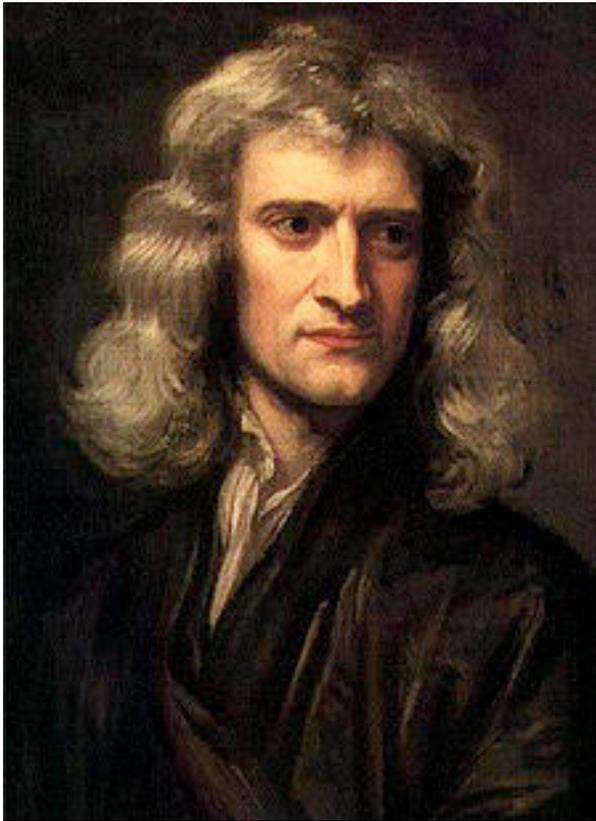


Newton's Laws of Motion



Sir Issac Newton
Portrait by Godfrey Kneller 1689

Dr. Zeemo demonstrates all three of Newton's law of motion in the assembly program. These demonstrations make use of common items that students are familiar with which also makes them easier to remember.

Newton's First Law of Motion:

I. Every object in a state of uniform motion tends to remain in that state of motion unless an external force is applied to it.

This we recognize as essentially Galileo's concept of inertia, and this is often termed simply the "Law of Inertia". This concept is demonstrated by Dr. Zeemo in a demonstration of juggling. When a juggling club is tossed in the air, gravity pulls it back down so it can be caught and tossed again.

Newton's Second Law of Motion:

II. The relationship between an object's mass m , its acceleration a , and the applied force F is $F = ma$. Acceleration and force are vectors (as indicated by their symbols being displayed in slant bold font); in this law the direction of the force vector is the same as the direction of the acceleration vector.

According to Newton, a force causes only a *change in velocity* (an acceleration); it does not maintain the velocity. This is demonstrated by Dr. Zeemo with a yo-yo. To perform around the world, a yo-yo is tossed straight up and makes an orbit before returning to the hand. To make two orbits, more force is required and so Dr. Zeemo throws the yo-yo harder.

Newton's Third Law of Motion:

III. For every action there is an equal and opposite reaction.

This concept is demonstrated by Dr. Zeemo with a balloon. If you blow a balloon up and let go of it, it will fly up. A paradox to this is also presented by attaching a propeller to the nozzle of the balloon and pointing the balloon down. With the propeller attached the balloon still flies up.

