CHANDRA X-RAY OBSERVATORY

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Outline

- Past X-Ray Observatories
- NASA Great Observatories
- The Chandra Mission
- Construction Of Chandra
- Delivery of Chandra
- Chandra Observations
- Chandra's Scientific Impacts
- Future X-ray Observatories

Past X-Ray Observatories

- Uhuru – 1970
- Skylab
- Einstein – 1978
- ROSAT – 1990-1999

NASA's Great Observatories

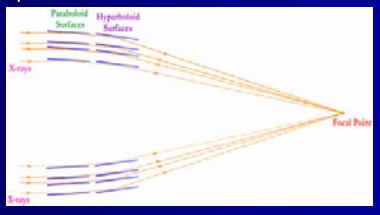
- Four Space Observatories
- Hubble Space Telescope – 1990
- Compton Gamma-Ray Observatory – 1991 to 2000
- Chandra X-Ray Observatory – 1999
- Spitzer Space Telescope – 2003

The Chandra Mission

- NASA's Chandra X-ray Observatory probes the mysteries of space with unprecedented X-ray images that help to unravel the structure and evolution of the universe.
  - From NASA's Chandra Main Website

Optics

- High Resolution Mirror Assembly (HRMA)
  - Unique Mirror Construction



  - If Colorado was as smooth as the mirrors, Pikes Peak would be less than an inch tall.

Instrumentation

- Integrated Science Instrument Module (ISIM)
- Holds the ACIS and HRC
- Moves instruments into focal plane of telescope

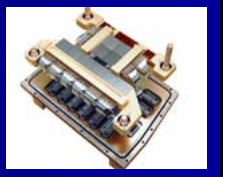
Instrumentation

- High Resolution Camera (HRC)
- One-Half Arc Second of Resolution

Same as Reading a News Paper from Half a Mile Away

Instrumentation

- Advanced CCD Imaging Spectrometer (ACIS)
- Used to Resolve Temperature Variations Across X-ray Sources



Instrumentation

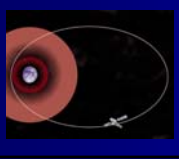
- HETGS & LETGS
  - High Energy Transmission Grating Spectrometer
  - Low Energy Transmission Grating Spectrometer
  - Between Mirror and ISIM
  - High Resolution Spectroscopy
  - Temperature and Chemical Composition

Other Aspects of Chandra

- Aspect Camera Stray Light Shade
- Space Craft Module
- Low Gain Antenna
- Thrusters
- Sunshade
- Solar Panels

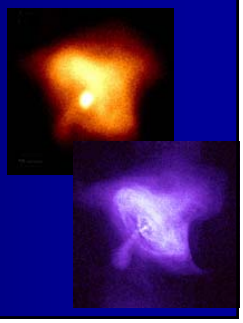
Getting to Space

- STS-93
  - July 23, 1999
- Elliptical Orbit



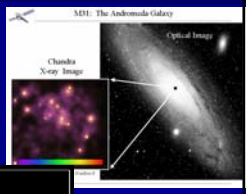
Observations

- Solar System
- Black Holes
- X-ray Binaries
- AGN and Quasars
- Supernovae



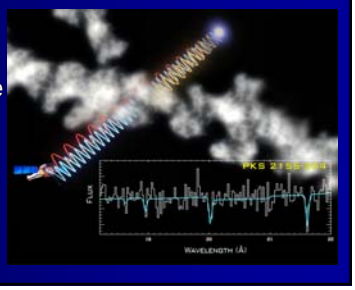
Observations

- Andromeda Center
- Our Galactic Center Sagittarius A



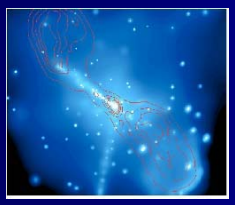
Observations

- Bands of Hot Gas Between Galaxies
- Viewed by Looking at the Emission and Absorption Lines of Quasars



Observations

- 3C58 and the Crab Nebula Pulsar
- Centaurus A (ACIS)

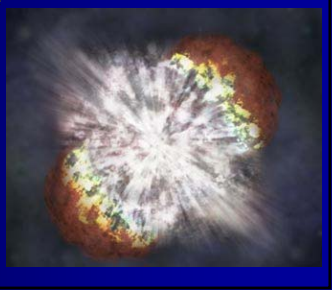


Observations

- Supernova Remnant
- Dispersal of Heavy Elements
- Elements Around Black Holes

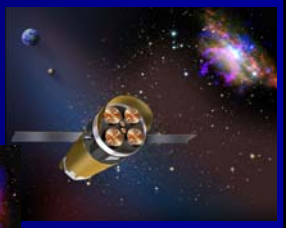
Scientific Advances

- Verification of Hubble Constant and Universe Age
- Structure of the Universe
- Star Formation
- Black Hole Science
- SN 2006gy
  - Early Superbright Supernovae



Future X-ray Observatories

- Constellation X
  - Crazy Configurations



Conclusion

- Science is a perception of the world around us. Science is a place where what you find in nature pleases you.

  ~Subramanyan Chandrasekhar

Resources

- http://chandra.harvard.edu/about/
  - Interactive Chandra
- http://www.nasa.gov/mission_pages/chandra/main/index.html
- http://www.nasa.gov/mission_pages/chandra/news/chandra_bright_supernova.html
- http://www.nasa.gov/vision/universe/starsgalaxies/chandra7years.html
- http://constellationx.nasa.gov/mission/overview/index.html