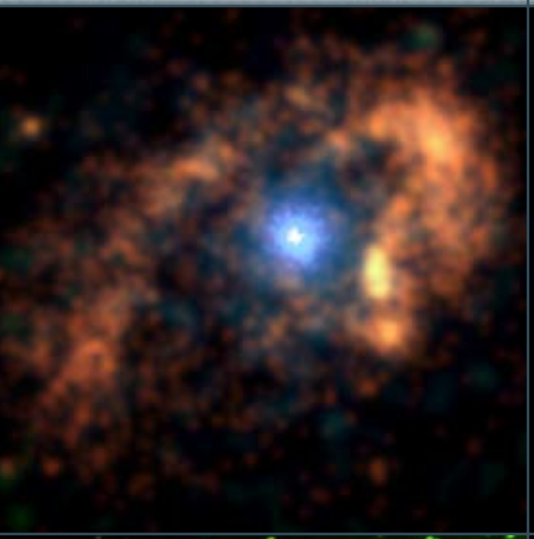
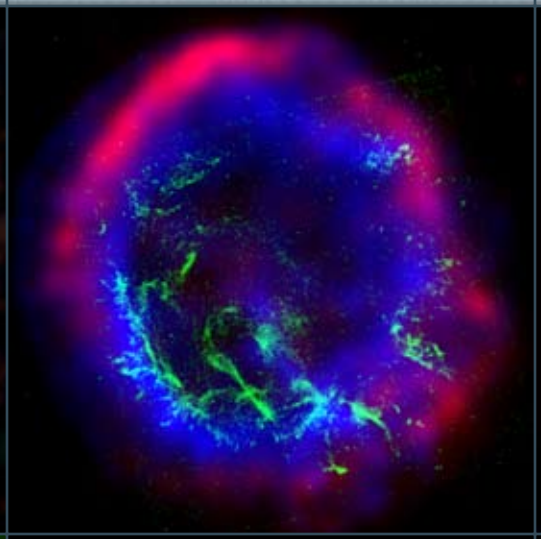
CHANDRA FAVORITES

