I'm not a robot

What is microscope

Formed by various means, the image is received by direct imaging, electronic processing, or a combination of these methods. (Leeuwenhoek's high-powered lenses of the 1670s had a focal length—and thus a working distance—of a few millimetres. If the diameter of the magnifying lens is sufficient to fill or exceed the diameter of the pupil of the eye, the virtual image that is viewed will appear to be of substantially the same brightness as the original object. A simple microscope can resolve below 1 micrometre (μm; one millionth of a metre); a compound microscope can resolve down to about 0.2 μm.Images of interest can be captured by photography through a microscope, a technique known as photomicrography. The microscope may provide a dynamic image (as with conventional optical instruments) or one that is static (as with conventional scanning electron microscopes).The magnifying power of a microscope is an expression of the number of times the object being examined appears to be enlarged and is a dimensionless ratio. There is thus a conflict between a short focal length, which permits a high magnifying power but small field of view, and a longer focal length, which provides a lower magnifying power but a larger linear field of view. The type and degree of distortion visible is intimately related to the possible spherical aberration in the magnifier and is usually most severe in high-powered lenses. The magnifying power, or extent to which the object being viewed appears enlarged, and the field of view, or size of the object that can be viewed, are related by the geometry of the optical system. The transmission electron microscope (TEM) has magnifying powers of more than 1,000,000×. Science Physics microscope, instrument that produces enlarged images of small objects, allowing the observer an exceedingly close view of minute structures at a scale convenient for examination and analysis. Spherical aberration produces an image in which the centre of the field of view is in focus when the periphery may not be and is a consequence of using lenses with spherical (rather than nonspherical, or aspheric) surfaces. Optical microscopes can be simple, consisting of a single lens, or compound, consisting of several optical components in line. (Early simple microscopes such as Leeuwenhoek's magnified up to 300×.) The image can be improved if the lens has specific aspheric surfaces, as can be easily obtained in a plastic molded lens. This type of magnifier is based upon the eyepiece of the Huygenian telescope, in which the lateral chromatic aberration is corrected by spacing the elements a focal length apart. Some digital microscopes have dispensed with an eyepiece and provide images directly on the computer screen. Chromatic aberrations produce coloured fringes about the high-contrast regions of the image, because longer wavelengths of light (such as red) are brought to focus in a plane slightly farther from the lens than shorter wavelengths (such as blue). The clarity of the magnified virtual image will depend upon the aberrations present in the lens, its contour, and the manner in which it is used. Present-day reflecting microscopes are confined to analytical instruments using infrared rays. This was a simple and inexpensive design but suffers from the requirement that the working distance of the magnifier be very short. microscope, Instrument that produces enlarged images of small objects, allowing … The closer the object is to the eye, the larger the angle that it subtends at the eye, and thus the larger the object appears. From the 19th century this was done with film, but digital imaging is now extensively used instead. It is usually expressed in the form 10× (for an image magnified 10-fold), sometimes wrongly spoken as "ten eks"—as though the × were an algebraic symbol—rather than the correct form, "ten times." The resolution of a microscope is a measure of the smallest detail of the object that can be observed. Since the imaging properties are provided and shared by two components, the spherical aberration and the distortion of the magnifier are greatly reduced over those of a simple lens of the same power. Crude microscopes date to the mid-15th century, but not until 1674 were the powerful microscopes of A. A direct improvement in the distortion that may be expected from a magnifier can be obtained by the use of two simple lenses, usually plano-convex (flat on one side, outward-curved on the other, with the curved surfaces facing each other). The object of interest is then brought toward the eye until a clear image of the object is seen. Distortion produces curved images from straight lines in the object. Thus, for example, a lens with a least distance of distinct vision of 25 cm and a focal length of 5 cm (2 inches) will have a magnifying power of about 5×. microscope, Instrument that produces enlarged images of small objects, allowing them to be viewed at a scale convenient for examination and analysis. The hand magnifying glass can magnify about 3 to 20×. A Coddington lens combines two lens elements into a single thick element, with a groove cut in