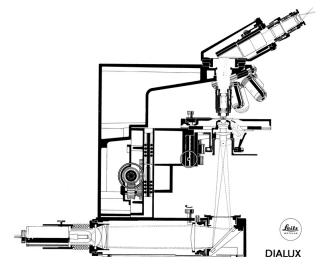
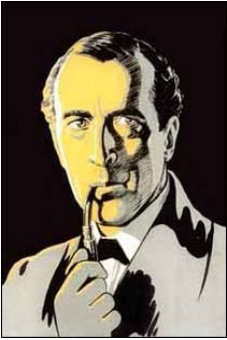


# The Microscope

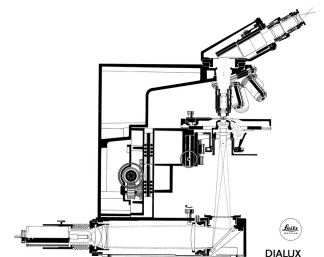
- Instrument that uses a lens or a combination of lenses to magnify and resolve the fine details of an object
- Early methods for examining physical evidence relied solely on the microscope.

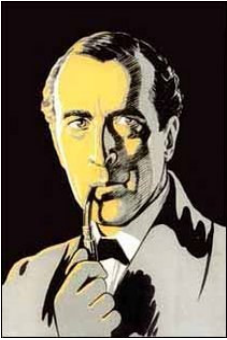




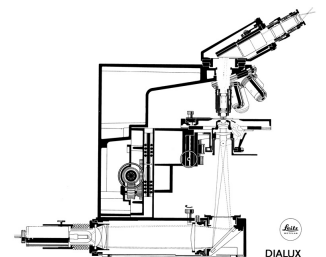
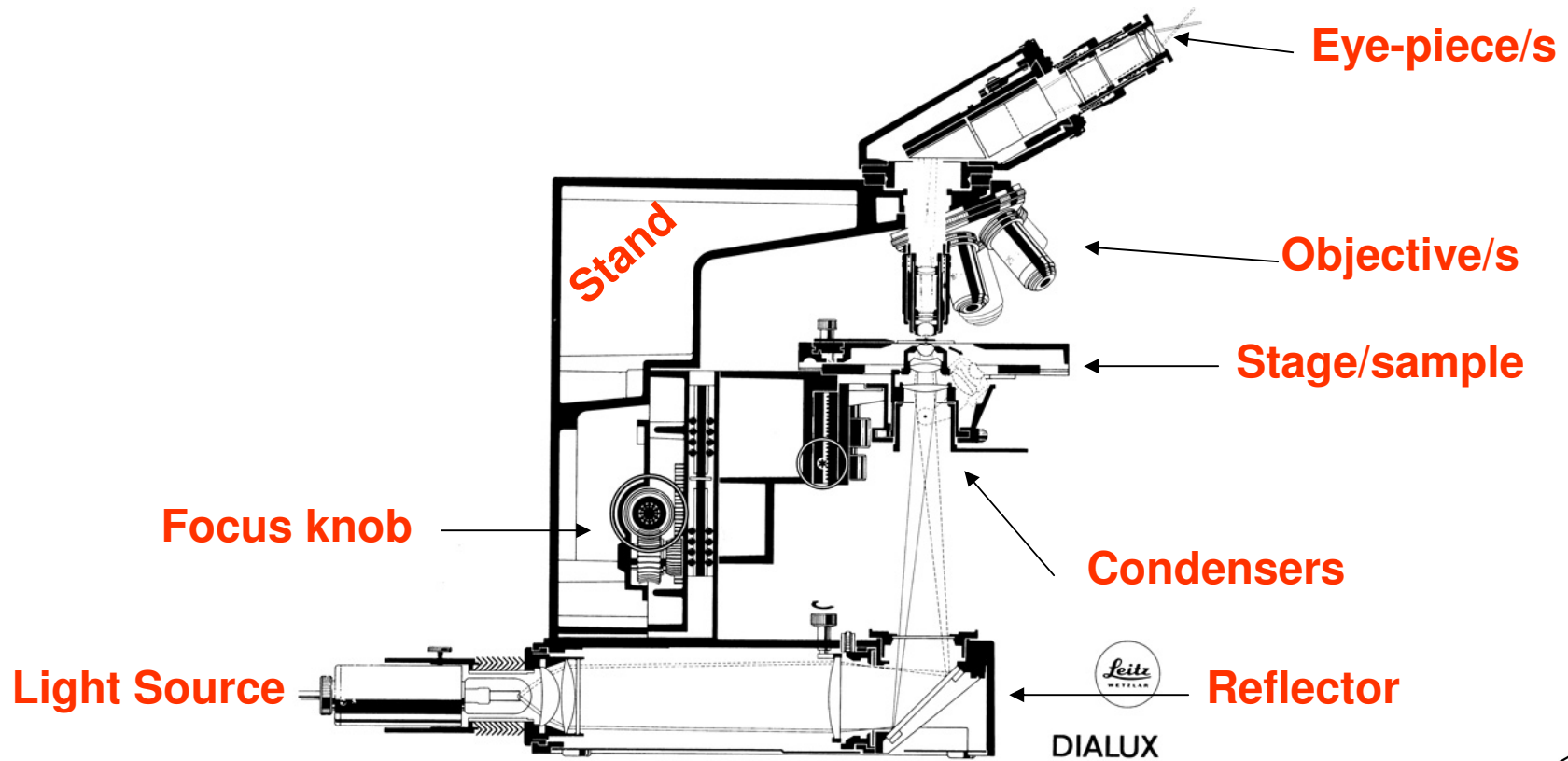
# Microscope Parts

