Gravity

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In physics, gravity (from Latin gravitas 'weight'), also known as gravitation or a gravitational interaction, is a fundamental interaction, which may - In physics, gravity (from Latin gravitas 'weight'), also known as gravitation or a gravitational interaction, is a fundamental interaction, which may be described as the effect of a field that is generated by a gravitational source such as mass.

The gravitational attraction between clouds of primordial hydrogen and clumps of dark matter in the early universe caused the hydrogen gas to coalesce, eventually condensing and fusing to form stars. At larger scales this resulted in galaxies and clusters, so gravity is a primary driver for the large-scale structures in the universe. Gravity has an infinite range, although its effects become weaker as objects get farther away.

Gravity is described by the general theory of relativity, proposed by Albert Einstein in 1915, which describes gravity in terms of the curvature of spacetime, caused by the uneven distribution of mass. The most extreme example of this curvature of spacetime is a black hole, from which nothing—not even light—can escape once past the black hole's event horizon. However, for most applications, gravity is sufficiently well approximated by Newton's law of universal gravitation, which describes gravity as an attractive force between any two bodies that is proportional to the product of their masses and inversely proportional to the square of the distance between them.

Scientists are looking for a theory that describes gravity in the framework of quantum mechanics (quantum gravity), which would unify gravity and the other known fundamental interactions of physics in a single mathematical framework (a theory of everything).

On the surface of a planetary body such as on Earth, this leads to gravitational acceleration of all objects towards the body, modified by the centrifugal effects arising from the rotation of the body. In this context, gravity gives weight to physical objects and is essential to understanding the mechanisms that are responsible for surface water waves, lunar tides and substantially contributes to weather patterns. Gravitational weight also has many important biological functions, helping to guide the growth of plants through the process of gravitropism and influencing the circulation of fluids in multicellular organisms.

Gravity Falls

Gravity Falls is an American mystery comedy animated television series created by Alex Hirsch for Disney Channel and Disney XD. The series follows the - Gravity Falls is an American mystery comedy animated television series created by Alex Hirsch for Disney Channel and Disney XD. The series follows the adventures of Dipper Pines (Jason Ritter) and his twin sister Mabel (Kristen Schaal), who are sent to spend the summer with their great-uncle (or "Grunkle") Stan (Hirsch) in Gravity Falls, Oregon, a mysterious town rife with paranormal incidents and supernatural creatures. The kids help Stan run the "Mystery Shack", the tourist trap that he owns, while also investigating the local mysteries.

The series premiered on June 15, 2012, and ran until February 15, 2016. On November 20, 2015, Hirsch announced that the series would conclude with its second season, stating that this was "100% [his] choice" and that "the show isn't being cancelled – it's being finished" and was reaching its intended conclusion. The series ended on February 15, 2016, with a one-hour finale, "Weirdmageddon 3: Take Back the Falls". Hirsch later stated that he remains open to continuing the series with additional episodes or specials, with the story continued in written form with the 2016 replica of Journal 3, the 2018 graphic novel Gravity Falls: Lost Legends and the 2024 teen-oriented novel The Book of Bill.

Gravity Falls received critical acclaim for its writing, characters, voice acting, animation, and humor. Additionally, the series won two Emmy Awards, three Annie Awards, and a BAFTA Children's Award, among various other wins and nominations. Gravity Falls garnered high viewership amongst children, teenagers, and young adults during its run and was Disney XD's highest rated show in 2015 and early 2016, while also setting several ratings records for the network. The series has attracted a broad and passionate fandom, is considered to be an influence for many animated shows that followed it, and spawned a variety of official merchandise.

Gravity (disambiguation)

Gravity may also refer to: Gravity (2009 film), a German crime film Gravity (2013 film), a British-American science fiction thriller film Gravity (TV - Gravity, or gravitation, is the mass-proportionate mutual attraction between all things that have mass.

Gravity may also refer to:

Gravity (2013 film)

Gravity is a 2013 science fiction thriller film directed by Alfonso Cuarón, who also co-wrote, co-edited, and produced the film. It stars Sandra Bullock - Gravity is a 2013 science fiction thriller film directed by Alfonso Cuarón, who also co-wrote, co-edited, and produced the film. It stars Sandra Bullock and George Clooney as American astronauts who attempt to return to Earth after the destruction of their Space Shuttle in orbit.

