Astrophysics Division Research & Analysis Status

Wilton Sanders
Astrophysics Division R&A Lead

28 January 2008

Astrophysics R&A Elements

- Supporting Research & Technology (SR&T)
  - Astronomy & Physics Research & Analysis (APRA)*
  - Astrophysics Theory Program (ATP)*
  - Origins of Solar Systems (SSO)*
- Data Analysis (DA)
  - Astrophysics Data Analysis (ADP)*
  - Far Ultraviolet Spectroscopic Explorer (FUSE)*, X-ray Timing Explorer (RXTE)*
  - GALEX*, Swift*, Suzaku*
  - Hubble, Chandra, Spitzer, XMM, INTEGRAL
- Mission science teams for the above missions, plus those in development
  - GLAST, JWST, Kepler, SOFIA, WISE

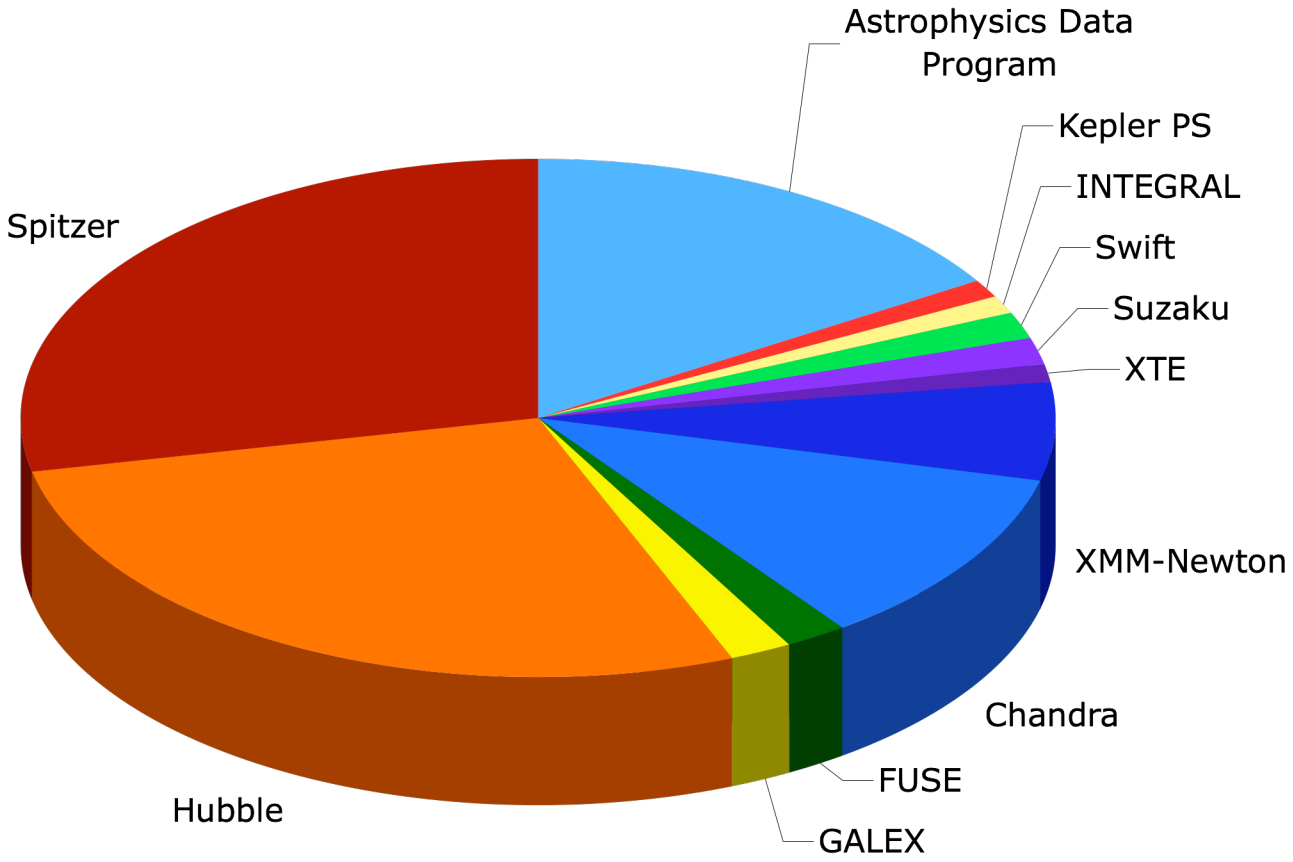
* ROSES Element

Astrophysics Research Budget

For *FY2007*, the following aggregates the competed Astrophysics research budget excluding flight hardware development

