NSF/AST Update AAAC

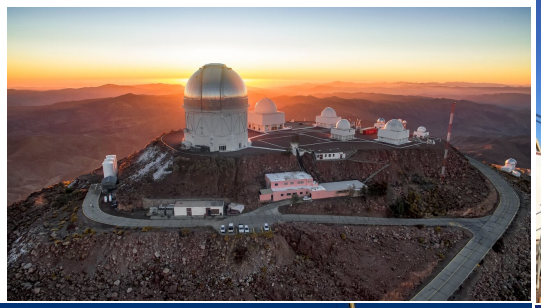
R. Chris Smith

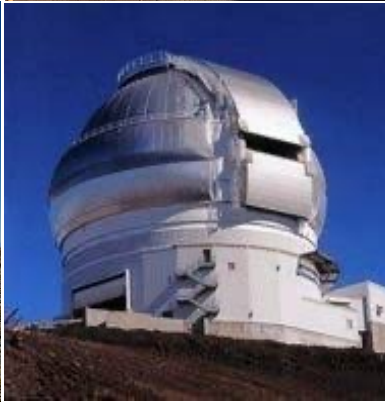
Division Director - Acting

Division of Astronomical Sciences

MPS/NSF

June 2, 2021

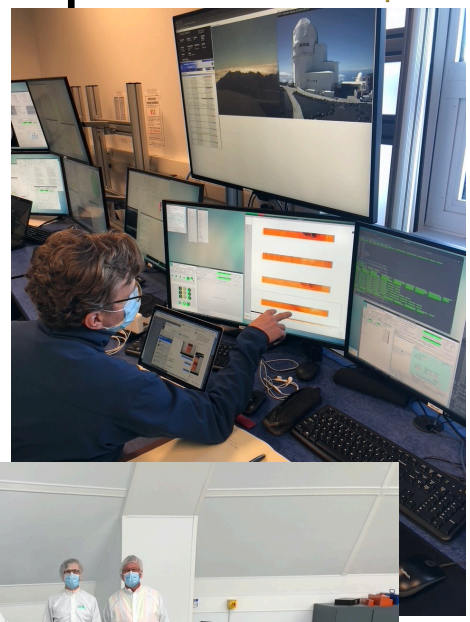




Highlights/Status

Daniel K. Inouye Solar Telescope

- March 2020: DKIST site construction halted
- June 2020: NSF Acting Director authorized $9.4M in **Management Reserve**
- July 2020: Project transitioned to a phase 1b return-to-work that allows for two overlapping shifts of approximately 35 personnel per shift; ~60-70% efficient
- May 2021: NSB authorized $9.5M in additional Management Reserve



