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Observations link gamma-ray bursts to black hole formation

Over recent years, astronomers have detected numerous short, intense bursts of gamma rays coming from all over the sky. For a brief instant, these flashes of radiation are more energetic than anything else in the universe. However, their origin remains a mystery. New observations of these gamma-ray bursts (GRBs) and their X-ray afterglow support the theory of electromagnetic black hole formation.

As a giant star collapses into a black hole, an extremely strong electromagnetic field can form. This energy could accumulate matter and antimatter, which generate an enormous pulse of energy, expanding with ultrarelativistic velocities. This produces the observed burst of gamma rays when the expanding fireball ceases to be opaque.

Using the GRO/BATSE gamma-ray observa-

tory archive, the Chandra X-ray observatory, the Beppo-Sax satellite and the Rossi-XTE satellite, a team of Italian and French researchers compared detailed observations of GRB 991216 with the predictions made by their model. They say that the timing and intensity of the burst as well as the extended X-ray afterglow can be explained.

The model also explains the association of some GRBs with supernovae explosions, say the researchers. The impact of the expanding fireball on a nearby star could, under certain conditions, induce a supernova explosion in that star. Other GRB theories include the hypernova model (*CERN Courier* June p11).

Reference

2001 *Astrophysical Journal Letters* **555** L107-120.

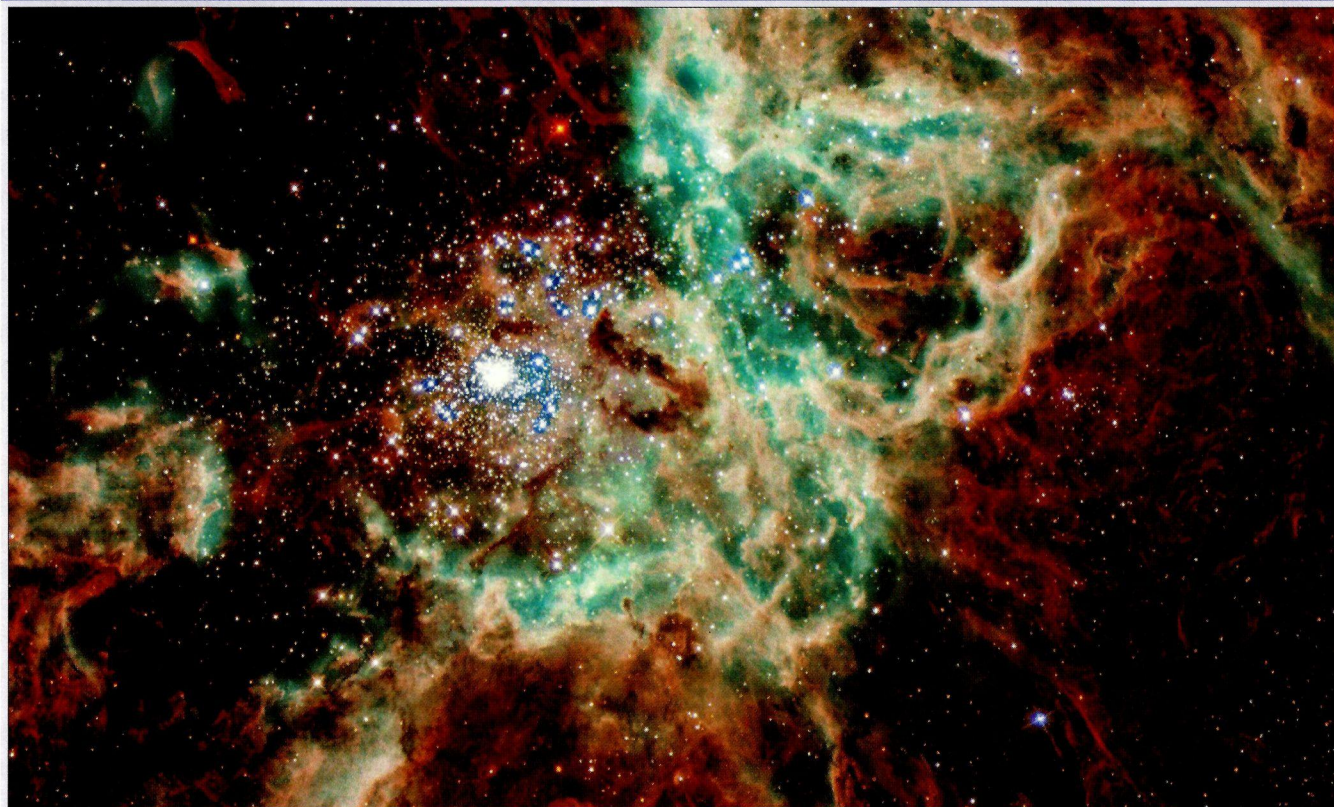
NASA MAPs the microwave background

NASA launched its Microwave Anisotropy Probe (MAP) this summer. The experiment will measure the cosmic microwave background to one part in a million, with a sensitivity that is greater than 20 μ K.

MAP will be the first spacecraft to follow an L2 orbit – the second Lagrange point – about the Earth and Moon, which is an exceptionally stable environment. It will take about 18 months to build up a full sky picture and carry out the analysis, so make a note in your diary for March 2003.

● For more on the microwave background and observations of fluctuations in it, see *CERN Courier* July/August p15.

Picture of the month



This star-forming region, called the 30 Doradus nebula, contains a cluster of massive stars in its core. The ultraviolet radiation and high-speed material released from the core trigger the collapse of surrounding gas and dust clouds, forming incubators for nascent stars. The nebula is in the Large Magellanic Cloud and was imaged using the Hubble Space Telescope. (NASA/ESA.)