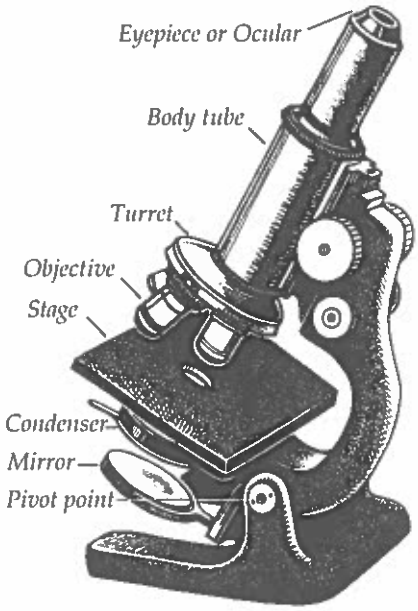
info

Nova Scotia Museum 1747 Summer Street Halifax, Nova Scotia, B3H 3A6, Phone 424-7353

Selecting A Child's Microscope



A microscope is a marvellous tool. With it, a tiny insect becomes the most intricate and foreboding of beasts, a moss leaf shows unimagined complexity and table salt reveals its orderly cubic crystals. Many types of microscopes are manufactured today. Some cost thousands of dollars and have special features to aid the researcher. Others are used for diagnosis medicine, in quality control for industry and as teaching instruments. The least expensive microscopes are those designed for home use by youngsters. Our purpose is not to compare brand names, but to help you look critically at microscopes and advertisements and make your own comparisons.

A microscope can kindle a child's enthusiasm, or leave him frustrated and disillusioned. The difference may be in your choice of instrument and the way it is used.

A simple magnifying glass can enlarge an image 10 to 15 times at most. A compound microscope is essentially one magnifying lens (the eyepiece) enlarging the image produced by another lens (the objective). Magnification can reach 1200 times. You will notice that the image produced by a magnifying glass is good in the centre but distorted at the edges. Much of the cost of compound microscopes has to do with correcting lenses to eliminate this distortion.

Compound microscopes are used for viewing transparent or very small objects - individual cells, pond algae or onion skin.

If you prefer to look at larger, thicker objects like rocks, fingers or whole flowers, consider a stereomicroscope. Although magnification is lower (10 to 80 times) you can view unprepared specimens in 3D. Stereomicroscopes have an eyepiece for each eye. They may be called "geology microscopes".

SUGGESTIONS

Magnification

Total magnification of a compound microscope is the power of the objective multiplied by the power of the eyepiece. (ie. 10X eyepiece with a 6X objective = 60x magnification). Although many student microscopes boast of high magnification, they are extremely difficult to use in the 600X - 1200X range. Focusing and locating the specimen become tedious. Light and image quality are usually poor. It is also difficult to obtain specimens thin enough for high power magnification. Don't be oversold on high magnification. A maximum of 300X - 500X is fine for most student uses.

Very high power objectives (100X) require a drop of oil between the lens and the slide. Although often touted as a selling point, these oil immersion lenses are difficult to use and, in children's microscopes, do not deliver a worthwhile image.

Zoom

Some microscopes have a zoom lens component which allows continuously variable magnification in a certain range, something like a telephoto camera lens. So instead of a 10X eyepiece and choice of 6X, 10X, or 30X objectives, you can "zoom" the magnification of the eyepiece from 10 to 20 times, giving continuous increase from 60X to 120X if the 6X objective were selected, for example. Generally, it is not possible to retain the same image quality with zoom lenses as you expect from fixed lenses. The few zoom systems which have recently appeared for research microscopes are complex and expensive.

Light

Most compound microscopes require light to pass upward through the transparent specimen to your eye. A light source may be built into the microscope beneath the stage. If the light is battery operated, you may find it a source of expense and frustration because the power cells have a very short life span. We have also noticed many problems with poor electrical connections on popular children's microscopes.

Most instruments are equipped with a mirror that allows you to reflect an outside light source up through the specimen. A bright desk lamp or sunny window makes a good light source, and is more reliable than the cheap built-in kind. Try for a bright, evenly lit field of view. Shine your light on the mirror, not on the specimen.

Some microscopes have a condenser between the mirror and the stage. This may be a moveable disc with different sized holes in it, or a diaphram you can open and close. Reducing the size of the condenser opening can give a sharper image if the light is bright.

Lenses

Check that the eyepiece lens is held firmly in its mount and is not scratched. Generally, the larger the diameter of the eyepiece lens, the easier it will be to use. Objective lenses should be fixed in sturdy, metal mounts. Shorter, or low power objectives are most useful. Check that the turret holding the objectives turns smoothly with click stops for each lens. Glass lenses are preferable to plastic. Some kits offer two eyepieces of different magnification, say a 10X and a 15X. Read the section on magnification before you spend extra money for these.

Mechanical Parts

The success of your microscope depends greatly on how sturdy it is. The eyepiece and objective are separated by a body tube. Either this tube or the stage must move up and down to allow you to focus on each specimen. This movement is accomplished with a "rack and pinion" mechanism. It should be smooth and fairly firm so that it does not slip.

Most microscopes have a pivot between the base and the body tube. Be sure this is firm - once you have set the microscope at a comfortable angle, it should not tilt further.

The base should be heavy enough and broad enough to hold the instrument without tipping. Check the rest of the instrument or flaws in the finish. Metal is more durable than the plastics commonly used.

Accessories

You may be offered everything from shrimp eggs to butterfly wings to tweezers to stains. Some tools are useful - tweezers, a probe (needle on a stick) and eye dropper. As for bee legs and butterfly wings, just collect your own.

Cell stains are informative when properly used, but your child will need to do some reading or obtain advice to enjoy them. Canada Balsam is used for making permanant slides - something a student will not likely want to do, because slides and cover slips are the necessary items microscope kits rarely provide in adequate quantity.

Don't pay for accessories you can collect or make yourself, but do try to acquire lots of blank slides and cover slips.

Working With Your Microscope
5 Easy Steps for Beginners

1. Set up the microscope on a steady table. If it tilts, adjust to a comfortable angle and be sure the tilt screw is tight. If the base is not heavy enough to hold it steady, you might tape the base to the table.

2. Check the light supply. With nothing on the stage, select the lowest power (shortest) objective and look through the eyepiece. Adjust the mirror until you see a bright, evenly lit circle. If the light remains dim, move to a table near a window or shine a desk lamp on the mirror.

3. When you have light, put an "easy" slide on the stage - something obvious, like an insect leg. Be certain the specimen is directly under the objective, ie. over the centre of the hole in the stage.

4. Turn the focus knob until the objective goes as far down as it can without touching the slide.

5. Finally, look through the eyepiece and focus by turning the focus knob slowly in the other direction. Always focus slowly. If your instrument has 2 separate focus knobs, adjust the coarse focus first (larger knob).

If you don't see anything but light, go back to step 3.
If you lose the light, go back to step 2.

Once you have examined the specimen under low power, try this:

- fiddle with the mirror. Sometimes you can change the light and see the specimen in a different way.
- as you look through the eyepiece, try moving the slide to see different parts of the specimen. This takes practice.
- try a higher power objective, but expect the light to be dimmer. You will probably have to change the focus a bit.