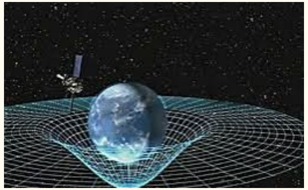
SPACE TIME THEORY



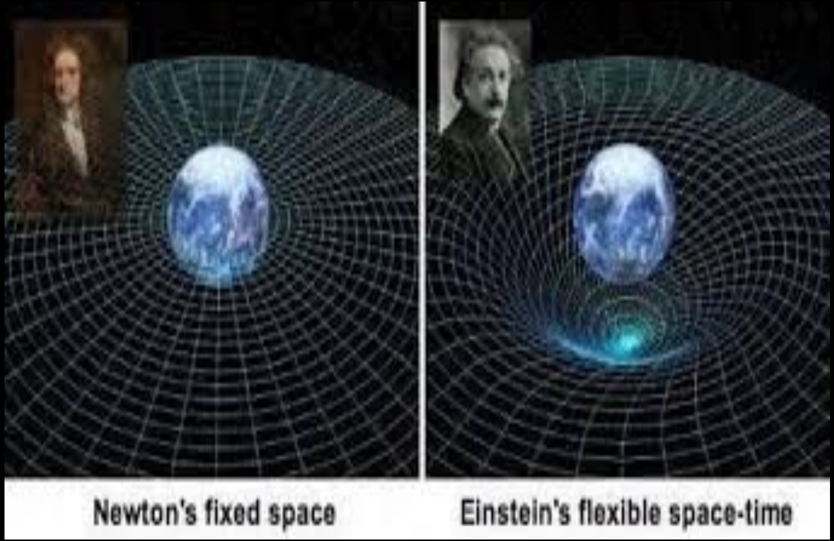
Space-time, in physical science, single concept that recognizes the union of space and time, first proposed by the mathematician Hermann Minkowski in 1908 as a way to reformulate Albert Einstein's special theory of relativity .

Space-Time

In physics, **spacetime**, also called the **space-time continuum**, is a mathematical model that fuses the three dimensions of space and the one dimension of time into a single four-dimensional continuum. Spacetime diagrams are useful in visualizing and understanding relativistic effects, such as how different observers perceive where and when events occur.

Until the turn of the 20th century, the assumption had been that the three-dimensional geometry of the universe (its description in terms of locations, shapes, distances, and directions) was distinct from time (the measurement of when events occur within the universe). However, space and time took on new meanings with the Lorentz transformation and special theory of relativity.

In 1908, Hermann Minkowski presented a geometric interpretation of special relativity that fused time and the three spatial dimensions of space into a single four-dimensional continuum now known as Minkowski space. This interpretation proved vital to the general theory of relativity, wherein spacetime is curved by mass and energy.



FUNDAMENTALS

Non-relativistic classical mechanics treats time as a universal quantity of measurement that is uniform throughout, is separate from space, and is agreed on by all observers. Classical mechanics assumes that time has a constant rate of passage, independent of the observer's state of motion, or anything external.] It assumes that space is Euclidean: it assumes that space follows the geometry of common sense.

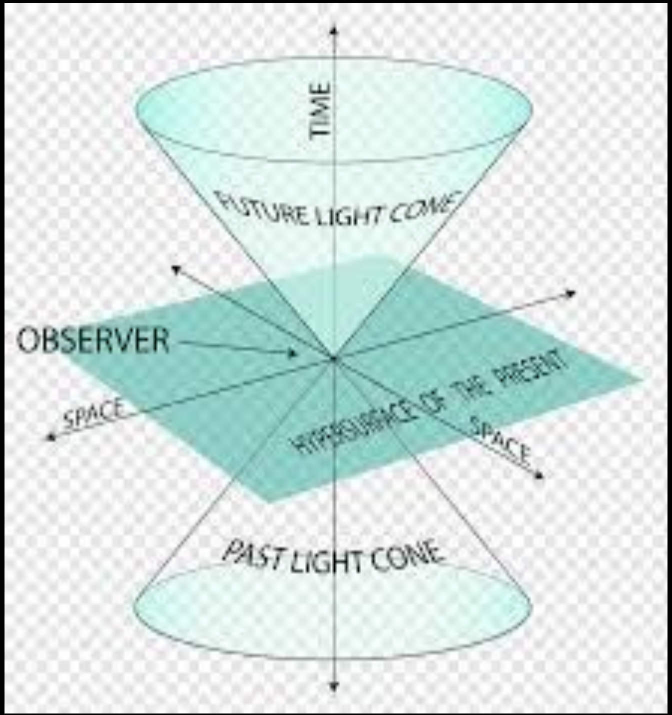
In the context of special relativity, time cannot be separated from the three dimensions of space, because the observed rate at which time passes for an object depends on the object's velocity relative to the observer. General relativity provides an explanation of how gravitational fields can slow the passage of time for an object as seen by an observer outside the field.

In ordinary space, a position is specified by three numbers, known as dimensions. In the Cartesian coordinate system, these are often called x, y and z. A point in spacetime is called an event, and requires four numbers to be specified: the three-dimensional location in space, plus the position in time (Fig. 1). An event is represented by a set of coordinates x, y, z and t. Spacetime is thus four-dimensional.

Unlike the analogies used in popular writings to explain events, such as firecrackers or sparks, mathematical events have zero duration and represent a single point in spacetime.[5] Although it is possible to be in motion relative to the popping of a firecracker or a spark, it is not possible for an observer to be in motion relative to an event.

The path of a particle through spacetime can be considered to be a sequence of events. The series of events can be linked together to form a curve that represents the particle's progress through spacetime. That path is called the particle's world line.[


THE SCIENCE OF SPACE-TIME
General relativity
Crossing space-time


TIME
FUTURE LIGHT CONE
OBSERVER
SPACE
HYPERSURFACE OF THE PRESENT
SPACE
PAST LIGHT CONE