

# The NASA HQ Perspective

Presented at the  
**Suzaku User Group**

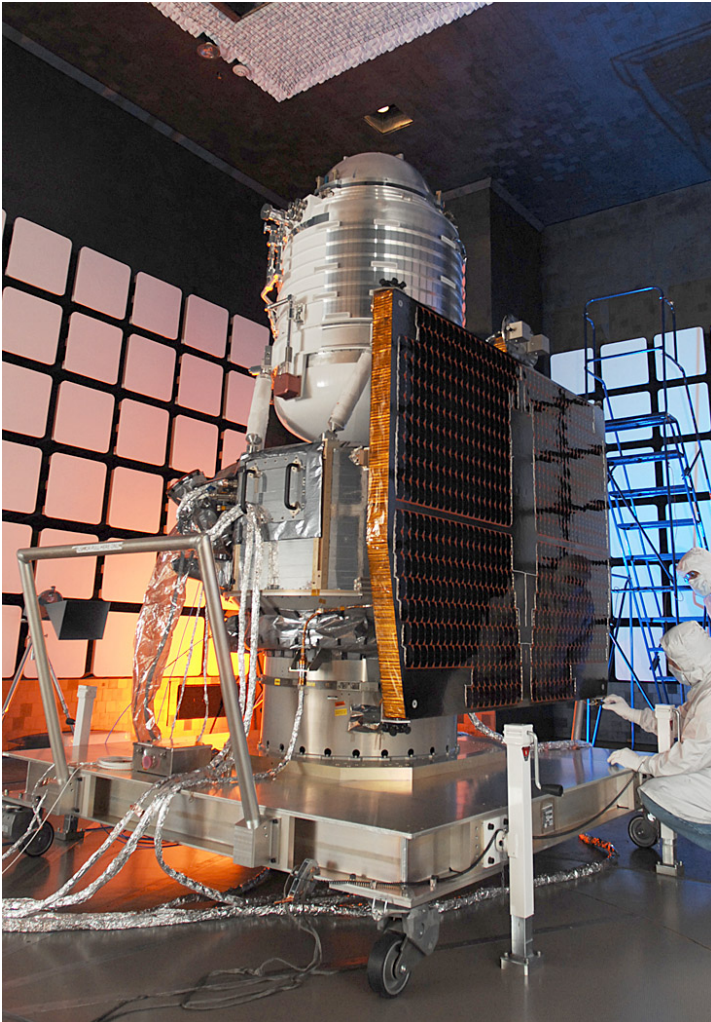
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Suzaku Program Scientist  
Astrophysics Division  
Science Mission Directorate  
NASA Headquarters  
September 21, 2009

# Herschel / Planck Launch May 14, 2009



The Herschel and Planck spacecraft launched on May 14, 2009, from the Guiana Space Centre in French Guiana. Image credit: ESA-CNES-Arianespace/Optique Vidéo du CSG

## Accomplishments and Significant Events



WISE just before shipping to VAFB

### WISE

- Passed Preship Review on Aug 4.
- **Flight System arrived at VAFB on Aug 14.**
- Launch date of Dec 7 approved by VAFB.
- Project is on track to support launch date.

### Hubble

- **Press conference Sept 9.**
- NICMOS successfully transitioned to operate mode on Aug 18. HST now has 5 working instruments..
- SMOV activities complete

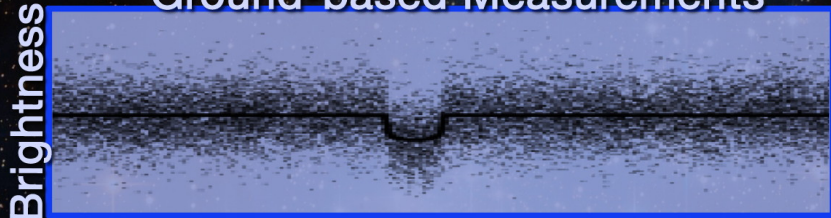
### Kepler

- **Press conference Aug 6.**
- Quality of light curves is very high, demonstrating capability to detect Earth-size planets.