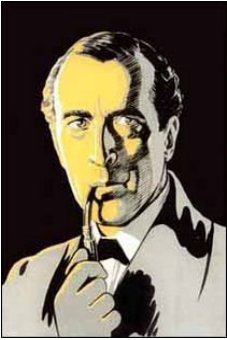
- Stage
- Specimen
- Objective
- Eyepiece/s
- Condensers
- Other accessories



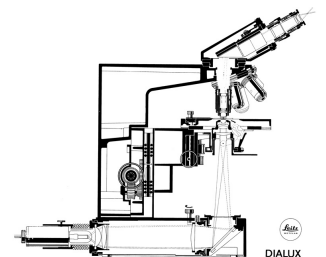


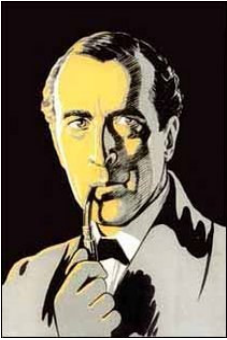
# Leitz Microscope Parts



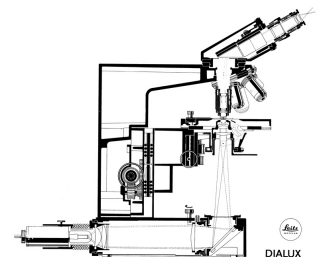
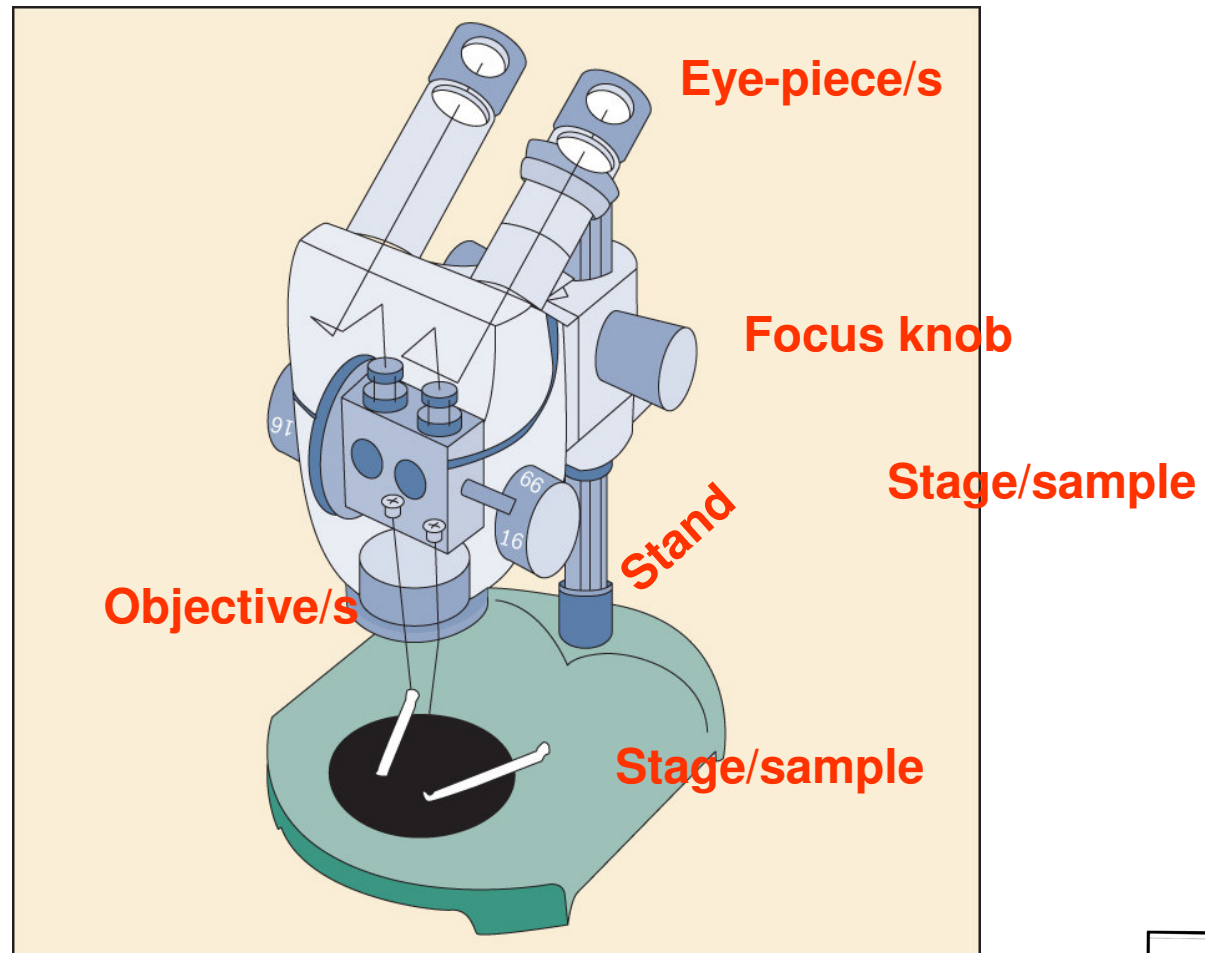


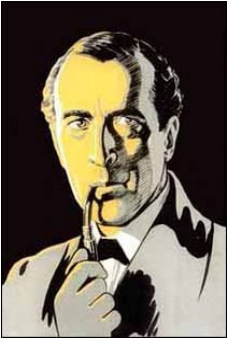
- ***Virtual image:*** magnified image seen by microscope
- ***Real image:*** image viewed directly
- The object to be magnified is placed under the lower lens, called the objective and viewed through the upper lens, called the eyepiece.
- Various types of microscopes are used to analyze forensic specimens.



