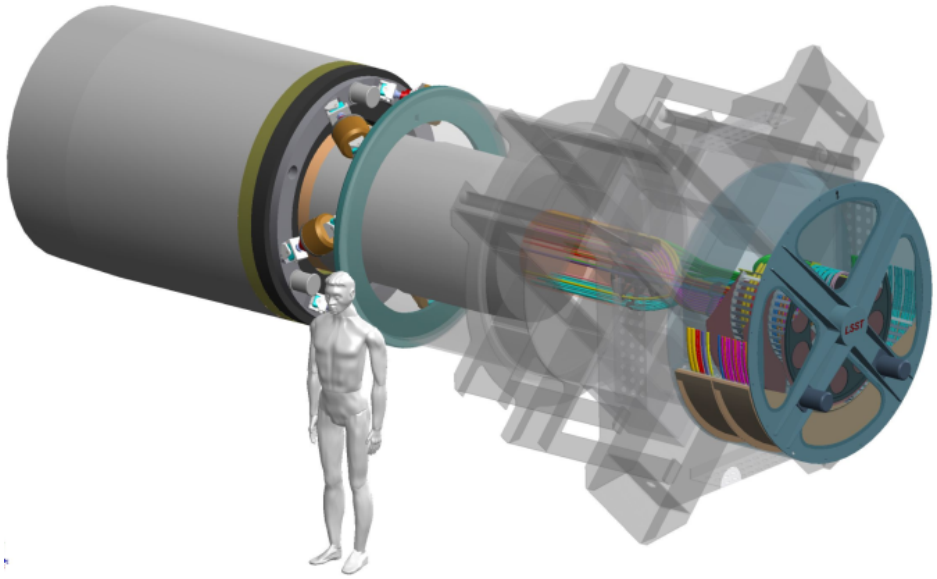
Summit Facility Construction RFP released; bids due in January



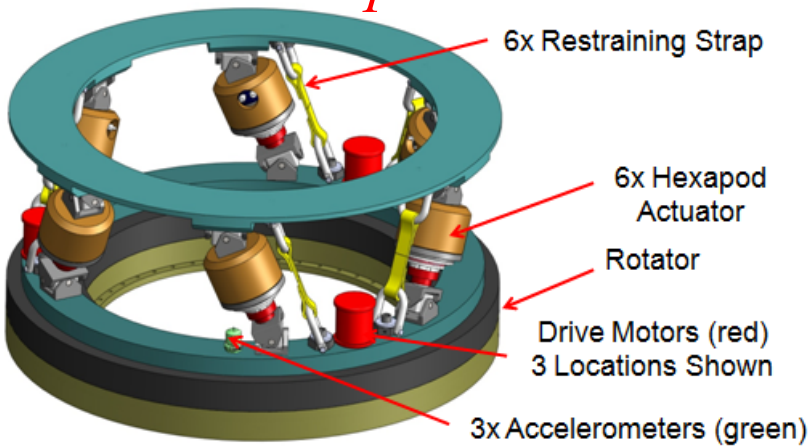
LSST Recent Progress-2

M2 Hexapod and Camera Hexapod/Rotator Contract in Place (design, option to build)

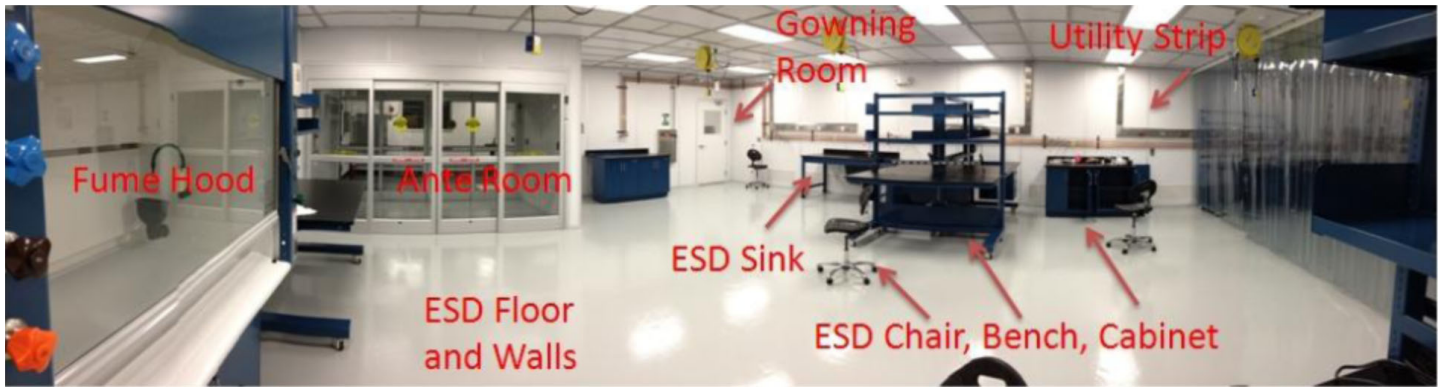
Five proposals received, reviewed, selection made



