Different Types of Microscopes

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Microscopes are used in educational and laboratory settings to examine objects that cannot be seen clearly by the naked eye. Since the invention of the microscope in 1595, there have been a variety of microscopes created. Four of the most commonly used microscopes are the optical microscope, the dissection microscope, the scanning electron microscope (SEM), and the transmission electron microscope (TEM.)

Optical microscopes are the simplest type of microscope. They use two glass lenses, the ocular lens situated closest to the eye, and the objective lens at the bottom of the microscope cylinder. The two lenses enhance the appearance of the object placed between the bottom lens and the light source. Also known as compound microscopes, they have a high magnification rate, from 4X-100X. However, the resolution is poor and lacks detail.

Dissection microscopes, also known as stereo microscopes, use two cylinders, one for each eye. This technique produces a 3D effect. Although it does not work on a cellular level, dissection microscopes are used for microsurgery and technology manufacturing. Resolution is much higher when using dissection microscopes. They provide a high quality image with great detail.

Scanning electron microscopes (SEM) use electrons instead of natural light to provide a detailed image of the object. The specimen is coated in gold, placed in a vacuum chamber, and the electrons bounce off of the surface. This technique uses computers to produce a black and white 3D image of the surface of the specimen. SEM use electromagnetic lenses instead of glass to examine the specimen. Archaeologists, geologists, and paleontologists frequently use SEM to examine the surfaces of fossils, bones and rocks. SEM can produce a magnification of about 100,000X.

Transmission electron microscopes (TEM) also scan the specimen with electrons in a vacuum. This method provides a 2D view of various slices of the object, also using electromagnetic lenses. These microscopes have high resolution and clarity. The electrons pass through the specimen, and allow interior views at different depths. The specimen must be carefully prepared, as electrons normally scatter very easily inside an object. TEM allow humans to see layers of organs or rocks which could not normally be seen by the unaided human eye. These microscopes have a magnification rate of up to 5,000,000X.

There are addition types of microscopes as well. A confocal microscope uses a laser beam to illuminate the specimen and produce high contrast images of it on a computer monitor. Often these specimens are dyed bright colors to improve the quality of the image. Inverted microscopes are used to study cultures in a liquid, and hold the specimen in an inverted position from most traditional microscopes. Scanning acoustic microscopes (SAM) use focused sound waves to produce images or to evaluate the elasticity of cells and tissues.

Microscopes are an important tool in many aspects of our lives, including medicine, technology, and archaeology. New scientific advances provide new types of microscopes, and new applications for current ones. Choose the correct microscope for your needs, and begin exploring your world today.