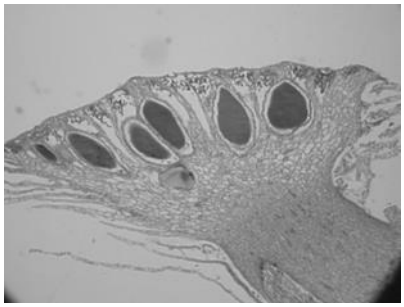
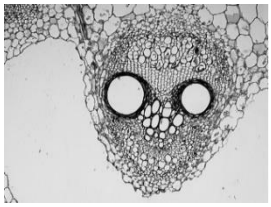


Biology 2

lab Packet

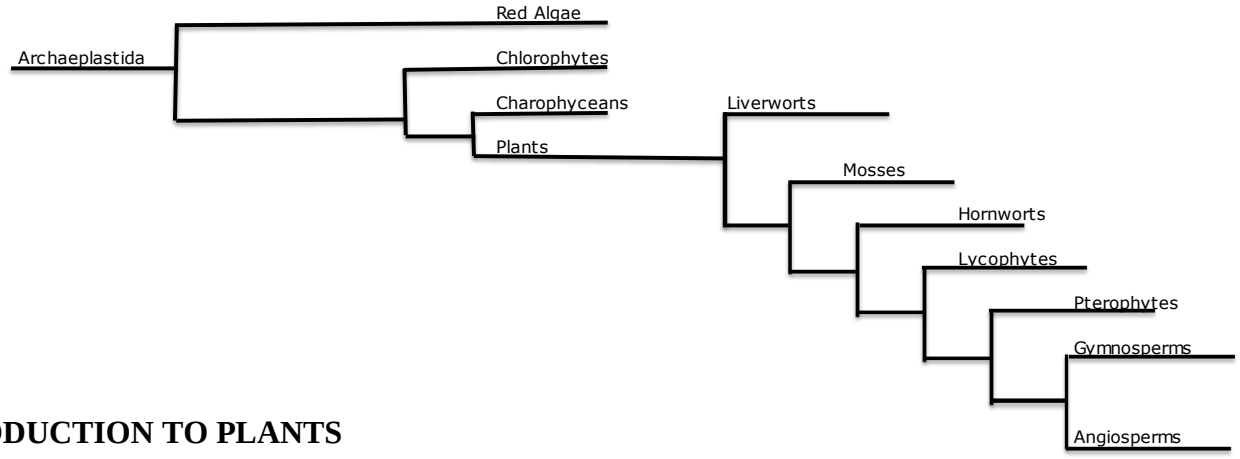


for

Practical 2

PLANT CLASSIFICATION:

Domain: Eukarya (**Supergroup: Archaeplastida)**
Kingdom: Plantae
Nonvascular Seedless Plants
Division: Hepatophyta - Liverworts
Division: Bryophyta - Mosses
Vascular Seedless Plants
Division: Lycophyta - Club Mosses
Division: Pterophyta
(Psilophyta) - Whisk ferns
(Sphenophyta) - Horsetails
(Pterophyta) - Ferns



INTRODUCTION TO PLANTS

The kingdom **Plantae** includes about twelve divisions. They are placed in the clade **Archaeplastida** along with the green algae and charophytes**.** They are all **eukaryotic** and **multicellular** with distinct **cell walls**. Photosynthetic pigments occur in organelles called **plastids**. Plants have adapted to the terrestrial environment with an increase in structural complexity. Many plants have developed organs for anchorage, conduction, support, and photosynthesis. Reproduction is primarily sexual, with an **alternation of generation** of haploid and diploid generations. The **sporophyte** generation becomes increasingly predominant as plants evolve.

The nonvascular plants **lack conductive tissue** and are limited to a specific range of terrestrial habitats. These plants display two adaptations that first made the move onto land possible. They possess a waxy **cuticle** to reduce water loss and their gametes develop within **gametangia** for protection of the embryo. These plants are limited in range because they require water for reproduction. They **lack vascular tissue**, which means they must live in moist environments and lack woody structures for support therefore they grow low to the ground.

Station 1 – Kingdom Planate

1. What supergroup do they belong to and what characteristic are responsible for this positioning?

2. What characteristics are specific to plants?

3. What adaptations enabled plants to move onto land?

4. When did the show up in the fossil record?

Station 2 - Division: Hepatophyta – Liverworts

Be able to recognize the example liverwort *Marchantia*. Examine preserved specimens of the liverwort thallus**.**

1. How are the thallus flattened?

2. Is this "plant" a gametophyte or a sporophyte?

Station 3 – Liverwort Thallus

Examine a prepared slide showing a cross section of a *Marchantia* thallus. The thallus is divided into an upper and lower section. Be able to recognize the following structures**: storage cells, photosynthetic cells, air pores, and air chambers**.

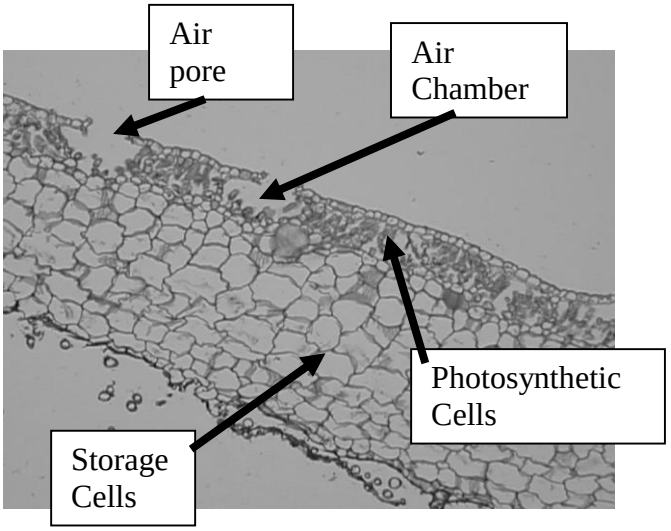
1. What is the function of the upper section of the thallus?

2. What is the function of the lower section of the thallus?

3. What is the difference between a rhizoid and a scale?

4. What is the function of the air chambers surrounding the chlorophyll-bearing cells?

5. What is the function of the rhizoids and scales?



Thallus

Station 4 –Antheridial and Archegonial Receptacles (Preserved)

Be able to recognize the **antheridial** and **archegonial receptacles** of a liverwort.

1. What does the antheridia produce?

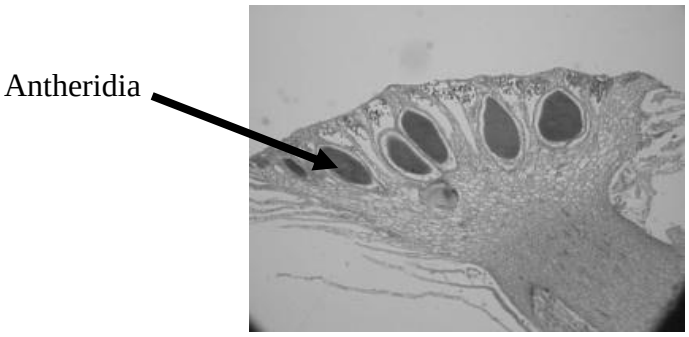
2. What does the archegonia produce?

Male

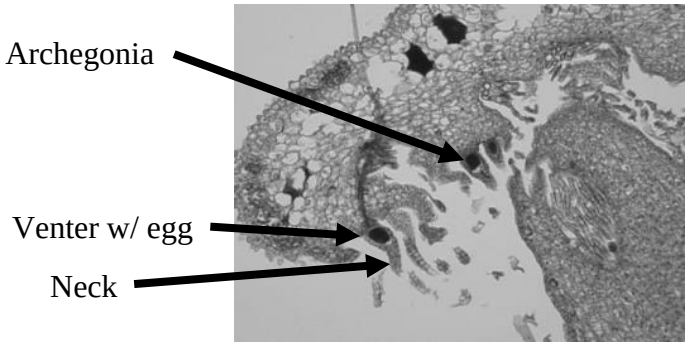
Female

Station 5 – Antheridial and Archegonial Receptacles (Prepared Slides)

Study prepared slides of **antheridial** and **archegonial** discs. Be able to recognize the following structures: **antheridia, sperm (in the male) and the archegonia, neck, egg, and venter (in the female)**



Male



Female

Station 6 - The Sporophyte Generation of a Liverwort

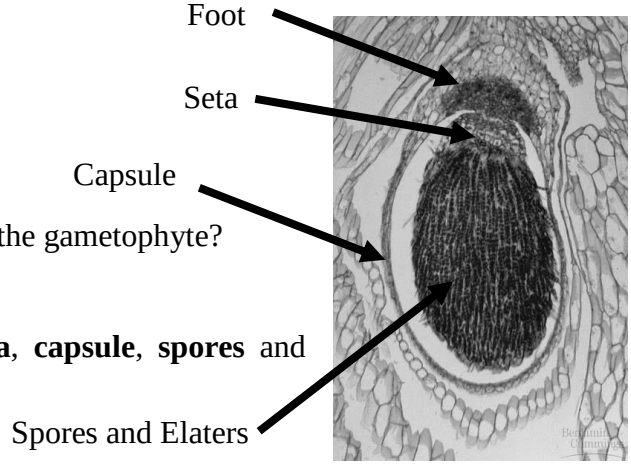
The sporophyte generation is dependent on the gametophyte generation. Examine a prepared slide of a *Marchantia* embryo.