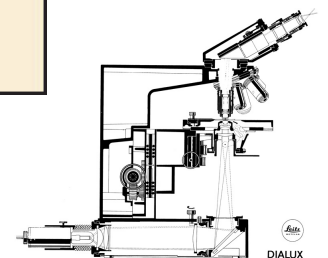
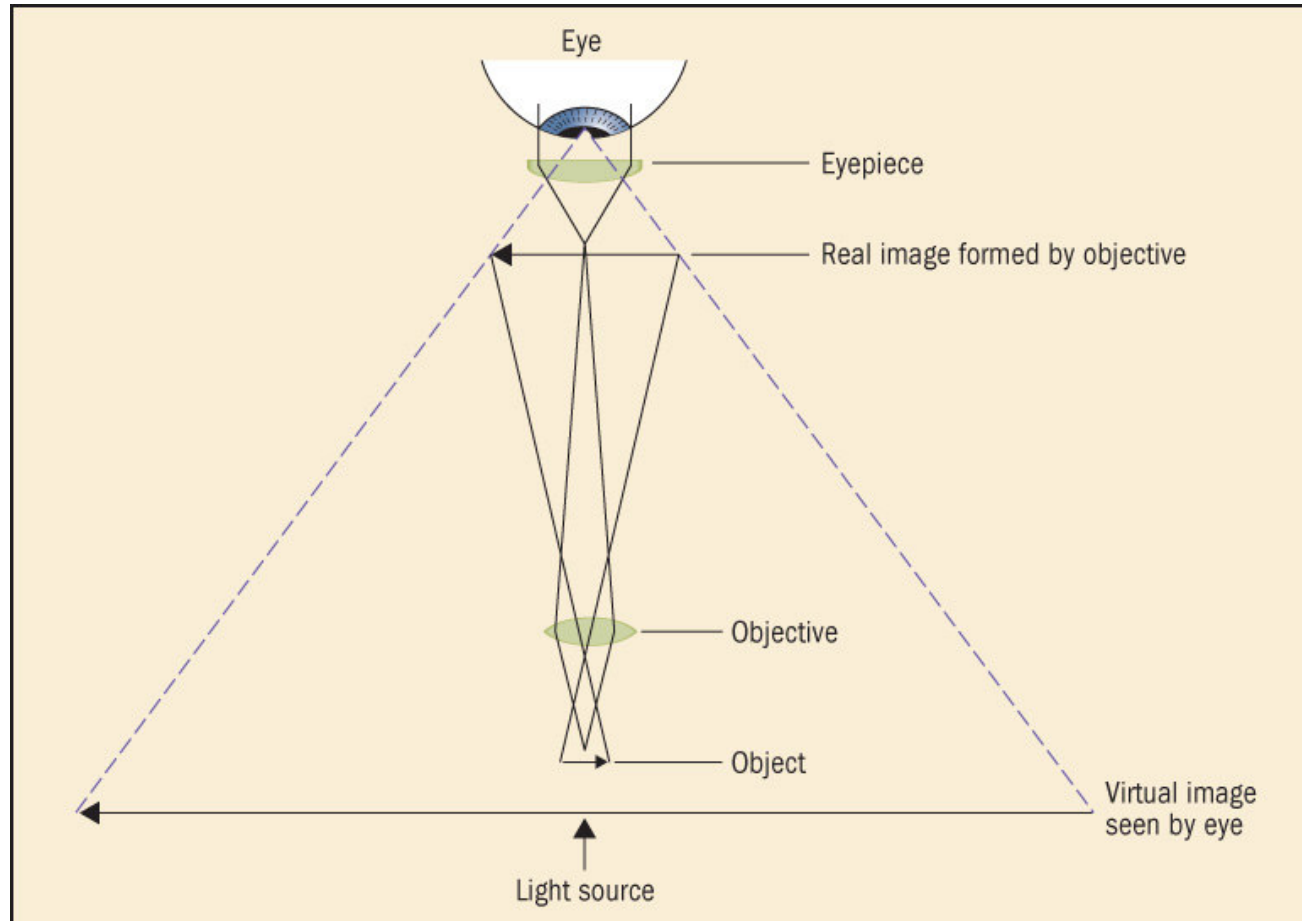


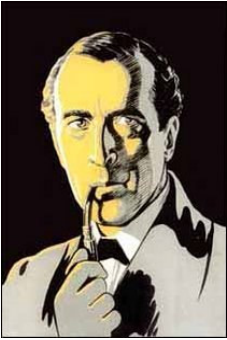
# Stereoscopic Binocular





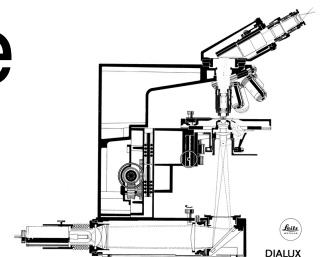
# Principle of the Compound Microscope

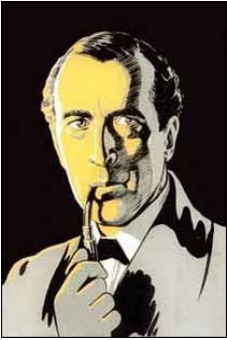




# The Compound Microscope

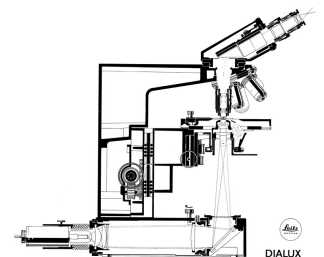
- The microscope is consists of:
  - mechanical system which supports the microscope,
  - an optical system which illuminates the object under investigation
  - light passes through a series of lens to form an image of the specime



