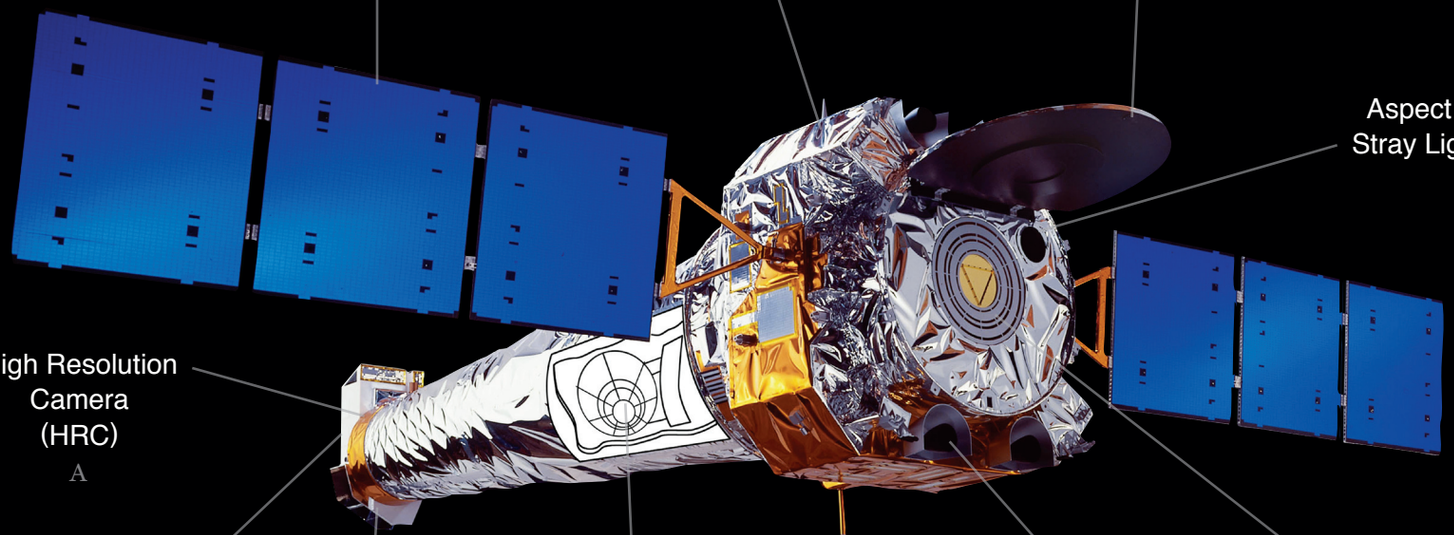
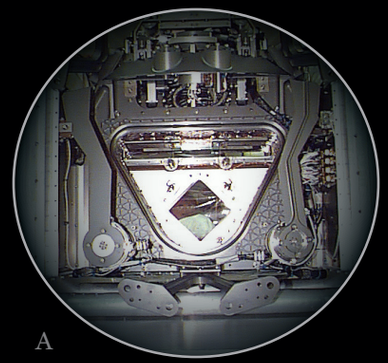
CHANDRA SPECIFICATIONS

CHANDRA
X-RAY OBSERVATORY

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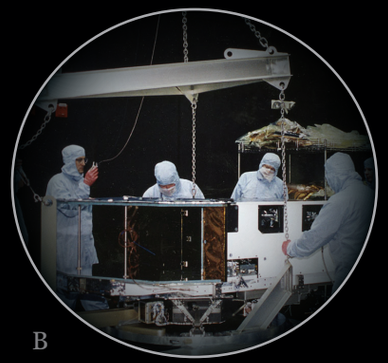
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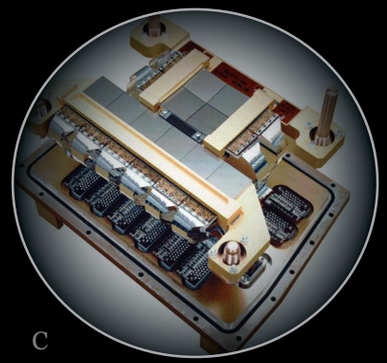
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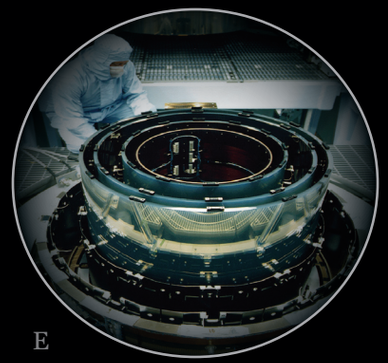
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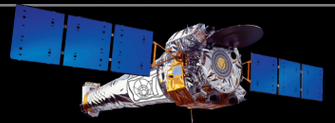

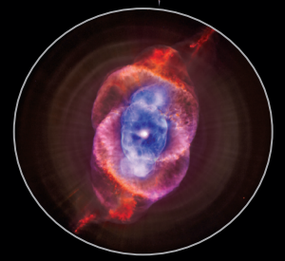

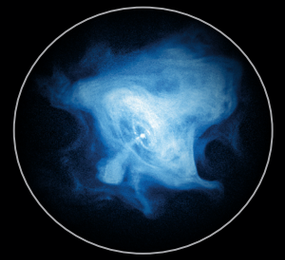

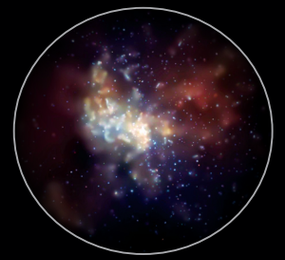

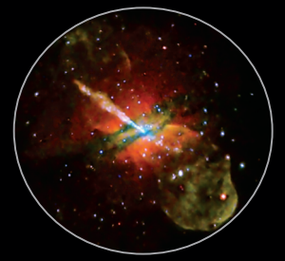

TOP 10 FACTS ABOUT CHANDRA

Chandra flies 200 times higher than Hubble—more than 1/3 of the way to the Moon.

