



## GRB 200826A: Gamma-Ray Burst

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### Why in News

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Recently, a group of astronomers have detected a **very short, powerful burst of high-energy radiation also known as Gamma-Ray Bursts (GRBs)** that lasted for about a second.

- It was named **GRB 200826A** after the date it occurred, which is **26<sup>th</sup> August 2020**.
- It was detected by **National Aeronautics and Space Administration's (NASA's) Fermi Gamma-ray Space Telescope.**

### Key Points

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- **Gamma-Ray Bursts:**

- **About:**

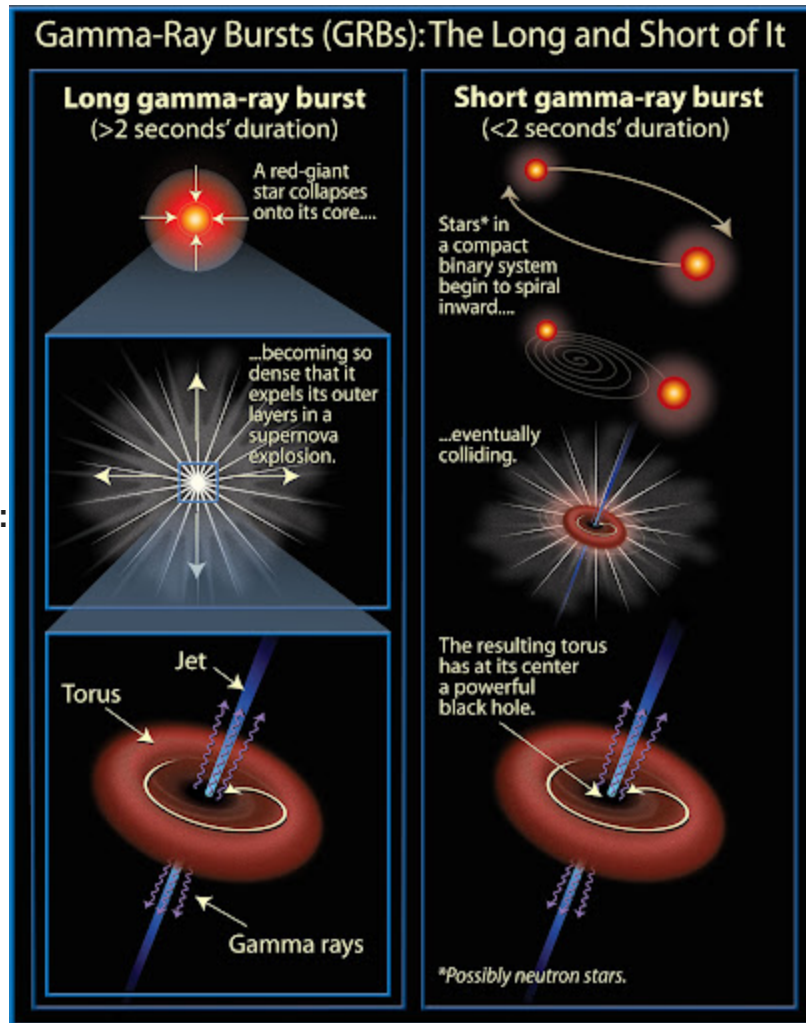
- They are the **most powerful events in the universe**, detectable **across billions of light-years**.

- A **light-year** is the distance a beam of light travels in a single Earth year, or 9.5 trillion kilometers.

- Astronomers classify them as **long or short based on whether the event lasts for more or less than two seconds**.

## Gamma-Ray Bursts (GRBs): The Long and Short of It

o Long GRBs:



- They observe long bursts in association with the demise of massive stars.
- When a star much more massive than the Sun runs out of fuel, its core suddenly collapses and forms a **black hole**.
  - **Black hole** refers to a point in space where matter is so compressed as to create a gravity field from which even light cannot escape.
- As matter swirls toward the black hole, some of it escapes in the form of two powerful jets that rush outward at almost the speed of light in opposite directions.
- Astronomers only detect a GRB when one of these jets happens to point almost directly toward Earth.
- Each jet drills through the star, producing a pulse of gamma rays – the highest-energy form of light – that can last up to minutes.
- Following the burst, the disrupted star then rapidly expands as a **supernova**.

A **supernova** is the name given to an exploding star that has reached the end of its life.

- **Short GRB:**

Short GRB, on the other hand, forms when pairs of compact objects – such as **neutron stars**, which also form during stellar collapse – **spiral inward over billions of years and collide**.

A **Neutron star** comprises one of the possible evolutionary end-points of high mass stars.
- **GRB 200826A:**
  - It was a **sharp blast of high-energy emission lasting just 0.65 seconds**.
    - After **traveling for a very long period of time** through the **expanding universe**, the signal had **stretched out to about one-second-long** when it was detected by Fermi's Gamma-ray Burst Monitor.
    - It had been **racing toward Earth for nearly half the present age of the universe**.
  - It is considered to be the **shortest GRB** till now and it occurred caused by the **death of a massive star**.
- **Significance of GRB 200826A:**

It has helped to **resolve the long-standing issues related to gamma-ray bursts**. Also, this study triggers to **re-analyse all such known events** to constrain number densities better.
- **Researchers:**

The group included **Indian astronomers from Aryabhata Research Institute of Observational Sciences (ARIES)**, The Inter-University Centre for Astronomy and Astrophysics, Pune (IUCAA), National Centre for Radio Astrophysics - Tata Institute of Fundamental Research, Pune (NCRA) and IIT Mumbai.
- **Fermi Gamma-ray Space Telescope:**
  - **About:**
    - Formerly called the **Gamma-ray Large Area Space Telescope (GLAST)**, it is a **space observatory being used to perform gamma-ray astronomy observations** from low Earth orbit.
    - It was **launched in June 2008**. It is **named after Enrico Fermi**, an Italian-American scientist who did pioneering work in high-energy physics.
  - **Collaboration:**

Fermi is an astrophysics and particle physics partnership, developed in collaboration with the **US Department of Energy**, along with important contributions from academic institutions and partners in **France, Germany, Italy, Japan, Sweden, and the U.S.**
  - **Major Function:**

It **maps the entire sky** every three hours. It **provides an important window into the most extreme phenomena of the universe**, like GRBs, black-hole jets, and pulsars.

**Pulsars** are types of neutron stars which emit radio pulses at regular intervals.

## Gamma Rays

- **About:**
  - They are the **highest-energy light in the universe**. They can have over a **billion times the energy of the type of light visible to our eyes**.
  - They are **produced by the hottest and most energetic objects in the universe**, such as **neutron stars** and **pulsars**, **supernova** explosions, and regions around **black holes**.
  - The gamma rays possess high energy; **they can pass right through any lens or mirror**, making it very difficult to focus them in a visible-light telescope.
- **Gamma-Rays on Earth:**
  - On Earth, gamma rays are **generated by nuclear explosions, lightning**, and the less dramatic activity of **radioactive decay**.
  - Gamma-ray astronomy is the **astronomical observation of gamma rays with photon energies above 100 keV (Kilo Electron Volt)**.
  - Gamma rays are so energetic that **they are harmful to life on Earth**.
  - Earth's **atmosphere absorbs gamma rays**, preventing them from affecting life on the ground.
  - Astronomical observations of gamma-ray sources are therefore **done with high-altitude balloons or satellites**, above the protective blanket of Earth's atmosphere.

Source: PIB