



Astronomy & Physics Division Overview

Presented to

OS/SEUS

Dr. Anne L. Kinney

Director

Astronomy and Physics Division

October 23, 2003



Significant Events

- Launched SIRTf on August 25, 2003.
 - Three Great Observatories up and operating.
- SIM & JWST successfully passed initial confirmation review to enter Phase B.
- Space Science Updates held for Chandra, HST and RXTE.
 - Eleven (11) SSU's during last year.
- GP-B delivered to Vandenberg and in preparation for launch on December 6, 2003.
- JWST selected beryllium-based primary mirror technology.
- About to begin Beyond Einstein strategic missions.

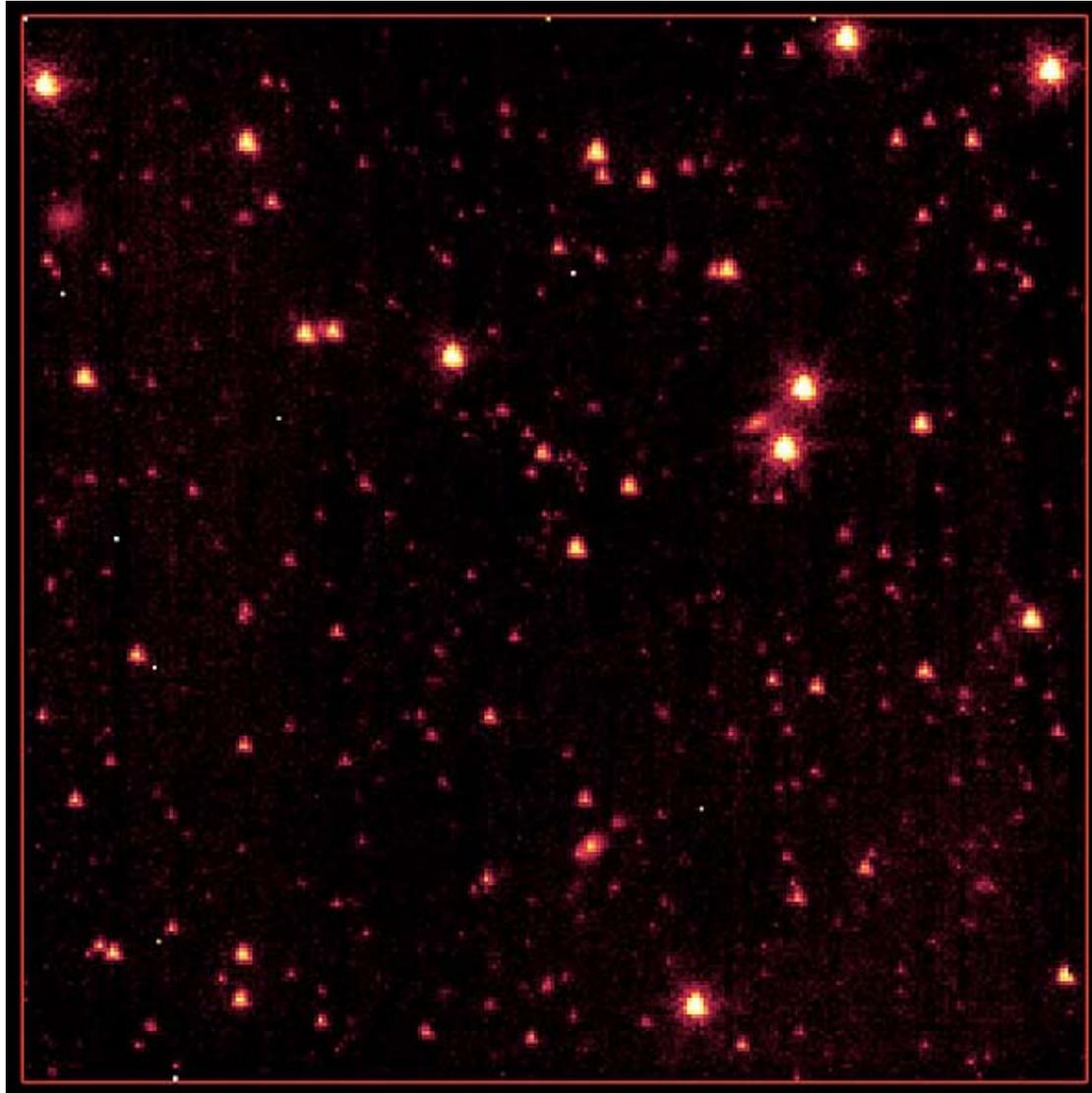


SIRTF Launch





SIRTF Aliveness Test





SIRTF



Launched: August 25, 2003 from Cape Canaveral, FL., on Delta II Heavy.

Primary Science Objective: SIRTF will obtain images and spectra by detecting the infrared energy, or heat, radiated by objects in space.

Current Status:

- In-Orbit Checkout proceeding as planned.
- Focus adjustment complete.
- HGA transition complete.
- Telescope has reached 5.5K.
- Data has been successfully returned by all instruments.
- SIRTF ERO SSU planned for December 18, 2003.



