

Energy Part 3: Source of Energy

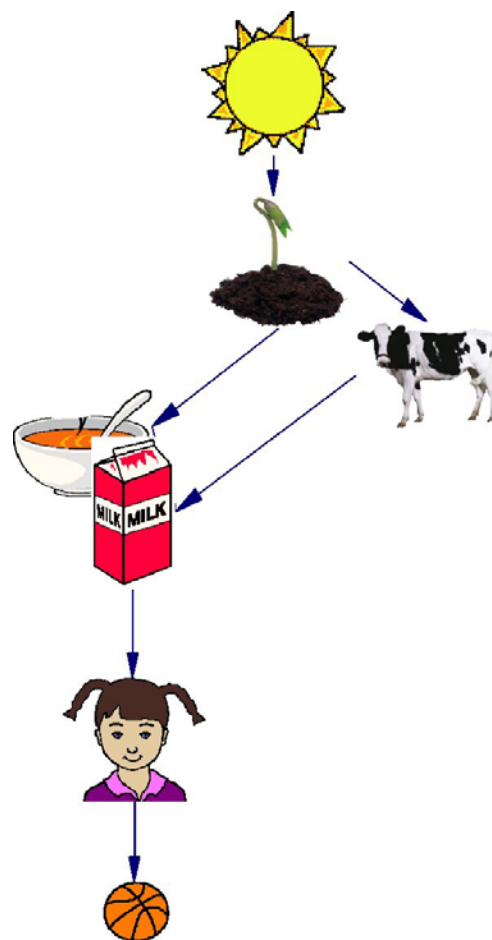
We've been looking at the relationship between **energy** and **work**. Last week, we examined **energy** within a system: when a child tossed a ball. The ball had **potential gravitational energy**. In addition, the ball had **kinetic energy**: as the ball was in motion, it was doing **work**, pushing air molecules out of the way. This led to the question:

Ultimately, where did the ball's energy come from?

No matter the form of **energy** (e.g., kinetic, electrical, light, sound), its existence can be traced back to the sun.¹ Let's look at some examples to see the flow of energy...

Ball system: child tossing a ball into the air

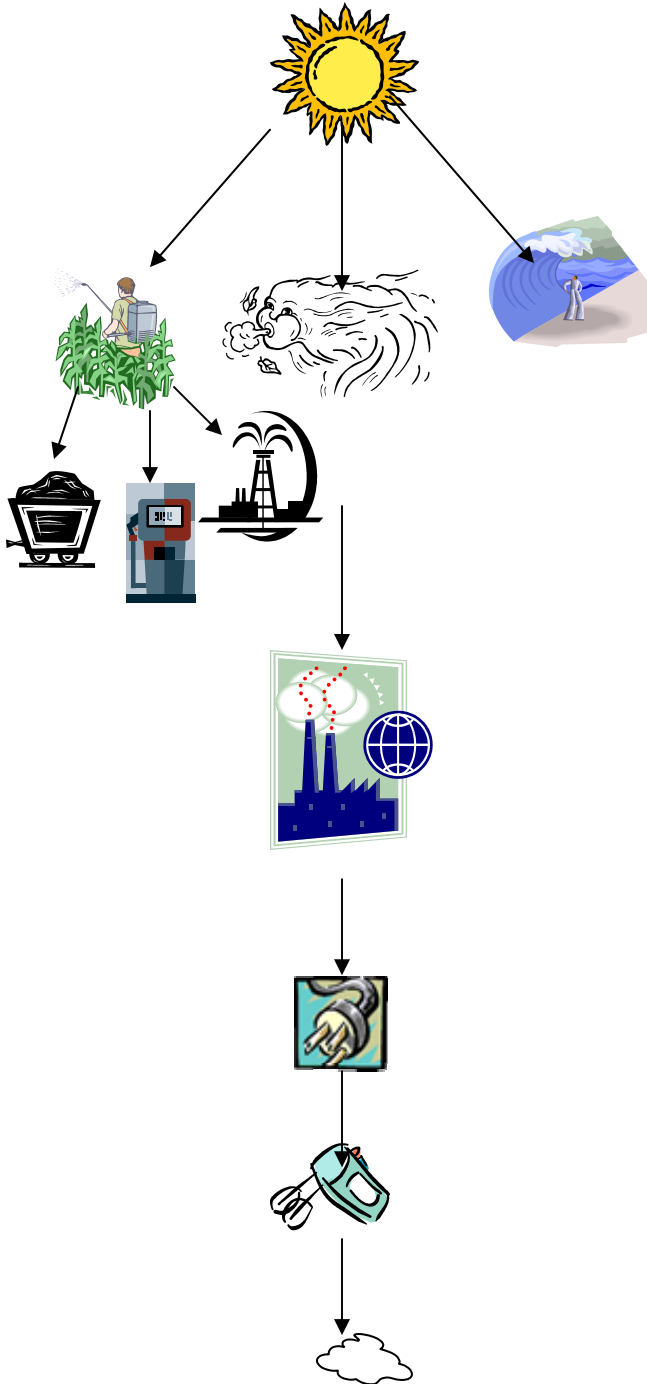
- The ball did **work** on the air molecules around it, pushing them out of the way. The ball got its **energy** from the child.
- The child did **work** on the ball as she set it in motion. She got her **energy** from cereal and milk for breakfast.
- The cereal came from plants, which got their **energy** from the sun.
- The milk came from an animal, which got its **energy** from plants, which, in turn, got their **energy** from the sun.



