



NSF AST Town Hall

June 14, 2016

Jim Ulvestad, Division Director, MPS/AST

@UlvestadNSF



High-Level Summary

- Outstanding science opportunities offered/developed
 - ALMA, EVLA, Dark Energy Camera, GPI, DKIST, LSST
 - ~110 awards/yr in AAG, plus MSIP, ATI, AAPF, REU, PAARE, CAREER
 - Interagency: DES, DESI, NN-EXPLORE (plus LSST, of course)
 - NSF spending ~\$100M on AST facility construction in FY 2016
- Partnerships with NASA and DOE have strengthened
- Data-enabled science continues to grow in importance
- Impact of LIGO detection of gravitational waves
- Mid-decadal review near release
- Unknown prospects for budget increases this decade
 - Next 1.5 yr are critical for divestment activities
- Staffing within AST continues to be a challenge
- Management of large facilities is becoming more complex
- Continued progress at the science frontiers



Outline

- Some Key Issues
- Science and Facility Highlights
- Astronomy and Astrophysics Advisory Committee
- AST Funding/Budget
- Individual Investigator Programs
- Divestment Activities



Some Key Issues



NSF Future Ideas

- At the May meeting of the National Science Board, the NSF Director proposed six new research areas and three “process” areas that NSF envisions as being ripe for major investments.
 - Windows on the Universe: Multi-Messenger Astrophysics (gravitational waves, particles, and electromagnetic radiation).
 - Harnessing data for 21st century science and engineering.
 - Support for midscale infrastructure (“process”).
- Developing these ideas would require increased support for basic research.



Division of Astronomical Sciences (AST)

Office of the Division Director



James Ulvestad
Division Director



David Boboltz
Acting
Deputy Division Director



Craig McClure
Program Support Manager



Donna O'Malley
Financial & Operations
Specialist



Vernon Pankonin
Senior Advisor



Elizabeth Pentecost
Project Administrator

Administration



Stephanie Hill
Program Assistant
(Student)



Diana Phan
Program Analyst



Matthew Vian
Program Specialist

Vacant
Program Assistant

Individual Investigator Programs and Astronomy & Astrophysics Research Grants



James Neff
Program Director
IIP Coordinator,
Education &
Special
Programs
(REU_PAARE)



Richard Barvainis
Program Director
Extragalactic
Astronomy &
Cosmology



Glen Langston
Program Director
Galactic
Astronomy



Harshil Gupta
Program Director
Astronomy &
Astrophysics
Postdoctoral
Fellowships



Joan Wrobel
Program Director
CAREER;
Extragalactic
Astronomy &
Cosmology



Faith Vilas
Program Director
Planetary
Astronomy



Maria Womack
Expert
Stellar
Astronomy &
Astrophysics



Hugh Van Horn
Program Director
AAG Grants



Joe Pesce
Program Director
AAG Grants,
Divestment

Vacant
Advanced Technologies &
Instrumentation

Vacant
Major Research
Instrumentation

David Boboltz
Theoretical &
Computational Astrophysics
Networks

Glen Langston
Enhancing Access to the
Radio Spectrum

Facilities, Mid-Scale, & MREFC Projects



Christopher Davis
Program Director

Gemini
Observatory



Philip Puxley
Program Director

National Radio
Astronomy
Observatory



Ralph Gaume
Program Director

Arecibo
Observatory



Nigel Sharp
Program Director

Large Synoptic
Survey
Telescope



Edward Ajar
Program Director

MREFC Projects
(LSST and
DKIST)

Vernon Pankonin
National Optical Astronomy Observatory

David Boboltz
National Solar Observatory

Richard Barvainis
Mid-Scale Innovations Program

Philip Puxley
Atacama Large Millimeter Array

ESM



Mangala Sharma
Program Director

To ISE



Thomas Wilson
Program Director



AST Positions Open

- After three years as Deputy Division Director, Pat Knezek has moved into a Senior Advisor position in the MPS Directorate.
- Deputy Division Director position open until June 30, 2016.

http://jobregister.aas.org/job_view?JobID=54152

- Two Intergovernmental Personnel Act (IPA) positions open until filled (interviewing over the summer).

<http://www.nsf.gov/pubs/2016/ast16001/ast16001.jsp>

- Expect to advertise Electromagnetic Spectrum Management position soon.



Changes in Astronomy and Astrophysics Research Grants (AAG) for FY 2017

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 - Purposes: Understand and resolve issues with proposal handling and merit review; alleviate impact of life events for proposers; investigate impact on proposal load over the year; enable proposal file updates for minor errors.
 - Solicitation in preparation.
 - Declined proposals may not be resubmitted for 12 months.
- The rest of AAG will run as before, with a November 15, 2016 proposal deadline.



Science and Facility Highlights



Management Competitions

- NOAO competition concluded. AURA selected. New 5-yr cooperative agreement began on October 1, 2015.
- NRAO competition concluded. AUI selected. New 10-yr cooperative agreement to begin on October 1, 2016.
 - ALMA + VLA + Central Development Laboratory + associated administration.
 - Green Bank Observatory and VLBA separated from NRAO beginning on October 1, 2016.
- Gemini competition concluded. AURA selected. New 6-yr cooperative agreement to begin on January 1, 2017.

What did LIGO detect on Sept 14, 2015?

The merger of two black holes and the birth of a new one.

Event GW150914

Original black holes:

29 and 36 solar masses (M_{\odot}).

Final black hole:

62 M_{\odot} with dimensionless spin 0.67

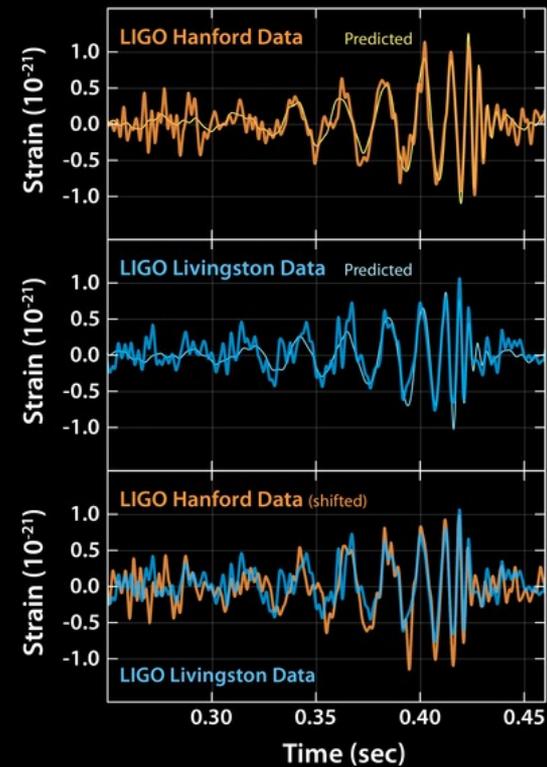
Energy emitted: 3 M_{\odot}

Power emitted: 200 M_{\odot}/s

(140 billion trillion times that of the Sun)

Most powerful explosion recorded not including the Big Bang!

