Set $F=ma$ to the Motion

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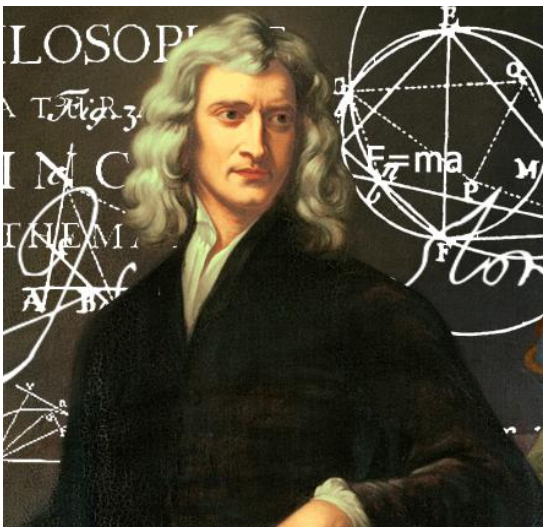


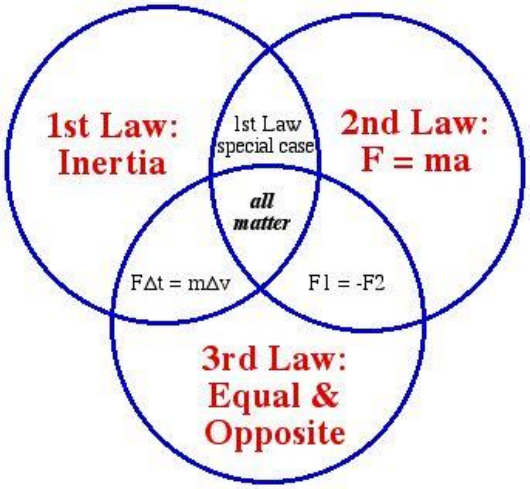
A philosopher, mathematician, astronomer, and physicist, was born on January 4th, 1643. He was the founder of modern science, a world known writer, and an experimental alchemist through his life time. “I do not know what I may appear to the world, but to myself I seem to have been only like a boy playing on the sea-shore, and diverting myself in now and then finding a smoother pebble or a prettier shell than ordinary, whilst the great ocean of truth lay all undiscovered before me.” (Newton, 2013) His name was Sir Isaac Newton and he gave us the Laws of Motion.

Sir Isaac Newton was 44 years old when he published *Philosophiae Naturalis Principia Mathematica*. The book is said to be the most influential book in physics because it contains information on nearly all of the essential concepts of physics, except energy. When Newton published this book, Robert Hooke accused Newton of plagiarism, claiming that “Newton had stolen his work.” (Bio, 2013) Hooke had only theorized on the ideas, but he had never brought it to any level of proof, so Newton was not charged with plagiarism.

“Every object persists in its state of rest or uniform motion in a straight line unless it is compelled to change that state by forces impressed on it.” (Philosophiæ Naturalis Principia Mathematica, 1687) Newton states that an object at rest will stay at rest as long

as nothing pushes or pulls on it, also an object in motion will stay in motion, traveling in a straight line until something pushes or pulls on it. Take a gyroscope, for example, it is an apparatus consisting of a rotating wheel mounted so that its axis can turn freely, it is capable of maintaining the same absolute direction in space in spite of movements of the. In a vacuum, once the gyroscope starts spinning it will not stop, ever. This is because when an object is in a vacuum there are no forces acting against that object, thus allowing the object to keeps its current state of motion or lack of.

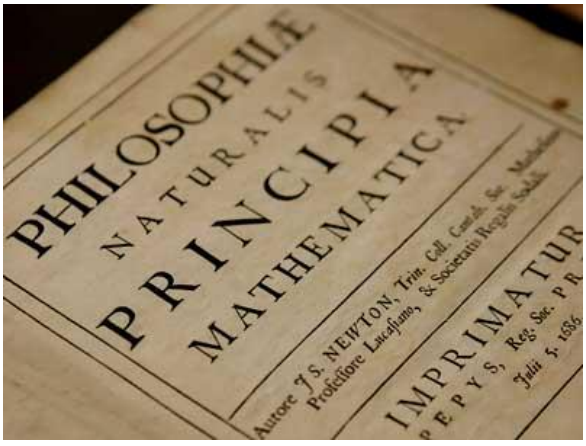
Sir Isaac Newton developed and built his first law of motion primarily on Aristotle's and Galileo's theories of inertia. Aristotle believed that a force is required to keep an object in motion. He deduced that the greater the force on an object would make the object's speed greater. Aristotle was proven wrong 200 years later by Galileo's own theories and observations. Galileo theorized that it was just as natural for an object to be in horizontal motion at a constant speed as it was for it to be at rest. Galileo stated that this could only work if society lived in a world with no friction. Thanks to the Aristotle and Galileo genius, Newton was able to explain the exact connection between force and motion.



