

The region around the Large Magellanic Cloud photographed from Kavalur before and after the appearance of the supernova 1987A. The supernova is seen close to the Tarantula nebula, the brightest nebulosity in the photographs.

Exploding the myths of creation

By Sumit Chakrabarty

ASTRONOMERS around the world are excited over an exploding star in our neighbouring galaxy — an event for which they have waited nearly four centuries. The last 'supernova' visible to the naked eye was seen in 1604, 383 years ago. That was even before the invention of the telescope. Why is this event all that significant?

In India, the excitement is focused on Kavalur in Tamil Nadu, where the Indian institute of astrophysics, Bangalore, has its biggest observatory. Kavalur is in the limelight because it has the only observatory whose location and equipment make it possible to make a detailed study of the 1987 A supernova from India.

The bright, exploding star is in the southern skies. In fact, Kavalur is just about the last point this side of the equator from where astronomers can peer out over the horizon at the brilliant spectacle, which the IIA director, Dr J.C. Bhattacharyya, describes as "the rarest of rare events in the universe."

Besides, as luck would have it, only last year was the huge 2.3 metre aperture Vainu Bappu telescope installed at Kavalur. This is the biggest and most sophisticated telescope in the country.

North of Kavalur, the supernova can't be seen. The advanced nations, nearly all of which are in the northern half of the globe, are mustering their resources to put up make-shift observatories down under — in Australia, southern Africa and Latin America.

Mauritius station

India also has plans to put up an astrophysical station in Mauritius temporarily to study the supernova, according to Dr Bhattacharyya. But this is yet to come through. An idea had also been floated to send astronomical equipment to the Indian research station in Antarctica which is perhaps the best place for observing this supernova. But then the scientists developed cold feet.

The Kavalur scientists are rolling up their sleeves after a brief pause for breath. For the past couple of months, the supernova has been blanked out by sunlight. Now, in August, it will again become clearly visible as the sun apparently shifts away from the supernova.

How does one explain all this hubbub over the death of a star?

Scientists believe that the supernova has the key to the most fundamental questions that have mystified people through the centuries: questions of life, the creation and birth of the universe; questions that have only been speculated upon so far, whether in religion or science. Now it is on display, the stupendous processes of creation, which may explode many of the myths about our origin.

There is good reason for such great expectations.

The supernova produces many of the elements that form our universe. An exploding star blasts out clouds of gas and dust, which later coalesce into new stars and planets. In fact, scientists believe that even the coalescing is triggered by shock-waves sent out by supernovas.

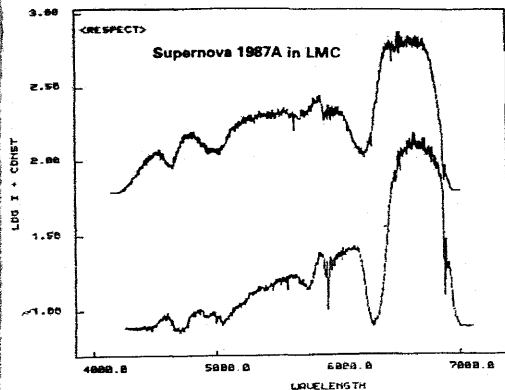
Thus, the elements forged in supernovas make up the stars and planets — as well as the life-forms on earth (and elsewhere, if they exist).

Not only that, supernovas generate cosmic rays which cause mutations in living organisms. Such mutations are believed to be responsible for biological evolution — leading to the creation of man. In a sense, we all have a common ancestor: a supernova.

Origin of life

Now we begin to see why the astronomical world is in ferment. During the past few decades, scientists have realised that the supernova is the single, most significant event in the skies, which has guarded its secrets so well that there are as many theories on the origin of life as there are scientists.

Now the faith-mongers will have to call it a day, because there will be verifiable facts, based on observations, which will have to be



Photographic spectra of the supernova 1987A in the Large Magellanic Cloud. The spectrograms were obtained with the 1-m reflector at the Vainu Bappu Observatory, Kavalur. The top spectrum was recorded on 1987 February 26.6 UT and the bottom on 1987 March 4.6 UT.

explained.

Now we have great instruments, thanks to technological advances, with which to watch in varied detail the cataclysmic death of this star — and learn from it. Human knowledge is being rewritten.

With today's giant telescopes and satellite-mounted instruments in space, supernovas are being spotted quite regularly in distant galaxies. But they are too far away to reveal the unknown.

The 1987 A supernova is in the large magellanic cloud (LMC), a satellite galaxy of our Milky way, just 170,000 light-years away.

The last supernova to be seen with the naked eye, nearly four centuries back, was in the constellation Ophiuchus. But the timing was all wrong. The event occurred just five years before Galileo scanned the heavens with a spy-glass, the forerunner of the modern telescope.

Johannes Kepler had left descriptions of the 1604 supernova for posterity. But these were from unaided observation.

Ever since then astronomers have been waiting for another one, especially since the 1930s when Fritz Zwicky and Walter Baade recognised the significance of these stellar flashes.

Modern astronomers, armed with high-tech instruments, have had a long wait to see a supernova close enough to be studied in all its detail.

The last one to come almost but not quite within the naked-eye limit was in 1885, in the Andromeda galaxy, 2.2 million light-years away. On an average a naked-eye supernova can be seen only four times in

a millenium.

Actually, this is the beginning of research on supernovas. Because this is the first supernova seen anywhere near the milky way after the coming of age of astronomy. Nobody knows how long it will take to find the answers we all seek.

The problem, Dr Bhattacharyya explains, "is that by the time the supernova is noticed, the interesting part is over. "All the action when it first blew up, when the first light came, has been missed by at least a few hours.

Dr Bhattacharyya says, "it may be necessary to know right from the beginning, possibly even before the explosion, how the light is changing and how it is really coming."

The supernova involves an enormous amount of brightening: it is equivalent to the combined light from a hundred million stars. However, all that you see in the focal plane of a large telescope is a fuzzy patch, with a peculiar brightening at one spot, which wasn't there before.

In fact, the Canadian astronomer, Ian Shelton, who first spotted the 1987 A supernova from an observatory in Chile, initially thought it was a flaw in his photographic plate. But then he went out into the balcony and looked up at that part of the sky, and there it was, the supernova.

The chances of a supernova being seen from or even before the moment it explodes are quite small, because there are trillions and trillions of stars and this is a rare happening. As Dr Bhattacharyya puts it, "You cannot spend a lifetime observing a place hoping that a supernova will happen."