NASA’s Astrophysics Program

- **Strategic Missions**
  - Flagships and Probes led by NASA
  - Contributions to Partner-led Missions
- **PI-led (competed) Missions**
  - Explorers Missions (small and medium)
  - Contributions to Partner-led Missions
- **Supporting Research and Technology**
  - Research and Analysis
  - Technology Development
  - Suborbital Payloads (Balloons, Sounding Rockets)
  - CubeSats and ISS-attached Investigations
- **Infrastructure and Management**
  - Data Archives
  - Balloon Program
  - Mission Studies

* Contribution to Partner-led Mission
Astrophysics Program Offices (after restructuring)

Astrophysics Division

Flight Programs
- Astrophysics Strategic Missions @ HQ
- WFIRST Webb*
- SOFIA**
- Astrophysics Explorers @ GSFC

Supporting Research and Technology Programs
- PCOS/COR @ GSFC
- EXEP @ JPL
- Research @ HQ
- TESS
- IXPE
- GUSTO
- XRISM
- Euclid

* after commissioning (CY2021)
** after PCA is cancelled (CY2018)
Major Accomplishments: April – July 2018

- Transiting Exoplanet Survey Satellite (TESS) launched April 2018
- SOFIA returned to science operations following extended maintenance period May 2018
- GUSTO completed System Requirements Review May 2018
- WFIRST passed KDP-B May 2018 and began preliminary design phase (Phase B); funds appropriated by Congress in FY18 allow WFIRST to begin Phase B
- Palestine balloon campaign flew two missions (SuperBIT, ASCOT) May-July 2018
- Sweden balloon campaign flew 3 missions (AESOP-lite, HiWIND, PMC Turbo) May-July 2018
- First NASA astrophysics CubeSat (HaloSat) launched May 2018, deployed July 2018
- IXPE completed Preliminary Design Review June 2018
- NASA submitted Webb replan cost and schedule report to Congress based on results of WIRB report June 2018
- TESS entered science operations August 2018
- Ft. Sumner balloon campaign underway August-October 2018
- Euclid sensor chip electronics (SCE) recovery plan approved September 2018
Planned Accomplishments August 2018 – June 2019

• IXPE will enter Phase C October 2018
• SOFIA Operations and Maintenance Review will be conducted in late 2018
• Kepler completes its amazing mission when the fuel is exhausted TBD 2018
• Antarctic balloon campaign will be conducted December 2018 – February 2019
• Next Astrophysics MIDEX and Mission of Opportunity will be downselected January 2019
• Astrophysics Decadal Survey will begin January 2019
• SOFIA Five Year Review will be conducted early 2019
• Astrophysics Senior Review will be conducted Spring 2019
• Next Astrophysics SMEX and Mission of Opportunity AO will be released in Spring 2019
• Large Mission Concept Studies will be submitted to Decadal Survey Summer 2019
• The FY18 consolidated appropriation provides funding for NASA Astrophysics to continue its planned programs, missions, projects, research, and technology.

- Total funding provided for FY18 (Astrophysics including Webb) rises from $1.352B in FY17 to $1.384B in FY18, an increase of ~$32M (2.4%) from FY17.
- NASA Astrophysics FY18 appropriation funds Webb for progress toward launch, WFIRST formulation into Phase B, Explorers mission development and MIDE/MO Phase A, increased funding for R&A, continued operating missions, suborbital missions and CubeSats, technology development, and mission studies.
- The NASA Astrophysics FY18 appropriation prohibits NASA from placing SOFIA into the Senior Review.
- $10M (2.2%) reduction in rest of Astrophysics to accommodate directed spending increases for WFIRST, Hubble, and SOFIA; accommodated by reducing carryover for operating missions (requires FY19 payback).

• The FY19 budget request proposes a reduced level of funding for NASA Astrophysics.

- Total requested funding for FY19 (Astrophysics including Webb) is ~$1.185B, a reduction of $200M (14%) from FY18 appropriation.
- Webb included as project within Astrophysics budget, integration and testing continues toward launch.
- Given its significant cost within a proposed lower budget for Astrophysics and competing priorities within NASA, WFIRST is terminated with remaining WFIRST funding redirected towards competed astrophysics missions and research.
### Astrophysics Budget – FY19 Appropriations