See Session 305, Wednesday 11:40 a.m.

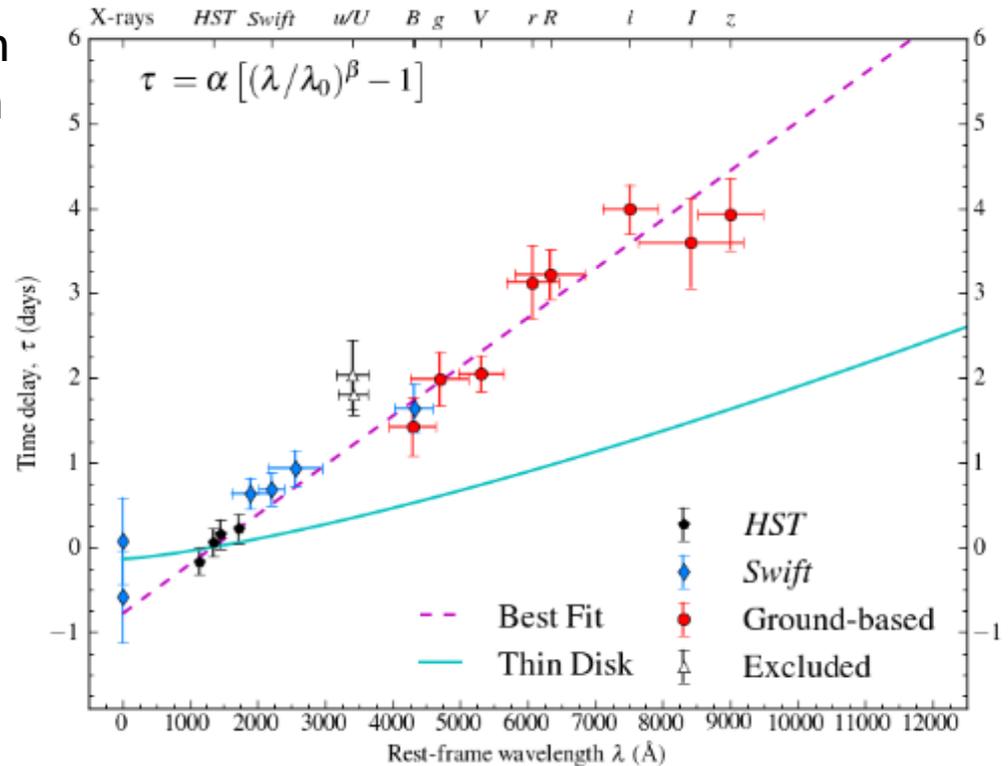


In band signal: 0.2 s from 35 – 250Hz
Peak strain 1×10^{-21} , S/N ~ 24



AGN-STORM Reverberation Mapping Campaign: Intensive monitoring of the Seyfert 1 Galaxy NGC 5548

- The most intensive AGN reverberation mapping campaign ever carried out, over a 6 month span in 2014
- HST/COS UV spectroscopy
- *Swift* monitoring
- Nightly ground-based imaging and spectroscopy
- New result (Fausnaugh et al. 2016, ApJ, 821, 56): definitive detection of UV-optical continuum lags
- Optical light curves lag the far-UV variations by 2-4 days
- Implies accretion disk size 3x larger than standard thin-disk model predictions



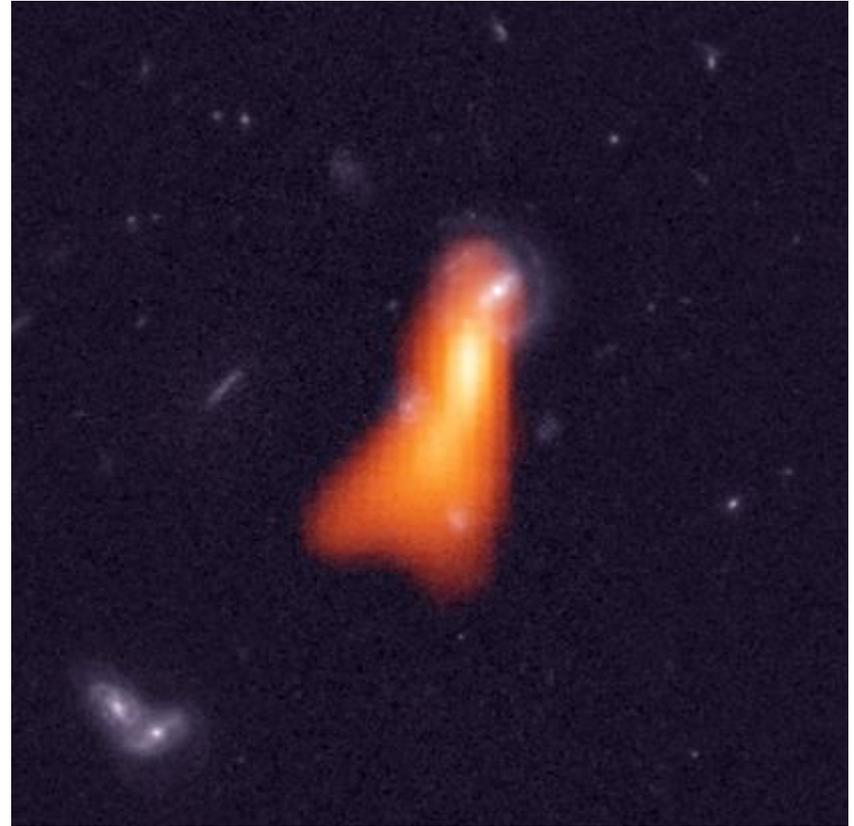
CREDIT: Fausnaugh et al.

