# Science and Language Arts

# A Brave and Startling Truth

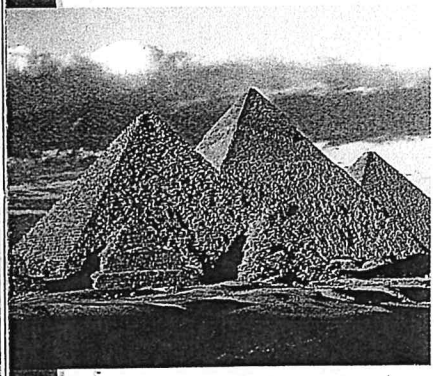
**by Maya Angelou**

We, this people, on a small and lonely planet
Traveling through casual space
Past aloof stars, across the way of indifferent suns
To a destination where all signs tell us
It is possible and imperative that we learn
A brave and startling truth ...

When we come to it
Then we will confess that not the Pyramids
With their stones set in mysterious perfection ...
Not the Grand Canyon
Kindled into delicious color
By Western sunsets
These are not the only wonders of the world ...

When we come to it
We, this people, on this minuscule and kithless[1]
globe ...
We this people on this mote[2] of matter

When we come to it
We, this people, on this wayward[3], floating body
Created on this earth, of this earth
Have the power to fashion for this earth
A climate where every man and every woman
Can live freely without sanctimonious piety[4]
Without crippling fear



When we come to it
We must confess that we
are the possible
We are the miraculous, the
true wonder of the world
That is when, and only
when
We come to it.

## Understanding Literature

**Descriptive Writing** The poet names some special places on Earth. These places, although marvelous, fall short of being really wonderful. How does Angelou contrast Earth's position within the universe to emphasize the importance of people?

### Respond to the Reading

1. What adjectives does the poet use to describe Earth?
2. What does the poet believe are the true wonders of the world?
3. **Linking Science and Writing** Write a six-line poem that describes Earth's movement from the point of view of the Moon.

INTEGRATE Physics

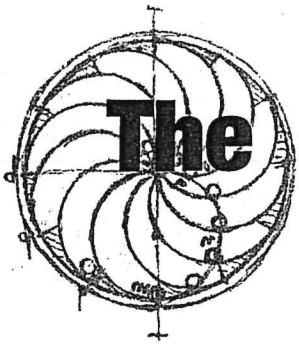
Sometimes a person doesn't need to see movement to know that something has moved. Even though we don't necessarily see Earth's movement, we know Earth moves relative to a reference point such as the Sun. If the Sun is the reference point, Earth moves because the Sun appears to change its position in the sky. The poem describes Earth's movement from a reference point outside of Earth, somewhere in space.

1 to be without friends or neighbors

2 small particle

3 wanting one's own way in spite of the advice or wishes of another

4 a self-important show of being religious



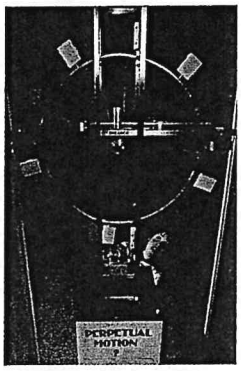
# The Impossible Dream

## A machine that keeps on going? It has been tried for hundreds of years.

Many people have tried throughout history—and failed—to build perpetual-motion machines. In theory, a perpetual-motion machine would run forever and do work without a continual source of energy. You can think of it as a car that you could fill up once with gas, and the car would run forever. Sound impossible? It is!

### Science Puts Its Foot Down

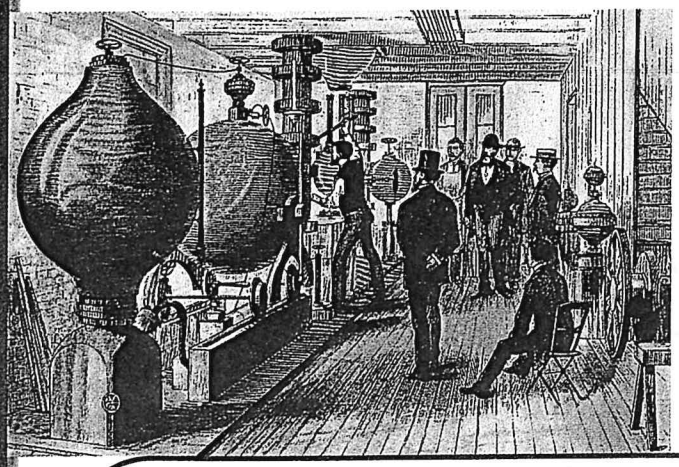
For hundreds of years, people have tried to create perpetual-motion machines. But these machines won't work because they violate two of nature's laws. The first law is the law of conservation of energy, which states that energy cannot be created or destroyed. It can change form—say, from mechanical energy to electrical energy—but you always end up with the same amount of energy that you started with.




