**Comparison Microscope**

A comparison microscope is a device used to observe side-by-side specimens. It consists of two **microscopes** connected to an optical bridge, which results in a split view window. The comparison microscope is used in forensic sciences to compare microscopic patterns and identify or deny their common origin. Without this device, the **identification** of **toolmarks** and **firearms** would be such a cumbersome process that it would be carried out on a very limited basis.

The idea behind the comparison microscope is simple. Two microscopes are placed next to each other and the optical paths of each microscope are connected together by the optical bridge. The optical bridge consists of a series of lenses and a mirror that brings the two images back together at the single eyepiece. The user looks through the eyepiece as with a regular microscope, except that a line in the middle separates the circular view field into two parts. The left side of the view field is the image produced by the left microscope, and the right side of the view field is the image produced by the right microscope. In some more modern or sophisticated comparison microscopes, it is also possible to super-impose the view fields generated by the two microscopes. This is particularly convenient when the forensic scientist compares impressed patterns rather than striated patterns. It is important that the two microscopes are identical. In order for a comparison to be valid, the two images produced in the circular view field needs to be at the same magnification and present the same lens distortion (if any). Comparison microscopes are mostly used in a reflected light setting, but a transmitted light setting is also available in some instances, and fluorescent light settings are found on higher-end models. This allows for comparison of more than just bullets and toolmarks.

**Use of a comparison microscope** is straightforward.

The incriminated impression, typically a bullet or casing found at a crime scene or a toolmark's cast from a crime scene, is placed under the left microscope and thus, appears in the left part of the circular view field. A comparison impression, such as a bullet fired from a revolver found on a suspect, is placed under the right microscope and thus, appears in the right part of the view field. When comparing striations, the forensic scientist moves the comparison object until the striations match the ones present on the incriminated object. If the striations do not present similarities, then the two objects cannot be associated with a common origin. If the striations match, then a common source between the two objects is established. When comparing impression marks, the forensic scientist can use the superimposition option and, again, by moving the comparison object on the right, try to find common characteristics between the two objects.

The comparison microscope is used to compare **impression evidence** that requires a magnification ranging from 5× to approximately 100×. Items that are commonly observed under the comparison microscope are fired bullets, fired casings, and toolmarks. These items are observed under a reflected light setting. Other **evidence** , including impressions of serial numbers or characters from a typewriter, can also be compared using the comparison microscope. These are compared using a reflected light setting. This comparison might allow for the link between a stamped serial number and a die or between a sheet of paper bearing characters and the typewriter that was used to write it.

The comparison microscope is also used to compare layers of a paint chip. This might allow for the identification of the vehicle from which the paint originated. Finally, when used in a transmitted light setting, hair, **fibers** , or the extruding striations of plastic bags can be compared. This allows the comparison of fibers found on a seat with the clothing of a suspect

The comparison microscope was invented in the 1920s by American Army Colonel Calvin Goddard (1891–1955) who was working for the Bureau of Forensic **Ballistics** of the City of [New York](https://www.encyclopedia.com/places/united-states-and-canada/us-political-geography/new-york).