NASA Townhall Meeting
AAS 227th Meeting
Kissimmee, Florida
January 6, 2016

This presentation is posted at
http://science.nasa.gov/astrophysics/documents/
Visiting Experienced Scientists at NASA HQ

Looking for a few good astrophysicists….

• Seeking one or more experienced scientists
  – to take leave from their U.S. home institution
  – for a 2-year visiting position (can extend up to 6 years)
  – to work in Astrophysics at NASA Headquarters

• Duties include:
  – Management of the NASA astrophysics grants programs
  – Planning, development, and management of NASA missions
  – Strategic planning for the future of NASA astrophysics

• Requires Ph.D., research experience, familiarity with NASA award programs and/or missions, and the ability to communicate effectively

• For additional info, talk with any of the NASA Astrophysics HQ staff

Applications welcome until position is filled

https://jobregister.aas.org/job_view?JobID=51984
Why Astrophysics?

Astrophysics is humankind’s scientific endeavor to understand the universe and our place in it.

1. How did our universe begin and evolve?
2. How did galaxies, stars, and planets come to be?
3. Are We Alone?

These national strategic drivers are enduring

http://science.nasa.gov/astrophysics/documents
Mid Term Review

• The National Academies has formed an ad hoc Committee to conduct a Review of Progress Toward the Decadal Survey Vision in New Worlds, New Horizons in Astronomy and Astrophysics.
  – Jacqueline N. Hewitt (MIT) is the Chair

• Meetings:
  – October 8-10, 2015; Washington, DC (NASA presentation summarizing progress)
  – December 12-14, 2015; Irvine, CA (symposium)
  – January 11-13, 2016; Washington, DC

• Charge: In the context of funding circumstances that are substantially below those assumed in NWNH, the committee's review will include the following tasks:
  1. Describe the most significant scientific discoveries, technical advances, and relevant programmatic changes in astronomy and astrophysics over the years since the publication of the decadal survey;
  2. Assess how well the Agencies' programs address the strategies, goals, and priorities outlined in the 2010 decadal survey and other relevant NRC reports;
  3. Assess the progress toward realizing these strategies, goals, and priorities; and
  4. In the context of strategic advice provided for the Agencies' programs by Federal Advisory Committees, and in the context of mid-decade contingencies described in the decadal survey, recommend any actions that could be taken to maximize the science return of the Agencies' programs.

http://sites.nationalacademies.org/SSB/CurrentProjects/SSB_161177
### Progress Toward Decadal Survey Priorities

**The NASA FY16 Appropriation and the notional out year budget planning guidance in the President’s FY16 Budget Request support:**

<table>
<thead>
<tr>
<th>Large-scale 1. JWST</th>
<th>JWST remains within budget guidelines and on track for an October 2018 launch.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Large-scale 1. WFIRST</td>
<td>2 years of preformation and focused technology development for WFIRST-AFTA (a 2.4m version of WFIRST with a coronagraph) are complete. Formulation (new start) planned to begin February 2016.</td>
</tr>
<tr>
<td>Large-scale 2. Augmentation to Explorer Program</td>
<td>Astrophysics Explorers planned budget increased to support cadence of four AOs per decade including a SMEX AO in Fall 2014 and a MIDEX AO in Fall 2016.</td>
</tr>
<tr>
<td>Large-scale 4. IXO</td>
<td>Planning a partnership on ESA’s L2 Athena X-ray observatory; the Athena study phase, with U.S. participation, is underway. Strategic astrophysics technology investments.</td>
</tr>
<tr>
<td>Medium-scale 1. New Worlds Technology Development Program</td>
<td>Focused technology development for coronagraph on WFIRST, strategic astrophysics technology investments, exoplanet probe mission concept studies. Partnership with NSF to develop precision Doppler spectrometer as facility instrument. Exozodi survey using LBTI.</td>
</tr>
</tbody>
</table>
## Progress Toward Decadal Survey Priorities

The NASA FY16 Appropriation and the notional out year budget planning guidance in the President’s FY16 Budget Request support:

<table>
<thead>
<tr>
<th>Medium-scale 2. Inflation Probe Technology Development</th>
<th>Balloon-borne investigations plus strategic astrophysics technology investments. Studying partnership on JAXA’s LiteBIRD.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small-scale. Research Program Augmentations</td>
<td>Increased annual R&amp;A budget by 10% from FY10 to FY12 and another 10% from FY14 to FY16. Within R&amp;A: established Theoretical and Computational Astrophysics Networks program with NSF; funding available for astrophysics theory; funding available for lab astrophysics; funding available for suborbital payloads.</td>
</tr>
<tr>
<td>Small-scale. Intermediate Technology development Augmentation</td>
<td>Established competed Strategic Astrophysics Technology program element; directed technology funding for WFIRST and other large-scale decadal priorities (e.g., WFIRST coronagraph, Athena detectors).</td>
</tr>
<tr>
<td>Small-scale. SPICA (U.S. contribution to JAXA-led)</td>
<td>Not supported as a strategic contribution; candidate for Explorer Mission of Opportunity.</td>
</tr>
</tbody>
</table>
Astrophysics - Big Picture

• The FY16 appropriation provides funding for NASA astrophysics to continue its programs, missions, projects, and supporting research and technology.
  – The total funding (Astrophysics including JWST) remains at ~$1.3B.
  – Fully funds JWST to remain on plan for an October 2018 launch.
  – Funds new start for WFIRST, start of formulation planned for February 2016.
  – Will require some adjustments to FY16 plans in response to appropriation levels.

