



# **NASA/NSF Joint Programs: NASA Balloon Program Astronomy and Astrophysics Advisory Committee**

Dr. Jon Morse  
Astrophysics Division Director  
Science Mission Directorate  
NASA Headquarters

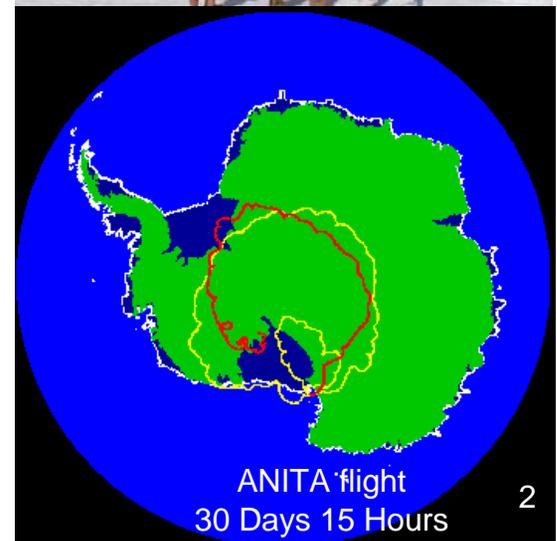
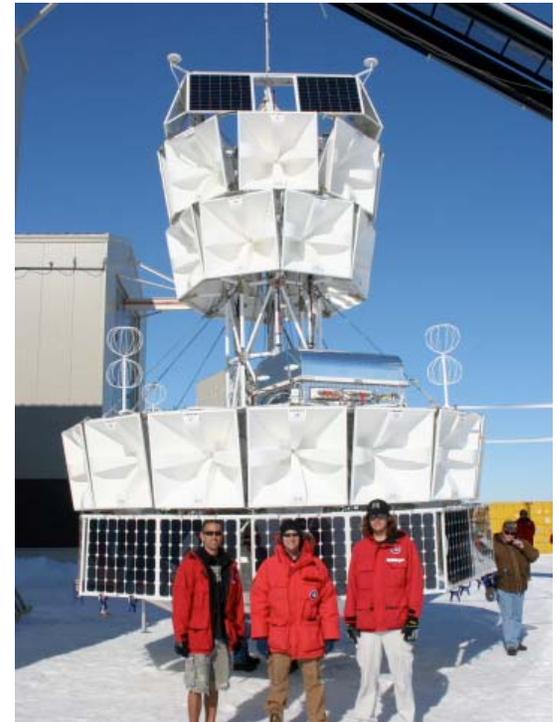
February 18, 2009



# ANITA-II (Antarctic Impulsive Transient Antenna)

PI: Dr. Peter Gorham, University of Hawaii.

- ANITA is a radio telescope to detect ultra-high energy cosmic-ray neutrinos from a balloon-borne payload over Antarctica.
- The goal of this first NASA observatory for neutrinos is to constrain the origin of the highest energy cosmic rays.
- It was launched 12/21/08 and terminated 01/28/09 after flying 30 day, 15 hr during three laps around Antarctica.
- It achieved comprehensive science and operations success, before the flight was terminated from CSBF in Palestine, Texas.
- The payload was in good condition upon impact, and it continued to transmit data via Iridium.
- The payload was fully recovered and transferred to McMurdo for return shipment to the U.S.





# CREAM IV (Cosmic Ray Energetics and Mass)

PI: Prof. Eun-Suk Seo, University of Maryland; PM: David Stuchlik, WFF

- The CREAM IV mission was launched 12/19/08, and terminated 01/06/09 after two circumnavigations.
  - Both the science and CDM systems functioned extremely well throughout the 19 day, 13 hour flight.
  - The CREAM Mission has accumulated 120 days of data at altitude in four flights.
- The payload transmitted telemetry down to the ice, and it was upright and fully functioning upon landing!
- Science payload recovery is complete, and air and surface shipments are underway.
- Termination of the payload over Victoria Land was successfully performed from Palestine, TX.





