

Challenges, Triumphs and Disasters



ERIC DUNFORD

UK-4 (Ariel 4)



Rutherford Appleton Lab.



Disadvantages of doing Science in Space

- Expensive
- No direct access
- Cannot change
- Severe size & weight limitations
- **Hostile environment**

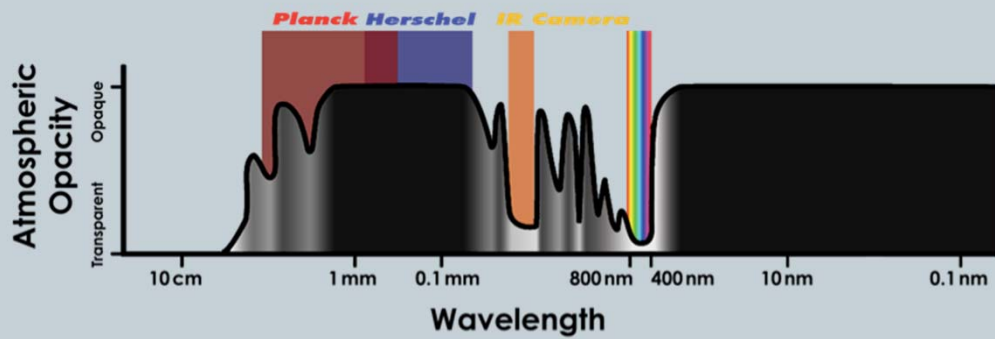
Environmental Challenges

- Temperature
- High Vacuum
- Cosmic Rays
- X-rays, UV Radiation
- Natural and Man-made Debris
- Launch Trauma

Why Bother?

- **To observe pristine radiation**

Light Absorbed by the Atmosphere



Why Bother?

- To observe pristine radiation
- To get close to objects



Why Bother?

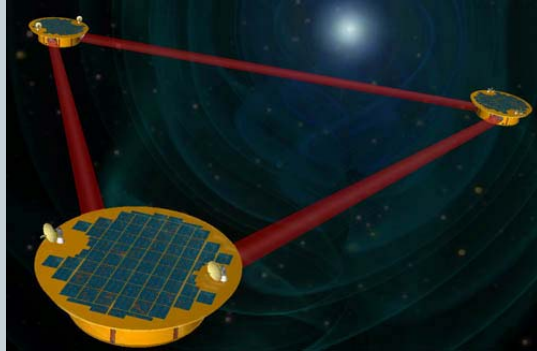


- To observe pristine radiation
- To get close to objects
- **To do fundamental physics**