Awards AST-1412693,
AST-1412315 (+ many more)



VLA Detection of HI in Starburst at $z=0.38$

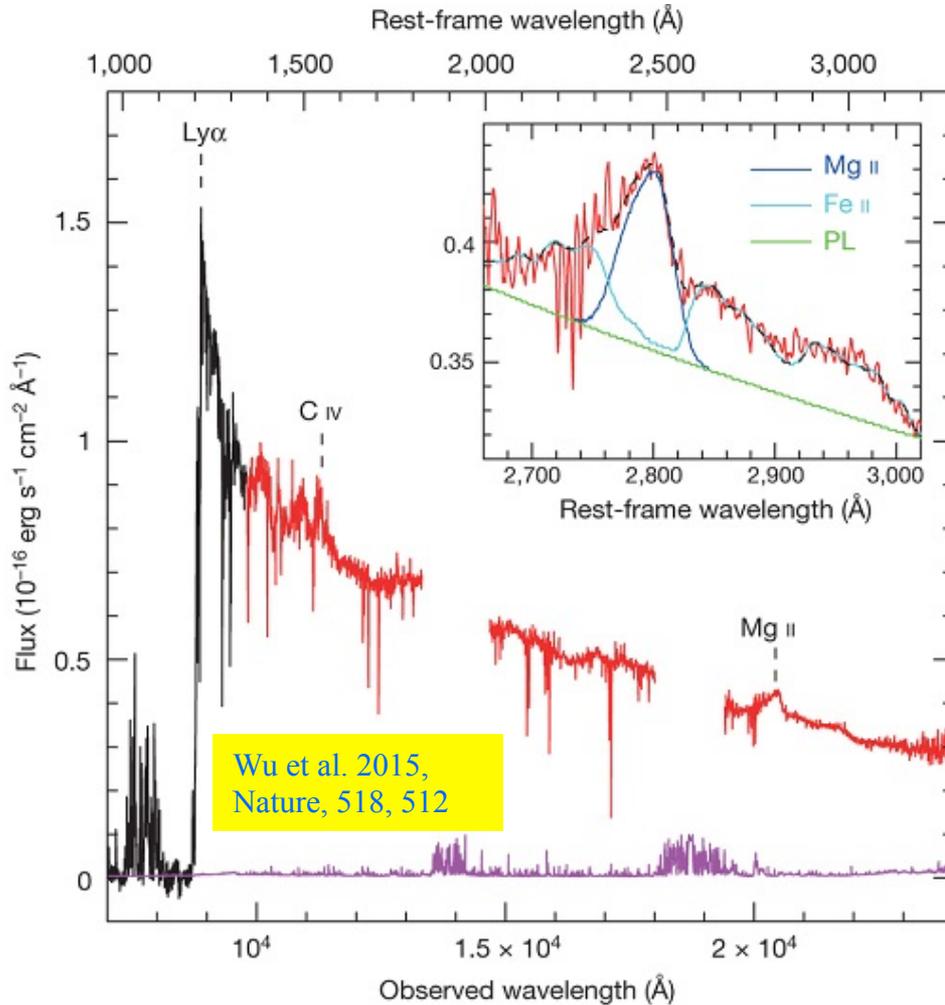
- COSMOS HI Large Extragalactic Survey (CHILES) simultaneously observing HI from $z=0$ to $z\sim 0.5$, with 1000 hours of VLA time.
- Studying the evolution of gas in and around galaxies over cosmic time.
- Fernandez et al. (2016) report VLA detection of $3 \times 10^{10} M_{\text{Sun}}$ of HI in COSMOS J100054.83+023126.2 at $z=0.376$ (double previous distance record).
- Follow-up CO detection of $2\text{-}10 \times 10^{10} M_{\text{Sun}}$ using LMT.
- Relies on the upgraded Karl G. Jansky VLA and a large collaborative individual investigator award (AST-14123102, AST-1412503, AST-1412843, AST-1413099, AST-1412578).



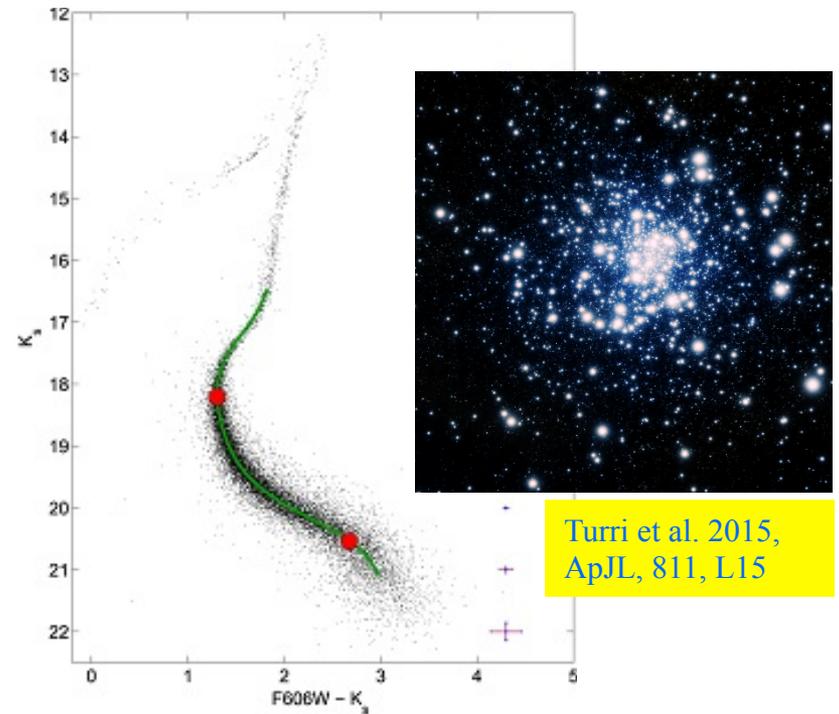
CREDIT: Fernandez et al., Bill Saxton, NRAO/AUI/NSF; Koekemoer et al., Massey et al., NASA.



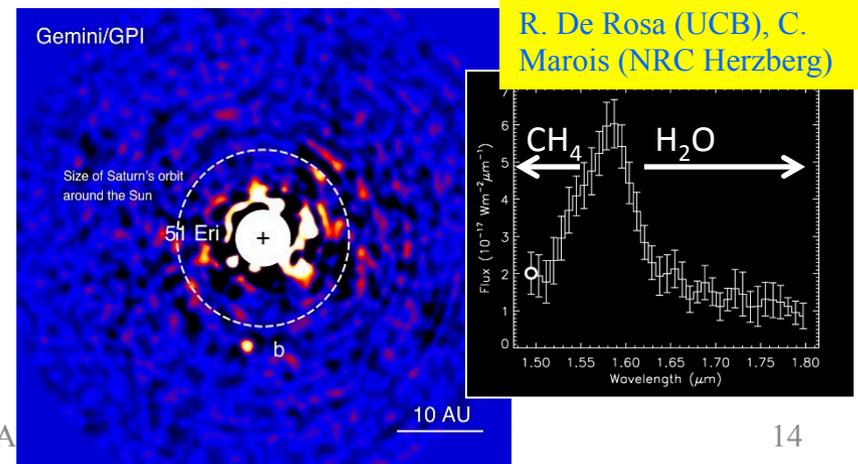
Gemini



Above: GNIRS observations of $z \sim 6.3$ quasar challenge models of Black Hole growth.