Camera Hexapod/Rotator



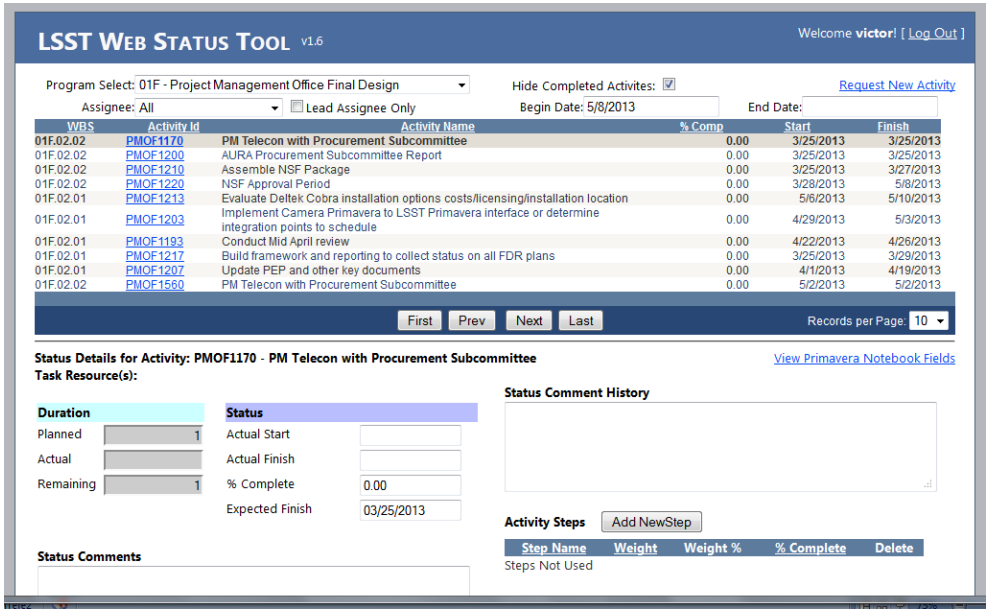
Sensor RFP released by camera team; one vendor qualified, one in process



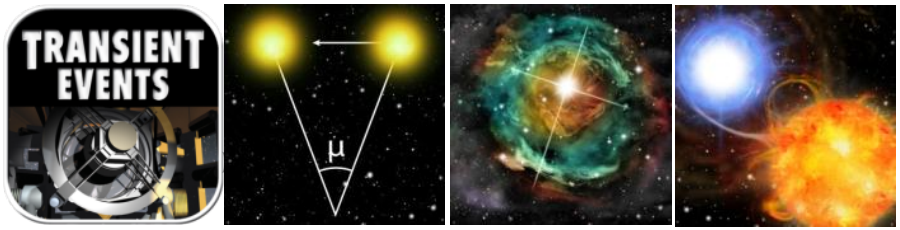
Clean room ready, some sensor integration & test activity started

LSST Recent Progress-3

Management: PMCS tool in place, updates under way for integrated EVMS system



Transient Event App now with iPad support, improved graphics and glossary



Data Management (DM)

- LSST DM delivered its eighth consecutive data challenge release in Jan.2013
- Processed 10.4 TB in ~25 days (50,000 CPU hours) on NSF's eXtreme Science and Engineering Discovery Environment (XSEDE) Gordon cluster at the San Diego Supercomputer Center
  - Twice-yearly release cycle, planned and tracked within the PMCS
  - Analysis suggests software at least as good as current operational surveys

