MICROSCOPE DISCOVERIES PROGRAM (grades 5 to 7)

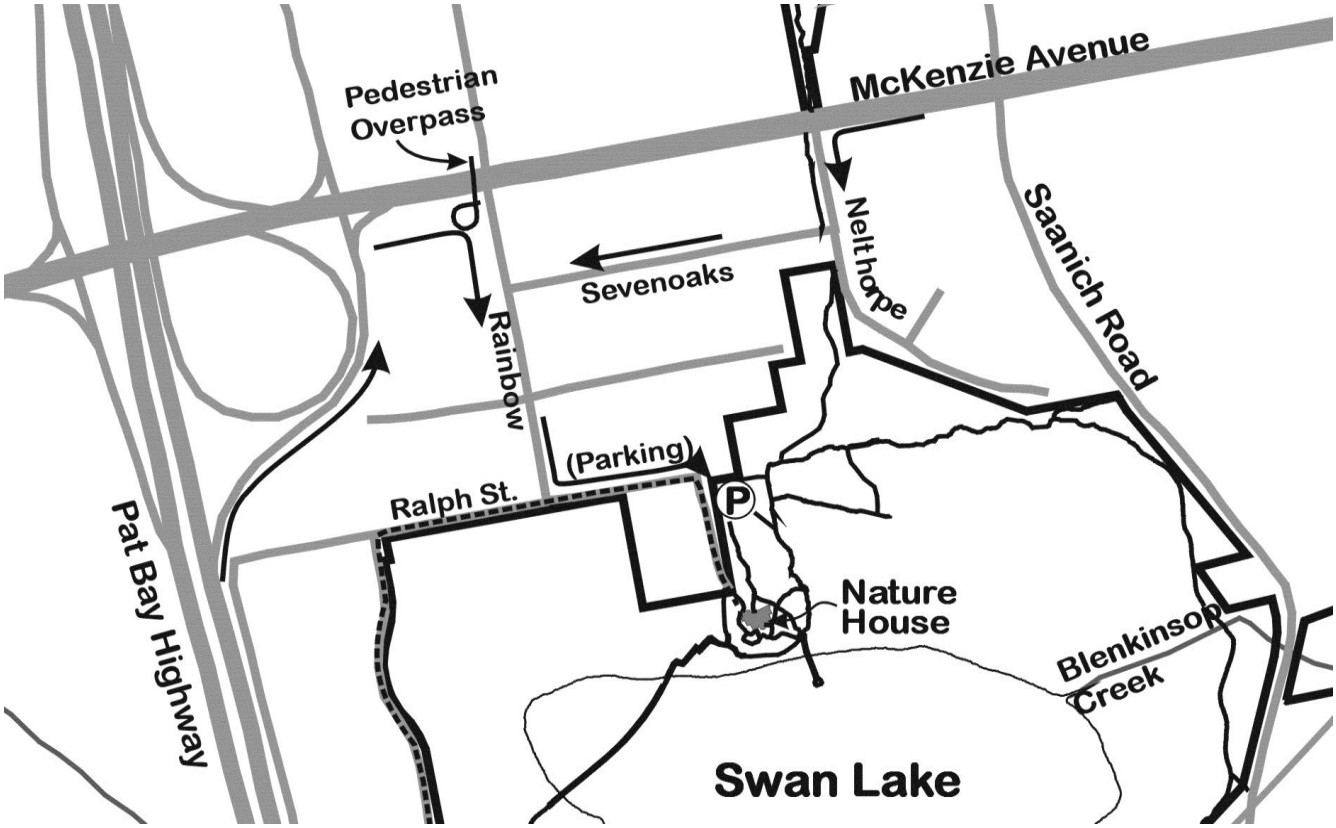
This one and a half hour program is delivered on site at Swan Lake Christmas Hill Nature Sanctuary.

BEFORE YOU ARRIVE

1. Provide each student with easily read **nametag** for both indoors and outdoors.
2. Have each student bring a **pencil**.
3. Please encourage appropriate **clothing** for the weather.
   Remember that up to 30 minutes of your program is outside.
4. Divide your class into **two groups** before the program. It is very helpful if you have another adult to go along with one group, so that they can manage any problems that may arise, such as taking a student to the washroom.

Thank you for your co-operation.

