Gravitational force

Newton's Law of Universal Gravitation Apples had a significant contribution to the discovery of gravitation. The English physicist Isaac Newton (1642-1727) introduced the term " gravity" after he saw an apple falling onto the ground in his garden. " Gravity" is the force of attraction exerted by the earth on an object. The moon orbits around the earth because of gravity too. Newton later proposed that gravity was just a particular case of gravitation. Every mass in the universe attracts every other mass. This is the main idea of Newton's Law of Universal Gravitation. A portrait of Issac Newton. Courtesy of AIP Emilio Segre Visual

Archives, W. F. Meggers Collection. The law was published in Newton's famous work, the Principia (" Mathematical Principles of Natural Knowledge") in 1687. It states that every particle in the universe exerts a force on every other particle along the line joining their centers. The magnitude of the force is directly proportional to the product of the masses of the two particles, and inversely proportional to the square of the distances between them. In mathematical terms: By team C007571, ThinkQuest2000. where and are the masses of the two particles, r is the distance between the two masses, F is the gravitational force between hem, and G is the universal gravitational constant, . The above equation only calculates the gravitational force of the simplest case between two particles. What if there are more than two? In that case, we calculate the resultant gravitational force on a particle by finding the vector sum of all the gravitational forces acting on it: By adding the unit vector to the equation, F now processes a direction! Interactively test the effects of gravitation on planets! Newton derived the relation in such a way that F is proportional to m because the force on a falling body

(remember the apple?) is directly roportional to its mass by Newton's 2nd law of motion: F = ma, so F is proportional to m . When the earth exerts a force on the falling body, by Newton's 3rd law of Motion, the falling body exerts an equal and opposite force on the earth. Therefore, the gravitational force F is proportional to both the masses of the falling body and the earth, i. e. and . The inverse square relationship , was justified by observing the motion of the moon. View of a full moon. Courtesy of NIX NASA Image ExchangePhotoID: AS11-44-6667 Date Taken: 07/21/69 Johannas Kepler Courtesy of : AIP Emilio Segre Visual Archives. Newton's Law of Universal

Gravitation has successfully explained theobservationon planetary movements made by the German astronomer Kepler (1571-1630). It works perfectly well in the world of ordinary experience and has dominated for about 250 years. It, however, shows its shortcomings when explaining the unusual orbit of Mercury around the Sun. It breaks down when the gravitational forces get very strong or involving bodies moving at speeds near that of light. Einstein's General Theory of Relativity of 1915, which has overcome this limitations of Newton's Law, was able to demonstrate a better theory of gravitation. Home Gravitational potential energy