

# Einstein Ring

September 9, 2022

**In news-** The James Webb Space Telescope has recently captured an image of an almost perfect “Einstein ring.”

## **What is the Einstein ring?**

- **An Einstein ring, also known as an Einstein–Chwolson ring or Chwolson ring is a ring of light created when light from a galaxy, star or other light-emitting cosmic objects passes near a massive object** before it reaches the Earth, or in this case.
- When this happens, **gravitational lensing causes the light to get diverted** and if the source, lens and the observing element are all in perfect alignment, this light appears as a ring.
- This particular example was formed from the light of a distant galaxy SPT-S J041839-4751.8, which is around 12 billion light-years away from our planet, which also makes it one of the oldest galaxies in the universe.
- **From Webb’s point of view, this galaxy is positioned directly behind another galaxy** that is so massive that its gravitational pull warps space and time.
- **The blue object in the centre of the ring is this foreground galaxy.** As the light from the background galaxy travels to the Webb telescope, **it has to cross the warped space-time near the foreground galaxy. This is what makes the light appear like a curved ring.**

## **Note:**

- Gravitational lensing is predicted by Albert Einstein’s theory of general relativity. Instead of light from a source travelling in a straight line (in three dimensions), it is bent by the presence of a massive body, which distorts spacetime.
- An Einstein Ring is a special case of gravitational

lensing, caused by the exact alignment of the source, lens, and observer.

- This results in symmetry around the lens, causing a ring-like structure.

### **About James Webb Space Telescope-**

- The \$10 billion telescope is a space telescope is a **joint venture of NASA, European Space Agency (ESA), and the Canadian Space Agency.**
- It was launched on 25 December 2021 on an Ariane 5 rocket from Kourou, French Guiana, and arrived at the Sun–Earth L2 Lagrange point in January 2022.
- **It succeeded the Hubble Space Telescope as NASA's flagship astrophysics mission.**
- It will observe in near-infrared light rather than light in the visible part of the spectrum (unlike Hubble) and thus it will have a much greater capacity to see obscure stars and galaxies.
- **Webb has two primary scientific missions,** which together will account for more than 50 percent of its observation time.
  - First, explore the early phases of cosmic history, looking back in time to only a few hundred million years after the Big Bang.
  - Its second major goal is the discovery of exoplanets, meaning planets outside the solar system. It will also investigate the potential for life on those worlds by studying their atmospheres.
- It was formerly known as the “Next Generation Space Telescope” (NGST) and it was renamed in 2002 after a former NASA administrator, James Webb.

**Further**

**reading:**

**<https://journalsofindia.com/james-webb-telescopes-first-images>**

L