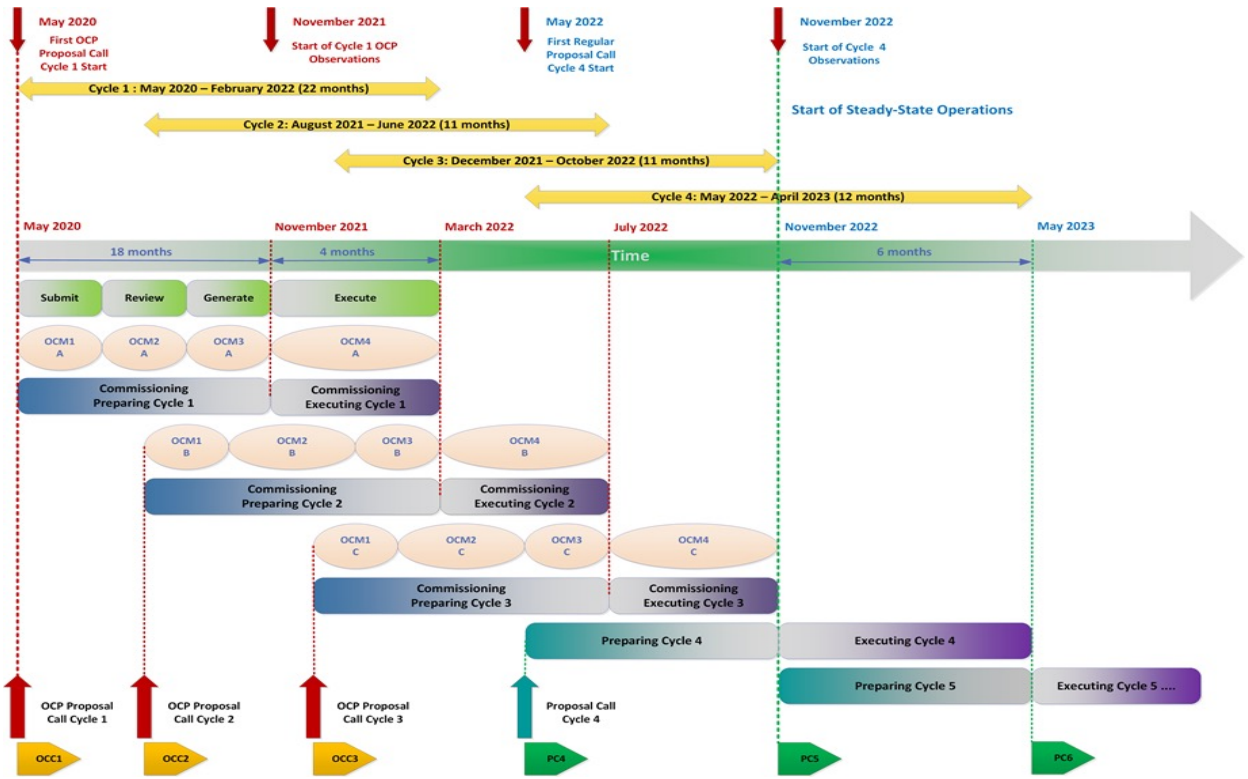
Bottom line

- Estimated Start of Operations milestone slips from May 2021 to ~end of CY2021 due to COVID-19 impacts
- Total Project cost estimated to increase to up to +$18.9M
  - From $344.13M to $363.03M

- On-Sun campaign #3 of 5 completed.
  - Successful site acceptance testing and science verification of the Visible Spectro-Polarimeter (ViSP) instrument

Plan for DKIST Operations Commissioning

- 1-year Operations Commissioning Phase (OCP)
  - Cycle 1 call for proposals – May 1, 2020
  - Cycle 2 call for proposals – August 2021
  - Cycle 3 call for proposals – December 2021
- **Schedule pushed out by ~1 year due to COVID-19**
- Anticipating start of Steady-state observations – November 2022
  - Start of Cycle 4 observing

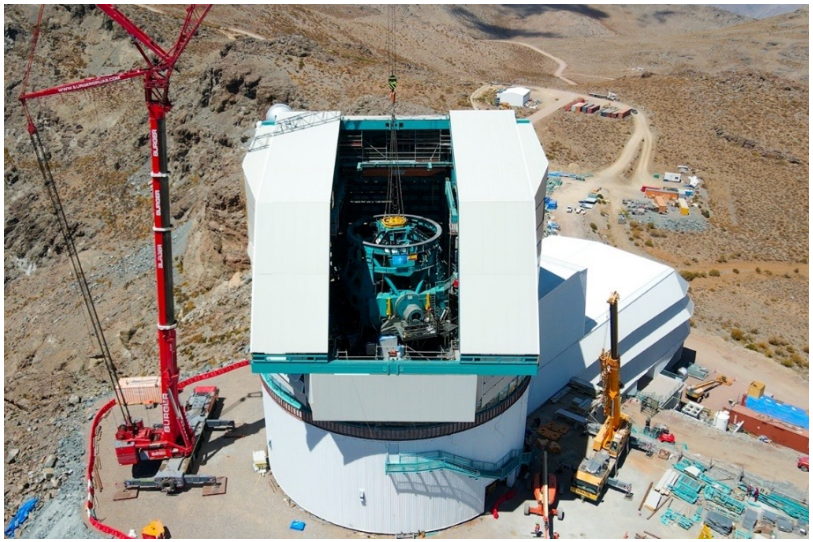


Vera C. Rubin Observatory

- March 2020: Construction abruptly halted due to COVID-19
  - Dome incomplete heading into winter; fortunately no significant damage
- June 2020: NSF Acting Director authorized $10M in Management Reserve
- September 2020: Ramp up of construction activity on summit began under COVID protocols
  - Dome now substantially closed, protecting TMA & associated work
  - Critical path subsystem, Telescope Mount Assembly (TMA)
- Current work slowed by resurgence of COVID in Chile

Bottom Line

- Rebaseline process underway
- Expected COVID delay of about 16 months
- Total Project cost estimated to increase roughly +$60M
  - From $473.0M to ~$533.39M