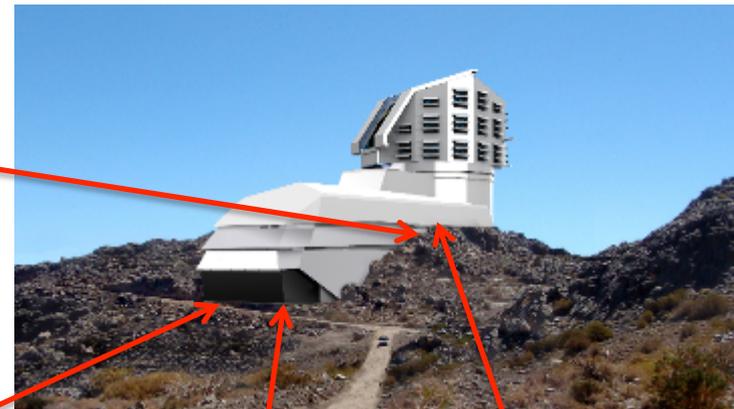
Above: MCAO/GeMS photometry deepest ever in crowded field. **Below:** GPI discovers young Solar System Gas Giant analog.





Large Synoptic Survey Telescope

- Construction continues to progress, with no change in late 2022 start date for full 10-yr survey.
- Operations plan under development.





Daniel K. Inouye Solar Telescope



- Excellent construction progress, with some delays on site work because of poor weather in Hawaii.
 - Scheduled for completion in late 2019.
- Data rate \approx LSST data rate, but three years earlier!





Astronomy and Astrophysics Advisory Committee



2016 AAAC Recommendations-1

- Cooperation in database design and data sharing is encouraged.
 - NSF, NASA, DOE, and key project leadership continue to meet in Three Agencies Group to discuss joint processing of LSST, WFIRST, and EUCLID data.
- Encourage DOE, NSF, and university community to continue work on a plan for ground-based CMB Stage 4 experiment.
 - NSF (AST, PHY, PLR) and DOE/HEP established a joint working group to discuss possible mechanisms that would enable agencies to move forward.
- Strong efforts for facility divestment should continue, with partnerships preferred.
 - See later slides.



2016 AAAC Recommendations-2

- Continue to pursue international partnerships, following “Principles for Access”.
 - See above comment on LSST-EUCLID-WFIRST.
 - International partners remain critical for LSST operations.
 - The principle of “reciprocity” from the Principles for Access is key in these conversations.
- Urge that full programmatic funding be provided to agencies to execute their programs.
 - Not in current Congressional markups for NSF for FY 2017.
- Community-based groups should study growth in research community.
 - NSF and NASA have held discussions with AAS and NRC about potential study parameters, and relation to next decadal survey.



AST Funding / Budget



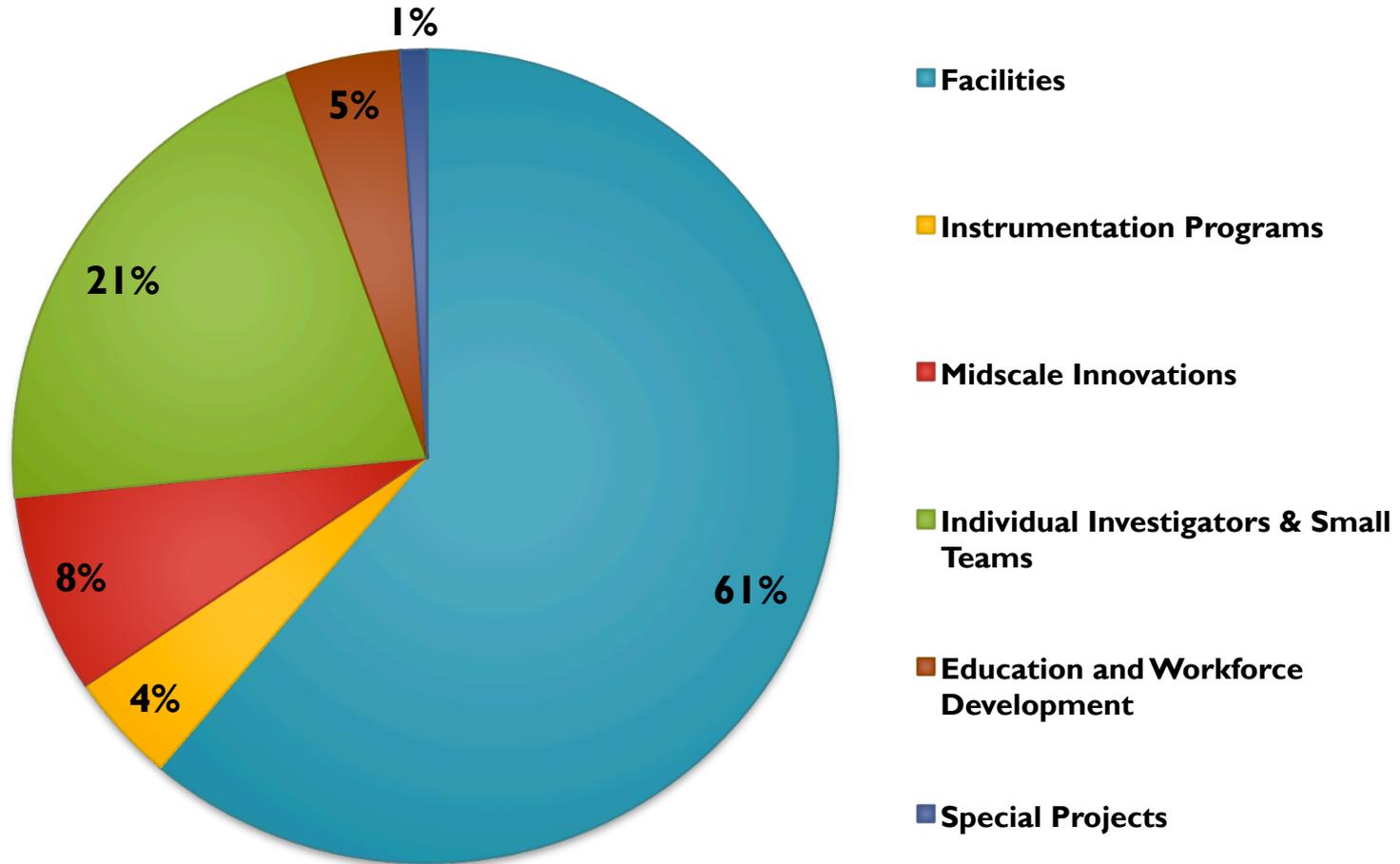
Current Budget Markups

- Senate Appropriations Committee has marked up the NSF budget with Research & Related Activities (R&RA) exactly flat from FY 2016 to FY 2017; added Major Research Equipment and Facilities Construction (MREFC) funds for third Regional Class Research Vessel (RCRV).
- House Appropriations Committee marked up NSF budget with R&RA increase of \$46 million, completely cutting the RCRV from the NSF request.
- Awaiting conference and further Congressional action.
- Conclusion: NSF should probably count on an R&RA budget that is flat, or increases by 1% at best (not the full program as recommended by AAAC in its 2015-2016 report).