2003 Space Science Launches

- CHIPSat - Launched from VAFB January 12.
- GALEX - Launched from CCAFS April 28.
- Mars Rover Spirit - Launched from CCAFS June 10.
- Mars Rover Opportunity - Launched from CCAFS July 7.
- SIRTf - Launched from CCAFS August 25.
- SPEAR - Instrument launched from Russia on Korean satellite August 27.
- Gravity Probe B - Scheduled from VAFB NET December 6.
- SWIFT - Scheduled from CCAFS May 2004.
- CINDI - Launched by Air Force November 2004.



Upcoming Launch GP-B

Launch:

December 6, 2003

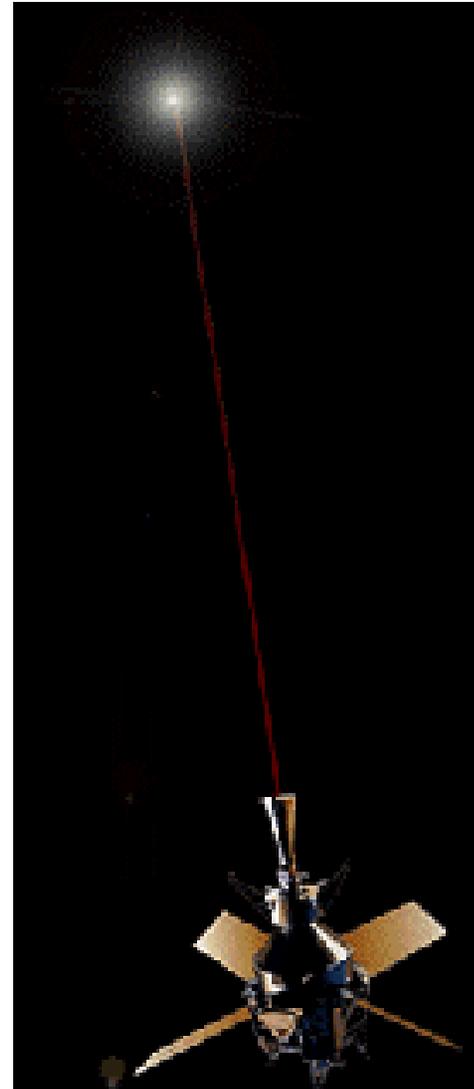
VAFB, CA.

Launch Vehicle:

Delta II

Primary Science Objective:

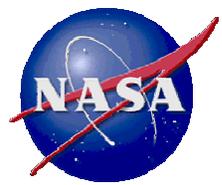
Gravity Probe B uses four gyroscopes developed to test two predictions of Albert Einstein's general theory of relativity. While in a polar Earth orbit, it will measure how space and time are warped by the presence of the Earth, and how the Earth's rotation drags space-time around with it.





GP-B Launch Preparations





Upcoming Launch SWIFT

Launch:

May 2004

Cape Canaveral, FL.

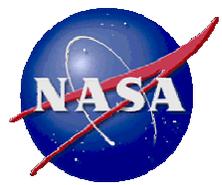
Launch Vehicle:

Delta 7320

Primary Science Objective:

The primary objective of the SWIFT mission is to determine the origin of Gamma Ray Bursts and to use them to probe the early universe.



