



# NSF & Astro2020 Priorities

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## **Assertion: Slow progress by NSF on Decadal Survey priorities for large initiatives has, up until now, been the result of programmatic rather than budgetary issues.**

- ▶ In principle, Congress sets the MREFC queue funding level based on the major projects proposed by NSF.
- ▶ In practice in the last several years, NSF advanced few if any new projects into the MREFC queue (Leadership-class computing).
- ▶ The Senate CJS appropriations subcommittee insisted on placing the Antarctic infrastructure Recapitalization into the MREFC funding line, just to keep it active at the ~\$200M level, in anticipation of future projects.
- ▶ The MREFC line in the past has been as high as \$500M, so there is precedent for multiple and/or large project support.



# Example: New Large Initiatives - Ground

- ▶ Decadal Survey recommendation for frontier project construction in 2021
  - ▶ US-ELT Project – two-hemisphere coverage; NSF contribution of \$1.6B (TRACE estimate)
  - ▶ CMB-S4 – NSF contribution of \$273M
  - ▶ ngVLA – development followed by construction if possible for NSF contribution of \$2.5B (TRACE estimate)
- ▶ Snapshot – where are we today?
  - ▶ US-ELT Project – one telescope (GMT) in no-cost Final Design Review stage -
  - ▶ CMB-S4 – Antarctic portion infeasible from deficiencies in Antarctic support infrastructure
  - ▶ ngVLA – in extended development phase with AST funding

## More detailed timeline of NSF process for US-ELT Program

- ▶ Late 2018: charge and order to National Academies from sponsoring Agencies for 2020 Decadal
- ▶ Nov 4, 2021: release of Pathways to Discovery...2020
- ▶ Dec 2022, US-ELT entered NSF Major Facility Preliminary Design Phase
- ▶ Feb 3, 2023: Two-phase PDR completed for both projects
- ▶ Jun 2023: NSF Blue Ribbon Panel supports AST plan for moving both projects forward (Technical Readiness)
- ▶ Feb 22, 2024: NSB Resolution of support for US-ELT Program with total project cost not to exceed \$1.6B
- ▶ Dec 9, 2024: US ELT External Evaluation Panel Report (Enterprise Risk) – success of the US-ELT program hinges on securing the necessary resources from Congress.
- ▶ June 12, 2025: NSF places GMT into Major Facility Final Design Phase (no cost to NSF) in response to AST request from Oct 2023.



## Two Bounding Scenarios: 1) Status quo during shutdown / CR; Senate CJS Committee language for 2026 appropriation

- ▶ The Committee therefore provides \$50,000,000 for NSF to support the development of next generation astronomy facilities recommended in Astro2020. [ngVLA...]
- ▶ The Committee remains strongly supportive of a two-hemisphere, U.S. Extremely Large Telescope [USELT] program with a robust user support system and data archive to ensure broad U.S. community access.
- ▶ This is consistent with the direction in division C of the joint explanatory statement accompanying Public Law 118-42 and Astro2020.
- ▶ NSF shall immediately advance both USELTs into final design review, at no cost to the Federal Government.
- ▶ Further, NSF, within the construct of the National Science Board approval process, is encouraged to advance the design of these Astro2020 priority projects during fiscal year 2026 so that appropriate Major Research Equipment and Facilities Construction funds can be included in the fiscal year 2027 budget request.

# Senate CJS Appropriations Committee Language (cont)

- ▶ The Committee's recommendation provides \$350,000,000 for Major Research Equipment and Facilities Construction [MREFC].
- ▶ The recommendation is \$116,000,000 above the fiscal year 2025 enacted level.
- ▶ The Committee's recommendation supports the continued construction of the Antarctic Infrastructure Recapitalization and the Leadership-Class Computing Facility.
- ▶ The Committee encourages NSF and the National Science Board to continue planning and budgeting for the next generation of major facilities needed to ensure the United States maintains its scientific leadership.



## 2) OMB drives NSF to PBR 2026 level & restructure during shutdown, where it stays during CR

- ▶ Math & Physical Sciences Directorate goes from \$1.513M to \$515M.
- ▶ MREFC goes from \$329M to \$251M.
- ▶ Operations & Award Mgmt (=staff) goes from \$458M to \$365M
- ▶ No more rotators (IPAs) from universities and research facilities -> 2 to 3 permanent Program Officers to administer the AAG grants program.
- ▶ Rumors
  - ▶ No more disciplinary divisions
  - ▶ MPS will become a cluster with focus on AI, nanotechnology, QIS (with all grant and facility solicitations approved by a political appointee)
  - ▶ Facilities operations from all disciplines will be consolidated into a Facilities Division; tradeoff process with budget reductions unclear

# Another Example: Mid-Scale Innovations Program & Mid-Scale Research Infrastructure

- ▶ Decadal Survey Recommendation: Ramp up to \$50M/yr for MSRI and MSIP for astronomy alone.
- ▶ Senate CJS Committee language: \$90M for MSRI for all disciplines.
- ▶ No current MSIP offering from AST; past decision factors have been absorption of DKIST and Rubin operations cost ramps and consideration of AAG success rate. (Admittedly, this is a budget issue!)
- ▶ Senate CJS language notes this issue:
  - ▶ The Committee expects that as major research facilities, such as the Vera C. Rubin Observatory, move from construction into science operations NSF will continue to use the Facility Operation Transition to allow the ongoing operations and maintenance costs to gradually be absorbed into the managing division or directorate.



# Musings

- ▶ When Paul Hertz and I developed the charge for the 2020 Decadal Survey, we shared the view that an ambitious, world-beating program could attract the necessary funding.
- ▶ Some Sessions of Congress are more amenable to that proposition than others, particularly earlier in the Decade, but the prospect for an adequately funded MREFC queue is still a possibility, even in the current Session.
- ▶ With the US-ELT Program being the single largest investment ever proposed to the NSF, the Director and top management exercised considerable caution and due diligence.
- ▶ Congressional highest priorities are breakthrough science ahead of competitors and delivery of the project as proposed on schedule and on budget. Total cost of one vs. two telescopes is a much more minor consideration in their view.

## Musings 2

- ▶ The Senate CJS subcommittee recognizes that the two-telescope system puts the US in the most competitive scientific position and states their expectation for an MREFC queue request for FY 2027.
- ▶ NSF's intentions are not clear; OMB management is not supportive. (Astronomy / basic research is not a high priority in the Administration's stated objectives for supporting federal research.)
- ▶ Even under normal conditions, NSF requires some internal changes for funding large projects of world-class scale
  - ▶ The development phase (~10-20% of capital cost) and operations phase (~100% of capital cost over a long period) are currently borne by the Division.
  - ▶ The MREFC line was set up because no one Division could support the capital cost of a new facility 30 years ago (Gemini Observatory).
  - ▶ The same is now true for development and operations.



# Politics

- ▶ The AAS Policy Team and Committee on Astronomy & Public Policy (CAPP) have adopted the position that the NSF cannot currently respond in a meaningful way to external advocacy; AAS is therefore focusing on Congress.
- ▶ In principle, the NSB has adequate grounds to contest OMB assertion of authority over NSF operations in that such authority (e.g., solicitations, peer review, staffing choices) is vested in the NSB by the black letter law charter of the NSF as an independent agency.
- ▶ However, the Director, Deputy Director (if there were one), and the entire NSB serves at the President's pleasure...
- ▶ Many members of Congress, particularly in the Senate, continue to respect and value the voice of NASEM and its committees. The AAS will continue to advocate for the execution of Decadal priorities.