

AAAC – NSF/AST Update

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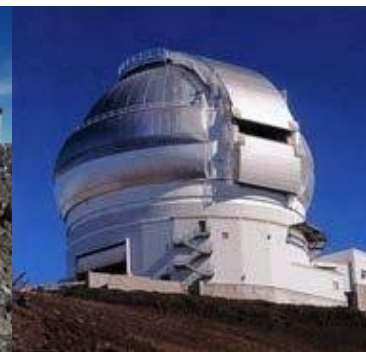
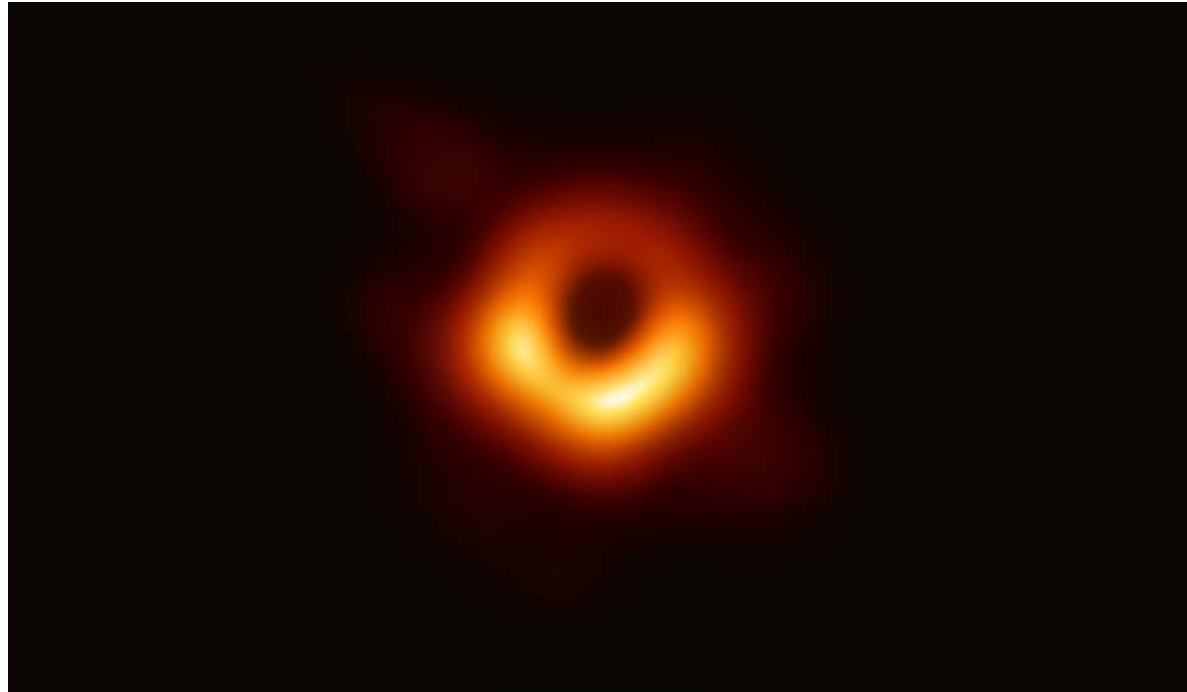


Image of M87 from Event Horizon Telescope

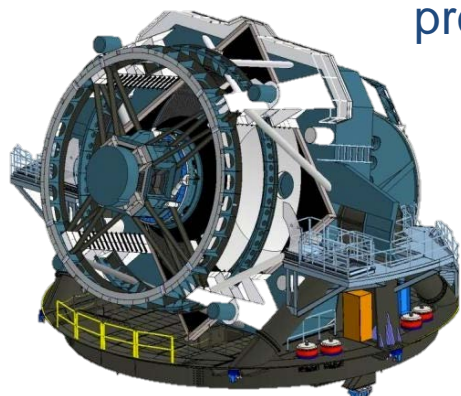
- Doeleman et al. team with 8 telescope VLBI at 1.3 mm.
- Black hole shadow with inferred angular gravitational radius of $3.4 \pm 0.4 \mu\text{as}$.
- Assumed distance yields $M = (6.5 \pm 0.7) \times 10^9 M_{\odot}$
- Crescent brightness distribution consistent with Kerr Black Hole.



