St.john Baptist de la salle catholic school

Physics Assignment

10B

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Introduction to The concept of Relativity

According to the theory of general relativity , matter causes space to curve. It is posited that gravitation is not a force, as understood by Newtonian physics, but a curved field. (on area of space under the influence of a force) In the space time continnum that is actually. Created by the presence of mass.

Essentially it is a theory of gravity. The basic idea is that instead of being an invisible force that attract objects to one another, gravity is a curving on warping of space. The more massive an object the more it wraps the space around it.

One example of relativity is to imagine two people on a train playing ping-pong. The train is travelling at around 30m/s north. When the ball is hit back and forth between the two players the ball appears to the players to move north at a speed of around 2m/s and then south at a speed of 2m/s.

General relativity:- Gravitational time dilation clocks run slower in deeper gravitational wells.

Precession:- orbits process in a way unexpected in newton's theory of gravity.

Light deflection:- rays of light bend in the presence of a gravitational field.

Einstein's revelation was that observes in relative motion experience time differently: It's perfectly possible for two events to happen simultaneously from the perspective of one observer, Yet happen at

different times from the perspective of the other. And both observers would be right.

A brief history of relativity

The Theory of Relativity, proposed by the Jewish physicist Albert Einstein (1879-1955) in the early part of the 20th century, is one of the most significant scientific advances of our time. Although the concept of relativity was not introduced by Einstein, his major contribution was the recognition that the speed of light in a vacuum is constant and an absolute physical boundary for motion. This does not have a major impact on a person's day-to-day life since we travel at speeds much slower than light speed. For objects travelling near light speed, however, the theory of relativity states that objects will move slower and shorten in length from the point of view of an observer on Earth. Einstein also derived the famous equation, E = mc2, which reveals the equivalence of mass and energy.

When Einstein applied his theory to gravitational fields, he derived the "curved space-time continuum" which depicts the dimensions of space and time as a two-dimensional surface where massive objects create valleys and dips in the surface. This aspect of relativity explained the phenomena of light bending around the sun, predicted black holes as well as the Cosmic Microwave Background Radiation (CMB) -- a discovery rendering fundamental anomalies in the classic Steady-State hypothesis. For his work on relativity, the photoelectric effect and blackbody radiation, Einstein received the Nobel Prize in 1921.

The basics of the theory of relativity

Physicists usually dichotomize the Theory of Relativity into two parts.

The first is the Special Theory of Relativity, which essentially deals with the question of whether rest and motion are relative or absolute, and with the consequences of Einstein's conjecture that they are relative.

The second is the General Theory of Relativity, which primarily applies to particles as they accelerate, particularly due to gravitation, and acts as a radical revision of Newton's theory, predicting important new results for fast-moving and/or very massive bodies. The General Theory of Relativity correctly reproduces all validated predictions of Newton's theory, but expands on our understanding of some of the key principles. Newtonian physics had previously hypothesised that gravity operated through empty space, but the theory lacked explanatory power as far as how the distance and mass of a given object could be transmitted through space. General relativity irons out this paradox, for it shows that objects continue to move in a straight line in space-time, but we observe the motion as acceleration because of the curved nature of space-time.

Einstein's theories of both special and general relativity have been confirmed to be accurate to a very high degree over recent years, and the data has been shown to corroborate many key predictions; the most famous being the solar eclipse of 1919 bearing testimony that the light of stars is indeed deflected by the sun as the light passes near the sun on its way to earth. The total solar eclipse allowed astronomers to-for the first time analyse starlight near the edge of the sun, which had been previously inaccessible to observers due to the intense brightness of the sun. It also predicted the rate at which two neutron stars orbiting one another will move toward each other. When this phenomenon was first documented, general relativity proved itself accurate to better than a trillionth of a percent precision, thus making it one of the best confirmed principles in all of physics.

Applying the principle of general relativity to our cosmos reveals that it is not static. Edwin Hubble (1889-1953) demonstrated in 1928 that the Universe is expanding, showing beyond reasonable doubt that the Universe sprang into being a finite time ago. The most common contemporary interpretation of this expansion is that this began to exist from the moment of the Big Bang some 13.7 billion years ago. However this is not the only plausible cosmological model which exists in academia, and many creation physicists such as Russell Humphreys and John Hartnett have devised models operating with a biblical framework, which -- to date -- have withstood the test of criticism from the most vehement of opponents.