1. What is the function of the elaters? How do they work?

2. Is the sporophyte haploid or diploid?

3. The sporophyte is attached to a gametophyte. What sex is the gametophyte?

4. Be able to recognize the following structures: **foot**, **seta**, **capsule**, **spores** and **elaters**.



Sporophyte

Station 7 - Asexual Reproduction of a Liverwort

Examine a living gametophyte showing asexually reproductive **gemmae cups**. Be able to recognize a gametophyte showing the cups with **gemmae** inside.

1. How are the gemmae dispersed?

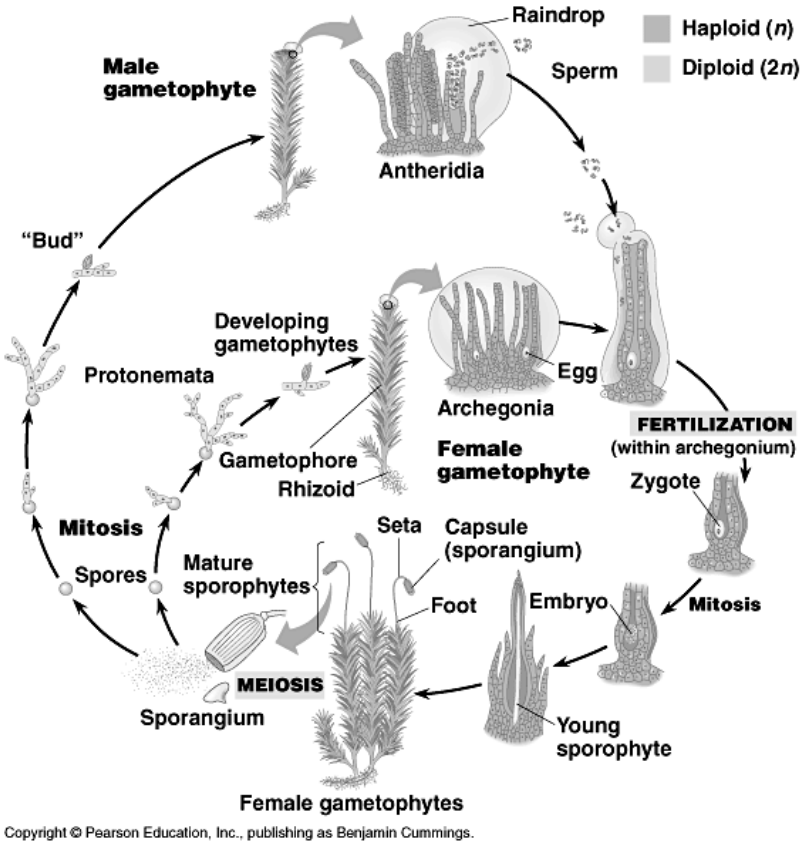
Gemmae Cups

Station 8 – Division: Bryophyta - Mosses

Examine the "leafy" moss plants provided for you. You need to be able to recognize these species as mosses.

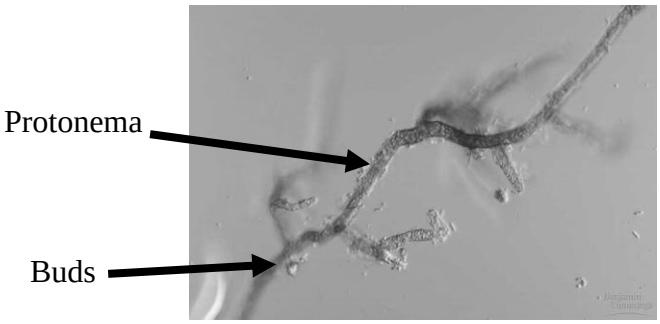
1. Is there a vein system present in the "leaves"?

2. Is this "plant" a gametophyte or a sporophyte?



Station 9 – Division: Bryophyta – Protonema

Examine a prepared slide of a germinating spore. The germinating structure is called a protonema. This structure is very similar to some filamentous green algae and is one piece of evidence that mosses might have evolved from some form of green algae. Be able to recognize the following structures**: protonema, buds.**



Germinating Spores

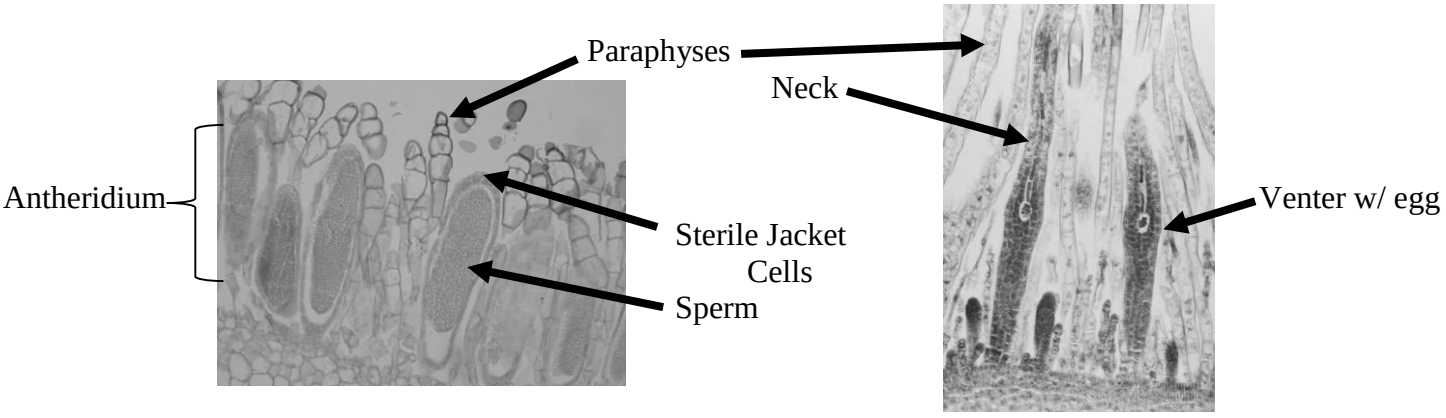
Station 10 – The Gametophyte Generation of a Moss

Male plants can be identified by the flower-like cluster of "leaves" at the tip of the gametophyte. In the female plants, the "leaves" closely surround the tip of the gametophyte**. Be able to recognize the difference between male and female plants.**

Male Female

Station 11 - The Antheridium and Archegonium

Examine the prepared slides of longitudinal cross section of a male and female gametophyte tip. Locate the **antheridium**. Be able to identify the following structures in the male: **antheridium**, **paraphyses**, **sterile jacket cells**, **sperm** and the following structures in the female: **archegonia**, **egg, venter, neck, and paraphyses.**

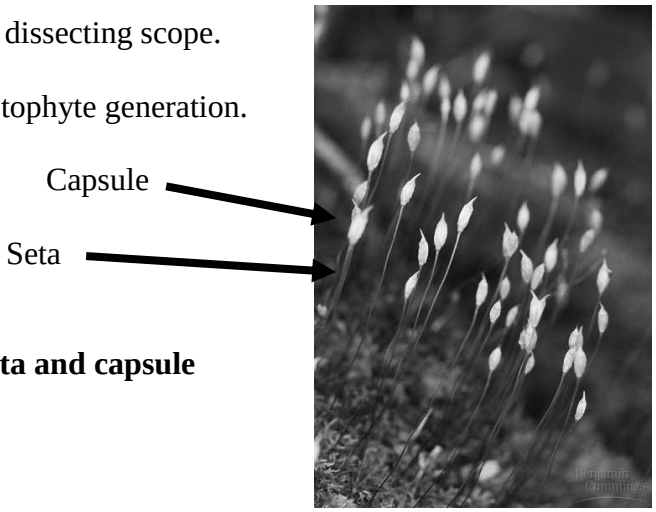


Antheridial Disc Archegonial Disc

Station 12 - The Sporophyte Generation of a Moss

Examine a sporophyte generation of a moss under a dissecting scope.

