

## Reflect

If you would like to view something that is extremely small—something that is even too small to be seen by the naked eye—what tool would you use? You may have thought, “That’s obvious: the microscope.”

Now, what type of microscope would you use? This question may be harder. How many different types of microscopes can you describe?



## Look Out!

### What is a microscope?

A microscope is an optical instrument used for viewing small objects, such as mineral samples or animal or plant cells, typically **magnified** several hundred times. There are several types of microscopes, each with their own unique structures and functions.

**magnified** – to make something appear bigger

- *Electron microscope* – a microscope that accelerates electrons in order to produce an illuminated image
- *Scanning electron microscopes (SEM)* – a microscope that produces images by scanning it with a concentrated beam of electrons
- *Stereo microscopes* – a dissection microscope designed for low-magnification observations
- *Light (optical) microscopes* – a microscope that uses light and a series of lenses to magnify images or items of small sample



### What are the types of microscopes?

- **Electron Microscopes**

Instead of using visible light waves to magnify an image, electron microscopes speed up individual electrons to produce the desired image. What advantage do electrons have over visible light? The biggest advantage is the microscopic size of electron waves as compared to light waves. Since electron waves are considerably shorter (up to 100,000 times shorter), electron microscopes can capture clearer details of magnified objects.



- **Scanning Electron Microscopes (SEMs)**

As the name suggests, SEMs also use electrons to produce a magnified image. The primary difference between the electron microscopes discussed above and scanning electron microscopes is how the actual image is produced. In SEMs, electrons are scanned along an object and actually interact with the atoms of the item. This interaction gives off a signal that can be interpreted by the microscope to produce the image.

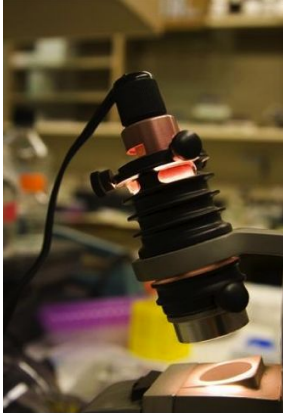
- **Stereo Microscopes**

Also known as stereoscopic or dissection microscopes, stereo microscopes can be easily identified by the two distinct optical paths. These two optical paths provide different viewpoints for the left and right eyes. Stereo microscopes can be used in microsurgeries and the inspection of circuit boards. The item being magnified is illuminated by light reflecting off its surface.



- **Light (Optical) Microscopes**

Alternatively, light microscopes illuminate items by shining light through a series of magnifying lenses. Light microscopes are the oldest type of microscope, because they use the simplest design. It is important to note, though, that modern light, or optical, microscopes can be very complex.



## Try Now

Write the identifying features of each microscope in the content frame below. Add a quick sketch to help you differentiate between the microscopes.

<b>Electron Microscope</b>	<b>Scanning Electron Microscope</b>
<b>Stereo Microscope</b>	<b>Light (Optical) Microscope</b>

## Connecting With Your Child

### Phone Magnification

To help your child learn more about microscopes, mirror the functionality of the apparatus with the zoom feature of your phone or other electronic device.

Take turns taking macro or close-up photos of objects around your home. (Examples of close-up photography can be seen below.) Then, challenge each other to identify what the zoomed-in photo's subject is. If your partner guesses correctly, switch roles. Some phones even have macro or micro photo settings; experiment with each to find the best results!

### Here are some questions to discuss with your child:

1. What is magnification?
2. How do microscopes work?
3. How are the phones similar to microscopes? How do they differ?

