NSF Division of Astronomical Sciences (AST) Report

November 17, 2014

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Outline

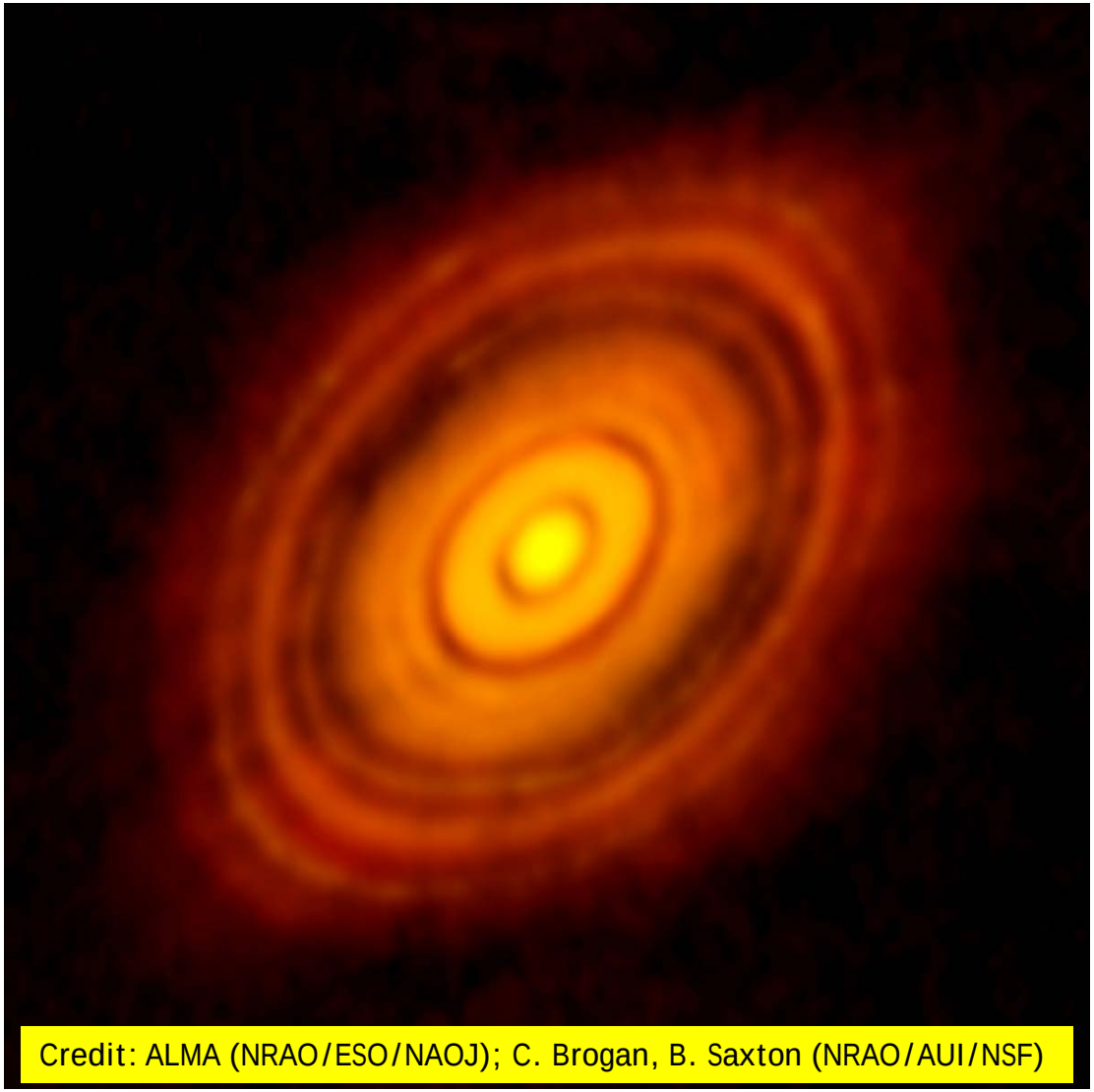
- Why are you here?
- Highlights, NSF and AST Budgets
- Progress on Previous AAAC Recommendations
- Decadal Survey Status
- Portfolio Review Status
- Astronomy and Astrophysics Research Grants (AAG)

Why are you here?

- NSF Authorization Act of 2002, as amended by DOE High-End Computing Revitalization Act of 2004
- Duties:
  - "assess, and make recommendations regarding, the coordination of astronomy and astrophysics programs of the [NSF, NASA, and DOE]"
  - "assess, and make recommendations regarding, the status of the activities of [NSF, NASA, and DOE] as they relate to the recommendations contained in the [2001 NRC decadal survey], and the recommendations contained in subsequent [NRC] reports of a similar nature"
  - "not later than March 15 of each year, transmit a report to [NSF, NASA, DOE, and Congress] on the Advisory Committee's findings and recommendations"

