• This remains a time of opportunity for NASA Astrophysics
  - The FY14 NASA astrophysics budget request remains at a high level.
  - Large and small space-based observatories spanning the electromagnetic spectrum are currently studying the universe.
  - The James Webb Space Telescope, the highest priority of the community, is on schedule and fully funded for an October 2018 launch.
  - Two new Explorer projects have been downselected and are beginning development for launch in this decade.
  - Individual investigators are leading data analysis, theory, and technology development projects selected through open, competitive, peer reviewed solicitations.
  - We are preparing for the strategic mission that will be developed following JWST.

• The budgetary future remains uncertain
  - FY13 rescission and sequester has an impact.
  - Constrained budget request for FY14 and planning for FY15-FY18 means priorities must be set and choices must be made.
Division Personnel Changes

Since January 2013

Departures
• Ilana Harrus completed her IPA on February 8. She has joined NSF AST as a program officer.

Arrivals
• Debra Wallace joined the Division on January 3 as an IPA from USC-Beaufort. She is the Fellowships Program Scientist.
• Tony Carro joined the Division on January 3 part time from the Planetary Science Division. He is the Exoplanet Exploration and Kepler Program Executive.
• Jeff Hayes started transitioning part time from the Heliophysics Division. He will be the Program Executive for selected operating missions and Senior Reviews.
• Janet Lawson joined the Division on April 15 to support Astrophysics Research.

Transitions
• Doug Hudgins is the new TESS PS; Mark Sistilli is the new TESS PE.
• Lou Kaluzienski is the acting NICER PS; Mark Sistilli is the acting NICER PE.
Astrophysics Program Structure at a Glance

Program Offices at Centers

- EXEP JPL
  - Keck
  - Kepler
  - LBTI
  - NExScI
- COR GSFC
  - Herschel
  - Hubble
  - * JWST Ops
  - * SOFIA
  - Spitzer
- PCOS GSFC
  - Chandra
  - Euclid
  - Fermi
  - Planck
  - ST-7/LPF
  - XMM-Newton
- APEX GSFC
  - Astro-H
  - GALEX
  - NICER
  - NuSTAR
  - Suzaku
  - Swift
  - TESS
  - WISE

Program Office at Headquarters

- Astrophysics Research Program Office
- APRA
- Lab Astro (w/in APRA)
- Theory
- Archives
- Data Analysis
- Balloon Project
- Suborbital payloads (w/in APRA)
- Balloons
- Sounding Rockets
- ISS CREAM

Disciplines

- Cosmic Ray/ Fundamental Physics
- Gamma Ray/ X-Ray
- IR/Submm/ Radio
- Optical/ Ultraviolet

* Science only as it relates to the overall COR scientific mission
<table>
<thead>
<tr>
<th>Program</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>Astrophysics Theory Program</td>
<td>Jul 13</td>
<td>Dec 6</td>
<td>146</td>
<td>181</td>
<td>28</td>
<td>15%</td>
</tr>
<tr>
<td>Euclid Science Team</td>
<td>Aug 31</td>
<td>Nov 7</td>
<td>68</td>
<td>8</td>
<td>3</td>
<td>38%</td>
</tr>
<tr>
<td>Swift Guest Investigators</td>
<td>Sep 26</td>
<td>Dec 18</td>
<td>83</td>
<td>158</td>
<td>45</td>
<td>28%</td>
</tr>
<tr>
<td>Nancy Grace Roman Technology Fellowships</td>
<td>Nov 8</td>
<td>Mar 5</td>
<td>117</td>
<td>12</td>
<td>2</td>
<td>17%</td>
</tr>
<tr>
<td>Fermi Guest Observer</td>
<td>Jan 18</td>
<td>[1]</td>
<td>97</td>
<td>233</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TCAN with NSF</td>
<td>Feb 14</td>
<td>[3]</td>
<td>70</td>
<td>101</td>
<td></td>
<td></td>
</tr>
<tr>
<td>APRA</td>
<td>Mar 22</td>
<td>[4]</td>
<td>34</td>
<td>182</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SAT</td>
<td>Mar 22</td>
<td>[4]</td>
<td>34</td>
<td>39</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>


See separate presentation by Linda Sparke.

Status: April 25, 2013
• Announced additional 461 planet candidates (61 HZ candidates of all sizes, including one super-Earth around sun-like star) at AAS.

• Completed Quarter 15 Month 3 Science Data download.

• Elevated friction on wheel 4 seen in X-band on January 7.

• After observing persistence of elevated friction, wheel placed in rest position for 10 days starting January 17.

• Reaction wheels restarted on January 27, less than 1 hour spent in low speed state.

• Returned to science mode on January 28.

• Wheel 4 exhibits erratic spikes on top of the elevated friction.

• Work continues with high priority on the implementation of a Thruster Controlled Safe Mode and the Point Rest State.

• Concepts for 2-RWA science operations under study.

• Using Kepler data, Dressing & Charbonneau reported that ~15% of cool stars have habitable zone planets.

• Kepler Press Conference on April 18.
Kepler Detects Gravitational Lensing

The plot on the right shows what happens when the white dwarf passes in front of the star. The dip in brightness is subtle because the white dwarf, while just over half as massive as our sun, is only the size of Earth, much smaller than the red dwarf star. The blue line shows what would be expected given the size of the white dwarf. The red line reveals what was actually observed: the mass of the white dwarf is so great, that its gravity bent and magnified the light of the red star. Because the star’s light was magnified, the transiting white dwarf blocked an even smaller fraction of the total starlight than it would have without the distortion.

The plot on the left shows Kepler data collected for KOI-256, a small red dwarf. Astronomers first thought the dip in starlight was due to a large planet passing in front of the star. But clues, such as the sharpness of the dip, indicated it was a white dwarf. In the data shown at the left, the white dwarf is passing behind the red dwarf, an event referred to as a secondary eclipse. The change in brightness is a result of the total light of the system dropping.
NuSTAR Helps Solve Riddle of Black Hole Spin
New Findings from the Planck Mission

This map shows the oldest light in our universe, as detected with the greatest precision yet. The ancient light was imprinted on the sky when the universe was 370,000 years old. It shows tiny temperature fluctuations that correspond to regions of slightly different densities, representing the seeds of all future structure: the stars and galaxies of today.

- The universe is 13.8 billion years old, 100 million years older than previous estimates.
- Results suggest the universe is expanding more slowly than scientists thought.
- The universe is made up of:
  - 26.8% dark matter
  - 68.3% dark energy
  - 4.9% normal matter
- The newly estimated expansion rate of the universe, known as Hubble’s constant, is 67.15 plus or minus 1.2 kilometers/second/megaparsec.

This full-sky map shows matter between Earth and the edge of the observable universe. Regions with less mass show up as lighter areas while regions with more mass are darker. The grayed-out areas are where light from our own galaxy was too bright, blocking Planck’s ability to map the more distant matter.
See separate presentation by Geoff Yoder/ Eric Smith
Program Update – SOFIA

  - Does not prevent instrument commissioning and science flights from proceeding.
- First four Cycle 1 Airborne Astronomy Ambassadors flew on board during commissioning/ V&V flights in February; next Airborne Astronomy Ambassadors scheduled to fly in June.
- SSPC met March 14-15 at Ames; stated general support for maintaining high rate of new instrument calls.
- FORCAST instrument commissioning phase 1 completed April 4.
- Cycle 1 Science began April 11 with GREAT instrument.
  - Successful GREAT commissioning and science flights on both April 11 (Flight #100) and April 12 (Flight #101).
  - On Flight #101, combined science instrument/observatory performance was good with 60% on source efficiency, 3 times better than during the Early Science phase. Preliminary performance data indicates pointing/tracking well within 1 arc-seconds.
- Southern Hemisphere deployment to New Zealand to occur in July 2013.
- Baseline plan established for 3rd-generation instrument call
  - Release AO July 2014; select instrument by April 2015
Science hour estimates were calculated based on maximum possible flights at 89% reliability.
Program Update – Astro-H

- New official Launch Readiness Date of 2015 was announced by JAXA (was Feb 2014).

- Flight mirror #1 completed Acceptance Review and was shipped to JAXA on March 21.

- SXS instrument-to-spacecraft micro-vibration testing was conducted in Japan (March 18-23). NASA team provided support.

- Vibrations must be reduced to acceptable levels for the mission to meet minimum science requirements.
  - JAXA has formally requested assistance from NASA to address vibration issue. The Project is working to identify best path to accommodate JAXA request within ITAR restrictions.