• The operating missions continue to generate important and compelling science results, and new missions are under development for the future.
  – Chandra, Fermi, Hubble, Kepler/K2, NuSTAR, Spitzer, Swift, ESA’s XMM-Newton all operating well; Senior Review is in Spring 2016 for FY17 and beyond.
  – SOFIA is in 5-year prime operations as of May 2014; 3rd generation instrument concept studies selected; Senior Review for SOFIA is in Spring 2018.
  – ESA’s LISA Pathfinder successfully launched on December 3, 2015.

• Progress being made toward recommendations of the 2010 Decadal Survey.
  – Update to the Astrophysics Implementation Plan released in December 2014.
  – NRC Mid Decade Review (with NSF, DOE) underway; Jackie Hewitt (MIT) is chair; NASA briefing at October 2015 meeting; NRC committee report expected in May 2016.
  – NASA initiating large mission concept studies as input for 2020 Decadal Survey.
## FY16 Appropriation

Outyears are notional planning from FY16 President’s budget request

<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>Astrophysics*</td>
<td>$678</td>
<td>$685</td>
<td>$731</td>
<td>$707</td>
<td>$750</td>
<td>$986</td>
<td>$1118</td>
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<tr>
<td>JWST</td>
<td>$658</td>
<td>$645</td>
<td>$620</td>
<td>$569</td>
<td>$535</td>
<td>$305</td>
<td>$198</td>
</tr>
<tr>
<td>Total</td>
<td>$1336</td>
<td>$1330</td>
<td>$1351</td>
<td>$1273</td>
<td>$1285</td>
<td>$1291</td>
<td>$1316</td>
</tr>
</tbody>
</table>

* Excludes “SMD STEM Activities” in all years.

- Provides $90M for WFIRST and directs NASA to start Formulation.
- Provides full funding ($85M) for SOFIA operations and places SOFIA into the 2018 Astrophysics Senior Review.
- Provides full funding ($98M) for continued Hubble operations.
- Provides $37M for SMD STEM education activities.
- Requires reduction of $36M in rest of Astrophysics portfolio.

<table>
<thead>
<tr>
<th>($M)</th>
<th>FY16 Request</th>
<th>FY16 Approps</th>
<th>Delta</th>
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<tbody>
<tr>
<td>JWST</td>
<td>$620</td>
<td>$620</td>
<td>--</td>
</tr>
<tr>
<td>WFIRST</td>
<td>$14</td>
<td>$90</td>
<td>+$76</td>
</tr>
<tr>
<td>SOFIA</td>
<td>$85</td>
<td>$85</td>
<td>--</td>
</tr>
<tr>
<td>Hubble</td>
<td>$97</td>
<td>$98</td>
<td>+$1</td>
</tr>
<tr>
<td>Rest of Astrophys*</td>
<td>$493</td>
<td>$457</td>
<td>-$36 (-7%)</td>
</tr>
<tr>
<td>Total</td>
<td>$1309</td>
<td>$1351</td>
<td>+$42</td>
</tr>
</tbody>
</table>

* Excludes “SMD STEM Activities.”
R&A Funding continues to Grow

- Core R&A Funding includes
  - Astrophysics Research and Analysis (APRA): all years
  - Astrophysics Data Analysis Program (ADAP): all years
  - Astrophysics Theory Program (ATP): all years
  - Exoplanet Research Program (XRP), was Origins of Solar Systems (OSS): all years
  - Theoretical and Computational Astrophysics Networks (TCAN): FY14+
  - Nancy G. Roman Technology Fellowships (RTF): FY12+
  - Long Term Space Astrophysics (LTSA): through FY09, then into ADAP
  - Beyond Einstein Foundation Science (BEFS): through FY06, then into ATP
  - Does not include WFIRST Preparatory Science (WPS) or mission-funded theory

“15% cut”

Post NWNH growth of 22% (FY11 to FY16)

Some adjustment possible in FY16 in response to appropriation
## Proposal Selections in 2015