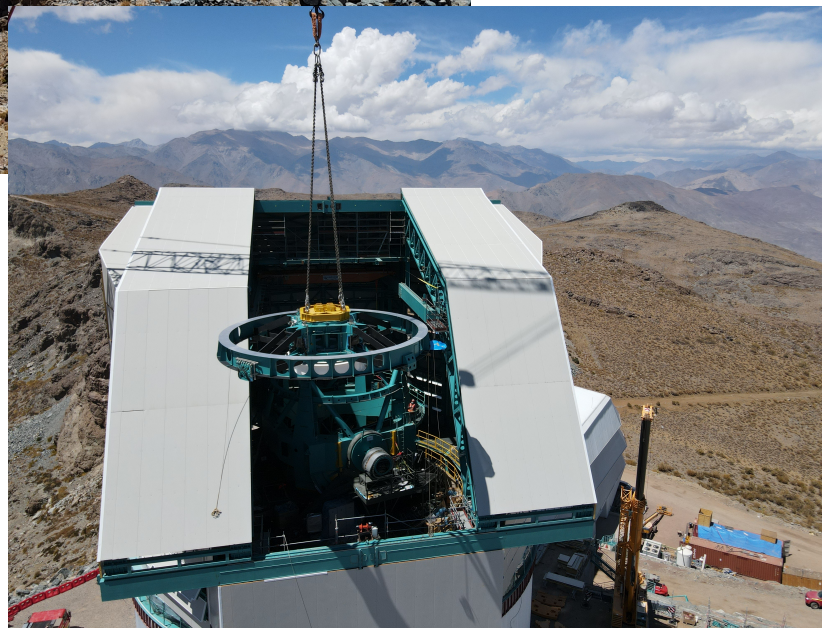


The Top-End Assembly for the Telescope Mount Assembly (TMA) was lifted by crane into the observatory dome an installed on the TMA on March 2, 2021. The task was completed successfully and was a highly celebrated milestone for Rubin Observatory. *Credit: Rubin Observatory/AURA/NSF.*

- Top-end assembly installed; continued progress on Telescope (TMA critical path), Camera (DOE), and Data Management system (NSF+DOE).

Significant progress on site in spite of COVID-19 challenges

- Dome substantially closed; good preparation as we go back into Chilean winter
- TMA Top End carefully lifted through dome slit and installed; progress being slowed due to travel challenges



Arecibo Observatory: Status

- August 2020: Auxiliary cable pulled out of socket
  - NSF authorized & awarded $7.1M for stabilization & analysis
- December 2020: Instrument platform collapsed
- Cleanup begun immediately: three pronged effort of
  - Removal of Debris
  - Environmental Mitigation
  - Historic and Cultural Preservation
- Ongoing science: Repairs to some facilities (12-m telescope), Lidar operations and optical observations at Culebra
  - Access to archival data from decades of Arecibo observations (~3PB) facilitated by Texas Advanced Computing Center w/ collaborators
  - Resumption of important outreach & educational programs pending safe conditions on site (some have continued remotely)

Panels removed as required for cleanup

TACC's Ranch supercomputer, a long-term data mass storage system, is safely preserving over three petabytes of data from the Arecibo radio telescope. Ranch is an allocated resource of the Extreme Science and Engineering Discovery Environment (XSEDE) funded by the National Science Foundation (NSF). (Credit: TACC)

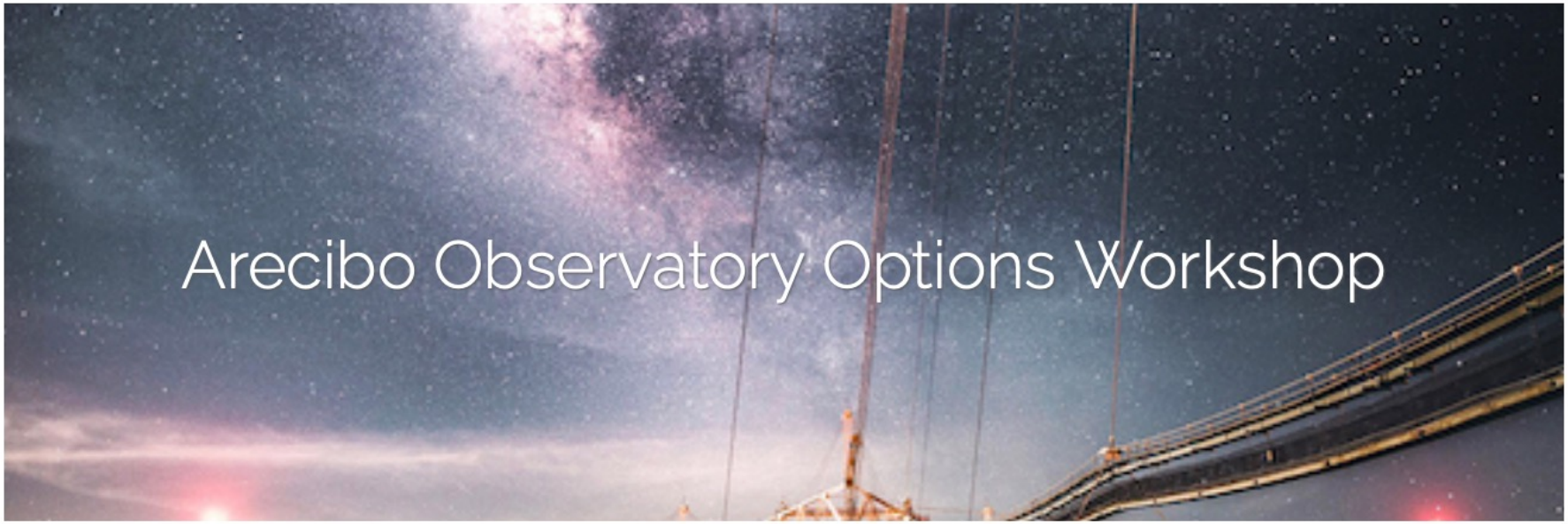
Bottom Line

- Estimated TOTAL cost of ongoing cleanup ~$40-50M
- Focus now turning to future of Arecibo Observatory