The LISA Mission



- The search for Gravitational Waves



lisa pathfinder



**→ FIRST STEPS TO OBSERVING
GRAVITATIONAL WAVES FROM SPACE**

Failure Categories

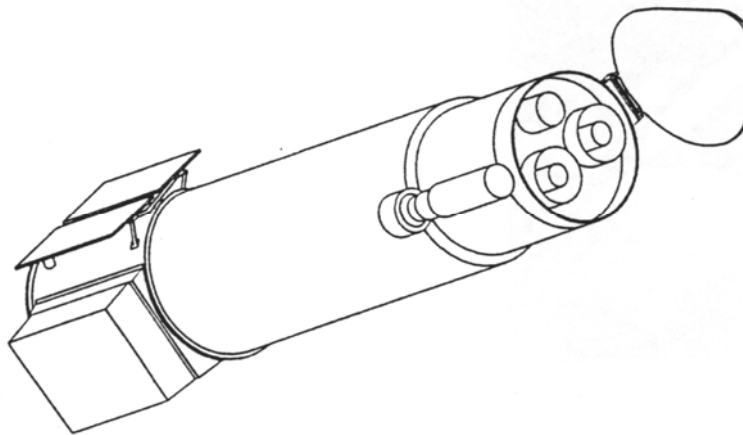
- Launch



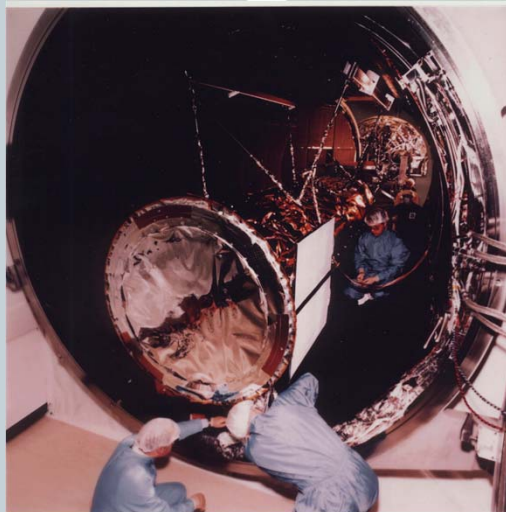
Failure Categories

- Launch