Cuarón wrote the screenplay with his son Jonás and attempted to develop the film at Universal Pictures. Later, the distribution rights were acquired by Warner Bros. Pictures. David Heyman, who previously worked with Cuarón on Harry Potter and the Prisoner of Azkaban (2004), produced the film with him. Gravity was produced entirely in the United Kingdom, where British visual effects company Framestore spent more than three years creating most of the film's visual effects, which involve over 80 of its 91 minutes.

Gravity opened the 70th Venice International Film Festival on August 28, 2013, and had its North American premiere three days later at the Telluride Film Festival. Upon its release, Gravity was met with widespread critical acclaim, with high praise for its direction, visuals, cinematography, acting, and score. Considered one of the best films of 2013, it appeared on numerous critics' year-end lists, and was selected by the American Film Institute in their annual Movies of the Year list. The film became the eighth-highest-grossing film of the year with a worldwide gross of over $723 million, against a production budget of around $100 million.

Gravity received a leading 10 nominations at the 86th Academy Awards, including Best Picture and Best Actress (for Bullock), and won a leading seven awards, including Best Director (for Cuarón). At the 67th British Academy Film Awards, the film received a leading 11 nominations, including Best Film and Best Actress in a Leading Role (for Bullock), and won a leading 6 awards, including Outstanding British Film and Best Director (for Cuarón). It also received 4 nominations at the 71st Golden Globe Awards, including Best Motion Picture – Drama and Best Actress in a Motion Picture – Drama (for Bullock), with Cuarón winning Best Director.

At the 19th Critics' Choice Awards, the film received 10 nominations, including Best Picture and Best Actress (for Bullock), and won a leading seven awards, including Best Sci-Fi/Horror Movie, Best Director (for Cuarón) and Best Actress in an Action Movie (for Bullock). Bullock also received a nomination for the Screen Actors Guild Award for Outstanding Performance by a Female Actor in a Leading Role, while the film won the 2013 Ray Bradbury Award, and the 2014 Hugo Award for Best Dramatic Presentation. Since its release, it has been cited as among the best films of the 2010s and the 21st century.

Quantum gravity

Quantum gravity (QG) is a field of theoretical physics that seeks to describe gravity according to the principles of quantum mechanics. It deals with - Quantum gravity (QG) is a field of theoretical physics that seeks to describe gravity according to the principles of quantum mechanics. It deals with environments in which neither gravitational nor quantum effects can be ignored, such as in the vicinity of black holes or similar compact astrophysical objects, as well as in the early stages of the universe moments after the Big Bang.

Three of the four fundamental forces of nature are described within the framework of quantum mechanics and quantum field theory: the electromagnetic interaction, the strong force, and the weak force; this leaves gravity as the only interaction that has not been fully accommodated. The current understanding of gravity is based on Albert Einstein's general theory of relativity, which incorporates his theory of special relativity and deeply modifies the understanding of concepts like time and space. Although general relativity is highly regarded for its elegance and accuracy, it has limitations: the gravitational singularities inside black holes, the ad hoc postulation of dark matter, as well as dark energy and its relation to the cosmological constant are among the current unsolved mysteries regarding gravity, all of which signal the collapse of the general theory of relativity at different scales and highlight the need for a gravitational theory that goes into the quantum realm. At distances close to the Planck length, like those near the center of a black hole, quantum fluctuations of spacetime are expected to play an important role. Finally, the discrepancies between the predicted value for the vacuum energy and the observed values (which, depending on considerations, can be of 60 or 120 orders of magnitude) highlight the necessity for a quantum theory of gravity.

The field of quantum gravity is actively developing, and theorists are exploring a variety of approaches to the problem of quantum gravity, the most popular being M-theory and loop quantum gravity. All of these approaches aim to describe the quantum behavior of the gravitational field, which does not necessarily include unifying all fundamental interactions into a single mathematical framework. However, many approaches to quantum gravity, such as string theory, try to develop a framework that describes all fundamental forces. Such a theory is often referred to as a theory of everything. Some of the approaches, such as loop quantum gravity, make no such attempt; instead, they make an effort to quantize the gravitational field while it is kept separate from the other forces. Other lesser-known but no less important theories include causal dynamical triangulation, noncommutative geometry, and twistor theory.

