

# Inverse microscope

The optical microscopes can be sorted on a structure basis accordingly to the purpose of their use, they can be upright or inverted.

It is possible to distinguish them by the location of the objective and the condenser.

## Principle

While in the inverted microscope the objective is located under the specimen and the condenser above, in the upright microscope (the most used microscope) the objective is located above the specimen and the condenser below.

In 1850 J. Lawrence Smith invented the inverse microscope that was shown, for the first time, to the scientific community during the World's Fair in 1852. This invention was extremely important for the evolution of the microscopy as it allowed, for the first time in history, to observe living and large specimens as until then all the specimens should be small and preserved on a slide.



## Structure

As said before, when comparing the structure of the upright microscope with the structure of the inverse microscope the main differences between them are the location of the objective and condenser. In this kind of instrument the lenses are located under a transparent viewing stage. The stage is fixed and the lenses move in a vertical axis, this movement permits to focus the sample from a further or closer distance. The illumination source is located above the subject and the direction of the light rays (which are conveyed from above through the objective), are modified by a group of mirrors making the light reach the eye from below. The inverse microscope has the possibility to fit video cameras, fluorescence illumination, material to confocal scanning and other applications suitable to diverse microscope techniques.

## Applications

This kind of microscope is mainly used to observe living cells and organisms big enough to fit a large container, which allows the specimen to be under natural conditions while in other types of microscopes the sample is under glass slide. As this microscope allows the direct manipulation of the subject (as it has space above the sample to manipulate the microtools used) it is widely used in micromanipulation applications. In metallurgical applications where polished samples can be placed on top of the stage and viewed from underneath using reflecting objectives.

## Advantages

- Possibility to observe living and large specimens
- Observe the specimen for a longer period of time
- Ability to manipulate directly the sample

## Disadvantages

- It is an expensive microscope

## Links

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### Bibliography

<http://ciencia.hsw.uol.com.br/microscopios-de-luz5.htm>

<http://encyclopedia2.thefreedictionary.com/Microscope>