



NSF/AST Update for Astro2020

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Update Outline



NSF/AST Update (since July 15, 2019)

- COVID Impacts

- AST Program Update

- Personnel

- Budget for the 2020s?

Astro2020 Update

- General

- Response to Steering Committee Questions

COVID-19 Impacts



- AST facilities
 - Observing: NRAO (VLA, VLBA), GBO, Arecibo, GONG, Gemini (N).
 - Restarted Construction/Commissioning: **DKIST**.
 - Idle: Gemini (S), CTIO, **Rubin Obs.**, ALMA, KPNO.
 - Restart risks/costs, **replan** of **MREFC** programs.



In Search of our Cosmic Origins

COVID-19 Impacts



- AST facilities

- Observing: NRAO (VLA, VLBA), GBO, Arecibo, GONG, Gemini (N).
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- Restart risks/costs, **replan** of **MREFC** programs.

- NSF: *NSF Implementation of OMB Memo M-20-26*

- Includes (but not limited to):
 - Allowability of salaries and other project activities.

Recipients are authorized to continue to charge salaries and benefits to active NSF awards consistent with the recipients' policy of paying salaries (under unexpected or extraordinary circumstances) from all funding sources, Federal and non-Federal. NSF continues to authorize recipients to charge other costs to NSF awards necessary to resume activities supported by the award, consistent with applicable Federal cost principles and the benefit to the project. Recipients must not assume that supplemental funding will be available should the charging of such costs or other fees result in a shortage of funds to eventually carry out the original goals of the project.

- See https://www.nsf.gov/news/special_reports/coronavirus/

COVID-19 Impacts: NSF Staff



- March 16: NSF implemented up to 100 % telework policy.
 - This is week 24.
 - NSF building essentially closed to staff until July.
 - Building now open, most staff continue 100% telework
 - Flexible staff work schedules, flexible dependent care.
 - *Return to work?* NSF never stopped working.
- Work-related travel cancelled.
- All NSF meetings/panels 100% video conference.
 - In March, AST was in middle of panel season.
 - AST successfully run all panels after mid-March remotely, 2 POs per panel plus Admin support.
 - Remote panels will continue into FY 2021