**Status:** January 1, 2016

<table>
<thead>
<tr>
<th>Proposal Due Date</th>
<th>Notify Date</th>
<th>Days past received</th>
<th>Number received</th>
<th>Number selected</th>
<th>% selected</th>
</tr>
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<tbody>
<tr>
<td><strong>Kepler K2 GO – Cycle 1</strong></td>
<td>Sep 23, 2014</td>
<td>Jan 16, 2015</td>
<td>115</td>
<td>92</td>
<td>36</td>
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<tr>
<td><strong>Swift GI – Cycle 11</strong></td>
<td>Sep 25, 2014</td>
<td>Jan 6, 2015</td>
<td>123</td>
<td>165</td>
<td>39</td>
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<tr>
<td><strong>Roman Tech Fellows</strong></td>
<td>Nov 6, 2014</td>
<td>Feb 3, 2015</td>
<td>89</td>
<td>8</td>
<td>3</td>
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<tr>
<td><strong>NuSTAR GO – Cycle 1</strong></td>
<td>Nov 25, 2014</td>
<td>Apr 17, 2015</td>
<td>143</td>
<td>193</td>
<td>35</td>
</tr>
<tr>
<td><strong>Fermi GI – Cycle 8</strong></td>
<td>Jan 22, 2015</td>
<td>June 26, 2015</td>
<td>155</td>
<td>190</td>
<td>36</td>
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<tr>
<td><strong>NESSF-15</strong></td>
<td>Feb 6, 2015</td>
<td>June 2, 2015</td>
<td>116</td>
<td>134</td>
<td>10</td>
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<tr>
<td><strong>Kepler K2 GO – Cycle 2</strong></td>
<td>Feb 27, 2015</td>
<td>June 12, 2015</td>
<td>105</td>
<td>76</td>
<td>35</td>
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<tr>
<td><strong>Chandra GO – Cycle 17</strong></td>
<td>Mar 17, 2015</td>
<td>July 17, 2015</td>
<td>122</td>
<td>582</td>
<td>175</td>
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<tr>
<td><strong>APRA (Basic Research)</strong></td>
<td>Mar 20, 2015</td>
<td>Aug 12, 2015</td>
<td>145</td>
<td>149</td>
<td>40</td>
</tr>
<tr>
<td><strong>SAT (Technology)</strong></td>
<td>Mar 20, 2015</td>
<td>Aug 12, 2015</td>
<td>145</td>
<td>28</td>
<td>9</td>
</tr>
<tr>
<td><strong>Hubble GO – Cycle 23</strong></td>
<td>Apr 10, 2015</td>
<td>June 24, 2015</td>
<td>75</td>
<td>1114</td>
<td>261</td>
</tr>
<tr>
<td><strong>EPDS (Doppler Spectr)</strong></td>
<td>Apr 24, 2015</td>
<td>July 2, 2015</td>
<td>69</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td><strong>ADAP (Data Analysis)</strong></td>
<td>May 15, 2015</td>
<td>Sep 29, 2015</td>
<td>137</td>
<td>250</td>
<td>51</td>
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<tr>
<td><strong>Exoplanet Research</strong></td>
<td>May 22, 2015</td>
<td>Oct 15, 2015</td>
<td>146</td>
<td>43</td>
<td>7</td>
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<tr>
<td><strong>Kepler K2 GO – Cycle 3</strong></td>
<td>Jul 1, 2015</td>
<td>Oct 14, 2015</td>
<td>105</td>
<td>72</td>
<td>32</td>
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<tr>
<td><strong>SOFIA GI – Cycle 4</strong></td>
<td>Jul 10, 2015</td>
<td>Oct 22, 2015</td>
<td>104</td>
<td>155</td>
<td>82</td>
</tr>
<tr>
<td><strong>Spitzer GO – Cycle 12</strong></td>
<td>Sep 11, 2015</td>
<td>Oct 26, 2015</td>
<td>45</td>
<td>104</td>
<td>31</td>
</tr>
<tr>
<td><strong>SOFIA 3rd Gen Instrument</strong></td>
<td>Oct 7, 2015</td>
<td>Dec 10, 2015</td>
<td>64</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td><strong>WFIRST Sci. Inv. Teams</strong></td>
<td>Oct 15, 2015</td>
<td>Dec 18, 2015</td>
<td>64</td>
<td>38</td>
<td>12</td>
</tr>
<tr>
<td><strong>Swift GI – Cycle 12</strong></td>
<td>Sep 25, 2015</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Roman Tech Fellows</strong></td>
<td>Nov 6, 2015</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>NuSTAR GO – Cycle 2</strong></td>
<td>Dec 11, 2015</td>
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</tr>
</tbody>
</table>

**100% of 2015 selections announced within 155 days**

**R&A Selection Rate:** 23%

**GO Selection Rate:** 28%
Proposal Opportunities Expected in 2016

ROSES research opportunities
- APRA/SAT, Exoplanet Research in March
- ADAP in May
- Astrophysics Theory in July
- Habitable Worlds in November

