NSF/AST Update AAAC

R. Chris Smith
Division Director - Acting
Division of Astronomical Sciences
MPS/NSF
September 28, 2021
NSF and COVID

NSF Operations

• Most staff still working from home (maximum telework status)
  • Building occupancy limited to 25%

• All meetings and reviews still to be held remotely
  • Includes internal meetings, i.e., no gatherings

• Only essential travel has been permitted
  • time sensitive and impossible to postpone

• Now transitioning to official travel being allowed (for the vaccinated)
NSF and COVID

Guidance for Facilities

• Managing Organizations advised to make decisions that keep their staff safe
  • Security of facility also critical

• Follow State Department & OMB guidance on travel; refer to CDC for information on COVID

• Document additional costs incurred that are directly related to COVID-19

• OMB flexibilities: Work with POs and G/AOs on allowability of costs, e.g.
  • COVID-19 testing expenses
  • Staff salaries

Kudos to NSF Facilities staff and management for their outstanding (hard) work!!
COVID Trends at Sites

New Cases/Day/Million people

Arizona
Chile
La Serena Region
Hawaii
US Average

Updated 11 Sept 2021
7-day trailing average
Both LEAPS and Ascend award portfolios are DEI focused

NSF and COVID

Individual Investigator Programs

• Targeted Funding: AST
  • Priority to retain those populations most at risk, including students, postdocs, early faculty
  • Supplements focused on those in last year of grants. Mostly AAG, but some in MSIP and ATI.
  • Additional AAPF funding through ARP

• Targeted Funding: MPS
  • Base funds + ARP funds,
  • supporting Divisions and MPS-wide initiatives
  • MPS-LEAPS pre-tenure faculty awards
  • MPS-Ascend postdoctoral fellowship awards

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NSF, MPS, & AST Personnel
NSF Management: Key Players

NSF OFFICE OF THE DIRECTOR
- Sethuraman Panchanathan: 15th NSF Director
- New COO: Karen Marrongelle
- New CORF: Linnea Avallone (Oct 12)

DIRECTORATE FOR MATHEMATICAL AND PHYSICAL SCIENCES (MPS)
- Sean Jones: Assistant Director
- Tie Luo: Deputy Assistant Director
AST Staffing

• AST Division Director: Pending
  • Ralph Gaume retired May 2021
  • Acting DD named in interim: Chris Smith

• New Program Staff
  • Luca Rizzi, will be supporting Rubin and NOIRLab
  • Andreas Berlind, will be supporting Grants, DEI, & Data Science

• New Financial Operations Specialist: Neila Odom-Jefferson
Science Highlights
Our Optical Universe: Nearby & Distant

Bernardinelli-Bernstein - Most Massive Comet
Blanco DECam

Most Distant Quasars J0313-1806 Z = 7.64
Gemini Flamingos-2 and GNIRS
Wang et al. 2021
VLA measures Magnetic Fields in a CME

- Coronal mass ejections (CME) are the most violent of space weather phenomena, traveling at \(~10^3\) km/s, with potential for major impact on the Earth.

- Polarization observation with the VLA, coupled with real-time *in situ* density measurements by the Parker Solar Probe, have provided the most precise measurement of the magnetic field in a CME.

- Observations of the rotation measures toward background quasars through a CME yields a magnetic field strength \(~30\) mG at \(10R_\odot\). The fields help to ‘sculpt’ the CME as it travels from the Sun.

*Left: SOHO coronographic image of a CME, showing the location of background radio sources used for Faraday rotation measurements with the VLA. Right: time behavior of the rotation measures with passage of the CME in front of source 1 (Kooi et al. 2021, Solar Physics, 296, 11).*
Akamai Workforce Initiative Internship Program:
Advancing Hawaii college students into STEM careers at observatories and beyond

451 local college students have been placed at telescopes and tech companies (2003-21):
- 37% Women
- 23% Native Hawaiian
- 47% All underrepresented minorities (URM)

Located 84% alumni

Akamai 2022 Application Coming Soon!

88% of alumni stay in STEM across all demographic groups
125+ in STEM jobs in Hawaii
4 Akamai alumna are now engineers at NSF DKIST on Maui

Akamai is managed by the Institute for Educators at the University of California and Hawaii Community Foundation.

Advancing Inclusive-Sky Precision AO on Telescope, University of California and Hawaii Community Foundation.
Facilities Highlights
Daniel K. Inouye Solar Telescope

- On schedule for transition to operations in Nov 2021
- Special presentation tomorrow
Vera C. Rubin Observatory
Construction & System Integration Progressing

Software integration, system verification and issue resolution

The entire Rubin team has managed to work through the difficult circumstance and made great progress

Dome Enclosure!