WE'LL MEET YOU IN FRONT OF THE NATURE HOUSE.



PROGRAM FORMAT

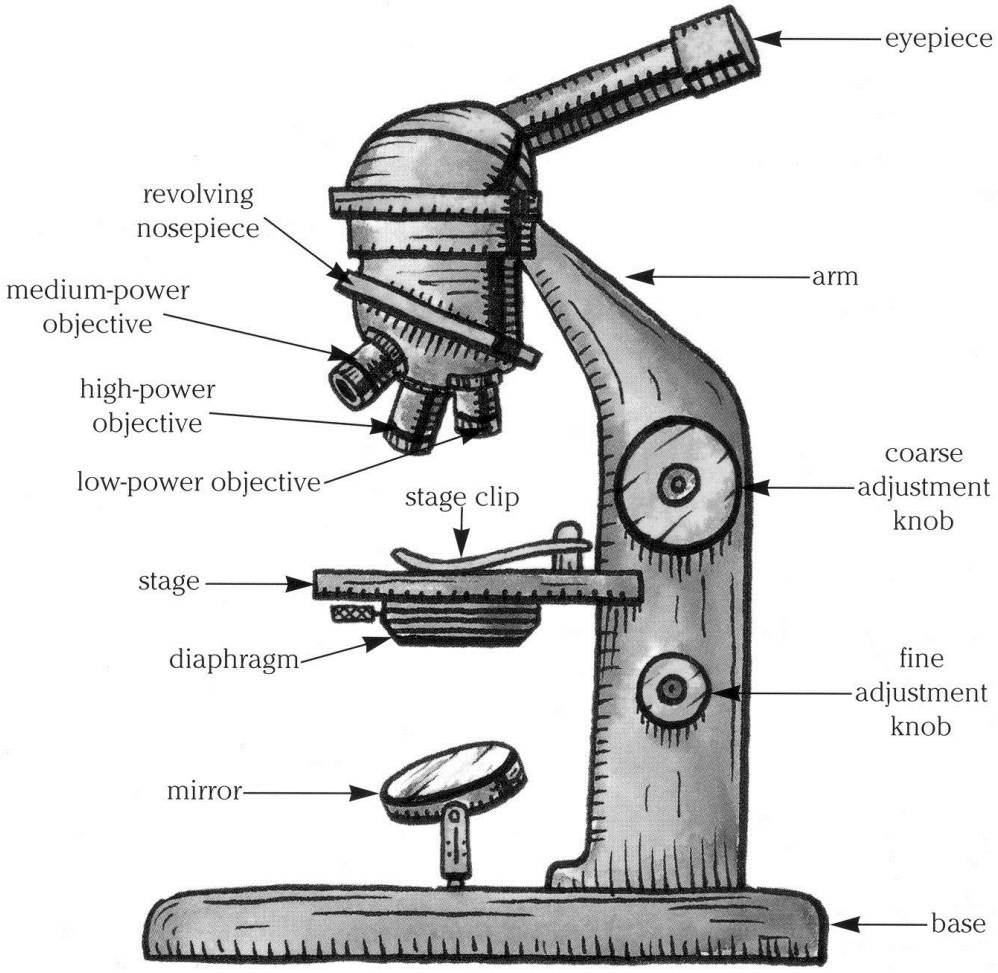
The program consists of the following activities:

1. Collecting samples from the lake edge, using nets and plankton tows
2. Using two different types of microscopes
3. Recording observations

We will provide **recording sheets** for drawing of observations, and of microscope parts.

Please divide your class into **2 groups**. Our staff will lead each group through the activities. Each group will do the activities in a different order.

A TYPICAL MICROSCOPE AND ITS PARTS



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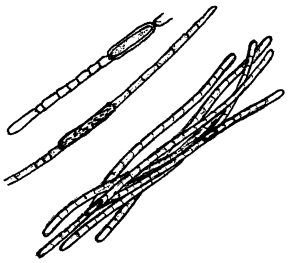
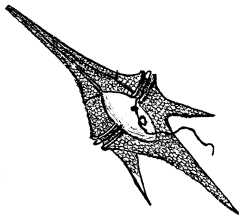
MICROSCOPE DISCOVERIES (grade 5 to 7)