ROSES Guest Observer/Guest Investigator opportunities
- Fermi GI Cycle 10 in January
- Kepler K2 GO Cycle 4 in February
- ASTRO-H GO Cycle 1 in July
- Swift GI Cycle 13 in September
- Kepler K2 GO Cycle 5 in October
- NuSTAR GO Cycle 3 in January 2017

Other Astrophysics Guest Observer opportunities
- Chandra Cycle 18 in March
- Hubble Cycle 23 in April
- SOFIA Cycle 5 and Spitzer Cycle 13 in June
- XMM-Newton in October

Explorer MIDEX proposals: target date in late summer 2016
Public Access to Federal Research
changes to ROSES

• All Federal research agencies must increase public access to the results of research funded by the Federal government.
  – This includes data and publications

• NASA’s policy has always been to make scientific data available
  – Starting in 2015, ROSES proposals require a Data Management Plan (DMP)
  – DMPs describe whether and how data generated will be shared and preserved
  – Minimum requirement is published results: data in figures
  – Many ROSES elements do not expect any data requiring preservation
  – DMP can be entered on NSPIRES cover page, not part of proposal text (unless otherwise instructed, e.g. ADAP)

• NASA will start making publications available
  – All peer reviewed publications generated under NASA grants must be uploaded into PubSpace
  – PubSpace is based on successful NIH PubMed
  – It will be the responsibility of the PI to ensure that publications are uploaded
  – This requirement will start on data TBD; new terms and requirements will be added to all grants

• NASA will develop training material on filling out DMPs and uploading to PubSpace
  – Read ROSES and ROSES FAQs carefully

http://science.nasa.gov/researchers/sara/faqs/dmp-faq-roses/
http://www.nasa.gov/offices/ocs/reportsPresentations.html
Salary Redacted in ROSES Proposals
changes to ROSES

• We currently redact NASA Civil Servant (CS) salary and overhead from ROSES peer reviewers, but we currently don’t redact salary and overhead of non-NASA proposers.

• Starting in ROSES-2016 we will treat all proposers equally: All salaries and overhead will be included in the NSPIRES cover pages, but automatically redacted from reviewers.

• Only level of effort (FTEs/WYE) will be in the body of proposals and assessed by peer reviewers.
Astrophysics in 2016
**Large Infrared Space Observatory**
Top priority of 2000 Decadal Survey

**Science themes**: First Light; Assembly of Galaxies; Birth of Stars and Planetary Systems; Planetary Systems and the Origins of Life

**Mission**: 6.5m deployable, segmented telescope at L2, passively cooled to <50K behind a large, deployable sunshield

**Instruments**: Near IR Camera, Near IR Spectrograph, Mid IR Instrument, Near IR Imager and Slitless Spectrograph

**Operations**: 2018 launch for a 5-year prime mission

**Partners**: ESA, CSA

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**2015 Accomplishments**

- Completed Telescope Structure
- Completed second Telescope Pathfinder test at JSC
- All updates/fixes made to ISIM following 2\textsuperscript{nd} cryovacuum test
- Spacecraft Bus Structure delivered to I&T
- Final ISIM cryovacuum test started
- Mirror installation onto Telescope Structure started

**2016 Plans**

- Complete ISIM cryovacuum testing
- Complete mirror installation
- Install ISIM into Telescope Structure
- Complete Flight Sunshield Membranes
- Conduct final GSE test at JSC before test of Flight telescope and instruments

http://www.jwst.nasa.gov/
JWST Hardware Progress

JWST remains on track for an October 2018 launch within its replan budget guidelines.

http://jwst.nasa.gov/webcam.html
**WFIRST – AFTA**

Wide-Field Infrared Survey Telescope with Astrophysics Focused Telescope Assets

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**Wide-Field Infrared Survey Telescope**

Top priority of 2010 Decadal Survey

**Science themes:** Dark Energy, Exoplanets, Large Area Near Infrared Surveys

**Mission:** 2.4m widefield telescope at L2; using existing hardware, images 0.28deg$^2$ at 0.8-2µm

**Instruments (design reference mission):**
Wide Field Instrument (camera plus IFU), Coronagraph Instrument (imaging/IFS)

**Phase:** Currently in pre-formulation

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**CURRENT STATUS:**

- Completed Mission Concept Review (MCR) held in December 2015
- Formulation Science Investigation Teams selected in December 2015
- Planning for Key Decision Point A (KDP-A) in Feb 2016
  - Official start of formulation phase
  - Supported by FY16 appropriations
- Industry RFI released July 2015; RFP for industry studies released in January 2016
- Other activities include:
  - Technology development for detectors and coronagraph (with STMD); prototyping key parts
  - Assessment of telescopes + risk mitigation
  - Mission design trades; performance simulations
- Maturing key technologies by FY19
  - H4RG infrared detectors for widefield imager
  - Internal coronagraph for exoplanet characterization
  - Milestones on road to achieve TRL-5 by end of CY16, TRL-6 by end of CY18; reports made public

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**WFIRST starts Formulation in February 2016**