- "Astrophysics R&A" (really ST&T) $50M
- Data analysis (other than "Astrophysics R&A") $88M
  - Mission specific General Observer/Guest Investigator programs
  - Archival data analysis programs
- Mission Science Teams (other than "Astrophysics R&A") .....~ $75M
  - PI teams for missions and instruments selected through AO
  - Additional team members selected through competition
    - Participating scientists, interdisciplinary scientists, science working group members, etc.
- Total Astrophysics research and data analysis funding .....~ $213M

FY2007 Astrophysics Data Analysis



Total FY07 Funding $88M

FY2007 Astrophysics Data Analysis

	FY07 Funding	Number of Investigations	Dollars per Investigation	Success Ratio	Time Oversubscription
Astrophysics Data Program	$14,500,000	113	$128,319	38%	-
Kepler PS	$1,000,000	10	$100,000	-	-
Swift	$1,300,000	40	$32,500	45%	-
Suzaku	$1,700,000	64	$26,563	39%	x4
XTE	$800,000	89	$8,989	70%	x5.46
FUSE	$1,800,000	68	$26,471	63%	x3
GALEX	$1,800,000	34	$52,941	45%	x3.5
Chandra	$10,100,000	184	$54,891	25%	x6.4
Hubble	$26,200,000	189	$138,624	23%	x4.5
Spitzer	$22,500,000	196	$114,796	27%	x6
XMM-Newton	$5,800,000	129	$44,961	30%	x5
INTEGRAL	$900,000	34	$26,471	61%	x6
TOTAL	$88,400,000	1150			

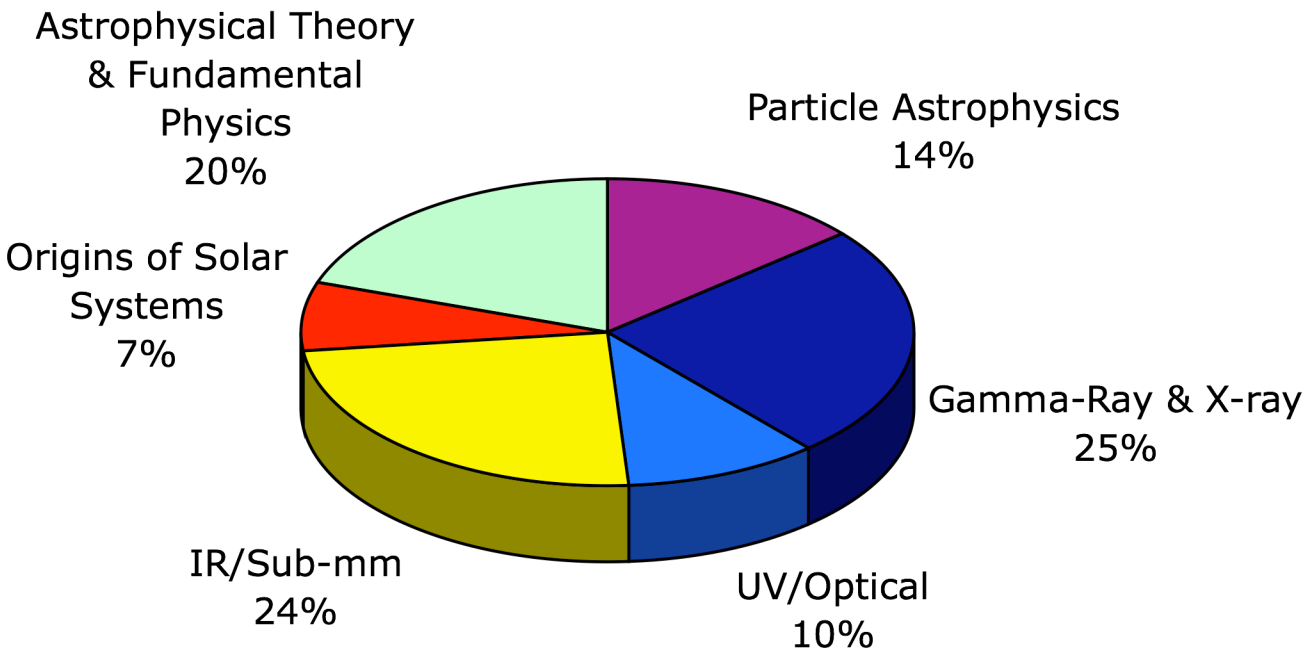
Total FY07 Funding $88M

Supporting Research & Technology (SR&T)

