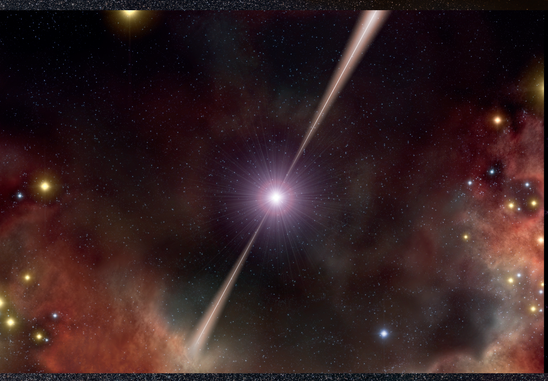
Gamma-Ray Bursts

Gamma-ray bursts (GRBs) are violent blasts of highly energetic gamma rays lasting from less than a second to several minutes — the blink of an eye on cosmological timescales. They are known to occur at huge distances from Earth, towards the limits of the observable Universe. Gamma-ray bursts can help us to understand the Universe as a whole.

ESO's Very Large Telescope has observed the afterglow of a gamma-ray burst that is **the furthest yet known**. Its light has taken more than 13 billion years to reach us. It must have released 300 times more energy in a few seconds than our Sun will in its entire lifetime of more than ten billion years. GRBs are the most powerful explosions in the Universe since the Big Bang.

Researchers have tried to discover the nature of these explosions for a long time. Observations show that GRBs come in two types — short duration (less than a few seconds) and long duration — and it was suspected that two different kinds of cosmic event caused them.

Astronomers using ESO telescopes played a key role in linking long-duration GRBs with the final explosions of massive stars, known as hypernovae. They showed that the light had similar properties to that from a supernova. ESO telescopes were also the first to detect visible light following a short-duration burst, showing that these bursts are caused by the violent mergers of neutron stars or black holes.



Artist's impressions of a gamma-ray burst.

Credit: ESO/A. Roquette

www.eso.org

Background image: A 360-million pixel mosaic from Paranal
Credit: ESO/S. Guisard (Guisard.com/Gianluca Lombardi)