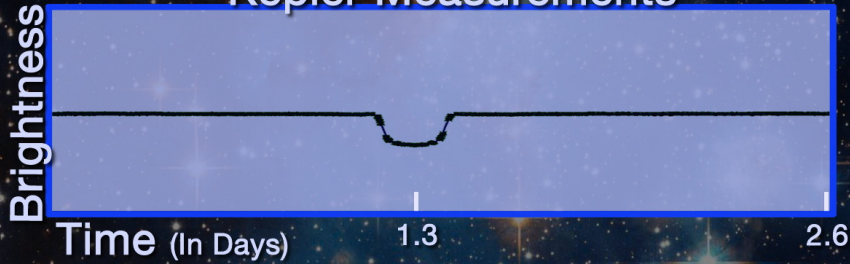
# Kepler Press Conference

## HAT-P-7 Light Curves

Ground-based Measurements

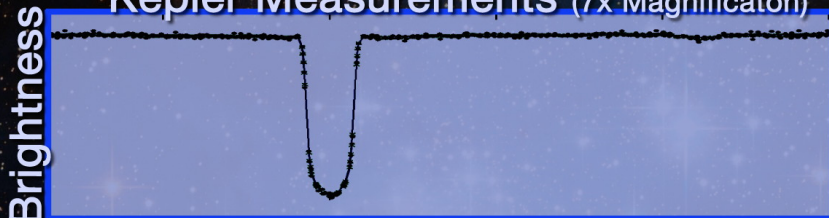


Kepler Measurements

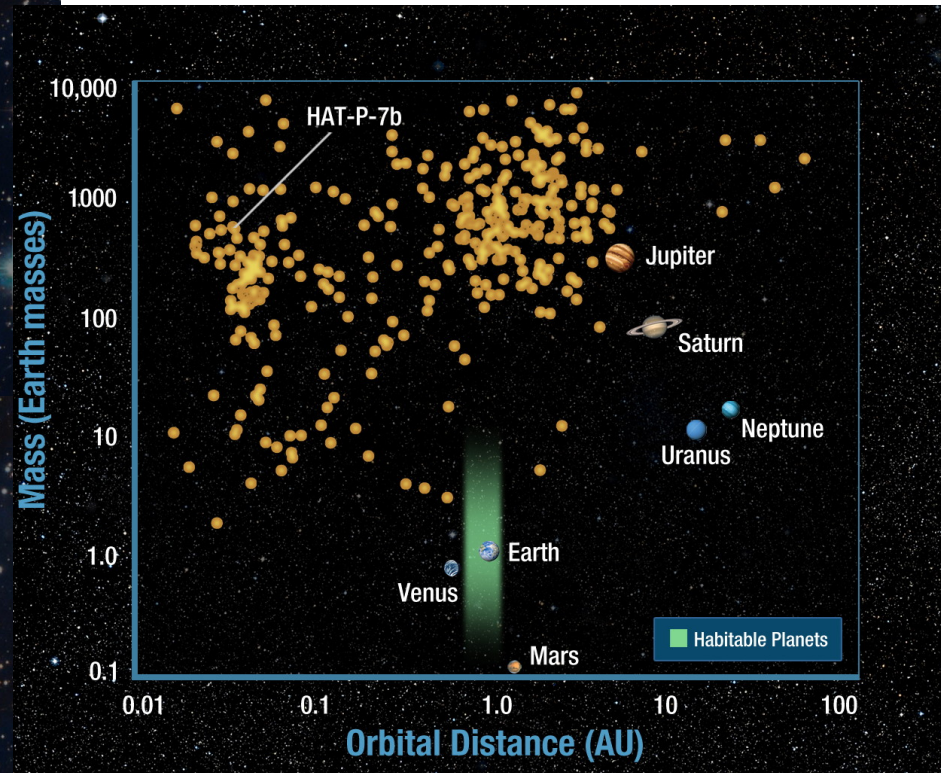


## HAT-P-7 Light Curves

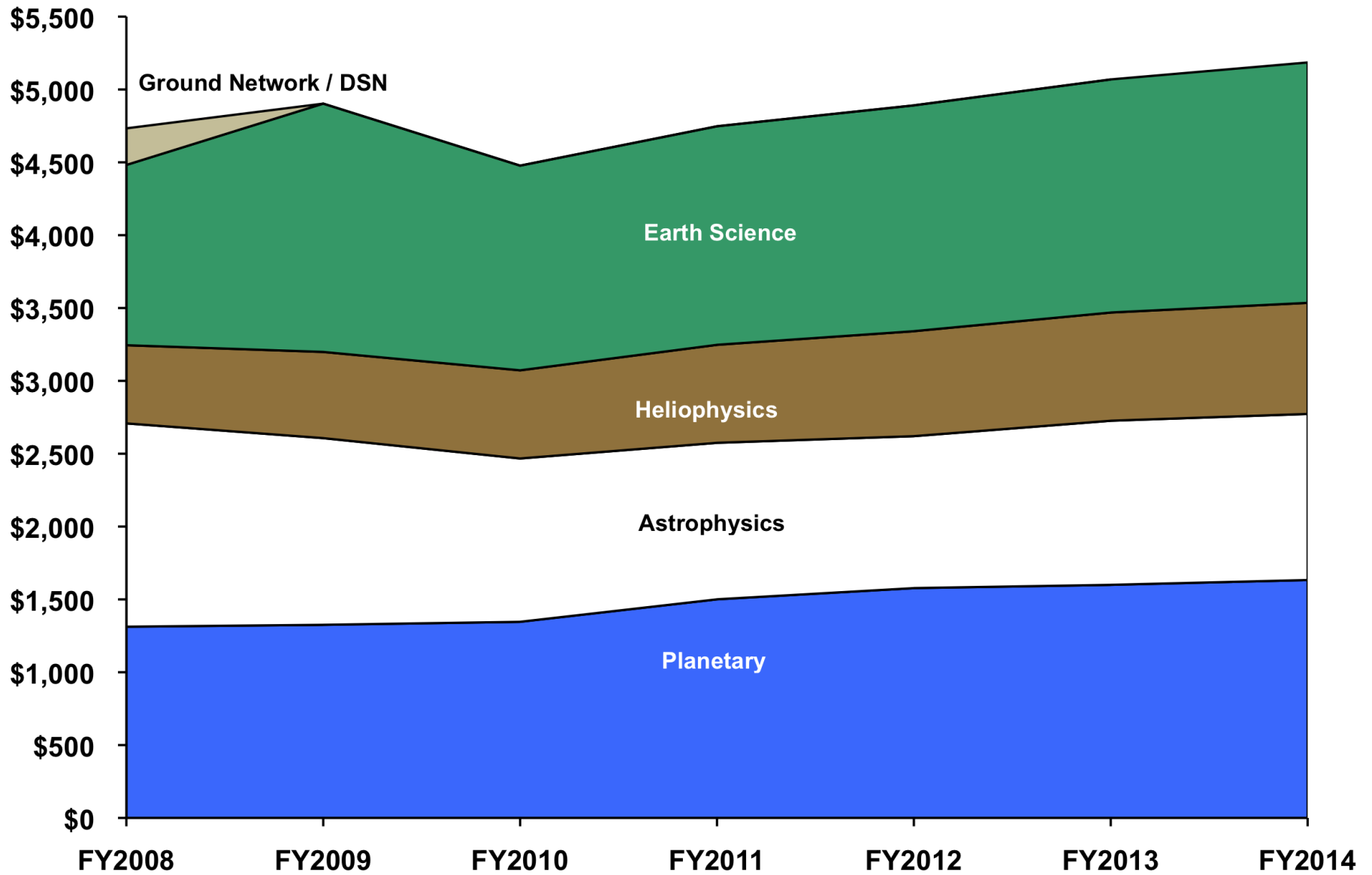
Kepler Measurements (7x Magnification)



Kepler Measurements (100x Magnification)



# SMD Budget by Science Theme



# Astrophysics Program Content

	FY09	FY10	FY11	FY12	FY13	FY14
<b>FY10 President Submit</b>	<b>1,281.3</b>	<b>1,120.9</b>	<b>1,074.1</b>	<b>1,042.8</b>	<b>1,126.3</b>	<b>1,139.6</b>
<b>Cosmic Origins</b>	<b>819.2</b>	<b>667.2</b>	<b>598.9</b>	<b>550.3</b>	<b>523.8</b>	<b>452.3</b>
James Webb Space Telescope	446.9	441.4	385.1	354.6	335.6	259.8
HST	207.7	112.6	101.6	94.6	91.1	93.2
SOFIA	72.8	72.8	74.0	75.8	77.6	79.1
Spitzer	71.7	27.1	23.9	8.2	0.3	
SR&T		5.2	6.7	9.6	11.5	12.5
Future Missions	20.0	8.1	7.6	7.5	7.7	7.7
<b>Physics of the Cosmos</b>	<b>128.3</b>	<b>147.7</b>	<b>188.5</b>	<b>213.9</b>	<b>291.4</b>	<b>330.3</b>
Fermi (GLAST)	13.2	22.2	23.0	23.8	24.0	24.5
Herschel / Planck	23.6	31.9	29.6	29.4	27.3	14.4
Chandra / GP-B / INTEGRAL / XMM	69.7	66.1	62.5	58.0	55.3	58.7
JDEM	8.5	6.4				
SR&T	2.8	4.9	7.2	9.2	11.2	12.5
LISA, Con-X, Future and Management	10.5	16.2	66.2	93.5	173.7	220.2
<b>Exoplanet Exploration</b>	<b>68.1</b>	<b>46.2</b>	<b>57.3</b>	<b>86.9</b>	<b>123.5</b>	<b>167.3</b>
Kepler	25.2	20.1	14.8	14.3	8.6	
SIM	20.0	2.0				
SR&T	11.0	13.3	12.7	14.2	15.5	15.9
Future Missions/Keck/LBTI/ Management	12.0	10.8	29.8	58.4	99.4	151.5
<b>Astrophysics Explorer</b>	<b>130.7</b>	<b>107.9</b>	<b>69.5</b>	<b>26.6</b>	<b>10.4</b>	<b>1.7</b>
WISE	65.2	13.0	5.2	1.6	0.2	
NuSTAR	38.7	59.5	33.7	6.8	6.4	
Astro-H / SXS	9.9	10.9	11.3	3.1	3.8	1.7
Operating Explorers	16.9	24.4	19.3	15.1		
<b>Astrophysics Research</b>	<b>135.0</b>	<b>151.9</b>	<b>160.0</b>	<b>165.0</b>	<b>177.2</b>	<b>188.0</b>
Research and Analysis	60.0	61.1	62.5	64.0	66.2	67.8
ADCAR / ADP / Senior Review	28.0	37.3	41.4	41.5	51.0	56.9
Balloons	24.6	26.7	28.8	32.4	33.2	35.8
SMD Administrative	22.4	26.9	27.2	27.0	26.9	27.5