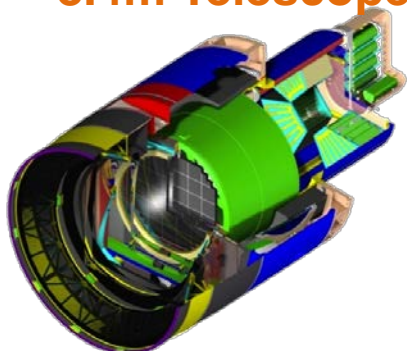
- NSF (AST) invested some \$28M in EHT research over the last two decades, including hardware and algorithm development as well as theoretical modeling (PIRE grant for international collaboration).
- ALMA observations were critical for closing phase; South Pole telescope provided critical baselines.



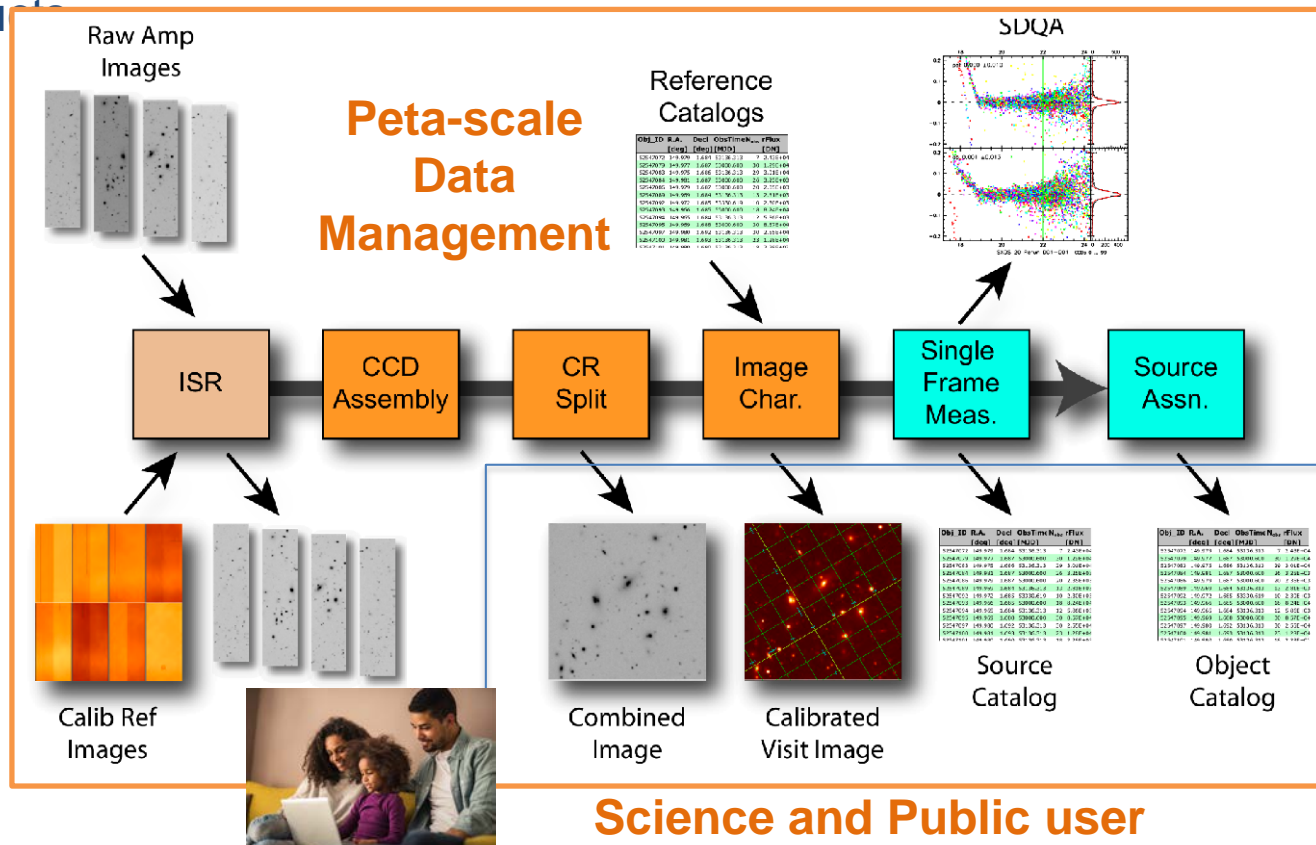
LSST: An observing facility to conduct 10-year optical survey, process, archive, and serve images and data products



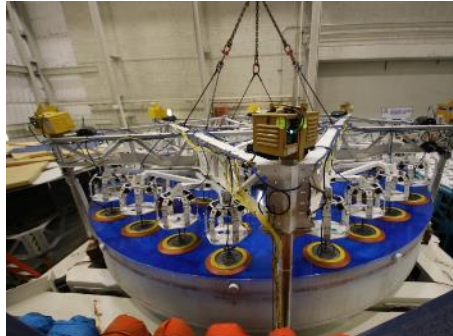
8.4m Telescope



3.2Gpix Camera



Many Critical Activities



M1M3 system
integrated and
optically tested



TMA Team in Spain. Completed
disassembly and shipping in
progress.



