TIME FOR KIDS

MIGHTY MICROS

LITTLE THINGS • BIG RESULTS



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For teachers' inspection ONLY

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Mini but Mighty

People are often told to think big. But some of the most powerful creatures and objects in the world are tiny. Tweezers are needed to place the microchips that run in computers. People need a microscope to see the plankton in the ocean. Yet these and other puny powerhouses make big things happen. They can be humans' greatest helpers or their worst enemies.

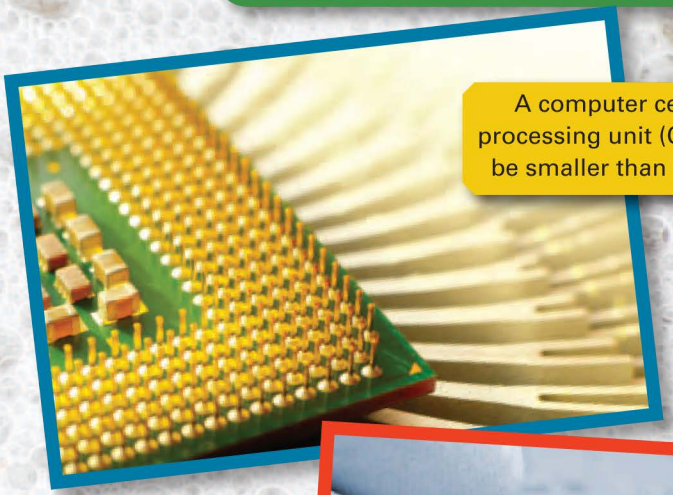


You can't view a simple life form such as a paramecium without using a microscope.

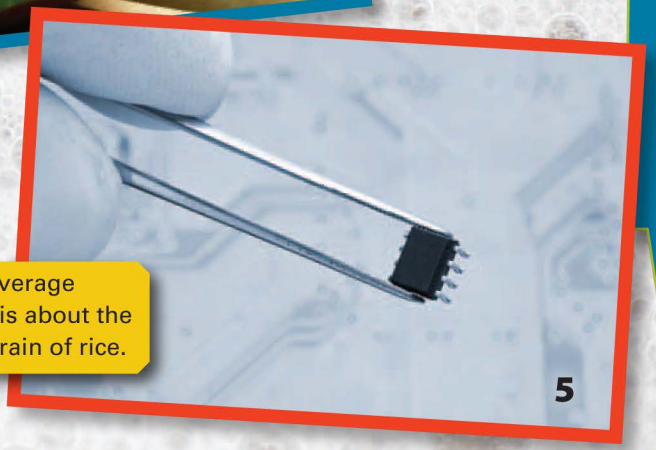
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THINK LINK

- What is the natural role of tiny living things on Earth?
- In what ways can tiny creatures wreak major damage?
- How do very small machines and technology make our lives better?



A computer central processing unit (CPU) can be smaller than a dime.

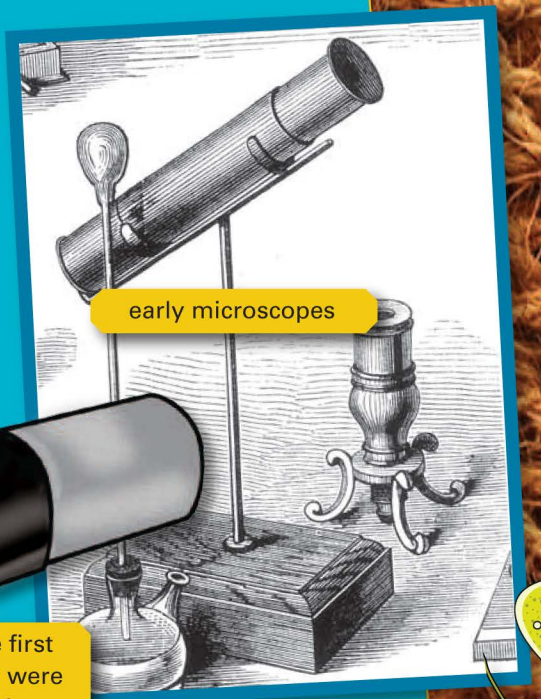


The average microchip is about the size of a grain of rice.

Little things can cause both bad and good results. Bugs and bacteria can spread deadly diseases. Scientists work with atoms and tiny technology to make powerful weapons. But small living things are an important part of the life cycle. They can help plants, animals, and humans stay healthy.

A Closer Look

People have wanted to take a closer look at tiny things for many years. Around 1590, Dutch eyeglass makers created the first light microscope. They placed two glass lenses in a tube. Objects looked larger through the tube. People have been studying smaller and smaller objects ever since.



early microscopes



Some of the first microscopes were made with glass, wood, cardboard, and fish scales.

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AMAZING ANIMALCULES

Anton van Leeuwenhoek was a cloth salesman. In the 1660s, he ground glass lenses to magnify cloth fibers. He soon used his microscopes to study other small things such as blood **cells** and insects. Van Leeuwenhoek was the first person to see bacteria in pond water. He called them *animalcules*.

SWEATING THE SMALL STUFF

The tiniest lines on most rulers are millimeters (mm). They are very useful for measuring little things like a flea or the microchip a vet puts under your pet's skin. But what about stuff so small it can't be seen with the human eye? Scientists use a unit of measure called a *micrometer* (µm) to measure tiny creatures such as plankton and bacteria. A micrometer is one thousandth of a millimeter. A light microscope reveals these objects. A nanometer (nm) is smaller still. It's one millionth of a millimeter. An **electron** microscope is needed to see these objects.

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STOP! THINK...

- Which of these objects have you seen?
- Which is bigger, a nano robot or a human cell?
- Could you use a light microscope to see a plant cell that is 80 µm in size?

visibility

human eye

light microscope

electron microscope

microchip	flea	copepod	diatom	human cell	bacterium	nano robot	virus	atom
11 mm	3.5 mm	2 mm	10–150 µm	30 µm	1 µm	0.1 µm	30–100 nm	0.3 nm



THE MIGHTIEST MAGNIFIERS

To get the closest view, scientists use a very powerful tool, the scanning electron microscope. These microscopes are much stronger than light microscopes. They can magnify an object to appear a million times larger and show objects in three dimensions.