# Astrophysics FY2010 President's Budget Request

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## What changed:

- JWST completed PDR/NAR and has entered the development phase; reflects 70% confidence level for budget and schedule (LRD 6/2014).
- Kepler and Herschel/Planck experienced launch delays to March and May 2009 due to external circumstances; Kepler launched successfully March 6, and H/P launched successfully May 14.
- HST SM4 delayed until May 2009 in order to restore redundancy to science instrument command and data handling unit. SM4 mission successfully completed.
- SOFIA open door flight tests delayed to summer 2009 and initial science observations now early 2010.
- Operating missions Senior Review results incorporated: extend GALEX, Swift and Spitzer-warm; ramp down XMM support (future ADP funding available through ROSES, like RXTE); maintain RXTE operation at minimum level until 2010 senior review; terminate NASA support for GP-B.
- The JDEM and Exoplanet mission AOs are on hold pending results of the Astro2010 decadal survey.
- Supporting research & technology lines established in each science area (COR, PCOS, ExEP); these support named fellowships (Hubble, Einstein, Sagan fellows), strategic GO opportunities (e.g., CSA/MOST), and mid-TRL technology development.

## What's the same:

- LISA, IXO (International X-ray Observatory, formerly Constellation-X and SIM/SIM Lite continue technology development pending results of 2010 decadal survey (JDEM now has the same posture).
- WISE LRD November 2009.
- NuSTAR LRD August 2011.
- Balloon flight opportunities continue at a rate of ~16-20 per year.
- R&A funding level.



XMM-Newton  
(ESA)

Swift

Suzaku (JAXA)

FERMI

INTEGRAL (ESA)

GALEX

RXTE

Herschel (ESA)

Planck (ESA)

WMAP

Hubble

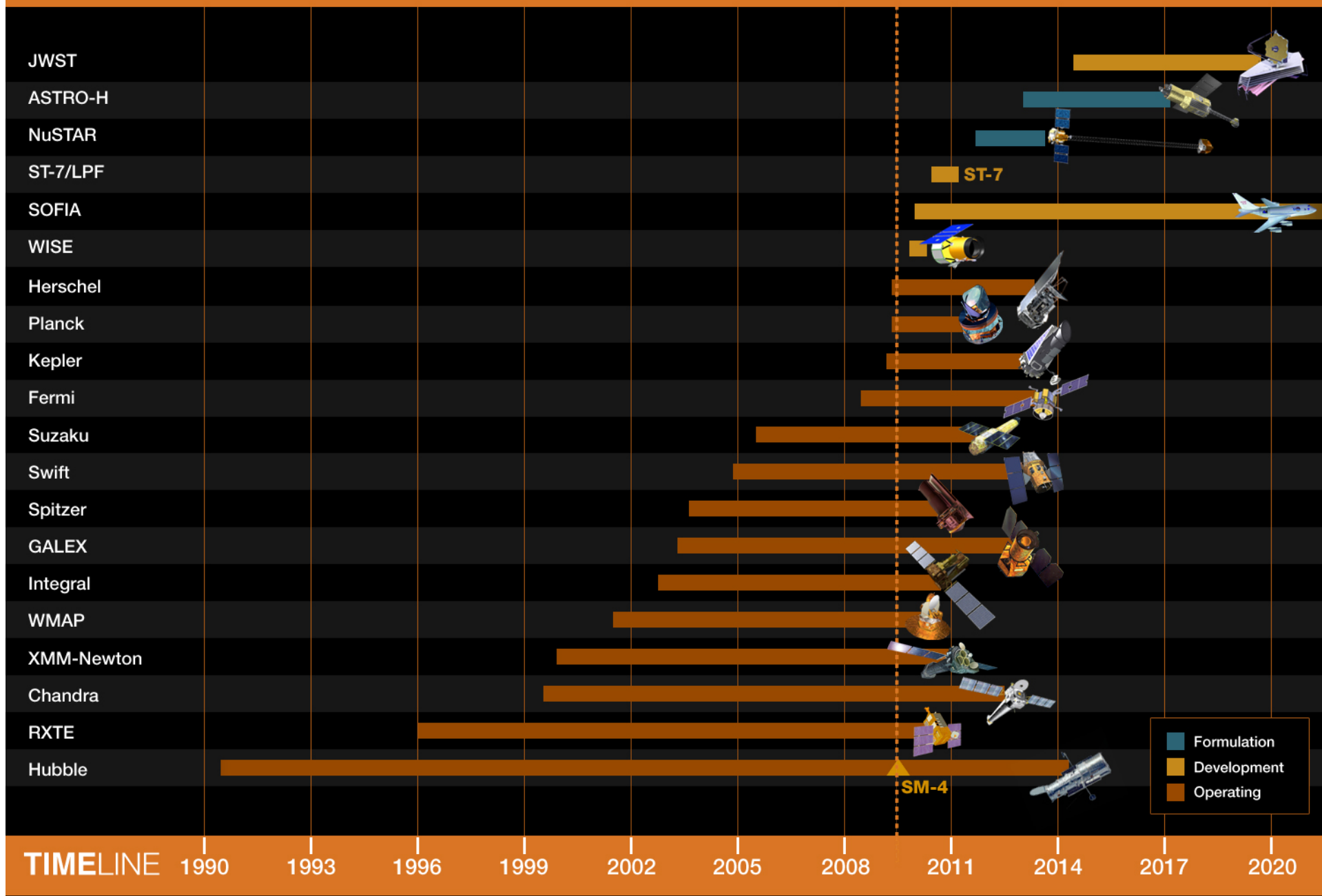
Kepler

Chandra

Spitzer



# Astrophysics Missions timeline



	CY2009	2010	2011	2012	2013
<b>Mission Launches etc.</b>	Mar 6 Kepler May 11 HST SM4 May 14 Herschel Planck Dec 7 WISE		Oct 26 SOFIA Early Sci	Aug NuSTAR	
<b>Suborbital Rocket Program.</b>	Feb CIBER #1 Jun DICE #1 Oct EXOS #1 Dec FUSP #1	Jan XQC #4 Feb BER #2 Mar URE #1 Jul PICT-#1 FOR-TIS #1	Oct FIRE #1 Nov FUSP #2 Dec EX-Oscro #2 Jan Mi-XGER #1 Jan IMA-#1 Feb FOR-#2 Mar ACC-TIS #1 Sep EX-OS #3 Sep ACC-#2	Jan XA-CT #1 Mar EX-OS #4 Mar ACC-#3 Apr XQC-#5 Sep XA-CT #2 Sep ACC-#4	
<b>Balloon Campaigns</b>	Antarctica (CREAM, ANITA, superpressure dev) D/J Sweden (AESOP, LEE, superpressure dev) M/J Ft. Sumner (spr) (EBEX, NCT, FIREBall, CREST) A/M/J Palestine Ft. Sumner (fall) (PROTOEXIST, STO, HASP) S/O Australia	(CREAM V, SPB Test) D/J (TIGRE, FIREBall, NCT, HERO, INFOCUS, SPB Test) M/A	(CREAM V, SPB Test) D/J (TIGRE, FIREBall, NCT, HERO, INFOCUS, SPB Test) M/A	(CREAM V, SPB Test) D/J (TIGRE, FIREBall, NCT, HERO, INFOCUS, SPB Test) M/A	(CREAM V, SPB Test) D/J (TIGRE, FIREBall, NCT, HERO, INFOCUS, SPB Test) M/A
<b>Opportunities</b>		TBD Explorer AO TBD JDEM AO TBD Exoplanet AO			