1. The sporophyte generation is attached to a gametophyte generation. What sex is the gametophyte?



Sporophyte

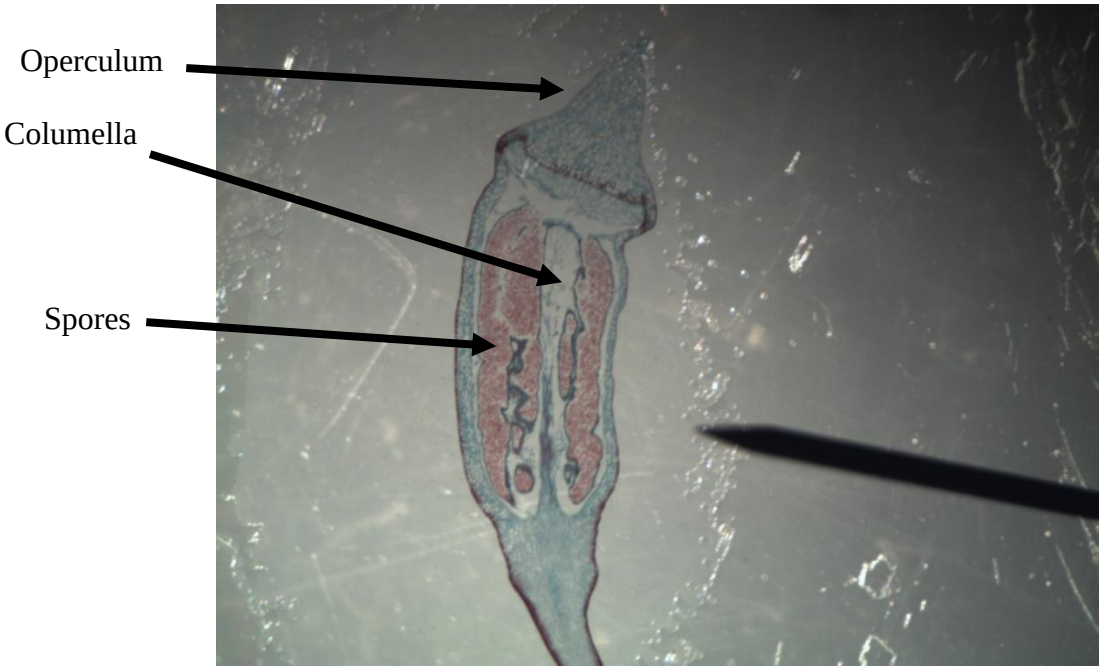
2. Be able to recognize the following structures: **seta and capsule**

Station 13 - The Sporophyte Generation of a Moss

Examine a prepared slide of a capsule.

1. Are the structures under the microscope haploid (n) or diploid (2n)?

2. Be able to recognize the following structures: **operculum**, **columella**, and **spores**.



Sporophyte Capsule

INTRODUCTION TO VASCULAR PLANTS

The vascular plants possess true conducting tissue consisting of **xylem and phloem**. They are said to possess true leaves, roots and stems. The also possess supporting tissue for more upright growth, stomata (small pores) for the exchange of gases, and a protective layer of **cutin** which forms a cuticle. These characteristics allow vascular plants to get large in size. Some vascular plants also begin to remove themselves from moist environments because they need less or no water for reproduction. In ferns for example, a single spore can germinate in the soil to form a gametophyte. Sexual reproduction follows and soon the organism is established.

Station 14 – Division: Lycophyta (Club Mosses)

The first seedless vascular plant division recognized is the club mosses. Be able to recognize the example seen in the jar (*Lycopodium*).

1. What vascular characteristics do the plants in this division demonstrate? (Leaves, Stems, or Roots)

2. Is the plant part of the gametophyte or sporophyte generation?

3. What is the term used for small leaves with one vein?

4. What is the term used for specialized leaves that produce sporangia?

Station 15 – Division: Pterophyta (Psilophyta -Whisk Ferns)

This is the second division of seedless vascular plants recognized. The most primitive of the pterophyte plants, the whisk ferns, resemble extinct fossil forms of the Paleozoic. Be able to recognize the example seen in the jar (*Psilotum)*

1. What vascular characteristics do the plants in this division demonstrate? (Leaves, Stems, or Roots)

2. Is the plant part of the gametophyte or sporophyte generation?

Station 16 – Division: Pterophyta (Sphenophyta - Horse Tails)

The second seedless vascular plant recognized as a pterophyte is the horsetails. Be able to recognize the example in the jar and the living example (*Equisetum*)

1. What vascular characteristics do the plants in this division demonstrate? (Leaves, Stems, or Roots)

2. Is the plant part of the gametophyte or sporophyte generation?

3. What is the term used for small leaves with one vein? Do they contain chlorophyll at maturity?

4. What substance is found in the rough ribbed stem?

5. What is the name of the small cones produced at the tips of specialized stems?

Station 17 – Divison: Pterophyta (Ferns)

The third seedless vascular plant pterophyte recognized is the ferns. Be able to recognize the examples in the jar and the living example (*Polypodium, Salvinia*)

1. What vascular characteristics do the plants in this division demonstrate? (Leaves, Stems, or Roots)

2. Is the plant part of the gametophyte or sporophyte generation?

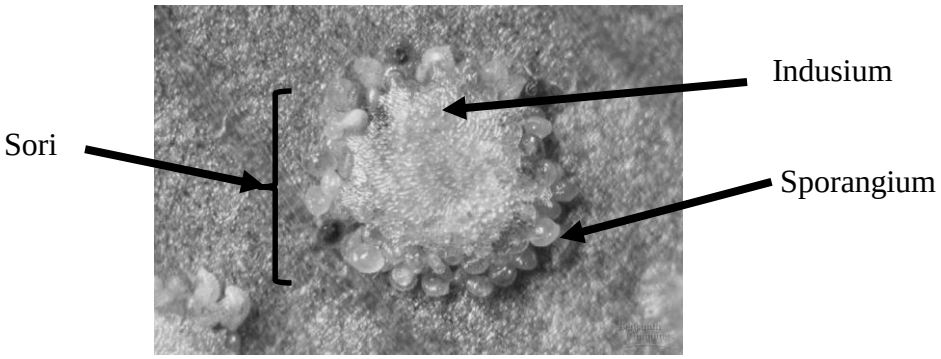
3. What is the term used for larger leaves with more than one vein? What is the common name of a fern leaf?

4. What is the name of the rolled up leaf? What is the name of the type of coiling?

5. What is the name of the specialized leaves that are used for reproduction?

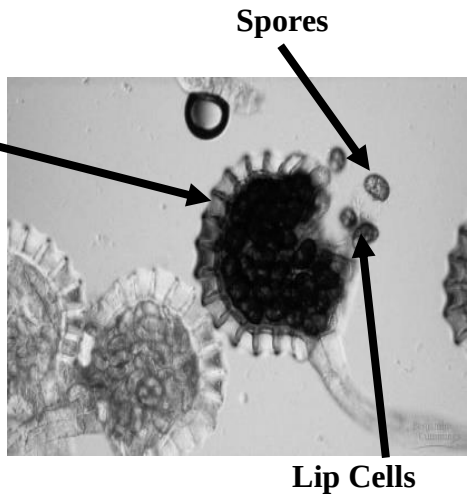
Station 18 – Fern Frond

Examine the back of a fern frond under a dissecting scope. You should be able to detect clusters of sporangium called sori. The sori **may** be covered with a protective covering called an **indusium**. Be able to identify the following structures: **frond, sori, sporangium, and indusium.**



Station 19 – Fern Sporangium

Examine a prepared slide of a sporangium under the microscope. Be able to recognize the following structures**: sporangium, annulus, lip cells, and spores.**

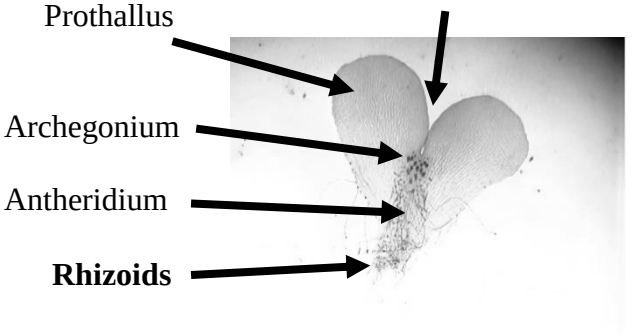


1. What is the name of the heavy walled brownish cells? What is their function?
2. What is the name of the cells that are at the open ends of the annulus?
3. Fern spores are all a single type but develop into a gametophyte with both sex organs (archegonium and antheridium). What is the term used for this condition?
4. Fern spores are wind disseminated and germinate after being transported to suitably moist habitats. What do they give rise to?