<table>
<thead>
<tr>
<th>($M)</th>
<th>Admin Request</th>
<th>House Markup</th>
<th>Senate Markup</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Astrophysics (w/ Webb)</strong></td>
<td>1,185.4</td>
<td>1,333.6</td>
<td>1,547.8</td>
<td>Senate: Start Astro2020 on time</td>
</tr>
<tr>
<td><strong>Webb</strong></td>
<td>304.6</td>
<td>304.6</td>
<td>304.6</td>
<td>Both: $8B cost cap</td>
</tr>
<tr>
<td><strong>Hubble</strong></td>
<td>78.3</td>
<td></td>
<td>98.3</td>
<td>Senate: Reject cutting costs</td>
</tr>
<tr>
<td><strong>SOFIA</strong></td>
<td>74.6</td>
<td>85.2</td>
<td></td>
<td>House: No Senior Review</td>
</tr>
<tr>
<td><strong>WFIRST</strong></td>
<td>0.0</td>
<td>150.0</td>
<td>352.0</td>
<td>House: $20M for starshade tech</td>
</tr>
<tr>
<td><strong>R&amp;A</strong></td>
<td>83.4</td>
<td>83.4</td>
<td></td>
<td>Both: $3.2B cost cap</td>
</tr>
<tr>
<td><strong>Science Activation</strong></td>
<td>44.6</td>
<td>44.0</td>
<td>45.0</td>
<td></td>
</tr>
<tr>
<td><strong>Technosignatures</strong></td>
<td>0.0</td>
<td>10.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Search for Life Tech</strong></td>
<td>&gt;&gt;15.0</td>
<td></td>
<td>15.0</td>
<td></td>
</tr>
<tr>
<td><strong>Rest of Astrophysics</strong></td>
<td>678.2</td>
<td>656.4</td>
<td>-21.8 (-3.2%)</td>
<td></td>
</tr>
<tr>
<td><strong>Rest of Astrophysics</strong></td>
<td>757.9</td>
<td></td>
<td>-10.0 (-1.3%)</td>
<td></td>
</tr>
</tbody>
</table>
Astrophysics Research and Analysis (R&A) Elements

Supporting Research and Technology
- Astrophysics Research & Analysis (APRA)
- Strategic Astrophysics Technology (SAT)
- Astrophysics Theory Program (ATP) (not 2018)
- Theoretical and Computational Astrophysics Networks (TCAN)
- Exoplanet Research Program (XRP)
- Roman Technology Fellowships (RTF)
- SmallSat Studies

Data Analysis
- Astrophysics Data Analysis (ADAP)
- GO/GI programs in ROSES for:
  - Fermi
  - Kepler/K2
  - Swift
  - NuSTAR
  - TESS
  - NICER (coming)

Mission Science and Instrumentation
- SOFIA next-generation instrumentation
- Sounding rocket, balloon, cubesat, and ISS payloads through APRA
- XARM Participating Scientists
- LISA Preparatory Science

Separately Solicited
- GO/GI/Archive/Theory programs for:
  - Chandra
  - Hubble
  - SOFIA
  - Spitzer
  - Webb
- NASA Hubble Fellowship Program
- Graduate Student Fellowships (NESSF)
## Proposal Status Update