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Electric mixer system: whipping egg whites



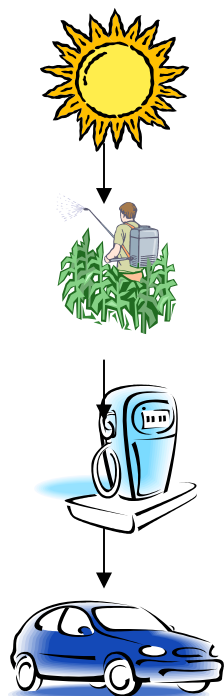
- The electric mixer does **work** on the egg whites as it whips them. The mixer gets its **energy** from electricity.
- Electrical generating plants may have different power sources:
- In oil-, gas-, or coal-powered electrical generating plants, the **energy** to turn the turbines comes from burning the **chemical energy** stored in the oil, gas, or coal. This stored **chemical energy** came from decomposed ancient green plants. These green plants got their **energy** from the sun.

- In wind-powered electrical generating plants, the **energy** to turn the turbines comes from the **kinetic energy** of the wind. This **kinetic energy** comes from differential heating of air. The heat for this comes from the sun.
- In hydroelectric plants, the **energy** to turn the turbines comes from the **kinetic energy** of the moving water. This process is ultimately dependent upon the sun for the continuation of the water cycle (precipitation, evaporation, condensation).

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Automobile System: driving a car



- The car does **work** on itself. It uses the road to exert the force on itself. The car gets its **energy** from gasoline.
- Gasoline products draw their **energy** from stores in the Earth that come from ancient green plants.
- These green plants got their **energy** from the sun.

The sun's energy

If the sun is the source of almost all the energy on earth, where does the sun get its energy?

- “Hydrogen is the natural starting point, since most of the matter in the sun (and also the stars) is hydrogen gas... The endpoint is helium, known to be the second most abundant element in the sun.”²
- “In the interior of the sun (and stars), nuclear reactions burn hydrogen to produce helium. Thus energy is released to heat the interior of the sun to millions of degrees, and power the emission of light and heat out into space.”³

In the next email, we're going to look more closely at energy provided by the sun during the process of photosynthesis.

In the meantime:

Remember the Plant-in-a-Jar system that we started last year?
What do you predict has happened to it?

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What forms of energy can be found within that system? Send your responses to:
<mailto:crsep.schenectady.k12.ny.us>



**Plant-in-a-Jar system
 started on
 February 26, 2003**

What do the New York State Standards say?

In the Elementary Core Curricula, Standard 4, The Physical Setting,

Major Understandings state:

- 4.1a: *The Sun is a major source of energy for earth. Other sources of energy include nuclear and geothermal energy.*
- 4.1c: *Most activities in everyday life involve one form of energy being transformed into another. For example, the chemical energy in gasoline is transformed into mechanical energy in an automotive engine. Energy, in the form of heat, is almost always one of the products of energy transformations.*

In the Intermediate Core Curricula, Standard 4, The Physical Setting,

Major Understandings state:

- 4.1a: *Energy exists in various forms: heat, electric, sound, chemical, mechanical, light.*
- 4.1d: *Energy and matter interact: water is evaporated by the Sun's heat; a bulb is lighted by means of electrical current; a musical instrument is played to produce sound; dark colors may absorb light, light colors may reflect light.*
- 4.2a: *Everyday events involve one form of energy being changed into another*
 - *animals convert food to heat and motion*
 - *the Sun's energy warms the air and water*

¹The only exception to this is **nuclear energy**.

²<http://academic.brooklyn.cuny.edu/physics/sobel/Nucphys/relativity.html>

³<http://academic.brooklyn.cuny.edu/physics/sobel/Nucphys/sun.html>