the centre of the element to select the portion of the imaging light with the lowest aberrations. Science Physics It is instinctive, when one wishes to examine the details of an object, to bring it as near as possible to the eye. The use of the magnifying lens between the observer and the object enables the formation of a "virtual image" that can be viewed in comfort. As people age, the nearest point of distinct vision recedes to greater distances, thus making a magnifier a useful adjunct to vision for older people. TEMs form images of thin specimens, typically sections, in a near vacuum. The field of view of the magnifier will be determined by the extent to which the magnifying lens exceeds this working diameter and also by the distance separating the lens from the eye. van Leeuwenhoek able to detect phenomena as small as protozoans. For low powers, about 2–10×, a simple double convex lens is applicable. A reduction of distortion is noted when an aspheric lens is used, and the manufacture of such low-power aspheric plastic magnifiers is a major industry. The most familiar type of microscope is the optical, or light, microscope, in which lenses are used to form the image. The choice of an optical design for a magnifier depends upon the required power and the intended application of the magnifier. For many people, this image distance is about 25 cm (10 inches). The scanning tunneling microscope (STM), which can create images of atoms, and the environmental scanning electron microscope (ESEM), which generates images using electrons of specimens in a gaseous environment, use other physical effects that further extend the types of objects that can be examined. To obtain the best possible image, the magnifier should be placed directly in front of the eye. If an object is brought too close, however, the eye can no longer form a clear image. Therefore, the aberrations of a lens whose diameter is twice the focal length will be worse than those of a lens whose diameter is less than the focal length. More-complex magnifiers, such as the Steinheil or Hastings forms, use three or more elements to achieve better correction for chromatic aberrations and distortion. Other types of microscopes use the wave nature of various physical processes, the most important being the electron microscope (see electron microscopy), which uses a beam of electrons in its image formation. This made them difficult to use, but they provided remarkable images that were not bettered for a century.) There are several types of magnifiers available. There is no chromatic aberration using a reflector, and distortion and spherical aberration are controlled through the introduction of a carefully contoured aspheric magnifying mirror. Mirrors are also used. A scanning electron microscope (SEM), which creates a reflected image of relief in a contoured specimen, usually has a lower resolution than a TEM but can show solid surfaces in a way that the conventional electron microscope cannot. In general, a better approach is the use of aspheric surfaces and fewer elements. Without lenses, the highest possible magnification is when the object is brought to the closest position at which a clear virtual image is observed. This has given rise to a new series of low-cost digital microscopes with a wide range of imaging possibilities, including time-lapse micrography, which has brought previously complex and costly tasks within reach of the young or amateur microscopist.Other types of microscopes use the wave nature of various physical processes. For higher powers of 10–50×, there are a number of forms for magnifiers in which the simple magnifier is replaced by a compound lens made up of several lenses mounted together. Although optical microscopes are the subject of this article, an image may also be enlarged by many other wave forms, including acoustic, X-ray, or electron beam, and be received by direct or digital imaging or by a combination of these methods. Resolution is expressed in linear units, usually micrometres (μm).The most familiar type of microscope is the optical, or light, microscope, in which glass lenses are used to form the image. The most important is the electron microscope, which uses a beam of electrons in its image formation. Single-lensed simple microscopes can magnify up to 300×—and are capable of revealing bacteria—while compound microscopes can magnify up to 2,000×. Various aberrations influence the sharpness or quality of the image. A working value for the magnifying power of a lens can be found by dividing the least distance of distinct vision by the lens' focal length, which is the distance from the lens to the plane at which the incoming light is focused. There are also microscopes that use lasers, sound, or X-rays. Reflecting microscopes, in which the image is magnified through concave mirrors rather than convex lenses, were brought to their peak of perfection in 1947 by British physicist C.R. Burch, who made a series of giant instruments that used ultraviolet rays. The aberrations of a lens increase as the relative aperture (i.e., the working diameter divided by the focal length) of the lens is increased.