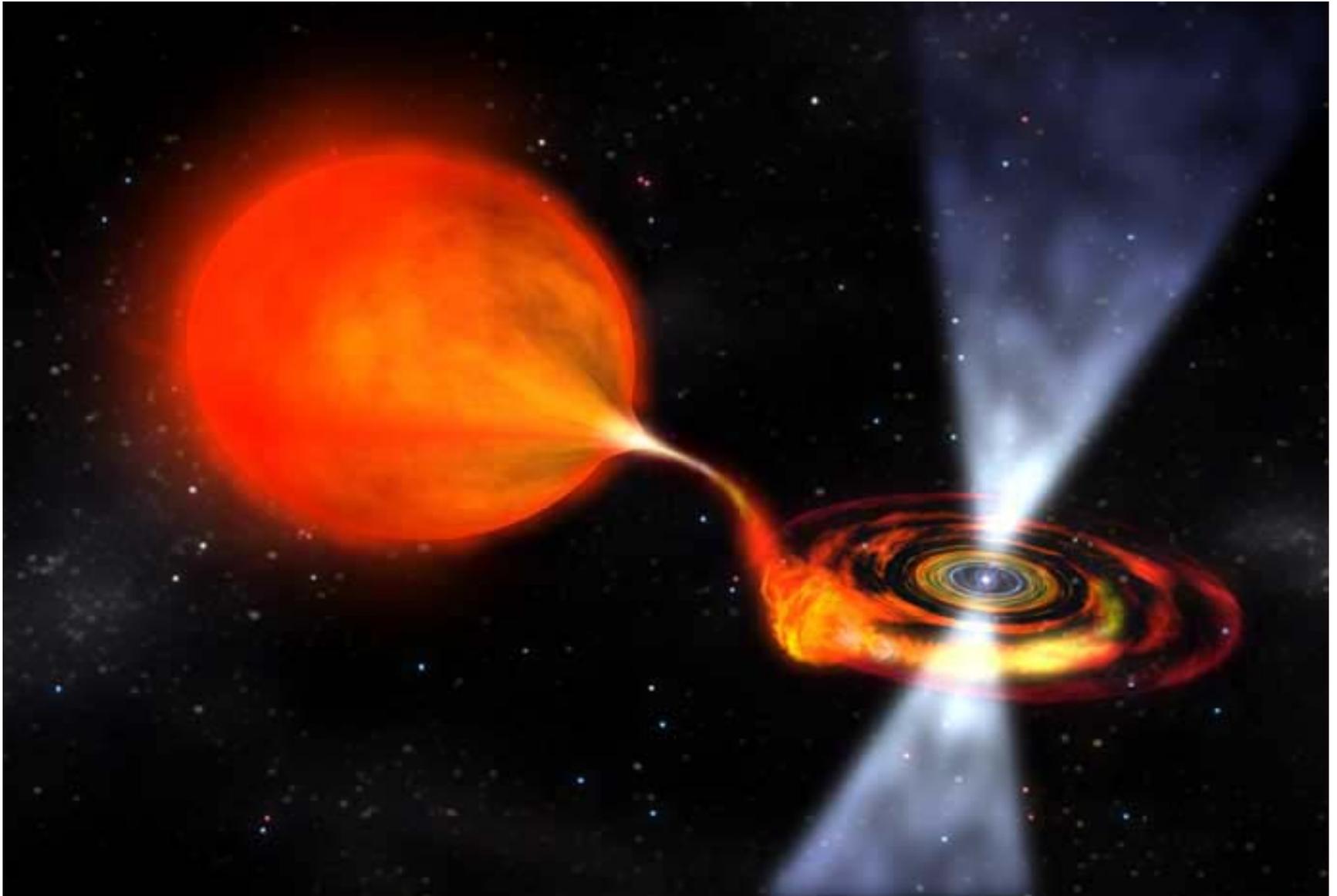


Space Science Updates

Chandra: Black Hole X-ray Jets	October 3, 2002
Chandra: Two Supermassive Black Holes	November 2, 2002
WMAP: Universe's Baby Picture	February 11, 2003
HETE: Nearby Gamma Ray Burst	March 19, 2003
RXTE: Cosmic Speed Limit on Pulsars	July 2, 2003
Hubble: Oldest Known Planet	July 7, 2003
Chandra: Black Hole Sound Waves	September 9, 2003



