NSF Division of Astronomical Sciences (AST) Report
January 28, 2015

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@UlvestadNSF
Outline

- Highlights
- Budget Information
- Facility Management Competitions
- Decadal Survey Status
- Portfolio Review Status
Highlights
Changes Since November

- Large Synoptic Survey Telescope (LSST) “first-stone” ceremony scheduled for April 14
- NSF FY 2015 appropriation included full appropriation at request level for NSF Major Research Equipment and Facilities Construction line (includes LSST and DKIST)
- Retirements from AST
  - Craig Foltz retired on January 9; Dave Boboltz has taken over National Solar Observatory (NSO) and Daniel K. Inouye Solar Telescope (DKIST)
  - Gary Schmidt scheduled to retire on March 6; Dan Evans is taking over Gemini and the Gemini competition, with an ad open until February 2 for a program officer concentrating on Gemini
Supermassive Black Hole Binary

- Catalina Real-Time Transient Survey detected apparent periodic variability in quasar PG 1302-102
  - Period ~5 yr, with amplitude of ~0.2 magnitudes
  - Periodicity attributed to supermassive black hole binary, with several possible physical mechanisms
- Graham et al., Nature, 7 January 2015
- Award AST-1313422

Credit: Santiago Lombeyda/Caltech Center for Data-Driven Discovery
ALMA in Early Science Cycle 2

- Capabilities (number of antennas, angular resolution etc.) and available observing time steadily increasing
- Received >1500 proposals from 3400 investigators
- Long-baseline campaign produced spectacular images

SDP.81 – spatially resolving galaxies in the distant Universe
HR 8799 image and exoplanet spectroscopy at 2.2 µm
- Planets have similar colors, but the spectral shapes indicate significant differences in atmospheric clouds or composition
- Data from early commissioning run of GPI
Asteroid 2004 BL86

- Passed 1.2 million km from Earth on Monday
  - Arecibo & Goldstone (2.3 GHz) monostatic observations
  - Confirmed as binary asteroid, with 330m primary and ~60m secondary

Bistatic observations involving Arecibo:
- VLBA (Arecibo transmission, VLBA receive)
- Goldstone transmission (DSS14 at 8 GHz, DSS13 at 5 GHz)
  Arecibo receive (technical problems)

Images courtesy of Arecibo Observatory
Major Construction Projects

DKIST

LSST

ALMA
NSF Relocation: 2018

- NSF Building under construction in Alexandria
Management Competitions

- National Science Board (NSB) policy states that periodic competitions of managing organizations for national facilities are important for providing fresh ideas and acquiring most efficient delivery of science for the taxpayer dollars invested
  - NOAO competition reaching its conclusion, new cooperative agreement to begin October 2015
  - NRAO proposal deadline in November 2014
    - New cooperative agreement, October 2016
  - Gemini proposal deadline in February 2015
    - New cooperative agreement, January 2017
- Three related information items at NSB meeting next week
Budget Primer and Status
For flat budgets, flexibility is at the margins.

Directorates divide among Divisions, using fancy algorithms based on past spending, play in new initiatives, etc.

Strong constraints on how Divisions can allocate funds

NSF holds out funds for initiatives, distributes rest to Directorates

Responsible stewardship of national facilities

Some allocations directed to priorities such as mid-scale

AST discusses priorities throughout year, focusing on NRC and Advisory Committee recommendations

OMB sets NSF budget level, includes initiatives
What Can Happen

- Congressional appropriation similar to President’s Request (e.g., FY 2010, FY 2015)
  - NSF will execute program similar to Request

- Congressional appropriation well below President’s Request (e.g., FY 2011-FY 2014)
  - Some initiatives/programs go away or are cut significantly, while others are protected
  - Most programs reduced relative to Pres. Request

- Example, MPS in FY 2013 sequestration year
  - Interdisciplinary initiatives protected: CHE, DMR
  - Facilities protected: AST
  - Consequence: PHY and DMS took very heavy cuts
FY 2015 Appropriation

- Congress received request for FY 2015 in Feb. 2014
- Congressional committees met over summer, reported out bills for various subsets of government
  - Included language mandating spending levels on some favorite or unfavorite programs
- “Cromnibus” appropriation passed in mid-December
  - Note: AST is not a “line” item in budget, included in “Research & Related Activities” line item
- NSF has 45 days to submit Plan to Congress
  - Committee language mandatory if not superseded
- Congress has 30+ days to approve or not
  - Hence, no “Approved” public plan until March 2015
  - This has been as late as May/June in recent years
# Expectations for AST in FY 2015