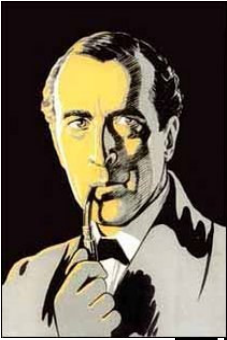


# Magnification

- **The magnification of the image**  
= (magnifying power of the  
objective lens)  
x (magnifying power of the  
eyepiece lens)

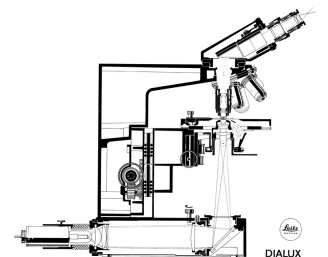


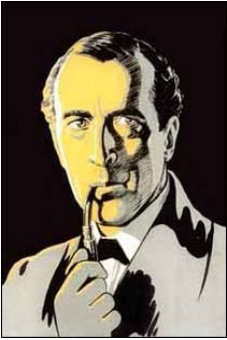




# The Comparison Microscope

- The comparison microscope consists of two independent objective lenses joined together by an optical bridge to a common eyepiece lens.
- When a viewer looks through the eyepiece lens of the comparison microscope, the objects under investigation are observed side-by-side in a circular field that is equally divided into two parts.
- Modern firearms examination began with the introduction of the comparison microscope, with its ability to give the firearms examiner a side-by-side magnified view of bullets.

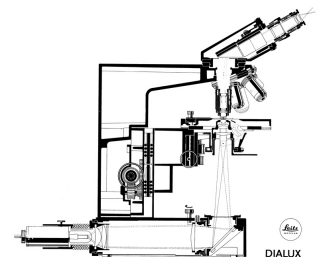


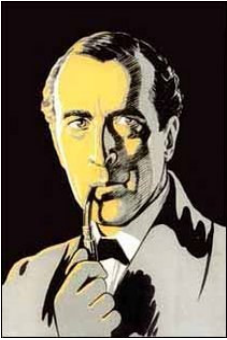


# The Comparison Microscope

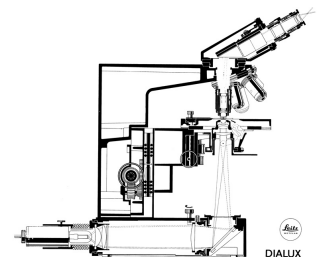
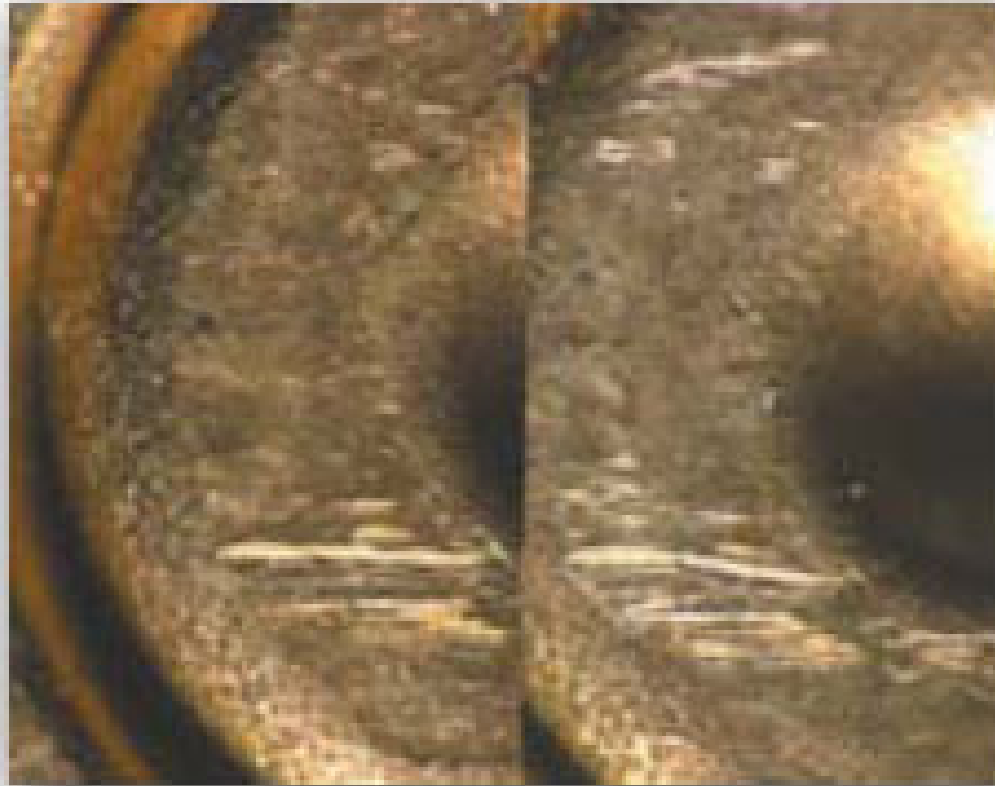