Summit 80 Ton lift completed. Dome panel installation begins



Coating Chamber arrived on
summit; commissioning has
begun.



M2 arrived on the
summit

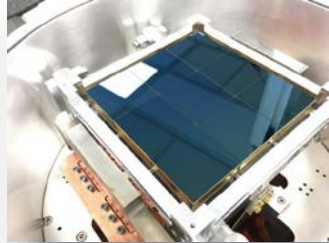


M1M3 arrived on summit and stored.

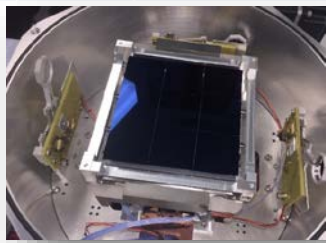
Key Camera Activities



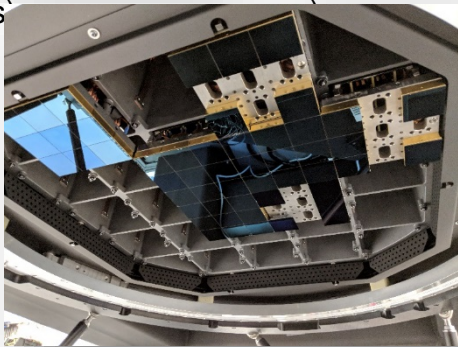
Vendor	Received	Science Grade	Reserve	Engineering Grade
e2v	125	121	4	0
ITL	256	109	59	88
Total	381	230	63	88



RTM8 (ITL sensors)



RTM6 in test Dewar (e2v)



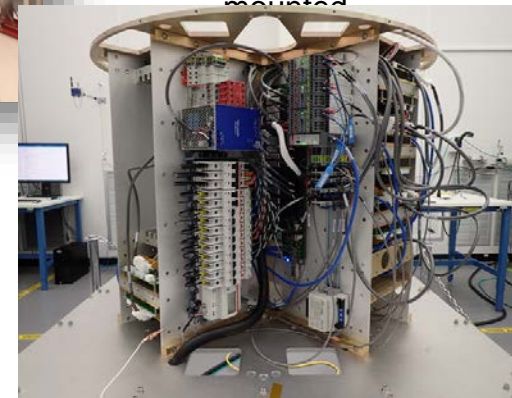
5 mechanical rafts and 2 engineering rafts inserted in the production cryostat



L2 lens coated and assembled in its structure



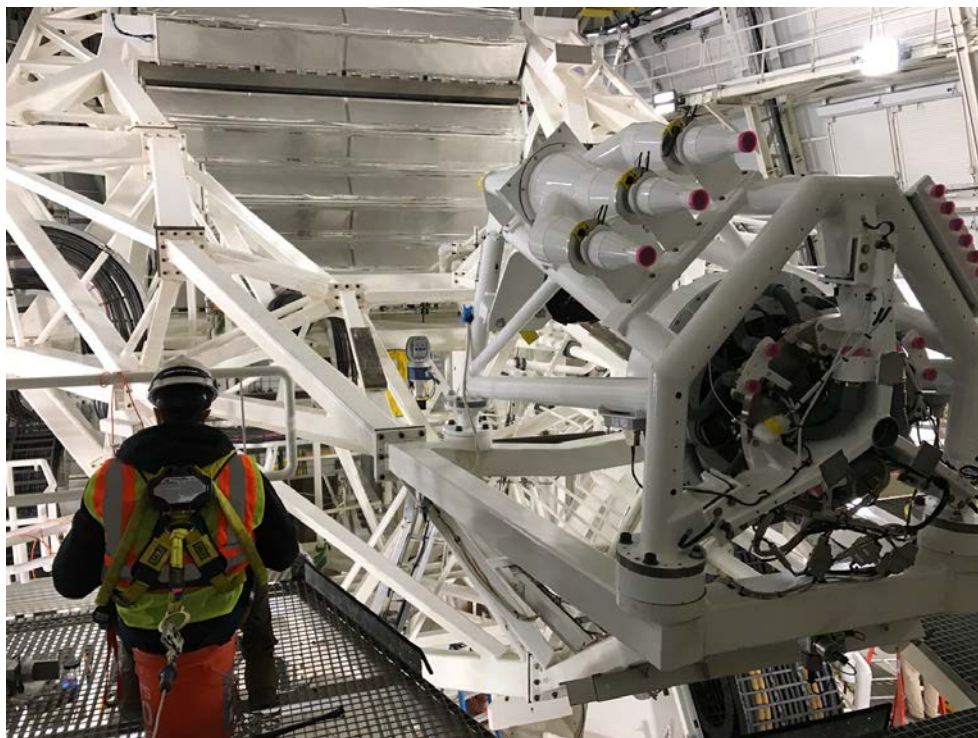
L1 Lens Coated and returned to AOS, L1 and L2 mounted



