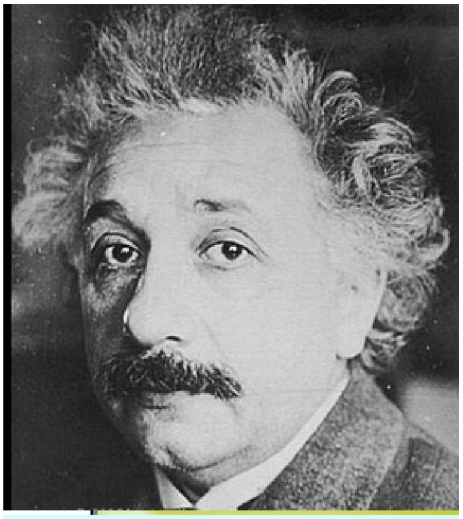
# Conservation of Energy

Change is a part of life. As we grow, we change. Organisms live and die; we build structures and watch them fall apart. Energy is a crucial part of the never-ending cycle of change. Energy is found in many different forms, but all forms of energy may be classified as potential or kinetic. **Potential energy** is stored energy. When the stored energy is released, it becomes **kinetic energy.** *Kinetic* means "related to motion."

The amount of energy in the universe is constant. Energy is neither created nor destroyed. Rather, energy can change forms and be transferred from one object or organism to another. This idea is known as the **Law of Conservation of Energy.** This law is crucial to understanding energy and the many ways we use it.

Ancient scientists long ago observed that energy was conserved. In other words, the overall amount of energy in a system stays the same. Our modern understanding of energy developed fairly recently. Albert Einstein is one of the most famous scientists to study energy. His theory of relativity, $E=mc^2$, expresses that an object's energy (the "E" in the equation) is related to the object's mass (the "m") and the speed of light (the "c") squared. According to this equation, mass and energy are interchangeable.



Albert Einstein (1879–1955) helped advance our understanding of the Law of Conservation of Energy.

Think for a moment about ways energy can be transformed. Can you think of some examples? Potential energy becomes kinetic energy when the stored energy is released. The potential energy of gasoline becomes kinetic energy when the engine of a car burns the gasoline.

Kinetic energy can also become potential energy. The kinetic energy of wind can be used to make electricity, which can be stored in a battery as potential energy. Energy exists in the foods we eat, as well as in renewable and nonrenewable resources.

The transfer of energy makes this energy available for our use. You may have heard people stating that energy in a system was lost. The Law of Conservation of Energy contradicts this

statement. Energy isn't ever truly lost, but sometimes the ways we use energy aren't efficient. Energy is the ability to do work. Usually when energy is transferred, some of the energy isn't useful for work. When people say energy is "lost," they mean that not all the energy was used for work. This "lost" energy is most often heat energy.

Let's look at an example to explain energy inefficiency. Our homes are connected to power lines that transmit electricity from the power plants that generate the electricity, often by burning fossil fuels like coal. As the electricity moves through the power lines, the electricity encounters resistance. When this happens, some of the electrical energy is changed to thermal energy. Therefore, the amount of useable electrical energy is reduced by the time it reaches your house. The energy didn't disappear, but less of it is available for the useful work of powering your home.

As electrical energy moves through power lines, some of the energy is transformed to heat, but energy is never lost.

Energy is constantly transforming, both naturally and with help from humans. Scientists are continually working to develop more efficient technologies. Today, many appliances are sold with a label that says "Energy Star." An Energy Star-certified appliance uses less energy or uses energy more efficiently. By increasing the amount of energy available for useful work and decreasing the amount lost to friction or heat, we can help protect natural resources and save money. In the future, better knowledge will help us maximize our energy use. Understanding how energy is transferred and transformed is an important step in this process.