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### WFIRST Science Investigation Teams

<table>
<thead>
<tr>
<th>PI</th>
<th>PI Institution</th>
<th>Title</th>
<th>Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Olivier Dore</td>
<td>JPL</td>
<td>Cosmology with the WFIRST High Latitude Survey</td>
<td>Galaxy Redshift Survey, Weak Lensing Survey</td>
</tr>
<tr>
<td>Ryan Foley</td>
<td>Illinois</td>
<td>Optimizing the WFIRST Type Ia Supernova Survey</td>
<td>Supernovae Survey</td>
</tr>
<tr>
<td>Scott Gaudi</td>
<td>Ohio State</td>
<td>Preparing for the WFIRST Microlensing Survey</td>
<td>Microlensing Survey</td>
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<tr>
<td>Jeremy Kasdin</td>
<td>Princeton</td>
<td>WFIRST Coronagraph Instrument Adjutant Scientist</td>
<td>Coronagraph Instrument Adjutant Scientist</td>
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<tr>
<td>Jason Kalirai</td>
<td>STScI</td>
<td>Resolving the Milky Way with WFIRST</td>
<td>GI/GO</td>
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<td>Bruce Macintosh</td>
<td>Stanford</td>
<td>Optimizing WFIRST Coronagraph Science</td>
<td>Coronagraphy</td>
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<td>Saul Perlmutter</td>
<td>LBNL</td>
<td>Investigating the Nature of Dark Energy using Type Ia Supernovae</td>
<td>Supernovae Survey</td>
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<td>James Rhoads</td>
<td>Arizona State</td>
<td>Cosmic Dawn with WFIRST</td>
<td>GI/GO</td>
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<tr>
<td>Brant Robertson</td>
<td>UC Santa Cruz</td>
<td>WFIRST Extragalactic Potential Observations</td>
<td>GI/GO</td>
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<tr>
<td>David Spergel</td>
<td>Princeton</td>
<td>WFIRST Wide Field Instrument Adjutant Scientist</td>
<td>Widesfield Instrument Adjutant Scientist</td>
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<td>Alexander Szalay</td>
<td>Johns Hopkins</td>
<td>Archival Research Capabilities of the WFIRST Data Set</td>
<td>GI/GO</td>
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<tr>
<td>Margaret Turnbull</td>
<td>SETI Institute</td>
<td>Harnessing the Power of the WFIRST Coronagraph</td>
<td>Coronagraphy</td>
</tr>
<tr>
<td>Benjamin Williams</td>
<td>Washington</td>
<td>WFIRST Infrared Nearby Galaxy Survey</td>
<td>GI/GO</td>
</tr>
</tbody>
</table>
LISA Pathfinder
ST-7/Disturbance Reduction System (DRS)

Launched December 3, 2015

Dec 3 Launch
Dec 11 On way to L1
Feb 3 Uncage test masses
Mar 4 Commissioning
June/July DRS ops

https://lisapathfinder.org/
NASA’s L3 Study

• NASA intends to partner with ESA on the ESA-led Large 3 (L3) gravitational wave mission with launch in 2034. This responds to the recommendations of the 2010 Astrophysics Decadal for a space-based gravitational wave observatory.

• Following the successful launch of the LISA Path Finder, NASA is forming an L3 Study Team (L3ST) drawing membership from members of the US astrophysics community.

• The goals of the L3ST are:
  1. Analyze the options for NASA participation in the L3 mission and work with the European L3 consortium on proposals to ESA; and
  2. Prepare a report to the 2020 Decadal Survey on NASA’s participation, including possible options, in the L3 mission as a minority partner.

• Dear Colleague Letter on December 7, 2015; applications due December 21, 2015; members to be announced NLT January 31, 2016.

• The L3ST Charter, a list of FAQs, and list of selected members (after January 15) can be found at http://pcos.gsfc.nasa.gov/studies.
CURRENT STATUS
• All U.S. hardware integrated onto the spacecraft.
• Spacecraft-level environmental testing completed
• Spacecraft arrived at launch site on December 6
• Spacecraft undergoing final preparations and check-out at Tanegashima launch site

UPCOMING EVENTS:
• Launch – February 12, 2016
• Cycle 1 GO call – April 2016 (TBC)

https://heasarc.gsfc.nasa.gov/docs/astroh/
NICER
Neutron star Interior and Composition Explorer

• All subsystems/sub-assemblies have completed fabrication and environmental testing.

• The NICER project has now started final payload integration.