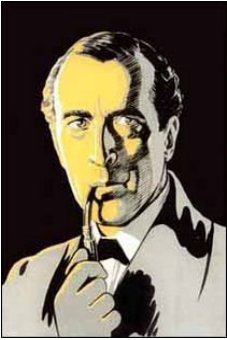
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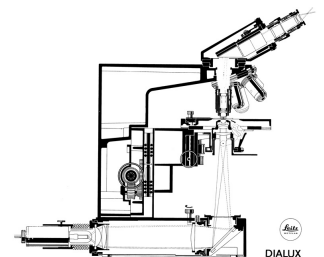
# Bullet markings Photographed using Comparison Microscope

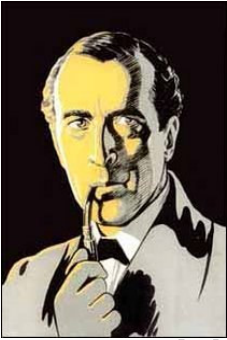




# The Stereoscopic Microscope

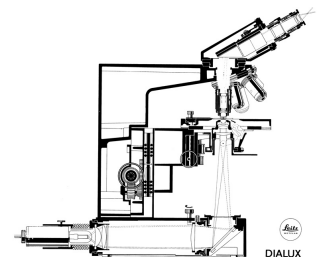
- The stereoscopic microscope is actually two monocular compound microscopes properly spaced and aligned to present a three-dimensional image of a specimen to the viewer, who looks through both eyepiece lenses.
- It is particularly useful for evidence not requiring very high magnification (10x–125x).
- Its large working distance makes it quite applicable for the microscopic examination of big, bulky items.