One of the difficulties of formulating a quantum gravity theory is that direct observation of quantum gravitational effects is thought to only appear at length scales near the Planck scale, around 10?35 meters, a scale far smaller, and hence only accessible with far higher energies, than those currently available in high energy particle accelerators. Therefore, physicists lack experimental data which could distinguish between the competing theories which have been proposed.

Thought experiment approaches have been suggested as a testing tool for quantum gravity theories. In the field of quantum gravity there are several open questions – e.g., it is not known how spin of elementary particles sources gravity, and thought experiments could provide a pathway to explore possible resolutions to these questions, even in the absence of lab experiments or physical observations.

In the early 21st century, new experiment designs and technologies have arisen which suggest that indirect approaches to testing quantum gravity may be feasible over the next few decades. This field of study is called phenomenological quantum gravity.

Gravity assist

A gravity assist, gravity assist maneuver, swing-by, or generally a gravitational slingshot in orbital mechanics, is a type of spaceflight flyby which - A gravity assist, gravity assist maneuver, swing-by, or generally a gravitational slingshot in orbital mechanics, is a type of spaceflight flyby which makes use of the relative movement (e.g. orbit around the Sun) and gravity of a planet or other astronomical object to alter the path and speed of a spacecraft, typically to save propellant and reduce expense.

Gravity assistance can be used to accelerate a spacecraft, that is, to increase or decrease its speed or redirect its path. The "assist" is provided by the motion of the gravitating body as it pulls on the spacecraft. Any gain or loss of kinetic energy and linear momentum by a passing spacecraft is correspondingly lost or gained by the gravitational body, in accordance with Newton's Third Law. The gravity assist maneuver was first used in 1959 when the Soviet probe Luna 3 photographed the far side of Earth's Moon, and it was used by interplanetary probes from Mariner 10 onward, including the two Voyager probes' notable flybys of Jupiter and Saturn.

Gravity Payments

Gravity Payments is a credit card processing and financial services company. It was founded in 2004 by Dan Price. The company is headquartered in the - Gravity Payments is a credit card processing and financial services company. It was founded in 2004 by Dan Price. The company is headquartered in the Ballard neighborhood of Seattle, Washington and employs 240 people. As of November 2021, Dan Price is the only shareholder and the only member of the board of directors.

The company received media attention in 2015 when CEO Dan Price announced that his employees at the Seattle office would receive a minimum salary of $70,000. In September 2019, Price issued an additional increase of $10,000 to all employees in the Boise office, with salaries increasing every year until 2023, when it would reach $70,000. In August 2022, the company's minimum salary was $80,000 per year.

Gravity of Earth

The gravity of Earth, denoted by g, is the net acceleration that is imparted to objects due to the combined effect of gravitation (from mass distribution - The gravity of Earth, denoted by g, is the net acceleration that is imparted to objects due to the combined effect of gravitation (from mass distribution within Earth) and the centrifugal force (from the Earth's rotation).

It is a vector quantity, whose direction coincides with a plumb bob and strength or magnitude is given by the norm

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In SI units, this acceleration is expressed in metres per second squared (in symbols, m/s2 or m·s?2) or equivalently in newtons per kilogram (N/kg or N·kg?1). Near Earth's surface, the acceleration due to gravity, accurate to 2 significant figures, is 9.8 m/s2 (32 ft/s2). This means that, ignoring the effects of air resistance, the speed of an object falling freely will increase by about 9.8 metres per second (32 ft/s) every second.

The precise strength of Earth's gravity varies with location. The agreed-upon value for standard gravity is 9.80665 m/s2 (32.1740 ft/s2) by definition. This quantity is denoted variously as gn, ge (though this sometimes means the normal gravity at the equator, 9.7803267715 m/s2 (32.087686258 ft/s2)), g0, or simply g (which is also used for the variable local value).