**Status:** Sep 18, 2018

### Solicitation

<table>
<thead>
<tr>
<th>Solicitation</th>
<th>Proposal Due Date</th>
<th>Notify Date</th>
<th>Days since received</th>
<th>Number received</th>
<th>Number selected</th>
<th>% selected</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hubble GO – Cycle 25</td>
<td>Apr 7, 2017</td>
<td>June 26, 2017</td>
<td>80</td>
<td>971</td>
<td>271</td>
<td>28%</td>
</tr>
<tr>
<td>Exoplanet Research</td>
<td>May 25, 2017</td>
<td>Oct 8, 2017</td>
<td>136</td>
<td>50</td>
<td>9</td>
<td>18%</td>
</tr>
<tr>
<td><strong>SOFIA GI – Cycle 6</strong></td>
<td><strong>June 30, 2017</strong></td>
<td><strong>Nov 7, 2017</strong></td>
<td><strong>130</strong></td>
<td><strong>198</strong></td>
<td><strong>104</strong></td>
<td><strong>53%</strong></td>
</tr>
<tr>
<td>Swift GI – Cycle 14</td>
<td>Sep 28, 2017</td>
<td>Jan 13, 2018</td>
<td>140</td>
<td>146</td>
<td>30</td>
<td>21%</td>
</tr>
<tr>
<td>TESS – Cycle 1</td>
<td>Oct 6, 2017</td>
<td>Feb 3, 2018</td>
<td>132</td>
<td>143</td>
<td>38</td>
<td>27%</td>
</tr>
<tr>
<td>K2 – Cycle 6 (Phase 2)</td>
<td>Apr 19, 2018</td>
<td>June 25, 2018</td>
<td>67</td>
<td>41</td>
<td>23</td>
<td>56%</td>
</tr>
<tr>
<td>NESSF-18</td>
<td>Feb 1, 2018</td>
<td>May 15, 2018</td>
<td>103</td>
<td>177</td>
<td>8</td>
<td>5%</td>
</tr>
<tr>
<td>Chandra GO – Cycle 20</td>
<td>Mar 16, 2018</td>
<td>July 16, 2018</td>
<td>122</td>
<td>526</td>
<td>156</td>
<td>24%</td>
</tr>
<tr>
<td>XARM Participating Scientist</td>
<td>Dec 13, 2017</td>
<td>Feb 21, 2018</td>
<td>64</td>
<td>39</td>
<td>5</td>
<td>13%</td>
</tr>
<tr>
<td>NuSTAR – Cycle 4</td>
<td>Jan 19, 2018</td>
<td>April 17, 2018</td>
<td>88</td>
<td>196</td>
<td>83</td>
<td>42%</td>
</tr>
<tr>
<td>TCAN</td>
<td>Jan 26, 2018</td>
<td>June 21, 2018</td>
<td>146</td>
<td>32</td>
<td>3</td>
<td>9%</td>
</tr>
<tr>
<td>Segmented Telescope Design</td>
<td>Feb 1, 2018</td>
<td>Mar 16, 2018</td>
<td>44</td>
<td>5</td>
<td>2</td>
<td>40%</td>
</tr>
<tr>
<td>Fermi GI – Cycle 11</td>
<td>Feb 23, 2018</td>
<td>May 26, 2018</td>
<td>92</td>
<td>138</td>
<td>42</td>
<td>30%</td>
</tr>
<tr>
<td>Spitzer GI – Cycle 14</td>
<td>Mar 23, 2018</td>
<td>May 29, 2018</td>
<td>67</td>
<td>116</td>
<td>50</td>
<td>43%</td>
</tr>
<tr>
<td>SAT (Technology)</td>
<td>Mar 19, 2018</td>
<td>Aug 14, 2018</td>
<td>148</td>
<td>25</td>
<td>8</td>
<td>35%</td>
</tr>
<tr>
<td>APRA (Basic Research)</td>
<td>Mar 19, 2018</td>
<td>Aug 14, 2018</td>
<td>148</td>
<td>170</td>
<td>35</td>
<td>21%</td>
</tr>
<tr>
<td>SmallSat Studies</td>
<td>Jul 13, 2018</td>
<td>Sep 10, 2018</td>
<td>59</td>
<td>38</td>
<td>9</td>
<td>24%</td>
</tr>
<tr>
<td>ADAP (Data Analysis)</td>
<td>May 17, 2018</td>
<td>Sep 18, 2018</td>
<td>124</td>
<td>242</td>
<td>42</td>
<td>17%</td>
</tr>
</tbody>
</table>

### Average

- **GO Selection Rate = 32%**
- **R&A Selection Rate = 20%**
- **Average:** 106 days (44 – 148 days)
- **80% PIs notified:** 89 days
NASA Astrophysics
Missions Update: TESS, Webb, WFIRST, Explorers, SmallSats, Athena/LISA, SOFIA, Senior Review
SOFIA
Stratospheric Observatory for Infrared Astronomy

- SOFIA’s initially agreed upon 5-year prime mission will be completed at the end of FY19
- At the end of a prime mission, NASA usually assesses the science performance, management of a program and proposed future science to decide on an extension of the program through a Senior Review Process, as required by the 2005 NASA Authorization Act.
- The 2018 Consolidated Appropriations Act, however forbade NASA from placing SOFIA in the 2019 Senior Review.
- Given that the program has finished 5 years of operations, the time is appropriate to review 2 aspects of the SOFIA Project:
  - A review of SOFIA’s science progress and science prospects to assure that SOFIA is and will remain scientifically productive and relevant (early 2019)
  - A review of SOFIA’s operational paradigm to assure that SOFIA is optimally efficient and effective in planning and executing the science program (late 2018)
- The reviews will not consider closeout or cancellation of SOFIA.
Senior Review 2019

Astrophysics Advisory Committee

Senior Review Subcommittee

Hubble Panel

Chandra Panel

Rest-of-Missions Panel

- Chandra X-ray Observatory (Chandra)
- Fermi Gamma-ray Space Telescope (Fermi)
- Hubble Space Telescope (Hubble)
- Neutron star Interior Composition ExploreR (NICER)
- Nuclear Spectroscopic Telescope Array (NuSTAR)
- Neil Gehrels Swift Observatory (Swift)
- Transiting Exoplanet Survey Satellite (TESS)
- X-ray Multi-mirror Mission-Newton (XMM-Newton)

Not in Senior Review: Kepler, SOFIA, Spitzer
Astrophysics
Decadal Survey Missions

1972
Decadal Survey
Hubble

1982
Decadal Survey
Chandra

1991
Decadal Survey
Spitzer, SOFIA

2001
Decadal Survey
JWST

2010
Decadal Survey
WFIRST