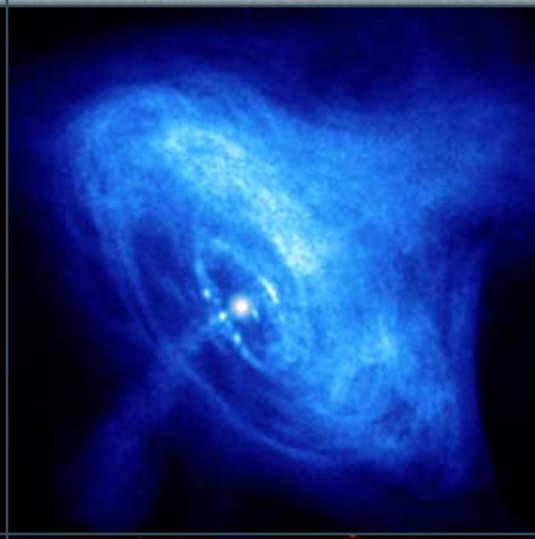


1999 - ETA CARINAE

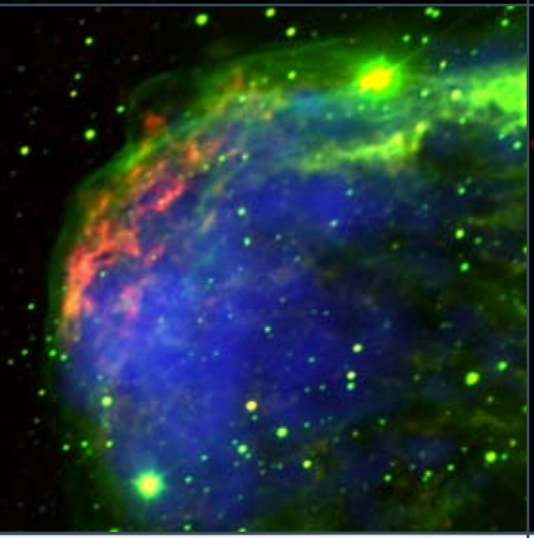


2000 - E0102-72.3

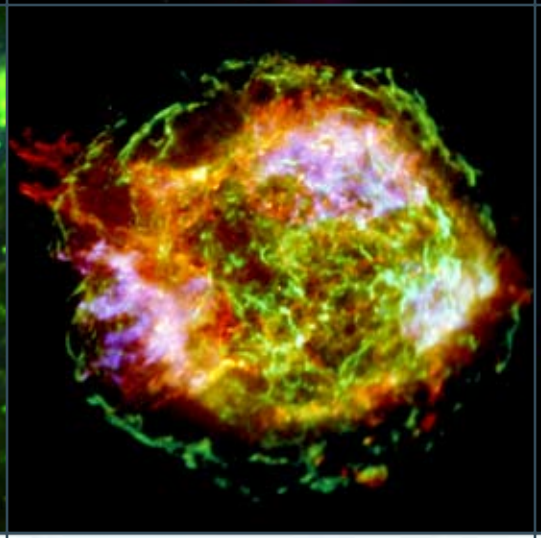
2001 - CAT'S EYE NEBULA



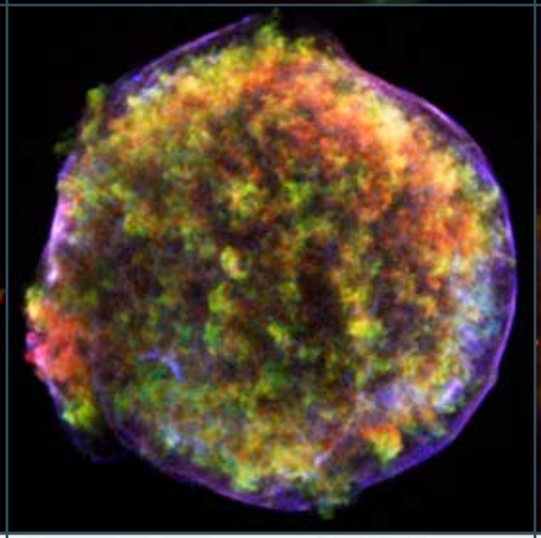
2002 - CRAB NEBULA



2003 - CRESCENT NEBULA



2004 - CASSIOPEIA A



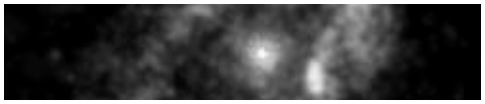
2005 - TYCHO'S SNR

2006 - M2 3

HTTP://CHANDRA.HARVARD.EDU

CHANDRA FAVORITES * 1999 - 2006

HTTP://CHANDRA.HARVARD.EDU

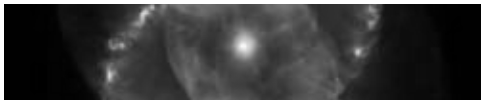


1999 - ETA CARINAE

The Chandra X-ray image shows the complex nature of the region around Eta Carinae, a massive supergiant star that is 7,500 light years from Earth. The outer horseshoe shaped ring has a temperature of about 3 million degrees Celsius. It is about two light years in diameter and was probably caused by an outburst that occurred more than a thousand years ago. The blue cloud in the inner core is three light months in diameter and is much hotter; the white area inside the blue cloud is the hottest and may contain the superstar which is vigorously blowing matter off its surface.

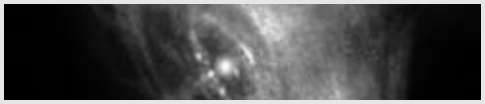
2000 - E0102-72.3

The Chandra X-ray image (blue) shows gas that has been heated to millions of degrees Celsius by a shock wave moving into matter ejected by the supernova. This gas is rich in oxygen and neon. The radio image (red) made with the Australia Telescope Compact Array, traces the outward motion of a shock wave due to the motion of extremely high-energy electrons. The optical image (green) made with the Hubble Space Telescope, shows dense clumps of oxygen gas that have “cooled” to about 30,000 degree Celsius.



2001 - CAT’S EYE NEBULA

Chandra X-ray Observatory data (purple) shows a bright central star surrounded by a cloud of multimillion-degree gas in the planetary nebula known as the Cat’s Eye. The central star is expected to collapse into a white dwarf in a few million years. This composite image with Hubble Space Telescope data (red and green) shows where the hot, X-ray emitting gas appears in relation to the cooler material seen in optical wavelengths. A planetary nebula (so called because it looks like a planet when viewed with a small telescope) is formed when a dying red giant star puffs off its outer layer, leaving behind a hot central core.



2002 - CRAB NEBULA

Chandra data provide a dramatic look at the activity generated by the pulsar (white dot near the center of the images) in the Crab Nebula. The inner X-ray ring is thought to be a shock wave that marks the boundary between the surrounding nebula and the flow of matter and antimatter particles from the pulsar. Energetic shocked particles move outward to brighten the outer ring and produce an extended X-ray glow. The jets perpendicular to the ring are due to matter and antimatter particles spewing out from the poles of the pulsar.

2003 - CRESCENT NEBULA

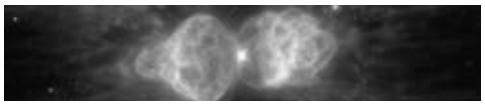
About 400,000 years ago, a massive star in the Crescent Nebula ejected its outer layers at about 20,000 miles per hour and expanded into a red giant. Two hundred thousand years later, intense radiation from the star’s exposed hot, inner layer began pushing gas away at over of 3 million miles per hour! The collision of the fast stellar wind with the slower red giant wind compressed gas into a dense shell (red), and produced two shock waves: an outward-moving shock that is visible at optical wavelengths (green), and an inward-moving shock wave that created a bubble of 2-million-degree X-ray emitting gas (blue).

2004 - CASSIOPEIA A

This spectacular image of the supernova remnant Cassiopeia A is the most detailed image ever made of the remains of an exploded star. The one million second image shows a bright outer ring (green) ten light years in diameter that marks the location of a shock wave generated by the supernova explosion. A large jet-like structure that protrudes beyond the shock wave can be seen in the upper left. In this image, the colors represent different ranges of X-rays with red, green, and blue representing, low, medium, and higher X-ray energies.

2005 - TYCHO’S SNR

X-ray data shows a bubble of hot supernova debris (green, red) inside a more rapidly moving shell of extremely high-energy electrons (blue). These features were created as the supersonic expansion of the debris into interstellar gas produced two shock waves - one that moves outward and accelerates particles to high energies, and another that moves backward and heats the stellar debris. The relative expansion speeds of the hot debris and the high energy shell indicate that a large fraction of the energy of the outward-moving shock wave is going into the acceleration of atomic nuclei to extremely high energies.



2006 - M2 3

This composite image (X-ray/blue, optical/green, and infrared/red) shows a scene of the unfolding drama of the last stages of the evolution of sun-like stars. Planetary nebulas are produced in the late stages of moderate-mass stars’ life. Over a period of a few hundred thousand years, much of a star’s mass is expelled at a relatively slow speed. This mass loss creates a more or less spherical cloud around the star and eventually uncovers the star’s blazing hot core. Later, shock waves generated by the collision of high-speed gas from the hot core with the previously ejected cloud create the multimillion degree bubbles.