Congressional report: https://www.nsf.gov/news/reports/AreciboReportFINAL-Protected_508.pdf

Arecibo Observatory: Future

National Science Foundation
WHERE DISCOVERIES BEGIN



Arecibo Observatory Options Workshop

An Interactive Workshop to Explore Novel Ideas for Future Scientific, Educational, and Cultural Activities with the Arecibo Observatory

Arecibo Observatory: Future

Timeline and Important Dates

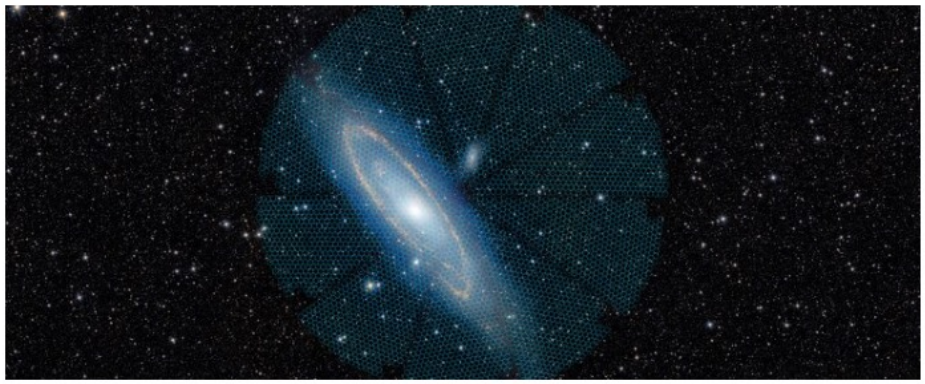
Event	Summary	Duration	Event Date
Overview	Presentation of the situation at the Arecibo Observatory, current activities and constraints, and a review of the goals of the workshop	2 hours (12:00 ET)	**April 2**
Technology Training "Happy Hour"	An opportunity for participants to try out the technology they will be using, and allow individuals to get to know the other participants	2 hours (4:00 ET)	**June 2**
Call to Action & Kickoff	Orientation for participants to the scope of the workshop, and discussion of the criteria for success	4 hours (12:00 ET)	**June 4**
Divergent Thinking	To engage in multiple rounds of ideation	4 hours (12:00 ET)	**June 10**
Stewarding	Participants provide feedback and help flesh out others' ideas	4 hours (12:00 ET)	**June 14**
Team Formation	Teams form to write up their ideas	2 hours (12:00 ET)	**June 16**
Collecting Feedback	Teams share preliminary outlines/drafts and solicit feedback before proceeding with their writing.	2 hours (12:00 ET)	**June 18**
Closing Session	Team give their final papers/presentations.	3 hours (12:00 ET)	**June 28**

noirlab2117 — Organization Release

DESI Begins Creating 3D Map of the Universe

The Dark Energy Spectroscopic Instrument (DESI) completes trial run, begins survey to map the Universe and unravel mysterious dark energy

17 May 2021



A quest to map the Universe and unravel the mysteries of dark energy began officially today, 17 May 2021, at Kitt Peak National Observatory, a Program of NSF's NOIRLab. Over the next five years, the Dark Energy Spectroscopic Instrument (DESI) will capture the light from tens of millions of galaxies and other cosmic objects. During its four-month trial run, which just concluded, the project already collected millions of observations.

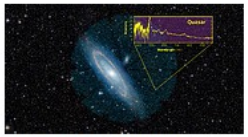
+ Search Press Release

About the Release

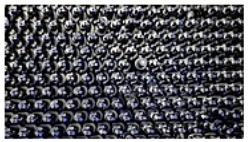
Release No.:	noirlab2117
Instruments:	DESI

Images

PR Image noirlab2117a
Andromeda Galaxy with DESI Overlay



PR Image noirlab2117b
Andromeda Galaxy with DESI Overlay and Spectrum



PR Image noirlab2117c
DESI Focal Plane

noirlab2118 — Science Release

Dark Energy Survey Releases Most Precise Look at the Universe's Evolution

First three years of survey data uses observations of 226 million galaxies over ⅛ of the sky

27 May 2021

In 29 new scientific papers, the Dark Energy Survey examines the largest-ever maps of galaxy distribution and shapes, extending more than 7 billion light-years across the Universe. The extraordinarily precise analysis, which includes data from the survey's first three years, contributes to the most powerful test of the current best model of the Universe, the standard cosmological model. However, hints remain from earlier DES data and other experiments that matter in the Universe today is a few percent less clumpy than predicted.