Highlights,NSF and AST Budgets

ALMA construction nearly completed

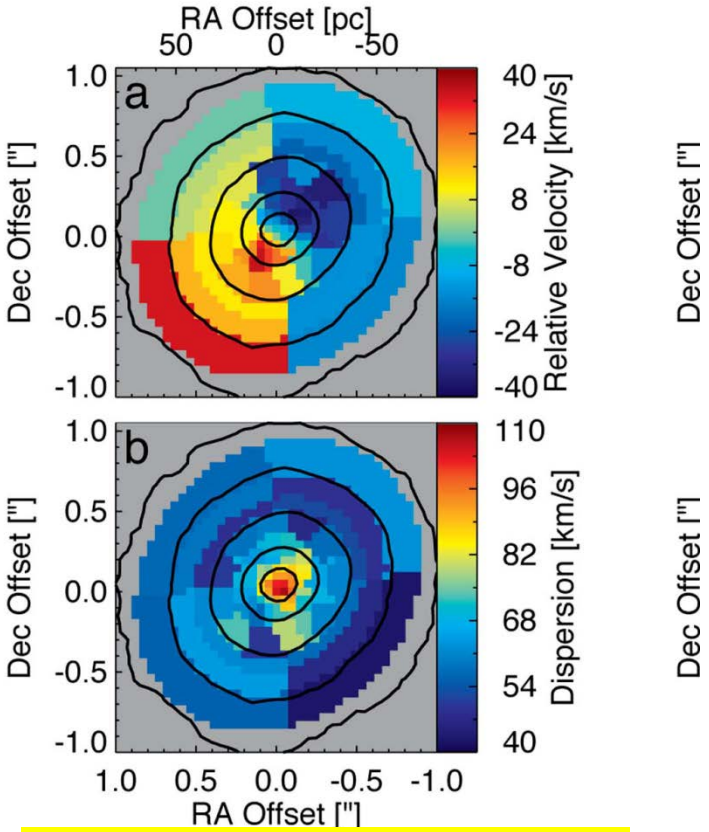


HL Tau:

- Astonishing detail in planet-forming disk ~235 AU in diameter around a young Sun-like star 450 ly away.
- Planet formation underway at <1 Myr
- Rings may have been created by planet-like bodies and/or resonances.
- λ=1.3 mm, 25-30 antennas, resolution = 35 mas, ~5 AU.

Massive Black Hole in M60-UCD1

- Ultra-Compact Dwarf Galaxy M60-UCD1 observed with Gemini-N AO system, imaged with HST
- Spectroscopy shows clear rotation in inner arc-second and high velocity dispersion in inner 0.1 arc-sec
- Interpreted as black hole of 20 x 10^6 M_{Sun} in galaxy of total mass only 140 x 10^6 M_{Sun}

