

# Objective (optics)

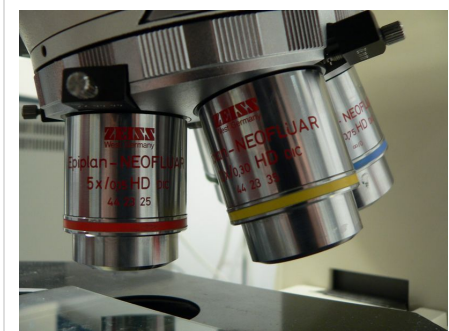
In an optical instrument, the **objective** is the optical element that gathers light from the object being observed and focuses the light rays to produce a real image. Objectives can be single lenses or mirrors, or combinations of several optical elements. They are used in microscopes, telescopes, cameras, slide projectors, CD players and many other optical instruments. Objectives are also called **object lenses**, **object glasses**, or **objective glasses**.

Microscope objectives are typically designed to be parfocal, which means that when one changes from one lens to another on a microscope, the sample stays in focus. Microscope objectives are characterized by two parameters, namely, magnification and numerical aperture. The former typically ranges from 5× to 100× while the latter ranges from 0.14 to 0.7, corresponding to focal lengths of about 40 to 2 mm, respectively. For high magnification applications, an oil-immersion objective or water-immersion objective has to be used. The objective is specially designed and refractive index matching oil or water must fill the air gap between the front element and the object to allow the numerical aperture to exceed 1, and hence give greater resolution at high magnification. Numerical apertures as high as 1.6 can be achieved with oil immersion.<sup>[1]</sup>

To find the total magnification of a microscope, one multiplies the magnification of the objective lenses by that of the eyepiece.

## See also

- List of telescope parts and construction



Several objective lenses on a microscope.



A photographic objective, focal length 50 mm, aperture 1:1.4



Diastar projection objective from a 35 mm movie projector, (focal length 400 mm)

## References

- [1] Kenneth, Spring; Keller, H. Ernst; Davidson, Michael W.. "Microscope objectives" (<http://www.olympusmicro.com/primer/anatomy/objectives.html>). *Olympus Microscopy Resource Center*. . Retrieved 29 Oct 2008.

# Article Sources and Contributors

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