$51M in FY2007, ~ $54M in FY2008

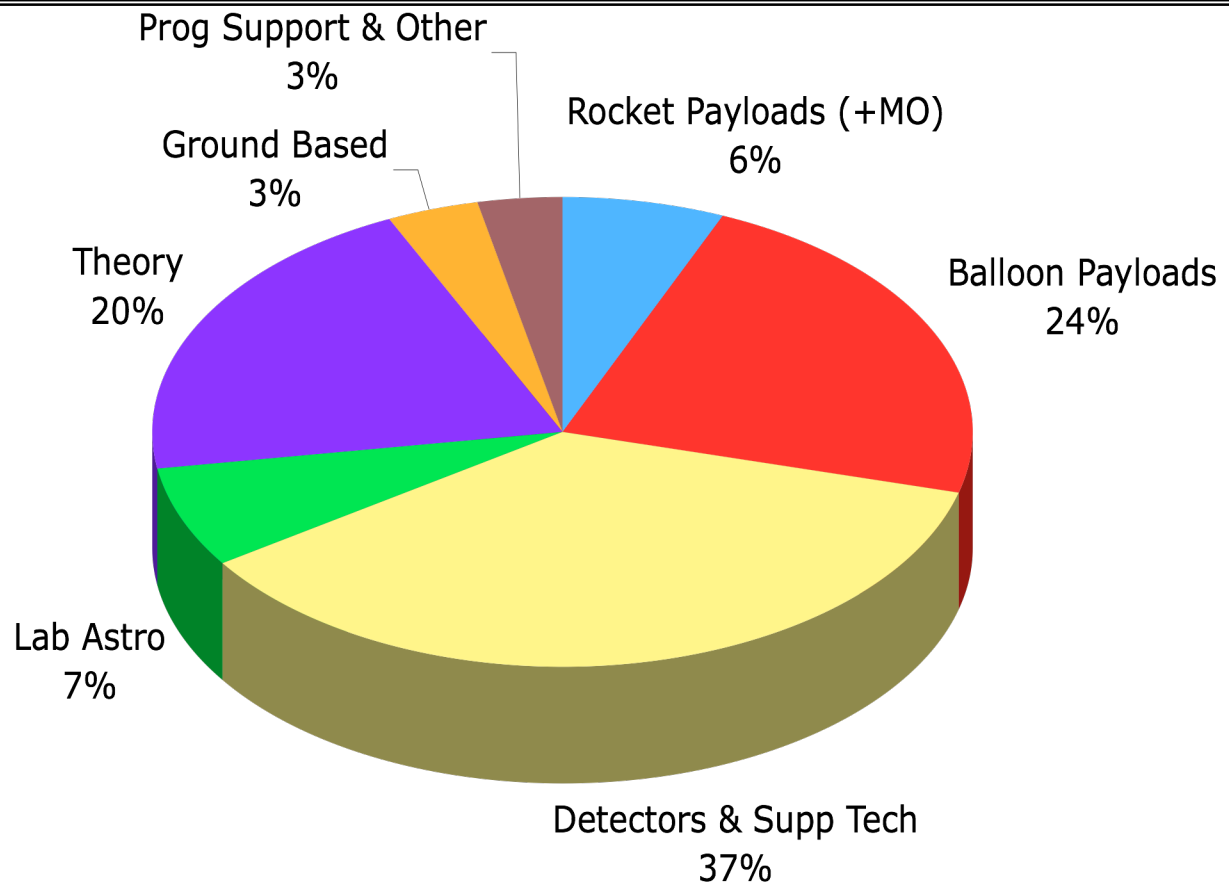
- **Astronomy & Physics Research & Analysis (APRA)**
  - **Disciplines**
    - Particle Astrophysics
    - Gamma-Ray
    - X-ray
    - UV/Optical
    - IR/Sub-mm/Radio
  - **Categories of Investigations**
    - Suborbital Investigations
    - Detector Development
    - Supporting Technology (Optics, Coatings, Coronagraphs, …)
    - Laboratory Astrophysics
    - Ground-based
- **Astrophysical Theory & Fundamental Physics (ATFP)**
- **Origins of Solar Systems**