Utility trunk quad box during assembly

- NSF total project cost \$473 million.
- DOE LSST Camera \$168 million.
- NSF construction 69% complete (March 2019).
- Remaining contingency \$30.7 million (21% of Estimate to Completion) (NSF).
- 6 months schedule contingency remain.
- Survey scheduled to begin October 2022.
- Cost and schedule tight but on track.

DKIST Telescope, May 2019



Still on schedule and within budget contingency.

Total NSF project funding is \$335M.

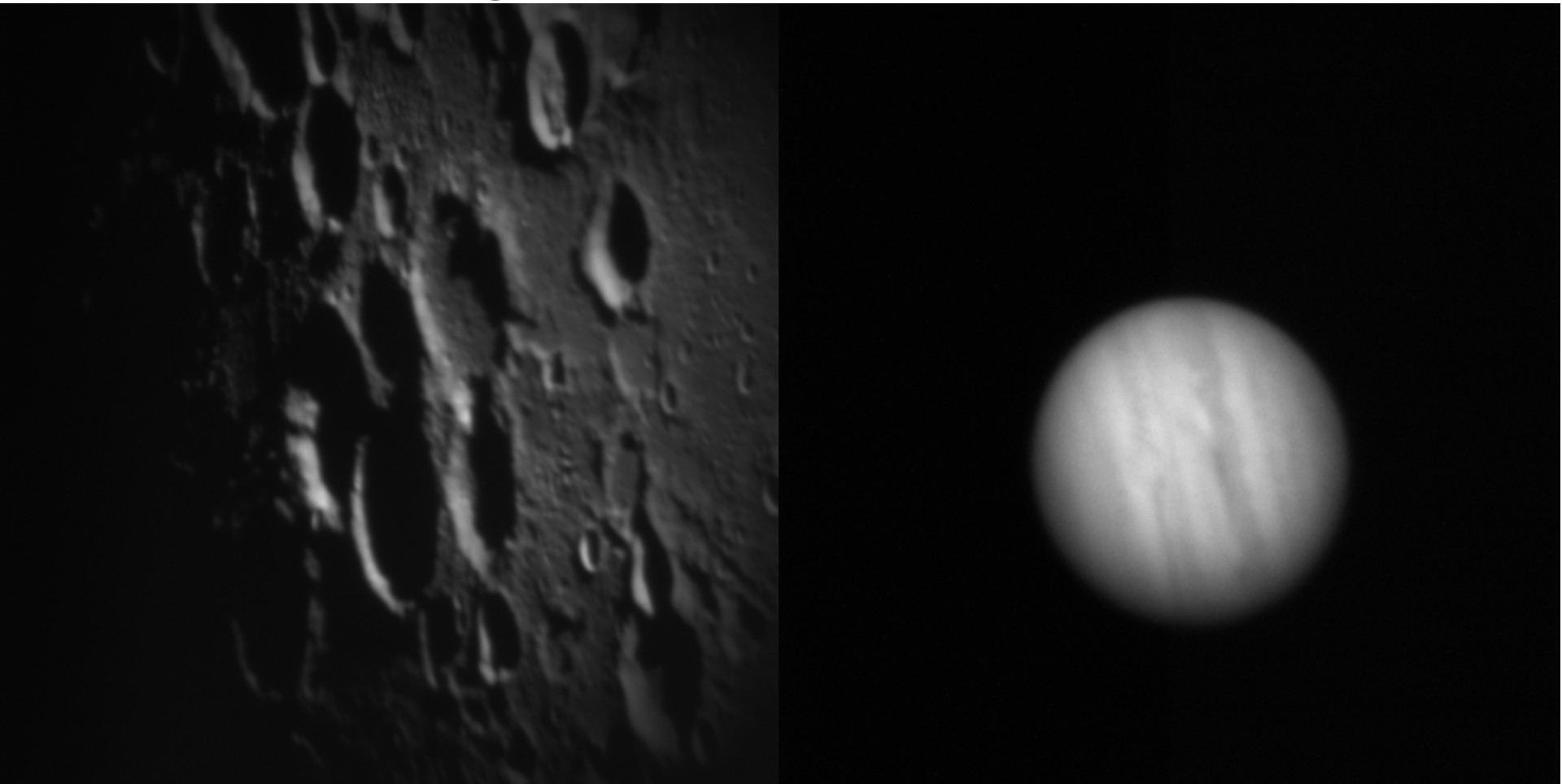
Project completion >87% as of 2/28.