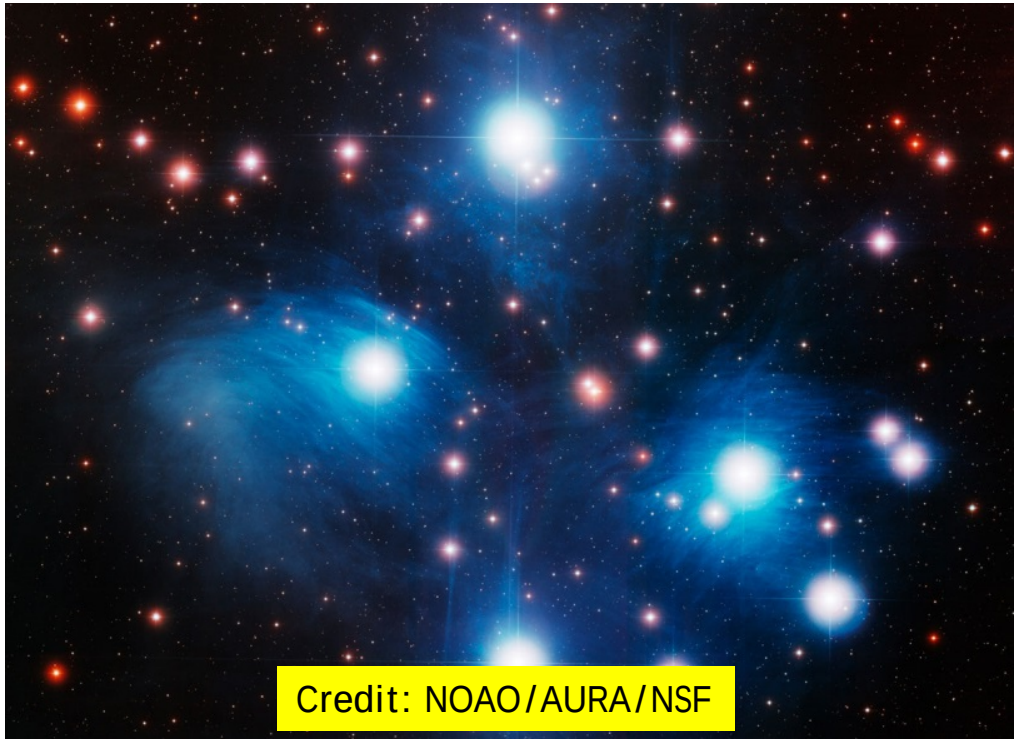


Credit: University of Utah/Nature

- Seth et al., 2014, Nature, 513, 398

Pleiades Distance

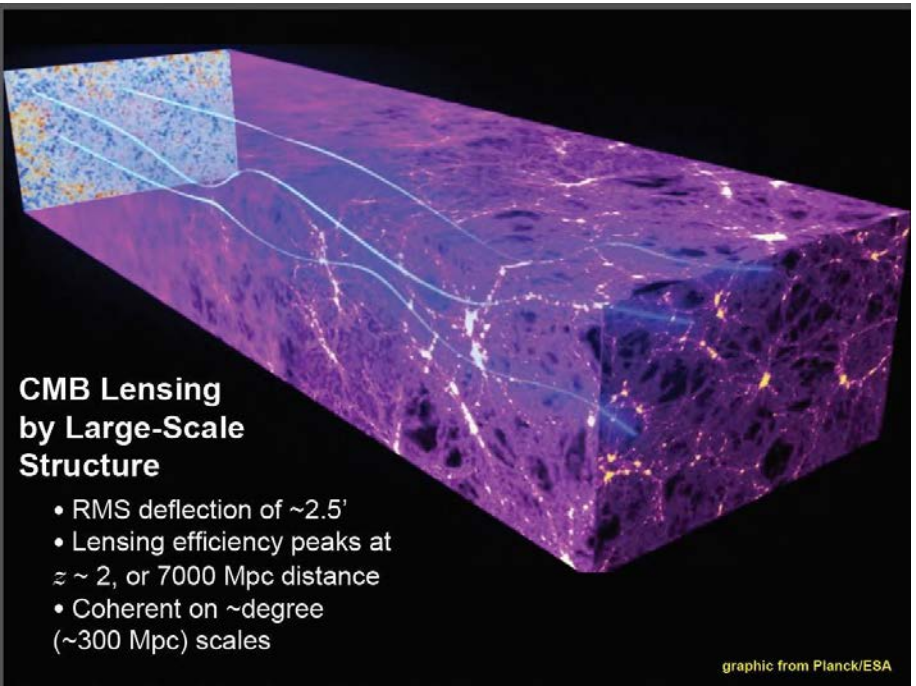
- Hipparcos “accepted” distance to Pleiades is 120.2 +/- 1.5 pc closer than previously accepted distances that were >10% larger
- VLBI parallax measurements of 5 stars in Pleiades give distance of 136.2 +/- 1.2 pc, consistent with pre-Hipparcos results
- Implications for astrophysical models of Pleiades-age stars

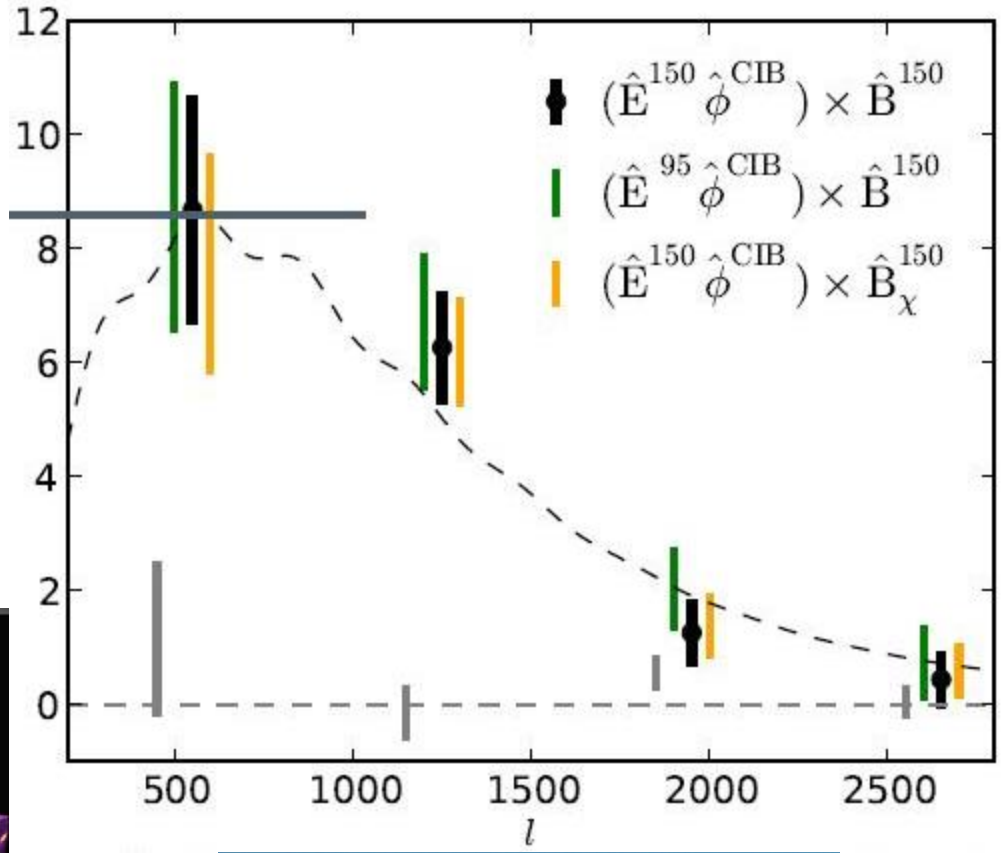


- Melis et al. 2014, Science 345, 1029

PLR/AAGS - Pioneering Astrophysical Research

Researchers operating the South Pole 10m Telescope (SPT) in Antarctica used recent data from a 100 degree-squared patch of the sky to detect for the first time tiny fluctuations in the Cosmic Microwave Background (CMB) - known as the B-mode polarization - that were caused by "gravitational lensing" - the bending of the CMB photon trajectories through the gravitational tug of matter as they travel to Earth through massive galaxy clusters. Also reported by POLARBEAR: ApJ, 794, 171.