Funding Distribution in AST

Modes of Support FY 2016





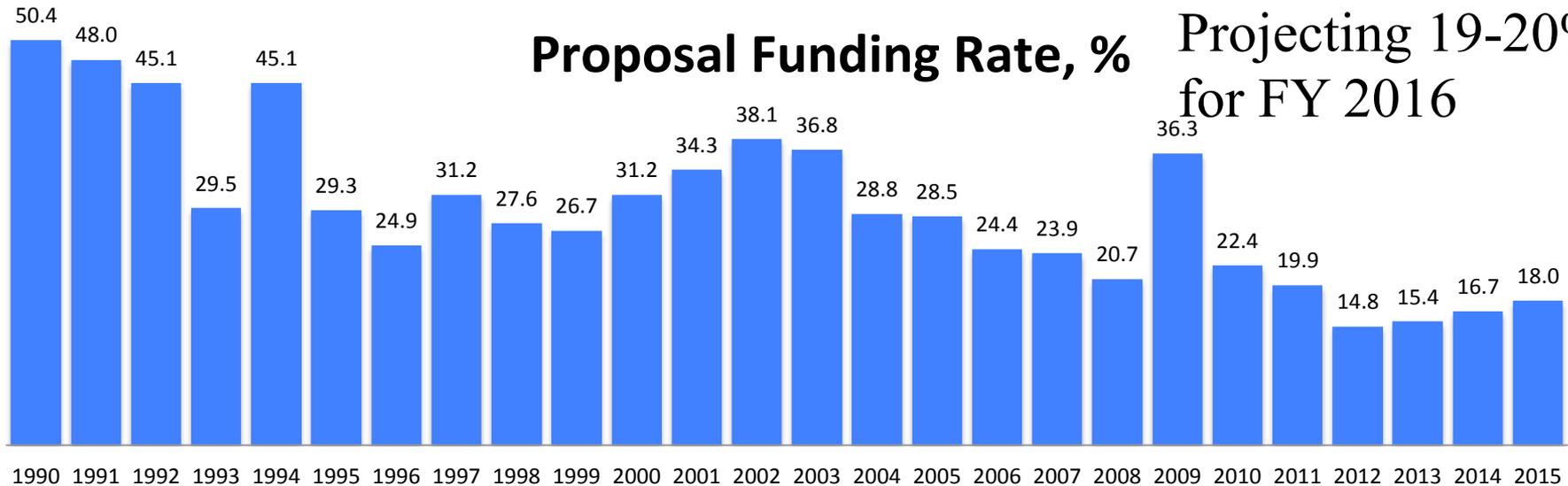
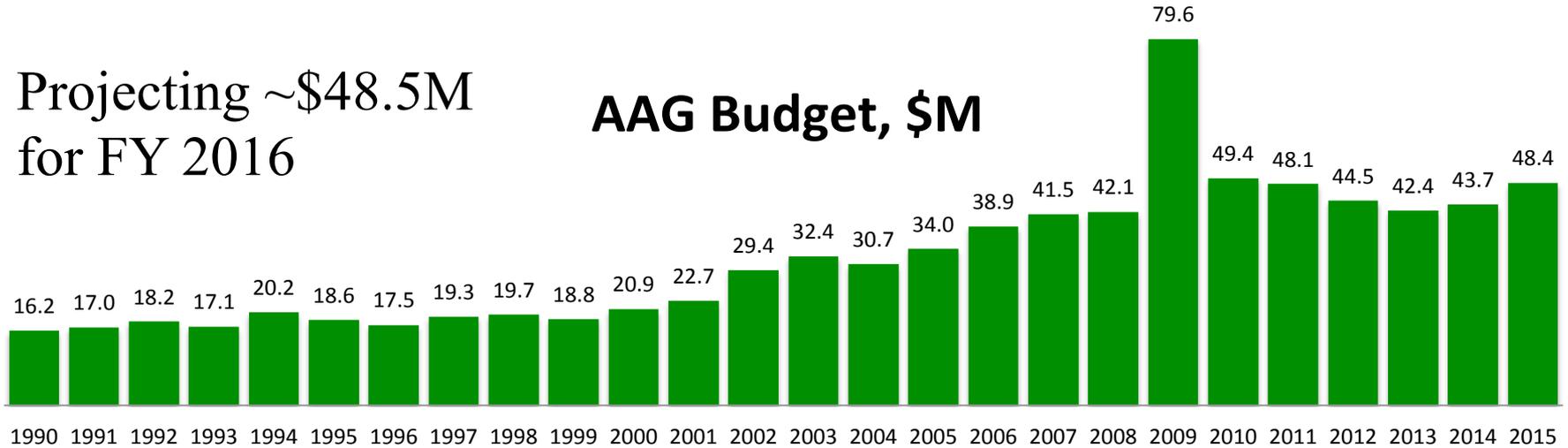
Individual Investigator Programs