# Super Pressure Balloon Test Flight

- The Super Pressure Balloon test flight has met its comprehensive success criteria and achieved new NASA Flight Duration Record.
- Additional time at float is desired to obtain engineering data on balloon's performance at the maximum designed operational pressure.
- A "Nature News" article issued 2/9/09 on the flight.

<http://www.nature.com/news/2009/090208/full/news.2009.85.html>

09 February 2009



## Test balloon breaks endurance record

NASA's pumpkin-shaped balloon stays aloft for more than 42 days.

## Latest news

[Genome sequencing: the third generation](#)

[The world's top ten telescopes revealed](#)

[Make methane while the sun shines](#)

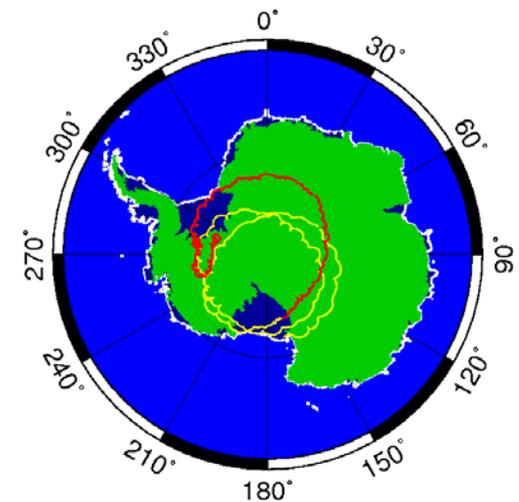
[naturenews](#)