The weight of an object on Earth's surface is the downwards force on that object, given by Newton's second law of motion, or F = m a (force = mass × acceleration). Gravitational acceleration contributes to the total gravity acceleration, but other factors, such as the rotation of Earth, also contribute, and, therefore, affect the weight of the object. Gravity does not normally include the gravitational pull of the Moon and Sun, which are accounted for in terms of tidal effects.

Gravity hill

A gravity hill, also known as a magnetic hill, mystery hill, mystery spot, gravity road, or anti-gravity hill, is a place where the layout of the surrounding - A gravity hill, also known as a magnetic hill, mystery hill, mystery spot, gravity road, or anti-gravity hill, is a place where the layout of the surrounding land produces an illusion, making a slight downhill slope appear to be an uphill slope. Thus, a car left out of gear will appear to be rolling uphill against gravity.

Although the slope of gravity hills is an illusion, sites are often accompanied by claims that magnetic or supernatural forces are at work. The most important factor contributing to the illusion is a completely or mostly obstructed horizon. Without a horizon, it becomes difficult for a person to judge the slope of a surface, as a reliable reference point is missing, and misleading visual cues can adversely affect the sense of balance. Objects which one would normally assume to be more or less perpendicular to the ground, such as trees, may be leaning, offsetting the visual reference.

A 2003 study looked into how the absence of a horizon can skew the perspective on gravity hills, by recreating a number of antigravity places in the lab to see how volunteers would react. In conclusion, researchers from the Universities of Padua and Pavia in Italy found that without a true horizon in sight, the human brain could be tricked by common landmarks such as trees and signs.

The illusion is similar to the Ames room, in which objects can also appear to roll against gravity.

The opposite phenomenon—an uphill road that appears flat—is known in bicycle racing as a "false flat".

General relativity

known as the general theory of relativity, and as Einstein's theory of gravity, is the geometric theory of gravitation published by Albert Einstein in - General relativity, also known as the general theory of relativity, and as Einstein's theory of gravity, is the geometric theory of gravitation published by Albert Einstein in 1915 and is the accepted description of gravitation in modern physics. General relativity generalizes special relativity and refines Newton's law of universal gravitation, providing a unified description of gravity as a geometric property of space and time, or four-dimensional spacetime. In particular, the curvature of spacetime is directly related to the energy, momentum and stress of whatever is present, including matter and radiation. The relation is specified by the Einstein field equations, a system of second-order partial differential equations.

Newton's law of universal gravitation, which describes gravity in classical mechanics, can be seen as a prediction of general relativity for the almost flat spacetime geometry around stationary mass distributions. Some predictions of general relativity, however, are beyond Newton's law of universal gravitation in classical physics. These predictions concern the passage of time, the geometry of space, the motion of bodies in free fall, and the propagation of light, and include gravitational time dilation, gravitational lensing, the gravitational redshift of light, the Shapiro time delay and singularities/black holes. So far, all tests of general relativity have been in agreement with the theory. The time-dependent solutions of general relativity enable us to extrapolate the history of the universe into the past and future, and have provided the modern framework for cosmology, thus leading to the discovery of the Big Bang and cosmic microwave background radiation. Despite the introduction of a number of alternative theories, general relativity continues to be the simplest theory consistent with experimental data.

Reconciliation of general relativity with the laws of quantum physics remains a problem, however, as no self-consistent theory of quantum gravity has been found. It is not yet known how gravity can be unified with the three non-gravitational interactions: strong, weak and electromagnetic.

Einstein's theory has astrophysical implications, including the prediction of black holes—regions of space in which space and time are distorted in such a way that nothing, not even light, can escape from them. Black holes are the end-state for massive stars. Microquasars and active galactic nuclei are believed to be stellar black holes and supermassive black holes. It also predicts gravitational lensing, where the bending of light results in distorted and multiple images of the same distant astronomical phenomenon. Other predictions include the existence of gravitational waves, which have been observed directly by the physics collaboration LIGO and other observatories. In addition, general relativity has provided the basis for cosmological models of an expanding universe.

Widely acknowledged as a theory of extraordinary beauty, general relativity has often been described as the most beautiful of all existing physical theories.