UPCOMING EVENTS:

• December 10-11, 2015: Pre-environmental Review

• January 28, 2016: Start Phase D

• February 2016: Start of payload environmental testing

• August 2016: Launch on SpaceX-11 commercial resupply service (CRS) flight to ISS (Switched with CREAM)

https://heasarc.gsfc.nasa.gov/docs/nicer/
ISS-CREAM
Cosmic Ray Energetics and Mass for the ISS

• August 2015: Delivered to KSC, in storage until 60 days before launch to International Space Station (ISS)

• December 2016: Launch on SpaceX-12 commercial resupply service (CRS) flight to ISS (Switched with NICER)
2015-2016 Antarctic LDB Campaign

Gamma-Ray Imager/ Polarimeter for Solar flares (GRIPS)

Stratospheric Terahertz Observatory (STO-II)

http://www.nsbf.nasa.gov/
http://www.csbf.nasa.gov/antarctica/ice.htm
Astrophysics SMEX/MO Missions in Formulation

**SPHEREx**
- PI: J. Bock, Caltech
- An All-Sky Near-IR Spectral Survey

**PRAXyS**
- PI: K. Jahoda, GSFC
- Polarimeter for Relativistic Astrophysical X-ray Sources

**IXPE**
- PI: M. Weisskopf, MSFC
- Imaging X-ray Polarimetry Explorer

**GUSTO: Gal/Xgal U/LDB Spectroscopic - Stratospheric Terahertz Observatory**
- PI: C. Walker, U. Arizona

**US Participation in JAXA’s LiteBIRD CMB Polarization Survey**
- PI: A. Lee, UC Berkeley
Explorers MIDEX and MO AO in 2016

• The target schedule for the solicitation:
  – Release of draft AO: Spring 2016 (target)
  – Release of final AO: Late summer 2016 (target)
  – Proposals due: 90 days after AO release
  – Selection for 9-month competitive Phase A studies: Summer 2017 (target)
  – Down-selection: Late 2018 (target)

• MIDEX Parameters
  – PI-managed mission cost cap is $250M (FY17$), not including the cost of the Expendable Launch Vehicle (ELV) or any contributions.
  – Standard launch services on an ELV will be provided for MIDEX missions at no charge against the mission cost cap; no MIDEX ISS-attached payloads.
  – MIDEX launch readiness date no later than December 2023.

• Mission of Opportunity Parameters
  – PI-managed mission cost cap is $70M (FY17$) for Partner MOs and Small Complete Mission MOs, including ISS-attached payloads.
  – PI-managed mission cost cap is $35M (FY17$) for suborbital-class MO.
  – Small Complete Mission launch readiness date no later than December 2022.

• Astrophysics Explorer Program planning budget is sufficient to select and execute one MIDEX mission and one MO.

http://explorers.larc.nasa.gov/APMIDEX2016/
NASA's Standard AO: Revision Process Underway

- NASA’s Science Mission Directorate (SMD) issues Announcements of Opportunity (AOs) for PI-led missions (e.g. Explorers, Discovery, Earth Venture).
- SMD develops each individual AO solicitation by customizing an SMD framework document, known as the Standard AO Template.
- The Standard AO Template is being revised with goals of reducing the burden on proposers and increasing the efficiency of review.
- Modifications that could result in shortening and/or simplifying Step 1 proposals and other suggestions may be submitted via email by January 15, 2016, to Thomas Wagner at thomas.wagner@nasa.gov and Washito Sasamoto at washito.a.sasamoto@nasa.gov.
- Revised version expected for release in April 2016.

Comments are invited from the community, due by January 15, 2016

http://soma.larc.nasa.gov/standardao/sao_templates.html
SMD Science Education Restructuring

• Background – FY16 Budget provides $37M for NASA Science Education

• Why Restructure? To further enable NASA scientists and engineers to engage more effectively with learners of all ages. SMD will no longer have minimum of 1 percent set-asides through our missions, or issue disparate 3-year grants. But we are taking a strategic approach, building on our science discipline-based legacy and looking for new approaches given Stakeholder priorities.

• Objectives?
  – Enable STEM Education
  – Improve US Scientific Literacy
  – Advance National Educational Goals
  – Leverage Through Partnerships

• How? Through the competitive selection of organizations that utilize NASA data, products, or processes to meet education objectives; and by enabling our scientists and engineers with education professionals, tools, and processes to better meet user needs. SME’s continue to be funded within the Divisions, where appropriate.

SMD Science Education Restructuring


• 27 Selections build upon legacy of excellence, balanced across diverse audiences, and fit within annual budget of $42M/year towards meeting NASA Science Mission Directorate’s desired Outcome and Objectives.
  