FY2007 Astrophysics SR&T



Total FY2007 Funding $51M

FY2007 Astrophysics SR&T



Total FY2007 Funding $51M

Astrophysics MoO & Sounding Rockets

	PI	INST	Type	Title	Flight Status	FY05	FY06	FY07
1	Edelstein	U. Cal., Berkeley	Mission of Oportunity	SPEAR: Spectroscopy of Plasma Evolution from Astrophysical Radiation Operations, Analysis and Science	Flew on Korean satellite, KAISTSAT-4, launched in late 2003	xxx	xxx	xxx
				Subtotal: Missions of Opportunity		**$430,000**	**$430,000**	**$430,000**
1	McCammon	U. Wisc. - Madison	Rocket	Sounding Rocket investigations of the Soft X-ray Diffuse Background, Fundamental Studies of Transition Edge Sensors, and Optimization of Detectors and Filters for Low Energy Diffuse Sources	Flight planned for fall 2007/early 2008	xxx	xxx	xxx
2	Cash	U. Colorado	Rocket	X-ray Spectroscopy of the Background and Highly Extended Sources	Initial flight in 2006; additional flights TBD	xxx	xxx	xxx
3	Figueroa	MIT	Rocket	Micro-X: The High-Resolution Microcalorimeter X-ray Imaging Rocket	Payload under development; anticipated first flight in 2010	0	0	xxx
4	Bock	CalTech	Rocket	The Cosmic Infrared Background Experiment (CIBER)	First flight proposed for spring 2008. Second Flight in 2009	xxx	xxx	xxx
5	Chakrabarti	Boston U.	Rocket	Planet Imaging Concept Testbed Using a Rocket Experiment (PICTURE)	Flight Scheduled for July 2007	xxx	xxx	xxx
6	Cruddace	NRL	Rocket	Spectroscopic Studies of White Dwarfs	Flight scheduled for February 2007	xxx	xxx	0
7	McCandliss	Johns Hopkins U.	Rocket	Rocket and Laboratory Studies in Astronomy (FORTIS)	Flew June 2007, Flew in January 2008	xxx	xxx	xxx
8	Green	U. Colorado	Rocket	Spectroscopy in the Far Ultraviolet	First flight in fall 2009	0	0	xxx
9	Nordsieck	U. Wisconsin	Rocket	Exploring New Astrophysical Diagnostics with the Far-Ultraviolet SpectroPolarimeter (FUSP)	First flight in fall 2008	0	0	xxx
				Subtotal: Sounding Rocket Payloads		**$2,502,801**	**$2,519,700**	**$3,487,567**

Astrophysics HE Balloon Payloads

1	Harrison	Caltech	Balloon	The High Energy Focusing Telescope (HEFT): A Platform for Science and Technology Demonstration	A Series of three flights planned beginning in 2008	xxx	xxx	xxx
2	Boggs	U.Cal., Berkeley	Balloon	The Nuclear Compton Telescope	Initial flight in June 2005; re-fllights (LDB from Australia) planned for December 2008 and 2010	xxx	xxx	xxx
3	Tueller	GSFC	Balloon	International Focusing Optics Collaboration for μCrab Sensitivity (INFOCUS)	Last flight in Fall 2004; series of LDB reflights planned beginning 2008	xxx	xxx	xxx
4	Ramsey	MSFC	Balloon	A Research Program in X-ray Astronomy	Flight scheduled for Spring 2007	xxx	xxx	xxx
5	Grindlay	Harvard U.	Balloon	Detector and Telescope Development for ProtoEXist	Flight planned for 2008	xxx	xxx	xxx
6	Zych	U.Cal., Riverside	Balloon	Balloon Flight Observations with the Prototype TIGRE Compton Gamma-ray Telescope	Flight planned for Spring/Fall 2007	xxx	xxx	0
				Subtotal: High Energy Astrophysics Balloon Payloads		**$3,305,000**	**$2,842,000**	**$2,741,000**