- Instrument Manager (IM) Cynthia Simmons has been reassigned to another project as of March 18, 2013. Deputy IM Jim Pontius has taken over as IM.

- SMD Program Management Council released remaining UFE to project in response to changing JAXA schedule.

- Later this calendar year, the SMD Program Management Council will review the overall cost impacts of the new JAXA schedule.
Program Update – Euclid

• First ESA engineering-phase detectors completed March 22.
  - First Test results reported out April 17.
• Yield from recent JWST detectors produced by Teledyne has been very high.
  - Mitigates concerns about yield for Euclid detectors.
• Program Level Requirements Appendix (PLRA) in review.
• ESA/JPL Technical Assistance Agreement (TAA) signed.

Upcoming key dates:
• Systems Requirements Review at JPL for NASA contribution April 10.
• ESA engineering-phase Test Readiness Review at Teledyne April 17.
• PDR at JPL June 12-13.
• KDP-C at SMD July 23.
Antarctic Campaign 2012-2013
See separate presentation by Vernon Jones

**Super-TIGER** (R. Binns, WUSL)

**BLAST** (M. Devlin, U Penn)

**EBEX** (S. Hanany, U Minn)
The E and B Experiment, measure the intensity and polarization of the cosmic microwave background. Launched Dec 28, 2012; landed Jan 23, 2013.
Sounding Rocket Program: Wallops Flight Facility and White Sands Missile Range (WSMR) safety organizations have agreed to new flight rules to maximize range safety should a Black Brant combustion instability occur. SMD launches back on WSMR manifest for April.

- Sequestration impacts at DOD reduce launch opportunities at WSMR (1 day/week closure & no weekends).

Research Range:

-- Antares Support

- Next milestones are the A-ONE test launch (April 17 @ 5 pm) and the first ORB-D1 demonstration with CYGNUS (June).
# FY 2013 Sounding Rocket Schedule

## Approx. 45 missions are in progress

### WALLOPS ISLAND

<table>
<thead>
<tr>
<th>#</th>
<th>Vehicle Type</th>
<th>Veh. No.</th>
<th>Experimenter</th>
<th>FY 2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Terrier Orion</td>
<td>41.107 GT</td>
<td>lithium Test WEST/NASA-GSFC-WFF</td>
<td>Oct ▲ Nov ▲ Dec ▲</td>
</tr>
<tr>
<td>2</td>
<td>Black Brant XII</td>
<td>40.030 UG</td>
<td>CIDER-DOCK/CAL TECH</td>
<td>Oct ▲</td>
</tr>
<tr>
<td>3</td>
<td>Terrier Orion</td>
<td>41.106 UO</td>
<td>RockOn-KOELER/UNIV. OF COLORADO</td>
<td>Oct ▲</td>
</tr>
<tr>
<td>4</td>
<td>Black Brant V</td>
<td>21.140 GE</td>
<td>Daytime Dynamo-PFAF/NASA-GSFC</td>
<td>Oct ▲</td>
</tr>
<tr>
<td>5</td>
<td>Terrier Orion</td>
<td>41.090 GE</td>
<td>Daytime Dynamo-PFAF/NASA-GSFC</td>
<td>Oct ▲</td>
</tr>
<tr>
<td>6</td>
<td>Terrier Imp. Malemute</td>
<td>46.006 GT</td>
<td>Test-ROSAVARA/NASA-GSFC-WFF</td>
<td>Oct ▲</td>
</tr>
<tr>
<td>7</td>
<td>Terrier Imp. Malemute</td>
<td>46.005 UO</td>
<td>RockSat-KOELER/UNIV. OF COLORADO</td>
<td>Oct ▲</td>
</tr>
</tbody>
</table>

### WSMR

<table>
<thead>
<tr>
<th>#</th>
<th>Vehicle Type</th>
<th>Veh. No.</th>
<th>Experimenter</th>
<th>FY 2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>Black Brant IX</td>
<td>36.255 US</td>
<td>FOXSI-KRUCKER/UC BERKELEY</td>
<td>Oct ▲</td>
</tr>
<tr>
<td>9</td>
<td>Black Brant IX</td>
<td>36.260 UG</td>
<td>IMAGER-COOK/BOSTON UNIVERSITY</td>
<td>Oct ▲</td>
</tr>
<tr>
<td>10</td>
<td>Black Brant IX</td>
<td>36.283 UH</td>
<td>DUL-GALLEAZZI/UNIV. OF MIA</td>
<td>Oct ▲</td>
</tr>
<tr>
<td>11</td>
<td>Black Brant IX</td>
<td>36.268 UG</td>
<td>FORTIS-MCCANDLJ-HU</td>
<td>Oct ▲</td>
</tr>
<tr>
<td>12</td>
<td>Black Brant IX</td>
<td>36.271 UG</td>
<td>SLICE-FRANCE/UNIV. OF COLORADO</td>
<td>Oct ▲</td>
</tr>
<tr>
<td>13</td>
<td>Terrier Orion</td>
<td>41.104 GT</td>
<td>Test-ROSAVARA/NASA-GSFC-WFF</td>
<td>Oct ▲</td>
</tr>
<tr>
<td>14</td>
<td>Black Brant IX</td>
<td>36.253 US</td>
<td>RAISE-HASSLER/SWRI</td>
<td>Oct ▲</td>
</tr>
<tr>
<td>15</td>
<td>Black Brant IX</td>
<td>36.235 US</td>
<td>HYPER-HARRIS/UNIV. OF CALIFORNIA/DAVIS</td>
<td>Oct ▲</td>
</tr>
<tr>
<td>16</td>
<td>Black Brant IX</td>
<td>36.269 GS</td>
<td>EUNIS-RABIN/NASA-GSFC</td>
<td>Oct ▲</td>
</tr>
<tr>
<td>17</td>
<td>Black Brant IX</td>
<td>36.245 UH</td>
<td>Micro-X-FIGUERO/UC</td>
<td>Oct ▲</td>
</tr>
<tr>
<td>18</td>
<td>Black Brant IX</td>
<td>36.239 DS</td>
<td>VERIS-KORENDYKE/NRL</td>
<td>Oct ▲</td>
</tr>
</tbody>
</table>

### BACK UP WSMR MISSIONS

<table>
<thead>
<tr>
<th>#</th>
<th>Vehicle Type</th>
<th>Veh. No.</th>
<th>Experimenter</th>
<th>FY 2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>19</td>
<td>Black Brant IX</td>
<td>36.289 US</td>
<td>DFS-JUDGE/UC</td>
<td>Oct ▲</td>
</tr>
<tr>
<td>20</td>
<td>Black Brant IX</td>
<td>36.262 UG</td>
<td>ACCESS-KAERJ-HU</td>
<td>Oct ▲</td>
</tr>
<tr>
<td>21</td>
<td>Black Brant IX</td>
<td>36.282 US</td>
<td>MOSES-KANDELBO/MONTANA ST. UNIV</td>
<td>Oct ▲</td>
</tr>
</tbody>
</table>

### Talos Terrier Oriole Nihka

<table>
<thead>
<tr>
<th>#</th>
<th>Vehicle Type</th>
<th>Veh. No.</th>
<th>Experimenter</th>
<th>FY 2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>22</td>
<td>Talos Terrier Oriole Nihka</td>
<td>49.001UE</td>
<td>VISIONS ROWLAND/NASA-GSFC</td>
<td>Oct ▲</td>
</tr>
</tbody>
</table>

### KWAJALEIN

<table>
<thead>
<tr>
<th>#</th>
<th>Vehicle Type</th>
<th>Veh. No.</th>
<th>Experimenter</th>
<th>FY 2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>23</td>
<td>Terrier Malemute</td>
<td>46.001 UE</td>
<td>EVEX-KUDEKI/UNIVERSITY OF ILLINOIS</td>
<td>Oct ▲</td>
</tr>
<tr>
<td>24</td>
<td>Terrier Oriole</td>
<td>45.005 UE</td>
<td>EVEX-KUDEKI/UNIVERSITY OF ILLINOIS</td>
<td>Oct ▲</td>
</tr>
</tbody>
</table>

### REIMBURSABLE MISSIONS

<table>
<thead>
<tr>
<th>#</th>
<th>Vehicle Type</th>
<th>Veh. No.</th>
<th>Experimenter</th>
<th>FY 2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td>Terrier Orion</td>
<td>41.100 DR</td>
<td>MOSC-CATON/USAF</td>
<td>Oct ▲</td>
</tr>
<tr>
<td>26</td>
<td>Terrier Orion</td>
<td>41.102 DR</td>
<td>MOSC-CATON/USAF</td>
<td>Oct ▲</td>
</tr>
</tbody>
</table>

### Where: Green indicates Astrophysics launches and Blue indicates Heliophysics launches.
All three subcontracts have now been signed (motor case, insulation/closure/exit cone, and propellant casting)
- The cast vendor has begun ordering propellant materials
- The Preliminary Manufacturing Review has been completed with the insulation vendor
- The case vendor has procured the mandrel material and is beginning the machining process

The Marshall Safety and Quality Assurance Group has drafted a Quality Plan for the Peregrine program

Kick-off meetings with the PI’s for the first & second Peregrine secondary experiments (funded by partner Space Technology Program) were conducted last week. The three experiment groups are from GRC, ARC, and JPL.