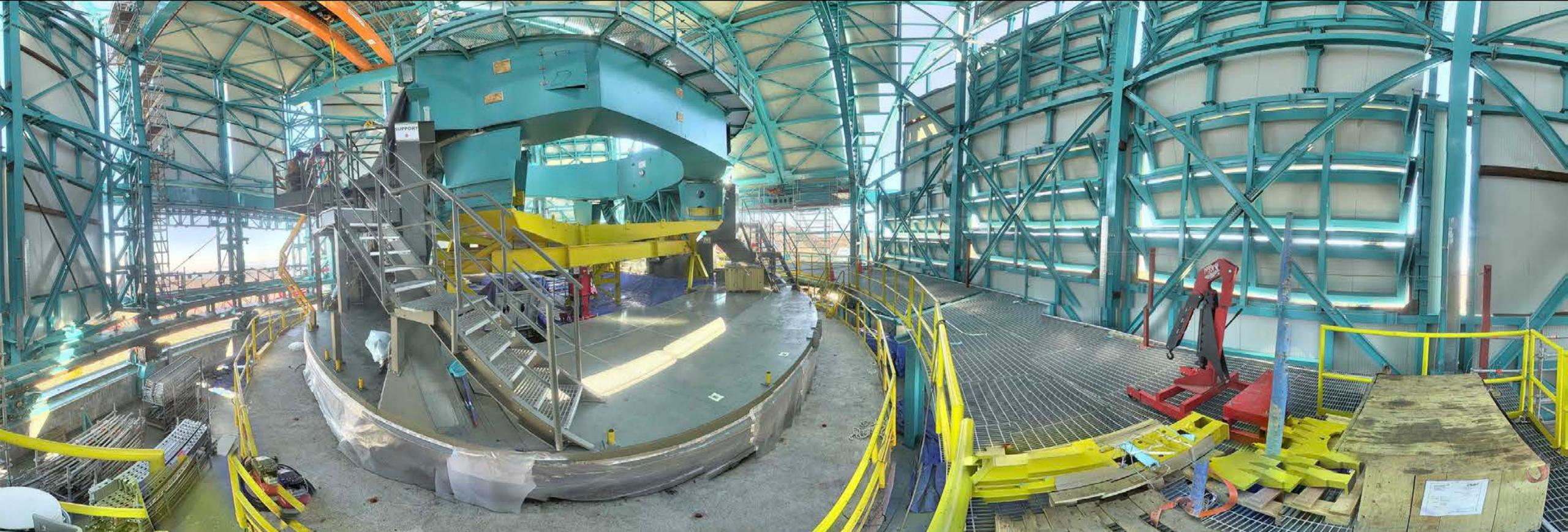




AST Program Update

Rubin Observatory: Opening a Window of Discovery on the Dynamic Universe





Current State of the Rubin Obs. Construction



Telescope mount tarped



Electrical boxes, equipment and materials tarped in dome



M1M3 Cell, coating facility, M2 system, Hexapods, all secured and shutdown

Construction paused: **Day for day** schedule slip plus start up and decreased efficiency delays

Chile Base Facility mostly complete



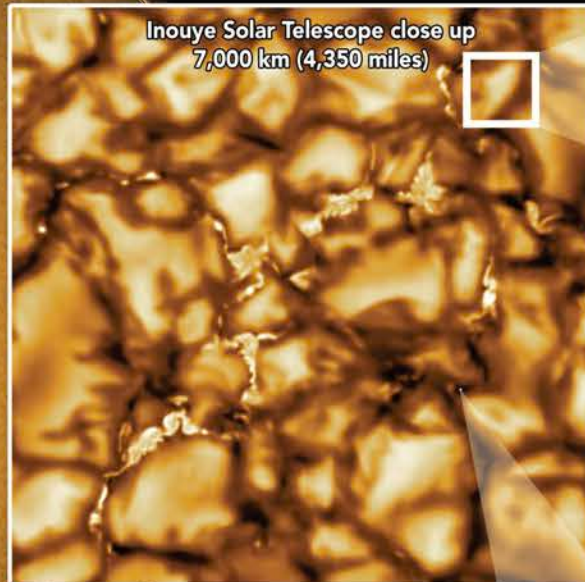


National
Science
Foundation

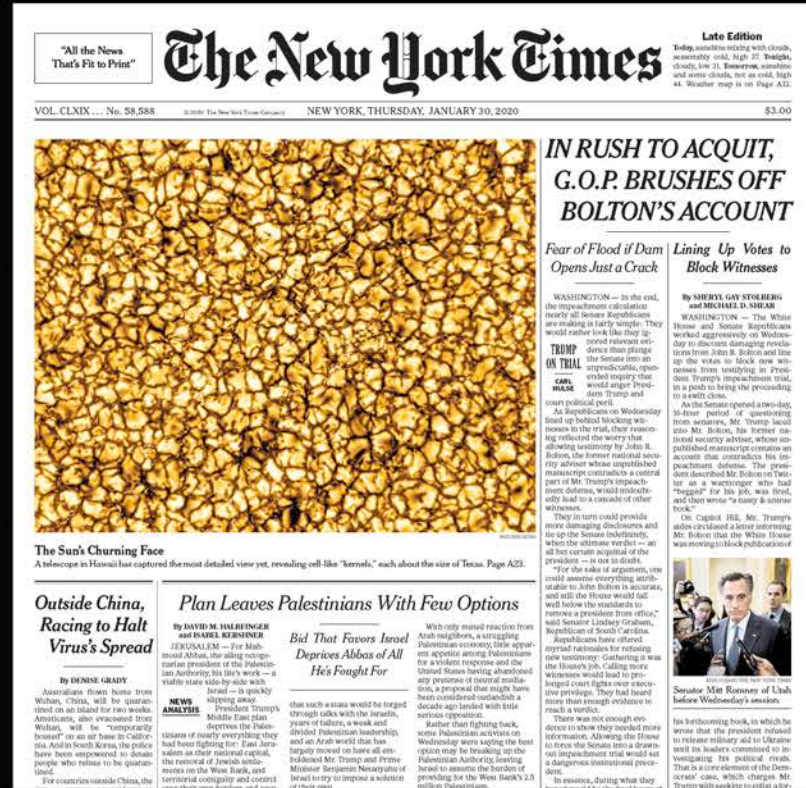
Daniel K. Inouye Solar Telescope

The Inouye Solar Telescope sees large bubbling cells the size of Texas but can also see tiny features as small as Manhattan Island. This is the first time these tiny features have ever been resolved. The Inouye Solar Telescope is showing us three times more detail than anything we've ever seen before. For more information about this telescope, visit www.nso.edu