Astrophysics UV/IR Balloon Payloads

1	Devlin	U. Penn.	Balloon	Extragalactic and Galactic Surveys with the Balloon-borne Large Aperture Sub-millimeter Telescope - BLAST	Flight planned for 2008	xxx	xxx	xxx
2	Hanany	U. Minnesota	Balloon	Search for the B-Mode Signal of the Cosmic Microwave Background Polarization With the Balloon-bourne E and B Experiment (EBEX)	Flight planned for 2008	xxx	xxx	xxx
5	Martin	CalTech/Columbia	Balloon	Faint-Intergalactic-Medium Redshifted Emission Balloon (FIREBALL)	Flew in Summer 2007	xxx	xxx	xxx
4	Lubin	U. Cal., Santa Barbara	Balloon	The COsmic Foreground Explorer (COFE) A Balloon Borne Microwave Polarimeter to Characterize Large Scale CMB Polarization Foregrounds		0	xxx	xxx
3	Lange	CalTech	Balloon	SPIDER: A Large Angular Scale Millimeter-wave Polarimeter	Flight planned for 2010	0	0	xxx
				Subtotal: UV/IR Balloon Payloads		**$1,995,000**	**$2,409,000**	**$2,460,000**

Astrophysics Particle Astro Payloads

1	Gorham	U. Hawaii	Balloon	ANITA: Antarctic Impulsive Transient Antenna to Search for Ultra-High Energy Astrophysical Neutrinos	xxx	xxx	xxx
2	Wefel	LSU	Balloon	ATIC: Advanced Thin Ionization Calorimenter to Study Cosmic Ray Nuclei to 10**14 eV and Electrons to 10**12 eV	xxx	xxx	xxx
3	Mitchell	GSFC	Balloon	BESS: Balloon-Borne Experiment with a Superconducting Spectrometer	xxx	xxx	xxx
4	Seo	U. Maryland	Balloon	CREAM: Cosmic Ray Energetics and Mass Experiment to Study Composition and Energy Spectra up to 10**15 eV	xxx	xxx	xxx
5	Musser	Indiana U.	Balloon	CREST: Cosmic Ray Electron Synchrotron Telescope to Study Cosmic Ray Electrons above 10**12 eV	xxx	xxx	xxx
6	Müller	U. Chicago	Balloon	TRACER: Experiments in High Energy Astrophysics	xxx	xxx	xxx
7	Hailey	Columbia U.	Balloon	GAPS: Development of a Novel Antimatter Detector for Indirect	xxx	xxx	xxx
8	Binns	Washington U.	Balloon	TIGER: Trans-Iron Galactic Element Recorder	xxx	xxx	xxx
				Subtotal: Particle Astrophysics Balloon Payloads	**$7,776,483**	**$7,260,562**	**$6,824,498**
				Subtotal: Astrophysics Balloon Payloads	**$13,076,483**	**$12,511,562**	**$12,025,498**
				Total: Astrophysics Suborbital Payloads	**$16,009,284**	**$15,461,262**	**$15,943,065**

ROSES-2006 Statistics

Program Element Title	Due Date	Notification Date	150-day Metric	# Props Received	# New Selected	% Selected
Astronomy and Physics Research and Analysis - 2006 (Proposals/Investigations)	14-Apr-06	27-Oct-06	196	143/128	39/34	27%/26%
Astrophysics Theory	2-Jun-06	13-Dec-06	194	118	20	17%
Beyond Einstein Foundation Science	2-Jun-06	13-Dec-06	194	56	12	21%
Origins of Solar Systems	2-Jun-06	26-Mar-07	297	22	9	41%
Astrophysics Data Analysis	23-Jun-06	22-Dec-06	182	99	35	35%
GALEX Guest Investigator -- Cycle 3	7-Jul-06	3-Jan-07	180	76	32	42%
Swift Guest Investigator -- Cycle 3	28-Jul-06	24-Jan-07	180	88	45	51%
FUSE Guest Investigator -- Cycle 8	15-Sep-06	1-May-07	228	107	68	64%
Suzaku Guest Observer -- Cycle 2	1-Dec-06	30-Mar-07	119	156	46	29%
Astronomy and Physics Research and Analysis - 2007 (Proposals/Investigations)	13-Apr-07	10-Aug-07	119	179/148	55/32	31%/22%
TOTALS			182	998	333	33%
Non-GO solicitations				571	142	25%
GO solicitations				427	191	45%

ROSES-2006 Statistics

Program	ROSES 2006 APRA	ROSES 2006 ATP/BEFS	ROSES 2006 ADP
# Received	128	175	98
# Funded	34	32	37
% Funded	27%	18%	38%
$ Requested (3 yr)	$117,592,729	$60,288,070	$7,599,000
$ Awarded (3y)	$29,321,340	$11,451,187	$2,761,000
% Awarded	25%	19%	36%
Success Fraction			
University	19/69=28%	27/147=18%	31
FFRDC	1/7=14%	1/8= 13%	0
NASA	13/50=26%	4/16=25%	4
Private	1/2=50%	0/4= 0%	1