## Super Pressure Test Flight

7 MCF At Float (12/28/08)



Super Pressure as of 02/17/09  
51+ Days at Float





# Very Successful NASA- NSF/OPP Partnership

## Substantial Month-Long Press Coverage of Antarctic Ballooning

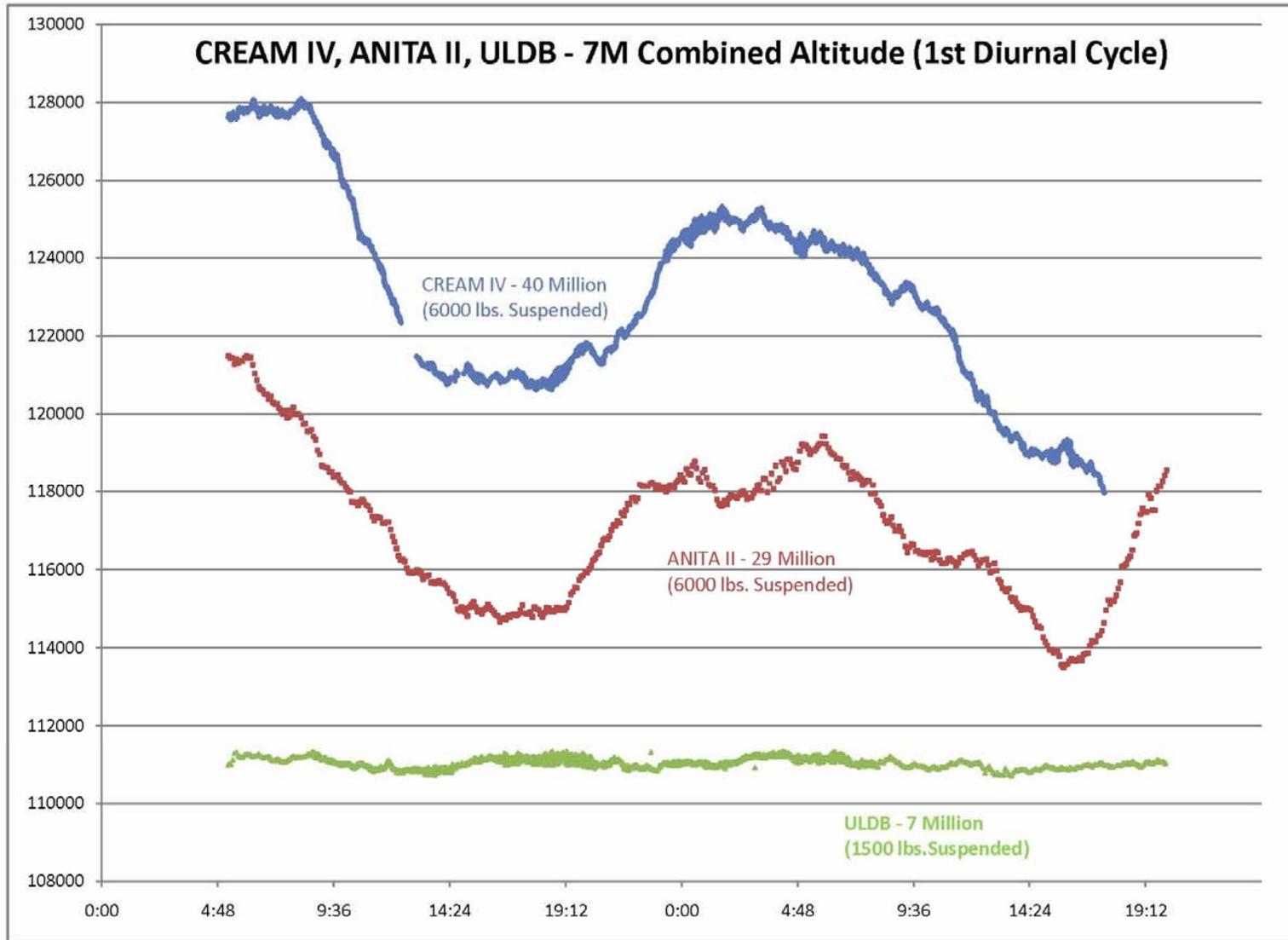
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- Coverage peaked around mid-January after talks/presentations at the AAS and are picking up now after the flight-duration record broken.
- Coverage from all over the world (Europe, Australia, India) and also localized in the US (New Mexico and Texas – team linked to these states).
- Rare cross-discipline coverage: general press (MSNBC, Web-NY Times, FOXnews, Reuters,...); specialized science press (Nature, Popular Mechanics,...), specialized business press ( CNNmoney, Marketwatch, MoneyCentral, tradingmarkets.com,...).
- Perhaps another (smaller) coverage peak when flight is terminated.