TMA major structure completion

Image from fully integrated ComCam - All 9 sensors show excellent performance
Rebaseline Critical Path Change Analysis

- Rebaseline still underway; COVID impacts still making some elements moving targets

Pre-COVID Critical Path

<table>
<thead>
<tr>
<th>Event</th>
<th>Date</th>
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</thead>
<tbody>
<tr>
<td>TMA Integration</td>
<td>20 Mar 2020</td>
</tr>
<tr>
<td>SIT-Com</td>
<td>12 Jan 2021</td>
</tr>
<tr>
<td>15 Jun 2021</td>
<td></td>
</tr>
</tbody>
</table>

Currently Projecting

- 20 22 month delay.
- Finish: Mid 2024

Early Finish

- 9 May 2022

- TMA vendor off-site for 10 months
- HBS Delay for 2 months
- TM integration inefficiency adds 2 months
- COVID changes add 2 months
Rubin Forecast Summary Schedule (for now)

Currently Projecting 20-22 month delay.

Finish: Mid 2024
Rubin 2021 PCW - Diversity, Equity & Inclusion

Creating and maintaining Diversity in its workforce and community through Equitable and Inclusive practices

- ~7 hours dedicated to DEI
- Anti-racism workshop 2x oversubscribed! (Thurs & Fri)

Open sessions:
- Building inclusive practices (Mon)
- Bystander intervention, being an ally (Wed)
Rubin Observatory Operations plan under development; NSF component led by NOIRLab, DOE by SLAC
NSF’s National Optical-infrared Astronomy Research Laboratory (NOIRLab)

Formerly NOAO

MSO
Mid-Scale Observatories

Cerro Tololo Inter-American Observatory
Kitt Peak National Observatory

CSDC
Community Science & Data Center

International Gemini Observatory

Vera C. Rubin Observatory

Operations

Mayall
WIYN
Blanco
SOAR
International Partnership

- The current six-year Gemini partner International Agreement expires Dec 31, 2021
- A renewal of the existing agreement with six-year duration, a mid-point assessment and ~similar partner shares is supported by all Participants
- The Gemini Board have approved an increase in the shares of the Republic of Korea from 5% to 7%.
- The Gemini Board have approved a decrease in the shares of Argentina from 3% to 2%.
- The NSF Director has signed the International Agreement for 2022-27 and the document is now being passed between the partners for signatures.
Instruments Ready to Deploy

GHOST High-Resolution Spectrograph in the Gemini South Dome

Waiting for the Project Team to come to Chile

NEWFIRM wide-field IR Imager being packed up for travel to Chile

Will go on Blanco for IR time-domain and MMA follow-up, while ISPI will go to SOAR
Windows on the Universe
Center for Astronomical Outreach

- Public education center for all NSF-supported facilities.
  Planetarium, Science on a Sphere, Exhibits, Virtual Control Room(s), Public Programs
- Construction and refurbishment has begun
- Exhibit designs pending/phased
- Engagement with Tohono O’odham Nation (TON) ongoing
  - Tribal Historic Preservation Officer updated on project
  - Site visit from the TON Chairman
ASP Award to Lars Christensen

THE KLUMPKE-ROBERTS AWARD FOR 2021 GOES TO LARS LINDBERG CHRISTENSEN, HEAD OF COMMUNICATIONS, EDUCATION AND ENGAGEMENT AT NATIONAL SCIENCE FOUNDATION’S NOIRLAB FOR MORE THAN 30 YEARS IN BRINGING SCIENCE TO THE PUBLIC AND INCREASING ITS AWARENESS OF THE UNIVERSE AND ITS ROLE IN HUMAN UNDERSTANDING.

Awarded to an individual or individuals who have made outstanding contributions to the public understanding and appreciation of astronomy, the Astronomical Society of the Pacific’s Klumpke-Roberts Award for 2021 goes to Lars Lindberg Christensen, Head of Communications, Education, and Engagement at NSF’s NOIRLab. The award recognizes Christensen for more than 30 years of bringing science to the public and increasing awareness of the Universe and its role in human understanding.

