NSF Town Hall
January 7, 2016

Jim Ulvestad, Division Director, MPS/AST
@UlvestadNSF

Patricia Knezeek, Deputy Division Director, AST
High-Level Summary

- Outstanding science opportunities offered/developed
  - ALMA, EVLA, Dark Energy Camera, GPI, DKIST, LSST
  - ~110 research awards/yr in AAG, plus MSIP, ATI, AAPF, REU, PAARE
  - Interagency: DES, DESI, NN-EXPLORE (plus LSST, of course)
  - Beyond AST budget, NSF spent over $100 million on construction of AST facilities in FY 2015

- No expectation for significant budget increases this decade
- Partnerships with NASA and DOE have strengthened
- Data-enabled science continues to grow in importance
- Challenges are many, but our community continues to make progress at the science frontiers
Outline

- Recent Highlights
- Budget Status and Outlook
- Decadal Survey Status
- Portfolio Review Status
- Summary
Recent Highlights
Atacama Large Millimeter/Submm Array (ALMA)

- Construction of ALMA was officially completed in 2015.
- ALMA is a joint project of North America (led by NSF), the European Southern Observatory, and East Asia, with a total construction cost of $1.4 billion.
- At upper right, an optical image of the merging “Antennae” galaxies is shown, progressively zoomed into a compact but intense source of millimeter radiation imaged with ALMA. This massive, dense, star-free cloud may be the first known example of a globular star cluster about to be born.

Credit: B. Saxton (NRAO/AUI/NSF); Images from NASA/ESA Hubble, B. Whitmore (STScI); K Johnson (U.Va.); ALMA (NRAO/ESO/NAOJ). (ApJ, 2015, 806, 35)
Gemini: GPI Results

The images to the left show the T Tauri star TW Hya, imaged polarimetrically at J and K bands (intensities in right-hand panels scaled by $r^2$), illustrating a 50% dimunition in intensity at $r\sim23$ AU. Modeling indicates at least one $0.2M_J$ planet (Rapson et al. 2015, ApJL, 815, L26).

- The image to the right shows the exoplanet 51 Eridani b (bottom of frame); this object is the most similar to our Solar System’s gas giants of any known exoplanet (Macintosh et al., Science, August 13, 2015).
Next Generation Fornax Survey

- Dark Energy Camera on the CTIO 4-m telescope reveals numerous “new” (red circles in the 3-deg$^2$ field at right) dwarf galaxies in the Fornax cluster (Muñoz et al. 2015, ApJL, 813, L15)
- Total of 30 deg$^2$ being studied
- Possible solution to the “missing” dwarf galaxies predicted by cosmological simulations
Daniel K. Inouye Solar Telescope

- Excellent construction progress, with some delays on site work because of poor weather in Hawaii
  - Scheduled for completion in 2019
- Data rate $\approx$ LSST data rate, but three years earlier!

Telescope enclosure assembly underway at the DKIST site on Haleakala, Maui, HI, November 2015. Credit: DKIST project web camera.
Management Competitions

- NOAO competition concluded. AURA selected. New 5-yr cooperative agreement began on October 1, 2015
- NRAO competition concluded. AUI selected. New 10-yr cooperative agreement to begin on October 1, 2016
  - ALMA + VLA + Central Development Laboratory + associated administration
- Gemini competition nearing completion, for 6-yr cooperative agreement to begin on January 1, 2017

- Also, non-competitive 10-yr award has been made to AURA for NSO (including DKIST), and will run through September 30, 2024
AST Scientific Staff Changes Since Jan. 2015

- **Retirements:** Craig Foltz: (DKIST/NSO); Gary Schmidt (Gemini); Eric Bloemhof (Arecibo/ATI)
- **Departures:** Dana Lehr: (NRAO, to AURA); Joan Schmelz (IPA, AAPF, to Arecibo); Dan Evans (IPA, ESP + AAG + Gemini, to NASA); Maria Womack (AAG PLA, end of IPA); Sandra Cruz-Pol (Spectrum Management, end of VSEE)
- **Arrive/Depart:** Claire Cramer (Gemini, detail from NIST); Greg Mack (MSIP, AAAS Fellow → Expert → APS)
- **Arrivals:** Chris Davis (Gemini, from Liverpool); Joan Wrobel (IPA, CAREER and AAG); Harshal Gupta (2-yr appt, AAPF); Faith Vilas (VSEE, AAG PLA); Tom Wilson (VSEE, Spectrum Management); Hugh Van Horn (Fed Temp, arrives January 10, AAG); Ed Ajhar (arrives late January, LSST and DKIST)
## Office of the Division Director