AAG Funding History, 1990-2015

Projecting ~\$48.5M
for FY 2016

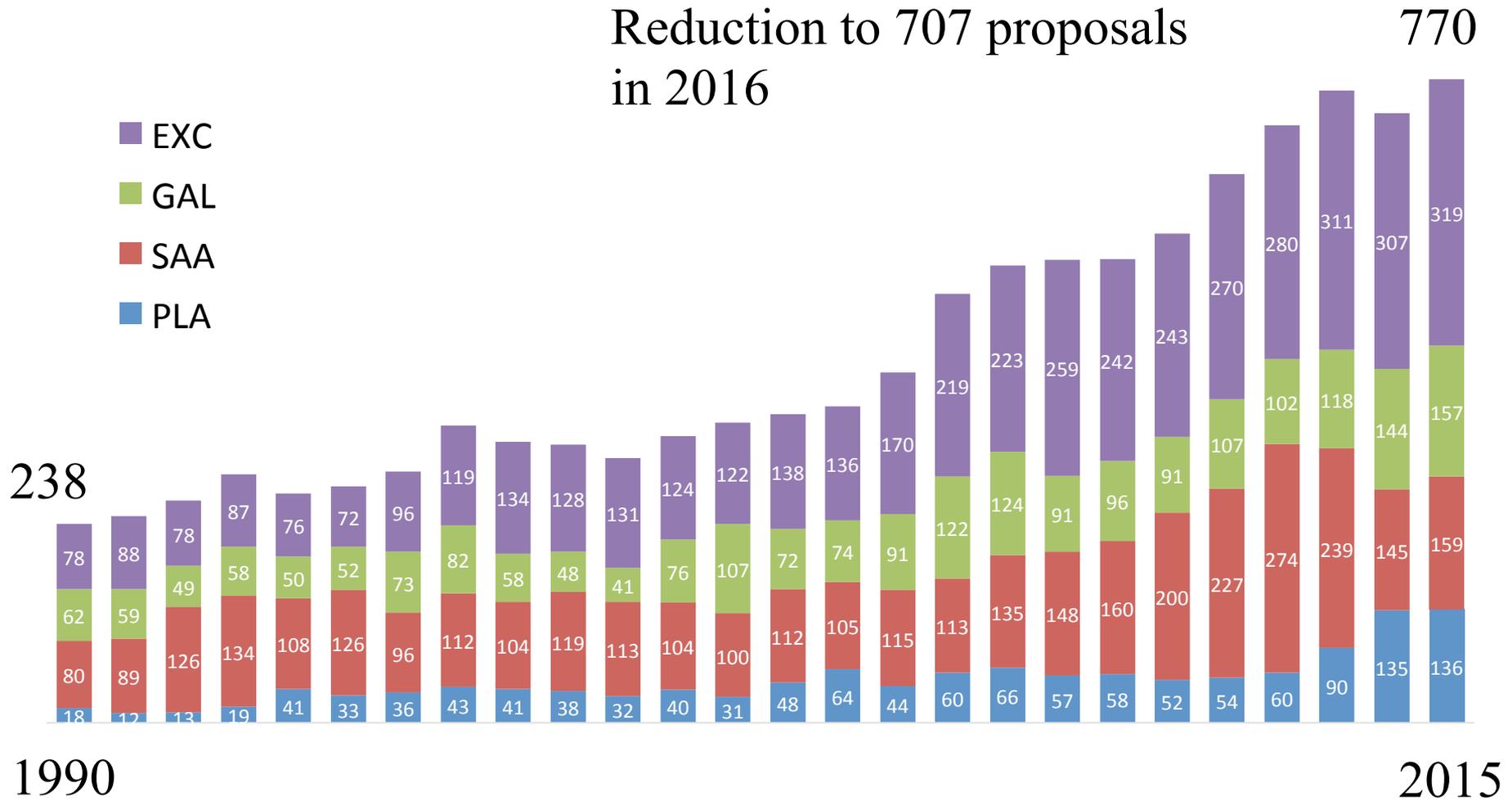
AAG Budget, \$M



Projecting 19-20%
for FY 2016



Proposals in AAG, 1990-2015





FY 2016 Proposal Review

- NSF has a goal of achieving “Division Director concurrence” on 75% of all proposals within six months of submission deadline (up from 70% previously).
 - In FY 2016, AST achieved 77% on AAG, nearly 100% on AAPF and CAREER.
 - No one available to run Advanced Technologies and Instrumentation (ATI) program, so we reached 0% on ATI (notified proposers that actions would be late).
- At current demand level, proposal review process is not sustainable for AST and community—achieved programmatic “success” in AAG only because of heroic efforts and because the number of proposals decreased by 9% from FY 2015 to FY 2016 .



Instrumentation & Postdoc Programs

- Review of second round of Mid-Scale Innovations Program (MSIP) full proposals is completed, with decisions in progress.
- Review of ATI proposals and AST-related MRI proposals is completed, with decisions in progress.
- AST aims to carry out a strategic review of instrumentation programs over the next year, to evaluate potential overlap in the goals of the programs.
- The total AAPF award size (including stipend, benefits, and research allowance) will be raised from \$89K/yr to \$100K/yr in FY 2017.



