Forces in Nature

Forces are acting all around you! Objects including you are being pushed and pulled in different directions. Sometimes these forces cause motion. Like when you toss a ball into the air. However, objects that are not moving also have forces acting upon them too to keep them in place.

A **force** is a push or pull on an object. For example, when you sit at a picnic table, you **exert** a force on the bench and the bench exerts a force back on you. Every force has a certain strength and direction. Forces can affect objects in several ways. Forces can set an object that is standing still into motion. Or forces can change a moving objects' speed and or direction that it is traveling in. Forces can also change the shape of an object, like how the force from wind makes waves on the water. Gravity and friction are the forces leading the way in creating motion. Changing either or both forces will affect the motion of an object.

Gravity is the force of **attraction** between two objects. Everything has **mass**, which is the amount of "stuff" in an object. The greater the mass of an object, the stronger the force of gravity between them. An apple will fall to Earth because Earth has a greater mass than your hand. Mass is not the same as the weight of an object. Weight is the measurement of the force of gravity acting on the object depending on its location. When hiking, a heavier backpack has greater mass. Therefore it is tougher to overcome gravity and get up the hill. More effort is needed to keep an object with greater mass in motion.

A **simple machine** is a tool that makes work easier. These machine work because they help you use less force to move the object. In the case of cutting firewood there are several factors at work to get the wood cut and ready for a campfire. The mass of the axe, the wedge shape of the axe, the effort of

the person cutting and the lever or handle of the axe all work together to make splitting a solid piece of wood easy.

Friction is the force that works against the motion between two objects that are touching each other. Friction might stop motion from starting, or it might slow the object's motion that is already happening. The amount of friction between two surfaces depends on three things: 1) the type of surface, 2) amount surface area, and 3) the amount of force being applied. When bicycling, the brakes use the force of friction to slow down and the tires use friction to grip the road surface.

When forces are acting on an object with equal **effort** the force is balanced and no change in motion is created. This means that the object will **remain** motionless if it is not moving and will remain at the same speed and direction if it is already moving. When a force on an object is greater in one way then the forces are unbalanced and this will create a change in the motion of an object. This means that an object that was at rest will begin motion and an object that was already in motion will change **speed** and **direction**. The greater the force acting on the object, the greater the change in motion it produces. These rules of motion can be observed when paddling a canoe on a river.