Fin and tail-can designs nearing completion and preparation of manufacturing drawings is underway.

Project remains on schedule and within budget
# Astrophysics Mission Events

<table>
<thead>
<tr>
<th>CY</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
<th>Last Update: 04-10-2013</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mission Launches etc.</strong></td>
<td>Apr 5</td>
<td>Ship Fit</td>
<td>TBD 2014</td>
<td>TBD 2015</td>
</tr>
<tr>
<td></td>
<td>Explorer11</td>
<td>CSI to JAXA</td>
<td>ISS CREAM</td>
<td>Astro-H</td>
</tr>
<tr>
<td></td>
<td>Downselect</td>
<td>Astro-H</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## Suborbital Rocket Program

<table>
<thead>
<tr>
<th>Year</th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>Jun</th>
<th>Jul</th>
<th>Aug</th>
<th>Sep</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013</td>
<td>XACT1</td>
<td>ACCESS1</td>
<td>ACCESS1</td>
<td>ACCESS2</td>
<td>ACCESS2</td>
<td>ACCESS2</td>
<td>ACCESS2</td>
<td>ACCESS2</td>
<td>ACCESS2</td>
<td>ACCESS2</td>
<td>ACCESS2</td>
<td></td>
</tr>
<tr>
<td>2014</td>
<td>D/J</td>
<td>D/J</td>
<td>D/J</td>
<td>D/J</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## Balloon Campaigns

<table>
<thead>
<tr>
<th>Location</th>
<th>Year</th>
<th>Mission</th>
</tr>
</thead>
<tbody>
<tr>
<td>Antarctica</td>
<td>D/J</td>
<td>Supertiger, BLAST, EBEX</td>
</tr>
<tr>
<td>Sweden</td>
<td>M/J</td>
<td>Superpressure</td>
</tr>
<tr>
<td>Ft. Sumner (spr)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Palestine</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ft. Sumner (fall)</td>
<td></td>
<td>X-Caliber, HEROES</td>
</tr>
<tr>
<td>Australia</td>
<td></td>
<td></td>
</tr>
<tr>
<td>New Zealand</td>
<td></td>
<td>M/A</td>
</tr>
</tbody>
</table>

## Timeline

- **2015 CY**: TBD 2015
- **2014 CY**: TBD 2014
- **2013 CY**: TBD 2013
## Astrophysics - Missions in Formulation & Implementation

<table>
<thead>
<tr>
<th>Project</th>
<th>Overall previous months</th>
<th>March 2013</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>-4</td>
<td>-3</td>
<td>-2</td>
</tr>
<tr>
<td>Physics of the Cosmos</td>
<td>G</td>
<td>G</td>
<td>G</td>
</tr>
<tr>
<td>Astrophysics Explorer</td>
<td>G</td>
<td>G</td>
<td>G</td>
</tr>
<tr>
<td>TESS, NICER</td>
<td>G</td>
<td>G</td>
<td>G</td>
</tr>
<tr>
<td>Cosmic Origins</td>
<td>G</td>
<td>G</td>
<td>G</td>
</tr>
<tr>
<td>SOFIA (ongoing)</td>
<td>Y/</td>
<td>G</td>
<td>Y/</td>
</tr>
<tr>
<td>Balloon Prog (ongoing)</td>
<td>G</td>
<td>G</td>
<td>G</td>
</tr>
</tbody>
</table>

O: Overall,  C: Cost,  S: Schedule,  T: Technical,  P: Programmatic

- **G**: On plan, adequate margin
- **Y**: Problems, working to resolve within planned margin
- **R**: Problems, not enough margin to recover
<table>
<thead>
<tr>
<th>Mission</th>
<th>Launch</th>
<th>End Date</th>
<th>Phase</th>
<th>-4</th>
<th>-3</th>
<th>-2</th>
<th>-1</th>
<th>this mon</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hubble</td>
<td>1990-04-24</td>
<td>2016-09-30</td>
<td>Prime</td>
<td>G</td>
<td>G</td>
<td>G</td>
<td>G</td>
<td>G</td>
<td>Cycle 21 GO Call had a 6:1 oversubscription rate.</td>
</tr>
<tr>
<td>Chandra</td>
<td>1999-07-23</td>
<td>2016-09-30</td>
<td>Ext</td>
<td>G</td>
<td>G</td>
<td>G</td>
<td>G</td>
<td>G</td>
<td>Cycle 15 GO Call had a 5.2:1 oversubscription rate.</td>
</tr>
<tr>
<td>XMM-Newton</td>
<td>1999-12-10</td>
<td>2015-03-31</td>
<td>Ext</td>
<td>G</td>
<td>G</td>
<td>G</td>
<td>G</td>
<td>G</td>
<td></td>
</tr>
<tr>
<td>GALEX</td>
<td>2003-04-28</td>
<td>2012-02-07</td>
<td>Ext</td>
<td>S</td>
<td>S</td>
<td>S</td>
<td>S</td>
<td>S</td>
<td>GALEX on loan to Caltech since May 2012 and returned to NASA in mid-April. Decommissioning to take place NLT April 30.</td>
</tr>
<tr>
<td>Spitzer</td>
<td>2003-08-25</td>
<td>2014-09-30</td>
<td>Ext</td>
<td>G</td>
<td>G</td>
<td>G</td>
<td>G</td>
<td>G</td>
<td></td>
</tr>
<tr>
<td>Suzaku</td>
<td>2005-07-10</td>
<td>2015-03-31</td>
<td>Ext</td>
<td>G</td>
<td>G</td>
<td>G</td>
<td>G</td>
<td>G</td>
<td></td>
</tr>
<tr>
<td>Fermi</td>
<td>2008-06-11</td>
<td>2016-09-30</td>
<td>Prime</td>
<td>G</td>
<td>G</td>
<td>G</td>
<td>G</td>
<td>G</td>
<td></td>
</tr>
<tr>
<td>Kepler</td>
<td>2009-03-07</td>
<td>2016-09-30</td>
<td>Ext</td>
<td>Y</td>
<td>Y</td>
<td>R</td>
<td>Y</td>
<td>Y</td>
<td>Science collection continues, but elevated friction persists with elevated friction spikes.</td>
</tr>
<tr>
<td>Herschel</td>
<td>2009-05-14</td>
<td>2013-05-14</td>
<td>Prime</td>
<td>G</td>
<td>G</td>
<td>G</td>
<td>G</td>
<td>G</td>
<td>Helium is projected to run out in early April 2013.</td>
</tr>
<tr>
<td>NuSTAR</td>
<td>2012-06-13</td>
<td>2014-08-01</td>
<td>Prime</td>
<td>G</td>
<td>G</td>
<td>G</td>
<td>G</td>
<td>G</td>
<td>Malindi ground station now being backed up by KSAT Singapore ground station. No nighttime Malindi passes.</td>
</tr>
</tbody>
</table>

Note: End dates beyond 2014 are pending approval in the 2014 Senior Review process.
AFTA WFIRST DRM Status

- SDT Report due Apr 30, HQ presentation Apr 19.
- SIP presentation May 30.
- CATE due May 31.
  - If AFTA study is continued following SIP decision, SDT will continue leading up to CAA and mid-decadal reviews.
- Master Equipment Lists (MELs) as well as development schedules are being updated in preparation for submission.
  - Spacecraft MEL is completed.
  - The Payload and Wide field Instrument MELs are near completion.
- Spacecraft modeling and design continues.
- Wide Field Instrument tasks are on track.
  - Design near completion.
  - Working requirements flowdown, packaging and detailed design parameters.
  - The IFU optical design is complete and has been folded into the overall design.
- The JPL Telescope team working tasks.
  - Developed study configuration and I&T flow.
  - Schedule, cost, and master equipment lists remain in work.
- The JPL Coronagraph team tasks are on track.
  - The final study configuration has been wrapped up and an associated cost estimate is in work.
  - A technology development plan, in response to the HQ Programmatic guidance, is currently in process.
AFTA WFIRST Wide Field Instrument

