

Edited by Emma Sanders

Explosion forces rethink on stellar collapse

An exceptionally powerful explosion in a nearby galaxy has led astronomers to re-examine their theories of stellar evolution. What is more, the explosion was co-incident with a burst of gamma rays, providing another clue to the origin of these bizarre phenomena.

As a large star reaches the end of its lifetime and runs out of nuclear fuel, it becomes unstable. The core collapses inwards forming an extremely dense neutron star or black hole and sending out a shockwave which blasts the rest of the star out into space. For a few weeks, this supernova explosion can be as bright as 100 billion ordinary stars.

Now, a supernova has been seen that is 30 times more powerful than any measured before. Moreover, it is coincident with a gamma ray burst. Trying to explain their observations, astronomers suggest the existence of "hypernovae." These are extremely massive stars that collapse into black holes and send out a very strong shockwave capable of generating the observed gamma rays.

Gamma-ray bursts have remained a mystery for 30 years. Last year, optical and radio observations linked them to galaxies at enor-



An unusually bright supernova explosion. (European Southern Observatories.)

mous distances. These new results are important because they connect a gamma-ray burst to an explosion much nearer to home.

The gamma rays were detected by the Italian-Dutch BeppoSAX satellite and optical observations were made using the European Southern Observatories telescopes in La Silla. The supernova was also observed by the Australian compact array radio telescopes.

Infrared reveals early universe

Observations using the Infrared Space Observatory (ISO) show that the first galaxies to form were far brighter than astronomers thought. The results were presented at a meeting in Paris.

Infrared telescopes reach parts of the sky other telescopes can't see. Large dusty clouds absorb the radiation emitted by the stars they hide. The heated dust glows in the infrared, revealing what is behind.

ISO has surveyed the faintest and furthest infrared objects, revealing a new population of luminous galaxies. "Two to three times more stars are being formed than the rate inferred originally from optical surveys," said Michael Rowan-Robinson of Imperial College, London.

Results are confirmed by the detection of the first-ever infrared bright gravitational arcs. These are images of distant galaxies magnified by up to 10 times by gravitational lensing, allowing astronomers to see objects that would otherwise be too faint and too small. All the galaxies detected this way have much higher rates of star formation than predicted.

Greenwich's time has come

Britain's Royal Greenwich Observatory (RGO) has closed due to funding cuts. Founded in 1675, it was home to the first Astronomer Royal, John Flamsteed, and was the country's oldest scientific institution. The original observatory marked the zero degree meridian line.

Most of the RGO's research was devoted to providing fundamental astrometric measures and almanacs for use by navigators and surveyors. In the 20th century the RGO's activities broadened to include research on stellar structure and evolution, galaxy dynamics, active galactic nuclei and the large-scale structure of the universe, as well as being home to a technology group devoted to telescope and instrument design. In the 1950s the observatory was moved out of London, and from 1990 was located in Cambridge, near to the University's Institute of Astronomy.

Some of the RGO's work will be continued by the Astronomy Technology Centre in Edinburgh.

Picture of the month

The Sun, pictured by the Extreme Ultraviolet Imaging Telescope onboard the Solar and Heliospheric Observatory (SOHO). The NASA/ESA satellite is making a full recovery since it span out of control last summer (October, page 9). All instruments have now been switched back on. SOHO is very popular with astronomers and has had many successes. In the past, helioseismological data from the spacecraft has given independent support for solar models, adding confidence to their predictions for solar neutrino flux. (NASA/ESA.)

