Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ September 2013

**Biology 102**

**Laboratory 2: Seedless Plants**

**A: Taxonomy:**

Phylum Bryophyta (Nonvascular Plants)

Mosses (p.351 to 353)

* Moss antheridia
* Moss archegonia
* Preserved and embedded moss specimens

Phylum Polypodiophyta

Ferns (p. 357 to 361)

* Fern sporangia
* Fern prothallium-archegonia
* Fern prothallium-antheridia
* Preserved & embedded fern specimens

**B. Introduction:**

To understand how plants were able to dominate the terrestrial environment, we will examine representative **nonvascular plants –** mosses - and **vascular** **plants –** ferns - in today’s lab. The shift from nonvascular to vascular plants was driven by several evolutionary innovations, which allowed plants to (1) flourish in environments that lacked a constant supply of water and (2) grow well above the surface (trees). In this lab, we will focus on two evolutionary innovations, which allowed plants to grow larger and survive in most terrestrial environments.

**1) Plant life cycles: Alteration of generations**

**2) Vascular tissue**

**C. Procedure**:

1. Prepared Slides: *Moss antheridia, Moss archegonia, Fern sporangia, Fern archegonia, Fern Antheridia*
2. Prepared and embedded specimens: Various ferns and various mosses

**Life Cycle Evolution:**

All plants undergo an **alteration of generations**. This means plants have both a **haploid gametophyte (n)** stage and a **diploid sporophyte (2n)** stage. Algae (a protist) have both a haploid (n) and diploid (2n) stage, but the diploid stage is a small part of its life cycle. Further, the egg and developing embryo of algae is unprotected from the environment.

Mosses spend the majority of their life cycle in the haploid gametophyte (n) generation, which is the green part of the moss. The diploid sporophyte (2n) generation grows out of the green part of a female moss. It is a brown stalk that grows up from the moss once the eggs have been fertilized. The fertilized eggs undergo meiosis to produce haploid spores (n). The spores will disperse andgrow into the green gametophyte. See fig. 32.5 on page 666 of your textbook.

**Unlike mosses, gametophytes** make up a small part of the fern life cycle. **Gametophytes** produce gametes (sperm and eggs) in a special structure called the **gametangium**. The **archegonium** of the gametophyte produces haploid (n) egg cells and the **antheridium** of the gametophyte produces haploid (n) sperm cells. The sperm fertilizes the egg to make a diploid sporophyte (2n). The mature **sporophyte life stage** of the fern produce spores in a special structure called the **sporangium**. The spores in the mature **sporangium** undergo meiosis, drop to the ground, germinate, undergo mitosis, and grow into **haploid gametophytes (n)**. See fig. 32.9 on p. 669 in your textbook.

**Vascular Tissue Evolution:**

Because plants transitioned from an aquatic environment to a terrestrial environment, they need a way to get water to their cells. Liverworts and hornworts get water into their cells via osmosis (diffusion of water), which moves water in an out of the plant along a concentration gradient. If these plants don’t live in a very wet environment, then their cells will not have a consistent supply of water and they will die. **Mosses** have a very simple and primitive conducting system, consisting of a few strands of conducting tissue in their central stem. However, the system of tubes in mosses is floppy and water can only travel a short distance in the plant, greatly limiting the size that mosses can become.

In vascular plants (like ferns), there is a well organized network of specialized tubes, called vascular tissue. Plants with vascular tissue are called tracheophytes (“tube plants”). “Tracheo” is greek for tube, think trachea. The vascular tissue in ferns and their allies consists of two types: **xylem** and **phloem,** and these “tubes” move water, nutrients, and food throughout the plant.

1. **Xylem:** conducts water and dissolved minerals upward from the roots
2. **Phloem:** conducts carbohydrates throughout the plant

**Mosses**: Read and answer the questions on page 350 to 352

***A. Moss antheridia:***

Obtain and observe a whole mount (w.m.) preserved slide of a male moss shoot, the antheridia.

Draw and label the flagellated sperm that are produced in the antheridia. Use the figure on p. 352 of your lab manual as a reference.

***B. Moss archegonia:***

Obtain and observe a whole mount (w.m.) preserved slide of a female moss shoot, the archegonia.

Draw and label the eggs that are produced in the archegonia. Use the figure on p. 352 of your lab manual as a reference.

***C. Moss preserved specimen:***

Draw and describe at least one preserved moss specimen. Use p. 351 and 352 of your lab manual as a reference.

**Ferns:** Read and answer the question on page 357 to 361

***A. Fern Sporangia***

Obtain and observe a whole mount (w.m.) preserved slide of a female fern, the archegonia.

Draw and label the sporangium and spores that are produced in the sporangia. Use the figure on p. 360 of your lab manual as a reference.

***B. Fern prothallium-archegonia***

Obtain and observe a whole mount (w.m.) preserved slide of a female fern, the archegonia.

Draw and label the eggs that are produced in the archegonia. Use the figure on p. 361 of your lab manual as a reference.

***C. Fern prothallium-antheridia***

Obtain and observe a whole mount (w.m.) preserved slide of a male fern, the antheridia.

Draw and label the sperm that are produced in the antheridia. Use the figure on p. 361 of your lab manual as a reference.

***D. Fern preserved specimen:***

Draw and describe at least one preserved fern specimen. Use p. 360 and 361 of your lab manual as a reference.