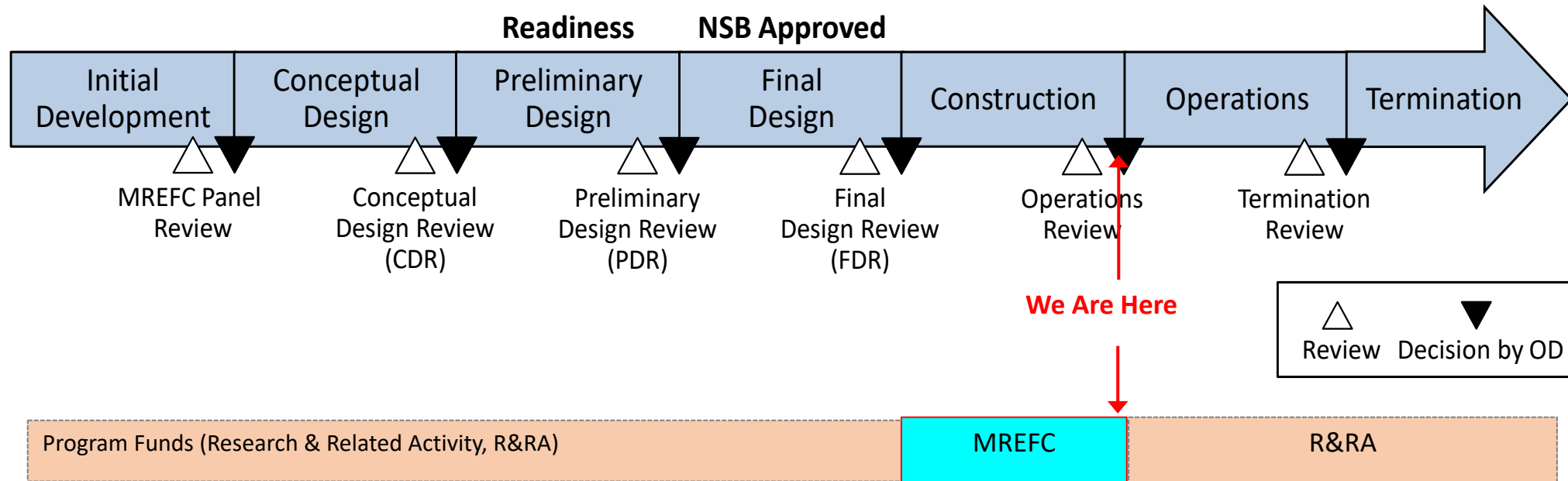
Inouye Solar
Telescope
Full image



Inouye Solar Telescope close up
7,000 km (4,350 miles)



DKIST in the NSF Facility Lifecycle





DKIST Restart

- March 17, 2020: site construction was halted.
- May 29, 2020: NSO held a restart review. DKIST site construction approved for Phase I restart.
- June 4, 2020: DKIST site construction restarted.
 - Phase 1 entails:
 - Telework. Some high-priority activities allowed on site.
 - Directorate approval and scheduling required for high-priority activities.
 - PPE & social distancing strictly enforced.
 - On-site workforce split into two teams/shifts to reduce worker density and enable continuity of construction activities.
 - Hawaii quarantine requirements remain in place.
- The DKIST Project Management office is in the process of estimating cost/schedule impacts of the site construction stoppage.



NSF's National Optical-infrared Astronomy Research Laboratory (NOIRLab)



NSF's National Optical-infrared Astronomy Research Laboratory (NOIRLab)