Education & Public Outreach

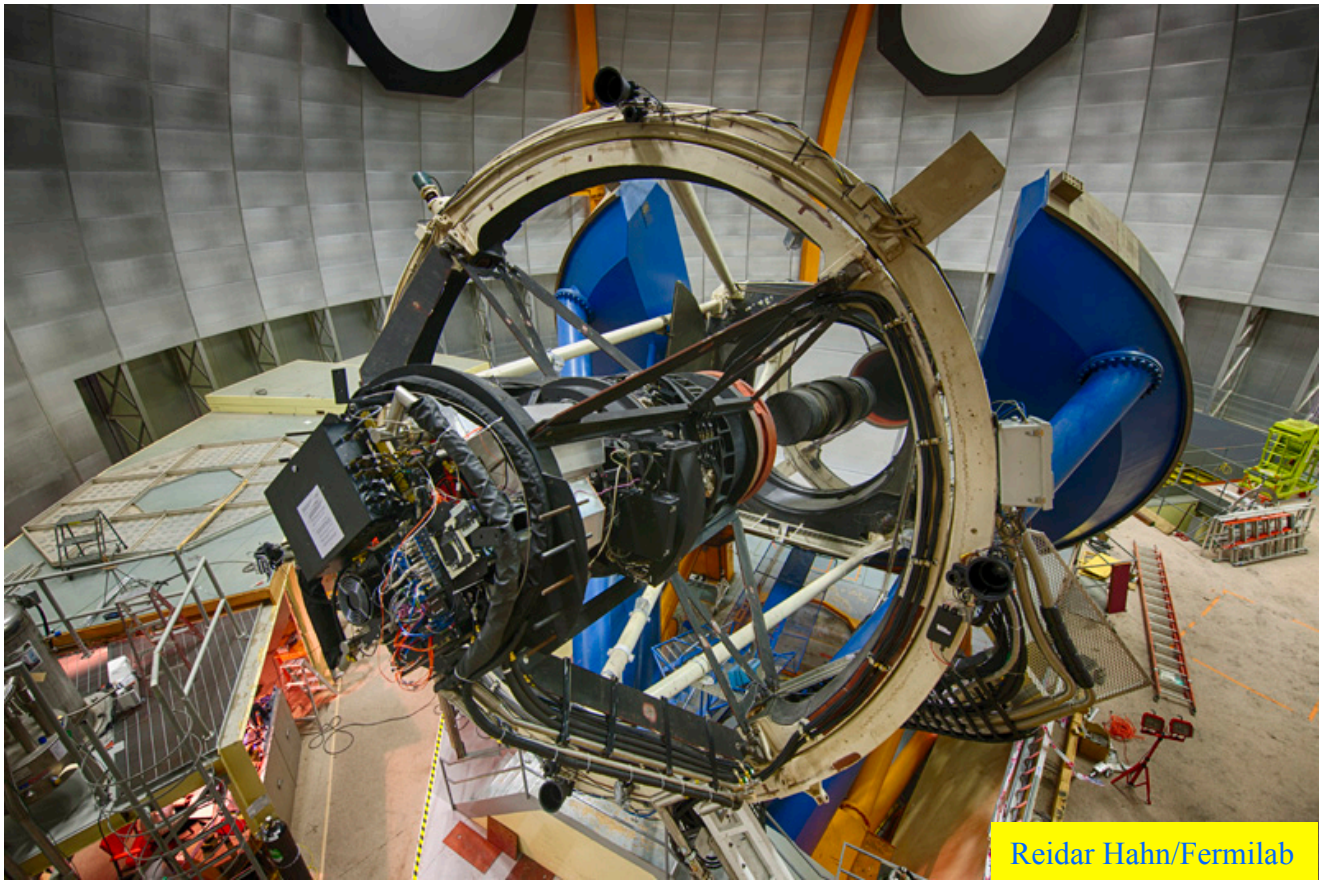
(EPO) very active: external reviews; Logic Model and evaluation plans complete