Theory of relativity – A statement to creation

Using the observed cosmic expansion conjunctively with the general theory of relativity, we can infer from the data that the further back into time one looks, the universe ought to diminish in size accordingly. However, this cannot be extrapolated indefinitely. The universe's expansion helps us to appreciate the direction in which time flows. This is referred to as the Cosmological arrow of time, and implies that the future is -- by definition -- the direction towards which the universe increases in size. The expansion of the universe also gives rise to the second law of thermodynamics, which states that the overall entropy (or disorder) in the Universe can only increase with time because the amount of energy available for work deteriorates with time. If the universe was eternal, therefore, the amount of usable energy available for work would have already been exhausted. Hence it follows that at one point the entropy value was at absolute 0 (most ordered state at the moment of creation) and the entropy has been increasing ever since -- that is, the universe at one point was fully "wound up" and has been winding down ever since. This has profound theological implications, for it shows that time itself is necessarily finite. If the universe were eternal, the thermal energy in the universe would have been evenly distributed throughout the cosmos, leaving each region of the cosmos at uniform temperature (at very close to absolute 0), rendering no further work possible.

The General Theory of Relativity demonstrates that time is linked, or related, to matter and space, and thus the dimensions of time, space,

and matter constitute what we would call a continuum. They must come into being at precisely the same instant. Time itself cannot exist in the absence of matter and space. From this, we can infer that the uncaused first cause must exist outside of the four dimensions of space and time, and possess eternal, personal, and intelligent qualities in order to possess the capabilities of intentionally space, matter -- and indeed even time itself -- into being.

Moreover, the very physical nature of time and space also suggest a Creator, for infinity and eternity must necessarily exist from a logical perspective. The existence of time implies eternity (as time has a beginning and an end), and the existence of space implies infinity. The very concepts of infinity and eternity infer a Creator because they find their very state of being in God, who transcends both and simply is.

General theory of relativity

General Relativity theory, developed by Einstein in 1907-1915, states that being at rest in the gravitational field and accelerating are identical physically. For example, an observer can see the ball fall the same way on the rocket and on Earth. This is due to the rocket’s acceleration, which equals 9.8 m/s2. This theory relates to Newton’s gravitational theory and special relativity.

Albert Einstein's theory of relativity is actually two separate theories: his special theory of relativity , postulated in the 1905 paper, The Electrodynamics of Moving Bodies and his theory of general relativity , an expansion of the earlier theory, published as The Foundation of the General Theory of Relativity in 1916. Einstein sought to explain situations in which Newtonian physics might fail to deal successfully with phenomena, and in so doing proposed revolutionary changes in human concepts of time, space and gravity.

The special theory of relativity was based on two main postulates: first, that the speed of light is constant for all observers; and second, that observers moving at constant speeds should be subject to the same physical laws. Following this logic, Einstein theorized that time must change according to the speed of a moving object relative to the frame of reference of an observer. Scientists have tested this theory through experimentation - proving, for example, that an atomic clock ticks more slowly when traveling at a high speed than it does when it is not moving. The essence of Einstein's paper was that both space and time are relative (rather than absolute), which was said to hold true in a special case, the absence of a gravitational field. Relativity was a stunning concept at the time; scientists all over the world debated the veracity of Einstein's famous equation, E=mc2, which implied that matter and energy were equivalent and, more specifically, that a single particle of matter could be converted into a huge quantity of energy. However, since the special theory of relativity only held true in the absence of a gravitational field, Einstein strove for 11 more years to work gravity into his equations and discover how relativity might work generally as well.

According to the theory of general relativity, matter causes space to curve. It is posited that gravitation is not a force, as understood by Newtonian physics, but a curved field (an area of space under the influence of a force) in the space-time continuum that is actually created by the presence of mass. According to Einstein, that theory could be tested by measuring the deflection of starlight traveling near the sun; he correctly asserted that light deflection would be twice that expected by Newton's laws. This theory also explained why the light from stars in a strong gravitational field was closer to the red end of the spectrum than those in a weaker one.

For the final thirty years of his life, Einstein attempted to find a unified field theory, in which the properties of all matter and energy could be expressed in a single equation. His search was confounded by quantum theory's uncertainty principle , which stated that the movement of a single particle could never be accurately measured, because speed and position could not be simultaneously assessed with any degree of assurance. Although he was unable to find the comprehensive theory that he sought, Einstein's pioneering work has allowed countless other scientists to carry on the quest for what some have called "the holy grail of physicists."

conclusion

Special relativity tells us that in order for the laws of physics to be the same for all inertial observers, space and time must fuse into a single space time continuum. The time elapsed between events and the lengths of objects are different as measured by observers in different states of motion.