Chandra can observe X-rays from clouds of gas so vast that it takes light five million years to go from one side to the other.

During maneuvers from one target to the next, Chandra slews more slowly than the minute hand on a clock.

At 45 feet long, Chandra is the largest satellite the shuttle has ever launched.

If Colorado were as smooth as Chandra's mirrors, Pikes Peak would be less than one inch tall.

Chandra's resolving power is equivalent to the ability to read a stop sign at a distance of twelve miles.

The electrical power required to operate the Chandra spacecraft and instruments is about 600 watts, less power than a hair dryer uses.

The light from some of the quasars observed by Chandra will have been traveling through space for ten billion years.

STS-93, the space mission that deployed Chandra, was the first NASA shuttle mission commanded by a woman.

Chandra can observe X-rays from particles up to the last second before they fall into a black hole.

Credits (front): Cat's Eye, Crab Nebula, MacsJ0025, Sagittarius A*, Cen A

CHANDRA SPECIFICATIONS

An X-ray telescope is the only way astronomers can observe the hot regions of the Universe. The most powerful optical telescopes, such as the Hubble Space Telescope, cannot see the vast clouds of hot gas that stretch millions of light years across and contain enough matter to make hundreds of trillions of stars. X-ray telescopes allow us to image matter swirling as close as 90 kilometers from the event horizon of a stellar black hole or to track the expansion of a hot gas bubble produced by an exploding star.

The Chandra X-ray Observatory has three major parts: (1) the X-ray telescope, whose mirrors focus X-rays from celestial objects; (2) the science instruments which record the X-rays so that X-ray images can be produced and analyzed; and (3) the spacecraft, which provides the environment necessary for the telescope and the instruments to work.

Chandra is the third of NASA's Great Observatories. The mirrors on Chandra are the largest, most precisely shaped and aligned, and smoothest mirrors ever constructed. The images Chandra makes are twenty-five times sharper than the best previous X-ray telescope. Chandra, which was launched by the Space Shuttle on July 23, 1999, is helping scientists to better understand the hot, turbulent regions of space and answer fundamental questions about the origin, evolution, and destiny of the Universe.

OVERALL SPECIFICATIONS

Size (solar arrays deployed):	13.8 m x 19.5 m (45.3 ft x 64.0 ft)
Weight:	4,800 kg (10,125 lbs)
Orbit:	10,000 km x 140,161 km (6,200 x 86,900 mi); 28.5° inclination
Ascending node:	200°
Argument of perigee:	270°
Life:	expected 15+ years

SPACECRAFT SPECIFICATIONS

Power:	two 3-panel silicon solar arrays (2350 W) three 40 amp-hour nickel hydrogen batteries
Antennas:	two low-gain, conical log spiral antennas
Frequencies:	transmit 2250 MHz, receive 2071.8 MHz
Command Link:	2 kilobits per second (kbps)
Data Recording:	solid state recorders; 3.6 gigabits (37.2 hours) recording capability
Downlink Operations:	downloaded typically every 8 hours
Contingency Mode:	32 kbps
Safing:	autonomous operation

SCIENCE INSTRUMENTS

Advanced Charged Couple Imaging Spectrometer (ACIS):	Ten CCD chips in 2 arrays provide imaging and spectroscopy; imaging resolution is 0.5 arc-sec over the energy range 0.2 – 10 keV; sensitivity: $4x10^{-15}$ ergs-cm^{-2} sec^{-1} in 10^5 s
High Resolution Camera (HRC):	Uses large field-of-view micro-channel plates to make X-ray images: ang. resolution < 0.5 arc-sec over field-of-view 31x31 arc-min; time resolution: 16 micro-sec. sensitivity: $4x10^{-15}$ ergs-cm^{-2} sec^{-1} in 10^5 s
High Energy Transmission Grating (HETG):	To be inserted into focused X-ray beam; provides spectral resolution of 60-1000 over the energy range 0.4 - 10 keV
Low Energy Transmission Grating (LETG):	To be inserted into focused X-ray beam; provides spectral resolution of 40-2000 over the energy range 0.09 - 3 keV

TELESCOPE SYSTEM

High Resolution Mirror Assembly:	4 nested pairs of grazing incidence paraboloid and hyperboloid mirrors
Length of Mirrors:	each 83.3 cm (32.8 in) long
Weight of Mirrors:	947.6 kg (2,089 pounds) total
Focal Length:	10 meters (32.8 ft)
Outer Diameter:	1.2 meters (3.9 ft)
Field of View:	1.0 degree diameter
Ang. Resolution:	0.5 arc-sec
Altitude Control:	6 reaction wheel control 2 inertial reference units
Aspect Camera:	1.40 deg x 1.40 deg field-of-view
Pointing Stability:	0.25 arc-sec (RMS) radius over 95% of all 10 second periods
Pointing Accuracy:	30 arc-sec 99% of viewing time
Remarks:	Mirrors have an effective area between 700 and 800 sq. cm. @1 keV; 150-200 A iridium coating

The Chandra program is managed by the Marshall Space Flight Center for NASA's Science Mission Directorate. Northrop Grumman (formerly TRW), the prime contractor, assembled and tested the observatory for NASA. The Chandra X-ray Center is operated for NASA by the Smithsonian Astrophysical Observatory.

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http://chandra.harvard.edu