Search Press Release

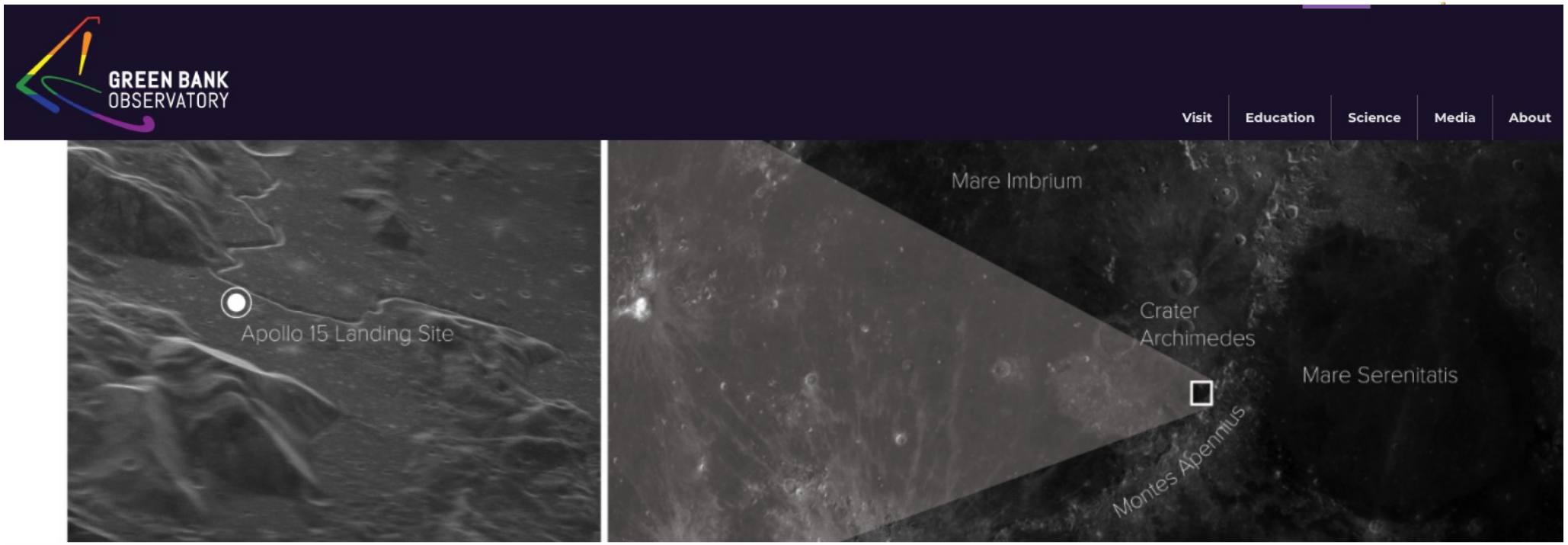
About the Release

Release No.: noirlab2118

Images

PR Image noirlab2118a
Dark Energy Survey deep field image

PR Image noirlab2118b
Víctor M. Blanco 4-meter Telescope



- Collaboration of GBO, NRAO, Raytheon Intelligence & Space
- 700 watt solid state transmitter on GBT
- 10 VLBA antennas used as receiving stations
- Radar imaged Apollo 15 landing site, 5m resolution, Nov. 2020
- Exploring development of 500-kilowatt transmitter

See https://public.nrao.edu/news/successful-test-new-planetary-radar/ (1/28/2021)

National Radio Astronomy Observatory

For Scientists

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GIVE

Search …

Home › News › Announcement: May 11, 2021 at 10:00 am EDT

National Radio Astronomy Observatory featured in the 2021 STEM for All Video Showcase

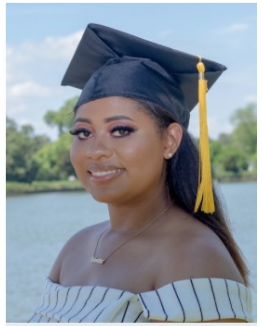
Three featured projects highlight NRAO's commitment to equity, social justice, and creative solutions to engagement during COVID-19

2021 STEM for All Video Showcase

Credit: STEM for All Video Showcase, NSF

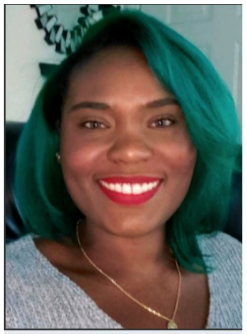
Paulina Bocaz is the NRAO Assistant Director for Chile, and one of the creators of the PROVOCA program, which inspires young girls in Chile to pursue careers in STEM.