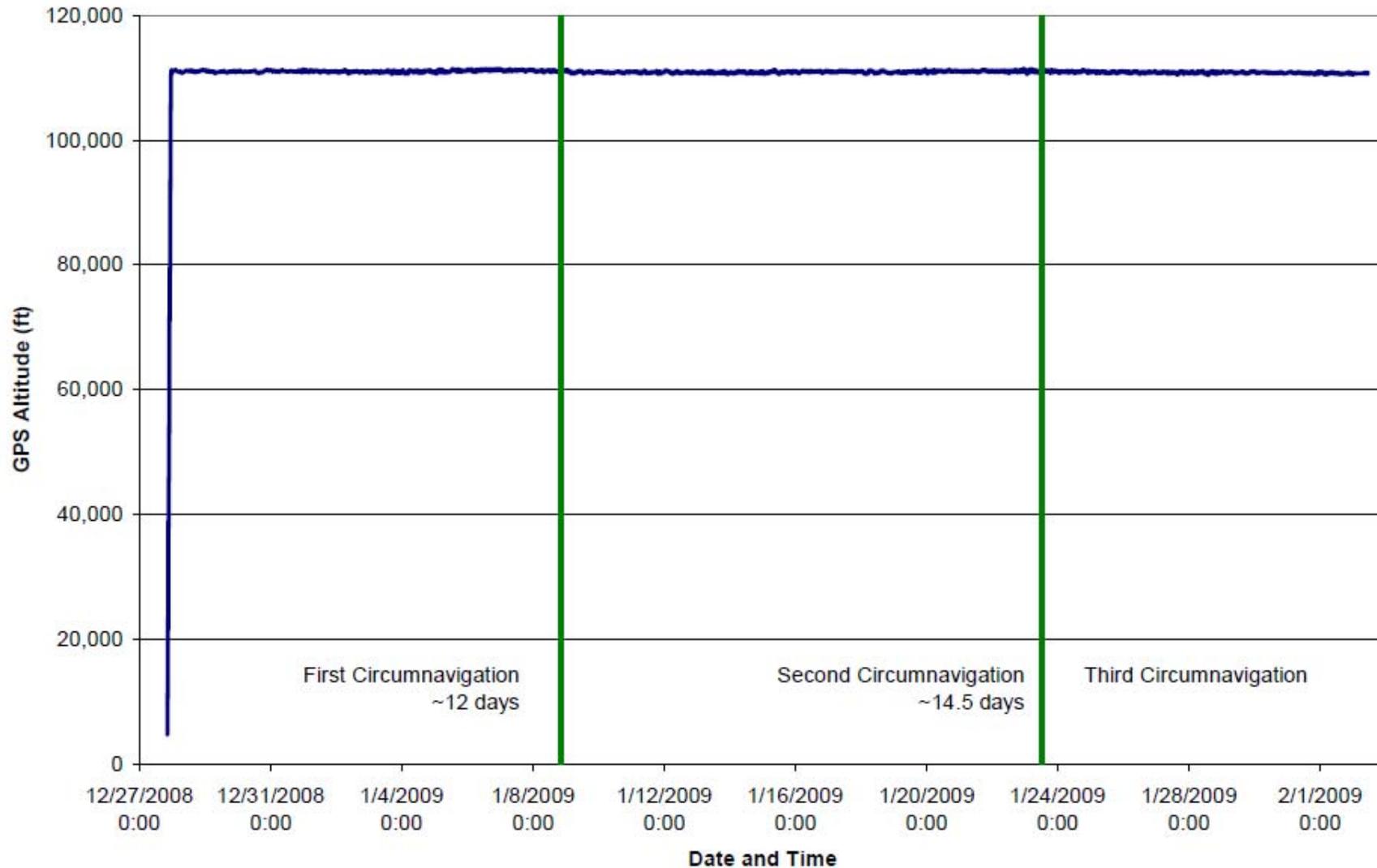
# Super-Pressure vs. Zero-Pressure Balloon Performance





