

GRAVITATIONAL WAVE [First proposed by Henri Poincare in 1905.]

Definition:

Gravitational waves are invisible ripples in space that travel at the speed of light and interact very weakly with matter.

- These wave squeeze and stretch anything in their path as they pass by.
- Gravitational waves are an invisible disturbance in the curvature of space-time, generated by accelerated masses.
- Gravitational waves are incredibly fast-**they travel at the speed of light 3×10^8 m/s**. These waves squeeze and stretch anything in their path as they pass by.
- Gravitational waves transport energy as gravitational radiation (**they propagate gravity**).

In 1916, in general theory of relativity (GTR), Albert Einstein theorized (predicted) that when objects move through space, they create waves in space time around them.

He believed that this kind of movement could cause ripples in space. *These ripple waves move outward, like ripples from a stone moving across the surface of a pond. Scientists call these ripples of space as **gravitational waves**.*

Importance of Gravitational wave:

- Gravitational waves carry information about their origin (origin of universe) and about the fundamental properties of gravity that can't be seen through observations of the electromagnetic spectrum.
- It helps to provide the information about the measure of expansion of universe.
- It helps to estimate the future of universe (origin and end of universe).
- The discovery of gravitational wave may lead to the discovery of new devices and technologies.

How are gravitational waves produced?

The most powerful gravitational waves are created when objects move at very high speeds. Some examples of events that could cause a gravitational wave are:

- when a star explodes asymmetrically (called a **supernova**).
 - when two big stars orbit each other (two stars- **binary stars**).
 - when two **black hole** orbit each other and merge.
- Gravitational waves generated by less massive objects- like our solar system- is undetectable.

Properties of gravitational wave:

1. It is an invisible ripple in space that travels at the speed of light.
2. These waves squeeze and stretch anything in their path.
3. These waves interact very weakly with matter, so it can easily penetrate the materials.
4. These waves obey inverse square law.
5. The quantum of gravitational wave is called as graviton (not discovered yet).

[Remember!!]

[The quantum of electromagnetic wave is **photon**.]

[The quantum of sound wave is **phonon**.]