A Historic Explosion

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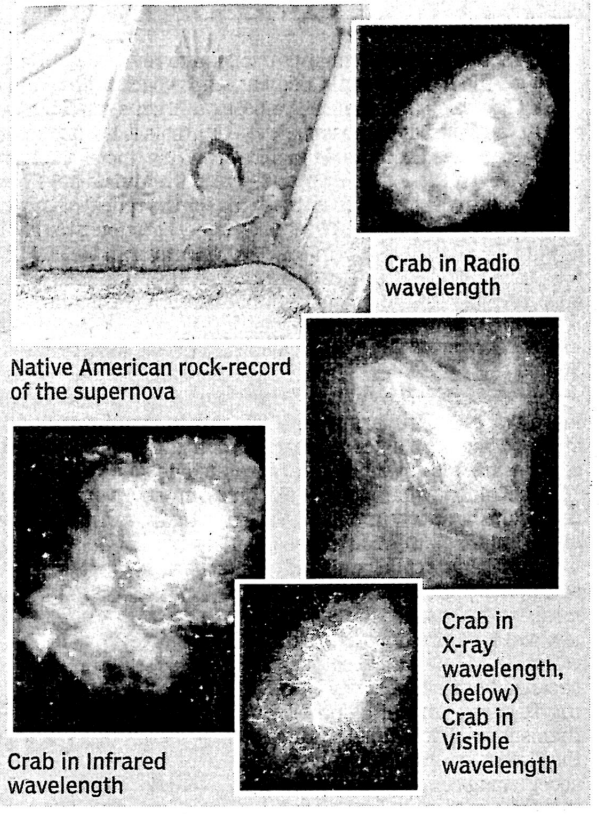

The most spectacular optical phenomenon one can hope to see in the heavens is that of a supernova. This term represents an explosive event that takes place at the end stage of the evolution of very massive stars. Once the nuclear fuel in the star is exhausted, its core contracts rapidly and the outer mantle flies away in a dramatic fashion making the star brighten up enormously.

Several civilisations — including the Chinese, Japanese and Middle Eastern — were fortunate to witness such an event nearly a millennium ago, on July 4 1054. (This event is designated as SN 1054.) On that day, a star in the constellation Taurus was seen to explode as a supernova and this event was witnessed by astronomers of different civilisations in earth. In fact, it would have been a hard-to-miss event since the supernova was bright enough to be seen in daylight for about 23 days and was visible in the night sky for nearly two years. In addition to astronomers, there is some evidence - from the rock records - that the native Americans from White Mesa and Navajo Canyon also recorded this event. It is unfortunate that we have no clear evidence of this event having been detected from India, one possible reason being a particularly strong monsoon. Two more supernovae were seen in our Galaxy, one in 1572 by Tycho Brahe and the other in1604 by Johannes Kepler. The nearest supernova to be seen since the invention of the telescope was in 1987. It was in the large Magellanic Cloud which is a dwarf galaxy satellite to ours.

After the supernova explosion, one is left behind with a very compact, highly dense, rapidly rotating star made of neutrons from which periodic radio signals can be received on Earth. Surrounding this neutron star, one can see a wisp-like tenuous medium which is the residue of the material ejected during the explosion. In this particular case, the remnant is called Crab pulsar and the medium is called Crab nebula. This pulsar and the surrounding region are probably two of the most well studied objects in the skies. This nebula is easily seen with a telescope if you know where to look in the constellation Taurus.

In the western world, the Crab nebula was first observed in 1731 by John Bevis and was later identified with the remnant of a historical supernova explosion. When the French astronomer Charles Messier developed his famous Messier catalogue of objects in the sky in 1774, Crab nebula was the first item in the list and is now referred to as Messier 1. It also emits about 100 times more energy in X-rays than in visible light and the X-ray emission was detected in 1963.

Located at a distance of about 6500 light years from Earth, the Crab nebula has a diameter of about 11 light years and is expanding at the rate of about 1500 km per second as seen today. In fact, the Crab supernova explosion was so powerful that had it occurred within about 50 light years of Earth, it could have wiped out all life on Earth. The Universe is a dangerous place to live.

(Next week: The ever changing Moon)

Astrophysicist Jayant Narlikar and theoretical physicist Thanu Padmanabhan will contribute to DNA's special series through 2009, designated the International Year of Astronomy.