# Altitude Profile of Super Pressure Balloon Flight

591NT Antarctica Super Pressure Flight



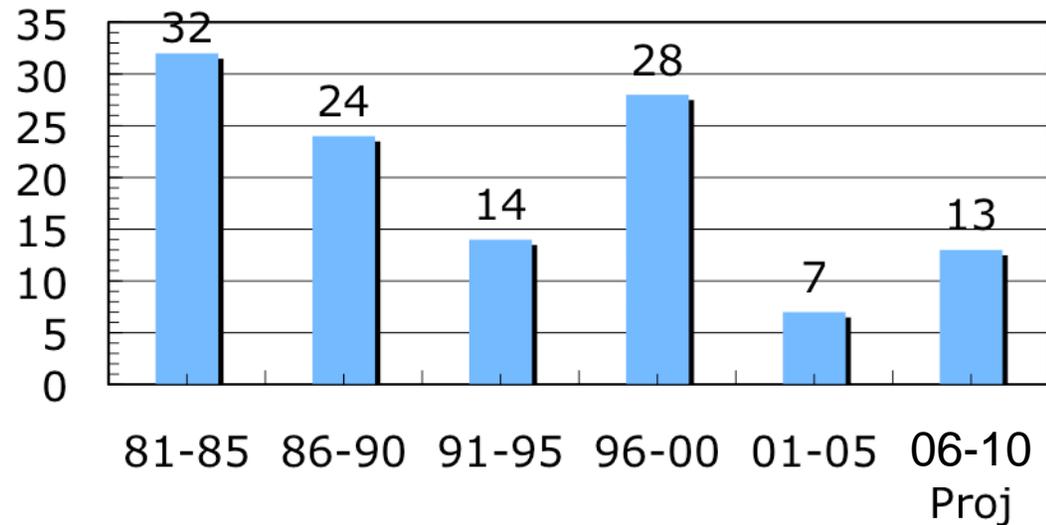




# Declining Flight Rates Over Past Decade

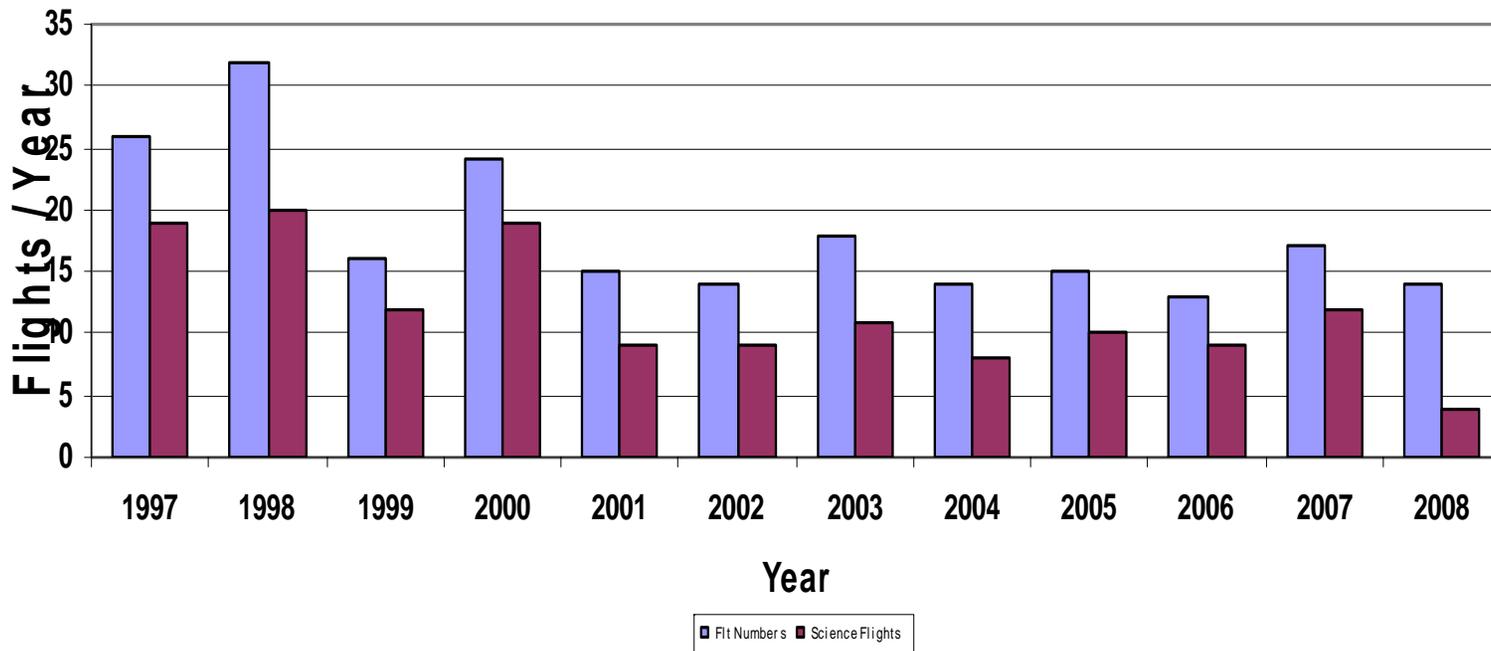
Astrophysics Sounding Rockets

- Including 2007-2008 surge in payload selections



NASA Balloon Flights

■ *Science Flights*  
■ *All Flights*





# Reinvigoration of the Suborbital Programs

- Augmented budgets for both payloads and flight operations.
  - Restore flight rates to 1990’s levels: Double the current rates.
- Payloads are being funded in wide range of disciplines.
  - Optical, UV, IR, Sub-mm, X-Ray, Gamma Ray, Cosmic Ray, etc.
- Balloon Project Flight Operations - \$K