RXTE SSU - Pulsar Speed Limit





HST SSU - Oldest Planet

Globular Cluster M4
Location of white dwarf
companion to pulsar B1620-26

HST



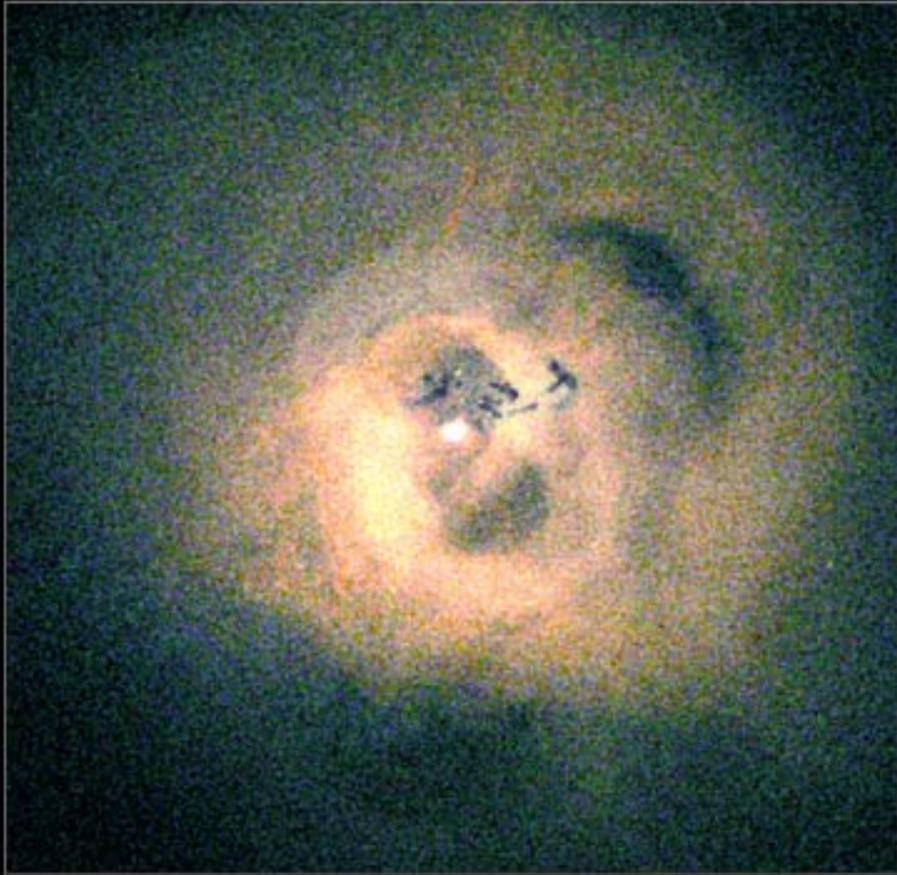
NOAO

Hubble Space Telescope • WFPC2

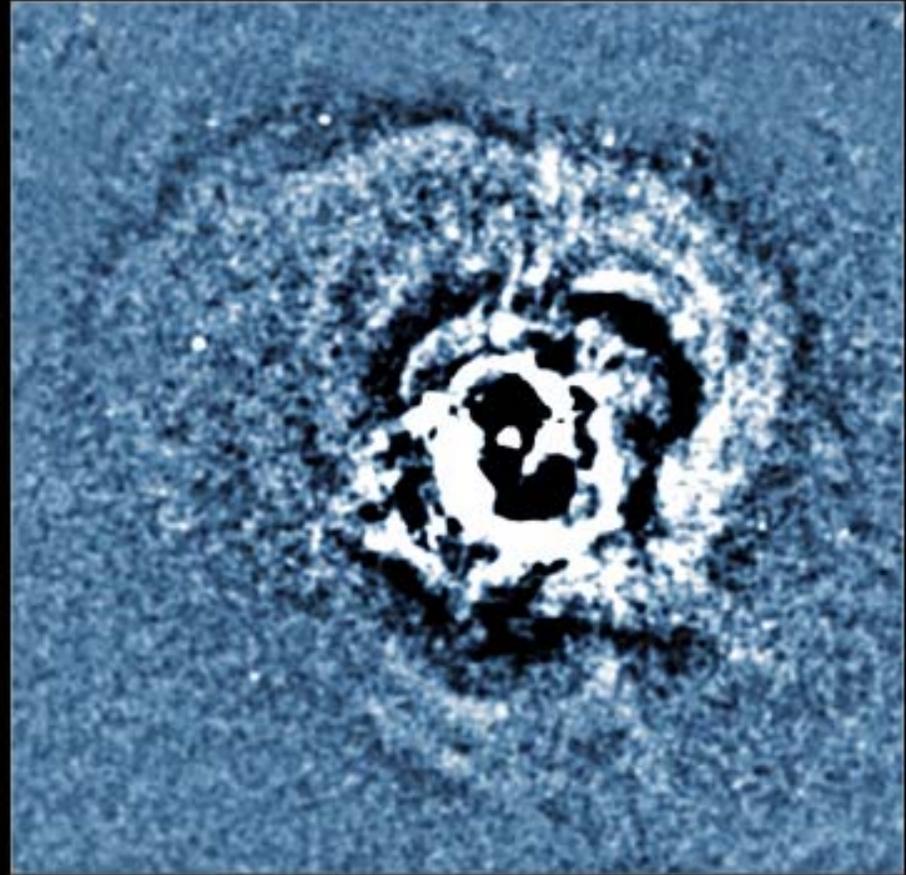
NASA and H. Richer (University of British Columbia)
STScI-PRC03-19b



Chandra Blackhole Sound Waves



CHANDRA X-RAY [3-COLOR]



CHANDRA X-RAY [SOUND WAVES]

Covered by: NY Times, Washington Post, LA Times, **Billboard**, USA Today, AP Wire, CNN, Reuters, Discovery Channel, Science News, astronomy orgs...



SSU Press Coverage

BBC NEWS UK EDITION

Last Updated: Wednesday, 10 September, 2003, 11:55 GMT 12:55 UK

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Black hole hums B flat

By Dr David Whitehouse
BBC News Online science editor

Astronomers have detected super-massive black hole detected from an object

The black hole lives in the Perseus cluster of galaxies, located 250 million light-years away.

The tremendous amounts of energy carried from the black hole by these sound waves solve a longstanding problem in astrophysics.

The pitch of the sound can be determined. Although far too low to be B flat.

Ran
By Gld
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www.jp
Attack

There's a major influx of stardust in our solar system again by 2013, according to measurements taken by a magnetic field deflects it out of the solar system. But colleagues report in the October Journal of Geophysical Research, the sun's magnetic field is currently flipping its polarity, and with its disarray, it can't eject the particles as it usually does. While the sun finishes the reversal that it began in 2001, the stardust will continue stream in unchecked. But don't go running for your Space Hoover just yet; Stardust, as far as we know, is not dangerous to life on Earth.

Deep bass note from deep black hole
Astronomers reported last week that black holes can sing bass -- in a manner of speaking. Using NASA's Chandra X-ray Observatory, they have detected the deepest note in the universe, a B-flat being emitted by a massive black hole in the Perseus galaxy cluster, 250 million light-years away. Though the researchers could identify it, they couldn't hear it. The note is 57 octaves below middle-C, at a frequency more than a million billion times deeper than the limits of human hearing. Using observations from Chandra, the astronomers found ripples in the gas filling the galaxy cluster. It is the ripples that are evidence for the sound waves that have traveled from the black hole in the cluster's core. The study's team leader, Andrew Fabian of the Institute of Astronomy in Cambridge, England, stated in a press release: "We have observed the prodigious amounts of light and heat created by a black hole; now we have detected the sound."

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News Brief

< news main

Black Hole Sings Deepest Note

AFP

Sept. 10, 2003 — For the first time ever, astronomers have detected sound waves coming from a massive black hole in space — and believe the discovery may help resolve a major mystery, the U.S. space agency NASA said Tuesday.

The Chandra X-ray Observatory has monitored for 53 hours noise coming from the central region of the Perseus galaxy cluster, according to NASA.