TCAN

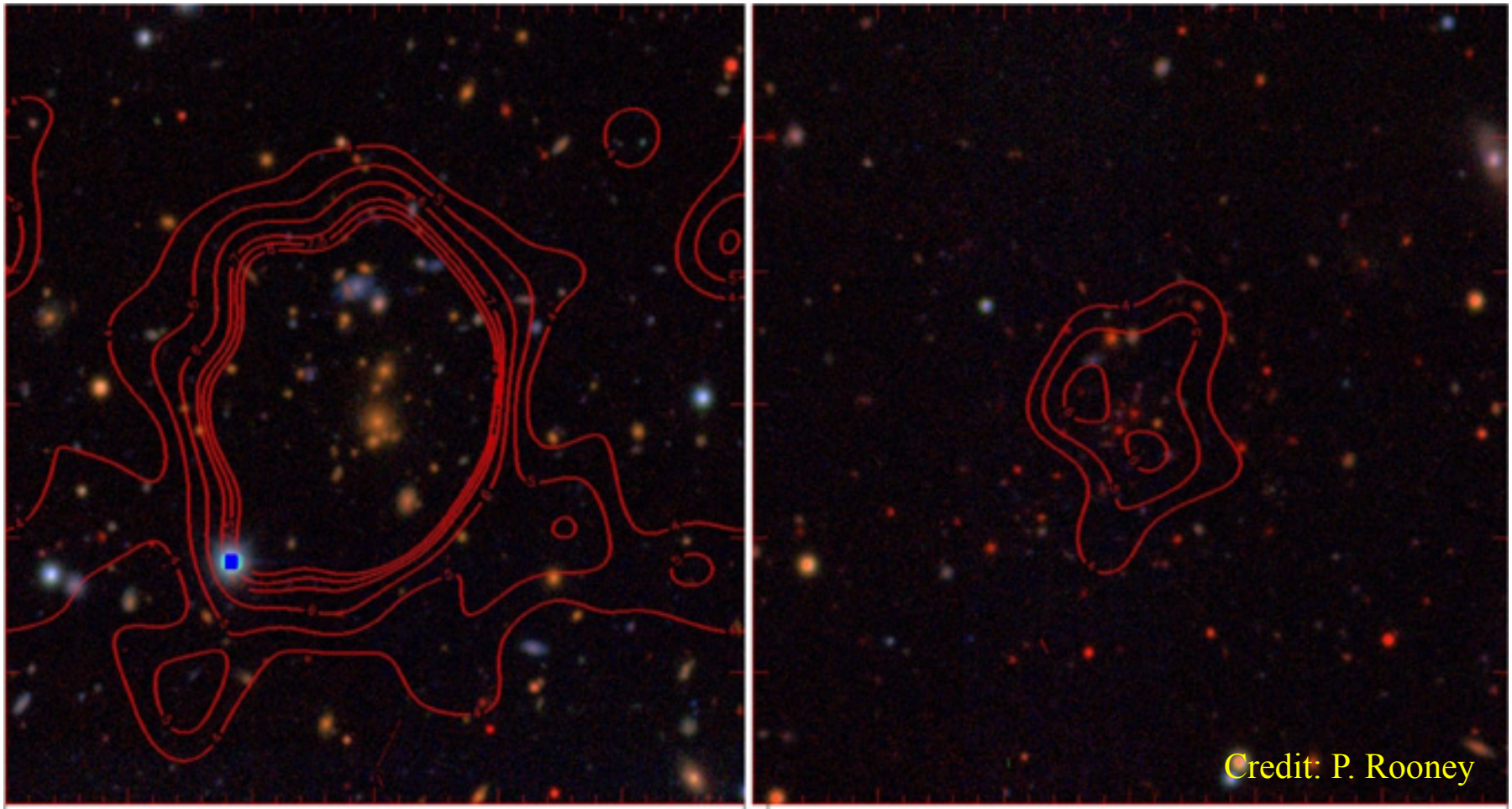
- Total of 30 projects, 108 proposals submitted
- NSF Awards (3 yr, total $1.5M each over 3 yr)
  - "Black Hole Accretion Theory and Computation Network"
    - Gammie (Illinois), Stone (Princeton), Quataert (UC Berkeley
  - "Theoretical-Computational Network for Extracting Astrophysics and Fundamental Physics from Multi-Messenger Observations of Compact Objects"
    - Ott (Caltech), Teukolsky (Cornell), Brown (Syracuse), Reddy (Washington)
  - "The Multi-scale Physics of Massive Black Hole Formation, Fueling, and Feedback"
    - Reynolds (Maryland), Natarajan (Yale), Laguna (Georgia Tech)
- Three awards also made by NASA in FY 2014

Dark Energy Survey (DES)

- NSF/DOE collaboration, 5-yr survey, 525 nights
  - NSF supplies telescope, camera from DOE
- Survey began August 31, 2013, on CTIO 4m



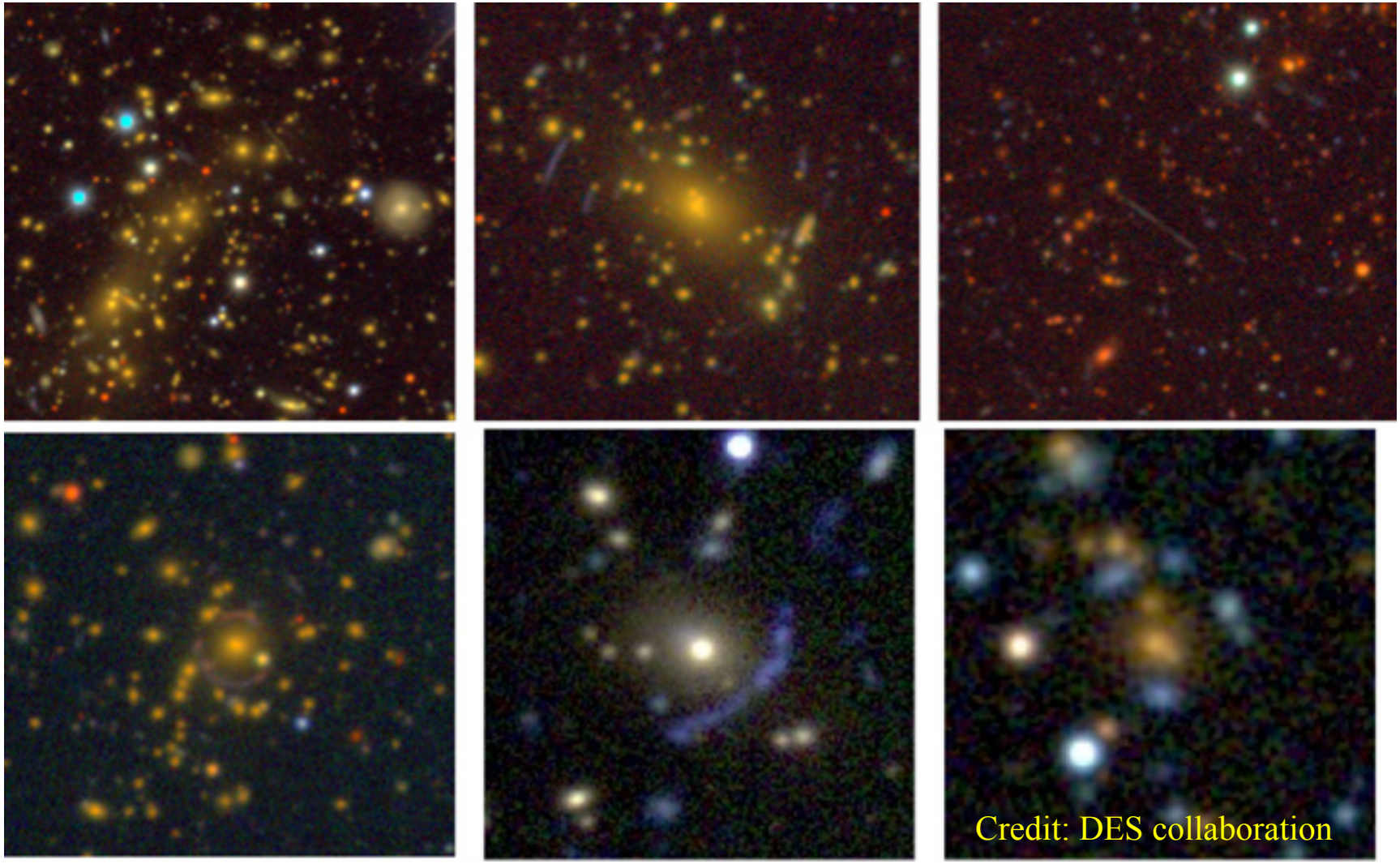
DES Science Verification
New X-ray Clusters



