Astrophysics

NASA Update
PCOS Town Hall, AAS Head Meeting
August 22, 2017

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Chandra, Fermi, NuSTAR, XMM Program Scientist
NICER, R&A and APRA Deputy
NASA Headquarters
• The FY17 appropriation and FY18 budget request provide funding for NASA astrophysics to continue its planned programs, missions, projects, research, and technology.
  – Total funding (Astrophysics including Webb) remains at ~$1.35B.
  – Funds Webb for an October 2018 launch, WFIRST formulation, Explorers mission development, increased funding for R&A, new suborbital capabilities, continued technology development.

• NASA continues to prioritize implementation of the recommendations of the 2010 Decadal Survey.
  – NASA is conducting large and medium mission concept studies for 2020 Decadal Survey (see later talk in this Town Hall).
• The FY17 Appropriation for Astrophysics resulted in a reduction of $63.0M for Astrophysics (including Webb) relative to the FY16 funding level.

<table>
<thead>
<tr>
<th>$M</th>
<th>FY16 Actual</th>
<th>FY17 Request</th>
<th>FY17 Approp</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Webb</td>
<td>620.0</td>
<td>569.4</td>
<td>569.4</td>
<td>Planned decrease of $50.6M</td>
</tr>
<tr>
<td>Astrophysics</td>
<td>762.4</td>
<td>781.5</td>
<td>750.0</td>
<td>Down $31.5M from FY17 request</td>
</tr>
<tr>
<td>Astrophysics w/ Webb</td>
<td>1,382.4</td>
<td>1,350.9</td>
<td>1,319.4</td>
<td>Down $63.0M from FY16 actual</td>
</tr>
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</table>

• The FY17 Appropriation for Astrophysics resulted in a reduction of $31.5M for Astrophysics (including Webb) relative to the FY17 budget request.

• The FY17 Appropriation for Astrophysics resulted in a reduction of up to $47.4M for Astrophysics programs excluding Webb, Hubble, SOFIA, WFIRST, relative to the FY17 budget request.
### Astrophysics Missions in Development

<table>
<thead>
<tr>
<th>Mission</th>
<th>Launch Date/Status</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ISS-CREAM</td>
<td>8/2017 In Operation</td>
<td>Cosmic Ray Energetics And Mass</td>
</tr>
<tr>
<td>TESS</td>
<td>3/2018</td>
<td>Transiting Exoplanet Survey Satellite</td>
</tr>
<tr>
<td>Webb</td>
<td>10/2018</td>
<td>James Webb Space Telescope</td>
</tr>
<tr>
<td>Euclid</td>
<td>2020</td>
<td>ESA-led Mission</td>
</tr>
<tr>
<td>IXPE</td>
<td>2020</td>
<td>NASA Mission</td>
</tr>
<tr>
<td>GUSTO</td>
<td>2021</td>
<td>NASA Mission</td>
</tr>
<tr>
<td>WFIRST</td>
<td>Mid 2020s</td>
<td>NASA Mission</td>
</tr>
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</table>

**Euclid**: ESA-led Mission

- NASA is supplying the NISP Sensor Chip System (SCS)

**IXPE**: NASA Mission
- Imaging X-ray Polarimetry Explorer

**GUSTO**: NASA Mission
- Galactic/ Extragalactic ULDB Spectroscopic Terahertz Observatory

**WFIRST**: NASA Mission
- Wide-Field Infrared Survey Telescope
Astrophysics Missions under Study

<table>
<thead>
<tr>
<th>Mission</th>
<th>Agency</th>
<th>Launch Year</th>
<th>Description</th>
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<tbody>
<tr>
<td>XARM</td>
<td>JAXA</td>
<td>2021</td>
<td>NASA is supplying the Resolve calorimeter detectors, ADRs, and SXTs</td>
</tr>
<tr>
<td>Athena</td>
<td>ESA</td>
<td>Late 2020s</td>
<td>NASA is supplying elements for both instruments</td>
</tr>
<tr>
<td>LISA</td>
<td>ESA</td>
<td>Mid 2030s</td>
<td>NASA is developing technology for both the payload and the mission</td>
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</table>
Explorers Concept Study Selections

• NASA Headquarters selected six astrophysics Explorers Program proposals for concept studies in August 2017.