Credit: NRAO/AUI/NSF



Angelina Gallego is a graduate student in the National Astronomy Consortium (NAC), and is a project co-presenter for "Virtual NAC."

Credit: courtesy Angelina Gallego



Alia Wofford is a graduate student in the National Astronomy Consortium (NAC), and was the project narrator for "Virtual NAC."

Credit: courtesy Alia Wofford

Suzanne Gurton is the Assistant Director of NRAO for Education and Public Outreach, and is the creator of On-the-Spot Feedback.

Credit: NRAO/AUI/NSF

AST Personnel

AST Staffing

- AST Division Director
  - Closed April 30th 2021; interviews underway
  - Acting DD named in interim
- AST Senior Advisor for Facilities
  - Ashley Vanderley
- New ESM Team member
  - John Chapin, Special Advisor for Spectrum
- New Support Staff
  - Tanner Abraham, Pathways Student Analyst
- Positions to be filled
  - AST Facilities Program Officer
  - AST Grants Program Officer (Fed)
  - AST Grants Program Officers (Rotators – always looking, see DCL !)

Division of Astronomical Sciences (AST)

Management Team

R. Chris Smith
Acting Division Director

James Neff
Deputy Division Director

Craig McClure
Program Support Manager

Donna O'Malley
Financial & Operations Specialist

Ashley VanderLey
Senior Advisor for Facilities

Administration

Elizabeth Pentecost
Project Administrator

Matthew Viau
Program Analyst

Allison Farrow
Program Analyst

Renee Adonteng
Program Analyst

Tanner Abraham
Program Analyst
Pathways Student

Individual Investigator Programs (IIP)

Hans Krimm
Program Director

IIP Coordinator; Lead: Stellar Astro.

Nigel Sharp
Program Director

Lead: Estragalactic & Cosmology; cross-NSF programs

Glen Langston
Program Director

Lead: Galactic Astronomy

Harshal Gupta
Program Director

Lead: Postdoctoral Fellowships; Lab Astro

Luke Sollitt
Program Director

Lead: Planetary Astronomy

Sarah Higdon
Program Director

Lead: CAREER; AAG

Zoran Ninkov
Program Director

Lead: Advanced Technology & Instrumentation; AAG

Marc Seigar
Program Director

Lead: REU; AAG

James Higdon
Program Director

AAG; SAA, EXC

Matthew Benacquista
Program Director

Expert

Facilities, Mid-Scale, & MREFC Projects

Nigel Sharp
Program Director

MSIP; MSRI

David Boboltz
Program Director

DKIST

Christopher Davis
Program Director

NOIRLab

Edward Ajhar
Program Director

Vera C. Rubin Observatory

Joe Pesce
Program Director

NRAO; ALMA

Harshal Gupta
Program Director

GBO

Martin Still
Program Director

Gemini

Carrie Black
Program Director

NSO

Alison Peck
Program Director

Arecibo

ESM

John Chapin
Special Advisor for Spectrum

Jonathan Williams
Program Director

David Morris
AAAS Fellow

Programs

AST Division Programs

Research

Technology/ Instrumentation

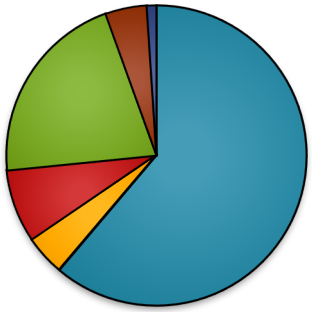
Education and Special Programs

Individual Investigators
(Lead: Hans Krimm)

- AAG
- CAREER
- AAPF
- ATI
- MRI
- REU
- ESP

Mid-scale
(Lead: Nigel Sharp)

- MSIP
- MSRI



Facilities
(Sr Advisor: Ashley Vanderley)

- NRAO
- ALMA
- GBO
- Arecibo

MREFC

- NSO
- DKIST
- NOIR Lab
- Rubin
- Gemini N & S
- MidScale Obs

FY 2022 Programs and Deadlines

Acronym	Program Name	Deadline	Program Lead
CAREER*	Faculty Early Career Development Program	26 Jul 21	S. Higdon
REU Sites*	Research Experiences for Undergraduates	25 Aug 21	Seigar
AAPF	Astronomy & Astrophysics Postdoctoral Fellowships	15 Oct 21	Gupta
AAG	Astronomy & Astrophysics Research Grants	15 Nov 21	Sharp (EXC), Langston (GAL), Krimm (SAA), Sollitt (PLA)
ATI	Advanced Technology and Instrumentation	15 Nov 21	Ninkov
MRI*	Major Research Infrastructure	19 Jan 22?	Ninkov
MSRI-2*	Mid-scale Research Infrastructure-2	20 Sept 21 (by invitation)	Sharp
MSRI-1*	Mid-scale Research Infrastructure-1	2023?	Sharp