"We have observed the prodigious amounts of light and heat created by black holes, now we have detected the sound," said the study's leader, the Institute of Astronomy (IoA) in Cambridge, England.

www.independent-media.tv

Science

Black Hole Sings Deepest Note

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By: Staff

Date: 09/10/2003

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Chandra 'hears' a black hole

NASA NEWS RELEASE

Posted: September 9, 2003

NASA's Chandra X-ray Observatory detected sound waves, for the first time, from a super-massive black hole. The "note" is the deepest ever detected from an object in the universe. The tremendous amounts of energy carried by these sound waves may solve a longstanding problem in astrophysics.

The black hole resides in the Perseus cluster, located 250 million light years from Earth. In 2002, astronomers obtained a deep Chandra observation that shows ripples in the gas filling the cluster. These ripples are evidence for sound waves that have traveled hundreds of thousands of light years away from the cluster's central black hole.



Astronomy and Physics Operating Missions Status

Launch/Phase		Aug	Sep	Oct	STATUS
HST	04/25/90 Prime	GRN	GRN	GRN	
Rossi XTE	12/30/95 Extended	GRN	GRN	GRN	
2MASS	04/01/97 Extended	GRN	GRN	GRN	
SWAS	12/3/98 Extended	GRN	GRN	GRN	
FUSE	06/24/99 Extended	GRN	GRN	GRN	
Chandra XO	7/19/99 Prime	GRN	GRN	GRN	HRC shutter failed to move as commanded; HRC door remains open while cause is investigated. No loss of science time.
XMM-Newton	12/09/99 Prime	GRN	GRN	GRN	
HETE-2	10/08/00 Extended	GRN	GRN	GRN	Science operations suspended (9/25-10/4) due to cell failure in one of six batteries. HETE can work on 4 batteries.
WMAP	06/30/01 Prime	GRN	GRN	GRN	
Integral	10/17/02 Prime	GRN	GRN	GRN	
CHIPS	1/15/03 Prime	GRN	GRN	GRN	
GALEX	4/28/03 Prime	GRN	GRN	GRN	

GRN

Proceeding on Plan, only normal, minor problems



Structure and Evolution of the Universe

Developmental Mission Status

	Launch	Aug	Sep	Oct	STATUS
GP-B	Dec '03	YEL	YEL	YEL	Ops Preparedness "gate" will not be passed until Safe Mode Contingency Procs completed and "Sim'd". Gyro #1 & #3 exhibit excessive noise under some conditions.
SWIFT	May '04	RED	RED	RED	Code S to provide guidance over the use of a Thermal vacuum chamber required by both SWIFT and Messenger.
Astro-E2	Feb '05	YEL	YEL	RED	XRS helium leak anomaly has eroded schedule reserves.
GLAST	Sep '06	YEL	GRN	GRN	Preparations for December 3, 2003 Agency CR continue.
Herschel	2007	YEL	RED	GRN	FY2004 SPIRE kevlar problem funding issue was solved by Code SZ.
Planck	2007	GRN	GRN	GRN	Cooler vibration level disagreement with ESA may soon be resolved.
EUSO	2008	GRN	GRN	GRN	Waiting for ESA to approve for Phase B.
LISA	2011	GRN	GRN	GRN	On agenda for October 27 bilateral with ESA.
Con-X	2013	GRN	GRN	GRN	All technology areas progressing well.
Balloons	Ongoing	GRN	GRN	GRN	Nineteen flights in FY03 with 100% balloon success

GRN	Proceeding on Plan, only normal, minor problems
YEL	Significant Problems or Concerns but feasible plan to resolve
RED	Major Problems; Solution path unclear