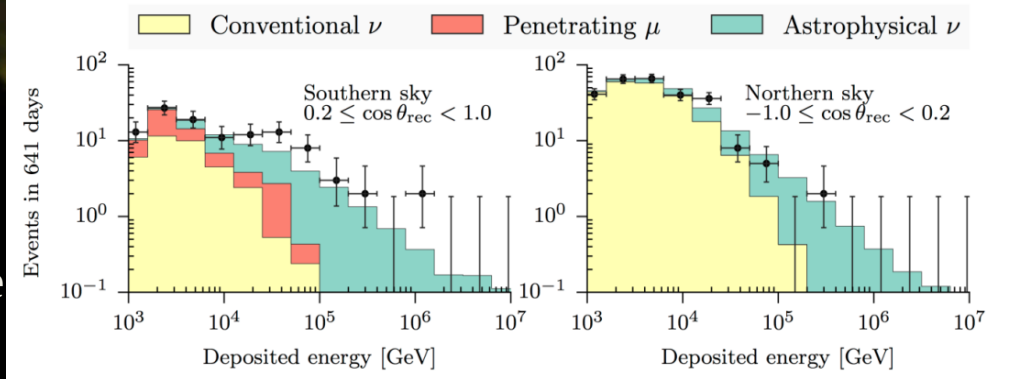




NSF-funded IceCube Neutrino Observatory at South Pole reported highest energy neutrinos from outside the Solar System

A PeV-energy electron neutrino event superimposed over UW-Madison lakefront

Up to date, over 40 neutrinos with energies above 30 trillion electron volts (TeV) have been spotted. IceCube researchers confirmed that astrophysical neutrinos (green in the figure) remain the dominant component in the Southern sky.



Highlights

- ALMA construction completed except for punchlist items
  - Spectacular science results already appearing
- Daniel K. Inouye Solar Telescope (DKIST) renamed, construction well on its way
- Construction award made for Large Synoptic Survey Telescope (LSST)
- Mid-Scale Innovations Program (MSIP) concluded its first round, with new awards
- Completed reorganization of grant discipline areas to group Planetary and Exoplanetary Astronomy

Major Construction Projects

Not-So "High"lights

- AST Division budget remains stagnant
  - President's Budget Request of $236 million for FY 2015, compared to $246 million appropriated in FY 2010
- Astronomy and Astrophysics Research Grants (AAG) budget went from $49.4 million in FY 2010 to $43.7 million in FY 2014, with funding rate falling from 22% to 16%
- Ended University Radio Observatories and Telescope Systems Instrumentation Program as standalone activities, folded into MSIP
- "Open Access" time headed for reductions in both optical and radio regimes

Issues to Watch

- Merit Review oversight by Congress
- America Competes reauthorization
- Outcome of FY 2015 appropriations
  - More sequestration in the future?
- Facility divestment and increasing activities in Chile
- Inspector General concerns about NSF construction projects

Progress on Previous AAAC Recommendations

AAAC 2014 Recommendations to NSF

- Use newly drafted "Principles for Access to Large Astrophysics Projects and Facilities" in negotiating future agreements
  - Being used in discussions for DESI, exoplanet programs
- Should budget situation improve, make more aggressive progress on decadal survey priorities
  - Awaiting improvement
- Pursue divestments in most expedient possible manner to enable decadal survey progress
  - Have started engineering feasibility and baseline environmental reviews for several telescopes/facilities
- Where possible, leverage divested facilities for community access
  - Many ongoing discussions, most in progress
- AAAC and agencies work together to clarify and quantify questions related to individual investigator grants and mid-scale programs
  - Ongoing, see separate agenda item

NRC/CAA OIR System Study (AAAC 2013)

- "A Strategy to Optimize the U.S. Optical and Infrared System in the Era of the Large Synoptic Survey Telescope (LSST)"
- Committee chaired by Debra Elmegreen, Vassar College
- Three meetings July 31/August 1; October 12-13; December 2-3
- Community input received and under discussion
- October meeting had presentations from observatory directors, GMT, TMT, adaptive optics experts, ESO, etc.
- NSF has noted importance of recommendations in areas of instrumentation and data management, plus the people/training needs to support these areas
- Report expected in Spring 2015

Decadal Survey Status

Decadal Survey (NWNH) Status

- Funding circumstances are substantially below those assumed in NWNH

- LSST construction approval in MREFC line was secured, with award made on August 1, 2014 (survey begins 2022)
- Mid-Scale Innovations Program (MSIP) proposals evaluated, and first awards have been made
- NSF and community participating in TMT Board, Science Advisory Committee, via planning award
- Only CTA and CCAT opportunities – MSIP
- "Small" recommendations: TCAN (Theoretical and Computational Astrophysics Network) started with NASA, no funds available for other recommended increases
- CAA O/IR System Study under way
- Portfolio review carried out in 2011-2012