• 3 Medium-Class Explorer selections:
  – **Arcus**: Exploring the Formation and Evolution of Clusters, Galaxies and Stars
    • PI: Randall Smith (SAO)
  – **Fast INfrared Exoplanet Spectroscopy Survey Explorer (FINESSE)**
    • PI: Mark Swain (JPL)
  – **Spectro-Photometer for the History of the Universe, Epoch of Reionization, and Ices Explorer (SPHEREx)**: An All-Sky Spectral Survey
    • Jamie Bock (Caltech)

• 3 Mission of Opportunity (MoO) selections:
  – **Compton Spectrometer and Imager Explorer (COSI-X), a Small Complete Superpressure Balloon Mission**
    • PI: Steve Boggs (UC Berkeley)
  – **Transient Astrophysics Observer on the International Space Station (ISS-TAO)**
    • PI: Jordan Camp (GSFC)
  – **Contribution to ARIEL Spectroscopy of Exoplanets (CASE). Conditional selection.**
    • Mark Swain (JPL)
Research and Analysis (R&A) Update
FY16 R&A Spending Summary

APRA: 50.3M
ADAP: 17.6M
Theory: 11.9M
XRP: 4.2M
Others: 3.3M
R&A Program Pressure

Research Funding ($M)

Success rate (%)

Year of Funding Start

APRA + ADAP + ATP + XRP Proposals

FY09 FY10 FY11 FY12 FY13 FY14 FY15 FY16 FY17 FY18

Success Rate (%) Research Funding ($M)
# R&A Budget Trends

<table>
<thead>
<tr>
<th>Program</th>
<th>FY09</th>
<th>FY10</th>
<th>FY11</th>
<th>FY12</th>
<th>FY13</th>
<th>FY14</th>
<th>FY15</th>
<th>FY16</th>
<th>FY17</th>
<th>FY18</th>
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<th>FY20</th>
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<tr>
<td>APRA</td>
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<td>$46 M</td>
<td>$49 M</td>
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<td>ADAP</td>
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<td>$14 M</td>
<td>$16 M</td>
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<td>Theory (ATP+TCAN)</td>
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<td>XRP+OSS</td>
<td>$3 M</td>
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<td>R&amp;A FY18 PBR</td>
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<td>CubeSat/SmallSat FY18 PBR</td>
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<td>Research Total</td>
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<td>$85 M</td>
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Research Total FY2018 President’s Budget Request

- APRA
- ADAP
- Theory (ATP+TCAN)
- XRP+OSS
- Others
- R&A FY18 PBR
- CubeSat/SmallSat FY18 PBR
XARM Update and Announcement
Substantial progress made on XARM.
Mission will include an X-ray microcalorimeter (named Resolve) and an X-ray imager.
XARM approved by Japanese Diet, NASA formulation this summer.
NASA KDP-C (confirmation review) expected late 2017.
XARM Community Participation

• The US community should expect major opportunities to participate in XARM, even more so than Hitomi.

• NASA will issue three open calls to the community:

1. **Call for a small number XARM Participating Scientists (expected in 2017).**
   - Play a major role in the pre-launch science planning of XARM.
   - Advise the XARM project on issues related to mission science goals and performance.
   - Update the Hitomi target list of essential observations to be carried out during the first six to nine months of XARM operations (named the Performance Verification phase of the mission).
   - Receive full access to all PV data.
   - Proposals from PIs at all career stages are strongly encouraged.
2. Call for PV Phase Target Team Members (expected before launch).
   - Designed to enable broad community participation in the early operation of XARM.
   - NASA will select numerous community members to join “target teams” alongside the XARM Science Team.
   - Community participants will receive access to PV phase data for a given object.

3. Call for GO proposals.
   - Following the conclusion of the PV phase of the mission approximately six to nine months after launch, XARM observing time will be dedicated to Guest Observations allocated through an Announcement of Opportunity process.