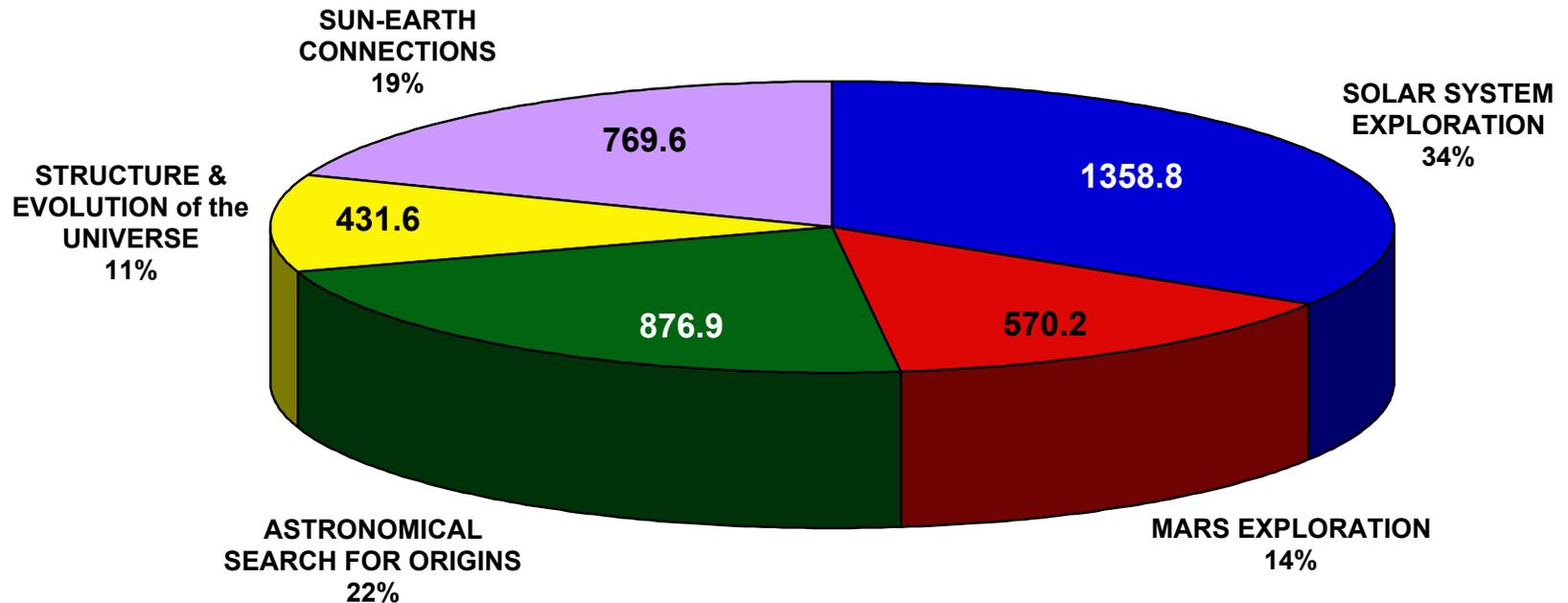
Astronomical Search for Origins

Developmental Mission Status

	Launch	Aug	Sep	Oct	STATUS
SIRTF	Aug '03	GRN GRN	GRN	GRN	IOC is proceeding per plan. Focal adjust is complete. Telescope 5.5K. Pipeline processing working well.
HST	Feb '05	GRN YEL	GRN RED	GRN RED	SM4 launch date TBD. Funding for continuing SM4 launch slips presently. Reqrd end-of-life mission STS/ELV launched de-orbit
SOFIA	Apr '05	GRN	GRN	YEL	PCA for 1st science flight vanishing. UAL role in flux.
Keck Interferometer	2005	GRN RED	GRN RED	GRN RED	Nuller 3-4 weeks behind schedule; will ship to Hawaii in December. EIS is required.
LBTI	Sep '06	GRN	GRN	GRN	No changes to plan.
Kepler	2007	GRN	GRN	GRN	SRR completed Oct 15-17, 2003. No major issues noted.
SIM	Dec '09	GRN	GRN	GRN	Project entered Phase B during 9/03. Held kick-off mtgs with KS requirements.
JWST	Aug '11	GRN	GRN	GRN	Primary activities centered around preparations for SRR in December.
TPF	tbd	GRN	GRN	GRN	University procurements underway. Science Roadmap progress
	GRN	Proceeding on Plan, only normal, minor problems			
	YEL	Significant Problems or Concerns but feasible plan to resolve			
	RED	Major Problems; Solution path unclear			



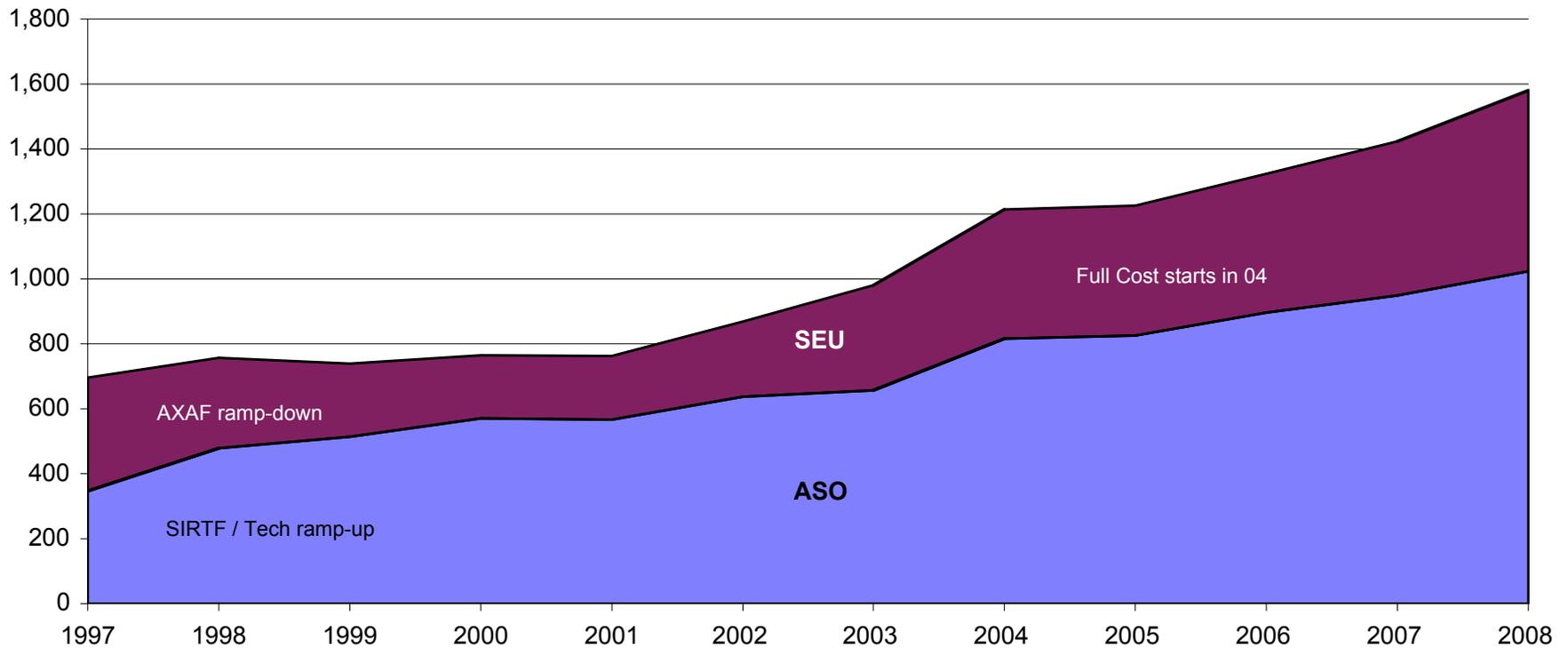
Space Science Budget Full-Cost FY04 President's Request