- Financial/Political

JET-X Conceptual Drawing



JET-X in TV Chamber



SPEKTR-RG

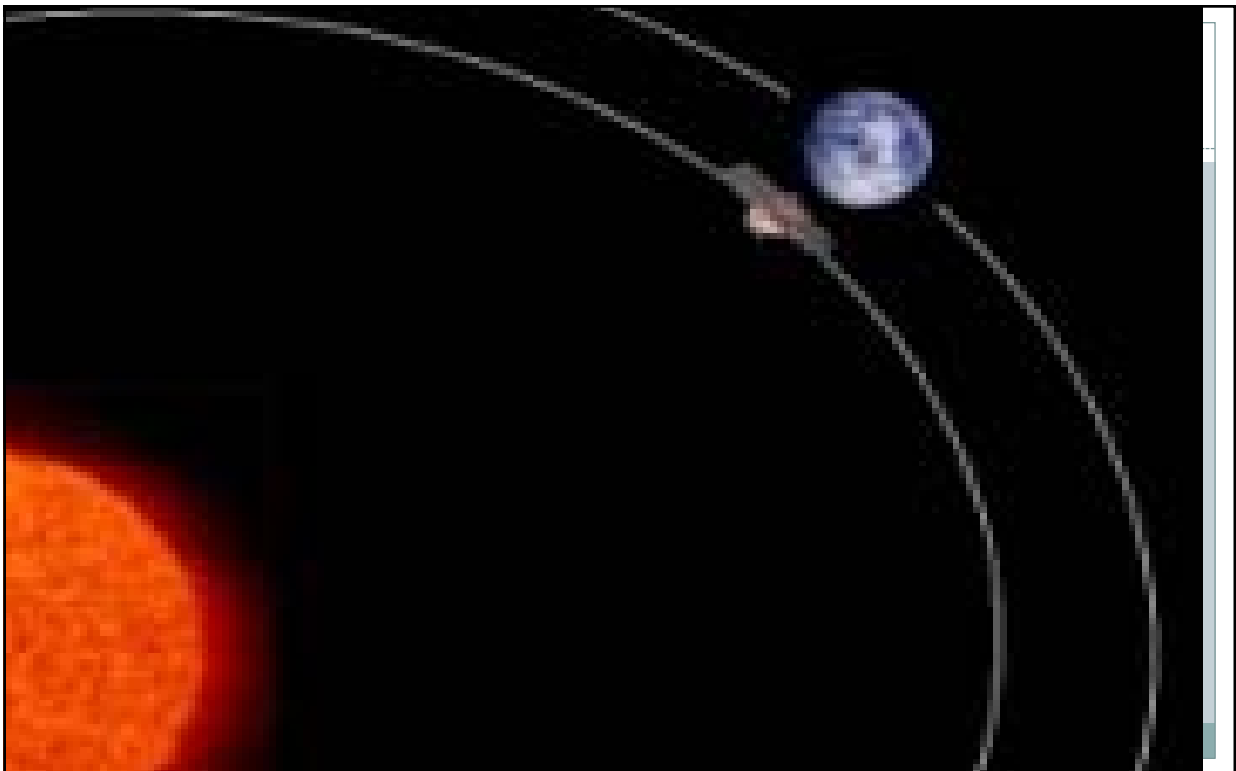


Failure Categories

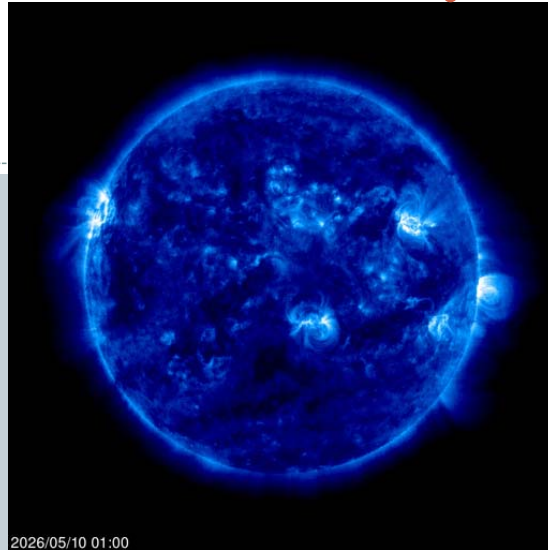
- Launch
- Financial
- Orbit
- Pointing

SOHO





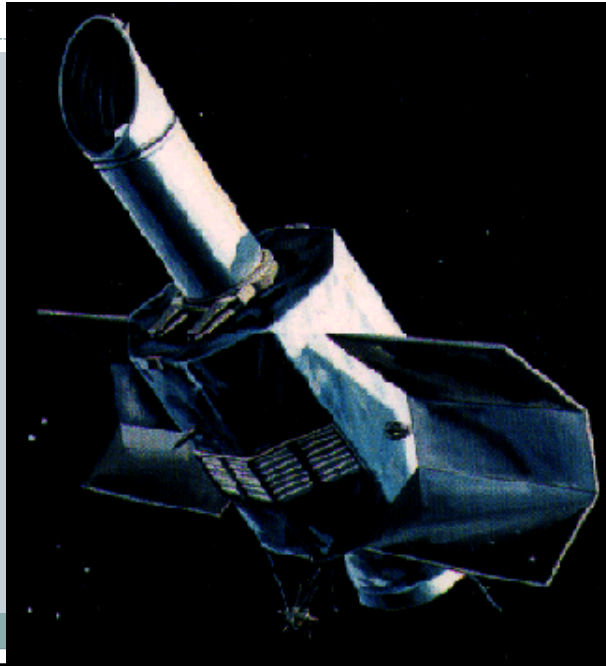
The sun last Sunday!