<table>
<thead>
<tr>
<th></th>
<th>FY14 Req</th>
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<th>FY15 Req</th>
<th>FY15 App</th>
<th>App/Req</th>
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<td>AST</td>
<td>244</td>
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<td>0.980</td>
<td>236</td>
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FY 2016 Budget Request

- President’s Budget Request will be submitted to Congress next week

- At present, “sequestration” is still the law for FY 2016
  - Agreement between Congress and Administration covered only FY 2014 and FY 2015
  - Budget Control Act limited discretionary spending to 0.2% increase in FY 2015, and another 0.2% increase in FY 2016
    - Pending possible Congressional action, expectations of large FY 2016 budget increases should be tempered
Decadal Survey Status
NWNH Budget vs. Actual Budget

FY15 Req.

Forecast
A2010
ScenA
ScenB

FY10 FY13 FY16 FY19

$M 200

0 100 200 300 400

01/28/2015
AAAC-NSF-AST
NWNH Response Summary

- Complete summary of AST response to NWNH is in a Dear Colleague Letter (DCL) that is currently in NSF clearance
  - Includes status of all major, actionable recommendations, plus status of Portfolio Review response
NWNH “Large” Ground Projects

- Large Synoptic Survey Telescope (LSST)
  - Construction award in August 2014; “first stone” in April
  - Spun up NRC committee to study OIR system in LSST era
- Mid-Scale Innovations Program (MSIP)
  - FY13 solicitation; categories modified from NWNH

<table>
<thead>
<tr>
<th>Awarded Proposal</th>
<th>PI</th>
<th>Amount (AST)</th>
<th>Funded</th>
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<tbody>
<tr>
<td>Zwicky Transient Facility</td>
<td>Kulkarni</td>
<td>$9.0M</td>
<td>FY 2014</td>
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<tr>
<td>Advanced ACTPol</td>
<td>Staggs</td>
<td>$10.0M</td>
<td>FY 2014</td>
</tr>
<tr>
<td>H Epoch of Reionization Array</td>
<td>Parsons</td>
<td>$2.1M</td>
<td>FY 2014</td>
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<tr>
<td>Event Horizon Telescope</td>
<td>Doeleman</td>
<td>$6.5M</td>
<td>FY 2015</td>
</tr>
<tr>
<td>Two More Proposals</td>
<td>Pending</td>
<td>Co-funds, $7.5M</td>
<td>Pending</td>
</tr>
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</table>
25% federal investment in one Giant Segmented Mirror (GSMT) candidate—MREFC

- No construction funding available this decade
- Issued a solicitation for a planning award for community participation in GSMT, awarded to TMT after thorough review

$100M federal share (~1/3 AST) in Atmospheric Cerenkov Telescope Array (ACTA)—non-MREFC

- AST informed CTA-US team that they need to compete in MSIP
- Recent HEPAP P5 subcommittee report
NWNH Medium Projects

- CCAT (formerly Cerro Chajnantor Atacama Telescope)
  - Recommended AST investment of $37 million in a $140 million project, plus $7.5 million annually in operations support
  - NSF funded final CCAT design at $4.5 million in FY 2011-2014, plus another $0.25 million supplement in FY 2015
  - Since funding CCAT as a strategic investment would leave no funds for an MSIP competition, CCAT team was told that they needed to compete in MSIP
$8M (17%) increase in AAG from ~$46M base
- $49.4 million in FY 2011, now $43.7 million in FY 2014

$5M (50%) increase in ATI from ~$10M base
- Held at $10.5 million through FY 2012, then reduced to $8.5/7.5M in FY 2013/2014 to make room for MSIP.

$2M increase in Gemini contribution subject to restructuring; increased U.S. observing share
- Restructured after 2012 U.K. withdrawal; U.S. share went from 50% to 65% with no increase in contribution
$1.5-2M increase in Telescope Systems Instrumentation Program (TSIP)
- No funds to maintain TSIP and start MSIP
- TSIP was folded into MSIP as recommended by PR

$2.5M for Theory & Computation Networks
- Initiated NSF/NASA program (TCAN) in FY 2013 with $1.5M/yr for three years for each agency
Other NSF Recommendations-1

- Decadal Survey Implementation Advisory Committee
  - Some functions to NRC Committee on Astronomy and Astrophysics
  - NRC committees typically advise on strategy, not implementation