MSIP Awards

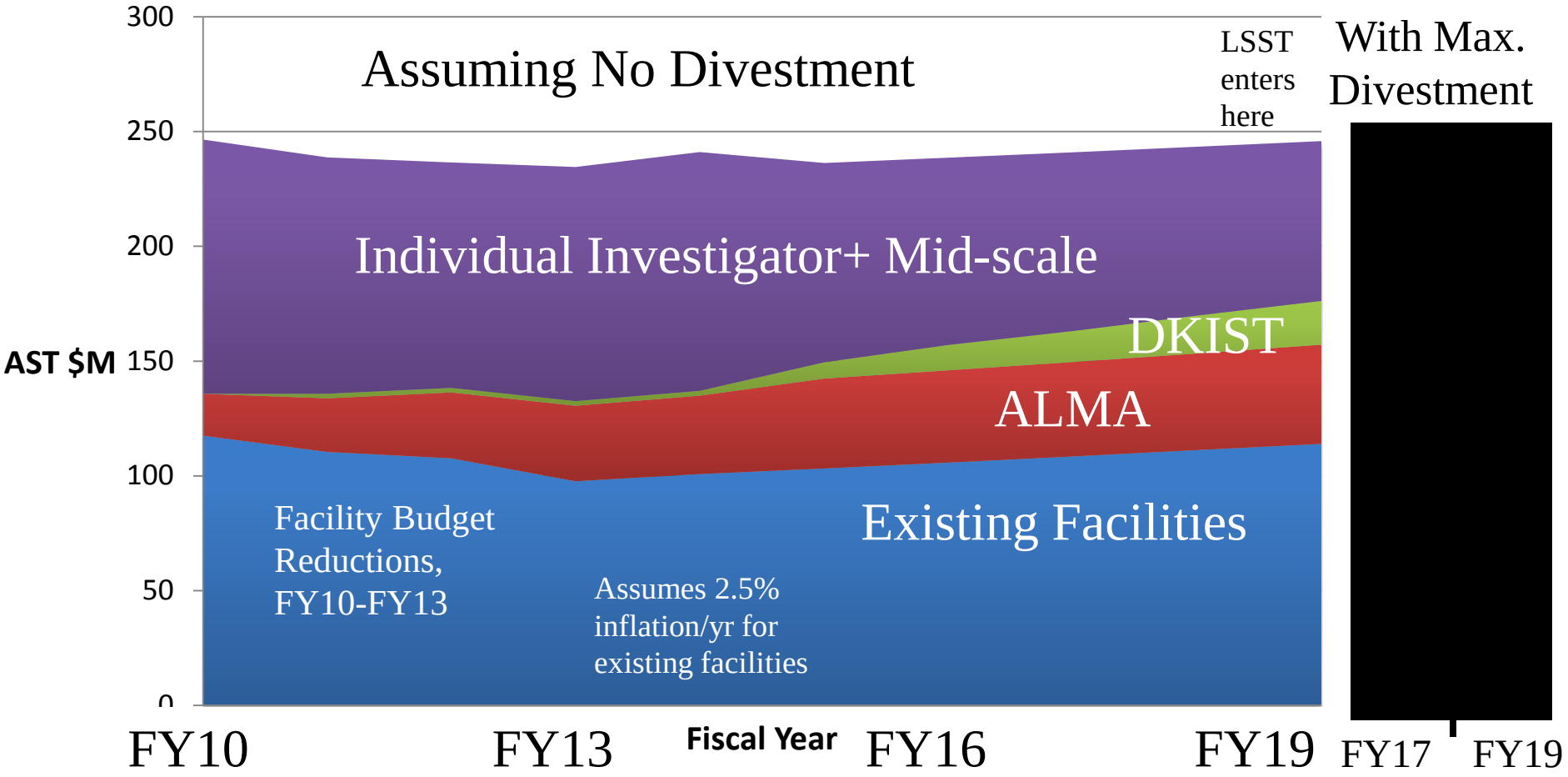
- 38 pre-proposals, requesting $398 million, 12 full proposals invited
- Two full awards in FY 2014
  - Zwicky Transient Facility – Kulkarni, Caltech, $9.0 million
  - Advanced ACTPol – Staggs, Princeton, $10.0 million
- One development award in FY 2014
  - HERA: Illuminating Our Early Universe – Parsons, Berkeley, $2.1 million
- ACTPOL and HERA are within the eight notable areas called out by *NWNH*, while ZTF is responsive to one of the *NWNH* "Science Frontier Discovery Areas"
- Projected FY 2015 Awards
  - Expect one full award and two partial/co-funded awards to be made in FY 2015

MSIP Moving Forward

- MSIP subsumed Telescope Systems Instrumentation Program (TSIP) and University Radio Observatories (URO) as a component of MSIP program, which also has open access to data as a goal
- FY 2013 MSIP solicitation was for FY 2014/15 funds
- Total AST MSIP budget started at ~$14 million/yr, hence with ~$27 million available through first solicitation
  - Also attracted several million dollars in co-funding and made small out-year commitments, for total of ~$35 million
- Expect similar FY 2015 solicitation for FY 2016/17 funds
  - Discussing possible modifications regarding the funding levels, instrumentation details, and open-access (telescopes and data) category

Portfolio Review Status

AST Portfolio Scenarios



AST budget assumption: FY15=Request, 1%/yr growth thereafter

Portfolio Review Status

- AST issued Dear Colleague Letter NSF 14-022 on December 20, 2013
  - Lays out future steps for all telescopes that were either recommended for divestment in the near term or for future consideration
  - NSF has begun engineering/environmental feasibility studies for a number of telescopes, while consideration of some others awaits specific external milestones
  - Expect next steps of environmental review to begin in FY 2015, as appropriate
- Achieved schedule will be slower than hoped