Newton's Laws

People know that it takes more force to move a heavier object the same distance than a lighter one. Sir Isaac Newton developed a mathematical equation to calculate the

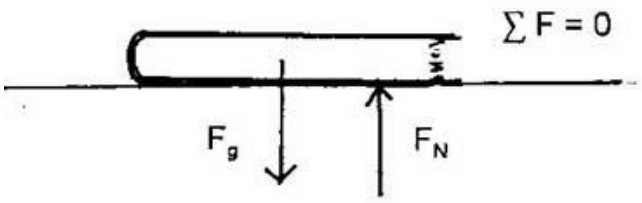
exact relationship between force (*F*) mass (*m*) and acceleration (*a*): *F=ma*, where *m* is multiplied by *a*. Newton stated that when a force acts on an object, the object accelerates in the direction of the force and if the mass of an object is constant, increasing force will increase its acceleration and if the force on an object remains constant, increasing mass will decrease its acceleration. "The change of motion is proportional to the [magnitude of the] impressed motive force, and to be made along the right line by which that force is impressed." (Newton, Philosophiæ Naturalis Principia Mathematica, 1687)



Newton's second Law of Motion is used in many ways everyday: walking, pushing, pulling, typing on a computer, blinking an eye, eating, drinking, thinking [the neurons in the brain are moving] gravity, and much more. The National Aeronautics and Space Administration (NASA) uses Newton's second law to launce shuttles, satellites, and other objects in to space. For example, a rocket that is travelling to space needs a certain amount of fuel to get there. The force of the rocket acts on the mass and thus produces acceleration. As the rocket ascends to outer space it burns fuel, which, in turn, decreases the total mass and increases the acceleration. NASA can calculate the total amount of fuel needed just by following Newton's second law of motion.

"When Chuck Norris does a push up, he isn't lifting himself up, he's pushing the Earth down." (Rousseau, 2013) This phenomenon can only be explained by Newton's

Third Law of Motion. “To an action there is always an equal and contrary reaction: or the actions of two bodies between themselves are always mutually equal and directed in opposite directions.” (Newton, Philosophiæ Naturalis Principia Mathematica, 1687)



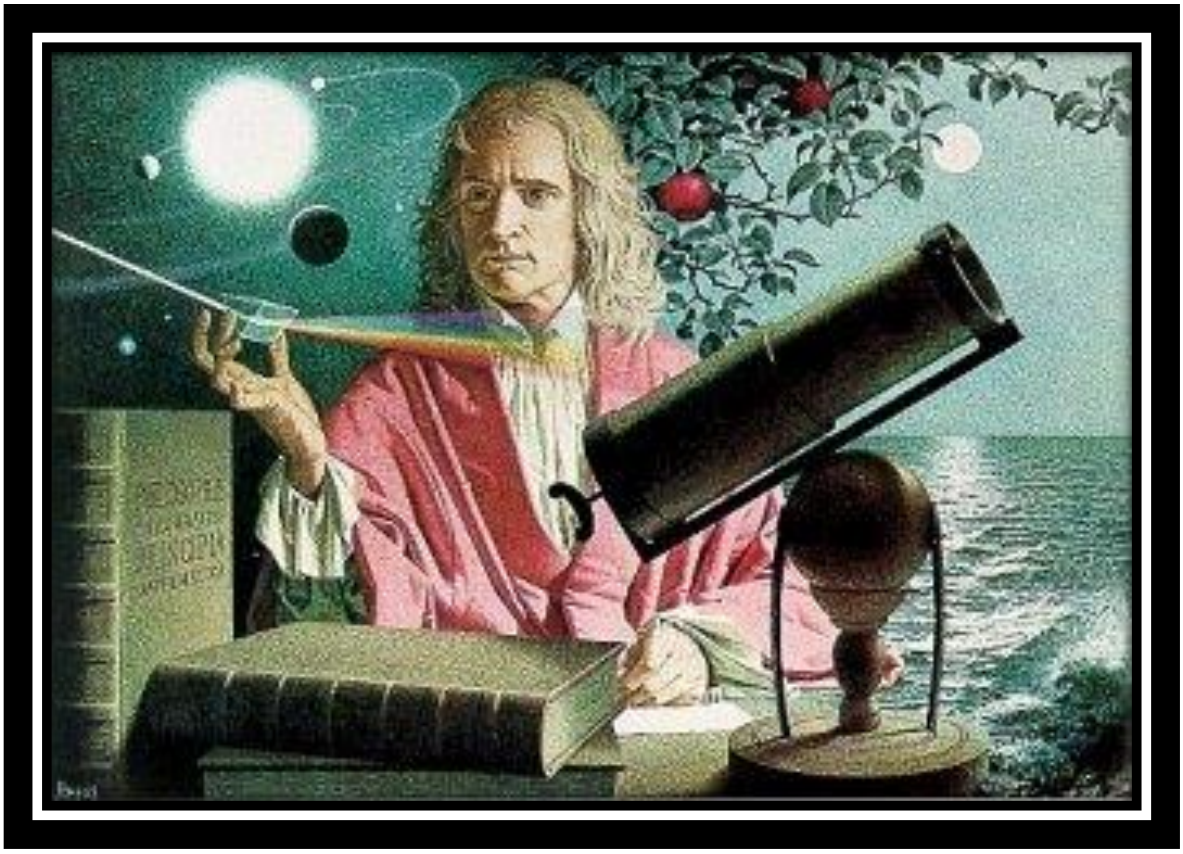
Newton saw very force involves the interaction of two objects. When one object exerts a force on a second object, the second object also exerts a force on the first object. The two forces are equal in strength and oriented in opposite directions.

Sir Isaac Newton’s three Laws of Motion are important to the science and physics community and formed the basis for the science of mechanics. Today, any machine has to be designed with Newton’s laws in mind. Without Newton’s laws, none of our machines would be here.

In order for society to understand the world around them, Newton’s laws are essential. For example, how much an item weighs. An object’s weight is the force on the object due to gravity. This can be calculated by using the equation $F=ma$ or Newton’s Second Law of Motion. Take the formula $F=ma$ and substitute F with W [weight] and a with g, the maximum velocity of gravity ($9.8 m/s^2$). Now you can calculate weight with the new formula W=mg!

Throughout history, there hasn’t been any other, more, influential scientist than Sir Isaac Newton. Newton's study in physics and mathematics put him at the top of the scientific community with many of the other greatest scientists. His three laws of motion, his study of the nature of light, and his law of universal gravitation are some of his

greatest achievements. Newton has been thought of the founding father of modern physical science.



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