<table>
<thead>
<tr>
<th>Position</th>
<th>Name</th>
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<tbody>
<tr>
<td>Division Director</td>
<td>James Ulvestad</td>
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<tr>
<td>Deputy Division Director</td>
<td>Patricia Knezek</td>
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<td>Program Support Manager</td>
<td>Craig McClure</td>
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<td>Operations Specialist</td>
<td>Donna O’Malley</td>
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<td>Senior Advisor</td>
<td>Vernon Pankonin</td>
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<td>Expert</td>
<td>Gregory Mack</td>
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## Administration

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<tr>
<td>Program Analyst</td>
<td>Diana Phan</td>
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<tr>
<td>Program Specialist</td>
<td>Matthew Viau</td>
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## Individual Investigator Programs and Astronomy & Astrophysics Research Grants

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<tr>
<td>James Neff</td>
<td>IIP Coordinator; Stellar Astronomy &amp; Astrophysics</td>
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<td>Richard Barvains</td>
<td>Extragalactic Astronomy &amp; Cosmology</td>
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<td>Glen Langston</td>
<td>Galactic Astronomy</td>
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<td>Harshal Gupta</td>
<td>Astronomy &amp; Astrophysics Postdoctoral Fellowships</td>
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<td>Joan Wrobel</td>
<td>CAREER; Extragalactic Astronomy &amp; Cosmology</td>
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<td>Faith Vilas</td>
<td>Planetary Astronomy</td>
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<td>Glen Langston</td>
<td>Enhancing Access to the Radio Spectrum</td>
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<td>Ralph Gaume</td>
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<td>Theoretical and Computational Astrophysics Networks</td>
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## Facilities, Mid-Scale, & MREFC Projects

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<td>Gemini Observatory</td>
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<td>Philip Puxley</td>
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<td>Nigel Sharp</td>
<td>Large Synoptic Survey Telescope</td>
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<td>David Boboltz</td>
<td>Daniel K. Inouye Solar Telescope</td>
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<td>Vernam Pankonin</td>
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<td>Richard Barvains</td>
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## ESM

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<tr>
<td>Mangala Sharma</td>
<td>Electromagnetic Spectrum Management</td>
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<td>Tom Wilson</td>
<td>Electromagnetic Spectrum Management</td>
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IPA Program Officers Needed

- AST has 2-3 openings for rotators under Intergovernmental Personnel Act (IPA), with a new ad soon to be posted
  - Typically 2-3 years at NSF, while maintaining employment status at home institution
  - Per diem of $22,500; up to 50 days of research time
- IPAs bring a different and important university perspective to the federal government, and can help translate federal requirements to the scientific community
  - As a default, IPAs return to their home institutions
  - Some come back to the federal government or leverage their experience for other positions
- At present, AST has only two IPAs on staff
- Potential candidates urgently needed!
Budget Status and Outlook
NWNH Budget vs. Actual AST Budget

- FY16Req.
- ~NSF input to A2010

- FY10
- FY13
- FY16
- FY19

- Forecast
- A2010
- ScenA
- ScenB

$M

0 100 200 300 400

01/07/2016 NSF-AAS-TownHall
FY 2016 Budget Status

- Omnibus funding bill for FY 2016 passed in December

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<tr>
<th>$M</th>
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<th>FY15 Actual</th>
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<td>244.2</td>
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<td>MREFC</td>
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<td>200.8</td>
<td>200.3</td>
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- Since NSF received less than the President’s Request Budget, MPS and AST are unlikely to receive more!
- NSF Current Plan for FY 2016 is in preparation for submission to Congress, and subsequent approval
- FY 2017 President’s Request will be out in early February, and probably will contain FY 2016 Estimated Budget
Facility fraction was 63%-65% in late 1990s, decreased to 53% in 2008, then rose back to 60% in FY 2016 request.
Status of Decadal Survey Response, and Follow-on Reports
High-Level Look at the Decade So Far

- NSF has successfully started the two highest priority “Large Ground-Based Projects” from *New Worlds, New Horizons*,
  - Large Synoptic Survey Telescope: under construction in Chile
  - Mid-Scale Innovations Program: full proposals invited from second solicitation
    - Plenary talks at this meeting on two projects awarded in the first MSIP round (Event Horizon Telescope; Zwicky Transient Facility)
- Realized budgets have precluded additional large actions
- Complete summary of NSF response to *NWNH* is in a Dear Colleague Letter (DCL), NSF 15-044, available at:
Large Synoptic Survey Telescope