Facility Futures-I

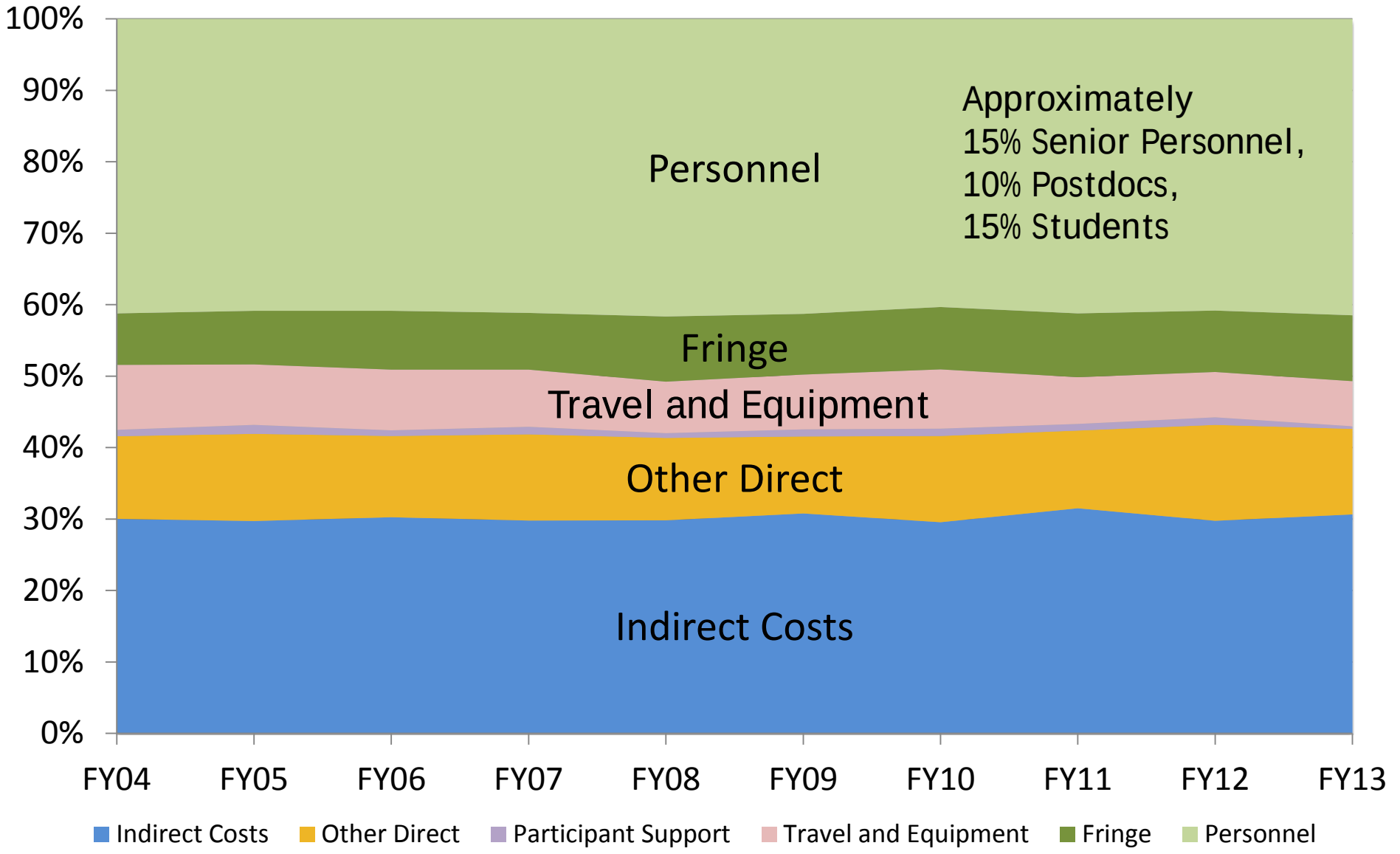
- Kitt Peak 2.1m open availability ended in FY 2014
  - Proposals to take over 2.1m under evaluation
- Mayall 4m leaves NOAO base budget after FY 2015
  - Continued operation for special projects funded outside NOAO base
  - Expect some community access continuing during 2016-2018 transition to DOE DESI project
- NOAO share in WIYN 3.5m telescope
  - Joint NASA/NSF exoplanet program is under development
  - Includes development of Extreme Precision Doppler Spectrograph under NASA solicitation

Facility Futures-2

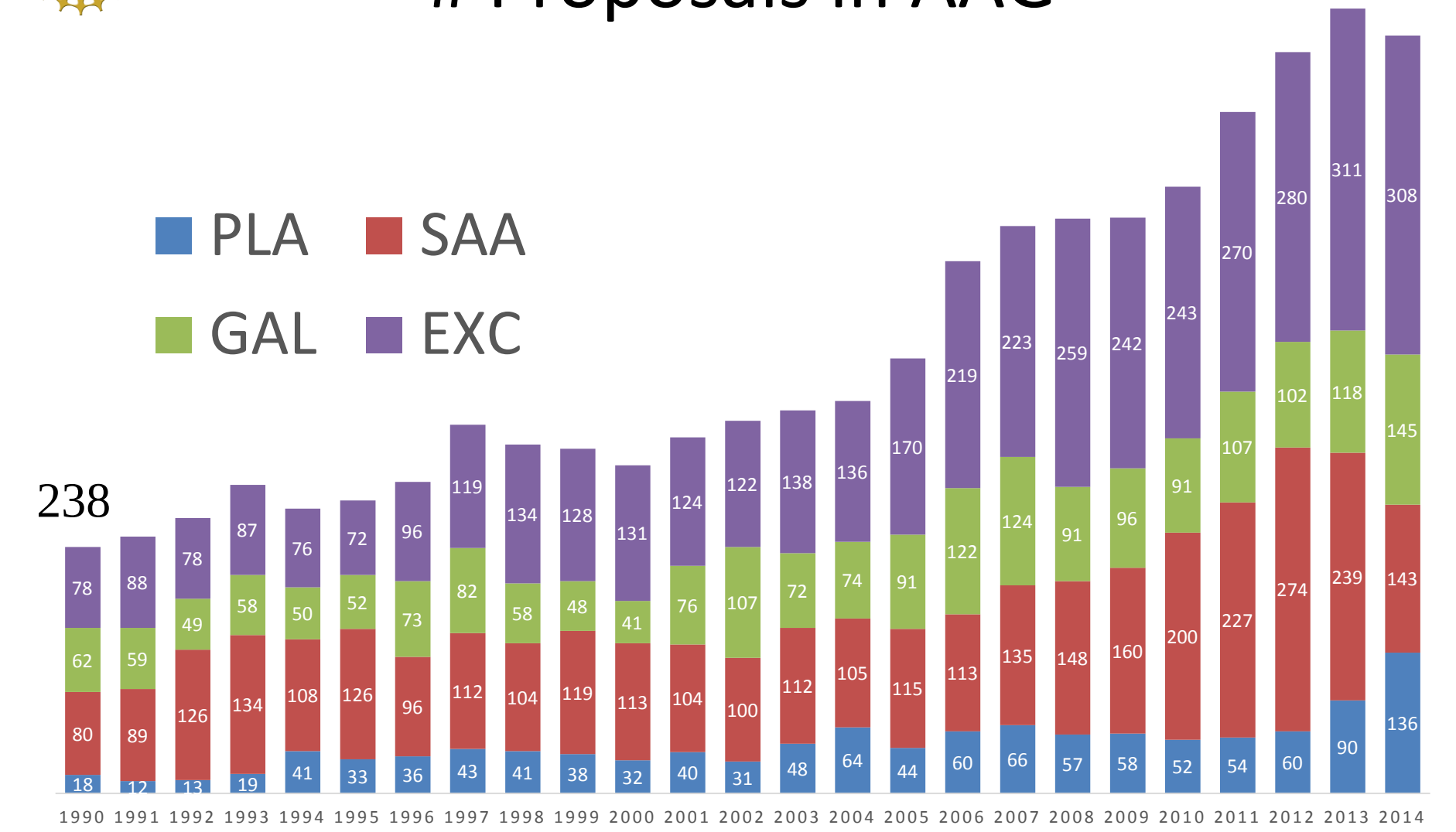
- GBT and VLBA partitioned from NRAO management competition
  - Engineering and environmental baseline review taking place for both
  - Similar to NOAO Kitt Peak, these are outside NRAO base budget in competition, with any operations to be funded separately
  - Partnerships under development
- DKIST will supplant open-access NSO observatories
  - Partnership discussions for GONG, Sac Peak, McMath-Pierce
- Arecibo undergoing baseline review similar to GBT
  - Will lead to decision about status post-2016