Remaining contingency is \$13.6M.

- Telescope Gregorian top end optical assembly installed.
- Connection of secondary and tertiary to primary cooling loop complete; installation of heat stop and wavefront sensors at Gregorian in anticipation of 'first sun' early this summer.
- Current challenges largely with instrument completion and delivery, as well as data policy.



DKIST Images, March 2019



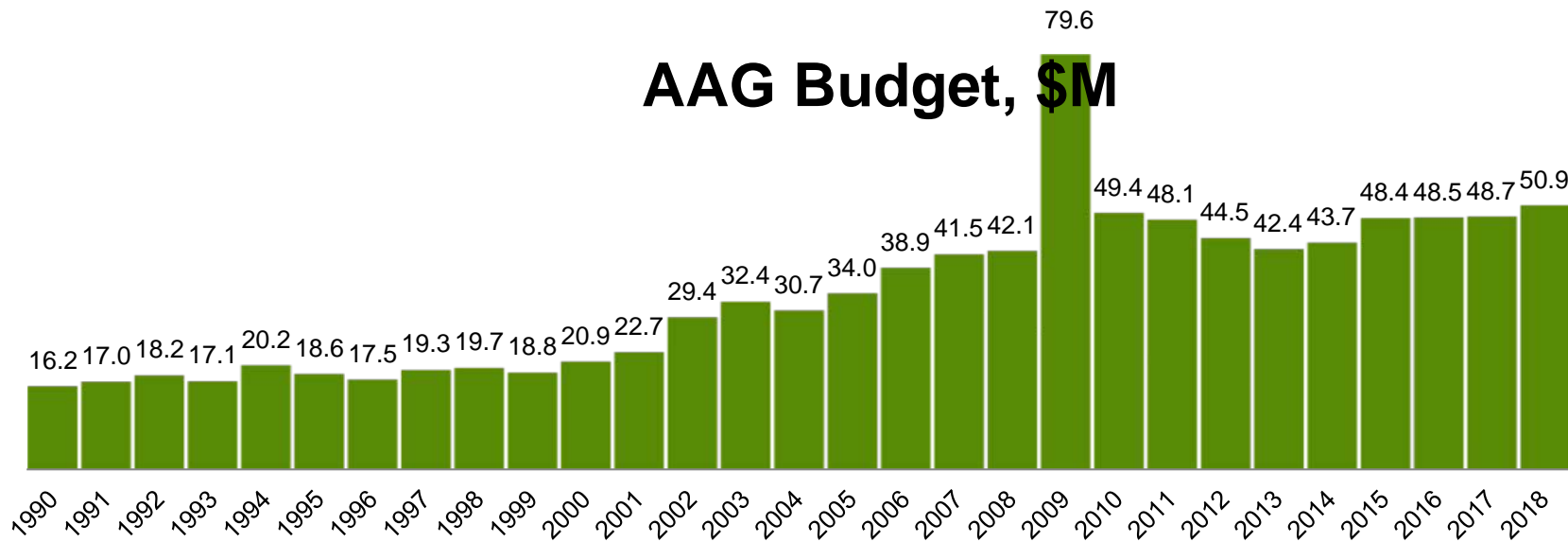
- Images using M1 and M2 final optics, taken as part of nighttime optics commissioning.

Green Bank Observatory (GBO)