- NSF construction award made in August 2014
- Strong NSF/DOE partnership in construction and operations
- NRC committee studied OIR system in LSST era (more later)
AAG Funding History, 1990-2015

Realized budgets have prevented the increase to ~$54M recommended in NWNH

AAG Budget, $M

Proposal Success Rate, %
Given funding circumstances that are substantially below those described in *NWNH*, the committee’s review will describe:

- The most significant scientific discoveries, technical advances, and relevant programmatic changes in astronomy and astrophysics since *NWNH*;
- How well the Agencies’ programs address the strategies, goals, and priorities outlined in *NWNH* and other NRC reports;
- Progress toward realizing these strategies, goals, and priorities; and
- Any actions that could be taken to maximize the science return of the Agencies’ programs.

Have NSF responses to funding realities (e.g., AST Portfolio Review, funding and programmatic choices) been consistent with the spirit of *NWNH*?
Mid-Decadal Survey Status

- Committee chaired by Jackie Hewitt, MIT
- Three face-to-face meetings
  - October 8-10; December 12-14; January 11-13
- Report expected in spring 2016

- Note: NSF presentation to October 8-10 meeting, available on either AST or NRC web sites, includes a comprehensive summary of AST responses to all NWNH recommendations
Portfolio Review
Status
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 Purpose & Outcome

- Portfolio Review Committee (PRC) was charged to recommend a balanced program, in realistic funding scenarios, that did the best job of responding to *NWNH* science program
  - Recommendations resulted in a balance among facilities, mid-scale programs, and grants that stayed similar to the balance in 2010
- Why did PRC recommend divesting facilities, which reduces community access to research tools?
  - Need to retain balance between community research tools (large and mid-scale facilities) and direct research funding (mid-scale experiments and individual investigator awards) in order to best sustain the astronomical enterprise
Divestment Activities

- Portfolio review identified facilities recommended for divestment from AST budget, or for future consideration
- NSF (through a contractor) is currently concluding engineering studies and baseline environmental surveys for a number of telescopes and observatories
  - Goals: Identify key issues, bound costs of different alternatives, and provide NSF information needed to assess viability of options
- Generic alternatives
  - New partnership arrangements (preferred, but complicated)
  - Conversion to new mission, including scope reductions
  - Mothballing
  - Decommissioning
- Real progress being made on partnerships, with ongoing negotiations in many cases
Chart above shows the maximum impact of divestment (or non-divestment) within a likely budget scenario.
What Comes Next

- After receiving engineering reports, NSF will identify viable options for evolution of different facilities/telescopes
  - If new partner options are in place for a facility, development of partner agreements may be the next step
  - Options such as scope reductions require study of alternatives, under National Environmental Policy Act
    - Formal and open process, including consultation of stakeholders and opportunity for comment/input
    - “No-action” alternative (i.e., continue operations as in the past) is always an alternative that must be considered
  - Following conclusion of formal alternative consideration, NSF will select a preferred alternative for each facility and then seek to execute that alternative
## Facility Futures

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<tr>
<th>Telescope</th>
<th>Status</th>
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<tbody>
<tr>
<td>KPNO 2.1m</td>
<td>Caltech-led consortium (Robo-AO) operating for FY 2016-2018</td>
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<tr>
<td>Mayall 4m</td>
<td>Slated for DESI; bridge from NSF; NSF/DOE MOU in place</td>
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<tr>
<td>WIYN 3.5m</td>
<td>NOAO share to NASA-NSF Exoplanet Observational Research Program; NSF/NASA MOU in place for transition</td>
</tr>
<tr>
<td>GBT</td>
<td>Engineering study under way; separation from NRAO in FY 2017</td>
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<tr>
<td>VLBA</td>
<td>Engineering study under way; separation from NRAO in FY 2017</td>
</tr>
<tr>
<td>McMath-Pierce</td>
<td>Engineering study; university-led consortium seeking funding</td>
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<tr>
<td>GONG/SOLIS</td>
<td>SOLIS is off Kitt Peak; GONG refurbishment; MOU with NOAA in draft form</td>
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<tr>
<td>Dunn Solar Tel.</td>
<td>Engineering study under way; partner discussions in progress</td>
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<tr>
<td>Arecibo</td>
<td>Engineering study under way; issued Dear Colleague Letter seeking viable concepts for future operations (deadline January 15, 2016)</td>
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<tr>
<td>SOAR</td>
<td>Post-2020 status to be reviewed</td>
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OIR System Study
“A Strategy to Optimize the U.S. Optical and Infrared System in the Era of the Large Synoptic Survey Telescope (LSST)”

