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In the world nowadays, science plays an important role in how we perceive it. For examples, when we cook, there’s smoke, chemistry helps us to understand why then we walk outside, physics help us to answer the question why we are stick on the ground, not floating like in the moon or universe. Gravitation, a fancy term in science that identifies gravity in-universe, is a broad topic and it is applied in most of the place where physics is involved, such as aviation, space and universe, and military. Isaac Newton is the ancient scientist who has developed the theory of gravitational, in which came from his three law of motion. This essay will be covered about Isaac Newton’s biography, three laws of motions, how do laws of motions strongly related to gravitational force and how do we use and apply gravitational into our daily life.

Isaac Newton was born on January 4, 1643, in England, best known as an English physicist and mathematician in the 17th century. He has developed many new concepts in Physics such as laws of motion, optics, light, and colors, and most of all is the theory of gravity. He was a professor at Cambridge University, not an official teacher but he still gets there every year to do lectures about optics. During his studies, he faced many challenges from his classmate and Isaac Newton and Robert Hooke is one example. Newton believed light is a composed of particles but Hooke believed they are made of waves. They have fought for several months for this theory and then Newton left the battle, but not admit to Hooke’s theory after his mother passed away. After that, he focused mainly on gravitational theory. They did not stop just there, during the time Newton research about planetary motion, Hooke came once again, ask Newton to develop his research in a mathematical way so they can publish a book, called Principia. No longer after that, Hooke accused Newton that Newton stole his theory and theorized to his own but he later can’t prove it. His mentor, by the time, was Isaac Barrow, a mathematician at Trinity College, same school with Newton, and by the time he got his Professor, is about the time Newton first get into the college. Unfortunately, there's not much information about how did they work together as well as what makes Newton influence to Barrow’s work.

One of the greatest ideas in Physics that is still applied in our daily life today is Gravitational. Gravitational is a theory that was concluded from Isaac’s three law of motions. His first law is, “A body at rest will remain at rest, and a body in motion will remain in motion unless it is acted upon by an external force” (Jim Lucas). For example, a car will not move when there is no force act upon it. Once we human push it, it will move at a constant speed (if there’s no hill) and will only stop if we go onto the other side and push it back to reduce the constant speed to zero. The second law, strongly related to gravitational force, is “The force acting on an object is equal to the mass of that object times its acceleration” (Jim Lucas). In a simple form, this law can be sum up into an equation, which is F = ma, where f is the total force of a certain object with a gravity force, m is the mass of an object and a is acceleration speed, or known as gravity. For example, compare total force of a normal person would be 784N (80kg \* 9.8m/s) and total force of a car would be 14700N (1500kg \* 9.8m/s), a car will accelerate faster toward the center core of the Earth where gravity exist if both dropped at the same height, due to the fact car has a greater force than a normal human body. However, the more we are away from the Earth’s core, the less gravity will act upon us, which explained why astronauts can easily “fly” or flow in the universe. That is the case for a normal human body, what about an asteroid? Will it get affected by the Earth’s gravity when it is “flying” so far away from Earth? Yes, but the chance for an asteroid to hit the Earth is pretty low. According to the above example, a heavier object tends to observe more force than a lighter object, so, a human body can easily flow in the universe as long as they reached into Stratosphere layer, which is from 10 km to 50 km away from the center core of Earth. A minimum safe distance for an asteroid to flyby Earth and not absorb the Earth’s gravity is at least 60 km and this distance increase depends on how large is the asteroid. If an object absorbs gravity from any planet at a certain distance, during the way its travel, it will burn itself due to friction between the object and the universe space. Newton’s third law of motion is a little bit related to the gravitational field, which started as “For every action, there is an equal and opposite reaction” (Jim Lucas). An easy example would be, when you push a shopping cart, you don’t feel any force acting toward you but imagine pushing a shopping cart with a full load of beer can, you would have to apply much more force to push it forward, as there is a force acting on you, which are the mass of the beer can. Or, when we are being pulled toward the center core of Earth due to gravity, the ground is there to push us up. As we have seen, these laws of motions sound complicated but it applied to our daily basis almost all the time. These laws of motion explained a lot about how a certain object can move, stop, change its velocity or acceleration.

Gravitational Force works closely with the three laws of motions, especially to the second and third law. His second explained that many objects on Earth can observe gravity, even object outside the Earth’s layer can also get effect depends on its mass and distance. This law leads to a conclusion about the dependence of gravity upon distance, which is “Force of Gravitational attraction between the Earth and other objects is inversely proportional to the distance separating the Earth’s center from the object’s center” (physicsclassroom.com). As we have discovered the third law of Newton, recalled “For every action, there is an equal and opposite reaction” (Jim Lucas), which mean is “the Force of Gravity acting between the Earth and any other object is directly proportional to the mass of the Earth, directly proportional to the mass of the object and inversely proportional to the square of the distance that separates the centers of the Earth and the object”. Let put it this way, object 1 is the current object and object 2 is the object that produces gravity. Object 1 will observe more gravity if it is close to object 2 and the bigger of object 2 is, the more gravity it will produce to object 1 (note that object produces gravity must bigger than the object that observed gravity.). This method applies to all object in universal, which can put down into an equation: F proportional to ((m1 \* m2)) / (d)^2. F represents for the total force between the center of object 1 and object 2, m1 is the mass of object 1, m2 is the mass of object 2 and d is the distance between the center of object 1 to distance of object 2. In extending from that, the formula that used calculate Gravitational is F = (G\*m1\*m2) / (d) ^2, where we added a G is the Universal Gravitation Constant as 6.67\*10^-11, m1 m2 in meters and d in km. This formula produces same value comparing to a much simple formula, 9.8\*mass of the object as scientists did a lot of research to calculate an exact number for Earth’s gravity and for another object beyond Earth, we will use a closed average number for it. Each object has it own gravitational value, it just scientists are lack of evidence as well as they don’t have enough resources to calculate that exact value. Gravitational Laws and Newton’s three law of motions are closely related to each other as it explained why things around are moving like that, or things around fall into the ground but not others direction.

Not just Newton’s laws of motion applied to our daily basis, gravitational sometimes involves, such as an item fall out from a shopping bag, or when driving, your speed will increase when you drive downhill and decrease when you drive uphill (same energy applied to the car). But for most of the time, gravitational is used to create spaceship, satellite or space science. It helps the astronauts to control the spaceship when it gets to an object with higher or lower gravity, which allowed them to land safely for investigation or to measure the gravitational so companies who want to launch a satellite can make changes in weight and height to meet their need. In a much further vision, gravity keeps the Earth and other surrounding planets to line properly around the sun or causes the moon to revolve around the Earth, cause the tides of the ocean which is created by the moon and so on. It seems like gravity is the basis of everything, where most experiments in science, especially in physics, will require.

Gravitation is the gravity force that exists in every object in the universe. Gravity is strong if the object is big and otherwise. Newton’s laws of motion are the foundation of gravitation, or laws of motions are the smaller vision, where it applies in our daily basis and gravitation is a bigger vision where it applies to the whole universe. Physics itself is an interesting experiment as it occurred everywhere and sometimes people wonder what was happening and after they discovered the answer, they turned out surprised as it is so magical. Gravitational is one of the greatest ideas in science that made Isaac Newton amongst one of the greatest scientist in the history.

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