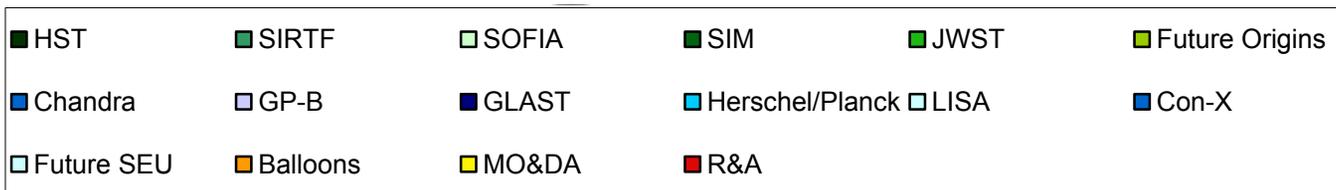
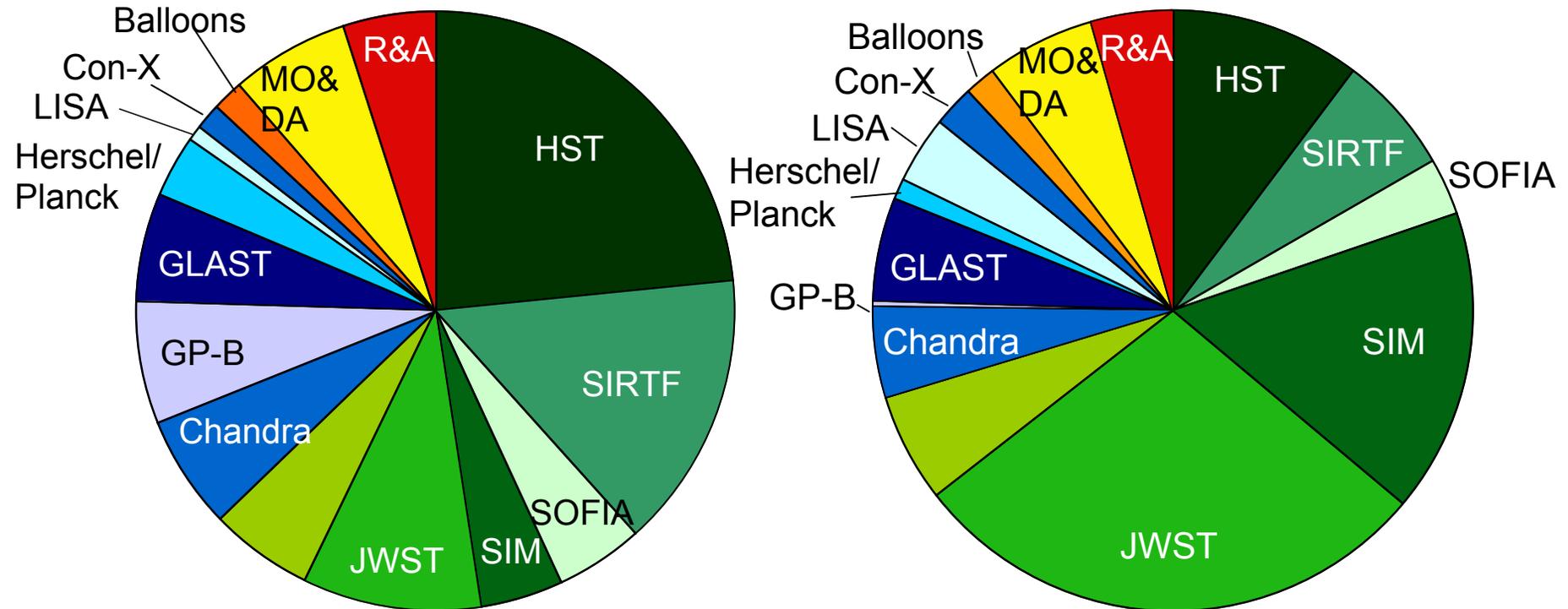
Astronomy and Physics

ASO/SEU Budget Trends (RY\$M)





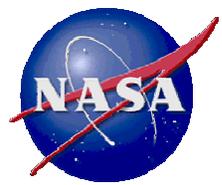
Astronomy and Physics FY'03 vs FY'06 Budgets





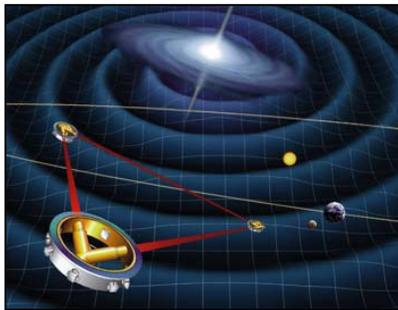
Space Science Budget FY 2004 New Content

- Incorporates the existing NSI program and the new Jupiter Icy Moons Orbiter (JIMO) mission into a new initiative called Project Prometheus.
- Establishes an Optical Communications program, which enables revolutionary new data communications/transmission.
- Provides development funding for two key elements of the Beyond Einstein program: LISA and Constellation X. The Einstein Probes are unfunded.