XMMXCSJ234231.5-562106.8 | XMMXCSJ234155.3-550745.5

DECam Imaging with X-ray contours overlayed.

DES Science Verification
Strong Lenses



FY 2013 NSF Budget Description

- NSF FY 2013 budget had 2.5% cut to Research and Related Activities relative to FY 2012
  - Resulted in 4.5% reduction to Directorate for Mathematical and Physical Sciences (MPS)

- NSF stated early in 2013 that early career programs, research infrastructure, and existing awards would be protected
  - Because of large facilities, AST budget had only 0.9% reduction relative to FY 2012
  - PHY and DMS (Math) were hit very hard

Budget History/Future

	FY11	FY12	FY13 Req	FY13 Plan	FY14 Req
MPS	1312.4	1308.7	1345.2	1249.5	1386.1
AST	236.8	234.7	244.6	232.5	243.6
CHE	233.6	234.0	243.9	229.0	253.7
DMR	294.9	294.4	302.6	290.7	314.6
DMS	239.8	237.7	245.0	219.2	244.5
PHY	280.3	277.4	280.1	250.7	289.0
OMA	27.1	30.4	29.1	27.4	40.6

- All quantities given in millions of then-year dollars
- At 2.5%/yr inflation, the AST FY13 budget used by Astro2010 would have been $297.8M
- FY14 Request prepared before FY13 budget was known

More Details of AST FY13 Plan

- Facilities decreased as in the President's FY13 request (except NOAO, which decreased in FY12)
- No new mid-scales
- Executed some forward-funding actions to help clear space for MSIP in FY14
- Kept future commitments in Individual Investigator Programs at conservative levels

	FY11	FY12	FY13 Req	FY13 Pln	FY14 Req
AAG	48.1	44.5	~43	42.4	~42
ATI	10.4	10.5	8.5	8.7	8.5
Natl. Obs.	133.9	136.3	132.6	132.6	137.0

AAG Now and Future

- FY13 saw 637 projects proposed, 90 awarded, for a 14% funding rate
  - Accounting for collaborative proposals, 112 proposals were funded primarily through AAG, with a 15% funding rate for proposals

- Anticipate possibility of funding rates near 10% in near future
  - Need ~20% funding rate for best merit review
  - Considering options

Impacts of Lapse in Appropriations

- LSST Final Design Review postponed from October to December
- NRAO-North America shut down because of lack of FY 2014 funds, several other facilities were close to depleting FY 2013 funds
- Mid-Scale Innovations Program schedule will be delayed approximately one month
  - Invitation letters in January, full proposals due in March 2014
- Delayed closure on plans for CAA O/IR study

