

SA #37- 38	SEEDLESS VASCULAR PLANTS
BIO 2130	Stern, Chapter 21

OVERVIEW: By now, you have probably encountered the “seedless vascular plants” first hand in the laboratory. Scan the Chapter 21 "Outline" and Overview, and notice that there are four phyla of seedless vascular plants, namely the following (with **web links** here for study):

[PSILOTOPHYTA](#) – Whisk Ferns

[LYCOPHYTA](#) – Clubmosses, Spikemosses, Quillworts

[EQUISETOPHYTA](#) – Horsetails

[POLYPODIOPHYTA](#) – Ferns

READING: Read Chapter 21, pages 396-420, a particularly well illustrated chapter; see also Internet Links from the course home page where you obtain Study Guides; just scroll down to Seedless Vascular Plants.

EMPHASIS: We will emphasize the Polypodiophyta or ferns, while aiming for the following learning goals:

1. Visually distinguish representatives of the four phyla of the “seedless vascular plants.”
2. Explain the morphology and reproductive cycle of the Polypodiophyta, the ferns.
3. Discuss the significance of heterospory as it represents an increasing role of the sporophyte generation in nutrition and support of the gametophyte generation.

The *Study Outline* will also aid you in identifying the emphasis of the chapter.

LECTURE DISCUSSION QUESTIONS:

1. Attempt to characterize the “seedless vascular plants” collectively from the Bryophytes. Use the table in the "Study Outline" as an aid to this task.
2. What characteristics would you use to assign whisk ferns, clubmosses, horsetails, and ferns to their respective phyla? You may want to print out the “Lower Vascular Plants” Table by Ross Koning (Internet Links at BIO 2130 home page or http://koning.ecsu.ctstateu.edu/Plant_Biology/lvp.html) which is excellent except that we will not emphasize differences in stem anatomy as seen in his “STEM” row in the table.
3. How would you distinguish *homosporous* from *heterosporous* members of Lycopphyta if given specimens and a microscope? Hint: Compare the genus *Lycopodium* (clubmoss) with *Selaginella* (spike mosses). What is the significance of heterospory with respect to aiding survival of the gametophyte of the spike mosses (*Selaginella*)? See Lecture Discussion-Application box, p. 39.3.

STUDY OUTLINE: SEEDLESS VASCULAR PLANTS

I. INTRODUCTION:

A. Compare "Seedless Vascular Plants" to Bryophytes. Use a "+" or "-" to indicate whether the description applies to each group or not. See Part B. below where you can list exceptions within the groups where necessary.

CHARACTERISTIC	BRYOPHYTES	SEEDLESS VASCULAR
1. Life cycle with <i>sporic meiosis</i>		
2. Archegonia and Antheridia		
3. Zygote develops to multicellular embryo		
4. Chl <i>a,b</i> , carotenoid, cellulose cell walls		
5. Cell Plate in cytokinesis		
6. Sporangia protected with multicellular layer		
7. Cuticle and stomata (well-developed)		
8. Motile sperm require free water		
9. Xylem and phloem (well developed)		
10. Lignified secondary walls for support		
11. Sporophytes nutritionally independent from gametophytes		
12. Sporophyte dominates life cycle		
13. Sporangia borne on leaves		

B. SOME EXCEPTIONS:

1. True roots and leaves (*i.e.* vascularized structures) are both absent in _____
 Instead, this genus has an underground rhizome (stem) + mycorrhizal fungi (in cortex)

2. Leaf Type Differs:
 - a. *Megaphylls* – vascularized with branched veins; these “true leaves are present only in _____
 - b. *Microphylls* – small "leaves" with one, unbranched vein; found in _____ and also in _____

3. Sporangia are borne in association with “true leaves” only in _____

II. SEXUAL REPRODUCTION -- life cycles

A. GENERALIZED LIFE CYCLE -- Figure 12.6, p. 228 -- study it and relate to the following:

1. POLYPODIOPHYTA -- Figures 21.16–21.21 and laboratory manual; our main emphasis
2. PSILOTOPHYTA – Whisk Fern, *Psilotum* Figure 21.2 – NOTE similarity to Fern cycle
3. LYCOPHYTA -- Clubmosses, Figures 21.3–21.16 – similar to Fern cycle
4. EQUISETOPHYTA -- Horsetails, Figures 21.10–21.13 – similar to Fern cycle

B. SPIKE MOSSES -- members of LYCOPHYTA, but different features:

1. THUS FAR ---> Spores look identical in size/morphology; produce distinct male & female gametophytes due only to genotype of spores
2. HOMOSPOROUS = name for condition wherein spores are the same
> NOTE: Resultant gametophytes are independent, not nourished by spores.
3. HETEROSPOROUS SPECIES = condition wherein the following occurs:
 - a. Spores differ in size – compare spores in strobili of HOMOSPOROUS (*Lycopodium*, Figure 21.4) with strobili of HETEROSPOROUS (*Selaginella*, Figure 21.6).
In *Selaginella*, the smaller spores, or *microspores*, develop into male gametophytes; whereas, the larger spores, or *megaspores*, develop into female gametophytes
 - b. Gametophytes are much reduced; develop within and in dependence upon nourishment from the *megaspore*

Lecture Discussion-Application Question:

In what way is heterospory in *Selaginella* a strategy in which the sporophyte takes a greater part in nurturing the gametophyte generation than the sporophyte of *Lycopodium*? Compare to Bryophytes.