Statistics

ROSES-2006 APRA Detail

Program	Sub-mm (CMB)	UV/Opt/IR/ Suborbital	UV/Opt Detectors	IR Detectors	Laboratory Astrophysics	Supporting Technology	Ground-Based	X-ray Astrophysics	Gamma-Ray Astrophysics	Particle Astrophysics	TOTAL APRA
# Received	13	9	8	17	27	11	9	16	11	7	128
# Funded	3	1	3	3	8	3	1	6	4	2	34
% Funded	23%	11%	38%	18%	30%	27%	11%	38%	36%	29%	27%
$ Requested	$18,264,408	$24,849,184	$6,584,996	$13,588,273	$9,651,562	$5,365,765	$1,252,558	$14,295,886	$20,097,064	$3,643,033	$117,592,729
$ Awarded	$5,544,000	$961,000	$2,397,000	$3,350,000	$2,806,146	$1,136,000	$308,600	$6,463,100	$4,537,200	$1,818,294	$29,321,340
% Awarded	30%	4%	36%	25%	29%	21%	25%	45%	23%	50%	25%
Success Fraction											
University	2/7	0/7	2/6	1/4	4/15	2/6	0/2	4/10	2/7	2/5	19/69=28%
FFRDC	-	-	-	-	1/3	0/2	0/1	0/1	-	-	1/7=14%
NASA	1/6	1/2	1/2	2/13	2/7	1/3	1/6	2/5	2/4	0/2	13/50=26%
Private	-	-	-	-	1/2	-	-	-	-	-	1/2=50%

ROSES-2007 NRA Review Schedule

Program Element	Program Officer	Proposals Due	Panel Review Complete	# of Proposed Investigations	# Panels/ Reviewers	Investi-gations Selected	Recent Activities
Kepler Participating Scientists	P. Marcum	05/18/07	08/09/07	37	3/28	8 (22%)	- Review completed. Selection letters sent.
Origins of Solar Systems (with Planetary Science Division)	Z. Tsvetanov	05/25/07	09/20/07	104	5/30	27 (26%)	- Review completed. Selection letters sent.
Astrophysics Theory and Fundamental Physics	R. Hellings	06/01/07	09/26/07	181	11/68	37 (20%)	- Review completed. Selection letters sent.
GALEX Guest Investigator - Cycle 4	Z. Tsvetanov	06/22/07	09/19/07	99	4/32	35 (35%)	- Review completed. Selection letters sent.
Astrophysics Data Analysis	J. Hayes	06/22/07	10/11/07	98	6/27	41 (42%)	- Review completed. Selection letters sent.
GLAST Guest Investigator - Cycle I	R. Harnden	09/07/07	12/19/07	167	4/33	41 (25%)	- Review completed. Selection letters sent.
Swift Guest Investigator - Cycle 4	R. Harnden	11/09/07	01/25/08	144	4/26		- Review completed.
Suzaku Guest Observer - Cycle 3	L. Kaluzienski	11/30/07	02/12/08	120	4/24		- Panels set up. Proposals to be reviewed in 2 weeks
Astronomy & Physics Research & Analysis - 2008	W. Sanders	04/11/08	06/13/08				

