name _____ class _____

team ____ seat ____ date _____

parent signature _____

our goal is to find out how microscopes work and how they can be used to make small objects appear larger.

sally

MICROSCOPE, an optical instrument by which objects are so magnified as to make visible details that are ordinarily invisible to the naked eye. A simple example is the ordinary magnifying glass. In the microscope two or more lenses are fixed in the two ends of a tube. The lens nearest the object is called the objective, and the lens nearest the eye is called the eyepiece. The tube is mounted on a device that permits it to be raised or lowered for focusing. The object is magnified by the lower lens, an inverted image being formed inside the focus of the eyepiece. This enlarged image is then further magnified by the eyepiece. The shorter the focus, the larger the image. Microscopes are both monocular and binocular, the image from the objective being diverted, by means of prisms, to two separate eyepieces in the latter type. There are many branches of microscopic work and diverse modifications and specialized mechanisms in microscopes. Various types of lighting are utilized. Photomicrography is a large sphere of activity in microscopy. Microscopes range in power from toys that magnify a hundred times to the modern electron microscope developed in the United States in 1940 by James Hillier and Vladimir Zworykin, which is capable of magnifying an object 100,000 times. Invention of the electron microscope, 50 times more powerful than optical microscopes, opened up a new world to scientists. The first compound microscope was probably invented about 1590 by Zacharias Janssen in The Netherlands.

The phase-difference microscope permits the study of living cells by eliminating the need for staining with dyes, which kills the cells. Minute differences and unusual details heretofore indiscernible are brought out. This microscope was described by a Netherlander, was developed by two Germans, and was brought to the United States for study and commercial production at the end of World War II.

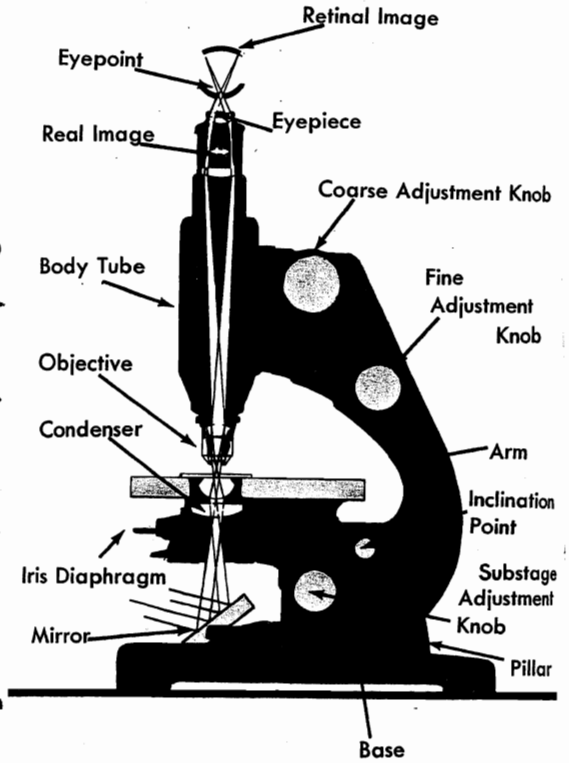
The phase-difference procedure is accomplished by use of two transparent rings, one of which, located between the specimen and the reflecting mirror, blocks out all but a hollow cone of light that focuses on the specimen. The other, built into the lens, bends the light and speeds it up about a quarter of a wavelength. The light coming from certain parts of the specimen is reinforced by bent light from other parts, and the result is an image of increased contrast, which reaches the eye.

From the High School Encyclopedia, Vol 11, pg 1625

explain how an optical microscope works

who and when was the first compound microscope used?

right there question



How can we study cells without killing them?

Standards S6a, S6b, S6d, S7a, S8b