1.8m (72"")

WFC3
Discover new worlds transiting the nearest and brightest stars

- **All-sky survey** of transiting extrasolar planets
- **Monitor >500,000 main-sequence stars**, focus on dwarfs of types F5 to M5.
- **Discover more than 2,000 new planets**, approximately 300 of which are expected to fall in Earth ($R_p \leq 1.25 \ R_E$) and super-Earth ($R_p \leq 2.0 \ R_E$) categories.
- **Provide the target list for JWST** future follow-up observations and future exoplanet characterization missions

**Instrument**: Four WFOV CCD cameras with overlapping FOV of 23x90deg mounted in a common lens hood. Passively-cooled 600-1000nm 4096x4096 pixel FPA

See separate presentation by George Ricker
**Mission**: X-ray spectrometer on ISS/ExPRESS Logistics Carrier (ELC) to study neutron stars

**Instruments**: 56 grazing-incidence X-ray concentrators w/matching silicon drift detectors at -55 C. Photon counting rotation-resolved spectroscopy & timing, 0.2-12 keV

**Neutron Star Interior Composition ExploreR**

Resolving the nature of matter at the threshold of collapse to a black hole

- Answer fundamental questions about **extremes in gravity, material density, and electromagnetism**.
- High resolution (5%-10%) mass and radius measurements will resolve competing models of neutron star interiors.
- ISS enables rapid response to Target of Opportunity triggers to uncover the origins of the dynamic X-ray sky.

NICER plumbs unexplored depths in time resolution, spectral resolution, and sensitivity.

See separate presentation by Keith Gendreau
Astrophysics Roadmap

• The NASA Astrophysics Roadmap is under development by a task force of the APS during 2013
• 23 member Team with broad expertise and visionary thinkers
• Schedule:
  - Virtual Town Hall workshop: Planned for May 6-7
  - One more face-to-face meeting planned in June
  - High-level themes ready for approval by APS by August 30, 2013
  - Final report ready for approval by APS with public release by December 16, 2013
• Roadmap team is inviting the astrophysics community to submit ideas for science & technology challenges
  - Abstracts received March 25, 2013.
  - 106 abstracts with 80 Science Challenges and 26 Technology Challenges.

See separate presentation by Chryssa Kouveliotou
Current Location on the Budget Cycle

Graphic courtesy of Kevin Marvel (AAS)
Current Location on the Budget Cycle

- **FY12** Reporting
- **FY13** Planning and executing simultaneously
  - A full year budget has been passed by Congress and signed by the President
  - The budget includes a 1.8% rescission and a 5% sequester to be applied to the appropriated funds
  - An operating plan must be submitted to Congress outlining how NASA will apply the reductions within FY13
- **FY14** Planning
  - A FY14 budget request has been submitted by the President to Congress
  - NASA is adjusting its plans to execute the president’s budget request
- **FY15** Formulating
  - The FY15 NASA budget formulation process leads to the President’s FY15 budget request to Congress in February 2014
    - Early May: Projects, programs, Centers report to HQ
    - June: Astrophysics Division reports to SMD
    - Summer: SMD reports to Agency
    - Fall: Agency reports to OMB
    - February: President submits request to Congress
FY13 Appropriation

- Congress appropriated $659M for Astrophysics and $628M for JWST
  - Astrophysics appropriation is $10M over FY13 PBR, earmarked for WFIRST
  - JWST appropriation is what was requested
- Rescission (~1.8%), Sequester (~5%), and other budget adjustments will result in an FY13 Astrophysics budget significantly lower
  - Exact amounts applied to Astrophysics are not public until the operating plan has been submitted to Congress and agreed upon
  - Estimating the reduction at 6.8% is a ROM estimate to astrophysical accuracy
- Astrophysics will take reductions in the following areas first
  - Reduce carry-over for operating missions, includes rephasing of GO funds
  - Rephase unneeded FY13 reserves for developing missions
  - Rephase R&A funding until FY14 for some PIs, reduced selections
  - Slow down development of future Explorers
- Impacts will include
  - Lowered R&A selection rates in 2013 (for FY14 funding)
  - Delays in future Explorer AOs
  - Other reductions in FY14 where funding requirements were deferred
FY 2014 SMD Program/Budget Strategy

• Provide the most productive Earth & space science program for the available resources
  – Guided by national priorities
  – Informed by NRC Decadal Surveys recommendations
  – Incorporating new ideas and partnerships
  – Increase cross-directorate collaboration on strategic projects (Mars 2020, NEOs)

• Responsibly manage the national investment in robotic space missions, with adherence to NPD 7120
  – Confirm new missions only after sufficient technology maturation and budgets at an appropriate confidence level
  – Take aggressive steps with missions that do not stay within budget
  – Aggressively manage JWST to the cost and schedule baseline

• Increase efforts to detect and study NEOs in support of future agency initiatives

• Begin Mars 2020 mission to build on Curiosity’s discoveries

• Plan for land imaging capability beyond LDCM, Climate Sensors (previously on JPSS-2), and DSCOVR Earth observing instruments

• Implement the Administration’s proposed STEM initiative
## Science Budget Request Summary

<table>
<thead>
<tr>
<th></th>
<th>FY2012</th>
<th>FY2013</th>
<th>FY2014</th>
<th>FY2015</th>
<th>FY2016</th>
<th>FY2017</th>
<th>FY2018</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Science Total</strong></td>
<td>5073.7</td>
<td>5115.9</td>
<td>5017.8</td>
<td>5017.8</td>
<td>5017.8</td>
<td>5017.8</td>
<td>5017.8</td>
</tr>
<tr>
<td><strong>Earth Science</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Earth Science Research</td>
<td>1760.5</td>
<td>1846.1</td>
<td>1854.6</td>
<td>1848.9</td>
<td>1836.9</td>
<td>1838.1</td>
<td></td>
</tr>
<tr>
<td>Earth Systematic Missions</td>
<td>879.9</td>
<td>787.5</td>
<td>811.2</td>
<td>861.9</td>
<td>839.1</td>
<td>833.3</td>
<td></td>
</tr>
<tr>
<td>Earth System Science Pathfinder</td>
<td>183.3</td>
<td>353.6</td>
<td>293.1</td>
<td>232.2</td>
<td>237.4</td>
<td>250.0</td>
<td></td>
</tr>
<tr>
<td>Earth Science Multi-Mission Operations</td>
<td>168.6</td>
<td>171.7</td>
<td>174.3</td>
<td>177.9</td>
<td>179.0</td>
<td>182.0</td>
<td></td>
</tr>
<tr>
<td>Earth Science Technology</td>
<td>51.2</td>
<td>55.1</td>
<td>56.2</td>
<td>55.1</td>
<td>56.1</td>
<td>56.1</td>
<td></td>
</tr>
<tr>
<td>Applied Sciences</td>
<td>36.4</td>
<td>35.0</td>
<td>36.7</td>
<td>38.4</td>
<td>40.1</td>
<td>40.1</td>
<td></td>
</tr>
<tr>
<td><strong>Planetary Science</strong></td>
<td>1501.4</td>
<td>1217.5</td>
<td>1214.8</td>
<td>1225.3</td>
<td>1254.5</td>
<td>1253.0</td>
<td></td>
</tr>
<tr>
<td>Planetary Science Research</td>
<td>174.1</td>
<td>220.6</td>
<td>233.3</td>
<td>229.1</td>
<td>230.4</td>
<td>232.2</td>
<td></td>
</tr>
<tr>
<td>Lunar Quest Program</td>
<td>139.9</td>
<td>17.7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Discovery</td>
<td>172.6</td>
<td>257.9</td>
<td>268.2</td>
<td>242.3</td>
<td>187.5</td>
<td>215.0</td>
<td></td>
</tr>
<tr>
<td>New Frontiers</td>
<td>143.7</td>
<td>257.5</td>
<td>297.2</td>
<td>266.5</td>
<td>151.0</td>
<td>126.2</td>
<td></td>
</tr>
<tr>
<td>Mars Exploration</td>
<td>587.0</td>
<td>234.0</td>
<td>227.7</td>
<td>318.4</td>
<td>504.7</td>
<td>513.2</td>
<td></td>
</tr>
<tr>
<td>Outer Planets</td>
<td>122.1</td>
<td>79.0</td>
<td>45.6</td>
<td>24.4</td>
<td>26.4</td>
<td>26.4</td>
<td></td>
</tr>
<tr>
<td>Technology</td>
<td>161.9</td>
<td>150.9</td>
<td>142.8</td>
<td>144.7</td>
<td>154.4</td>
<td>140.0</td>
<td></td>
</tr>
<tr>
<td><strong>Astrophysics</strong></td>
<td>648.4</td>
<td>642.3</td>
<td>670.0</td>
<td>686.8</td>
<td>692.7</td>
<td>727.1</td>
<td></td>
</tr>
<tr>
<td>Astrophysics Research</td>
<td>165.5</td>
<td>147.6</td>
<td>170.6</td>
<td>192.3</td>
<td>207.2</td>
<td>218.5</td>
<td></td>
</tr>
<tr>
<td>Cosmic Origins</td>
<td>239.9</td>
<td>228.0</td>
<td>216.5</td>
<td>193.1</td>
<td>196.7</td>
<td>194.1</td>
<td></td>
</tr>
<tr>
<td>Physics of the Cosmos</td>
<td>108.3</td>
<td>110.4</td>
<td>107.5</td>
<td>100.0</td>
<td>82.8</td>
<td>86.4</td>
<td></td>
</tr>
<tr>
<td>Exoplanet Exploration</td>
<td>50.8</td>
<td>55.4</td>
<td>59.4</td>
<td>57.7</td>
<td>60.7</td>
<td>90.7</td>
<td></td>
</tr>
<tr>
<td>Astrophysics Explorer</td>
<td>83.9</td>
<td>100.9</td>
<td>116.0</td>
<td>143.8</td>
<td>145.3</td>
<td>137.4</td>
<td></td>
</tr>
<tr>
<td><strong>James Webb Space Telescope</strong></td>
<td>518.6</td>
<td>658.2</td>
<td>645.4</td>
<td>620.0</td>
<td>569.4</td>
<td>534.9</td>
<td></td>
</tr>
<tr>
<td><strong>Heliophysics</strong></td>
<td>644.8</td>
<td>653.7</td>
<td>633.1</td>
<td>636.8</td>
<td>664.3</td>
<td>664.6</td>
<td></td>
</tr>
<tr>
<td>Heliophysics Research</td>
<td>166.7</td>
<td>195.7</td>
<td>163.0</td>
<td>167.5</td>
<td>172.1</td>
<td>174.1</td>
<td></td>
</tr>
<tr>
<td>Living with a Star</td>
<td>196.3</td>
<td>216.2</td>
<td>277.7</td>
<td>332.6</td>
<td>353.9</td>
<td>374.4</td>
<td></td>
</tr>
<tr>
<td>Solar Terrestrial Probes</td>
<td>216.0</td>
<td>146.6</td>
<td>68.7</td>
<td>48.9</td>
<td>50.1</td>
<td>27.9</td>
<td></td>
</tr>
<tr>
<td>Heliophysics Explorer Program</td>
<td>65.8</td>
<td>95.2</td>
<td>123.7</td>
<td>87.9</td>
<td>88.2</td>
<td>88.2</td>
<td></td>
</tr>
</tbody>
</table>