Formerly NOAO

MSO

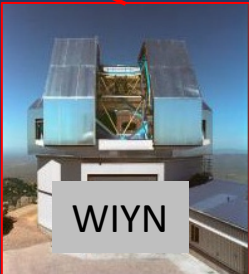
Mid-Scale Observatories

Kitt Peak
National
Observatory

Cerro Tololo
Inter-American
Observatory



Mayall



WIYN



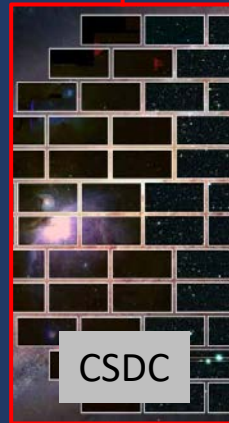
Blanco



SOAR

CSDC

Community
Science &
Data Center

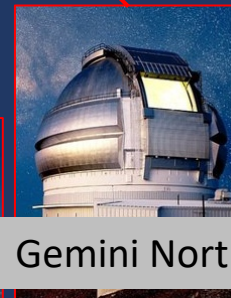


CSDC

International
Gemini
Observatory

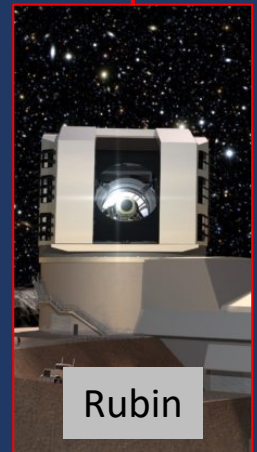


Gemini South



Gemini North

Vera C. Rubin Observatory Operations



Rubin



Personnel

Directorate for Mathematical and Physical Sciences (MPS)



- Anne Kinney, Assistant Director (AD) for MPS, left NSF May 1, to become the GSFC Deputy Director in May 2020.
- Sean Jones, Deputy AD, is acting AD.
- Tie Luo, Deputy Division Director of the Division of Mathematical Sciences is acting Deputy AD.



NSF Office of the Director



- France Córdoba ended a 6-year term as NSF Director March 31.
- Kelvin Droegemeier served as Acting NSF Director April 1 – June 22. Dr. Droegemeier is current Director of OSTP and former member of the National Science Board.
- Sethuraman Panchanathan became the 15th NSF Director (23 June 2020).





Internet Satellites and Ground Based Optical Telescopes



- About 7,000 satellites in CelesTrak catalog
- Internet satellites: SpaceX Starlink, Amazon, OneWeb, Telesat, etc.
 - SpaceX: 30,000
 - Launch in batches of 60, ~twice per month.
 - Amazon/Kuiper: 3236
 - OneWeb: 47,844
 - Telesat: 1,671
- Internet satellites typically will be in LEO, up to ~1,000 km altitude.

NSF Investment



- NSF funded workshop: “Satellite Constellations 1 Workshop” June 29-July 2
 - NSF’s NOIRLab and AAS
 - Goal: *Work collectively toward effective solutions to mitigate impacts*
 - Four working groups:
 - Synthesizing observational results and identifying future observing program needs
 - Examining the current status of simulations
 - Exploring mitigation through satellite ground measurements, detector performance, ops strategies
 - Developing metrics for Optical/IR.
 - SATCON1 Report **released this afternoon.**
- NSF funded JASON study: Considers impacts and mitigations at optical and other wavelengths
- Rubin Observatory continues to work closely with companies launching satellites to understand causes of optical brightness and to find mutually acceptable solutions.
- NSF will continue to engage satellite vendors:
 - Radio Spectrum Management role.
 - Discuss identified metrics and mitigation opportunities with NSF facilities.



Budget for the 2020s?

Future budgets



- President's Budget Request (PBR) FY 2021 released Feb.
 - FY 2021 AST PBR budget request is below recent appropriations.
 - In the past few years, Congress has appropriated NSF funding above the PBR level.
- Decadal funding:
 - Pre-COVID-19 bipartisan support in Congress to ramp up Federal R&D funding in the 2020s.
 - For example: In late January House Science, Space, & Technology Committee Republicans introduced *Securing American Leadership in Science and Technology Act*
 - F. Lucas (R-OK) (paraphrased): S&T is foundational for addressing generational challenges: competition with China and climate change.
 - Increases NSF budget to \$14.9B by 2029.
 - Introduced prior to COVID. Impact of COVID-19 on economy ?
- Endless Frontier Act





Astro2020: General

Introductory slide from July 2019
Presentation

NSF Goals for Astro2020

- Astro2020 will be most effective if it is *aspirational, inspirational, and transformative*.
- Astro2020 will be most effective if it is based on *community consensus science priorities*.
- The agencies are the *customers*. Astro2020 will be conducted independently of the customer, but must provide *recommendations, clear priorities, and actionable advice* to the customer.

Summary slide from July 2019
Presentation

Summary

- Astro2020 will be most effective if it is *aspirational, inspirational, and transformative*.
- Astro2020 will be most effective if it is based on *community consensus science priorities*.
- Let NSF sweat implementation details.
- Provide clear priorities with explanatory decision rules leading to the priorities.