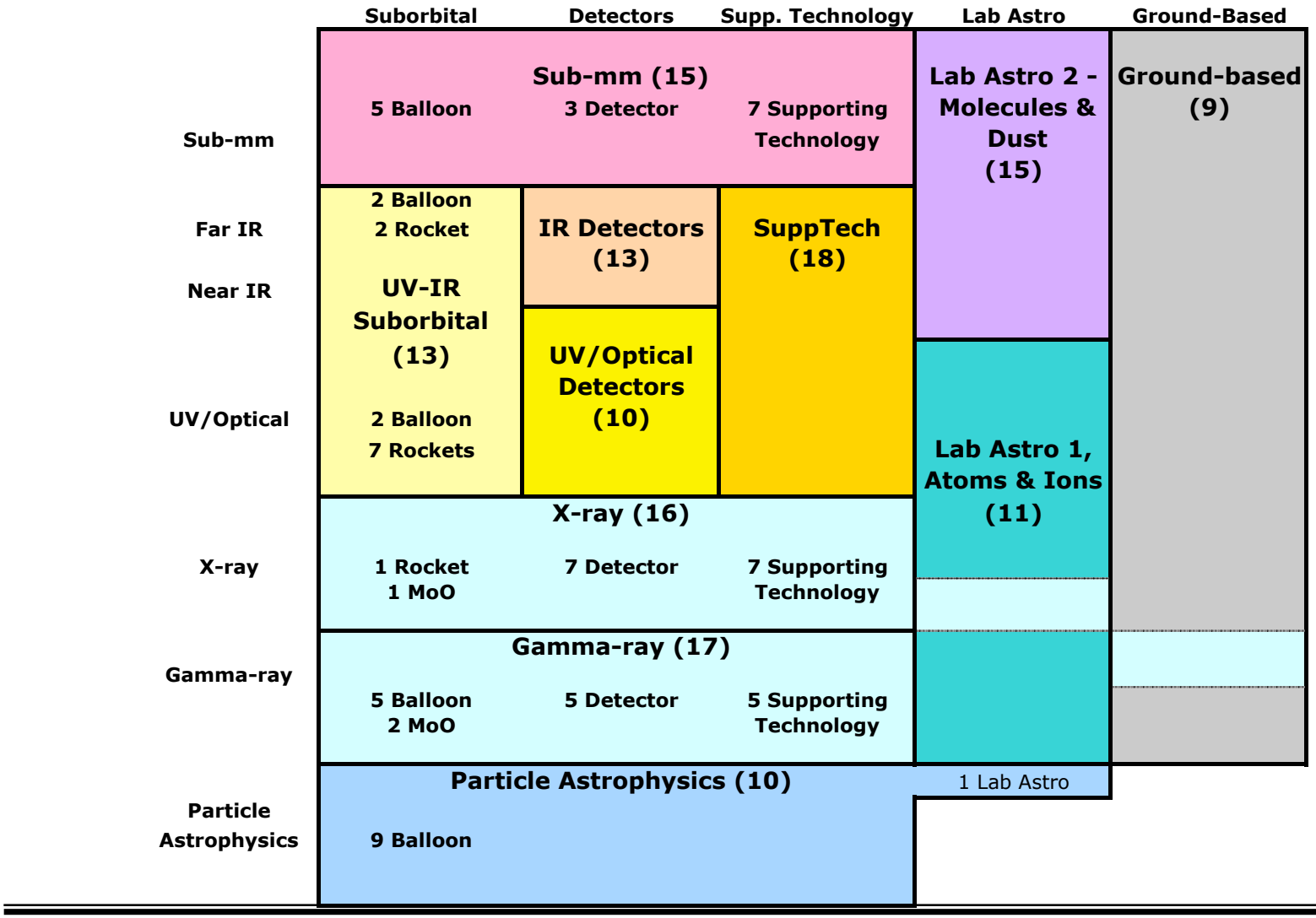
ROSES Changes for 2008

1. ROSES-2007 APRA-2008 was amended to allow grants of up to 4 years for Detector Development, Supporting Technology, Laboratory Astrophysics and Ground-Based Proposals. Suborbital Investigations will remain at up to 5 years.
2. ROSES-2008 will allow 4-year awards for ATFP, ADP, and APRA.
3. ROSES-2007 APRA-2008 (and ROSES-2008) amended to encourage suborbital proposals to establish absolute photometric standards across the electromagnetic spectrum.
4. ROSES-2007 APRA-2008 (and ROSES-2008) amended to include technology and training as factors of intrinsic merit:
   - "For suborbital proposals, specific factors that will be considered when evaluating a proposal's intrinsic merit are the scientific merit, the degree to which it advances the technology readiness level of a detector or supporting technology, and the degree to which it advances the readiness of junior researchers or graduate students to assume leadership roles on future NASA space flight missions."

