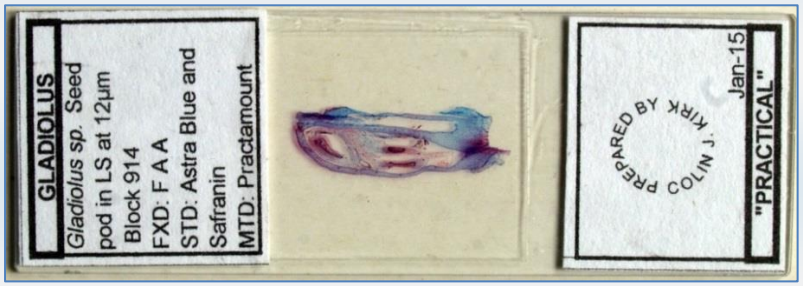
If the specimen is thick or opaque it must be viewed by reflected light A compound microscope usually used for transmitted light can be fitted with a small light to direct light onto the specimen with x5, x10 and often x20 magnification objectives. The specimen must be as flat as possible and some samples can just be supported on Blu-tac® on a slide and viewed. Others can be prepared by using a glass slide or cover slip to flatten them. The slide of a dead bumblebees wings was made like this.

The next step

There are lots more techniques in mounting specimens. For example some specimens may need to be dried, cut into thin sections and stained before mounting in a resin which will provide a permanent mount.



There is lots of information available on these more advanced methods. See for example the following book and websites:

- Practical Microscopy: J.E. Marson. 72 pages from Brunel Microscopes - http://www.brunelmicroscopes.co.uk/
- The Micscape website - http://www.microscopy-uk.org.uk. Check out the index for lots of information on different mounting media for the amateur and different methods for preparing lots of types of specimens.

To learn more about microscopes, find links to useful websites and see great images, visit www.quekett.org

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Simple sample preparation

To see detail in a specimen there are two important concepts:

- The microscope must have controlled illumination
- The sample must be prepared in such a way that the detail can be illuminated

Generally, the smaller the detail the more control and preparation is needed. However, many natural history specimens can be observed with relatively simple procedures. These will be divided into those needed for whole sample observation, such as a dead fly, and those required for observing specific areas in detail, such as the structure of the antenna of the fly.

Whole sample observation

The microscopes used for this will have modest magnification, usually given by an objective of x1-x4 with eyepiece magnifications of x10 giving total magnification of x10-x40. The microscope may be a stereo microscope, where light from the specimen passes to the eyes using two different light paths so the image is seen with stereoscopic vision. This gives the perception of depth and is essential if the specimen needs to be manipulated. The alternative microscope is a compound microscope where the light from the specimen passes along a single light path which is directed to a single eyepiece or to two eyepieces in a binocular system.

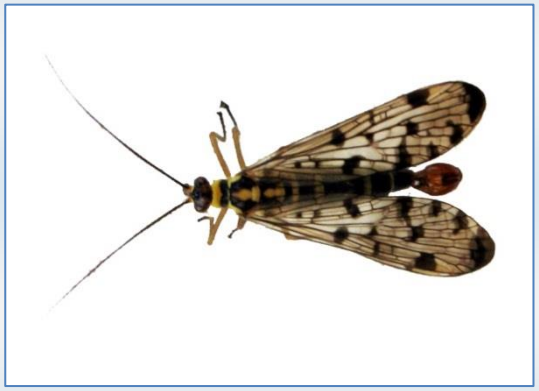
Stereo microscope

Simple Compound Microscope

The other thing to know is that the microscopes can be set-up so the light is either reflected by the specimen or passes through the specimen. In the latter case at least some of the specimen must be transparent!

A mount of a whole specimen

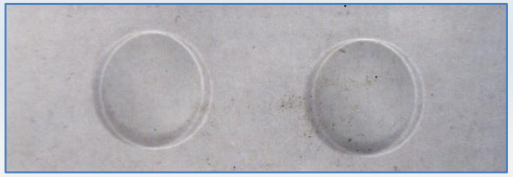
A lamp is used to direct light onto the specimen so we observe the light reflected from the surface. The specimen is supported on a flat surface, a glass plate or a piece of card, but it might be difficult to see some parts because they are hidden by other sections. It needs to be orientated to the microscope lenses (and probably to the illuminating light). If the specimen is supported on a small piece of Blu-tac®, it can be tilted such that different areas can be illuminated and observed.



Scorpion Fly (Panorpa communis)

If a specimen is small and needs to be examined in reflected light more than once it can be permanently mounted. There are custom slides as shown below. In the ring mount the specimens (possibly sand grains) can be shaken to show different sides, in the grid slide several specimens may be mounted to show all sides.

To observe transparent or semi transparent specimens, such as the small beasties in pond water, special glass plates - microscope slides - are needed. There are special glass slides called cavity slides or ring slides where there is a small well to trap the drop of liquid. You can get cavity slides with up to four cavities on each slide.



Alternatively flat slides where a drop of water is trapped under a smaller, thinner piece of glass – the cover slip – can be used. Of course, small live animals in pond water will often move around so they are difficult to see in focus using the microscope.

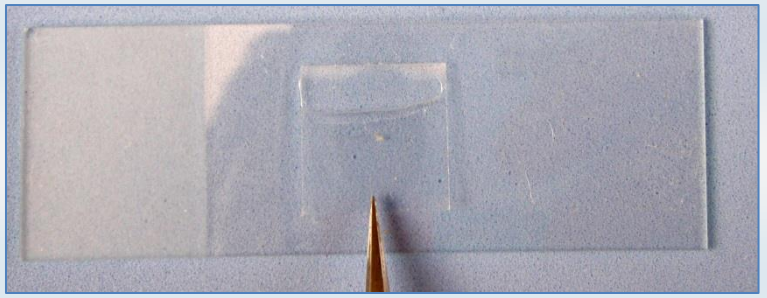
They can be slowed down if a few fibres of cotton wool are incorporated with the drop of pond water or a small amount of a chemical which temporarily anesthetises them is added to the water. An anaesthetic throat spray is often used.

Observation of detail (small structures) in a specimen

The most common way of looking at detail is by transmitted light microscopy with a compound microscope. The techniques used are based on putting the thin specimen onto a microscope slide, flooding it with a mountant (usually applied as a liquid) and then covering with a cover slip. Most microscopes are standardised to work best with microscope slides that are 3”x1” in size and 1.2mm thick with cover slips of thin glass (often designated No 1 or 1½) which may be square or circular.

The mountant surrounds the specimen excluding air and providing contrast at the edges of the transparent structures. It does this by having a different refractive index to the specimen. Water can be used as a mountant but for many specimens glycerine or special resins are used. Of course, if a mountant is a liquid it can leak out from below the cover slip but can be trapped for a modest amount of time by painting round the edge of the cover slip with a lacquer (nail varnish works well). A more robust mountant is glycerine jelly.

The best way to introduce the mountant is to put the dry specimen on the microscope slide, put a drop of the mountant as a line along one edge of the cover slip, then place that edge of the coverslip at an angle on the slide and let it drop gently onto the specimen. The mountant will flow over the specimen pushing out the air ahead of it.



The microscope will usually have objective lenses giving magnifications of x10 to x40. With standard x10 eyepieces the total magnification range is x100 to x400. It is now critical that the specimen is as flat as possible and does not move around too much.