Last Updated: September 18, 2009

**Legend**  
 Purple - Mission with International lead  
 \* Student Opportunity balloon flight

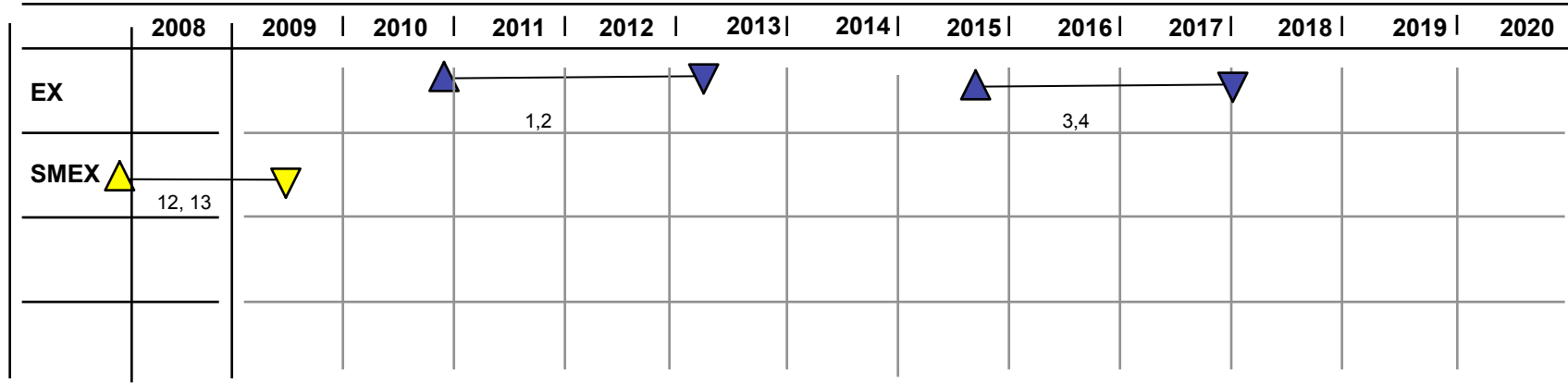
# SMEX Selections

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- Two **Small Explorer (SMEX)** missions downselected from six previously in study phase -- one in Astrophysics, one in Heliophysics:
  - Astrophysics SMEX: “The Gravity and Extreme Magnetism SMEX” (GEMS)
    - X-ray polarimetry of SMBH inner accretion disks (GR), magnetars, and supernova shock acceleration using a time projection chamber.
    - PI: Jean Swank, Goddard Space Flight Center.
    - Launch date 2014.
  - Astrophysics **Mission of Opportunity** investigation selected:
    - High Resolution Soft X-ray Spectrometer (SXS) for JAXA’s Astro-H
    - PI: Richard Kelly, Goddard Space Flight Center
- Upcoming call is planned for SPICA instrument concept studies ( $\leq 3$ ) which could form the basis for future NASA/JAXA discussions. Contingent upon Decadal Survey recommendations and interagency agreement, a later AO would be issued for science investigations and flight hardware.