How does that apply to perpetual-motion machines? When a machine does work on an object, the machine transfers energy to the object. Unless that machine gets more energy from somewhere else, it can't keep doing work. If it did, it would be creating energy.

The second law states that heat by itself always flows from a warm object to a cold object. Heat will only flow from a cold object to a warm object if work is done. In the process, some heat always escapes.

To make up for these energy losses, energy constantly needs to be transferred to the machine. Otherwise, it stops. No perpetual motion. No free electricity. No devices that generate more energy than they use. No engine motors that run forever without refueling. Some laws just can't be broken.



**Visitors look at the Keely Motor, the most famous perpetual-motion machine fraud of the late 1800s.**

**Analyze** Using your school or public-library resources, locate a picture or diagram of a perpetual-motion machine. Figure out why it won't run forever. Explain to the class what the problem is.

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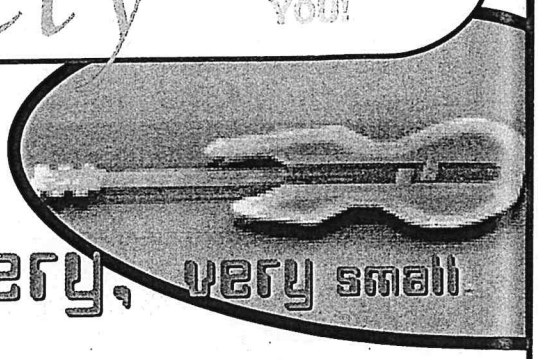
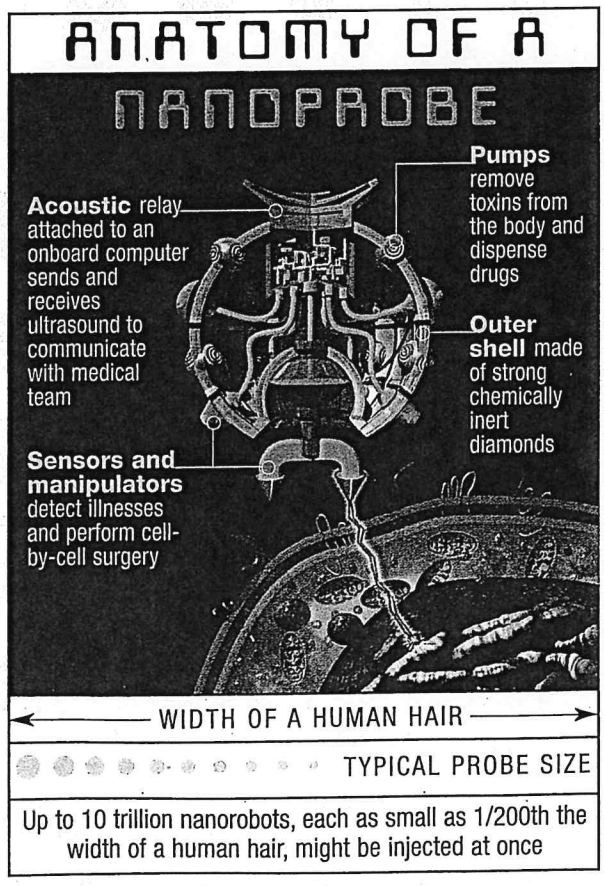
# The Science of very, very small



**This is the smallest guitar in the world. It is about as big as a human white blood cell. Each of its six silicon strings is 100 atoms wide. You can see the guitar only with an electron microscope.**

Imagine an army of tiny robots, each no bigger than a bacterium swimming through your bloodstream.

Welcome to the world of nanotechnology—the science of creating molecular-sized machines. These machines are called nanobots.




The smallest of these machines are only billionths of a meter in size. They are so tiny that they can do work on the molecular scale.