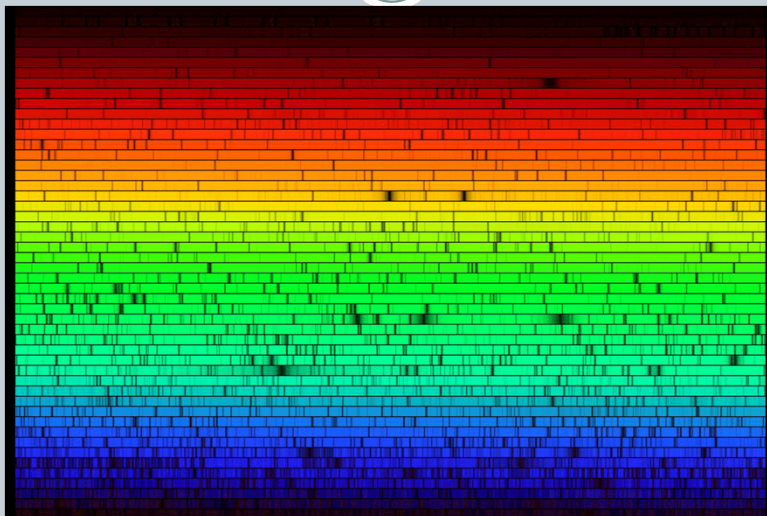
Failure Categories

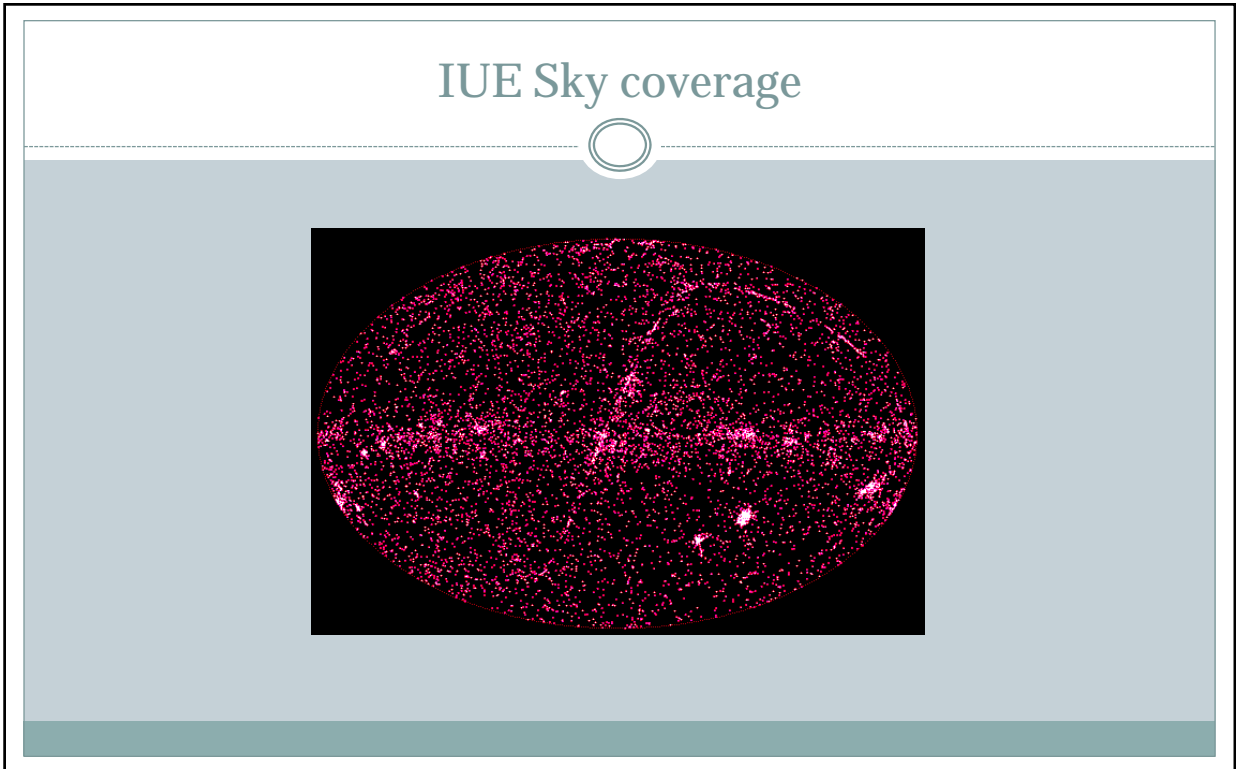