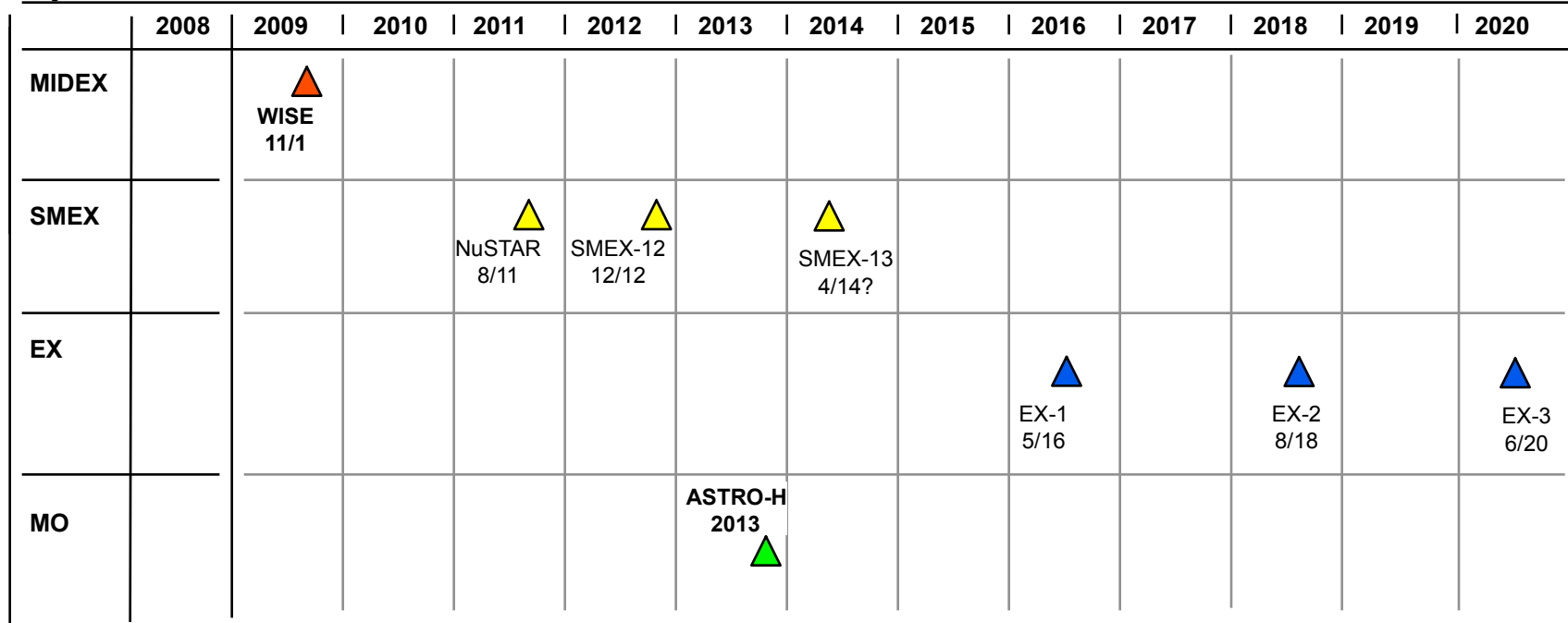
# Explorers Tentative Schedule

## Projected Announcements of Opportunity



▲ = Issued    ▼ = Selected

## Projected Launch Schedule



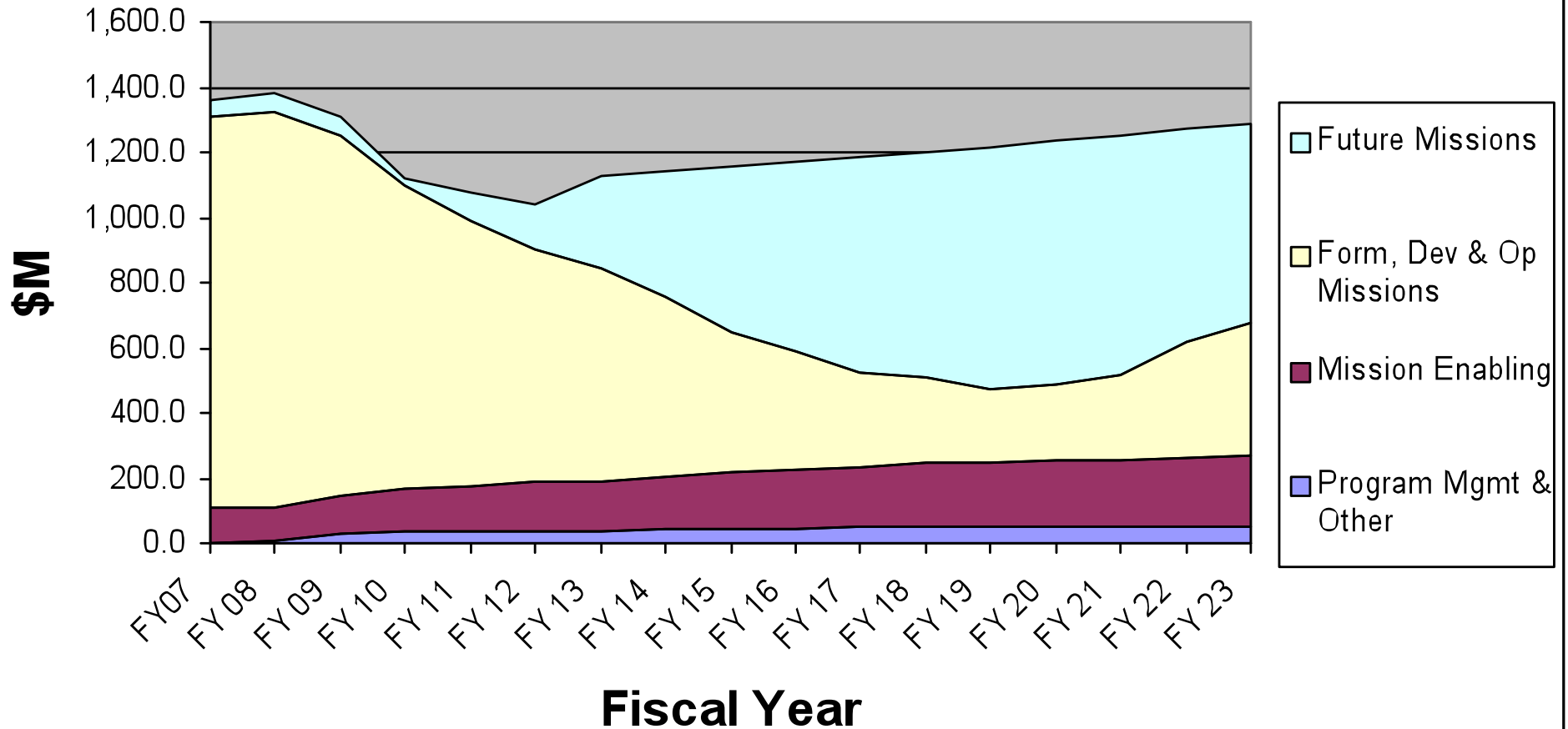
•NOTE: Chart represent approximate dates for EX missions depending on budget, access to space, SMEX selection, which are subject to change

# Astronomy & Astrophysics Decadal Survey

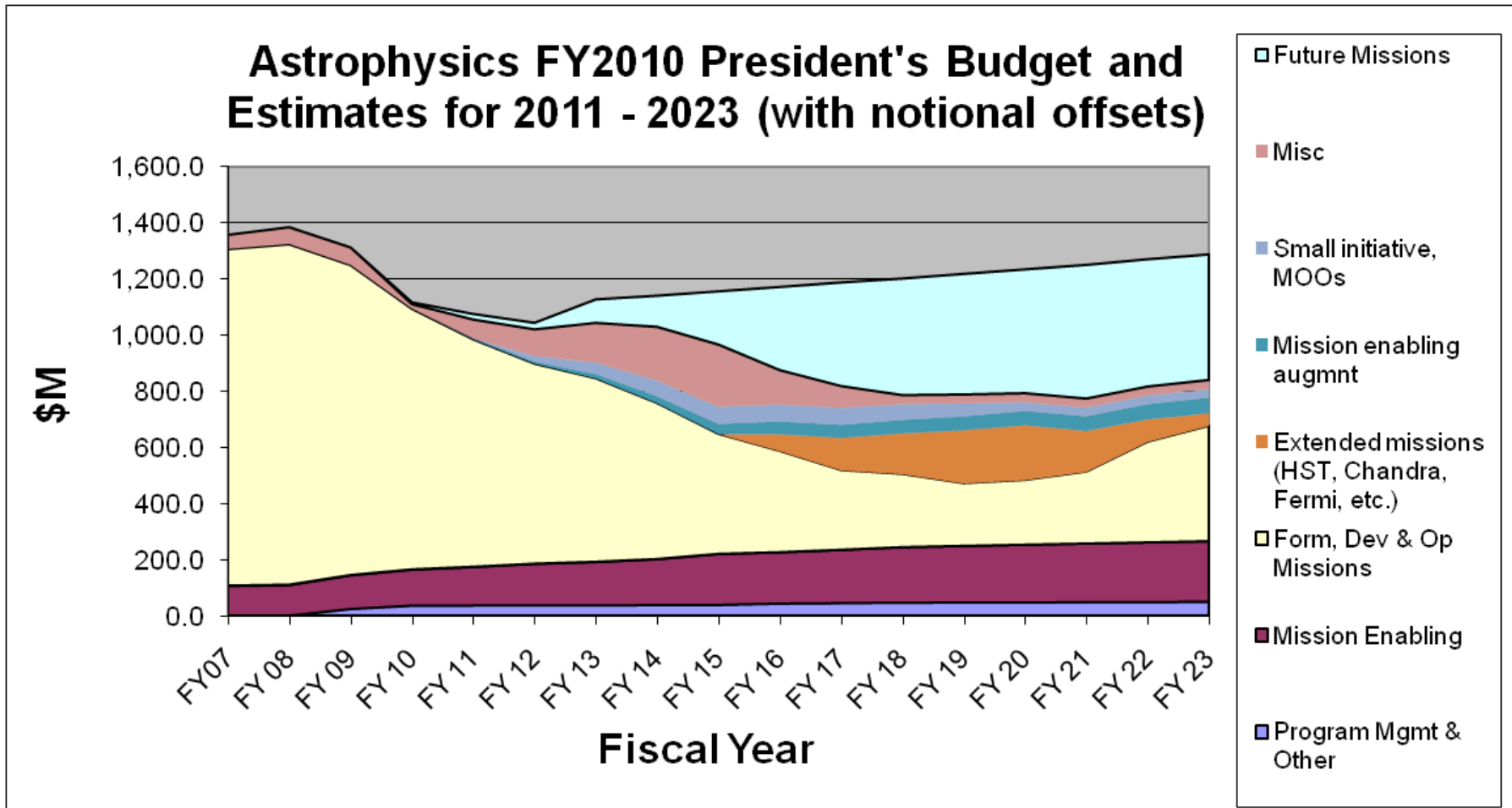
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- NRC Decadal Survey now well underway, Roger Blandford (Stanford U.) is Chair. Nearly 160 scientists involved.
  - Five Science Frontiers Panels
  - Four Program Prioritization Panels
  - Six Infrastructure Study Groups
- Eighteen Town Halls have taken place around the country.
- Nearly 600 community responses to Astro2010 solicitations.
- New science priorities for the next decade and beyond.
- Division is working diligently with the Survey to provide information and support mission inputs.
  - PPPs met during June 8-11
- Independent cost estimation should result in better estimates for medium and large strategic missions.
- Final Report targeted for release Summer 2010.
- ***[http://www7.nationalacademies.org/bpa/BPA\\_049810](http://www7.nationalacademies.org/bpa/BPA_049810)***