Station 20 - The Gametophyte Generation of a Fern

The gametophyte generation of a fern a heart-shaped prothallus. Under a dissecting scope, Locate the antheridia, which are usually interspersed among the rhizoids. Locate the archegonia, which are usually located by the apical notch. Be able to recognize the following structures: **prothallus, apical notch, archegonia, antheridia, and rhizoids.**

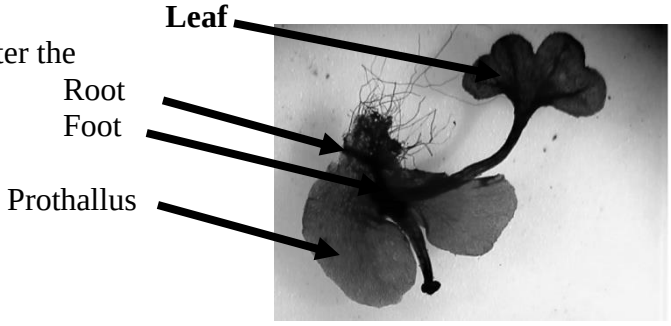
1. What do the antheridia produce? What do the archegonia produce?
2. What is the function of the rhizoids?
3. What eventually grows out of the archegonia?



Station 21 – Prothallus with a growing Sporophyte

Under a dissecting scope, study a prepared slide of a prothallus with a growing sporophyte. Be able to recognize the following structures: **prothallus, foot**, **root, and leaf. (P 100, Fig. 6.94 & 6.96)**

1. What happens to the gametophyte prothallus after the sporophyte begins to grow?



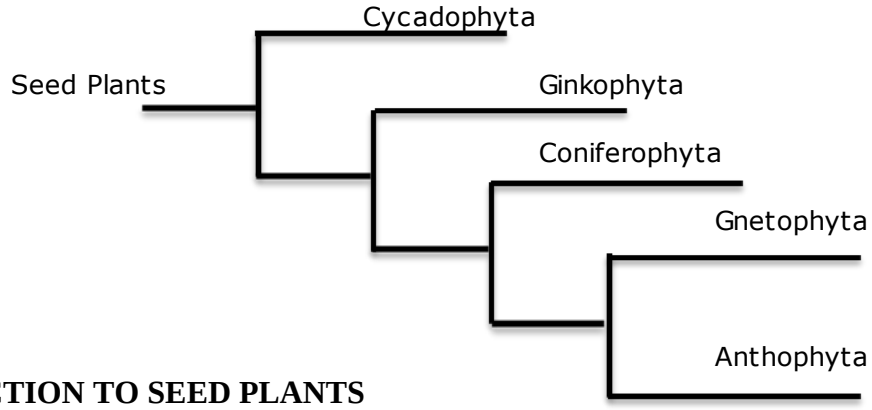
SEED PLANTS

CLASSIFICATION:

Domain: Eukarya

Kingdom: Virdiplantae

Vascular Seed Plants (Gymnosperms)	
Division: Coniferophyta	Conifers
Division: Cycadophyta	Cycads
Division: Ginkgophyta	Ginkgo
Division: Gnetophyta	Mormon Tea
Vascular Seed Plants (Angiosperms)	
Division: Anthophyta	Flowering Plants
Class: Dicotyledonae	Dicots
Class: Monocotyledonae	Monocots



INTRODUCTION TO SEED PLANTS

The vascular plants possess true conducting tissue consisting of **xylem and phloem**. They are said to possess true leaves, roots and stems. The also possess supporting tissue for more upright growth, stomata (small pores) for the exchange of gases, and a protective layer of **cutin** which forms a cuticle. These characteristics allow vascular plants to get large in size. Vascular plants also begin to remove themselves from moist environments because they need less or no water for reproduction.

In ferns, a single spore can germinate in the soil to form a gametophyte. Sexual reproduction follows and soon the organism is established. In Gymnosperms (naked seed) and Angiosperms (covered vessels), the spores cannot be agents of dispersal. The sporophyte is heterosporous producing two different types of spores (microspores and megaspores). The microspores, produced in microsporangia, will develop into male gametophytes (pollen). The megaspores, produced in megasporangia are located within ovules. In the Gymnosperms, the sporangia are located in cones. In the Angiosperms, the sporangia are located in flowers.

Station 22 – Seed Plants

1. What characteristics are specific to seed plants?

2. What adaptations enabled plants to move onto land?

3. When did the show up in the fossil record?

Station 23 – Division: Cycadophyta (Sago Palm)

The word Gymnosperm means "naked seed" and refers to the fact that the seeds are exposed on the surface of the upper surface of the female sporophyll (bract). There are four divisions of extanct gymnosperms. The first gymnosperm division recognized is the Sago Palms. Be able to recognize the living example (*Cycas*)

1. What is first seen in the trunk of this plant in evolutionary time?

Station 24 – Division: Ginkgophyta (Ginkgos)

The second gymnosperm division recognized is the *Ginkgo* or Maidenhair Tree. Be able to recognize the example in the jar (*Ginkgo biloba*)

1. Why are only male plants usually planted in this country?

2. Where do they originally come from?

Station 25 - Division: Gnetophyta (Mormon Tea)

The third gymnosperm division recognized is the gnetophytes. Be able to recognize the example in the jar (*Ephedra*)

1. What drug does this plant produce? What are the effects of this drug?

2. What vascular structure do these plants have?

Station 26 – Division: Coniferophyta (Pine trees)

The fourth gymnosperm division recognized is the conifers. Be able to recognize the examples in the jars (*Pinus, Larix*)

1. Study the male and female pinecones found in class. Be sure you can tell the difference between a male (staminate) cone and a female (ovulate) cone.

2. What kind of spore does the male cone produce?

3. What kind of spore does the female cone produce?

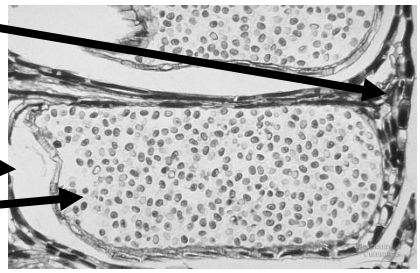
4. Where on the tree is the male cone located?

5. Where on the tree is the female cone located?

Station 27 – Male Cone

Study the longitudinal cross section (LS) slides of a pine staminate cone. Observe slides of both the young and mature cones.

1. Be able to recognize the following structures: **microsporophyll, microsporangia, and pollen (microspores).**

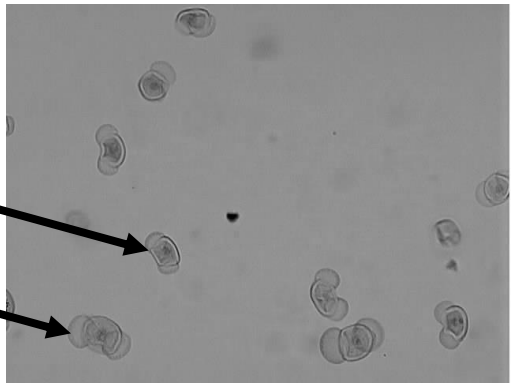


2. What type of cell division produces the pollen?

Station 28 – Pollen Grain

Study the slide of a mature pollen grain.