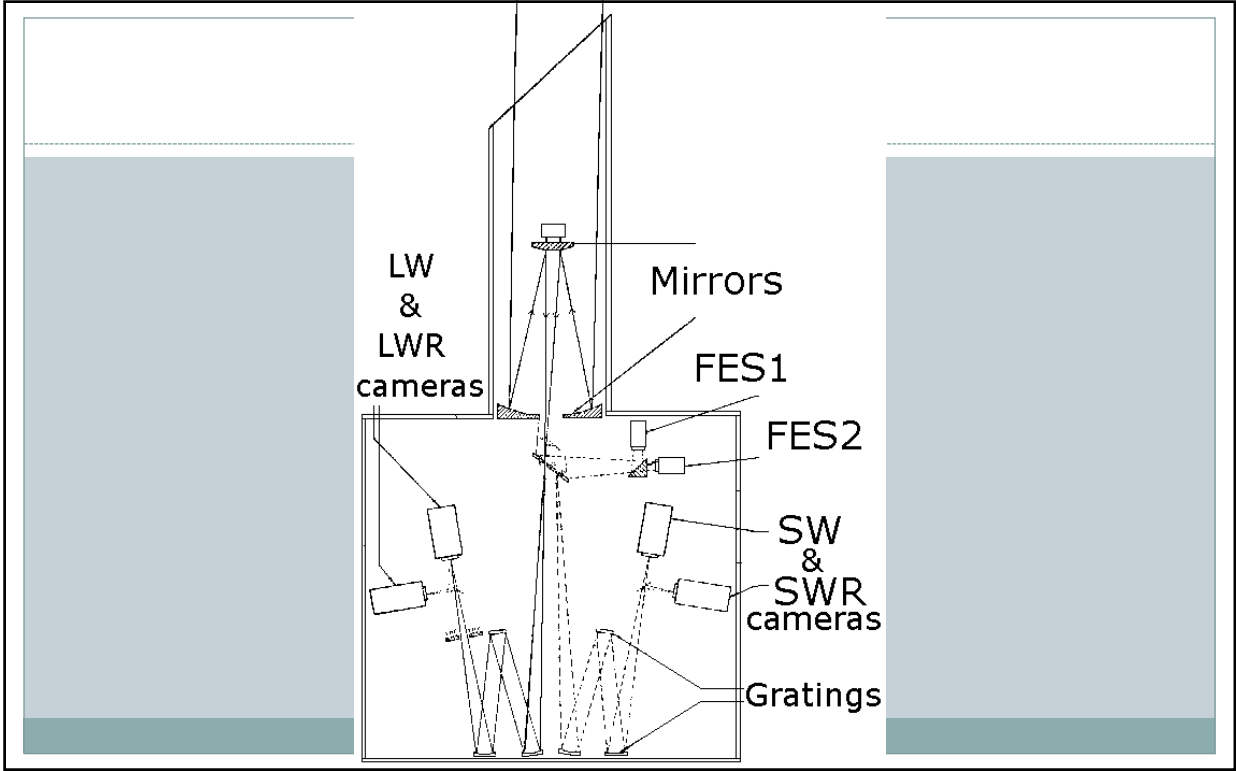
- Financial
- Launch
- Orbit
- Pointing
- Equipment Failure