* NSF-wide solicitations

Two new MPS-wide funding opportunities

MPS-Ascend (NSF 21-573)

- Supports postdoctoral fellows who will broaden the participation of groups that are underrepresented in MPS fields.
- Facilitates career development and transition to a faculty position
- Administered like AAPF – awards to individuals, not institutions.
- Deadline: 15 June 2021

MPS-LEAPS (NSF 21-570)

- Emphasis on supporting pre-tenure faculty at MSIs, PUIs, and R2 universities
- Focus on broadening participation
- No past NSF research support
- 24-month duration
- Deadline: 14 June 2021

Budgets: FY2020, FY2021, FY2022

NATIONAL SCIENCE FOUNDATION

FY 2022 Budget Request to Congress

AST Table

DIVISION OF ASTRONOMICAL SCIENCES (AST) **$294,050,000**
+$17,000,000 / 6.1%

AST Funding
(Dollars in Millions)

	FY 2020 Actual	FY 2021 Estimate	FY 2022 Request	Change over FY 2021 Estimate Amount	Change over FY 2021 Estimate Percent
Total	**$279.10**	**$277.05**	**$294.05**	**$17.00**	**6.1%**
Research	**64.99**	**52.92**	**72.47**	**19.55**	**36.9%**
CAREER	4.74	4.81	4.81	-	-
Education	**4.27**	**4.60**	**5.10**	**0.50**	**10.9%**
Infrastructure	**209.85**	**219.53**	**216.48**	**-3.05**	**-1.4%**
Arecibo Observatory[1]	3.75	12.68	8.00	-4.68	-36.9%
AST Portfolio Review Implementation	0.05	-	-	-	N/A
Green Bank Observatory[2]	9.42	8.90	9.12	0.22	2.5%
Midscale Research Infrastructure	23.30	20.80	19.50	-1.30	-6.3%
National Radio Astronomy Observatory (NRAO)	85.75	88.13	91.16	3.03	3.4%
NRAO O&M	*38.48*	*39.45*	*40.53*	*1.08*	*2.7%*
Atacama Large Millimeter Arrary (ALMA)	*47.27*	*48.68*	*50.63*	*1.95*	*4.0%*
National Solar Observatory (NSO)	21.79	22.09	25.46	3.37	15.3%
NSO O&M	*4.78*	*4.55*	*5.88*	*1.33*	*29.2%*
Daniel K. Inouye Solar Telescope (DKIST) O&M[3]	*17.01*	*17.54*	*19.58*	*2.04*	*11.6%*
NSF's National Optical-Infrared Astronomy Research Lab (NOIRLab)	57.86	57.93	54.44	-3.49	-6.0%
NOIRLab O&M (Mid-Scale Observatories & Community Science and Data Center)[4]	*35.54*	*29.95*	*26.26*	*-3.69*	*-12.3%*
Gemini Observatory O&M	*22.31*	*22.98*	*22.98*	-	-
Vera C. Rubin Observatory O&M	*0.01*	*5.00*	*5.20*	*0.20*	*4.0%*
Research Resources	7.92	7.00	8.80	1.80	25.7%

[1] Includes $28.88 million in FY 2021 and $15.0 million in FY 2022 in supplemental funding for cleanup of the Arecibo site.

[2] FY 2020 Actual includes $1.75 million from a technical deobligation/reobligation action from a previous award.

[3] FY 2021 Estimate excludes funding of $2.0 million for cultural mitigation activities as agreed to during the compliance process.

[4] Includes $2.0 million in FY 2020 for transition activities associated with the creation of NOIRLab, as well as special projects funding of $13.63 million in FY 2020, $9.44 million in FY 2021, and $5.13 million in FY 2022.

FY2020 Actuals

- FY2020 AST funding down from FY2019, coming off of extra investments in infrastructure in FY2018 and FY2019 (which also allowed Research funding to grow)

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FY2021 Estimates

- FY2021 **Estimates** are only that
- Total AST FY2021 appears down a bit from FY2020, but confusing
  - Additional funding for Arecibo cleanup not shown in AST line (see MPS table, +$20M)
- FY2021 estimates **NOT final**, but it will be a down year for new grants
  - AST & MPS investing in COVID-19 mitigation for affected grantees
  - Although spread out over global NSF, GEO/AGS, and MPS/AST funds, Arecibo cleanup costs will have significant impacts

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[1] Includes $28.88 million in FY 2021 and $15.0 million in FY 2022 in supplemental funding for cleanup of the Arecibo site.

[2] FY 2020 Actual includes $1.75 million from a technical deobligation/reobligation action from a previous award.

[3] FY 2021 Estimate excludes funding of $2.0 million for cultural mitigation activities as agreed to during the compliance process.