## Astrophysics FY2010 President's Budget and Estimates for 2011 - 2023



- Assumed operating missions beyond 2016 include JWST, SOFIA
- HST De-orbit mission development ramps up ~2020
- “Future Missions” wedge would be used for new mission initiatives, R&A/technology augmentations, extended missions, etc.
- The amount of “Future Missions” funding available between 2013 – 2020 is ~\$4B



- Assumed operating missions beyond 2016 include JWST, SOFIA; plus HST, Chandra, Fermi, etc. (e.g., Astro-H)
- HST De-orbit mission development ramps up ~2020
- “Future Missions” wedge is for strategic missions recommended by the Astro2010 decadal survey
- The amount of “Future Missions” funding available between 2013 – 2020 is ~\$2.3B

# *Backup*

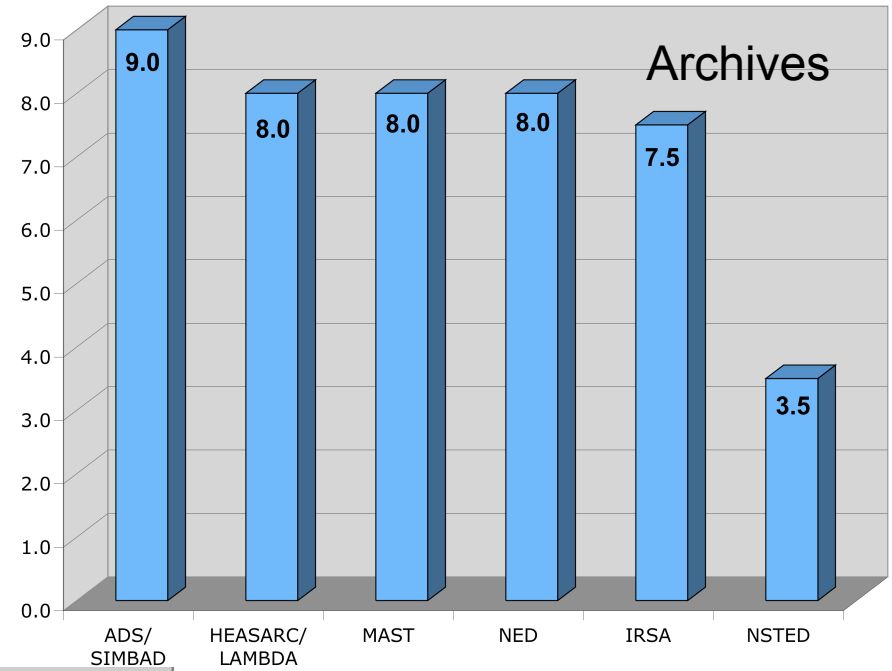
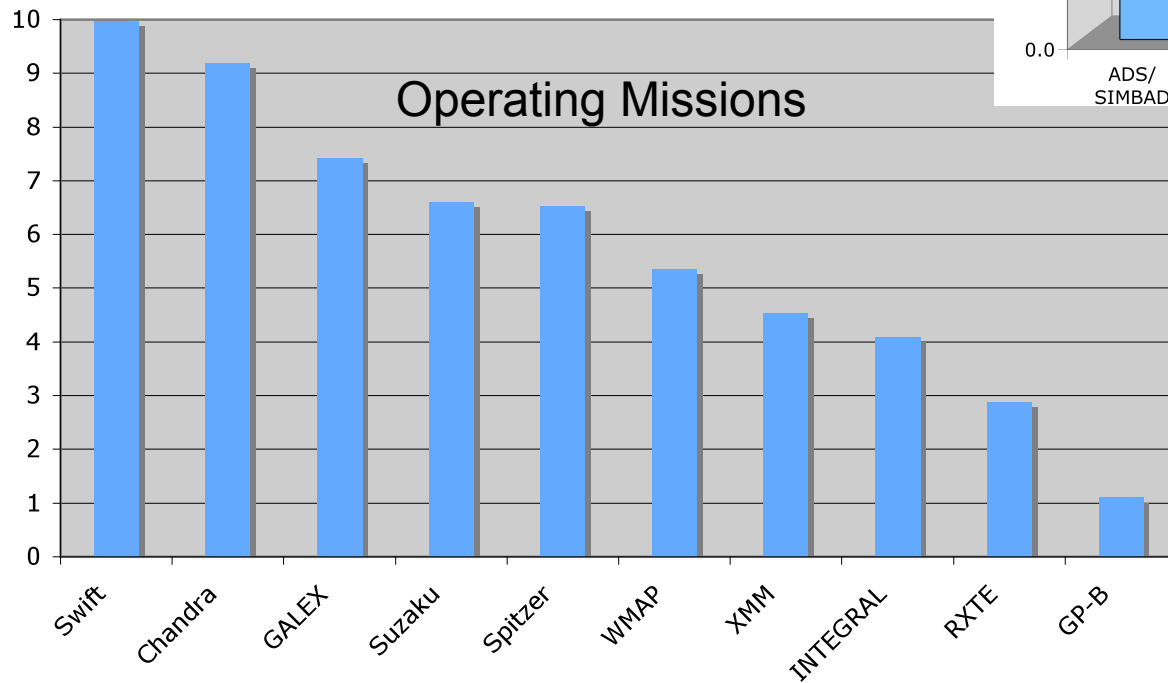


## Recent Press Releases (Typical Month)

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- Apr 28 – **Swift** - New GRB Smashes Cosmic Distance Record.
- Apr 28 – **Spitzer/GALEX** - Multispectral Triangulum Galaxy (M33).
- Apr 29 – **Chandra** - Galactic X-ray Ridge.
- Apr 30 – **Hubble** - Starbursts in Dwarf Galaxies are a Global Affair.
- Apr 30 – **Spitzer** - “Missing Link” Found (in M81).
- Apr 30 – **Spitzer** - Why are Galaxies so Smooth? (NGC 2841).
- May 4 – **Fermi** - Fermi Explores High-energy “Space Invaders”.
- May 7 – **Hubble** - Refined Hubble Constant Narrows Possible Explanations for Dark Energy.
- May 10 – **Hubble** - Hubble Photographs a Planetary Nebula to Commemorate Decommissioning of Super Camera.
- May 13 – **Kepler** - Begins its Search for Other Earth-like Planets.
- May 13 – **Spitzer** - Seeing Crystals form Around a Young Star.
- May 14 – **Chandra** - 3C305: An Intriguing Glowing Galaxy.
- May 14 – **Herschel/Planck** - Launch, On Way to Study our Cosmic Origins.
- May 15 – **Spitzer** – Cryogenes exhausted; transition to Warm Mission begins.