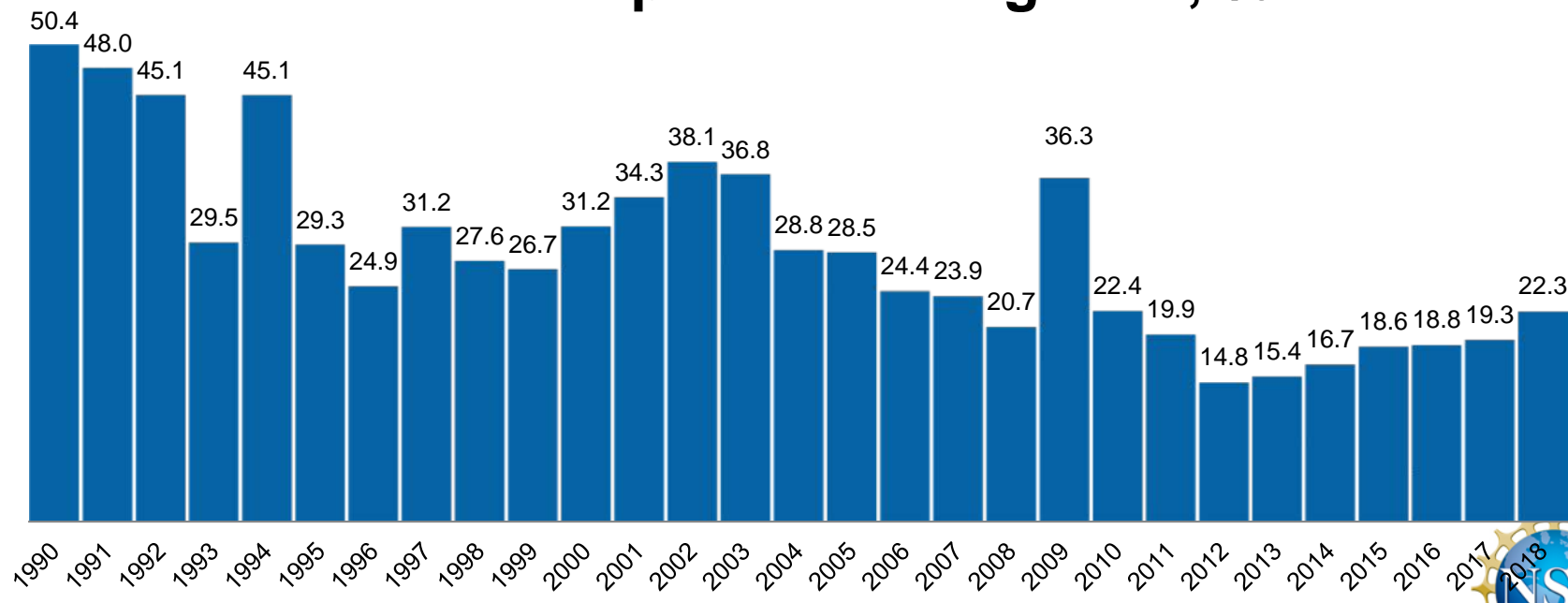


- When the Director or her designee, with National Science Board authorization, signs the Record of Decision, that will conclude the compliance process for the Environmental Protection Act, Endangered Species Act, and National Historic Preservation Act.
- The ROD chooses the Agency Preferred Alternative: *Collaboration with interested parties for continued science- and education-focused operations with reduced NSF funding.*
- Cooperative Agreement with AUI for management and operations up for renewal at the end of the current FY.

AAG Budget, \$M



Proposal Funding Rate, %



MID-SCALE RESEARCH INFRASTRUCTURE (MSRI)

NEW PROGRAM, OFFERED FOR THE FIRST TIME IN FY19



MSRI-1

- IMPLEMENTATION \$6M TO \$20M
- DESIGN \$600,000 TO \$20M
 - (BUT NOT CONCEPTUAL DESIGN)
- PRELIMINARY PROPOSALS REQUIRED
 - DEADLINE FEB.19 – 246 RECEIVED
- INTERNAL REVIEW; FULL PROPOSALS BY INVITATION ONLY, DEADLINE MAY 20
- SUPPORT WITH FY 2019 FUNDS

MSRI-2

- INFRASTRUCTURE FROM \$20M TO \$70M
 - (NO SCIENCE, NO DESIGN, NO O&M)
- LETTER OF INTENT – FEB.14, 64 RECEIVED
 - REQUIRED FOR PLANNING PURPOSES
- PRELIMINARY PROPOSALS, REQUIRED
 - DEADLINE MAR.11 (INVITATION NOT REQUIRED BUT MUST HAVE LOI)
- EXTERNAL REVIEW; FULL PROPOSALS BY INVITATION ONLY, DEADLINE AUGUST 2
- SUPPORT WITH FY 2020 FUNDS

Upgrades to existing research infrastructure allowed

Require strong scientific merit, must respond to identified need of community

NSF-sponsored FFRDCs may submit (includes AST observatories, NCAR)