Funding History by Level-3 WBS

	WBS	FY04 Targets	Final FY05 Targets	Final FY06 Targets	Final FY07 Targets	Initial FY08 Targets	Current FY08 Targets
HEA	399131.02.01	$ 14,548,000	$ 13,693,202	$ 14,779,227	$ 12,131,980	$ 11,306,593	TBD
ATP	399131.02.02	$ 7,860,000	$ 7,363,285	$ 10,245,457	$ 10,106,352	$ 9,469,512	TBD
Particle Astro	399131.02.03	$ 8,248,000	$ 7,670,887	$ 8,543,526	$ 6,971,071	$ 6,531,797	TBD
ULDB	399131.02.04	$ 2,740,000	$ 2,566,052	$ 2,736,137			
UV/Opt	399131.02.05	$ 8,643,000	$ 7,919,208	$ 6,486,966	$ 5,158,608	$ 4,833,544	TBD
IR/Sub-mm	399131.02.06	$ 11,766,000	$ 10,822,918	$ 15,363,712	$ 12,146,210	$ 11,380,831	TBD
Orig SS	399131.02.07	$ 4,209,000	$ 3,871,613	$ 4,149,617	$ 3,673,163	$ 3,441,703	$ 3,441,703
Keck Support	399131.02.08	$ 2,800,000	$ 2,355,524	$ 2,645,826			
Other	399131.02.09	$ 1,019,000	$ 854,085	$ 337,664	$ 931,616	$ 559,020	$ 559,020
Astrophysics R&A		$ 61,833,000	$ 57,116,774	$ 65,288,132	$ 51,119,000	$ 47,523,000	~$54M
BEFS		$ 4,000,000	$ 4,000,000	$ 2,000,000	$ -	$ -	$ -
TPF-FS		$ 2,000,000	$ 2,000,000	$ -	$ -	$ -	$ -
TOTAL		$ 67,833,000	$ 63,116,774	$ 67,288,132	$ 51,119,000	$ 47,523,000	~$54M

APRA Review Panels



Issues & Concerns

1. Funding cuts in recent years have been devastating, but we are optimistic for the future.
2. We do not have the APWG or UWG any more to provide community input to us on R&A issues, so the Astrophysics NAC Subcommittee is it. Are you the appropriate ones to do that?
3. We need to have a structured process to step back and examine the funding balance amongst the SRT disciplines, theory, data analysis, fellowship programs, etc.
4. What is the role of proposal pressure, aka “demand-based balancing?”

Backup

How awardees are selected

- Solicitations for proposals are made via NASA Research Announcements (NRAs)
- Annual R&A solicitation, "Research Opportunities in Space and Earth Sciences" (ROSES), is open to University, NASA, FFRDC, Industry
  - SMD's omnibus NRA; ROSES-2006 has 64 program elements
  - Used to solicit virtually all non-flight opportunities
  - No special treatment for successor proposals
- Peer Reviews - panels evaluate:
  - Scientific or technical merit
  - Relevance to NASA's objectives
  - Cost realism and reasonableness
- Program officer recommends selections based on peer review evaluations and programmatic considerations

Principles for the Research Program

- Scientific merit through peer review
  - Use scientific merit, as determined through community and peer review, as the primary criterion for science program planning and resource commitment.
- Timely availability of data
  - Ensure vigorous and timely interpretation of mission data, requiring that data acquired be made publicly available as soon as possible after scientific validation.
- Community participation
  - Ensure the active participation of the research community outside NASA, which is critical to success.
- Maintain NASA capabilities
  - Maintain essential technical capabilities at the NASA Centers.

ROSES-2005 Statistics

Program Element Title	Due Date	Notification Date	150-day Metric	# Props Received	# New Selected	% Selected
GALEX Guest Investigator – Cycle 2	8-Apr-05	3-Oct-05	178	64	25	39%
Astronomy and Physics Research and Analysis	22-Apr-05	22-Sep-05	153	160	45	28%
Terrestrial Planet Finder Coronagraph / Instrument Concept Studies	29-Apr-05	28-Jun-05	60	13	5	38%
Terrestrial Planet Finder / Foundation Science	27-May-05	16-Feb-06	265	25	3	12%
Astrophysics Theory	3-Jun-05	10-Nov-05	160	128	21	16%
Beyond Einstein Foundation Science	3-Jun-05	10-Nov-05	160	54	7	13%
Swift Guest Investigator – Cycle 2	8-Jul-05	1-Dec-05	146	67	33	49%
FUSE Guest Investigator – Cycle 7	16-Sep-05	1-Mar-06	166	81	49	60%
Rossi X-ray Timing Explorer Guest Observer – Cycle 11	19-Sep-05	18-Jan-06	121	131	59	45%
Astro E2/Suzaku Guest Observer – Cycle 1 Resolicitation	6-Jan-06	13-Sep-06	250	158	59	37%
Concept Studies for the Joint Dark Energy Mission	17-Mar-06	28-Jul-06	133	6	3	50%