# Senior Review 2008 Rankings



# Accomplishments and Significant Events



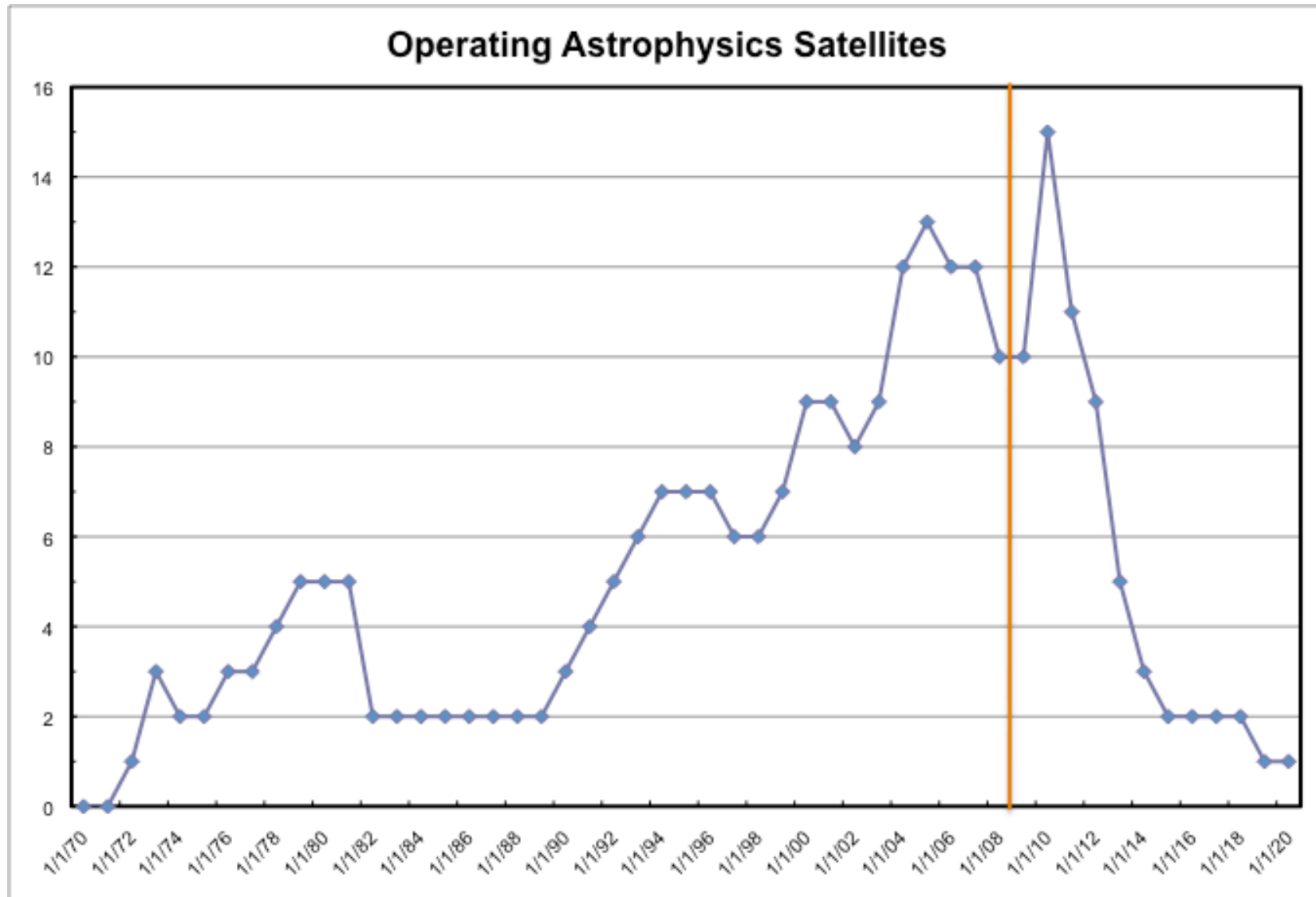
Hubble leaving the Atlantis bay

## Hubble Development (SM-4)

- ✓ Launched – May 11 at 2:02 PM.
  - ✓ Rate Sensor Units – replaced
  - ✓ WFC3 – installed
  - ✓ SI C&DH – installed
  - ✓ COS – installed
  - ✓ New batteries – installed
  - ✓ ACS – wide field channel repaired
  - ✓ STIS – repaired
  - ✓ Fine Guidance Sensor – replaced
  - ✓ New Outer Blankets 5, 7 & 8 – replaced
  - ✓ Soft Capture Mechanism – installed
- Reboost – not required



# Astrophysics Division Future Missions



\* Projections based on budget projections and missions currently in *development*

# Astrophysics Fellowships

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Fellowships aligned with Astrophysics Division Science Themes.

- Solicit proposals with Physics of the Cosmos, Exoplanet Exploration, or Cosmic Origins science as focus rather than mission specific.
- Management by existing fellowship organizations.
  - *Sagan* fellows: Exoplanet Exploration program office, JPL
  - *Einstein* fellows: Chandra X-ray Center
  - *Hubble* fellows: STScI
- Stipend (all new fellows): \$60,500.
- Identical Deadline for Applications: (most recent round).
  - Einstein Fellows: 156 applicants, 10 selections.
  - Sagan Fellows: 51 applicants, 5 selections.
  - Hubble Fellows: 237 applicants, 17 selections.
- For more information see:
  - Sagan: <http://nexsci.caltech.edu/sagan/fellowship.shtml>
  - Einstein: <http://cxc.harvard.edu/fellows/>
  - Hubble: <http://www.stsci.edu/institute/org/spd/hubble-fellowship/hubble-fellow-overview>

# Other Astrophysics Division News

- **WISE**

- S/C thermal vacuum test completed with no major issues.
- **Payload integrated to S/C and environ testing complete.**
- **Ready to support Launch Readiness Date of 11-1-09 from Vandenberg AFB, though manifested 12-10-09.**

- **SOFIA**

- Nighttime telescope line operations to test operations and tracking of stars; Cavity Door Drive System installed.
- Reviews ongoing in preparation for open door flight tests.
- Erick Young named science mission operations director.

- **JWST**

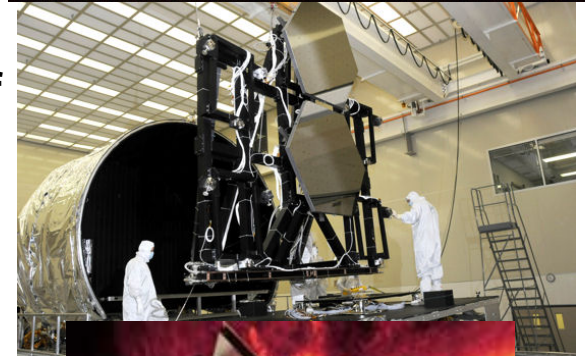
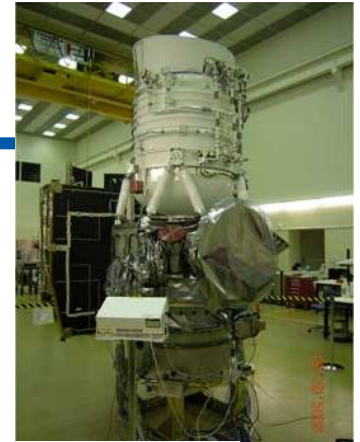
- **Core Thermal test has completed (cryo vacuum test of full-scale rep of the core region of the observatory).**
- First mirror segment completed cryo testing.
- ISIM approved for full-scale implementation (CDR March 12, 2009).