Beyond Einstein

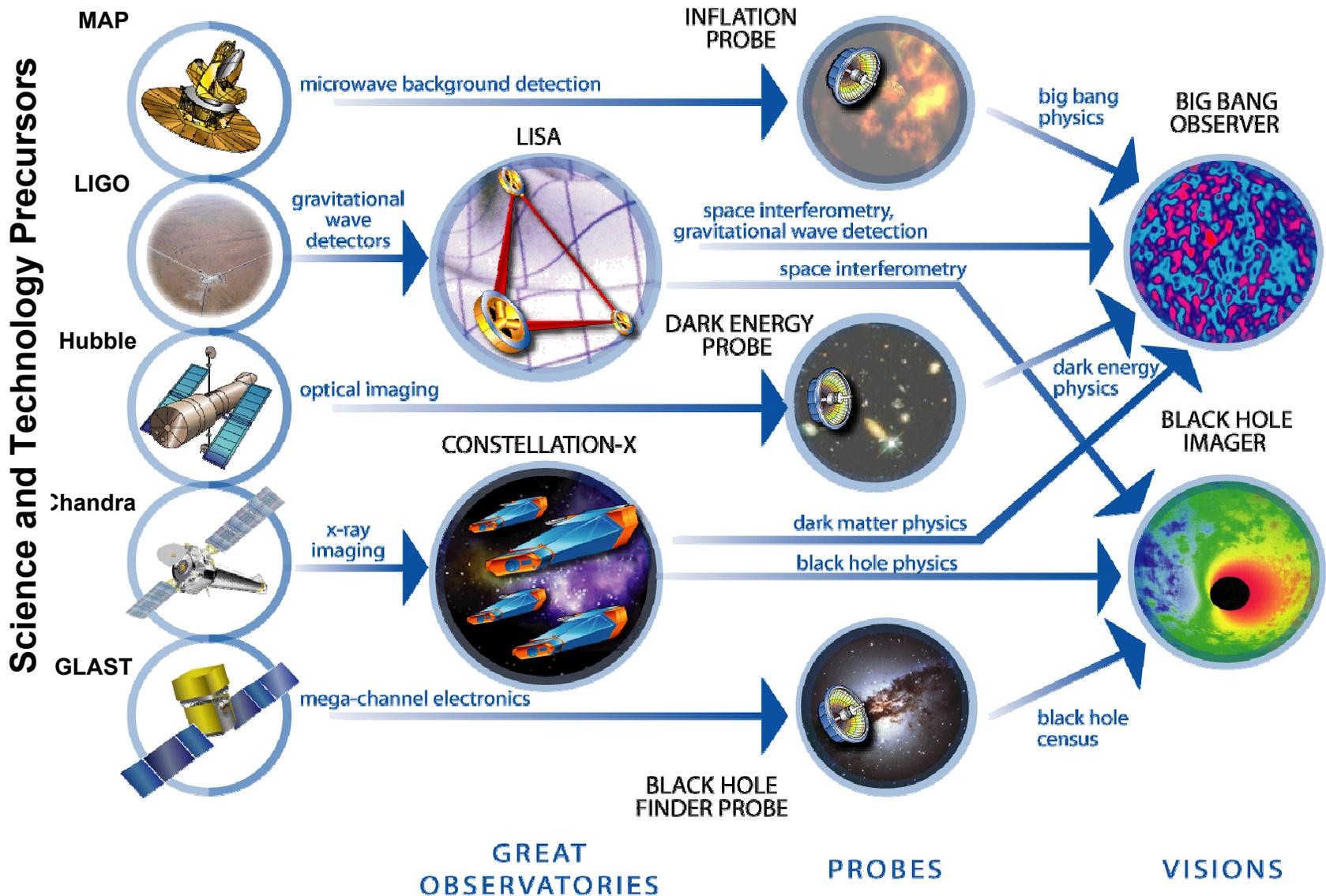
- Significant expansion of efforts in NASA's Structure and Evolution of the Universe (SEU) theme, addressing its highest priorities as determined by the National Academy of Sciences' Decadal Survey.
- Funding for full development of two major missions: LISA and Constellation-X.



- “Einstein Probes,” an unfunded program that is planned for later this decade.
 - This program consists of fully and openly competed missions (in the manner of the Discovery, Explorers, and New Frontiers programs) to conduct investigations that benefit the Beyond Einstein science objectives.



Beyond Einstein Program





Current Division Key Issues

- Launch GP-B.
 - Launch criteria not yet met.
- Funding SM-4 delay.
 - Delay costs \$10M per month.
 - Launch date TBD.
 - Funding source for delay not identified.
- Swift launch delayed.