No operations & maintenance support; no scientific research support

Necessary commissioning possible under MSRI-1



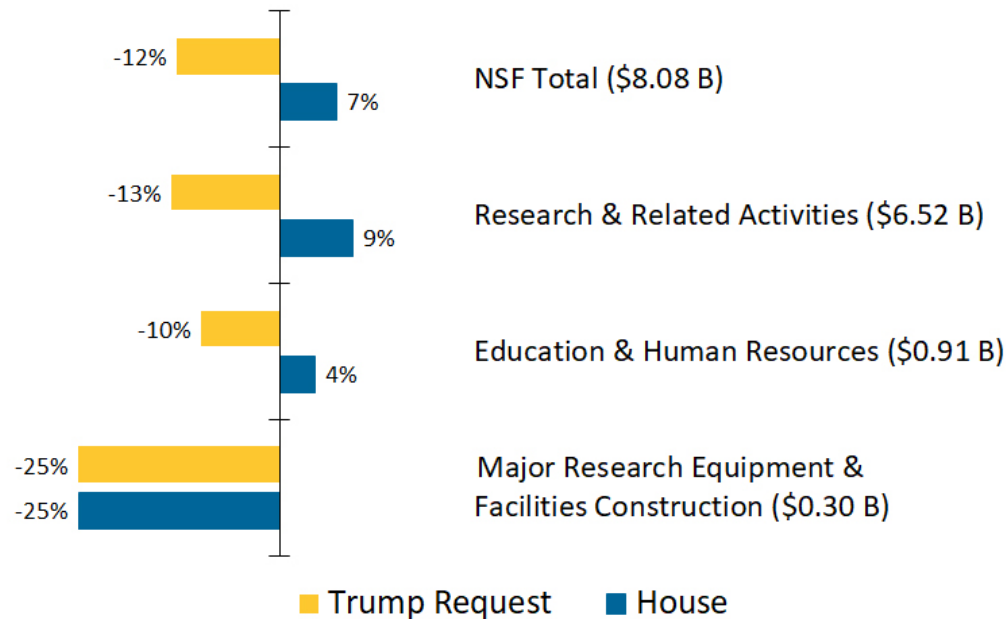
FY 2019 Budget

- Enacted appropriation increases R&RA by 3%.
- MREFC line re-incorporates Antarctic infrastructure; DKIST and LSST at requested levels.
- Directorate and Divisional allocations completed internally. Iteration with OMB, and Congress has 30 days to comment after submission. Will be made public with approved Operations Plan. Interval longer than 30 days, but not yet specifically approved by Congress.
- FY 20 President's Budget Request has been released; House appropriations committee has made initial mark.



FY20 Budget Proposal: NSF

\$ in () are the FY19 amounts



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House language had specific mandates:

- Produce a “comprehensive and prioritized list of large-scale facilities requested by NSF-supported science disciplines.”
- Fund all facilities operations at FY 19 levels. (Some complication for two-year supplements started in FY 18, as well as model for partner cost sharing.)