International Ultra-violet Explorer (IUE)

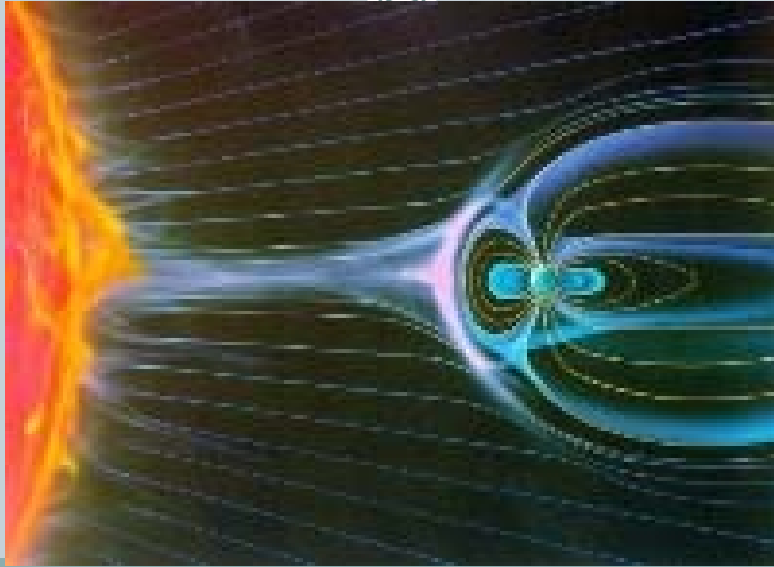


Visible light Echelle Spectrum

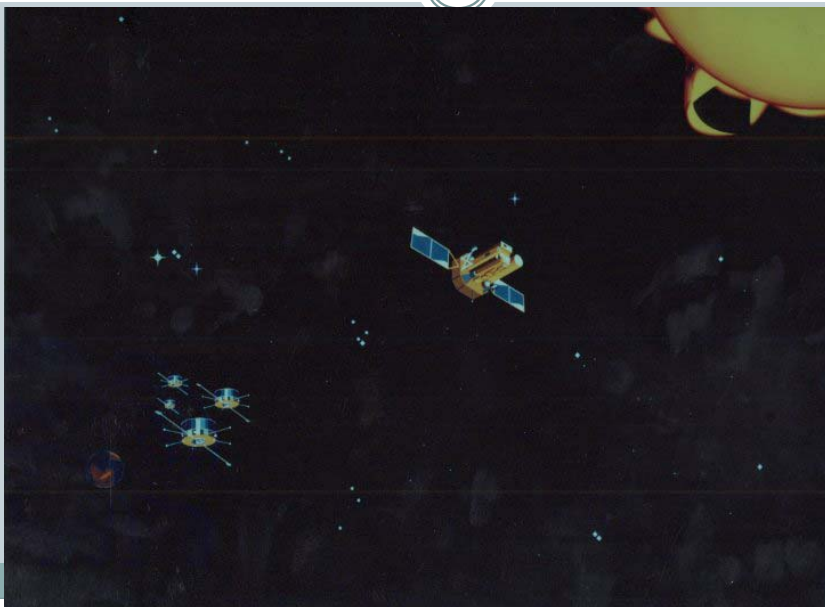




Solar Wind

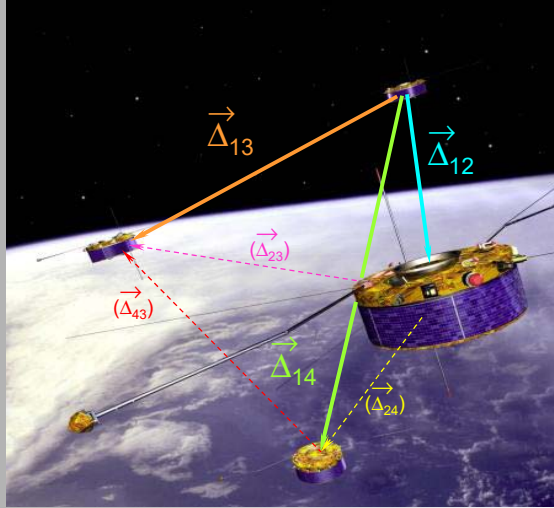


SOHO and Cluster





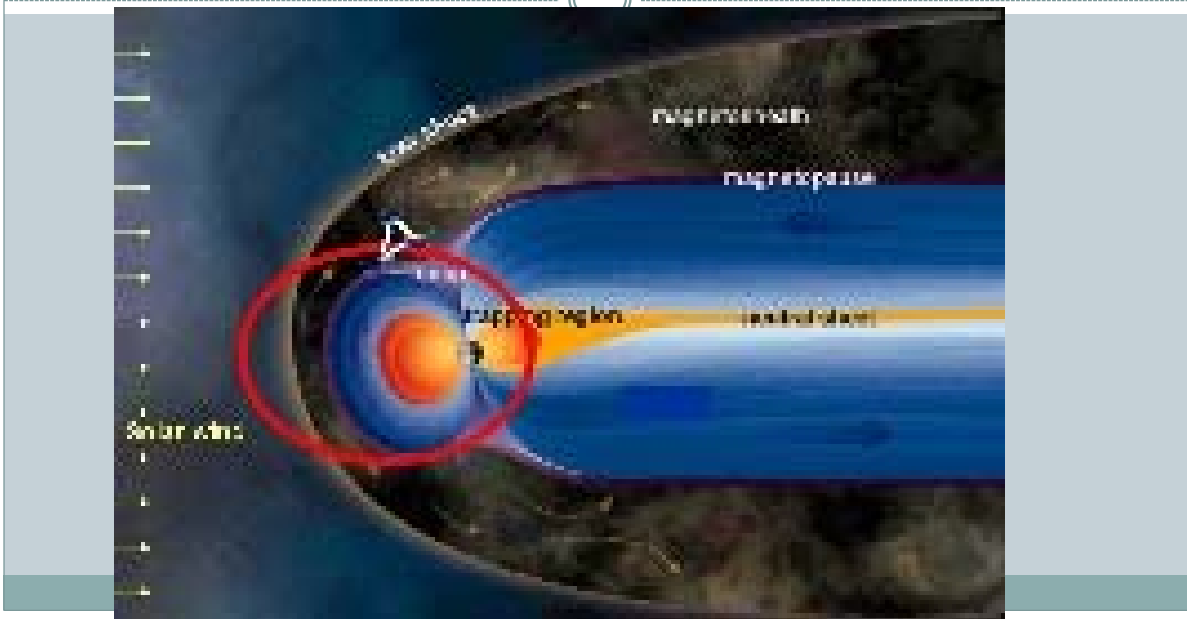
Cluster: the first 3-dimensional observations of space