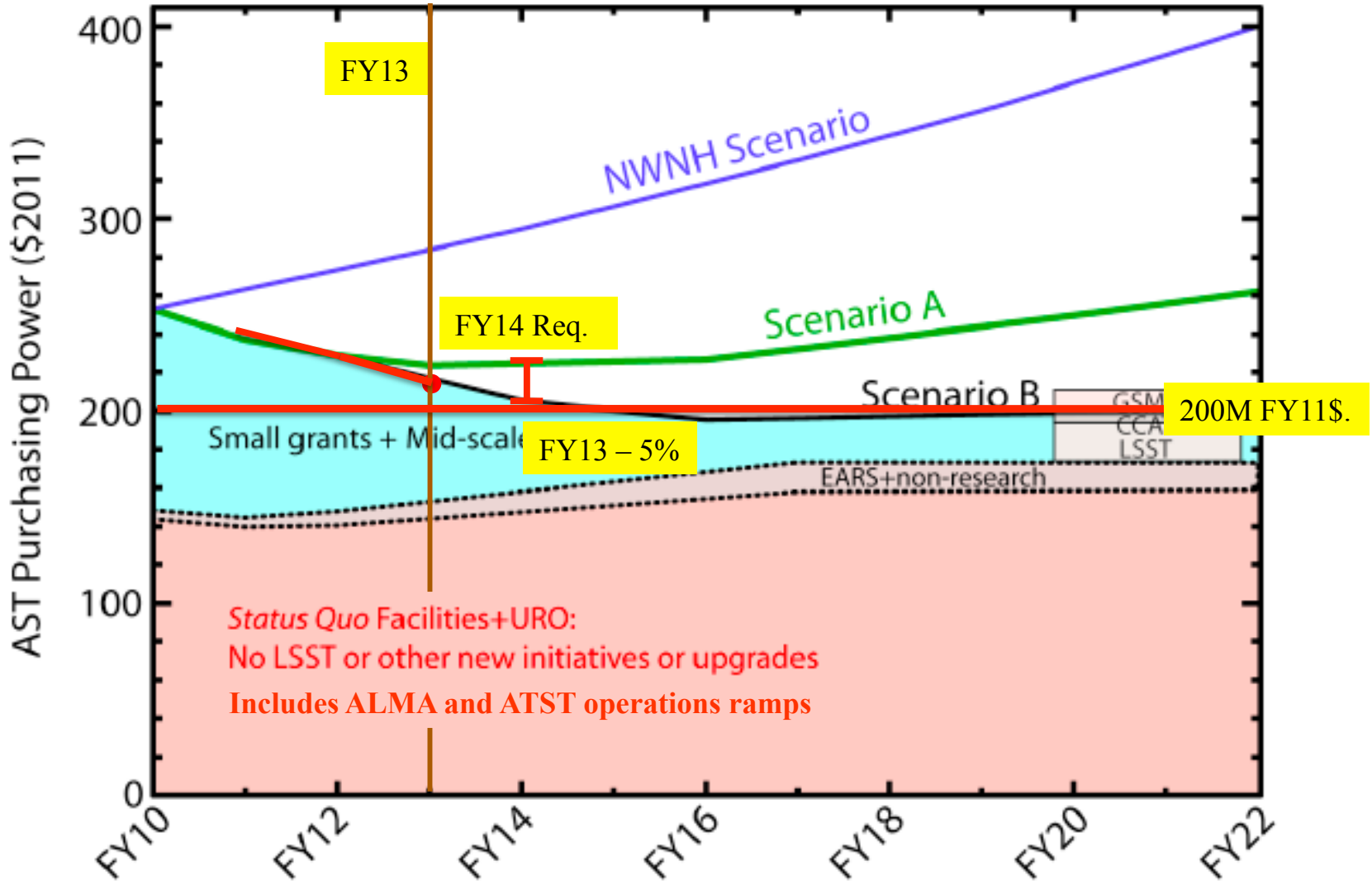
FY14 Request/Markups

- Good news in President's FY14 Request
  - Strong support of NSF overall
  - LSST funding is requested in MREFC line
  - Mid-Scale Innovations Program start
- House and Senate committees used different funding assumptions, and thus produced different budgets for NSF
- Outcome remains in doubt

FY14 Expectations

- In FY 2013 sequester budget, NSF Director set priorities that provided full support for early-career scientists, existing awards, and research infrastructure
  - Consequence: new individual investigator awards bore a disproportionate share of sequester cuts
- NSF hopes that Congress fully supports the FY 2014 NSF budget request, which we are prepared to execute
- In the event of sequester, or a Continuing Resolution near sequester levels, expectations are that the protections of research infrastructure at the expense of individual investigators would not be repeated
  - Research facilities would share at least proportionately in any budget reductions
  - For AST, this could mean a significant budget reduction relative to FY 2013 levels

Portfolio Review Budget Scenarios



Portfolio Review Status

- AST advertised that divestment decisions will be made "near the end of CY 2013"
  - Decisions will require consideration of alternatives in compliance with NEPA, NHPA, ESA
  - Preparing Dear Colleague Letter to community
- Note the context of management competitions
- Many partnership discussions with other agencies, universities, etc., but funding is tight everywhere