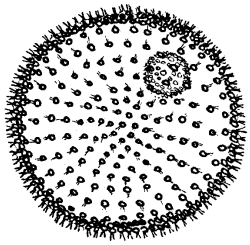
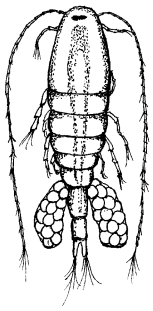
Swan Lake nature programs strive to support Teachers in the classroom:
Curricular Competencies:

- Questioning and predicting: How can you observe the concept of interconnectedness within ecosystems in your local area? (gr.5)
- Choose appropriate data to collect to answer their questions(gr.5, gr.6)
- Observe, measure and record data using appropriate tools (gr.5, gr.6, gr.7)
- Use equipment and materials safely, identifying potential risks (gr.5, gr.6)
- Experience and interpret the local environment (gr.5, gr.6, gr.7)

Our goals:

- Show the functional parts of the dissecting, and the compound microscope
- Demonstrate the proper care and storage of microscopes
- Demonstrate the light, magnification and focus adjustments of microscopes
- Prepare a wet mount slide
- Prepare a Petri dish specimen
- Collect specimens for microscopic observation
- Demonstrate safe use and proper cleaning of slides and cover slips
- Record observations of microscopic specimens
- Recognize the difference between plant and animal cells

PROGRAM OVERVIEW

1. **Introduction** to the program:
   - Why we use microscopes
   - Who has used microscopes before?
   - Other types of magnifying devices

- Brief introduction to the two types of microscopes:
  - **A. Dissecting** – Petri dishes for specimens, light shines on object
  - **B. Compound** – Slides and cover slips, light shines through object

Demonstration of microscope use, especially with regard to the dissecting scope and what is appropriate to collect for it.

2. **Collect** at lake edge (nets and plankton tow).

3. **Use** both types of microscopes

A. Compound Scope –

- Hands on demonstration of microscope use, showing light source, magnification, focusing, and material preparation
- Look at printed letters with and without microscope
- Demonstrate making slide of plankton
- With instruction, students make their own slide of squamous epithelium (inside of cheek)
- Instruct on proper cleaning of slides and cover slips

B. Dissecting Scope-

- Hands on demonstration of microscope use, showing light source, magnification, focusing, and material preparation
- Look at printed letters with and without microscope
- Look at collected specimens (Leaf skeleton, mushroom, cattail leaf, *Elodea*, coontail, *Azolla*, multicellular animal), fingernails, seeds, etc.

Payment:
An invoice will accompany the confirmation letter you receive. Payment is due at the time of the program, and cheques should be made out to **Swan Lake Nature Sanctuary** and given to the programmer. **VISA or MC** payments may be phoned in.
Receipts will be sent by fax or e-mail as requested.

Change of Dates and/or Times:
If you wish to change the date or time of your program please contact us at **250.479.0211** or at **programs@swanlake.bc.ca.** We will do our best to accommodate your request, depending on available times and dates.

If you have any questions or comments please don't hesitate to contact us; we always welcome your feedback.

MICROSCOPE BASICS

Understanding the parts of a microscope and how it works can save you a lot of frustration and time later on. There are minor variations in microscopes, but the following information should help all understand the basics of microscope use.

PARTS OF A MICROSCOPE

A. The eyepiece (ocular) is the part of the microscope closest to your eye, through which you look. It contains the ocular lens, which enlarges the image produced by the objective's lens. Microscopes in which separate images are seen by each of the observer's eyes at the same time are called binocular microscopes. An eyepiece may be labeled with its magnification or power – for example 10X (meaning the eyepiece enlarges 10 times).

B. The arm is the curved metal piece that holds the body tube in place over the stage and the base.

C. The revolving nosepiece holds the objectives and allows you to change objectives while looking at a slide.

D. The objectives are the parts at the bottom of the body tube, closest to the sample that you are examining. Each objective has a lens and a tube like holder, the mount. Like the eyepieces, the objectives come in various powers. The longer mounts hold the stronger or higher-powered lenses. The shorter mounts hold the weaker or lower-powered lenses. Some microscopes have several objectives e.g. 4X, 10X, 40X and 100X; some only have one or two.

E. The stage is the flat surface on which you put your slides or sample.

F. The diaphragm is used to adjust the amount of light shining through the sample on the stage. (Some microscopes do not have a diaphragm.)