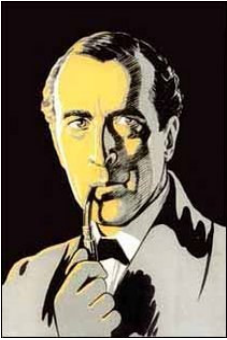




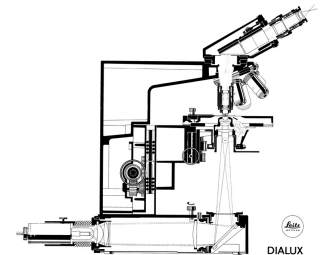
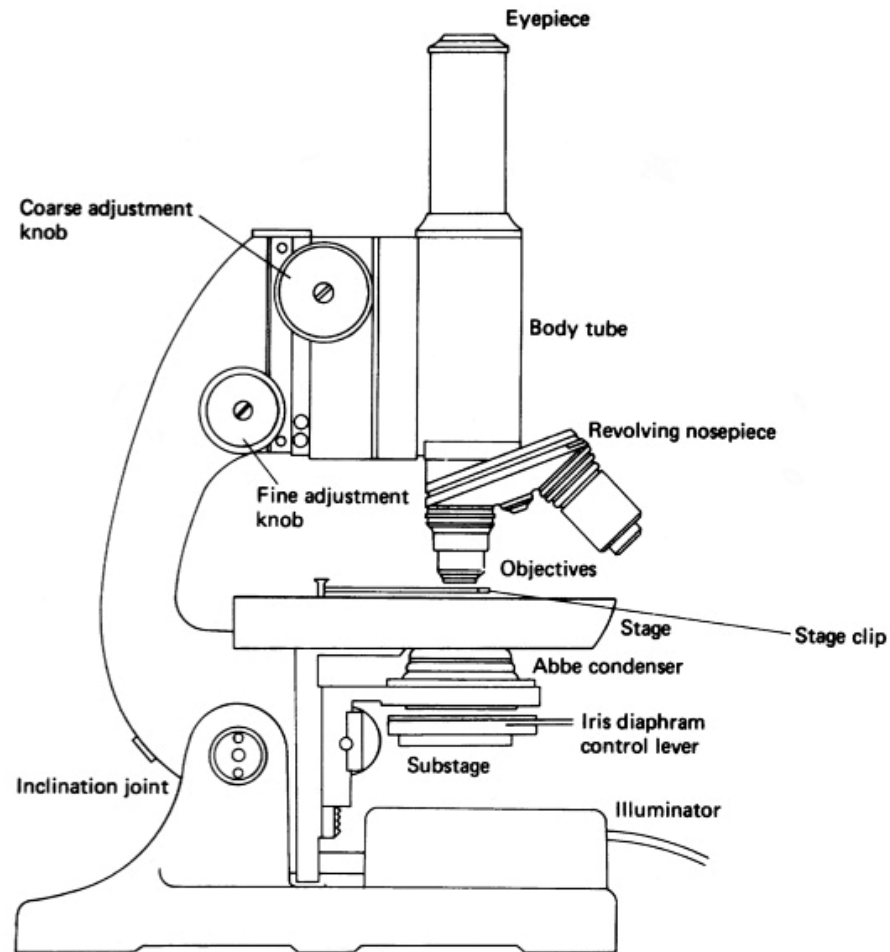
# Polarizing Microscopy

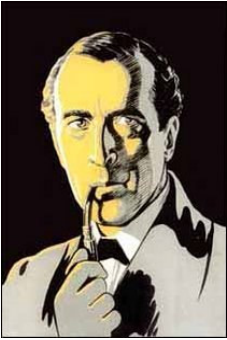
- Light that is confined to a single plane of vibration is said to be plane-polarized.
- The examination of the interaction of plane-polarized light with matter is made possible with the polarizing microscope.
- Polarizing microscopy has found wide applications for the study of *birefringent* materials; materials that split a beam of light in two, each with its own refractive index value.
- The determination of these refractive index data provides information that helps to identify minerals present in a soil sample or the identity of a man-made fiber.





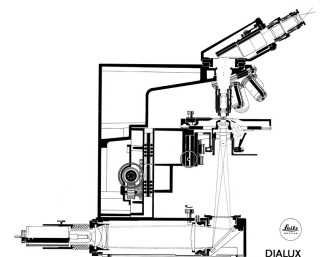
# The compound microscope

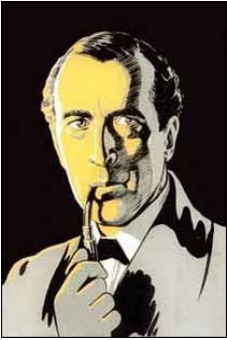




# The Microspectrophotometer

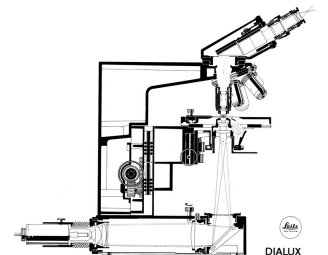
- The microspectrophotometer is a spectrophotometer coupled with a light microscope.
- The examiner studying a specimen under a microscope can simultaneously obtain the visible absorption spectrum or IR spectrum of the material being observed.
- This instrument is especially useful in the examination of trace evidence, paint, fiber, and ink evidence.



