

## Naked-eye Gamma Ray Burst

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**March 21, 2008:** A powerful gamma ray burst detected March 19th by NASA's Swift satellite has shattered the record for the most distant object that could be seen with the naked eye.

"It was a whopper," says Swift principal investigator Neil Gehrels of NASA's Goddard Space Flight Center. "This blows away every gamma ray burst we've seen so far."

Swift's Burst Alert Telescope picked up the burst at 2:12 a.m. EDT on March 19, 2008, and pinpointed the coordinates in the constellation Bootes. Telescopes in space and on the ground quickly moved to observe the afterglow. The burst was named GRB 080319B and registered between 5 and 6 on the visual magnitude scale used by astronomers. (A magnitude 6 star is the dimmest visible to the human eye; magnitude 5 is almost three times brighter.)



**Above:** GRB 080319B makes a brief appearance among the stars of Bootes in a movie made by Pi of the Sky, a Polish group that monitors the sky for afterglows and other short-lived phenomena. [More]

Later that evening, the Very Large Telescope in Chile and the Hobby-Eberly Telescope in Texas measured the burst's redshift at 0.94. A redshift is a measure of the distance to an object. A redshift of 0.94 translates into a distance of 7.5 billion light years, meaning the explosion took place 7.5 billion years ago, a time when the universe was less than half its current age and Earth had yet to form. This is more than halfway across the visible universe.

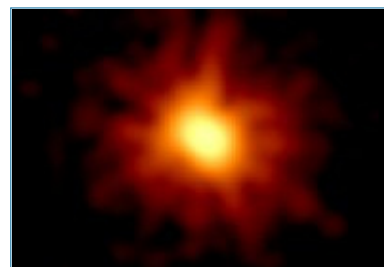
"No other known object or type of explosion could be seen by the naked eye at such an immense distance," says Swift science team member Stephen Holland of Goddard. "If someone just happened to be looking at the right place at the right time, they saw the most distant object ever seen by human eyes without optical aid."

Most gamma ray bursts occur when massive stars run out of nuclear fuel. Their cores collapse to form black holes or neutron stars, releasing an intense burst of high-energy gamma rays and ejecting particle jets that rip through space at nearly the speed of light. When the jets plow into surrounding interstellar clouds, they heat the gas to incandescent visibility. It is this gaseous "afterglow" which was visible to the human eye on March 19th.

GRB 080319B's afterglow was 2.5 million times more luminous than the most luminous supernova ever recorded, making it the most intrinsically bright object ever observed by humans in the universe. The most distant previous object that could have been seen by the naked eye is the nearby galaxy M33, a relatively short 2.9 million light-years from Earth.

**Right:** The afterglow of GRB 080319B as recorded by Swift's X-ray Telescope. [More]

Analysis of GRB 080319B is just getting underway, so astronomers don't know why this burst and its afterglow were so bright. One possibility is the burst was more energetic than others, perhaps because of the mass, spin, or magnetic field of the progenitor star or its jet. Or perhaps it concentrated its energy in a narrow jet that was aimed directly at Earth.



GRB 080319B was one of four bursts that Swift detected on March 19th, a Swift record for one