Past Honorees:

Carl Sagan
Isaac Asimov
Dava Sobel
Phillip Morrison
Heidi Hammel
Patrick Moore
Fred Hoyle
Structural Integrity Survey

NSF’s NOIRLab
NSF’s Radio Observatories managed by AUI

Complementary & synergistic capabilities
Balanced scientific portfolio

Allow studies of:
• Very large to very small scales
• Virtually all of astronomy & astrophysics
ALMA renewal/upgrades

• First light on a set of Band 1 receivers on Aug 14, 2021
  • New window: 6-8.5mm
  • Led by Taiwan’s ASIAA, with support from NRAO’s CDL for critical components

• NRAO is leading upgrade to Band 6
  • the workhorse of ALMA, 53% of all publications include it
  • for the same observing time, sensitivity improved by 1.4x for spectral line and 2x for continuum
Arecibo Observatory: Status

Area of reflector where platform and azimuth arm fell – removed debris, tested soil, placed anti-erosion matting to foster regrowth of vegetation

• Focus now turning to future of Arecibo Observatory
Arecibo Observatory: Future

Arecibo Observatory Options Workshop

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

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

• More than 100 community members, spanning a range of ages, genders, professions, and backgrounds, registered for this event.
  • Including participants from observatories and educational institutions in Puerto Rico and beyond, and also individuals from various walks of life who had spent time at the Observatory in early careers or had grown up there.

• Outcomes spanned a range of concepts
  • From cutting edge technological projects
  • to multidisciplinary research centers which would develop human resources on the island, foster community engagement and build closer collaborations with academic institutions on the island, across the U.S. and Latin America, and the world

• NSF is encouraging the teams from the workshop and others to develop their ideas into proposals that can be acted on
Cyber Infrastructure and Cyber Security

• 2021 JASON Study on CyberSecurity underway
  • Engagement with AST, NRAO, NOIRLab, and others – June 2021

• NSF Cyber Security Summit for Large Facilities, Oct 12-19
  • Organized by TrustedCI, the NSF CyberSecurity Center of Excellence
  • Includes Large Facility webinar on Cyber Infrastructure & Security

• NSF Large Facilities Workshop/Webinar – October 14
  • 2 sessions: Cyber Infrastructure; Cyber Security
  • Registration Link: https://nsf.zoomgov.com/webinar/register/WN_5Ed9PWMrQEGhq9ud70jxXw

Protecting NSF cyberinfrastructure (CI) since 2012. The mission of Trusted CI is to lead in the development of an NSF Cybersecurity Ecosystem with the workforce, knowledge, processes, and cyberinfrastructure that enables trustworthy science and NSF’s vision of a nation that is a global leader in research and innovation. Are you an NSF project in need of cybersecurity help? Contact us.
Protection of Dark Skies/Satellite Constellations

• 2020 Jason Report on the *Impacts of Large Satellite Constellations* is now available (NSF website)

• SATCON1 (Jun/Jul 2020) and SATCON2 (Jul 2021) Workshops,
  • NSF-funded, NOIRLab-led in collaboration with AAS

• IAU Conference: *Dark & Quiet Skies for Science and Society*
  • Requested by the UN’s Committee on the Peaceful Uses of Outer Space (COPUOS), the UN Office for Outer Space Affairs
  • La Palma, October 2021

• IAU Center for the *Protection of the Dark Sky from Satellite Constellation Interference*
Maunakea Informal Outreach

• NSF has held meetings with individuals and small groups over last year with people from all sides of the spectrum of opinions ("talk story")
• Pace of meetings has slowed to a few per month
• Astro2020 and other factors will inform decision whether to move forward with US ELT
• In the meantime, looking at MK lease situation
  • Including VLBA site
Programs
AST Division Programs

Individual Investigators
(Lead: Hans Krimm)
- AAG
- CAREER
- AAPF

Mid-scale
(Lead: Nigel Sharp)
- MSIP
- MSRI-1
- MSRI-2

Facilities
(Sr Advisor: Ashley Vanderley)
- NRAO
- ALMA
- GBO
- Arecibo
- NOIR Lab
- Gemini Obs
- NSO
- NOIR Lab
- MidScale Obs
- CSDC

Research
- Technology/Instrumentation
  - ATI
  - MRI
- Education and Special Programs
  - REU
  - ESP

AST Budget Allocation

* NSF Wide
# FY 2022 Programs and Deadlines

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Program Name</th>
<th>Deadline</th>
<th>Program Lead</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAREER*</td>
<td>Faculty Early Career Development Program</td>
<td>26 Jul 21</td>
<td>S. Higdon</td>
</tr>
<tr>
<td>REU Sites*</td>
<td>Research Experiences for Undergraduates</td>
<td>25 Aug 21</td>
<td>Seigar</td>
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<tr>
<td>AAPF</td>
<td>Astronomy &amp; Astrophysics Postdoctoral Fellowships</td>
<td>15 Oct 21</td>
<td>Gupta</td>
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<tr>
<td>AAG</td>
<td>Astronomy &amp; Astrophysics Research Grants</td>
<td>15 Nov 21</td>
<td>Multiple</td>
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<tr>
<td>ESP</td>
<td>Education and Special Programs</td>
<td>none</td>
<td>Langston</td>
</tr>
<tr>
<td>ATI</td>
<td>Advanced Technology and Instrumentation</td>
<td>15 Nov 21</td>
<td>Ninkov</td>
</tr>
<tr>
<td>MRI*</td>
<td>Major Research Infrastructure</td>
<td>19 Jan 22</td>
<td>Ninkov</td>
</tr>
<tr>
<td>MSIP</td>
<td>Mid-scale Innovations Program</td>
<td>FY23?</td>
<td>Sharp</td>
</tr>
<tr>
<td>MSRI-1*</td>
<td>Mid-scale Research Infrastructure-1</td>
<td>FY23?</td>
<td>Sharp</td>
</tr>
<tr>
<td>MSRI-2*</td>
<td>Mid-scale Research Infrastructure-2</td>
<td>20 Sept 21(by invitation)</td>
<td>Sharp</td>
</tr>
</tbody>
</table>