Explanatory Decision Rules:

Astro2020 Statement of Task

Item #4:

- Utilize and recommend decision rules, where appropriate, for the comprehensive research strategy that can accommodate significant but reasonable deviations in the projected budget or changes in urgency precipitated by new discoveries or unanticipated competitive activities



Astro2020 Questions and NSF Response

Comment & Mid-Scale Innovations Program Question



Astro2020 Preface comment: It would be helpful if answers could be provided as numbers in an excel spreadsheet or table rather than sand charts (which are difficult to convert to numbers accurately).

Astro2020 Question: Could you provide the MSIP funding for each solicitation? Preferably for the decade, but for as many years as you have the data.

Mid-Scale Innovations Program (MSIP)



Astro2010 (New Worlds, New Horizons):

Build up to \$40 million per year by mid-decade. Investment over the decade would fall between \$93 million and \$200 million.

Solicitations:

2013: 13-567
2015: 15-580
2017: 17-592
2019: 19-605

Investment

2014: \$14.15 M
2015: \$12.95 M
2016: \$21.25 M
2017: \$20.67 M
2018: \$32.98 M
2019: \$15.59 M

\$117.59 M

Pres. Budget
Request

2020: \$5.0 M
2021: \$1.0 M



MSIP 2018 Awards

- Keck All-Sky Adaptive Optics – Wizinowich @ CARA, \$7.0M
- Facility IFU Spectrograph for Magellan – Simcoe @ MIT, \$5.4M
- HERA Project for low-frequency – Parsons @UCB, \$7.1M
- MMT Adaptive Optics System – Hinz @ Arizona, \$1.5M
- BICEP upgrade to Stage 3 – Kuo @ Stanford, \$9.2M
- Dedicated FRB localization – Hallinan @ Caltech, \$5.3M
- Long Wavelength Array – Taylor @ UNM, \$0.6M
- GBT Metrology – Lockman @ NRAO, \$1.3M
- ALPACA L-Band Phased Array for Arecibo – Jeffs @ BYU, \$5.8M

Operations and Maintenance Funding



- Astro2020 Question: Please update the committee on the status of efforts, mentioned at the initial briefing, to have operations funding for an initial period included in the MREFC line for new projects.
- NSF Response: This is the subject of ongoing discussions, and we have no new results to present at this time. If there were operations funding in the MREFC account, for a fixed account wedge, that funding would reduce the amount of free energy available for construction

Extend MREFC funding wedge to 2035



- Astro2020 Question: Please provide a projected MREFC ‘wedge’ that would be available for new initiatives that extend through 2035.
- NSF Response: The wedge you were provided previously was an ‘ambitious’ wedge, not a ‘projected’ wedge. That ambitious wedge was presented before the COVID-19 pandemic began; COVID-19 has a potentially significant impact on ongoing construction projects that in turn will affect the availability of MREFC account funds. We are unable to make any realistic projections beyond the projects currently approved in the MREFC construction phase.

Mid-Scale Research Infrastructure



- Astro2020 Question: Please provide a projected mid-scale wedge for MSRI from 2020 – 2040 (separate from the MREFC wedge).
- NSF Response: Track 2 of the Mid-Scale RI program is within the MREFC account and cannot be distinguished separately. There is no projection possible for 20 years into the future, for a program that is still in its second year.

MREFC & MSRI: 'Normal' Scenario



- Astro2020 Question: For the two items above (MREFC wedge and MSRI) Astro2020 has been presented with an ambitious scenario only. Could you provide guidance on what should be assumed in a 'normal' scenario?
- NSF Response: Astro2020 was provided a *Notional (Ambitious) Future NSF MREFC Account Profile* and tasked to provide clear priorities and explanatory decision rules that accommodate significant but reasonable deviations from the projected budget.

Mid-Scale Innovations Program



- Astro2020 Question: For AST, please provide the funding wedge in the MSIP program available for new projects from 2020 – 2035.
- NSF Response: Historical funding levels for MSIP have been provided for 2014 – 2019. President's Budget Request (PBR) levels have been provided for FY 2020-2021. No MSIP funding wedge has been established beyond the FY 2021 PBR.

Advanced Technologies & Instrumentation

- Astro2020 Question: Please provide the funding wedge for new ATI projects from 2020 – 2040
- NSF Response: Recent historical funding levels for the ATI program is approximately \$8M per year. No ATI funding wedge has been established beyond the FY 2020.



Grants Programs

- Astro2020 Question: Please provide assumptions for the grants programs (decrease, flat, increase with inflation, increase faster than inflation) for 2020 – 2040.
- NSF Response: Beyond the FY 2020 and FY 2021 President's Budget Request, no funding wedge for the AST grants program has been established.



Discussion