- **Spitzer**

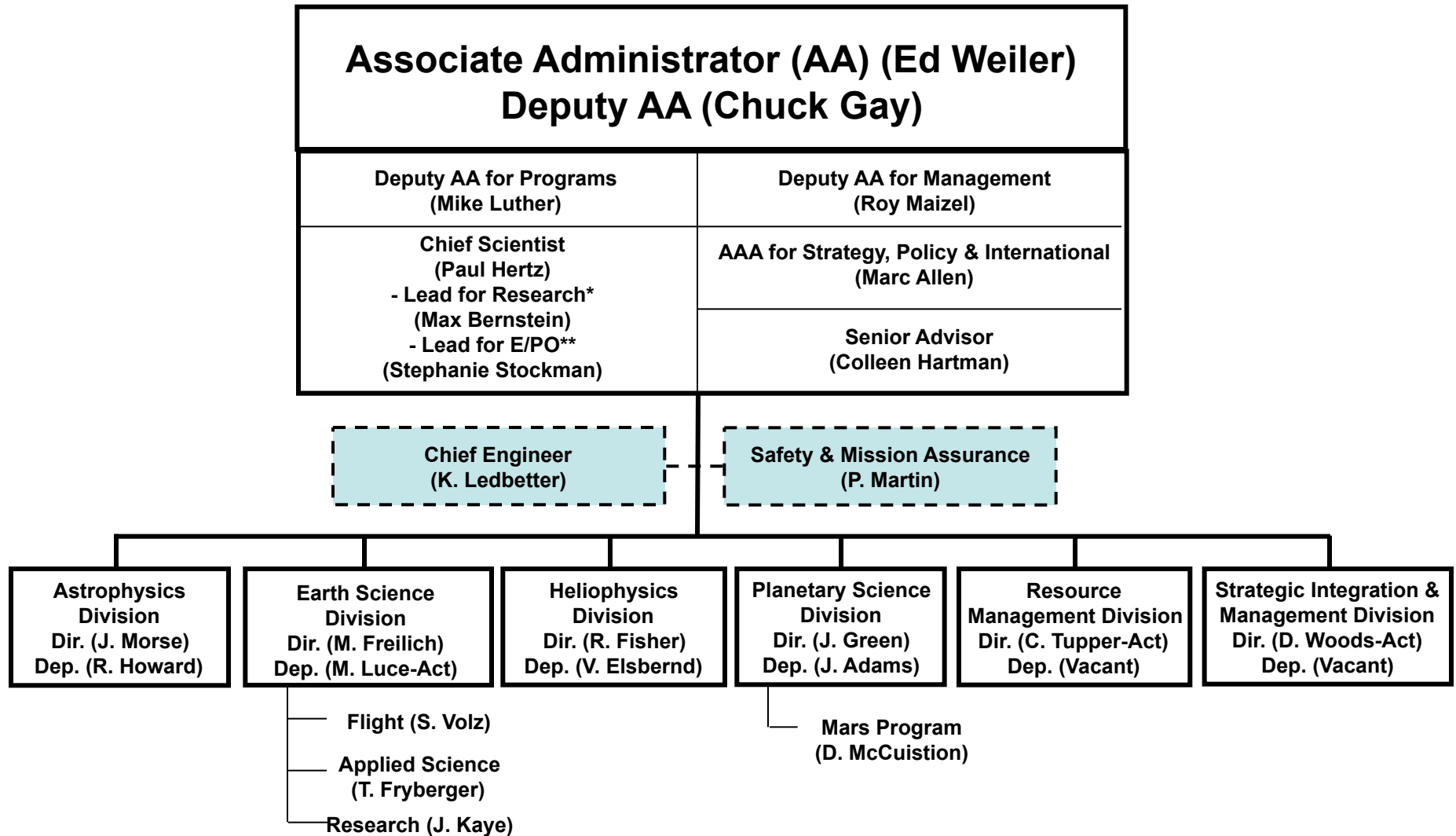
- Cryogenes exhausted May 15; beginning warm operations

- **Personnel Changes**

- Doug Hudgins was hired as the Exoplanet Exploration Program Scientist (May 2009).



# SMD Organization



Blue dashed boxes denote individuals who report to other organizations, but support SMD

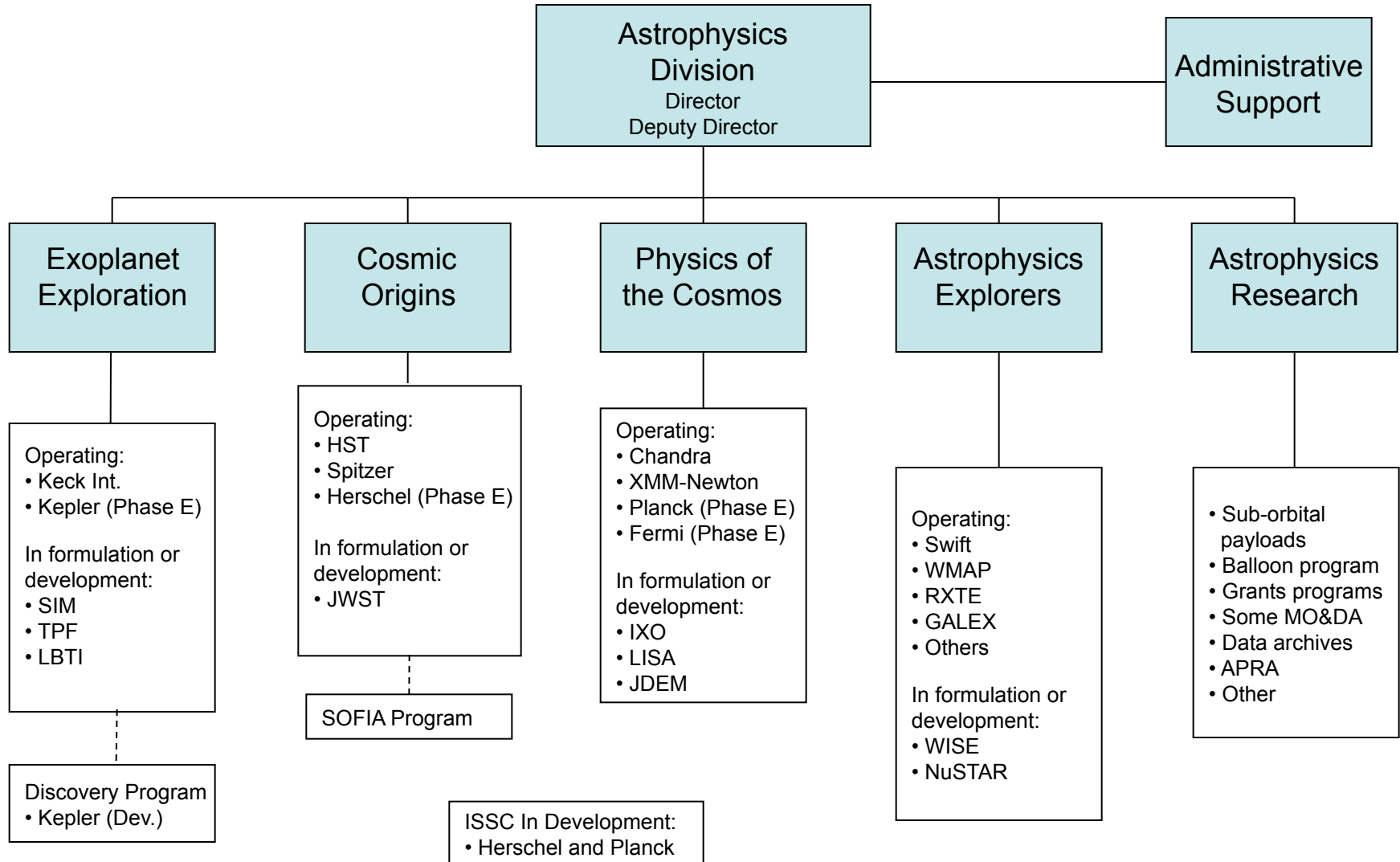
\* = Co-located from Planetary Science Division

\*\* = Co-located from Earth Science Division

Draft: January 12, 2009



# Proposed Astrophysics Organization





# Astrophysics Division - Science Mission Directorate

September 2, 2009

