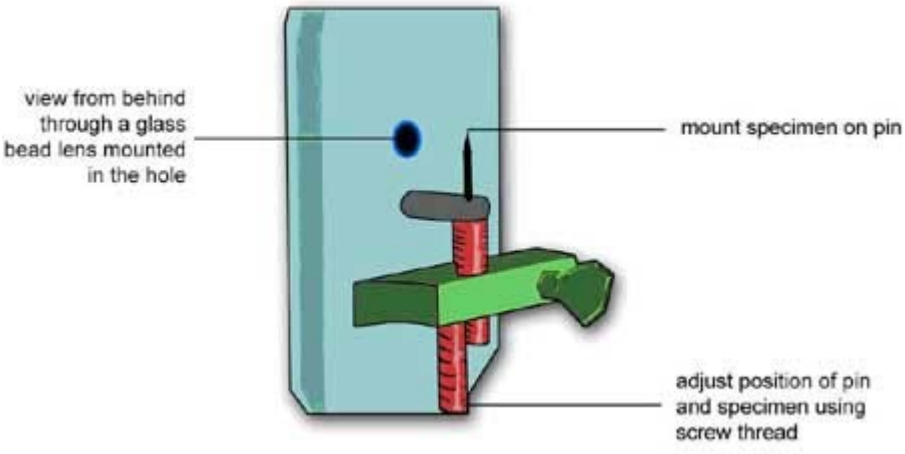
Focusing on the details

You can work ‘magic’ with a glass crystal ball. No, you can’t see the future; but you can see real things that are invisible to the naked eye. The first microscopes used a small glass bead as a lens.

A 17th century microscope:



The invention of the microscope opened up a whole new world of scientific discovery, particularly in biology. In 1673, with a microscope like the one above, van Leeuwenhoek studied the mouth parts and sting of a bee. Three years later he became the first person to see bacteria. He also discovered blood cells and sperm.

Modern light microscopes still use curved glass lenses. They have at least two lenses – an objective close to the specimen, and an eyepiece. There may be others in the tube in between. The specimen is mounted, not on a pin, but on a flat stage. However, if you simply put a bee on the stage and peer into the eyepiece, you are unlikely to see details of its mouth or sting. You may see a very fuzzy image – but more likely, nothing at all.

The trick is to set up the specimen, objective and eyepiece carefully. You need to:

- have a thin, flat specimen mounted on a glass slide (rather than a whole bee, for instance);
- choose a suitable magnification (depending on the size of the object and detail you wish to see);
- get the image in focus, by adjusting the distance between the objective and the specimen.

Usually you shine light through the specimen from underneath. That’s why it needs to be thin. If the specimen is opaque, (for example a metal), shine light onto it from above. Sometimes you need to colour the specimen with special stains that show up the details that you want to study.

The procedures below show you how to make effective use of a microscope by setting it up correctly, and preparing suitable specimens. To start with you could use the microscope to read a microdot. These aren’t just used by spies. When stuck onto a computer or vehicle they act as a theft-deterrent. Each tiny dot contains an identification number and is difficult for a thief to find and remove.

SP 0001:2005 Methods for setting up and adjusting a light microscope

SP 0002:2005 Methods of preparing slides for microscopy

Part 1: Mounting a hair or other fibre

Part 2: Preparing a blood smear

Since light must pass through a microscope slide, the quality of the glass is important. Any distortions or colour in the glass, will affect the image. Small scratches or chips on the surface will be magnified and may become very noticeable. Eyepiece graticules for measuring the size of an image are small, but must be accurately made.

British Standard BS 7011 – Consumable accessories for light microscopes gives specifications for the quality of microscope slides and cover slips.

British Standard BS 7012 –Light microscopes gives specifications for objectives, eyepieces and graticules. An objective lens has its magnifying power (or magnification) marked on it as a number (e.g. 10 or 40). So that lenses can be distinguished from any side, the power is also shown by a coloured band. Magnifying power increases through the spectrum from a red band to dark blue, followed by white for the highest powers (100x or over).