FY 2015-FY 2018 estimates are notional

* FY2013 reflects pre-appropriation “annualized CR” rate; pending Operating Plan will be less than $4.8B after rescissions and sequestration
FY12 and FY14 Budgets (excluding JWST)

FY12 $648.4M

- Astrophysics Research
- Cosmic Origins
- Physics of the Cosmos
- Exoplanet Exploration
- Astrophysics Explorer

FY14 $642.3M

- No GEMS
- Start TESS, NICER
- No SMD E/PO
- Add Euclid
- Reduced Fermi
- Herschel rampdown
Astrophysics Budget Features

What’s changed (since the President’s FY13 budget request)
- A new Explorer mission (TESS) and a new Explorer Mission of Opportunity (NICER) downselected for development leading to flight
- New Euclid project created in PCOS program to fund hardware procurement and US science team
- Spitzer, Planck, Chandra, Fermi, XMM, Kepler, Swift, and Suzaku extended per the recommendation of the 2012 Senior Review
- Efficiencies in Fermi mission operations implemented in FY14, ahead of schedule and resulting in a significant reduction of operating costs, and the Fermi GO program canceled for one year (FY14)
- Budget does not support selections for the 2012 Astrophysics Explorer Mission of Opportunity AO
- 30% reduction to COR/PCOS program office budget (commensurate with reduced scope and content)
- Rebalancing of SR&T in all programs to implement Decadal Survey recommendations

What’s the same
- JWST funded to maintain progress toward 2018 launch
- Hubble, SOFIA, NuSTAR, Astro-H, ST-7, Balloons, R&A, Archives
- Budget for large decadal survey mission begins to grow in FY17
FY14 Budget Request for Astrophysics

- **Reduction in Fermi Budget**
  - In response to the recommendations of the 2012 Senior Review, reductions were planned for the Fermi Gamma-ray Space Telescope to take advantage of operational efficiencies. These reductions were planned to be phased in over three years.
  - The FY14 PBR requests less funding for Fermi than planned. The savings from operational efficiencies will need to be realized immediately (in FY14).
  - In addition, due to a need to realize additional savings in FY14 that exceed those attainable through operational efficiencies alone, the Fermi Guest Observers program will be eliminated for one year (FY14).
  - NASA is working with DOE and its international partners on Fermi to make the necessary changes in Fermi operations.
FY14 Budget Request for Astrophysics

• Reduction in Astrophysics Explorer Budget
  - The Astrophysics Explorer Program continues to support missions in development and missions in operation. We continue to implement a science rich program including the recent selections of TESS and NICER.
  - The pace of how we implement the program, however, will have to be adjusted to stay within the funding profile requested for the Astrophysics Explorer Program in the President’s FY14 budget request.
  - The President’s FY14 budget request for the Astrophysics Explorer Program does not support the selection of an astrophysics mission of opportunity from the 2012 Astrophysics Explorer Mission of Opportunity AO.
  - We will complete the evaluation of the proposals, but will not make a selection. Once the evaluation of proposals is completed, we will put on hold any further selection activities for this AO.
• Future Explorer AOs
  - The future Astrophysics Explorer schedule must be revisited following the selections of TESS and NICER, the FY13 reductions due to the rescission and sequester, the FY14 budget request, and the elimination of selections from the 2012 MO AO.
  - There will be no Astrophysics Explorer SMEX AO in CY 2013.
  - The next Astrophysics Explorer AO will be for a SMEX and a MO. It will be in the 2014/2015 time period (NET 2014).
  - The following Astrophysics Explorer AO will be for a EX and a MO. It may be in the 2016/2017 time period (NET 2016).
FY14 Budget Request for Astrophysics

• Impacts to R&A
  - Unable to realize additional planned growth plus new requirements (e.g. TCAN) within existing budget
  - Reduced selection rates in ATP 2012 for FY13 funding
  - Reduced overall selection rates in 2013 for FY14 funding

See separate presentation by Linda Sparke
NASA Astrophysics Budget:
FY07-FY13 Appropriated, FY14 Proposed, FY15-FY18 Notional
(FY13 estimated awaiting op plan)
Flagship Missions vs Astrophysics Budget

Pre-2004 is not full-cost
Astrophysics Programs (w/out JWST)

Astrophysics Budget (w/out JWST) in $K
FY10-FY12 Actuals; FY13 Estimate; FY14 Request; FY15-FY18 Notional
Astrophysics Budget (w/out JWST) in $K
FY10-FY12 Actuals; FY13 Estimate; FY14 Request; FY15-FY18 Notional

- Strategic Missions (development and operations)
- Explorer Missions (development and operations)
- SR&T (technology, mission studies, decadal survey mission)
- Other / Support (archives, balloons, telescopes, senior review, management)
- Research Funding (from bottom up): R&A, GO, Postdoc Fellowships
- SMD Admin
### Astro2010 Decadal Report Status - Response