Decadal Survey (NWNH) Status

- LSST is in FY 2014 President's request, Final Design Review re-scheduled
- MSIP is in FY 2014 President's request, solicitation was released, and proposals are in
- NSF and community participating in TMT Board, Science Advisory Committee, via planning award
- Only CTA opportunity is through MSIP

- Only CCAT opportunity is through MSIP

- "Small" recommendations: TCAN (Theoretical and Computational Astrophysics Network) started with NASA, no funds available for other recommended increases

Questions/Discussion

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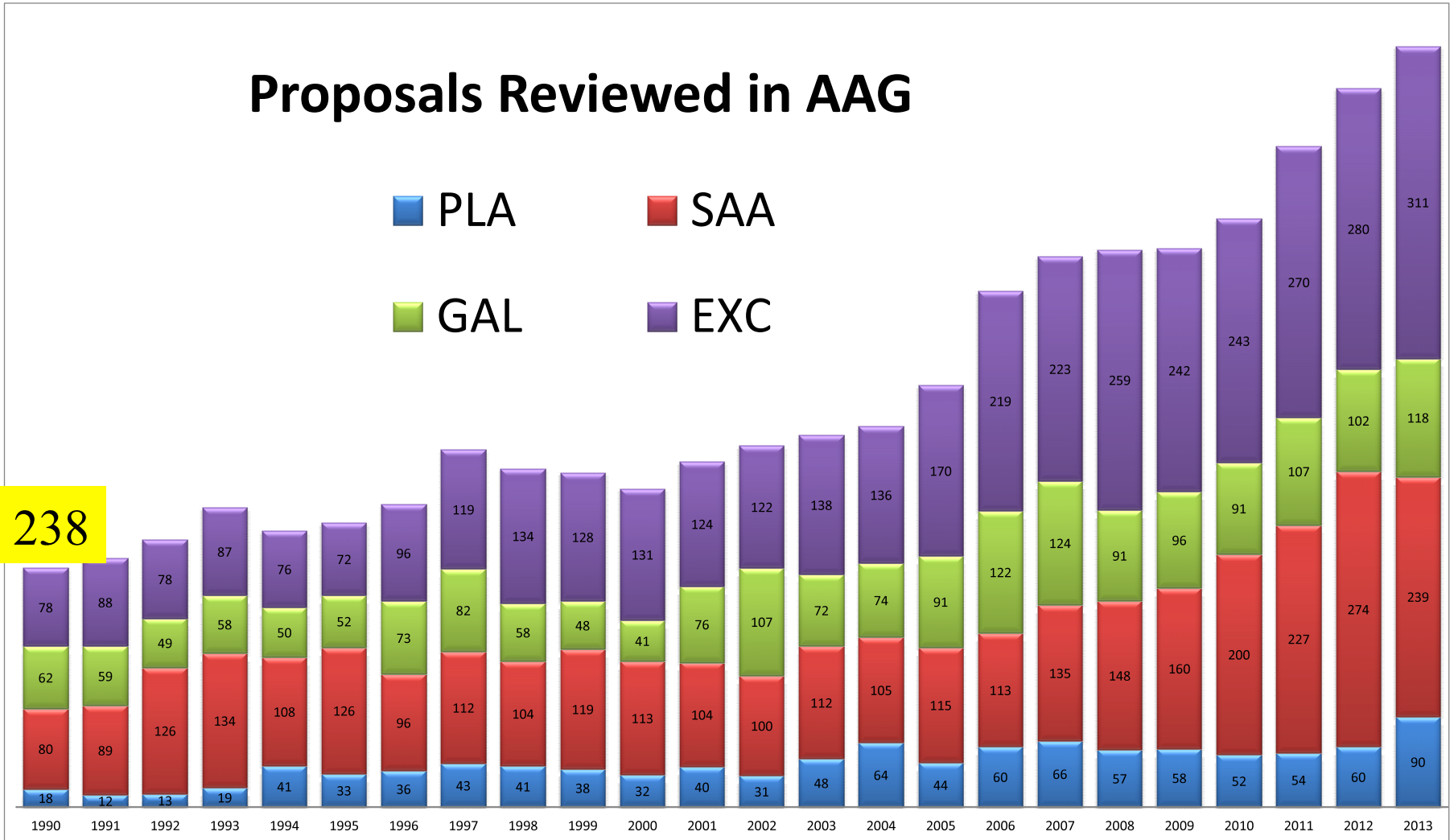