G. The coarse adjustment knob is the large knob used to roughly adjust the position of the body tube, allowing you to quickly focus your sample into view.

H. The fine adjustment knob is the small knob used to change the position of the body tube, allowing you to make small adjustments to the focus of your sample. Most microscopes have both a coarse and fine adjustment knob, but some only have one knob.

I. The mirror or lamp beneath the stage and diaphragm increases the amount of light shining through your sample.

J. Beneath the stage some microscopes have a condenser which collects and concentrates the light before it passes through the sample.

K. The base of the microscope is the heavy bottom part. It supports all the other parts of the microscope.

USING THE MICROSCOPE

1. Always pick up your microscope correctly: grasp it firmly with two hands, one hand under the base and the other on the arm

2. If your microscope has a light, turn it on. If it does not, turn on the external light source.

3. If necessary, adjust the mirror or other light source to focus light through the sample. You should be able to see a circle of light when you look into the eyepiece. NEVER use your microscope in direct sunlight, as the reflected light could damage your eyes.

4. Make sure the low-power objective is in place over the hole in the stage. Use the coarse adjustment knob to lower the objective until it comes to a stop, about 2.5 cm above the stage.

5. Place your sample on the stage, adjusting the position of your sample so it is over the hole in the stage. (Some prefer to secure the slide with stage clips, but we have removed them as we prefer the freedom to move the slides around.)

6. Look through the eyepiece and use the coarse adjustment knob to focus upwards (moving away from the sample) this should bring the sample into view. If necessary, move the sample around to bring it into the centre of your field of view.

7. When the sample is in view, use the fine adjustment knob to bring it clearly into focus.

8. To use the high-power objective, turn the revolving nosepiece to bring the objective into position over your sample. You should be able to see the sample through the high-power objective, so you will only have to adjust the fine adjustment knob. Remember to always focus upwards so that the objective is moving away from the sample. Focusing downwards could break your slide or damage your lens.

9. Return to the low-power objective before removing the sample from the stage. To look at another sample, repeat steps 2 through 8.

10. When you are finished using the microscope, make sure the low-power objective is in position over the hole in the stage and turn off the light source.

THE HISTORY OF MICROSCOPES

During that historic period known as the Renaissance, there occurred the inventions of printing, gunpowder and the mariner's compass, followed by the discovery of America. Equally remarkable was the discovery of the **microscope:** an instrument that enables one, by means of a lens or combination of lenses to observe **enlarged** images of tiny objects.

The earliest simple microscope was merely a tube with a plate for the object at one end, and, at the other end a **lens** which gave a magnification less than 10 times the actual size. These devices excited people, when they were used to view fleas or tiny creeping things, and so were called "flea glasses".

About 1590, two Dutch spectacle makers, Zaccharias and Hans Janssen, while experimenting with several lenses in a tube, discovered that nearby objects appeared greatly enlarged. That was the forerunner of the compound microscope and the telescope.

In 1609, **Galileo**, father of modern physics and astronomy, heard of these experiments, worked out the principles of lenses, and made a much better instrument with a focusing device.

Considered the father of microscopy, the Dutchman **Anton van Leewenhoek** (1632-1723) started as an apprentice in a dry goods store where magnifying glasses were used to count the threads in cloth. He ground and polished a small glass ball into a lens with a magnification of 270X, and used this lens to make the first practical microscope. It had only one lens, and so is referred to as a **single lens microscope.**

Further developments led to the **compound microscope**, in which the lens closer to the object to be viewed is referred to as the “objective”, while the lens closer to the eye is called the “eyepiece”. Since its invention, the **compound microscope** has made tremendous contributions to the progress of science. In the mid-1600’s the Englishman **Robert Hooke** built himself a compound microscope. When looking at thin slices of cork, he discovered the fact that living things are composed of **cells.** More precisely, what Hooke saw were the cell walls in cork tissue. In fact, it was Hooke who coined the term "cells": the boxlike cells of cork reminded him of the cells of a monastery.

Compound microscopes were instrumental in the discovery of yeast **fungus** by Louis Pasteur, typhoid **bacteria** by Karl Ebert in 1880, and tuberculosis and cholera **bacteria** by Robert Koch in 1882. Microscopes have become the main tool for analysis of micro-organisms that cause illness in humans and other animals.