  – 27 of 73 compliant proposals selected (37%) for negotiations leading to cooperative agreement awards
  – 15 are from “Legacy” institutions (56%)
  – 3 selections support the 2017 Total Solar Eclipse, allowing for one full academic year of preparation
  
  – 15 include Astrophysics content
  – 16 include Earth Science content
  – 17 include Planetary Science content
  – 15 include Heliophysics content

• Scheduled start date for awards – January 4, 2016.
## 2016 Senior Review Timeline

<table>
<thead>
<tr>
<th>Action</th>
<th>Date</th>
<th>Done</th>
</tr>
</thead>
<tbody>
<tr>
<td>Draft Call for Proposals issued</td>
<td>August 20, 2015</td>
<td>✓</td>
</tr>
<tr>
<td>Deadline to send comments on draft to NASA</td>
<td>September 10, 2015</td>
<td>✓</td>
</tr>
<tr>
<td>Final Call for Proposals issued</td>
<td>September 25, 2015</td>
<td>✓</td>
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<tr>
<td>Senior Review Proposals due</td>
<td>January 22, 2016</td>
<td></td>
</tr>
<tr>
<td>Main panel meets in Washington, DC</td>
<td>February 22-25, 2016</td>
<td></td>
</tr>
<tr>
<td>HST review and site visit in Baltimore, MD</td>
<td>March 8-10, 2016</td>
<td></td>
</tr>
<tr>
<td>CXO review and site visit in Cambridge, MA</td>
<td>March 22-24, 2016</td>
<td></td>
</tr>
<tr>
<td>Delivery of panel reports to NASA HQ</td>
<td>April 2016</td>
<td></td>
</tr>
<tr>
<td>NASA Response/direction to projects. Reports released on APD website.</td>
<td>May-June 2016</td>
<td></td>
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</tbody>
</table>

For more information:
http://science.nasa.gov/astrophysics/2016-senior-review-operating-missions/
Astrophysics

Preparing for the 2020 Decadal Survey in Astronomy and Astrophysics
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
Assumes (1) President’s FY16 budget request and notional runout through FY20, (2) flat funding for Astrophysics for FY21 through FY35, (3) completion of WFIRST-AFTA and other missions planned for new starts in FY16-FY20.
Preparing for the 2020 Decadal Survey
Large Mission Concepts

• NASA will study large mission concepts as input to the 2020 Decadal Survey
  – Science case
  – Technology assessment
  – Design reference mission with strawman payload
  – Cost assessment

• Charge to the Astrophysics Program Analysis Groups (PAGs): COPAG, ExoPAG, PhysPAG (December 2014)
  – “I am charging the Astrophysics PAGs to solicit community input for the purpose of commenting on the small set [of large mission concepts to study], including adding or subtracting large mission concepts.”

• PAGs reported to the Astrophysics Subcommittee in October 2015
  – PAGs unanimously endorsed a common set of four mission concepts to study
  – Astrophysics Subcommittee reported to the NAC Science Committee that NASA should study these four mission concepts
  – All three PAG reports posted at http://cor.gsfc.nasa.gov/copag/rfi/
Preparing for the 2020 Decadal Survey
Large Mission Concepts

NASA is initiating studies of the following four large mission concepts:

- **FAR IR Surveyor** – The Astrophysics Visionary Roadmap identifies a Far IR Surveyor as contributing through improvements in sensitivity, spectroscopy, and angular resolution.

- **Habitable-Exoplanet Imaging Mission** – The 2010 Decadal Survey recommends that a habitable-exoplanet imaging mission be studied in time for consideration by the 2020 Decadal Survey.

- **Large UV/Optical/IR Surveyor** – The Astrophysics Visionary Roadmap identifies a Large UV/Optical/IR Surveyor as contributing through improvements in sensitivity, spectroscopy, high contrast imaging, astrometry, angular resolution and/or wavelength coverage. The 2010 Decadal Survey recommends that NASA prepare for a UV mission to be considered by the 2020 Decadal Survey.

- **X-ray Surveyor** – The Astrophysics Visionary Roadmap identifies an X-ray Surveyor as contributing through improvements in sensitivity, spectroscopy, and angular resolution.
NASA is initiating community-led studies of the following four large mission concepts.

<table>
<thead>
<tr>
<th>Mission Concept</th>
<th>Community STDT Chair</th>
<th>Center Study Scientist</th>
<th>Study Lead Center</th>
<th>HQ Program Scientist</th>
</tr>
</thead>
<tbody>
<tr>
<td>Far IR Surveyor</td>
<td>TBD</td>
<td>David Leisawitz</td>
<td>GSFC</td>
<td>Kartik Sheth</td>
</tr>
<tr>
<td>Habitable Exoplanet Imaging Mission</td>
<td>TBD</td>
<td>Bertrand Mennesson</td>
<td>JPL</td>
<td>Martin Still</td>
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<tr>
<td>Large UV/Optical/IR Surveyor</td>
<td>TBD</td>
<td>Aki Roberge</td>
<td>GSFC</td>
<td>Mario Perez</td>
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<tr>
<td>X-ray Surveyor</td>
<td>TBD</td>
<td>Jessica Gaskin</td>
<td>MSFC</td>
<td>Dan Evans</td>
</tr>
</tbody>
</table>
Preparing for the 2020 Decadal Survey
Large Mission Concepts

NASA is asking for applications for membership on the four large mission concept Science and Technology Definition Teams (STDTs)

• STDTs have a significant role and responsibility
  – Develop science case
  – Flow science case into mission parameters
  – Vet technology gap list
  – Direct trades of science vs cost/capability

• STDT members will be appointed by NASA HQ
  – Community call for applications will be released via NSPIRES and Astrophysics Programs mailing lists on the day after the AAS Town Hall
  – Responses requested by February 1, 2016

• STDTs will be chartered and managed by HQ
  – Charter and management plan available at:

  http://science.nasa.gov/astrophysics/2020-decadal-survey-planning/
Preparing for the 2020 Decadal Survey
Large Mission Concepts

• Applications for the STDTs are due to NASA by February 1, 2016.