	<u>FY 09</u>	<u>FY 10</u>	<u>FY 11</u>	<u>FY 12</u>	<u>FY 13</u>
FY08 President’s Budget	24,107	23,863	23,830	25,148	
FY09 President’s Budget	24,607	26,663	28,830	32,448	33,216

- Astrophysics Suborbital Payloads - \$M

	<u>FY07 Actual</u>	<u>FY08 Actual</u>	<u>FY09 Projection</u> +
Sounding Rockets	4	5	7
Balloons	12	13	15

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+ The uncertainty in these projections depends on the proposal peer reviews.



# Merit of the Suborbital Programs

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- Suborbital Programs offer flight opportunities for unique science investigations that require, or can be done in, near-space.
  - Quick access to space at much less cost than orbital missions.
- They play important roles in migrating bench top technologies to space flight readiness levels.
- Suborbital options can maintain scientific & technical momentum for missions beyond the funding horizon.
- They provide students with the hands-on hardware training crucial for developing the next generation of scientists and engineers.
  - Time from concept, to detector, to flight and data analysis is consistent with pursuit of a graduate degree.
- They are primary engines for generating new scientists with hardware and management skills to lead new space missions.

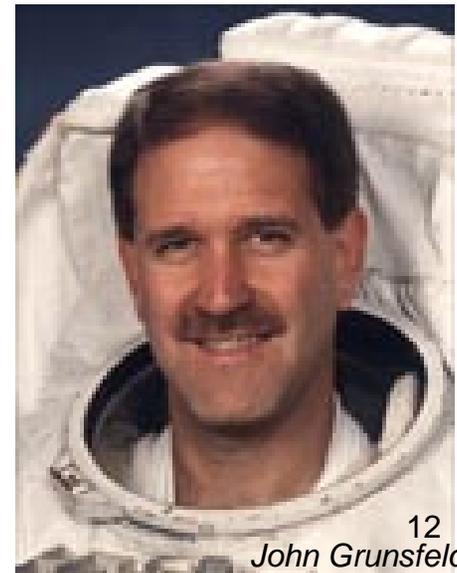


# Leading Scientists Trained in Suborbital Programs

- **John Mather** (NASA/GSFC Senior Scientist)
  - Nobel Prize 2006 for COBE
  - Senior Project Scientist for JWST
- **John Grunsfeld** (NASA/JSC Astronaut)
  - Astrophysicist; Hubble Space Telescope repairs
- **Martin Israel** (Wash. U., St. Louis Professor)
  - HEAO C-3 PI, Balloon PI
- **Chris Martin** (Caltech Professor)
  - GALEX PI, Both Sounding Rocket & Balloon PI
- **Fiona Harrison** (Caltech Professor)
  - NuSTAR PI, “One of America’s Best Leaders - 2008”



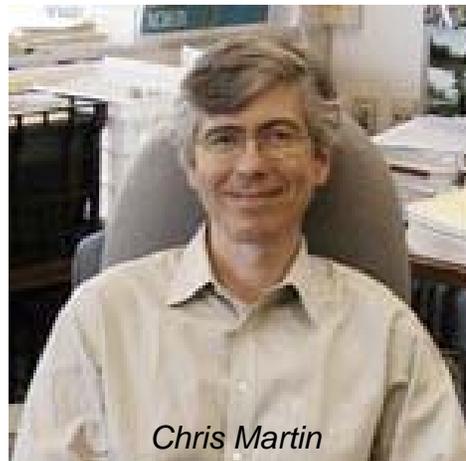
*John Mather*



12  
*John Grunsfeld*



*Fiona Harrison*



*Chris Martin*



*Martin Israel*