* NSF-wide solicitations
Mathematical and Physical Sciences Ascending Postdoctoral Research Fellowships – MPS-Ascend (NSF 21-573)

- **Purpose:** To support postdoctoral Fellows who will broaden the participation of groups that are significantly underrepresented in MPS fields in the U.S., enabling them to develop as future leaders in science.

- **Intent:** To recognize and support beginning investigators of significant potential in research experiences that will broaden perspectives, facilitate interdisciplinary interactions, and help broaden participation within MPS fields.

- Awards will support research in any scientific area within the purview of the five MPS Divisions: the Divisions of Astronomical Sciences (AST), Chemistry (CHE), Materials Research (DMR), Mathematical Sciences (DMS), and Physics (PHY).
  - Fellowships are awards to individuals, not institutions, and are administered by the Fellows.

Launching Early-Career Academic Pathways in the Mathematical and Physical Sciences – LEAPS-MPS (NSF 21-570)

- **Emphasis:** Helping to launch the careers of *pre-tenure faculty* in Mathematical and Physical Sciences (MPS) fields at *minority-serving institutions* (MSIs), *predominantly undergraduate institutions* (PUIs), and *Carnegie Research 2* (R2) universities,

- **Intent:** Initiating viable independent research programs for researchers attempting to launch their research careers in MPS supported fields.

- **Goal:** Achieving excellence through diversity and broadening participation to include members from groups underrepresented in the Mathematical and Physical Sciences, including Blacks and African Americans, Hispanics, Native Americans, Alaska Natives, and Native Hawaiians, and other Pacific Islanders.

MSRI-1: Next Generation Radar Designs

- Partnership between AUI/NRAO+GBO & Ratheon
- Goal: an integrated technical design for new scientific and space domain awareness radar capabilities
- Conceptual designs for
  - High-power high frequency phased-array radar transmitter for GBT
  - Medium-power phased-array modular transmitter system for deployment on antennas like ngVLA prototype design.
- Funding partially from AST with support from Director’s office

*Credit: NRAO/GBO/Raytheon/NSF/AU*
Center for Advanced Radio Sciences and Engineering

- Award for ~ $15 million over 5 years to establish this Center in Puerto Rico at UPR Mayagüez

- Co-funded by EPSCoR, AST, and MPS/OMA, this strategic investment includes
  - catalyzing new faculty lines
  - postdoctoral fellowships and graduate student support
  - an annual conference
  - significant funding towards institutional collaborations at other Puerto Rico institutions
  - faculty seed grants for summer research programs
  - Industry collaboration for active radio frequency interference cancellation pilot
  - collaborative work with the Arecibo Observatory with an aim to build scientific and engineering capacity

- The radio spectrum is becoming increasingly congested and scientific uses of the spectrum need to coexist with many active users such as communications and radar; the Puerto Rico Coordination Zone at the Arecibo Observatory makes the location an ideal laboratory for radio sciences R&D

- Includes support for diversity, equity and inclusion with funding for partnership with the UPRM Centro Universitario para el Acceso (CUA) program which provides educational opportunities for economically disadvantaged youth, as well as the NRAO Radio Astronomy Data Imaging and Analysis Lab (RADIAL)

- Complementary to NSF's Spectrum Innovation Initiative and ESM unit efforts (see separate presentation)
Budgets: FY2022, FY2023

NATIONAL SCIENCE FOUNDATION

FY 2022 Budget Request to Congress
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, probable continued investments in LEAPS and Ascend programs to promote broader participation
- House mark for NSF top line down from request (+14% vs +20%)
FY2022
Request: MREFC

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

Further delays will impact eventual FY23 request.
FY2023 Request

• Given the continued 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

• Will be balancing Grants with
  • Maintenance requirements of middle-aged Major Facilities
  • Major Facilities O&M, including Rubin Operations
  • Funding development & design of next generation facilities
Questions?