<table>
<thead>
<tr>
<th>Program Scale</th>
<th>Recommendation</th>
<th>Current Response FY14</th>
</tr>
</thead>
<tbody>
<tr>
<td>Large</td>
<td>WFIRST</td>
<td>DRM1 and DRM2 completed in FY12; AFTA DRM completed in FY13; detector technology development begun in FY13; continued pre-formulation and technology development in FY14; decision regarding new start in FY15</td>
</tr>
<tr>
<td>Large</td>
<td>Explorer</td>
<td>Impacted by sequester and budget reductions; EX AO in 2010; SMEX AO in 2014/2015; EX AO in 2016/2017; each AO has a mission and a MO</td>
</tr>
<tr>
<td>Large</td>
<td>LISA Technology</td>
<td>CST completed in FY12; technology supported through SAT; ST-7/LPF supported; will pursue partnership with ESA if a GW mission is selected for L2/L3 mission</td>
</tr>
<tr>
<td>Large</td>
<td>IXO Technology</td>
<td>CST completed in FY12; technology supported through SAT; X-ray probe SDT planned for 2013; will pursue partnership with ESA if an X-ray mission is selected for L2/L3 mission</td>
</tr>
<tr>
<td>Medium</td>
<td>New Worlds Technology</td>
<td>Technology supported through TDEM/SAT; SDTs started in FY13; AFTA coronagraph study in FY13; will consider partnership with ESA if an exoplanet mission is selected for L2/L3 mission; working with STMD on early-stage technology</td>
</tr>
<tr>
<td>Medium</td>
<td>Inflation Probe Technology</td>
<td>Technology supported through APRA including multiple suborbital payloads; will consider partnership with ESA if a CMB mission is selected for L2/L3 mission</td>
</tr>
<tr>
<td>Small</td>
<td>Astrophysics Theory Program Augmentation</td>
<td>Impacted by budget reductions</td>
</tr>
<tr>
<td>Small</td>
<td>(Definition of) a future UV-optical space capability</td>
<td>RFI in FY12; technology supported through APRA, SAT, and working with STMD</td>
</tr>
<tr>
<td>Small</td>
<td>Intermediate Technology Development Augmentation</td>
<td>SAT program initiated and funded for prioritized investments</td>
</tr>
<tr>
<td>Small</td>
<td>Laboratory Astrophysics Augmentation</td>
<td>Augmentation started in FY12 including selection of large consortium; impacted by budget reductions</td>
</tr>
<tr>
<td>Small</td>
<td>SPICA mission (U.S. contributions to JAXA-led)</td>
<td>Candidate for future Explorer Mission of Opportunity</td>
</tr>
<tr>
<td>Small</td>
<td>Suborbital Program Augmentation</td>
<td>Technology augmentation for balloon program; continued development of ULDB balloon platforms; ISS payload selections; future is impacted by budget reductions</td>
</tr>
<tr>
<td>Small</td>
<td>Theory and Computation Networks (NASA, NSF, DOE)</td>
<td>First NASA-NSF call in 2013 for FY14 funding</td>
</tr>
<tr>
<td>N/A</td>
<td>Additional core program augmentations</td>
<td>Impacted by budget reductions</td>
</tr>
</tbody>
</table>
Spring 2013: Continue AFTA study pending Administrator’s approval

Identified SDT studies:
- Versions of WFIRST (2012)
- Exoplanet probe(s) (2013)
- X-ray probe (2013 TBC)

Spring 2014: Interim SDT reports to NASA and CAA

Winter 2015: Final SDT reports to NASA and CAA; CATE on each

Spring 2015: NRC study of all SDT reports resulting in a NRC letter report

ESA’s L2/L3 process

Astrophysics Implementation Plan (CY2012)  |  Astrophysics Roadmap (CY2013)

Directed Technology investments for prime candidate

Technology Investments through SAT for prioritization  |  Technology Investments through SAT for 2020 Decadal Survey

Continuing advice from the Committee on Astronomy and Astrophysics on decadal survey implementation

Herschel cryogen depleted April ??

Herschel (ESA, UK, Netherlands)

Planck (ASI, CNES, UK, ESA)

Kepler

Fermi (DOE, Intl team)

Suzaku (JAXA)

Swift (ASI, UK)

Spitzer

GALEX (South Korea) May 2012- April 2013, Will decommission by the end of April 2013.

XMM-Newton (ESA)

Chandra (SRON)

Hubble (ESA)
Backup
SMD Organization

Associate Administrator (AA) (John Grunsfeld)
Deputy AA (Chuck Gay)

- Deputy AA for Programs (Mike Luther)
- Deputy AA for Mgt (Roy Maizel)
- Deputy AA for Research (M. Allen)

Chief Scientist (Vacant)
Strategic & Intl Planning Director (Marc Allen)

Resource Management Division
Dir. (C. Tupper)
Dep. (K. Wolf)

Strategic Integration & Management Division
Dir. (D. Woods)
Dep. (J. Feeley)

Earth Science Division
Dir. (M. Freilich)
Dep. (M. Luce)
  - Flight (S. Volz)
  - Applied Sciences (L. Friedl)
  - Research (J. Kaye)
  - Technology (GSFC) (G. Komar)

Joint Agency Satellite Division
Dir. (M. Watkins)
Dep. (Vacant)

Heliophysics Division
Dir. (V. Elsbernd - Act)
Dep. (V. Elsbernd)

Planetary Science Division
Dir. (J. Green)
Dep. (D. Schurr)

Astrophysics Division
Dir. (P. Hertz)
Dep. (A. Razzaghi)

JWST Program Office
Dir. (Geoff Yoder)*
Dep. (E. Smith)

Embeds/PQC's
  - Chief Engineer (T. Hyde)
  - Safety & Msn Assurance (P. Martin)
  - General Counsel (V. Salgado)
  - Legislative & Intergvt Affairs (S. Valley)
  - Public Affairs (D. Brown)
  - Intl & Interagency Relations (K. Feldstein)

* Direct report to NASA Associate Administrator
** Co-located from the Front Office

April 2013
Astrophysics Division Organization Chart

**Director**
Paul Hertz

**Deputy Director**
Andrea Razzaghi

**Lead Secretary**
Leslie Allen (acting)

**Secretary**
Christie Ashley *

**Program Support Specialist**
Sheila Gorham

**Cross Cutting**

- **Technology Lead**
  William (Billy) Lightsey *

- **Strategic Integration**
  Joan CENTRELLA *

- **Division E/PO POC**
  Hashima Hasan (Lead Comm Team)

- **Division PAO POC**
  Lisa Wainio *

- **Information Manager**
  Lisa Wainio *

**Astrophysics Research**

- **Program Manager**
  Linda Sparke

- **Astrophysics Data Analysis**
  Doug Hudgins, Debra Wallace

- **Astrophysics Theory**
  Linda Sparke

- **Origins of Solar Systems**
  Larry Petro *

  APRA lead: Michael Garcia *

- **Cosmic Rays, Fundamental Physics**
  Joan CENTRELLA *
  Vernon Jones, Keith MacGregor *

- **Gamma Ray/X-ray**
  Michael Garcia *,
  Lou Kaluzienski, Wilt Sanders *

- **Optical/Ultraviolet**
  Michael Garcia, Richard Griffiths, Hashima Hasan,
  Mario Perez *, Larry Petro *

- **IR/Submillimeter/Radio**
  Richard Griffiths, Doug Hudgins, Larry Petro,
  Glenn Wahlgren *

  Lab Astro: Glenn Wahlgren *

  Data Archives: Hashima Hasan

- **Astrophysics POC for Sounding Rockets**
  Wilt Sanders *

  Balloons Program: Vernon Jones (PS), Mark Sistilli (PE)