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Divestment Activities

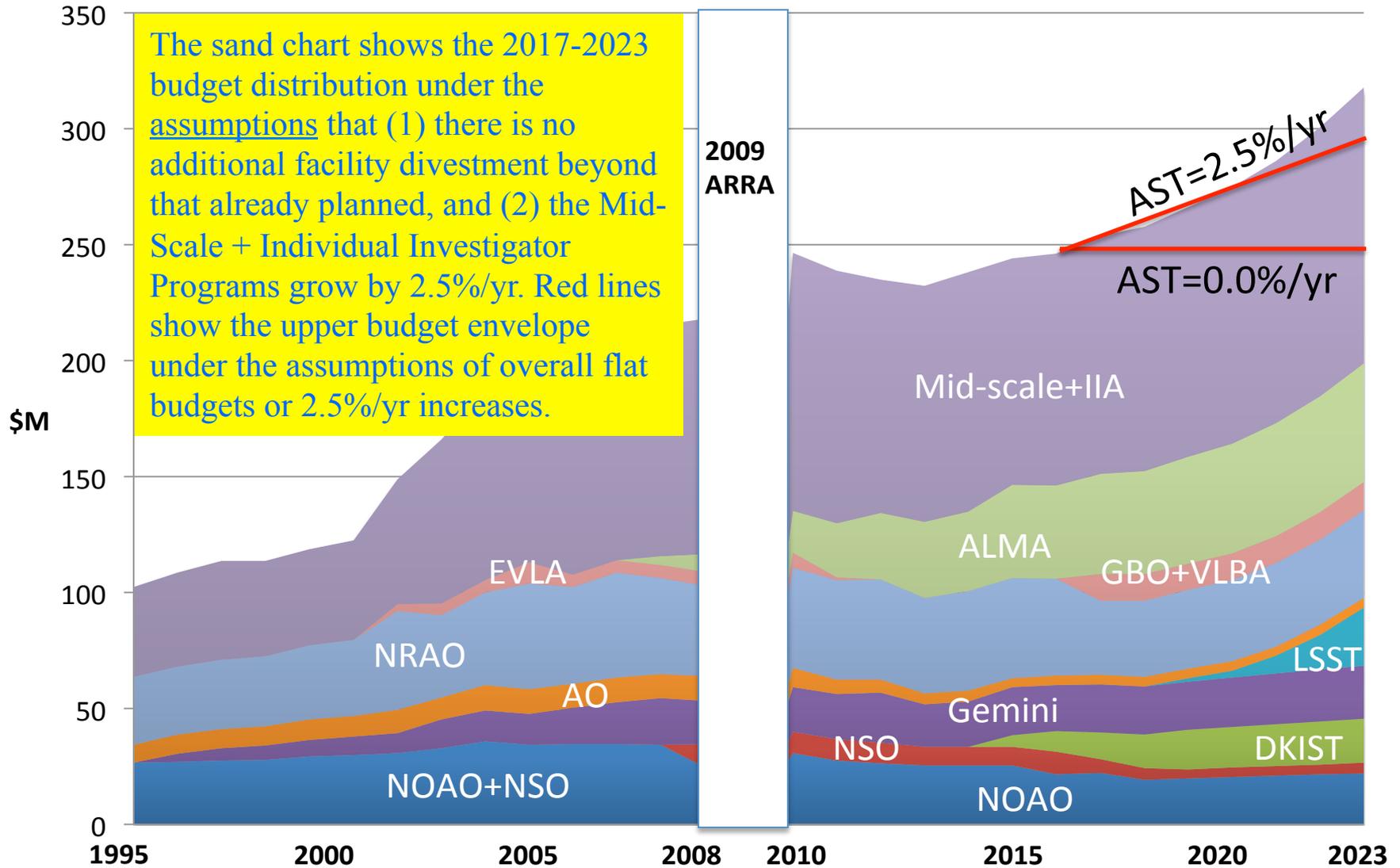


Divestment Activities

- Portfolio review identified facilities recommended for divestment from AST budget, or for future consideration.
- NSF (through a contractor) has concluded feasibility studies for alternatives, including engineering assessments and baseline environmental surveys for a number of telescopes and observatories.
 - Goals: Identify key issues, bound costs of different alternatives, and provide NSF information needed to assess viability of options.
- Generic alternatives.
 - New partnership arrangements (**preferred, but complicated**).
 - Conversion to new mission, including scope reductions.
 - Mothballing.
 - Decommissioning.
- Real progress being made on partnerships, with ongoing negotiations in many cases.



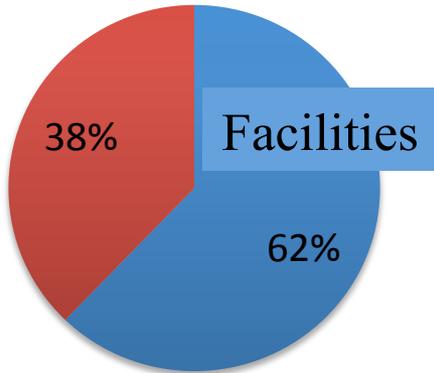
Hypothetical Budget Runouts for AST



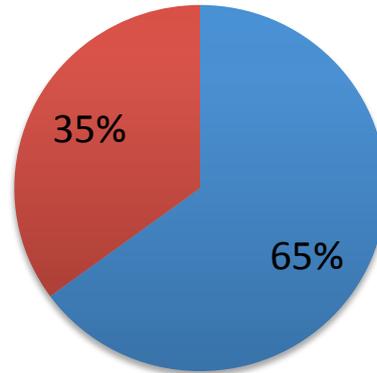


Historical Funding Breakdown

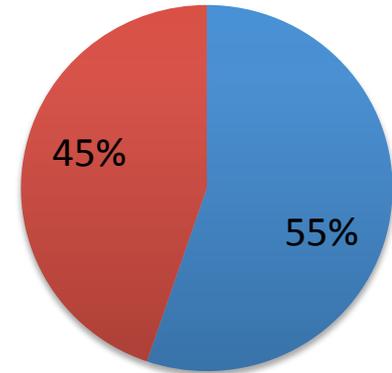
1995



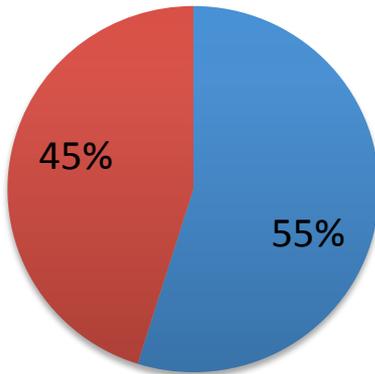
2000



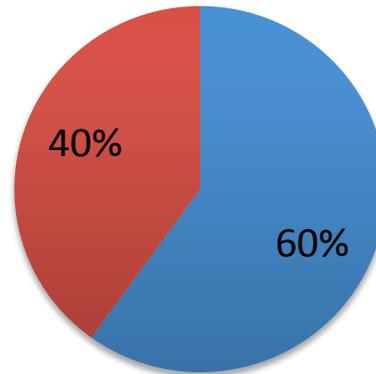
2005



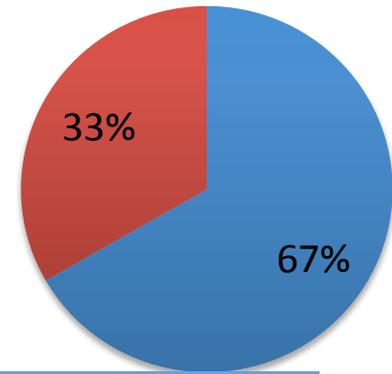
2010



2015



2020?





Facility Divestment Process

- Final engineering/environmental feasibility studies have been received for Arecibo, Green Bank, and Sacramento Peak. Expect to finalize VLBA and Kitt Peak (2.1m, McMath-Pierce, vacuum tower) studies during June.
- Kitt Peak 4m telescope transitioning to DOE funding for Dark Energy Spectroscopic Instrument in 2018.
- NASA has selected Extreme Precision Doppler Spectrometer for WIYN 3.5m telescope on Kitt Peak.
- Arecibo Environmental Impact Statement (EIS) process started (see next two slides).
- Aiming to start formal environmental review processes for additional facilities this year (see later slide).



Arecibo “Notice of Intent” & Scoping

- NSF has issued a “Notice of Intent to Prepare an Environmental Impact Statement and Initiate Section 106 Consultation for Proposed Changes to Arecibo Observatory Operations, Arecibo, Puerto Rico and Notice of Public Scoping Meetings and Comment Period”.
- Beginning scoping process to solicit public comments and identify issues to be analyzed in the EIS.
- Public comment period ends on June 23, 2016; scoping meetings in Puerto Rico occurred on June 7, 2016.
- Also initiating consultation process under Section 106 of the National Historic Preservation Act to evaluate potential effects to Arecibo Observatory, which is a historic property listed on the National Register of Historic Places.



Arecibo Environmental Review Process

- NSF welcomes input from all stakeholders to this transparent, public process (see www.nsf.gov/AST).
- Purpose of scoping process is to seek public input regarding relevant issues that will influence the scope of the environmental analysis, including viable alternatives.
- E-mail comments to envcomp-AST@nsf.gov, by June 23.
- Scoping will be followed by preparation of a Draft EIS.
- A 45-day public comment period will follow the publication of the Draft EIS.
- These comments will be incorporated into a Final EIS, followed by a subsequent “cooling-off” period of at least 30 days prior to issuance of a Record of Decision.
- Expect to complete process in 2017.