## Small, Smaller, Smallest

Nanotechnologists are predicting that within a few decades they will be creating nanobots that can do just about anything, as long as it's small. Already, nanotechnologists have built gears 10,000 times thinner than a human hair. They've also built tiny molecular "motors" only 50 atoms long. At Cornell University, nanotechnologists created the world's smallest guitar. It is appoximately the size of a white blood cell and it even has six strings.

In the future, they might transmit your internal vital signs to a nanocomputer, which might be implanted under your skin. There the data could be analyzed for signs of disease. Other nanomachines then could be sent to scrub your arteries clean of dangerous blockages, or mop up cancer cells, or even vaporize blood clots with tiny lasers. These are just some of the possibilities in the imaginations of those studying the new science of nanotechnology.

**Design** **Think up a very small simple or complex machine that could go inside the body and do something. What would the machine do? Where would it go? Share your diagram or design with your classmates.**

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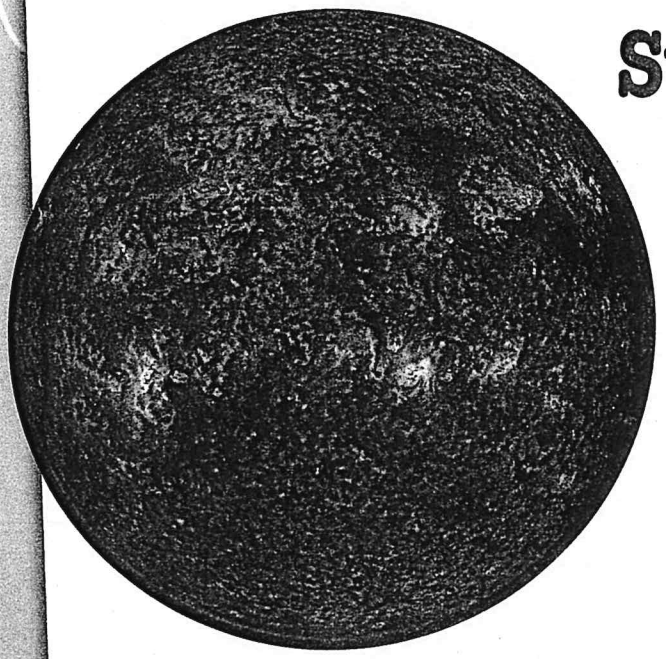
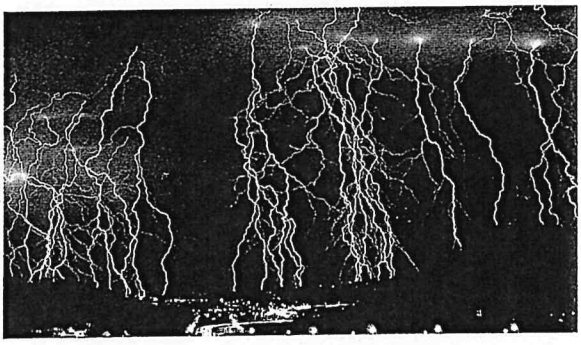
# SCIENCE Stats



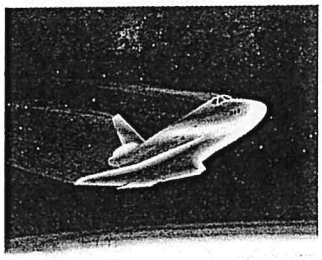
## Surprising Thermal Energy

### Did you know...

**. . . The average amount of solar energy** that reaches the United States each year is about 600 times greater than the nation's annual energy demands.



**. . . When a space shuttle reenters** Earth's atmosphere at more than 28,000 km/h, its outer surface is heated by friction to nearly 1,650°C. This temperature is high enough to melt steel.



**. . . A lightning bolt heats the air** in its path to temperatures of about 25,000°C. That's about 4 times hotter than the average temperature on the surface of the Sun.

**Applying Math**

1. The highest recorded temperature on Earth is 58°C and the lowest is −89°C. What is the range between the highest and lowest recorded temperatures?
2. What is the average temperature of the surface of the Sun? Draw a bar graph comparing the temperature of a lightning bolt to the temperature of the surface of the Sun.
3. The Sun is almost 150 million km from Earth. How long does it take solar energy to reach Earth if it travels at 300,000 km/s?