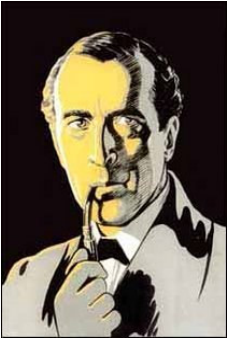


# The Scanning Electron Microscope

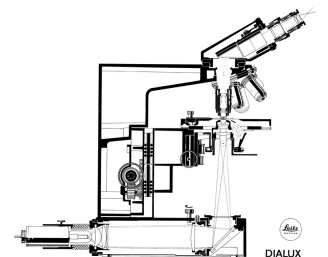
- The scanning electron microscope (SEM) bombards a specimen with a beam of electrons instead of light to produce a highly magnified image from 100x to 100,000x.
- The bombardment of the specimen's surface with electrons normally produces X-ray emissions that can be used to characterize elements present in the material under investigation.

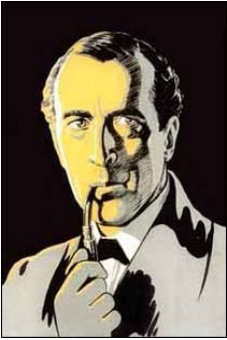






# Scanning Electron Microscope





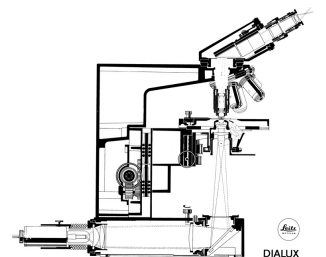
# Scanning Electron Microscope

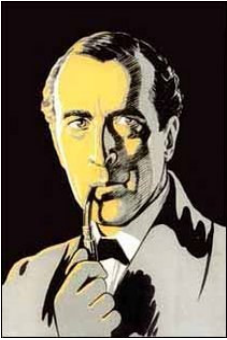


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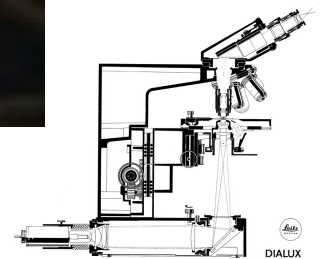
**Spring 2007**

**Prof. Nehru**





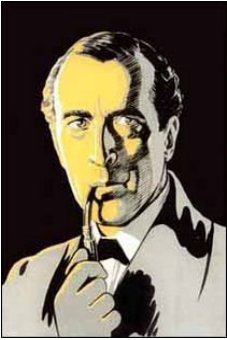
# Scanning Electron Microscope



**Forensic Science CC 30.07**

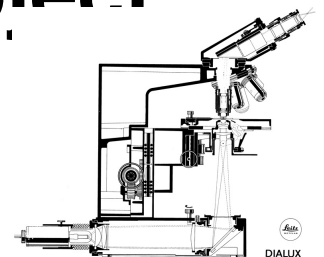
**Spring 2007**

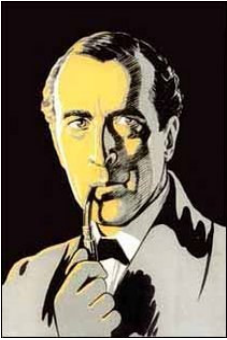
**Prof. Nehru**



# Scanning Electron Microscope

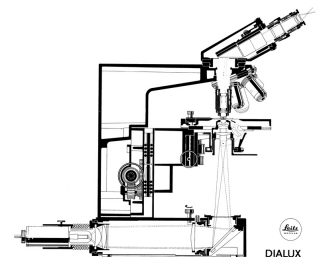
- Its depth of focus is some 300 times better than optical systems at similar magnification
- Magnification: up to about 2 milli microns across – several thousand times the real size of the object



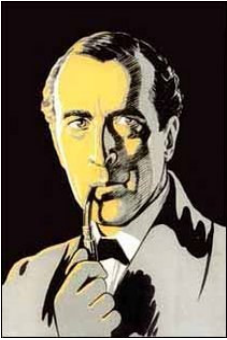


## Milli-micron - $m\mu$

- mil-li-mi-cron (mĭl'ə-mī'krŏn)
  - (*Abbr.*  $m\mu$ ) A unit of length
  - equal to one thousandth ( $10^{-3}$ ) of a micrometer
- or
- one billionth ( $10^{-9}$ ) of a meter; nanometer.







# Refractometer