**Programs / Missions**

**Exoplanet Exploration (EXEP)**
- **LEADS**
  Doug Hudgins

  Hashima Hasan

  **Program Scientist**
  Tony Carro *

  **Program Executive**
  Mario Perez *

**Keck**
- **LEADS**
  Hashima Hasan

  **Program Scientist**
  Doug Hudgins

  **Program Executive**
  Tony Carro *

**Kepler**
- **LEADS**
  Hashima Hasan

  **Program Scientist**
  Doug Hudgins

  **Program Executive**
  Mario Perez *

**LBTI**
- **LEADS**
  Hashima Hasan

  **Program Scientist**
  Doug Hudgins

  **Program Executive**
  Mario Perez *

**NExScI**
- **LEADS**
  Hashima Hasan

  **Program Scientist**
  Doug Hudgins

  **Program Executive**
  Mario Perez *

**Cosmic Origins (COR)**
- **LEADS**
  Michael Garcia *

  Glenn Wahlgren *

  **Program Scientist**
  Richard Griffiths *

  **Program Executive**
  John Gagosian

**Herschel**
- **LEADS**
  Glenn Wahlgren *

  **Program Scientist**
  Richard Griffiths *

  **Program Executive**
  John Gagosian

**Hubble**
- **LEADS**
  Richard Griffiths *

  **Program Scientist**
  Hashima Hasan

  **Program Executive**
  John Gagosian

**JWST**
- **LEADS**
  Joan CENTRELLA *

  **Program Scientist**
  Glenn Wahlgren *

  **Program Executive**
  N/A

**SOFIA**
- **LEADS**
  Glenn Wahlgren *

  **Program Scientist**
  Richard Griffiths *

  **Program Executive**
  John Gagosian

**Spitzer**
- **LEADS**
  Glenn Wahlgren *

  **Program Scientist**
  Richard Griffiths *

  **Program Executive**
  John Gagosian

**ST-7/LPF**
- **LEADS**
  Wilt Sanders *

  **Program Scientist**
  Joan CENTRELLA *

  **Program Executive**
  Anne-Marie Novo-Gradac

**XMM-Newton**
- **LEADS**
  Lou Kaluzienski

  **Program Scientist**
  Wilt Sanders *

  **Program Executive**
  Anne-Marie Novo-Gradac

**Physics of the Cosmos (PCOS)**
- **LEADS**
  Richard Griffiths *

  **Program Scientist**
  Wilt Sanders *

  **Program Executive**
  Lia LaPiana

**Chandra**
- **LEADS**
  Wilt Sanders *

  **Program Scientist**
  Michael Garcia *

  **Program Executive**
  Lia LaPiana

**Euclid**
- **LEADS**
  Richard Griffiths *

  **Program Scientist**
  Lou Kaluzienski

  **Program Executive**
  Lia LaPiana

**Fermi**
- **LEADS**
  Lou Kaluzienski

  **Program Scientist**
  Michael Garcia *

  **Program Executive**
  Lia LaPiana

**Planck**
- **LEADS**
  Joan CENTRELLA *

  **Program Scientist**
  Glenn Wahlgren *

  **Program Executive**
  Anne-Marie Novo-Gradac

**ST-7/LPF**
- **LEADS**
  Wilt Sanders *

  **Program Scientist**
  Joan CENTRELLA *

  **Program Executive**
  Anne-Marie Novo-Gradac

**Astrophysics Explorers (APEX)**
- **LEADS**
  Wilt Sanders *

  **Program Scientist**
  Anne-Marie Novo-Gradac

  **Program Executive**
  Anne-Marie Novo-Gradac

**Astro-H**
- **LEADS**
  Lou Kaluzienski

  **Program Scientist**
  Larry Petro *

  **Program Executive**
  Anne-Marie Novo-Gradac

**GALEX**
- **LEADS**
  Larry Petro *

  **Program Scientist**
  Lou Kaluzienski

  **Program Executive**
  Mark Sistilli

**NuSTAR**
- **LEADS**
  Lou Kaluzienski

  **Program Scientist**
  Lou Kaluzienski

  **Program Executive**
  Anne-Marie Novo-Gradac

**Suzaku**
- **LEADS**
  Lou Kaluzienski

  **Program Scientist**
  Lou Kaluzienski

  **Program Executive**
  Anne-Marie Novo-Gradac

**Swift**
- **LEADS**
  Michael Garcia *

  **Program Scientist**
  Hashima Hasan

  **Program Executive**
  Anne-Marie Novo-Gradac

**WISE**
- **LEADS**
  Hashima Hasan

  **Program Scientist**
  Doug Hudgins

  **Program Executive**
  Anne-Marie Novo-Gradac

February 11, 2013

Kelly Johnson on detail until Aug., 2013.
Rita Sambruna on detail until Sept. 2013

* Member of the Resources Mgmt Division
+ Detailee, IPA, or contractor

JWST now part of the JWST Program Office.
# Astrophysics Program Content

<table>
<thead>
<tr>
<th>Year</th>
<th>FY2012</th>
<th>FY2013</th>
<th>FY2014</th>
<th>FY2015</th>
<th>FY2016</th>
<th>FY2017</th>
<th>FY2018</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>FY15-18 estimates are notional</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Category</th>
<th>FY2012</th>
<th>FY2013</th>
<th>FY2014</th>
<th>FY2015</th>
<th>FY2016</th>
<th>FY2017</th>
<th>FY2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>Astrophysics</td>
<td>648.4</td>
<td>642.3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Astrophysics Research</td>
<td>165.5</td>
<td>147.6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Astrophysics Research and Analysis</td>
<td>68.6</td>
<td>65.7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Balloon Project</td>
<td>31.6</td>
<td>32.9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other Missions and Data Analysis</td>
<td>65.3</td>
<td>49.1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Keck Single Aperture</td>
<td>2.3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Astrophysics Data Analysis Program</td>
<td>16.4</td>
<td>17.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Astrophysics Data Curation and Archival</td>
<td>20.0</td>
<td>18.2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Astrophysics Senior Review</td>
<td></td>
<td></td>
<td></td>
<td>13.9</td>
<td>24.5</td>
<td>35.8</td>
<td>41.0</td>
</tr>
<tr>
<td>Education and Public Outreach</td>
<td>12.9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contract Administration, Audit &amp; QA Svcs</td>
<td>13.7</td>
<td>13.9</td>
<td></td>
<td>14.0</td>
<td>14.5</td>
<td>14.5</td>
<td>14.5</td>
</tr>
<tr>
<td>Astrophysics Directed R&amp;T</td>
<td></td>
<td></td>
<td></td>
<td>5.4</td>
<td>12.3</td>
<td>14.3</td>
<td>20.5</td>
</tr>
<tr>
<td>Cosmic Origins</td>
<td>239.9</td>
<td>228.0</td>
<td></td>
<td>216.5</td>
<td>193.1</td>
<td>196.7</td>
<td>194.1</td>
</tr>
<tr>
<td>Hubble Space Telescope (HST)</td>
<td>98.3</td>
<td>96.3</td>
<td></td>
<td>92.3</td>
<td>88.2</td>
<td>88.2</td>
<td>83.9</td>
</tr>
<tr>
<td>SOFIA</td>
<td>84.2</td>
<td>87.4</td>
<td></td>
<td>87.3</td>
<td>85.2</td>
<td>85.1</td>
<td>86.2</td>
</tr>
<tr>
<td>Other Missions And Data Analysis</td>
<td>57.4</td>
<td>44.3</td>
<td></td>
<td>36.9</td>
<td>19.7</td>
<td>23.4</td>
<td>24.0</td>
</tr>
<tr>
<td>Spitzer</td>
<td>17.8</td>
<td>16.3</td>
<td></td>
<td>14.2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Herschel</td>
<td>24.3</td>
<td>12.2</td>
<td></td>
<td>5.5</td>
<td>2.7</td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td>Cosmic Origins SR&amp;T</td>
<td>10.2</td>
<td>12.8</td>
<td></td>
<td>13.1</td>
<td>13.3</td>
<td>18.6</td>
<td>19.2</td>
</tr>
<tr>
<td>Cosmic Origins Future Missions</td>
<td>1.0</td>
<td>0.4</td>
<td></td>
<td>1.6</td>
<td>1.0</td>
<td>1.0</td>
<td>2.0</td>
</tr>
<tr>
<td>Cosmic Origins Program Management</td>
<td>4.1</td>
<td>2.6</td>
<td></td>
<td>2.6</td>
<td>2.7</td>
<td>2.8</td>
<td>2.9</td>
</tr>
</tbody>
</table>
## Astrophysics Program Content (cont’d)