1. Be able to recognize the following structures: **pollen grain and the wings.**

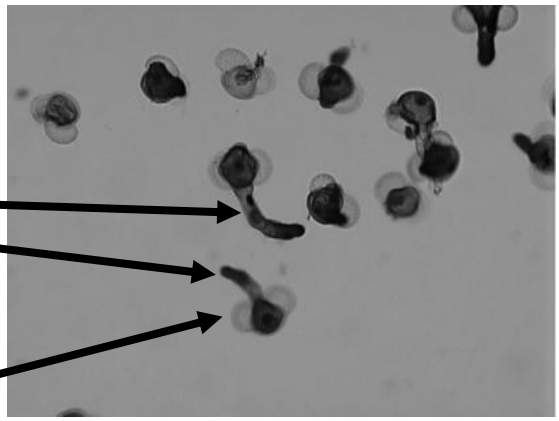


2. What function does the "wings" serve?

Station 29 – Pine Pollen Tube

Study the slide of the pine pollen tubes. These are the male gametophytes.

1. Be able to recognize the following structures: **sperm cell, pollen tube, and wings.**

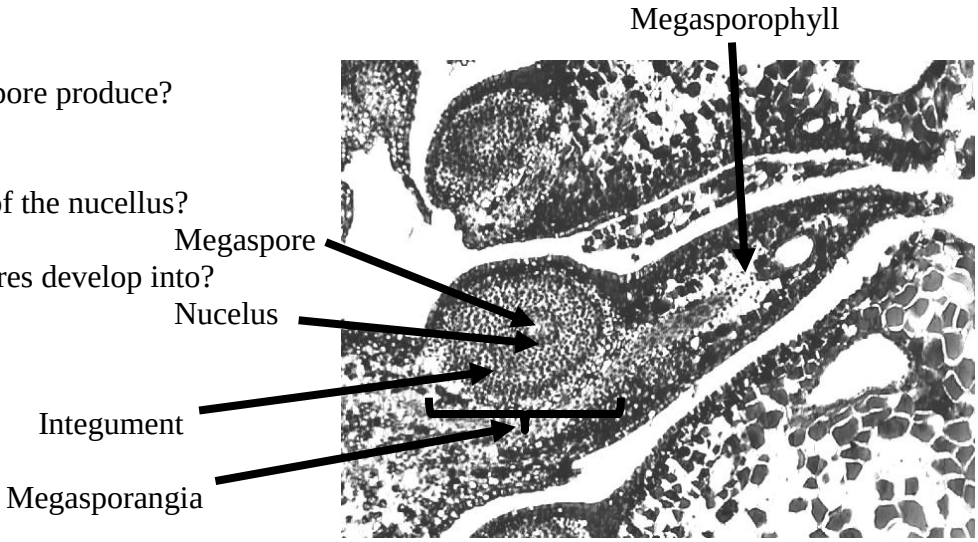


2. What actual cell produces the 2 sperm cells?

Station 30 – Female Cone

Study the longitudinal cross section (LS) of the ovulate cone. . Observe slides of the young ovulate cone cell sections.

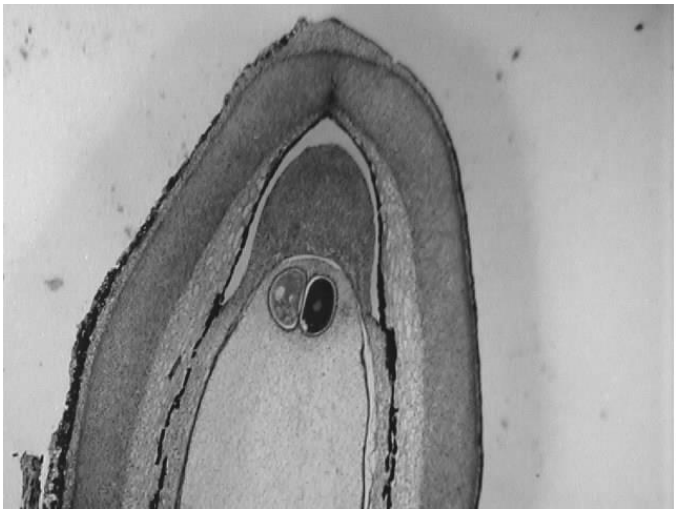
1. Be able to recognize the following structures**: megasporophyll, the ovule (megasporangia), the megaspore, the nucellus, and the integument.**
2. What does the megaspore produce?
3. What is the function of the nucellus?
4. What do the megaspores develop into?

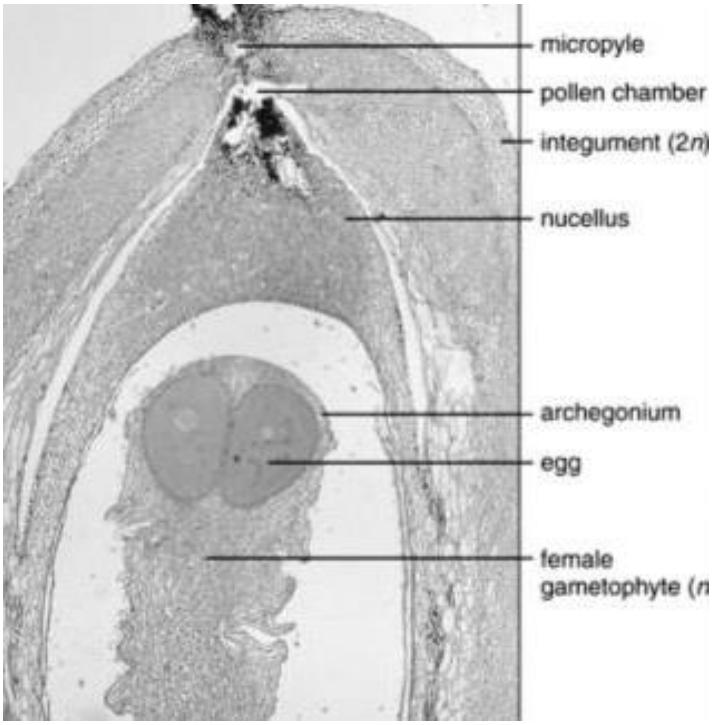


Station 31 – Pine Ovule within a Mature Archegonium

Study a slide of a pine ovule with a mature archegonium under a dissecting scope. Be able to recognize the following structures: **the archegonium, the female gametophyte, the eggs, the nucellus, the integument, the pollen chamber, and the micropyle.**

1. Which structures are haploid?
2. Which structures are diploid?





Station 32 – Female Cone with an Embryo

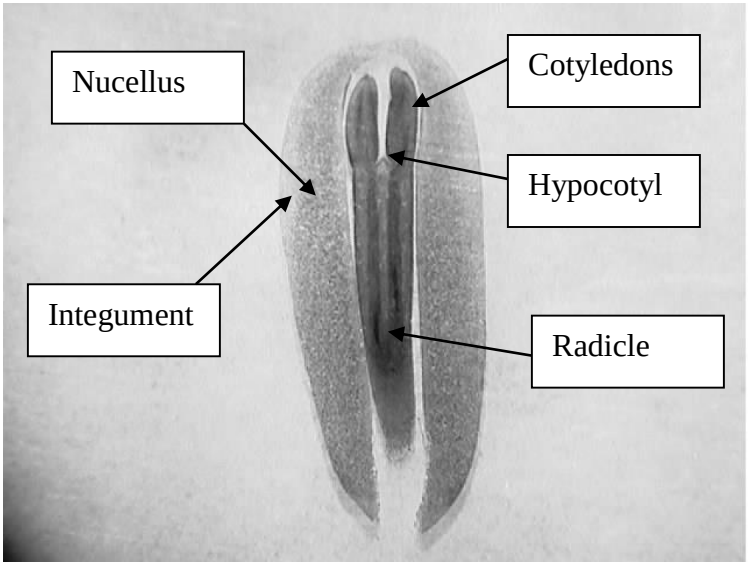
Study the pine embryo slide and the seed of a pine. Be able to identify the following structures on the slide: **the integument, the nucellus, the cotyledons, the hypocotyl, and the radicle.** Be able to recognize a pine seed.