- International Collaboration and Open Access
  - “Principles for Access to Large Federally Funded Astrophysics Projects and Facilities” developed in conjunction with AAAC

- International Science Community Forum
  - Would require more future commitments to facility operations

- Data Handling and Data Curation
  - LSST, DES, national facilities, “Principles for Access”

- Maintain/increase funding for lab astrophysics
  - Instituted 1-2 panels focused on lab astro
Other NSF Recommendations-2

- Restructure Gemini, consider NOAO/Gemini consolidation
  - Not feasible to simply “combine” NOAO and Gemini
  - AURA consolidated administrative services
  - NSF increased NOAO engagement in Gemini
  - NRC OIR Committee considering science coordination needs
- Solar astronomy program (operations, multidisciplinary)
  - Space weather discussions
  - First DKIST operations increment in FY 2015 budget request
  - Relocation of NSO headquarters to Boulder
- NASA & NSF—high-precision radial velocity surveys
  - Joint NN-EXPLORE program using NOAO share of WIYN 3.5-m telescope, will start in FY 2015
  - NASA ROSES update for extreme precision Doppler spectrometer released last week
Broadening Participation

- NWNH (Chapter 4) contains “Conclusions” but no specific recommendations regarding gender equity and underrepresented minorities
- AST and MPS have developed new web pages describing all the programs and opportunities available in these areas, including direct links to some of the prominent programs funded by AST
  - Partnerships in Astronomy & Astrophysics Research & Education
  - Research Experiences for Undergraduates
  - Astronomy & Astrophysics Postdoctoral Fellowships
  - CAREER
  - Education & Special Programs unsolicited proposals

http://www.nsf.gov/mps/broadening_participation/index.jsp
Next “Senior Review”

- *NWNH*, p. 32:

  “NSF-Astronomy should complete its next senior review before the mid-decade independent review that is recommended elsewhere in this report, so as to determine which, if any, facilities NSF-AST should cease to support in order to release funds for (1) the construction and ongoing operation of new telescopes and instruments and (2) the science analysis needed to capitalize on the results from existing and future facilities.”

- This became the AST Portfolio Review (PR)
Portfolio Review
Status
AST Portfolio Scenarios

Assuming No Divestment

- Individual Investigator+ Mid-scale
- Existing Facilities
- Facility Budget Reductions, FY10-FY13
  - Assumes 2.5% inflation/yr for existing facilities

With Max. Divestment

AST budget assumption: FY15=Request, 1%/yr growth thereafter
Generic Divestment Response Process

- Pursuing partnerships with universities, institutes, and federal agencies through meetings & negotiations
- AST issued Dear Colleague Letter NSF 14-022 on December 20, 2013
  - Lays out future steps for all telescopes that were either recommended for divestment in the near term or for future consideration
- In 2014, NSF (Office of General Counsel) hired an engineering firm for all NSF environmental contract work
  - Undertaking engineering feasibility and baseline environmental review to identify feasible alternatives for facilities
  - Will be followed (2015-2016) by formal environmental review processes, leading to preferred alternatives for facilities that do not have viable partnerships in view
## Facility Futures

<table>
<thead>
<tr>
<th>Telescope</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>KPNO 2.1m</td>
<td>Open ops ended; proposals for new operator under evaluation</td>
</tr>
<tr>
<td>Mayall 4m</td>
<td>Slated for DESI, pending DOE funding; bridge from NSF</td>
</tr>
<tr>
<td>WIYN 3.5m</td>
<td>NOAO share to NASA-NSF Exoplanet Research Program</td>
</tr>
<tr>
<td>GBT</td>
<td>Partner discussions in progress; engineering study under way</td>
</tr>
<tr>
<td>VLBA</td>
<td>Partner discussions in progress; engineering study under way</td>
</tr>
<tr>
<td>McMath-Pierce</td>
<td>Bridging to university-led consortium; engineering study</td>
</tr>
<tr>
<td>GONG/SOLIS</td>
<td>SOLIS moved off Kitt Peak; GONG partner discussions in progress</td>
</tr>
<tr>
<td>Dunn Solar Tel.</td>
<td>Partner discussions in progress; engineering study under way</td>
</tr>
<tr>
<td>Arecibo</td>
<td>Post-2016 status in discussion; engineering study under way</td>
</tr>
<tr>
<td>SOAR</td>
<td>Post-2018 status to be reviewed</td>
</tr>
</tbody>
</table>
Questions/Discussion