Isaac Newton (a 17th century scientist) put forth a variety of laws, which explain why objects move (or don't move) as they do. These three laws have become known as Newton's three laws of motion.

NEWTON'S FIRST LAW:

Newton's first law of motion states that "An object at rest tends to stay at rest and an object in motion tends to stay in motion with the same speed and in the same direction unless acted upon by an unbalanced force." Objects tend to "keep on doing what they're doing." In fact, it is the natural tendency of objects to resist changes in their state of motion. This tendency to resist changes in their state of motion is described as **inertia**.

Inertia: the resistance an object has to a change in its state of motion.

Newton's conception of inertia stood in direct opposition to more popular conceptions about motion. The dominant thought prior to Newton's day was that it was the natural tendency of objects to come to a rest position. Moving objects, so it was believed, would eventually stop moving; a force was necessary to keep an object moving. But if left to itself, a moving object would eventually come to rest and an object at rest would stay at rest; thus, the idea which dominated people's thinking for nearly 2000 years prior to Newton was that it was the natural tendency of all objects to assume a rest position.

According to Newton's first law, an object in motion continues in motion with the same speed and in the same direction unless acted upon by an unbalanced force. It is the natural tendency of objects to keep on doing what they are doing. All objects resist changes in their state of motion. In the absence of an unbalanced force, an object in motion will maintain its state of motion. This is often called the *law of inertia*.

The law of inertia is most commonly experienced when riding in cars and trucks. In fact, the tendency of moving objects to continue in motion is a common cause of a variety of transportation accidents - of both small and large magnitudes. Consider for instance a ladder strapped to the top of a painting truck. As the truck moves down the road, the ladder moves with it. Being strapped tightly to the truck, the ladder shares the same state of motion as the truck. As the truck accelerates, the ladder accelerates with it; as the truck decelerates, the ladder decelerates with it; and as the truck maintains a constant speed, the ladder maintains a constant speed as well.

But what would happen if the ladder was negligently strapped to the truck in such a way that it was free to slide along the top of the truck? Or what would happen if the straps deteriorated over time and ultimately broke, thus allowing the ladder to slide along the top of the truck? Supposing either one of these scenarios were to occur, the ladder may no longer share the same state of motion as the truck. With the strap present, the forces exerted upon the car are also exerted upon the ladder. The ladder undergoes the same accelerated and decelerated motion that the truck experiences. Yet, once the strap is no longer present, the ladder is more likely to maintain its state of motion.

If the truck were to abruptly stop and the straps were no longer functioning, then the ladder in motion would continue in motion. Assuming a negligible amount of friction between the truck and the ladder, the ladder would slide off the top of the truck and be hurled into the air. Once it leaves the roof of the truck, it becomes a projectile and continues in projectile-like motion.

NEWTON'S SECOND LAW:

The acceleration of an object as produced by a net force is directly proportional to the magnitude of the net force, in the same direction as the net force, and inversely proportional to the mass of the object.

F = m * a

NEWTON'S THIRD LAW:

A force is a push or a pull upon an object, which results from its interaction with another object. Forces result from interactions! Some forces result from *contact interactions* (normal, frictional, tensional, and applied forces are examples of contact forces) and other forces are the result of action-at-a-distance interactions (gravitational, electrical, and magnetic forces). According to Newton, whenever objects A and B interact with each other, they exert forces upon each other. When you sit in your chair, your body exerts a downward force on the chair and the chair exerts an upward force on your body. There are two forces resulting from this interaction - a force on the chair and a force on your body. These two forces are called *action* and *reaction* forces and are the subject of Newton's third law of motion. Formally stated, Newton's third law is:

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

The statement means that in every interaction, there is a pair of forces acting on the two interacting objects. The size of the forces on the first object equals the size of the force on the second object. The direction of the force on the first object is opposite to the direction of the force on the second object. Forces always come in pairs - equal and opposite action-reaction force pairs