Astronomy and Astrophysics Research Grants (AAG)

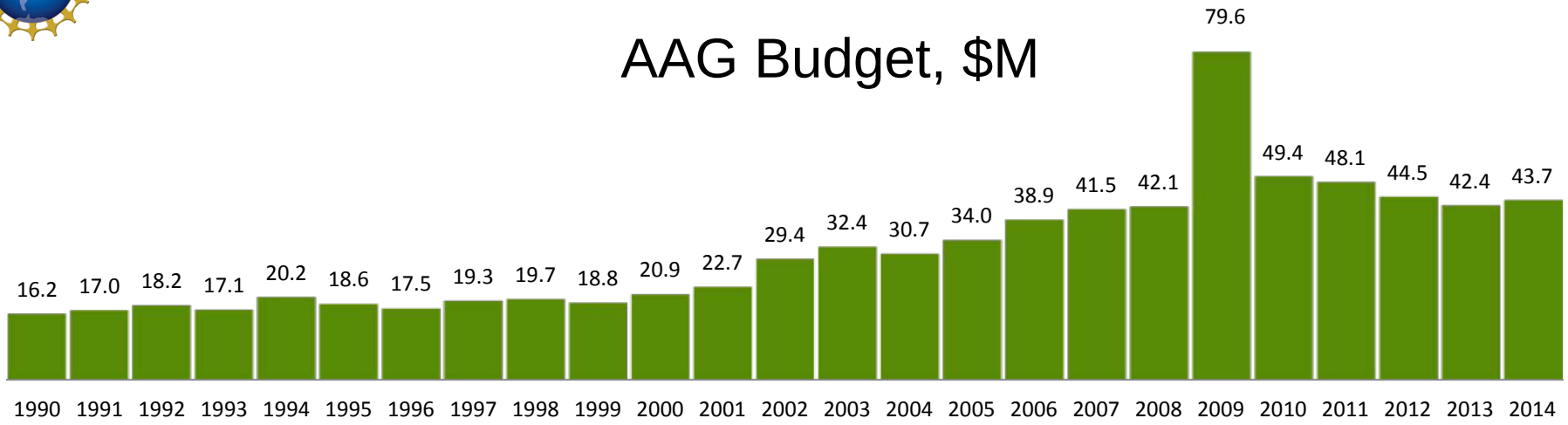
AAG Global Budget Breakdown



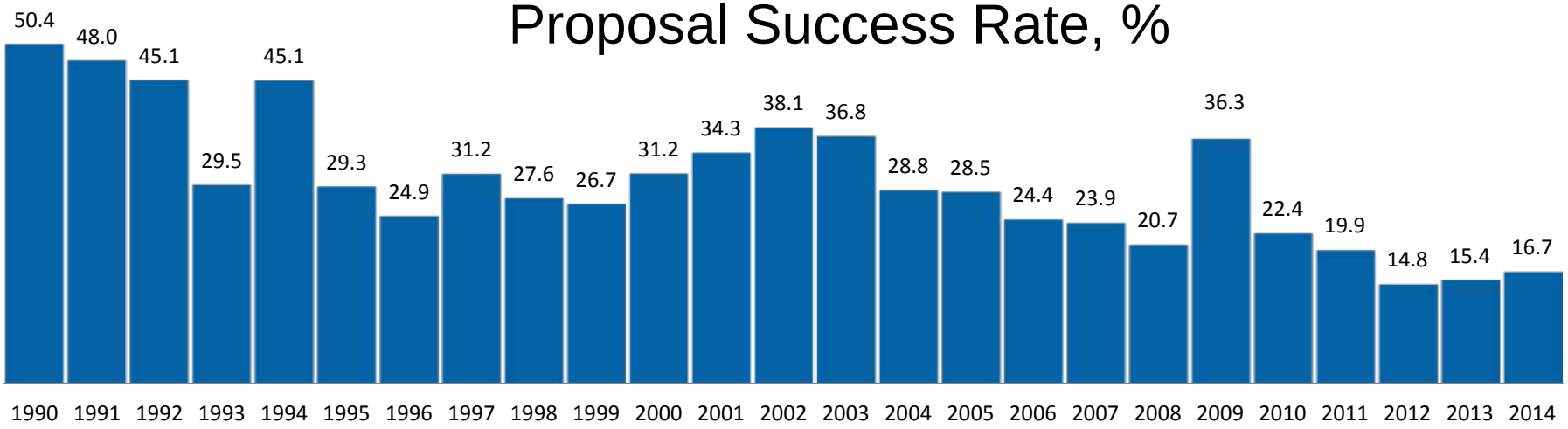
Proposals in AAG



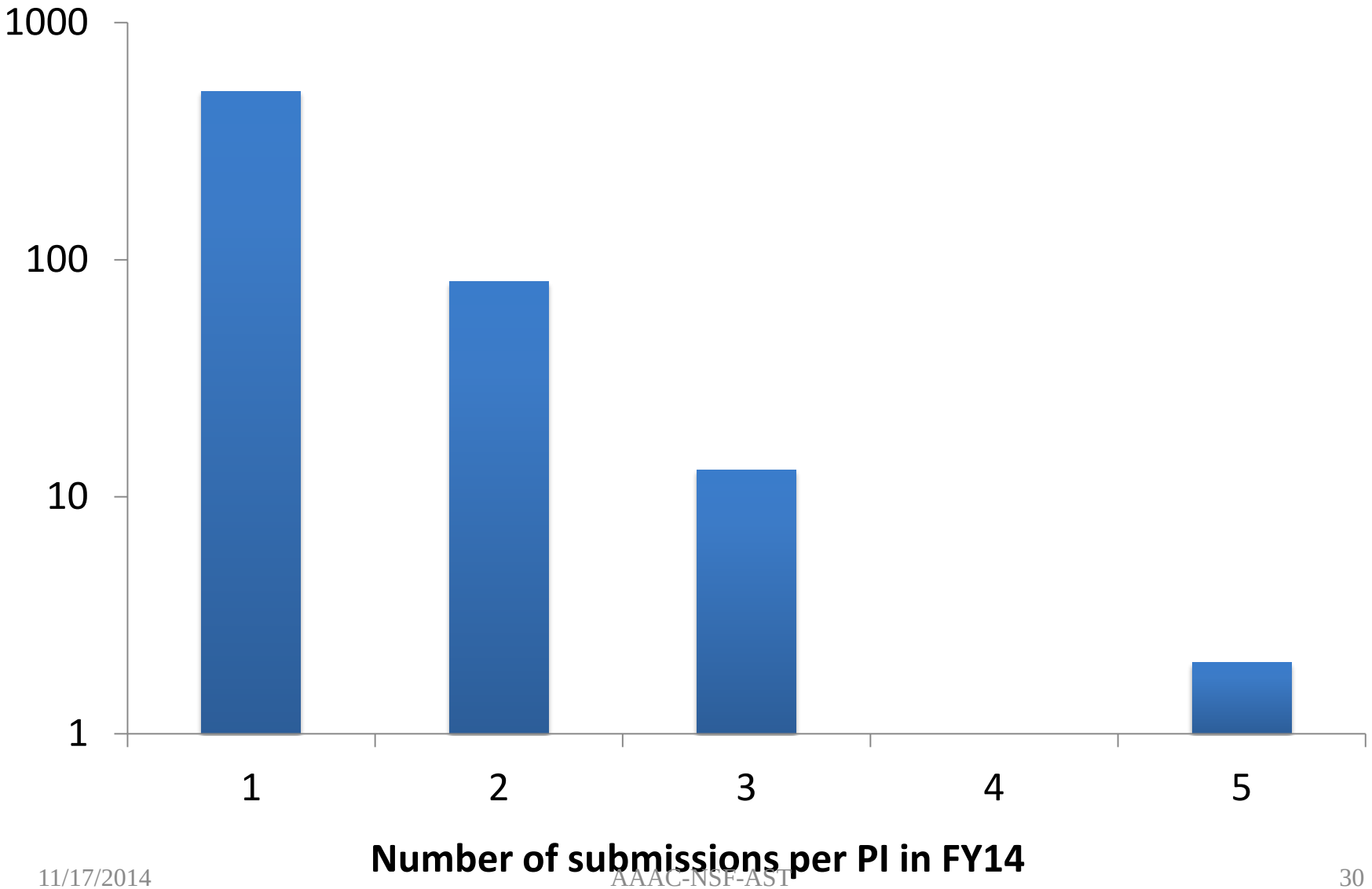
AAG Budget, $M



Proposal Success Rate, %



Multiple Submissions in FY14



AAG Now and Future

- FY14 funding rate was 16%
  - Higher than expected rate of ~13%, because co-funding contributions from elsewhere enabled AST to release the entire year-end reserve to AAG
  - Proposers reduced budgets where possible without impacting scope
- Changes needed to achieve best review, reduce workload
  - Under consideration: reducing frequency of AAG calls, restricting numbers of proposals per investigator/institution
  - Strongly encouraging investigators to restrict themselves to 1 AAG proposal in FY 2015
  - AST needs to develop strategy for what to do when funding rates hit 12%, 10%, 8%

Questions/Discussion