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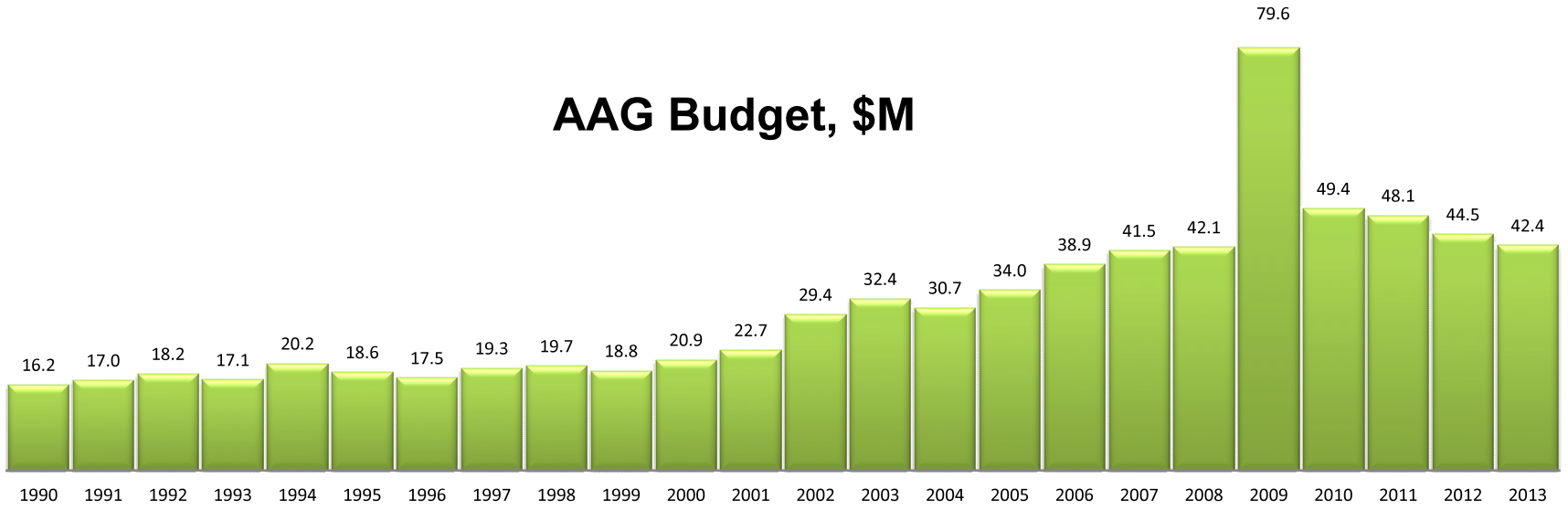
AAG Budget, $M
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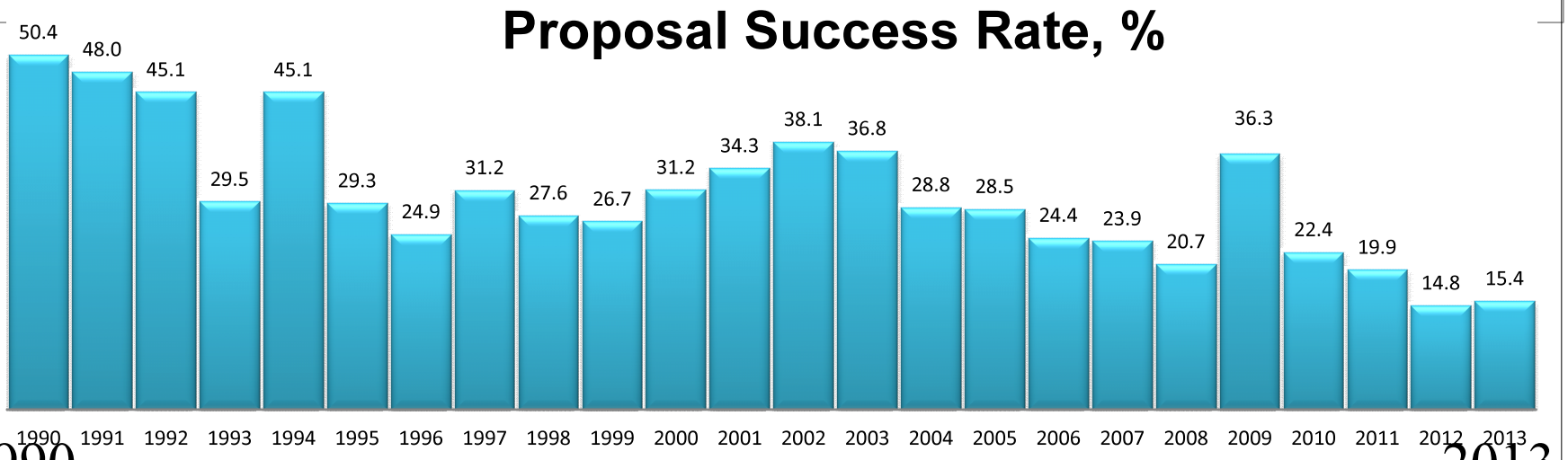
Proposal Success Rate, %
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