1. What is the function of the nucellus?

2. What is the function of the cotyledons?

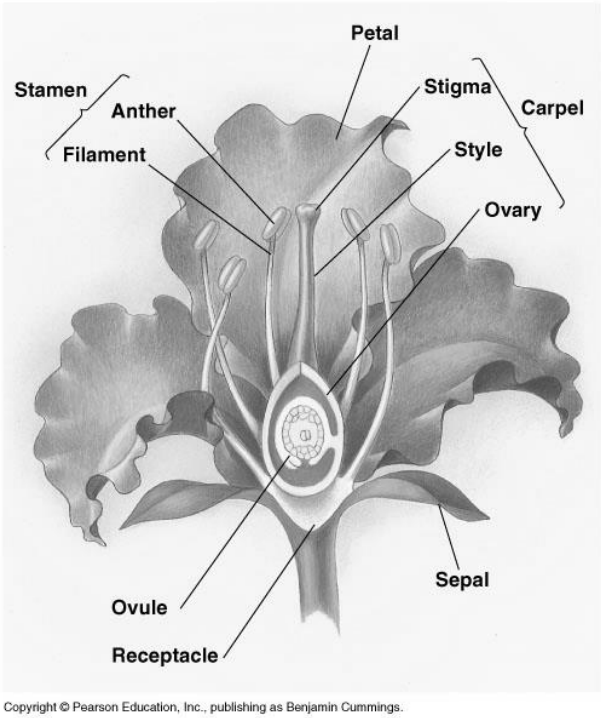
3. What does the hypocotyl develop into?

4. What does the radicle develop into?



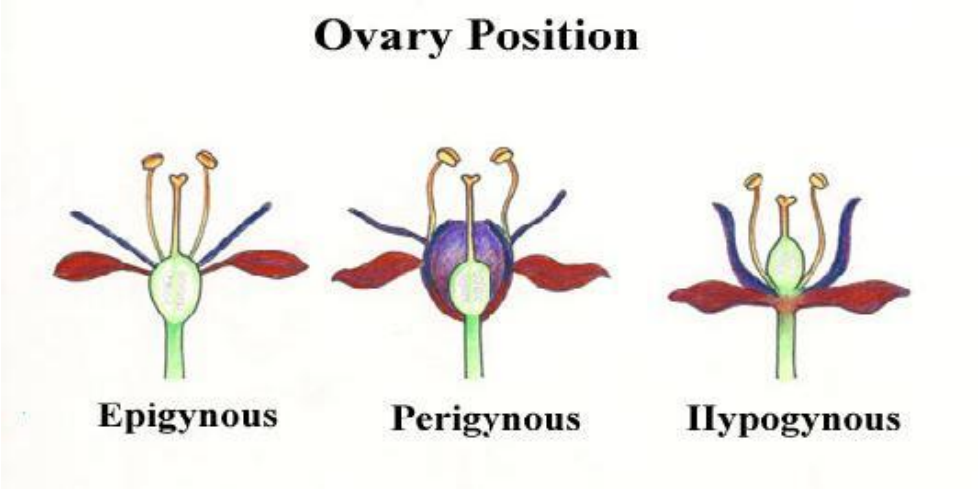
Station 33 – Angiosperm Flower

The word Angiosperm means, "enclosed seed" and refers to the fact that the seeds are enclosed within an ovary. The ovary contains an ovule, which is part of the flower. The ovary usually becomes the fruit and the ovule develops into the seeds. Examine the flowers that have been provided. Be sure you can identify the following structures and their functions: **receptacle, pedicel, ovary, ovule, sepal (calyx), petal (corolla), stamen, anther, filament, carpel (pistil), stigma, and style**.



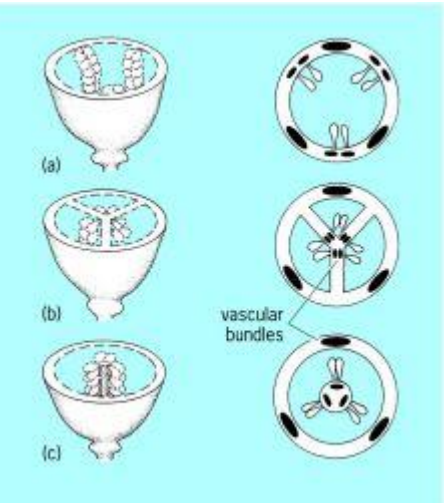
Station 34 – Ovary Position

The position of the ovary in flowering plants relative to their flower structure is one way some plants are identified. Be able to tell the difference between a **hypogynous, Perigynous and epigynous** ovary.



Station 35 – Placentation

Placentation refers to the arrangements of the seeds (ovules) in relationship to the ovary wall. There are three types of placentation **(Parietal, Axial, or Free Central).** Be able to recognize all three in a cross section of an ovary.



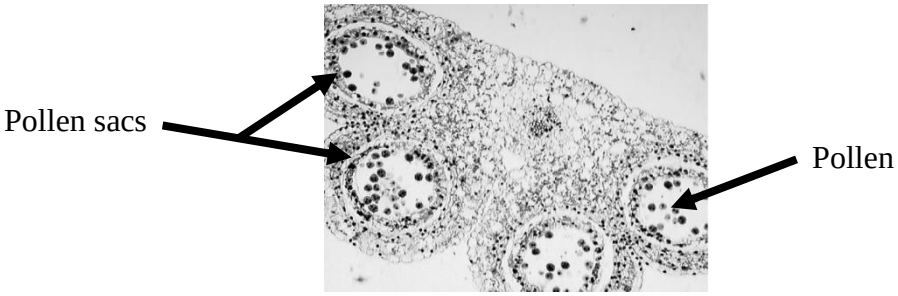
Parietal

Axile

Free-Central

Station 36 – Male Gametophyte

Study the slide of a *Lilium* anther tetrad. This shows a cross section (CS) of an anther. Be able to identify the following structures: **four pollen sacs with pollen**. The pollen tetrads will break apart to form individual pollen grains.



Station 37 – Fertilization

Plants have various mechanisms that prevent self-fertilization.

1. What is cross pollination?

2. What is the most common method to prevent flowers from pollinating themselves? How does it work?

Station 38 – Germinating Pollen

Study the slide of pollen germinating.

1. Be able to identify the following structures**: the pollen grain and pollen tube.**

2. What are the three nuclei that may be seen in a pollen tube?

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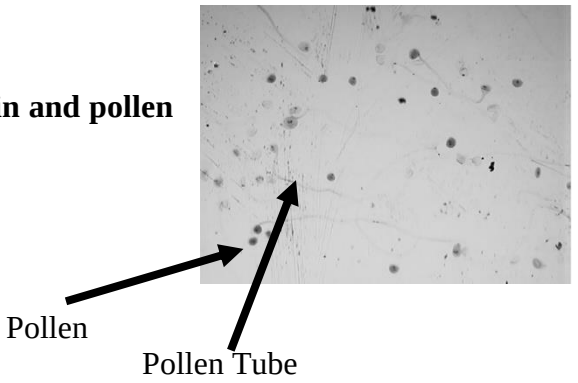
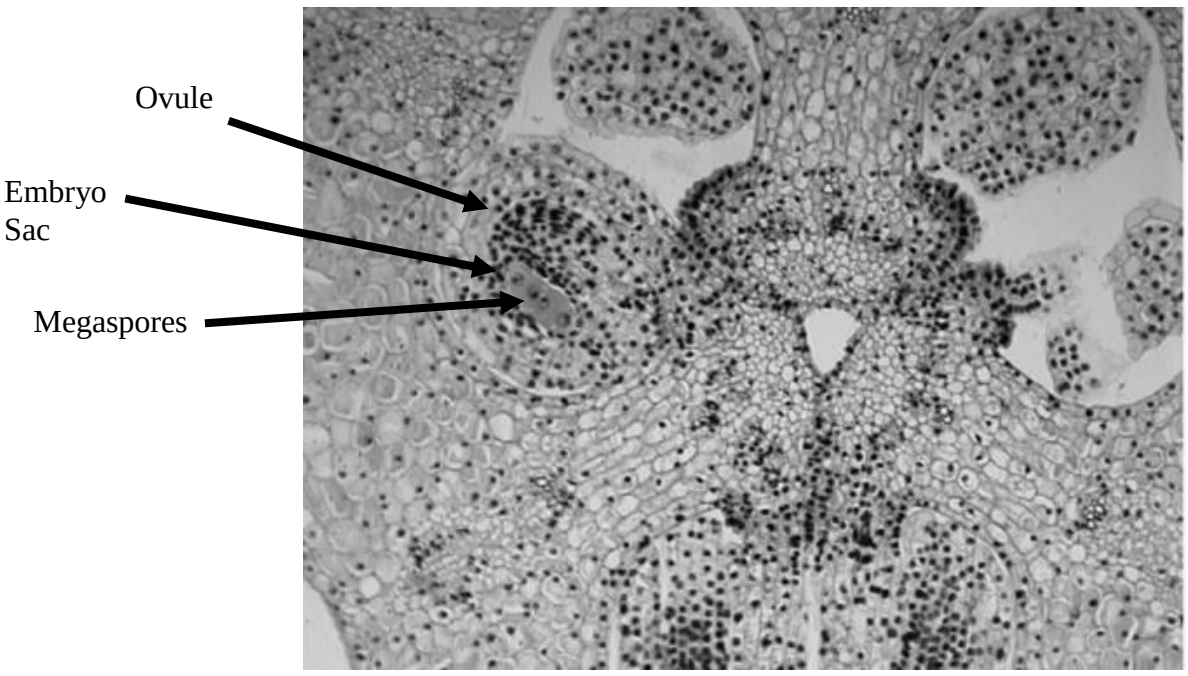


