The Science of Bikes

The bicycle might be one of the greatest inventions of all time. It is simple, efficient and fun transportation. You can get to places quickly by converting your body's energy into **kinetic energy**, energy in motion.

A bike is a machine that can **magnify** force or speed to move you up a hill more easily. It is also capable of changing the energy from the human body to energy for motion. Energy in all forms cannot be created or destroyed, energy can only change from one form to another. Biking can feel like hard work at times because you must use a lot of muscle force to pedal. If you are going uphill you must work against the force of gravity. If you are trying to go fast you are working against a force called **air resistance**. If there are any bumps or turns then you must use energy to slow down and use the force of friction from the brakes. When riding a bike, you are always using energy to make the wheels go around and keep in motion.

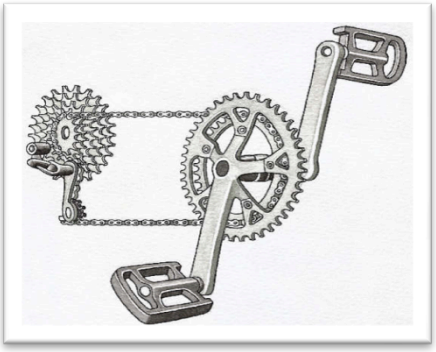
What Does a Bike Frame Do?

The frame of the bike is the base, it supports you and spreads your mass out over the whole bike. You sit on the bike towards the back but lean forward over the handlebars to balance better. The frame of the bike is made from materials that bend and flex a little to **absorb** the impacts of riding.

How do Bike Wheels Work?

A wheel and an axle are a simple machine. The wheel will increase the force or speed depending on how it is turned. The greater the **diameter** of the wheel the more your speed can increase. Wheels support your mass as you sit on the seat. The rubber tire sits inside a wheel that has a rim and several **spokes,** which make the wheel strong, lightweight and help reduce the force of air resistance. Like strands of a spider web, the spokes are pulled tight and are crisscrossed from the rim to the opposite rim. This design stops the wheel from crushing under the mass of the rider.

How do Bike Gears Work?



The **gears** on a bike are wheels with teeth connected by a chain, which make the bike faster and even easier to **overcome** forces when riding. The main gear is attached to what is called a crank, which is a pair of **levers**, which is where the pedals are located. Gears make you faster because there is a **ratio** of teeth on the front gear to the back gear, a single spin of the pedals and crank will move the bike wheel even that much more.

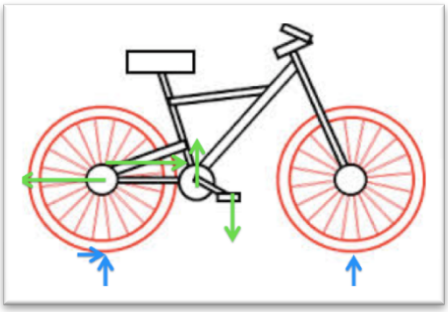
How do Bike Brakes Work?

Every bike must have a way to stop. Brakes on a bike work because of friction. Many bikes have brakes that are **activated** by squeezing a rubber shoe against the rim of the wheel causing the wheel rotation to slow. As the brake shoe is rubbing against the wheel rim, your kinetic energy is converted into heat, which has the effect of slowing you down.

How do Bike Tires Work?

Bike tires use the force of friction to keep you on the road or trail. Bike tires are made of a hollow rubber material. Inside there is an inner tube filled with air. The tire surfaces are different depending on the surface you might be riding on. Mountain bike tire are fat, with deep **treads** creating more surface area to grip the trail. Road bike tires are skinnier and smooth for maximum speed. Friction is created when the road surface touches the bike tire surface.

Bicycles are Physics in Action!



The frame divides the riders mass between both wheels. Larger wheels can increase the speed. Gears linked together by a chain increase the pedaling force. The pedal crank levers increase the pedal force. Spokes make the wheel strong and support the mass of the rider. The brake shoes apply friction to the rim to change energy into heat, which slows the bike down.