Gamma-Ray Burst Makes Quite a Bang

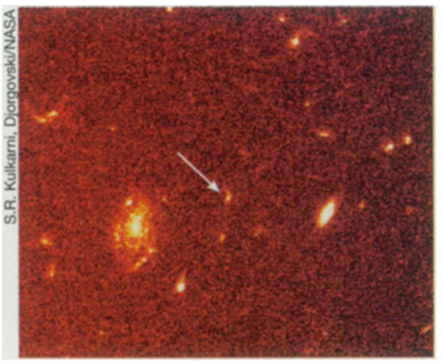
For one brief moment, long ago in a faraway galaxy, a titanic explosion poured a torrent of gamma rays into space. Some 12 billion years later—Dec. 14, 1997—this flash of radiation reached Earth.

Astronomers are calling this gamma-ray burst "the most powerful explosion since the Big Bang." While that may be hyperbole, researchers have calculated that this cosmic flash packed 100 times more energy than a supernova explosion. Until now, researchers had considered supernovas the most energetic phenomenon known.

For the second or two that it lasted, "this burst was as luminous as all the rest of the entire universe," says S. George Djorgovski of the California Institute of Technology in Pasadena, a member of the team reporting the finding in the May 7 NATURE. The group calculated the energy from the brightness of the burst and its afterglow, as well as the distance of the host galaxy from Earth—12 billion light-years.

Gamma rays from the burst were detected by the Dutch-Italian BeppoSAX satellite and NASA's Compton Gamma Ray Observatory. Then came a crucial step in finding the host galaxy. BeppoSAX also recorded an X-ray afterglow, part of the smoldering fireball that lingers after gamma rays have vanished.

A few hours later, using the afterglow as a guide, Jules P. Halpern of Columbia University and his colleagues detected a visible-light afterglow, they report in the May 7 NATURE. Two weeks later, Djorgovski's team used the Keck II Telescope on Hawaii's Mauna Kea to find the host galaxy.



Hubble Space Telescope image of the source galaxy (arrow) of the Dec. 14 burst.

This marks the second time that astronomers have measured the distance to a galaxy that hosted a gamma-ray burst (SN: 5/17/97, p. 305).

These observations settle the long-standing debate over whether most gamma-ray bursts originate within our galaxy or far beyond it, some astronomers say. However, several of the findings call into question a popular theory in which bursts are generated when two dense stars, known as neutron stars, collide and merge.

Dale A. Frail of the National Radio Astronomy Observatory in Socorro, N.M., notes that to generate the energy associated with the Dec. 14 burst, virtually the entire mass of the neutron stars had to have been converted into gamma rays—an unlikely situation.

Frail told SCIENCE NEWS that data from another burst, detected March 29, may prove equally damning for the theory. For the first time, researchers glimpsed an afterglow at radio wavelengths before finding one in visible light.

That sequence suggests that the burst originated from a place containing lots of dust, which blocks visible light but is transparent to radio waves. Stellar nurseries are rich in dust, and previous studies have hinted that several other bursts originated in star-forming locales. Neutron stars "cannot merge within star-forming regions," asserts Bohdan Paczyński of Princeton University. He explains that during the 100 million years or so that it would take for neutron stars to form and merge, they would have migrated from their birthplace.

Paczyński favors another model—described in the Feb. 10 ASTROPHYSICAL JOURNAL LETTERS—in which a massive, short-lived star undergoes a "hypernova" explosion, hurling a shock wave into space at nearly the speed of light. —*R. Cowen*

Gene variants linked to childhood IQ

Scientists have for the first time linked a specific gene to high intelligence, at least as assessed on a standard IQ test.

One variant of the gene, located on chromosome 6, appears to exert a small effect on a measure of an individual's general intellectual ability, reports a team headed by Robert Plomin of the Institute of Psychiatry in London. The gene is one of many that have specific variants which, when occurring together, can result in a much higher than average IQ score, Plomin's group proposes.

"The hope is that [this work] will provide discrete windows through which to view neurophysiological pathways between genes and behavior," the team observes in the May PSYCHOLOGICAL SCIENCE.

A DNA marker inserted into the gene for insulinlike growth factor-2 receptor (IGF2R) on chromosome 6 revealed that one form of the gene occurs more frequently in a group of 51 high-intelligence children, with an average IQ of 136, than in 51 youngsters with more modest scores, averaging 103. The same genetic difference appeared more often in a second test: 52 kids with an average IQ of 160 and 50 with an average IQ of 101.

The participants, all of whom are white, ranged in age from 6 to 15.

Plomin and his coworkers suggest that numerous variable genes make small positive or negative contributions to individual differences in IQ. Some folks possess most or all of the positive genetic versions, which add up to a high IQ, while a mix of positive and negative genes underlies average IQs.

The researchers excluded low-IQ youngsters from their analysis because depressed scores on intelligence tests can result from a variety of unusual events, such as oxygen deprivation at birth or prenatal exposure to cocaine.

Plomin emphasizes that the IGF2R variant associated with high IQs is not a "genius gene." It appeared in nearly half of the high-IQ children but also in nearly one-quarter of those with average IQs. The majority of high-IQ youngsters missing this specific gene presumably have other genetic variants that boost general intelligence scores, the researchers theorize.

The IGF2R gene variant accounts for less than 2 percent of individual IQ disparities, or a difference of about 3 IQ points, according to Plomin. The exact function of the gene, as it relates to cognitive ability, remains unclear, he notes.

"This is really important work," comments psychologist Robert J. Sternberg of Yale University, "but we don't know yet whether this approach to the genetics of intelligence will work." For example, Sternberg remarks, the amount of IQ variation attributed to the IGF2R gene is quite small, and it's not known whether enough genes with similar cognitive effects exist to add up to a substantial influence.

Also, a correlation between the presence of a gene variant and high IQ does not mean that the gene directly raises cognitive ability. The IGF2R gene may influence intelligence through interactions with other genes or with certain environments, making the type of analysis reported by Plomin's group difficult to interpret, Sternberg explains. —*B. Bower*