<table>
<thead>
<tr>
<th></th>
<th>FY2012</th>
<th>FY2013</th>
<th>FY2014</th>
<th>FY2015</th>
<th>FY2016</th>
<th>FY2017</th>
<th>FY2018</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Physics of the Cosmos</strong></td>
<td>108.3</td>
<td>110.4</td>
<td></td>
<td>107.5</td>
<td>100.0</td>
<td>82.8</td>
<td>86.4</td>
</tr>
<tr>
<td>Euclid</td>
<td>1.0</td>
<td>15.1</td>
<td></td>
<td>9.3</td>
<td>3.7</td>
<td>4.0</td>
<td>5.0</td>
</tr>
<tr>
<td>Chandra X-Ray Observatory</td>
<td>56.4</td>
<td>55.0</td>
<td></td>
<td>55.8</td>
<td>55.4</td>
<td>55.6</td>
<td>55.6</td>
</tr>
<tr>
<td>Fermi Gamma-ray Space Telescope</td>
<td>25.3</td>
<td>14.3</td>
<td></td>
<td>18.6</td>
<td>20.7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Planck</td>
<td>7.1</td>
<td>6.2</td>
<td></td>
<td>4.1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>XMM-New ton</td>
<td>2.1</td>
<td>1.9</td>
<td></td>
<td>1.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physics of the Cosmos SR&amp;T</td>
<td>13.3</td>
<td>15.3</td>
<td>14.9</td>
<td>16.4</td>
<td>19.3</td>
<td>20.8</td>
<td></td>
</tr>
<tr>
<td>Physics of the Cosmos Program Mgmt</td>
<td>3.0</td>
<td>2.7</td>
<td>2.8</td>
<td>2.8</td>
<td>2.9</td>
<td>3.0</td>
<td></td>
</tr>
<tr>
<td>Physics of the Cosmos Future Missions</td>
<td>0.3</td>
<td></td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
<td>2.0</td>
<td></td>
</tr>
<tr>
<td><strong>Exoplanet Exploration</strong></td>
<td>50.8</td>
<td>55.4</td>
<td>59.4</td>
<td>57.7</td>
<td>60.7</td>
<td>90.7</td>
<td></td>
</tr>
<tr>
<td>Kepler</td>
<td>19.6</td>
<td>18.7</td>
<td>18.0</td>
<td>18.3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Large Binocular Telescope Interferometer</td>
<td>2.0</td>
<td>2.9</td>
<td>2.0</td>
<td>0.5</td>
<td>0.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Keck Operations</td>
<td>3.2</td>
<td>5.8</td>
<td>6.0</td>
<td>6.1</td>
<td>6.1</td>
<td>6.2</td>
<td></td>
</tr>
<tr>
<td>Keck Interferometer</td>
<td>0.4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exoplanet Exploration SR&amp;T</td>
<td>18.4</td>
<td>22.2</td>
<td>26.0</td>
<td>26.1</td>
<td>34.3</td>
<td>34.3</td>
<td></td>
</tr>
<tr>
<td>Exoplanet Exploration Program Mgmt</td>
<td>5.6</td>
<td>4.6</td>
<td>5.4</td>
<td>5.5</td>
<td>5.6</td>
<td>5.7</td>
<td></td>
</tr>
<tr>
<td>Exoplanet Exploration Future Missions</td>
<td>1.5</td>
<td>1.2</td>
<td>2.0</td>
<td>1.2</td>
<td>14.2</td>
<td>44.4</td>
<td></td>
</tr>
<tr>
<td>Project</td>
<td>FY2012</td>
<td>FY2013</td>
<td>FY2014</td>
<td>FY2015</td>
<td>FY2016</td>
<td>FY2017</td>
<td>FY2018</td>
</tr>
<tr>
<td>--------------------------------------------</td>
<td>--------</td>
<td>--------</td>
<td>--------</td>
<td>--------</td>
<td>--------</td>
<td>--------</td>
<td>--------</td>
</tr>
<tr>
<td>Astrophysics Explorer</td>
<td>83.9</td>
<td>100.9</td>
<td></td>
<td>116.0</td>
<td>143.8</td>
<td>145.3</td>
<td>137.4</td>
</tr>
<tr>
<td>Astro-H (SXS)</td>
<td>16.2</td>
<td>1.3</td>
<td>0.9</td>
<td>0.9</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Swift</td>
<td>4.3</td>
<td>4.8</td>
<td>5.0</td>
<td>5.1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wide-Field Infrared Survey Explorer</td>
<td>4.5</td>
<td>0.2</td>
<td>0.3</td>
<td>0.3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Suzaku (ASTRO-E II)</td>
<td>0.3</td>
<td>0.3</td>
<td>0.3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nuclear Spectroscopic Telescope Array</td>
<td>15.6</td>
<td>1.3</td>
<td>0.4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GALEX</td>
<td>0.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wilkinson Microwave Anistropy Probe</td>
<td>1.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gravity and Extreme Magnetism SMEX</td>
<td>33.2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Astrophysics Explorer Future Missions</td>
<td>2.7</td>
<td>86.0</td>
<td>105.8</td>
<td>130.9</td>
<td>137.9</td>
<td>133.4</td>
<td></td>
</tr>
<tr>
<td>Astrophysics Explorer Program Mgmt</td>
<td>5.6</td>
<td>7.0</td>
<td>3.5</td>
<td>6.8</td>
<td>7.4</td>
<td>4.0</td>
<td></td>
</tr>
</tbody>
</table>
## Astrophysics PAGs

### NASA Advisory Council (NAC)
- NASA / Charlie Bolden

### Science Committee
- SMD / John Grunsfeld

### Astrophysics Subcommittee
- Astrophysics / Paul Hertz

<table>
<thead>
<tr>
<th>COPAG</th>
<th>ExoPAG</th>
<th>PhysPAG</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>COPAG SAGs include:</strong></td>
<td><strong>ExoPAG SAGs include:</strong></td>
<td><strong>PhysPAG SAGs include:</strong></td>
</tr>
<tr>
<td>• Technologies for a 4m-8m UV/Optical mission</td>
<td>• Exoplanet flagship requirements and characteristics</td>
<td>• Gas Giant Planetary Analysis Group</td>
</tr>
<tr>
<td>• Technologies for an 8m-class segmented telescope UV/Optical mission with external occulter</td>
<td>• State of precision RV measurements for planetary census</td>
<td>• Grand Mission for a Study Analysis Group</td>
</tr>
<tr>
<td>• Technologies for a future far-IR mission</td>
<td>• Exoplanet probe requirements and characteristics</td>
<td>• Inflation Probe Study Analysis Group</td>
</tr>
<tr>
<td>• Science objectives and technology requirements for a series of Cosmic Origins Probes</td>
<td></td>
<td>• X-ray Study Analysis Group</td>
</tr>
</tbody>
</table>

*Table 2—Analysis Groups.* Structure of Program Analysis Groups (PAGs) and Study Analysis Groups (SAGs) reporting to the Astrophysics Subcommittee.
<table>
<thead>
<tr>
<th>NASA Advisory Council (NAC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Science Committee</td>
</tr>
<tr>
<td>Astrophysics Subcommittee</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>COPAG</th>
<th>ExoPAG</th>
<th>PhysPAG</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>COPAG SAGs include:</strong></td>
<td><strong>ExoPAG SAGs include:</strong></td>
<td><strong>PhysPAG SAGs include:</strong></td>
</tr>
<tr>
<td>- Science objectives for a 4m–8m UV/Optical mission</td>
<td>- Potential for exoplanet science measurements from solar system probes</td>
<td>- Cosmic Ray Study Analysis Group</td>
</tr>
<tr>
<td>- Technologies for a 4m-class monolithic telescope UV/Optical mission with internal coronagraph</td>
<td>- Planetary measurements needed for exoplanet characterization</td>
<td>- Gamma-ray Study Analysis Group</td>
</tr>
<tr>
<td>- Technologies for an 8m-class segmented telescope UV/Optical mission with external occulter</td>
<td>- Exoplanet flagship requirements and characteristics</td>
<td>- Gravitational Wave Study Analysis Group</td>
</tr>
<tr>
<td>- Technologies for a future far-IR mission</td>
<td>- State of precision RV measurements for planetary census</td>
<td>- Inflation Probe Study Analysis Group</td>
</tr>
<tr>
<td>- Science objectives and technology requirements for a series of Cosmic Origins Probes</td>
<td>- Exoplanet probe requirements and characteristics</td>
<td>- X-ray Study Analysis Group</td>
</tr>
</tbody>
</table>

**Table 2—Analysis Groups.** Structure of Program Analysis Groups (PAGs) and Study Analysis Groups (SAGs) reporting to the Astrophysics Subcommittee.
In June 2012, NASA announced that it had acquired the use of two sets of 2.4m space-qualified telescope optics systems and supporting components.

Although their most obvious applications are in astrophysics, NASA is interested in identifying possible uses for these systems to address a broader range of its science, exploration, and technology goals.

- In November 2012, NASA released an RFI soliciting broad community inputs focused on utilization of the telescope assets for Agency goals in space technology, human exploration and operations, heliophysics, planetary science, and astrophysics (excluding a wide field infrared survey).

- A workshop was held February 5-6, 2013, in Huntsville AL to provide a forum for concept presentation and discussion of innovative ideas.

- Astrophysics concepts included UV/Visible observatories, exoplanet observatories, solar system observatories, time domain observatory, deep imaging observatories, exo-ecliptic observatory, binocular observatory, balloon borne observatory, etc.

NASA will use all of the information gathered to formulate and evaluate future strategies for utilizing the assets to advance Agency goals.

- A final study report will contain the workshop briefings and the results of follow-on analyses. This report will be completed about May 2013 and publicly released thereafter.

http://science.nasa.gov/salso/