- a cornerstone mission of the European Space Agency (ESA)
- we use timing at 4 craft to find motion, orientation, thickness and curvature of boundaries in space for the first time



Cluster Orbit

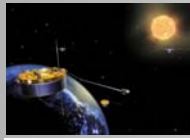


Ariane V



Cluster Launch





Cluster: the first attempt in 1996



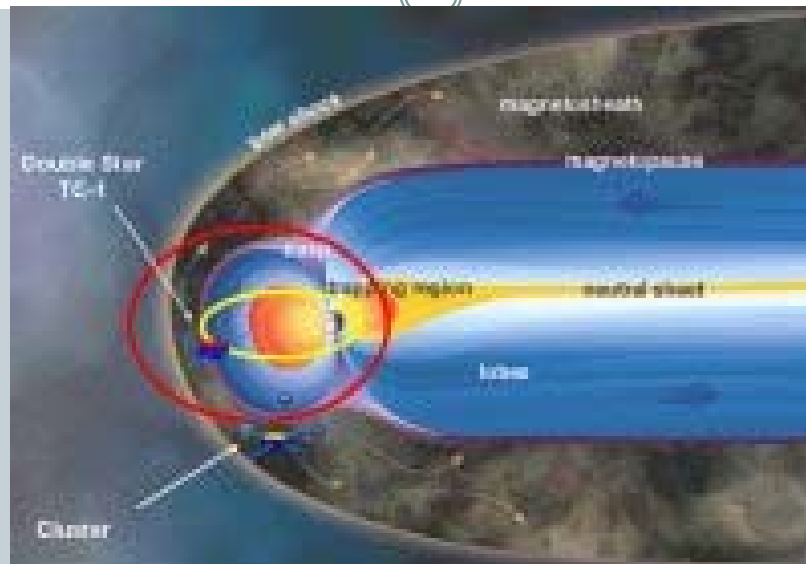
Photos: Andre Balogh



- was to be launched on the first test flight of Ariane 5
- used of software borrowed from Ariane 4
- caused rocket to blow up
- it took 4 years to rebuild instruments and craft an launch on 2 Russian rockets