Environmental Review Timeline

- May 2016: Kicked off Environmental Impact Statement and consultation under National Historic Preservation Act (NHPA) Section 106 for Arecibo.
- June-December 2016: Decide on avenues/need for environmental review and NHPA consultation for Green Bank Observatory, Sacramento Peak Observatory, Very Long Baseline Array, and McMath-Pierce Solar Telescope. Initiate as needed.
- June 2017- June 2018: Conclude formal environmental reviews and consideration of alternatives. Select preferred alternatives (Record of Decision). Begin implementation.



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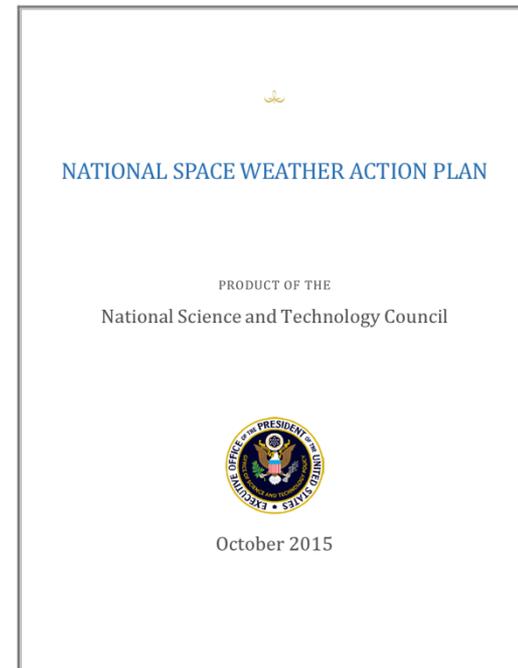
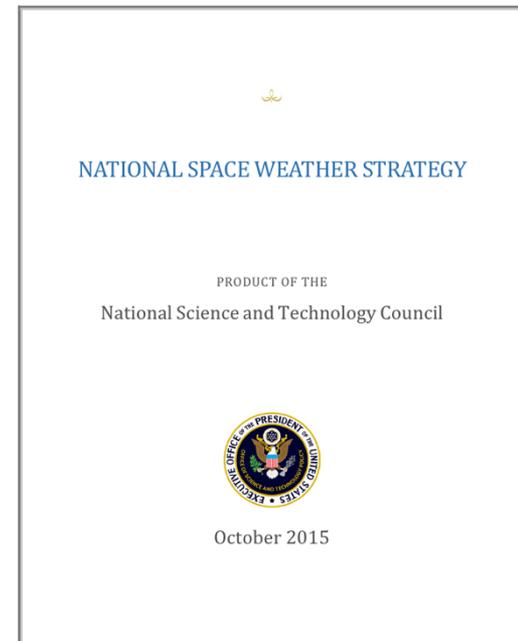


Backup Slides



NSO and National Space Weather Action Plan

- National Solar Observatory can contribute to the National Space Weather Strategy and Action Plan through:
 - Space weather observations (5.3)
 - Forecasting improvement (5.4)
 - Enhancing fundamental understanding of space weather (5.5)
 - International cooperation (6.2)
- See NSO White Paper at
 - <http://www.nso.edu/node/1290>





FY 2017 NSF Request by Account (\$M)

	FY 2016 Estimate	FY 2017 Discretionary		FY 2017 Mandatory	House Approp.	
Research & Related Activities	\$ 6034	\$ 6079	0.8%	\$ 346	6079	0.8%
Education & Human Resources	880	899	2.1%	54	880	0.0%
Major Res Equip & Facilities Const.	200	193	-3.6%		87	-56%
Agency Operations & Award Mgmt.	330	373	13%		340	3.0%
National Science Board	4	4			4	0.3%
Office of the Inspector General	15	15			15	0.3%
Total NSF	\$ 7463	\$ 7564	1.3%	\$ 400	\$ 7405	-0.8%



Facility Futures

(as of June 14, 2016)

Telescope	Status
KPNO 2.1m	Caltech-led consortium (Robo-AO) operating for FY 2016-2018
Mayall 4m	Slated for DESI; bridge from NSF; NSF/DOE MOU for transition
WIYN 3.5m	NOAO share to NASA-NSF Exoplanet Observational Research Program; NSF/NASA MOU in place
GBO	Feasibility study concluded; separation from NRAO in FY 2017
VLBA	Feasibility study concluded; separation from NRAO in FY 2017
McMath-Pierce	Feasibility study concluded; evaluation in progress
GONG/SOLIS	SOLIS is off Kitt Peak; GONG refurbishment; MOU with NOAA in draft form (NOAA sharing GONG operations costs)
Sacramento Pk.	Feasibility study concluded; partner discussions in progress
Arecibo	Feasibility study concluded; formal environmental review in process, to result in an Environmental Impact Statement and Record of Decision in 2017
SOAR	Post-2020 status to be reviewed



Arecibo Preliminary Alternatives

- Continued NSF investment for science-focused operations (No-Action Alternative).
- Collaboration with interested parties for continued science-focused operations.
- Collaboration with interested parties for transition to education-focused operations.
- Mothballing of facilities (suspension of operations in a manner such that operations could resume efficiently at some future date).
- Deconstruction and site restoration.
- Similar initial options are likely for other facilities.



Acronym Dictionary

- AAG=Astron. & Astrophys. Research Grants
- AAPF=Astronomy & Astrophysics Postdoctoral Fellowships
- ALMA=Atacama Large mm/submm Array
- AO=Arecibo
- AST=NSF Division of Astronomical Sciences
- ATI=Advanced Technologies and Instrumentation
- DES(DM)=Dark Energy Survey (Data Management)
- DESI=Dark Energy Spect. Inst.
- DKIST=Daniel K. Inouye Solar Telescope
- EARS=Enhancing Access to the Radio Spectrum
- EVLA=Expanded VLA
- GBO=Green Bank Observatory
- GONG=Global Oscillations Network Group
- GPI=Gemini Planet Imager
- GSMT=Giant Segmented Mirror Telescope
- IPA=Intergovernmental Personnel Act
- KITP=Kavli Institute for Theoretical Physics
- LIGO=Laser Interferometer Gravitational-wave Observatory
- LSST=Large Synoptic Survey Telescope
- MPS=NSF Directorate for Mathematical and Physical Sciences
- MREFC=Major Research Equipment & Facility Construction
- MSIP=Mid-Scale Innovations Program
- NN-EXPLORE=NASA-NSF Exoplanet Observational Research partnership
- NOAO=National Optical Astronomy Observatory
- NRAO=National Radio Astronomy Observatory
- NRC=National Research Council
- NSO=National Solar Observatory
- OIR=Optical/Infrared
- OMB=Office of Management and Budget
- PAARE=Partnerships in Astron. & Astrophys. Research & Education
- PHY=NSF Division of Physics
- REU=Research Experiences for Undergraduates
- SOLIS=Synoptic Long-Term Observations of the Sun
- SPT=South Pole Telescope