• The application material should consist of:
  – A two-page cover letter describing
    1. The STDT of choice,
    2. The reasons for the submitter's interest in the STDT, and
    3. The capabilities and experience that the submitter brings to the STDT;
  – A short statement of commitment to perform the tasks assigned to
    the STDT within the allocated timeframe, and
  – A one or two page resume including relevant publications.

Applications are solicited from the community at U.S.-based research
and academic institutions, Government laboratories, industry, and
private individuals.

http://science.nasa.gov/astrophysics/2020-decadal-survey-planning/
Preparing for the 2020 Decadal Survey
Large Mission Concepts

Special Session this afternoon to discuss NASA’s community-led large mission concept studies and the call for STDT nominations and self-nominations

Agenda

<table>
<thead>
<tr>
<th>The Mission Concept Study Process and the STDT Membership Call</th>
<th>Paul Hertz, Astrophysics Director, NASA HQ</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Far Infrared Surveyor Study</td>
<td>David Leisawitz, FIR Surveyor Study Scientist, GSFC</td>
</tr>
<tr>
<td>The Habitable Exoplanet Imaging Mission Study</td>
<td>Bertrand Mennesson, HabEx Study Scientist, JPL</td>
</tr>
<tr>
<td>The Large Ultraviolet/Optical/Infrared Surveyor Study</td>
<td>Aki Roberge, LUVOIR Study Scientist, GSFC</td>
</tr>
<tr>
<td>The X-ray Surveyor Study</td>
<td>Jessica Gaskin, X-ray Surveyor Study Scientist, MSFC</td>
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<tr>
<td>Discussion and Q&amp;A</td>
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</table>
Astrophysics
### Astrophysics Missions in Development

<table>
<thead>
<tr>
<th>Mission</th>
<th>Advisor</th>
<th>Launch Date</th>
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<tbody>
<tr>
<td>LISA Pathfinder</td>
<td>ESA-led</td>
<td>12/2015</td>
</tr>
<tr>
<td>ASTRO-H</td>
<td>JAXA-led</td>
<td>02/2016</td>
</tr>
<tr>
<td>NICER</td>
<td>NASA</td>
<td>8/2016</td>
</tr>
<tr>
<td>TESS</td>
<td>NASA</td>
<td>8/2017</td>
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<tr>
<td>JWST</td>
<td>NASA</td>
<td>10/2018</td>
</tr>
<tr>
<td>Euclid</td>
<td>ESA-led</td>
<td>2020</td>
</tr>
</tbody>
</table>

- **LISA Pathfinder**: ESA-led Mission, launched 12-3-2015 successfully.
- **ASTRO-H**: JAXA-led Mission, supplied NASA the Soft X-ray Spectrometer (SXS) instrument.
- **NICER**: NASA Mission, Neutron Star Interior Composition Explorer.

- **Transiting Exoplanet Survey Satellite**: NASA Mission.
- **NASA is supplying the NISP Sensor Chip System (SCS)**: ESA-led Mission.
Athena
Advanced Telescope for High Energy Astrophysics

CURRENT STATUS:
• Selected as 2nd Large mission in ESA Cosmic Visions Program.
• Currently in 2 year Study Phase.
• NASA and US community involved in Study Phase via membership on ESA-chartered Athena Science Study Team and Science Working Groups.
• NASA budgeting for a $100M-$150M hardware contribution, plus a U.S. GO program and a U.S. data center.
• NASA will provide the sensor array for the X-ray Integral Field Unit (calorimeter).
• NASA and ESA are discussing other possible NASA contributions, such as:
  - A contribution to the Wide Field Imager
  - Use of the NASA XRCF for Calibration
  - Contribution to ESA science data center (U.S. node)
• NASA continues to invest in Athena technologies via SAT and directed investigations.

• Second ESA Cosmic Vision Large mission
  - L-class with NASA/JAXA participation
  - Decadal Survey recommendation
  - Large X-ray mirror, X-IFU and WFI instruments
• Launch Date: 2028
• Breakthrough Technologies:
  - High Throughput, Wide FOV, High spectral resolution X-ray Astronomy
  - 10x Chandra area, 100x improved non-dispersive spectral resolution, 5x FOV.
• Science Objectives: The Hot and Energetic Universe: How does ordinary matter assemble into the large scale structures that we see today? How do black holes grow and shape the Universe?