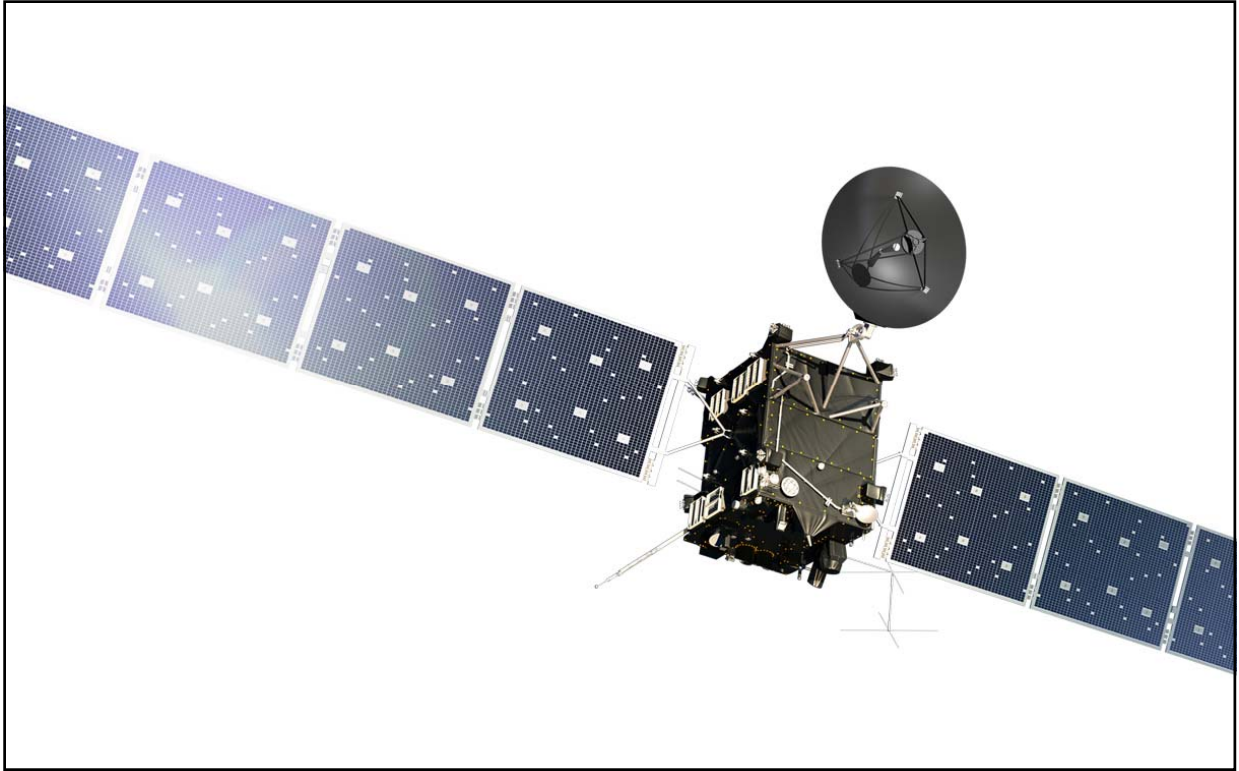


Cluster and Double Star Orbits



Cluster Spacecraft being de-orbited!

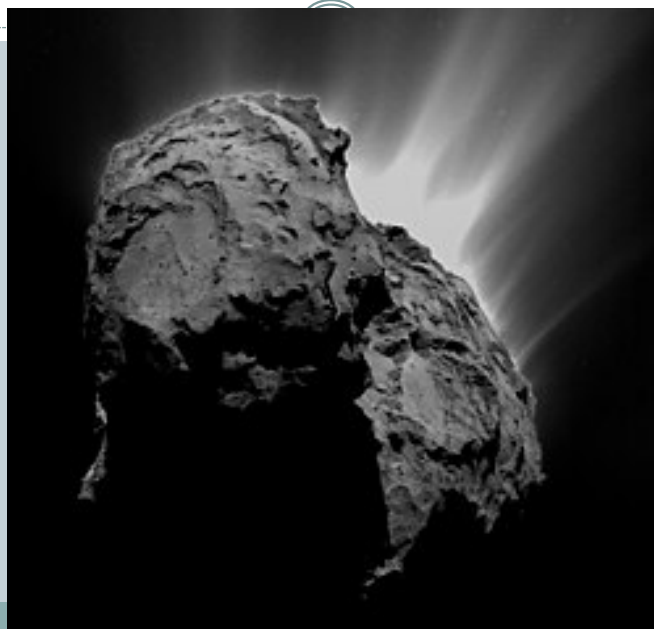




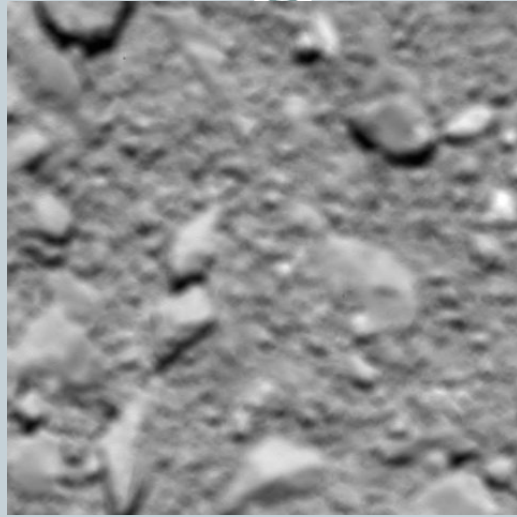
What was supposed to happen!



ROSETTA observation showing tail



Last image from Rosetta



- Thank you