Recommended by AAAC in 2013
Committee chaired by Debra Elmegreen, Vassar College
Three face-to-face meetings in 2014
  - July 31/August 1; October 12-13; December 2-3
Report delivered in April 2015
NSF initial response in Dear Colleague Letter NSF 15-115, issued in August 2015
  - Extensive discussions and planning ongoing, with both NOAO and LSST
OIR System Recommendations-1

- **R1**: Direct NOAO to administer telescope-time exchange system
  - Under discussion with NOAO; may need injection of funds
  - First, need data on who wants to offer time in marketplace
  - This is the most challenging recommendation

- **R2**: NOAO to lead community-wide planning process and facilitate System organizing committee. NSF would solicit proposals to meet prioritized capabilities.
  - A natural role for NOAO
  - **Action**: See response to R3 below
OIR System Recommendations-2

- R3: Wide-field highly multiplexed spectroscopic capability
  - Community working group (R2) needed to define highest priority science case and instrument requirements.
  - Action: NSF wrote to NOAO and LSST in August asking them to work jointly to develop specific requirements for R3 and R4
  - Action: Kavli Institute is supporting a workshop in May 2016 to move toward development of specific instrument requirements. Input process for this workshop is under way
OIR System Recommendations-2

- R4a: Support development of event brokers for LSST
  - Action: NSF is funding several projects along these lines
    - Zwicky Transient Facility through MSIP (see plenary talk)
    - INSPIRE grant: Joint Arizona-NOAO
  - Special instance of the more global issue of development of Level 3 data products for LSST

- R4b: Position Gemini-S for faint object spectroscopy early in era of LSST operations
  - Gen 4#3 instrument for Gemini may meet this recommendation
  - Action: Feasibility studies for Gen 4#3 completed, with summaries reported out at Gemini science meeting in June 2015
  - Action: Gemini Request for Proposals under construction, for release in 2016
OIR System Recommendations-3

- **R4c:** Ensure that OIR system time can be allocated for faint transient observations prioritized by LSST event broker
  - **Action:** NSF is in discussion with Gemini partners and NOAO (see R4D below)

- **R4d:** Enhance coordination among federal telescopes in Southern Hemisphere to optimize LSST follow-up
  - **Action:** NSF has told AURA that the first LSST operations proposal must take advantage of synergies with NOAO (scientific and operational); ongoing discussions with LSST, NOAO, AURA, DOE
  - **Action:** Gemini (Gemini Board + Observatory) is presently developing a Strategic Science Vision that will incorporate the changed landscape of OIR telescopes in the post-2020 period
  - NSF believes that “follow-up” should mean coordination for a range of studies, not just for transient sources
OIR System Recommendations-4

- **R5**: Plan for an investment in one or both Giant Segmented Mirror Telescopes
  - **Action**: MSIP competition is open to instrument proposals

- **R6**: Continue to invest in development of critical technologies, including Adaptive Optics and precision Radial Velocities
  - **Action**: Precision RV is a goal of NN-EXPLORE, with concepts for Extreme Precision Doppler Spectrometer now under evaluation by NASA, with NOAO and NSF input

- **R7**: Coordinated suite of schools, workshops, and training networks for training in instrumentation, software, and data analysis
  - AST believes this is not sufficient for maintaining and enhancing instrumentation and data science expertise, and will continue to consider possibilities
High-Level Summary

- Outstanding science opportunities offered/developed
  - ALMA, EVLA, Dark Energy Camera, GPI, DKIST, LSST
  - ~110 research awards/yr in AAG, plus MSIP, ATI, AAPF, REU, PAARE
  - Interagency: DES, DESI, NN-EXPLORE (plus LSST, of course)
  - Beyond AST budget, NSF spent over $100 million on construction of AST facilities in FY 2015

- No expectation for significant budget increases this decade
- Partnerships with NASA and DOE have strengthened
- Data-enabled science continues to grow in importance
- Challenges are many, but our community continues to make progress at the science frontiers
Questions?