Station 39 – Female Gametophyte with the 4-nucleate Embryo Sac

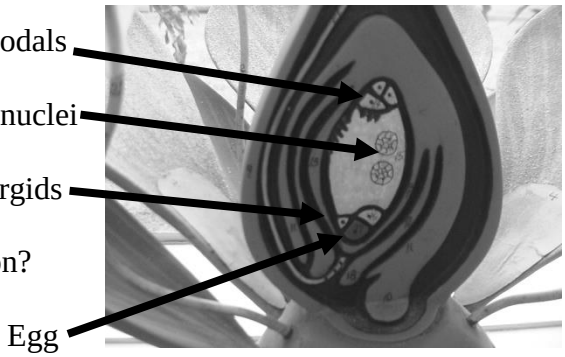
Study the slide of the *Fritillaria* 4-nucleate embryo sac. On the slide, there are 6 cross sections of the ovary. Locate an embryo sac showing the 4-nucleate stage. Be able to identify the following structures**: ovule, embryo sac, and the 4 megaspores (nuclei).**



Station 40 – Female Gametophyte with the 8-nucleate Embryo Sac

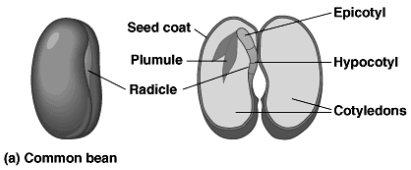
Study the flower model. Locate the embryo sac showing the 8-nucleate stage. Be able to identify the following structures: **ovary, ovary wall, embryo sac, antipodals, polar nuclei, synergids, egg, integument, and micropyle.**

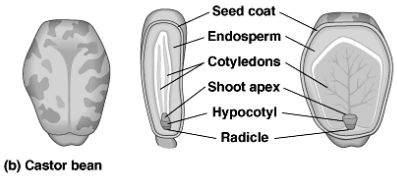
1. What happens to the antipodals after fertilization?
2. What happens to the polar nuclei after fertilization?
3. What happens to the synergids after fertilization?
4. Why is fertilization in flowering plants called double fertilization?



Station 41 – Seeds

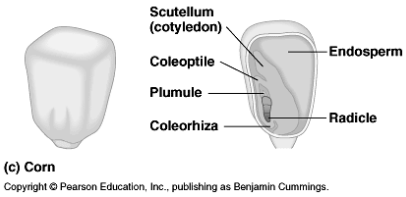
Be able to recognize the structures on a monocot (corn) and a dicot (Bean) seed diagram





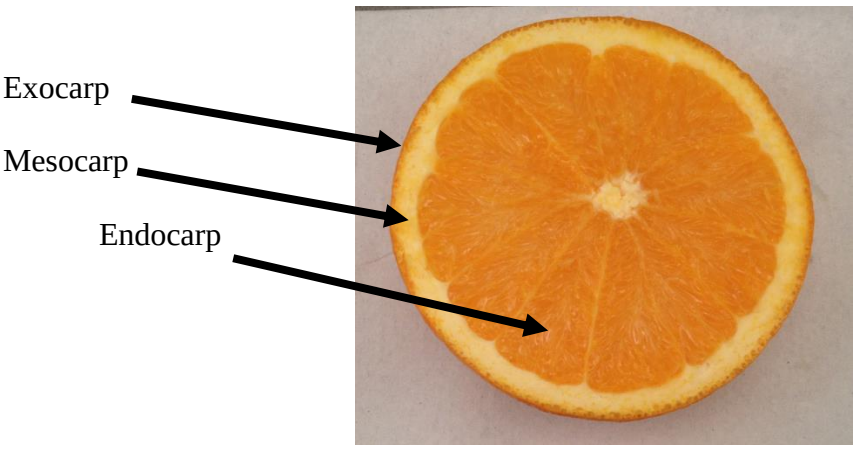
Station 42 – Fruit and Seed Dispersal

1. What are the different types of dispersal mechanisms?
2. What are the most efficient transporters of fruits and seeds?



Station 43 – Fruit Wall

The fruit wall, developed from the ovary wall, is called the pericarp. The pericarp consists of three layers: the **exocarp, the mesocarp, and the endocarp**. Be able to identify these structures on an orange.



Station 44 – Fruits: Be able to identify the fruit shown in class.

FRUIT TYPES	CATEGORIES	NAMES
Fleshy Fruits	Simple	**Drupe**: fleshy fruit with a single seed enclosed by a hard, stony endocarp (pit) Examples: Olives, Almonds, Coconuts
		True Berry: fleshy fruit with a thin skin and a pericarp which is soft at maturity Examples: Tomatoes, Bell Pepper, Grapes, Bananas
		Pepos: fleshy fruit with a relatively thick rind Examples: Cucumbers, Zucchinis
		Hesperidium: fleshy fruit with a leathery skin containing oils with the ovary wall becoming saclike and swollen with juice. Examples: Oranges
		Pome: fleshy fruit with the bulk of the flesh coming from an enlarged receptacle that grows around the ovary. The endocarp around the seeds is papery or leathery Examples: Apples
	Aggregate	Fleshy fruit derived from a single flower with several carpels. Examples: Strawberries
	Multiple	Fleshy fruit derived from several flowers in a single inflorescence Examples: Pineapples
Dry Fruits	Split at Maturity	**Follicle**: dry fruit that splits along one side or seam only. Examples: Milkweeds, Magnolias
		Legume: dry fruit that splits along two sides or seams. Examples: Peanuts, Peas, Beans
		Silique: dry fruit that splits along two sides or seams but the seeds are borne on a central partition. Examples: Mustards
		Capsule: dry fruit that consists of at least two carpels and splits in a variety of ways. Examples: Irises, Snapdragons
	Not Split at Maturity	**Achene**: dry fruit with a single seed, which is attached to its surrounding pericarp only at its base. Examples: Sunflower Seeds, Dandelions
		Nuts: dry fruit with a single seed, which is large and the pericarp is hard and thick. Examples: Walnuts, Acorns, Brazil Nuts
		Grain: dry fruit with the seed tightly united with the pericarp and cannot be separated from it. Examples: Corn, Grasses
		Samara: dry fruit with the pericarp surrounding the seed extending out in the form of a wing or membrane, which aids in maples. Examples: Maple, Ashes
		Schizocarp: dry fruit, which is derived from a compound ovary but splits at maturity into two or more one-seeded portions. Examples: Parsley family

PLANT STRUCTURE AND PHYSIOLOGY

INTRODUCTION

A plant's root and shoot systems are evolutionary adaptations to living on land. Roots, stems and leaves are three structures that are associated with higher vascular plants. The purpose of this lab will be to acquaint you with the composition of these structures. Be sure you are able to distinguish between a root and stem. You should know the tissues they have in common and the tissues unique to each structure. You will be asked to recognize the difference between a monocotyledon and a dicotyledon stem. You will also be asked to recognize the difference between a normal leaf and a leaf from a conifer.