[4] Includes $2.0 million in FY 2020 for transition activities associated with the creation of NOIRLab, as well as special projects funding of $13.63 million in FY 2020, $9.44 million in FY 2021, and $5.13 million in FY 2022.

FY2022 Request

- Total FY2022 REQUEST shows strong support in AST funding
- Support for major new Astro2020 initiatives will come from the top line
  - Arecibo cleanup costs wrapping up, still shared
- At MPS level, continued investments in LEAPS and Ascend programs to promote broader participation

DIVISION OF ASTRONOMICAL SCIENCES (AST) **$294,050,000**
+$17,000,000 / 6.1%

AST Funding
(Dollars in Millions)

	FY 2020 Actual	FY 2021 Estimate	FY 2022 Request	Change over FY 2021 Estimate Amount	Change over FY 2021 Estimate Percent
Total	**$279.10**	**$277.05**	**$294.05**	**$17.00**	**6.1%**
Research	**64.99**	**52.92**	**72.47**	**19.55**	**36.9%**
CAREER	4.74	4.81	4.81	-	-
Education	**4.27**	**4.60**	**5.10**	**0.50**	**10.9%**
Infrastructure	**209.85**	**219.53**	**216.48**	**-3.05**	**-1.4%**
Arecibo Observatory[1]	3.75	12.68	8.00	-4.68	-36.9%
AST Portfolio Review Implementation	0.05	-	-	-	N/A
Green Bank Observatory[2]	9.42	8.90	9.12	0.22	2.5%
Midscale Research Infrastructure	23.30	20.80	19.50	-1.30	-6.3%
National Radio Astronomy Observatory (NRAO)	85.75	88.13	91.16	3.03	3.4%
NRAO O&M	*38.48*	*39.45*	*40.53*	*1.08*	*2.7%*
Atacama Large Millimeter Array (ALMA)	*47.27*	*48.68*	*50.63*	*1.95*	*4.0%*
National Solar Observatory (NSO)	21.79	22.09	25.46	3.37	15.3%
NSO O&M	*4.78*	*4.55*	*5.88*	*1.33*	*29.2%*
Daniel K. Inouye Solar Telescope (DKIST) O&M[3]	*17.01*	*17.54*	*19.58*	*2.04*	*11.6%*
NSF's National Optical-Infrared Astronomy Research Lab (NOIRLab)	57.86	57.93	54.44	-3.49	-6.0%
NOIRLab O&M (Mid-Scale Observatories & Community Science and Data Center)[4]	*35.54*	*29.95*	*26.26*	*-3.69*	*-12.3%*
Gemini Observatory O&M	*22.31*	*22.98*	*22.98*	-	-
Vera C. Rubin Observatory O&M	*0.01*	*5.00*	*5.20*	*0.20*	*4.0%*
Research Resources	7.92	7.00	8.80	1.80	25.7%

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FY2022 Request: MREFC

- Request shows completion of DKIST,
- Request supports completion of Rubin with additional funding to support COVID impacts through FY2023

MREFC Account Funding, by Project

(Dollars in Millions)

	FY 2020 Actual	FY 2021 Estimate[1]	FY 2022 Request	FY 2023 Estimate	FY 2024 Estimate	FY 2025 Estimate	FY 2026 Estimate	FY 2027 Estimate
Antarctic Infrastructure Recapitalization	$48.78	$90.00	$90.00	$60.00	$60.00	TBD	TBD	TBD
DKIST	-	-	-	-	-	-	-	-
HL-LHC Upgrade	33.00	33.00	36.00	33.00	18.00	-	-	-
Mid-scale Research Infrastructure[2]	-	76.25	76.25	76.25	76.25	76.25	76.25	76.25
NEON	0.74	-	-	-	-	-	-	-
RCRV	25.00	-	5.00	15.00	-	-	-	-
Vera C. Rubin Observatory	46.35	40.75	40.75	15.00	-	-	-	-
Dedicated Construction Oversight	0.97	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Total	**$154.84**	**$241.00**	**$249.00**	**$200.25**	**$155.25**	**$77.25**	**$77.25**	**$77.25**

[1] A total of $129.35 million was carried forward from FY 2020 into FY 2021: $29.71 million for AIMS, $9.40 million for DKIST, $65.0 million for Mid-scale RI, $10.97 million for RCRV, $10.07 million for the Rubin Observatory, and $780,000 for Dedicated Construction Oversight.

[2] Outyear amounts are for planning purposes only. NSF will evaluate Mid-Scale Research Infrastructure in the context of agency priorities for future budget submissions.

FY2023 Request

- Process starting (ramping up in the June/July timeframe)
- Given the delay in Astro2020 release, it will be challenging to work in large investments for the new recommendations
    - We are actively exploring scenarios to try to prepare options and requests

DIVISION OF ASTRONOMICAL SCIENCES (AST)

AST Funding
(Dollars in Millions)

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Questions?