The Electron Microscopy Facility (EMF) provides advanced electron microscopy services to Oregon State University’s research communities and helps attract faculty and students to OSU.

Oregon State University

Al Soeldner, previous Director of EMF

Test Your Knowledge on Microscopes
Fill in the blanks from the list below

______________ are tools used to see microscopic things that the naked eye cannot see. There are ____ different microscopes talked about in this booklet. The most basic microscope that is like a magnifying glass is the ________________. A more complex microscope that uses a glass slide to see things is the ________________. The SEM and TEM microscopes both use _______________ to see the object, which are tiny particles which are parts of atoms. The _____ is used to see details on the surface and the _____ is used to see the internal structure of something.

Stereo light microscope  SEM
Compound microscope  TEM
Electrons  4  Microscopes
Centuries ago a tool was invented that helped scientists see very tiny objects that cannot be seen by just looking at them with the naked eye. This scientific tool is called a microscope. A microscope is a scientific instrument used to see very tiny objects on a larger scale. For example, with the microscope you can see the germs on your skin, the tiny hairs on a bee, and the cells inside a human body. Since the microscope was invented there has been much advancement in science. A few examples of different types of microscopes are the stereo light microscope, the compound light microscope, the transmission electron microscope (TEM), and the scanning electron microscope (SEM).

The advancements of the microscopes over time are amazing. Microscopes are helping science advance and evolve. Microscopes allow people to see the tiny things all around them and learn about how they look and function.

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In order to see even smaller details on the leaf, SEM would be used. This shows more details of what is on the surface of the leaf, things like bumps on the leaf surface, bacteria, tiny insects, or a dusting of pollen. To look even closer inside the leaf's cells a TEM can be used. The leaf cell must be cut into super thin, super small pieces and put on a little screen, and then the specimen will be ready to look at. This allows a person to see the structures inside a leaf's cells. The many uses of different microscopes help take science to another level.

Scientists use different microscopes depending on what they want to see. A doctor would use a different microscope to examine germs than a jeweler would use to examine diamonds. A scientist would use a different microscope than either of them to examine atoms. There are many types of microscopes because there are so many different ways to examine different objects.
The stereo light microscope is the most basic microscope. There is a single set of lenses to look through and these make the object you are looking at appear larger. This microscope is just like using a magnifying glass to look at something small on an object. Bugs are good things to look at under a stereo light microscope.

A more complex microscope is called the compound microscope. There is a lot more parts to this microscope than the stereo microscope. A compound microscope has multiple lenses. One set of lenses adjusts light onto the specimen, another gathers light to form the image from the object, and a third set of lenses is for the person to look into to see the object. For this microscope it is necessary to use a slide to look at the object. A slide is a rectangular piece of glass with a specimen on it. The specimen needs to be thin enough for light to pass through it in order to look at the object. Compound microscopes are used for examining many different cells.

The transmission electron microscope, also known as the TEM, is the most advanced microscope we will discuss. This microscope uses electrons to see and explore the object. The electrons interaction with the object being looked at determines how the image forms. For this microscope to work correctly, a slide needs to be prepared. The object you are examining on the slide must be extremely thin for the microscope to work. The slide used for a TEM specimen is a three millimeter circle of screen, so the specimen is not only is very thin, it is very small. The image from a TEM comes up on a computer screen instead of looking through a lens to see it. The TEM microscope is used by scientists who want to see the internal structure of something, such as tiny structures inside a cell. The image of the object seen by a TEM looks two dimensional, in other words, flat, like a piece of paper.

After learning about these four types of microscopes it is important to understand when to use each one. To look at a leaf’s surface in more detail then just the naked eye, a stereo light microscope would be used. However, to look at the detail inside of the leaf a compound microscope would be used. To use a compound microscope the leaf must be chopped up into tiny pieces to make a slide. Once the slide is made, then the compound microscope can be used.
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The scanning electron microscope, which is also known as the SEM, is an advanced microscope in comparison with the stereo light and compound light microscopes. This microscope uses electrons instead of light to explore and see the object. It is important to understand the concept of an electron. Electrons are very tiny particles that are parts of atoms. Atoms make up matter; all the objects surrounding us is matter that is made with atoms.

The SEM allows people to see fine details on the surfaces of an object. This microscope can be compared to a telescope. Telescopes are for seeing things far away and this microscope is for seeing objects up close. Unlike the two microscopes we talked about earlier, the image made by the SEM is displayed on a computer screen. This microscope is for seeing the details that nobody could see with just the naked eye. An example of what a person may use a SEM for is looking at the details of an insect, such as hairs on a bee or the bee’s eye.
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