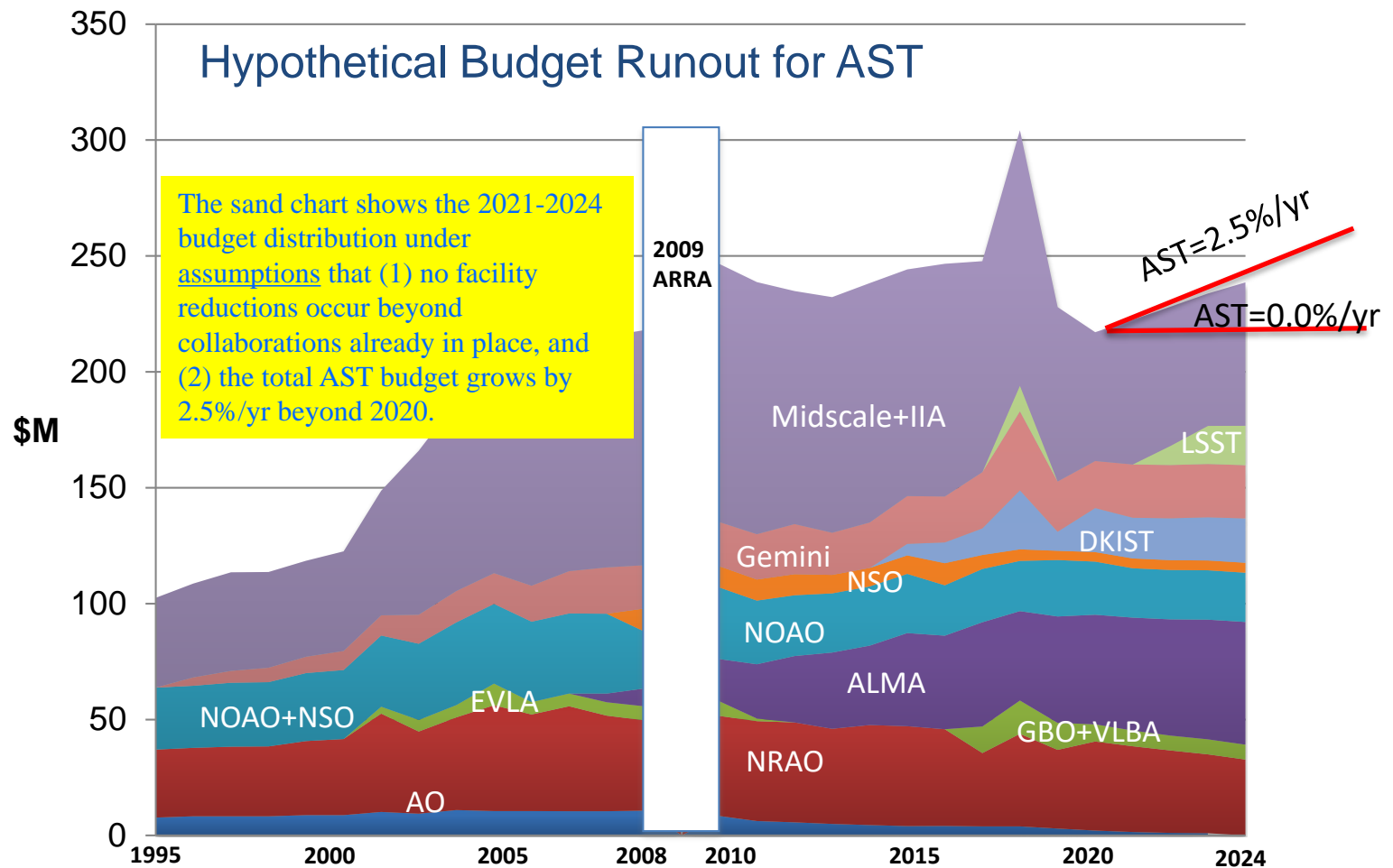
DIVISION OF ASTRONOMICAL SCIENCES (AST)

\$217,080,000
-\$94,080,000 / -30.2%

AST Funding (Dollars in Millions)

	FY 2018 Actual	FY 2019 (TBD)	FY 2020 Request	Change over FY 2018 Actual Amount	Percent
Total	\$311.16	-	\$217.08	-\$94.08	-30.2%
Research	65.35	-	43.44	-21.91	-33.5%
CAREER	4.17	-	5.00	0.83	19.9%
Education	4.73	-	4.70	-0.03	-0.6%
Infrastructure	241.08	-	168.94	-72.14	-29.9%
Arecibo Observatory ¹	8.10	-	2.13	-5.97	-73.7%
ALMA	38.55	-	47.26	8.71	22.6%
AST Portfolio Review Implementation	0.24	-	-	-0.24	-100.0%
DKIST ²	24.00	-	19.01	-4.99	-20.8%
Gemini Observatory ³	34.02	-	20.28	-13.74	-40.4%
LSST ⁴	11.10	-	-	-11.10	-100.0%
Midscale Research Infrastructure	32.98	-	5.00	-27.98	-84.8%
NOAO ³	25.09	-	22.91	-2.18	-8.7%
NRAO ^{3,5,6}	44.46	-	38.40	-6.06	-13.6%
NSO ³	8.82	-	4.13	-4.69	-53.2%
Other AST Facilities	11.91	-	8.42	-3.49	-29.3%
<i>LBO</i> ⁶	<i>3.49</i>	<i>-</i>	<i>-</i>	<i>-3.49</i>	<i>-100.0%</i>
<i>GBO</i>	<i>8.42</i>	<i>-</i>	<i>8.42</i>	<i>-</i>	<i>-</i>
Research Resources	1.81	-	1.40	-0.41	-22.5%





Comments on Sand Chart Model

- The outcome of the appropriations process for the last two years has been an increase in NSF R&RA relative to the President's Budget Request.
- Therefore, a projection pivoting off the FY20 PBR with no inflation is conservative.
- Should no change be made to projected facilities support and LSST operations added in full, the remaining grants program would be only 6% of the Division budget in 2024 in the flat funding projection.
- The consistent advice of AAAC is balance between facilities and grants, not satisfied (at all) in that model.
- Preceding chart shows a more balanced approach, with some limitation to facilities funding and an internal sharing of LSST operations costs.