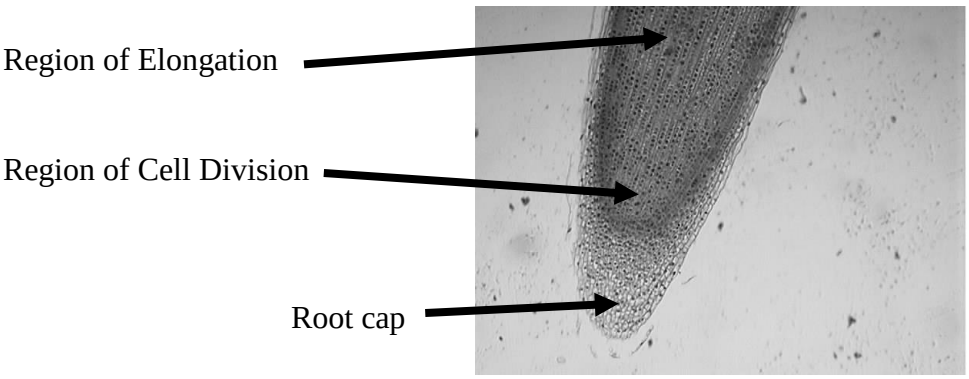
Station 1 – The Root

Botanists have traditionally recognized four regions or zones in developing young roots. Observe the end of a root tip of an onion (*Allium*) in longitudinal section (LS) and identify the four regions: **the root cap, the apical meristem, the region of elongation, and the region of maturation**. You will also be held responsible for each region's function.

1. What are the functions of a root?

2. Fill out the following table.

ROOT TIP REGIONS	STRUCTURE	FUNCTION
Root Cap	Made up of dead parenchyma cells that last for less than a week	
Apical Meristem	Embryonic plant tissue	
Region of Elongation	Elongated and wider cells	
Region of Maturation	Differentiated cells with root hairs	

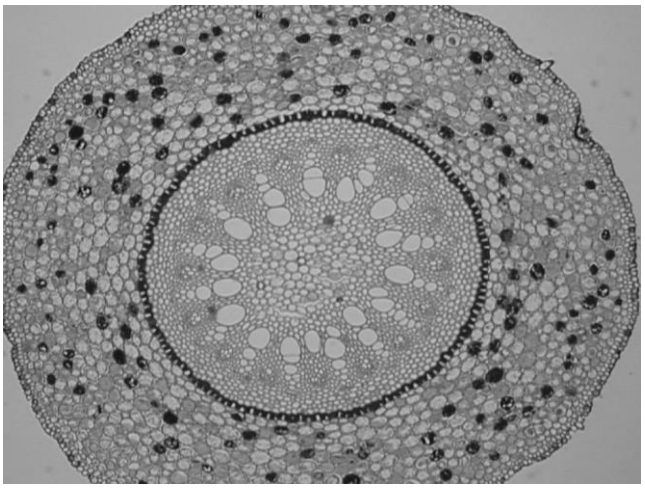


Root Tip of *Allium* (LS)

Station 2 – The Tissues of a Young Monocot Root

Observe the cross section (XS) of a monocotyledon root from the corn plant *Zea* **Root.** You will be held responsible for the following tissues: **Epidermis, stele, xylem, phloem, pericycle, cortex, endodermis, and passage cells**. You also need to know their function.

1. What are the three types of meristem origins?

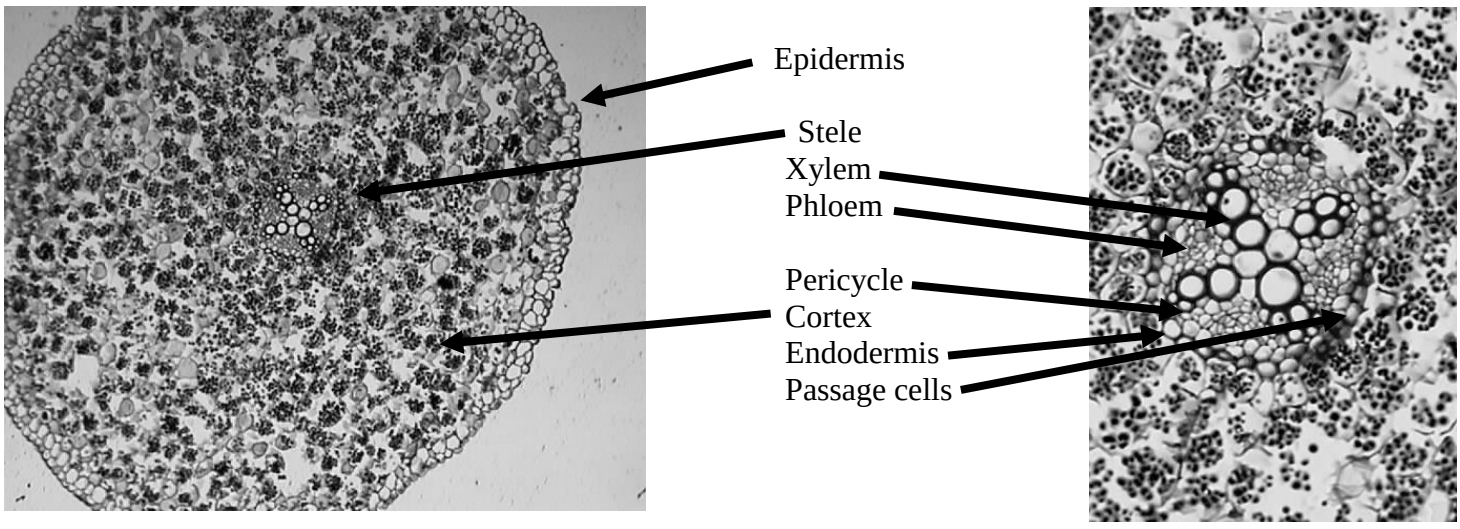


2. Fill out the following table.

TISSUE	LOCATION	MERISTEM ORIGIN	FUNCTION
Epidermis	Single layer of cells around the outside of root		
Stele	Central cylinder of tissue made up of primary xylem, phloem, pith, and pericycle		Xylem: Phloem: Pericycle:
Cortex	Parenchyma cells found between the stele and the epidermis with passage cells		Cortex: Endodermis: Passage cells:

Station 3 - The Tissues of a Young Dicot Root

Observe the cross section (XS) of a dicotyledon root from the buttercup *Ranunculus*. ***(Ranunculus* Root)** Be able to recognize the difference between a monocot and a dicot root. You will be held responsible for the following tissues: **Epidermis, stele (xylem, phloem), pericycle, cortex, endodermis, and passage cells**. You also need to know their function.

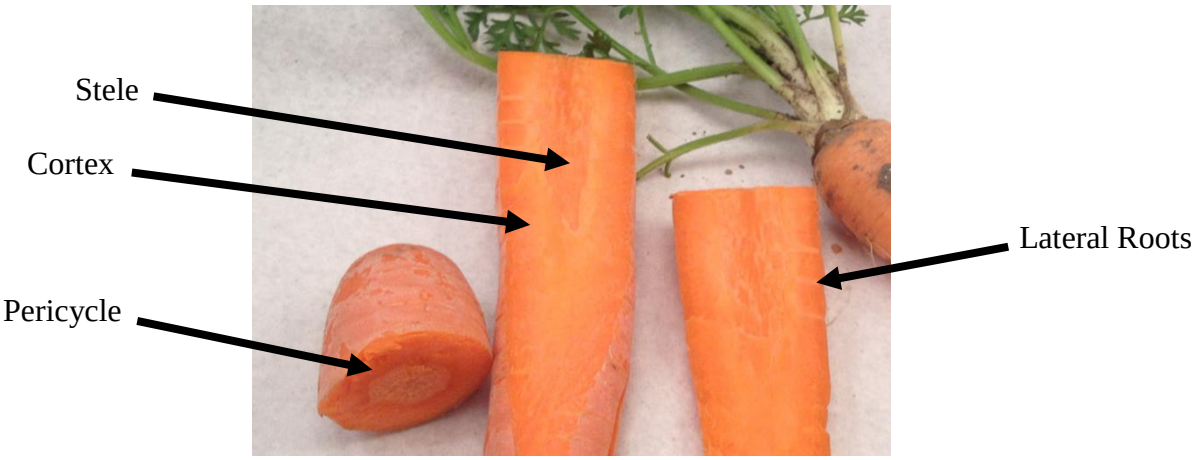


1. Fill out the following table.

TISSUE	LOCATION	MERISTEM ORIGIN	FUNCTION
Epidermis	Single layer of cells around the outside of root		
Stele	Central cylinder of tissue made up of primary xylem, phloem, pith, and pericycle		Xylem: Phloem: Pericycle:
Cortex	Parenchyma cells found between the stele and the epidermis with passage cells		Cortex: Endodermis: Passage cells:

Station 4 – Carrot

Look at the longitudinal and cross sections of a carrot (Daucus) root and identify the following structures: **cortex, stele, pericycle and lateral (secondary) roots**.



Carrot (CS) **Carrot (LS)**

Station 5 - Root Hairs

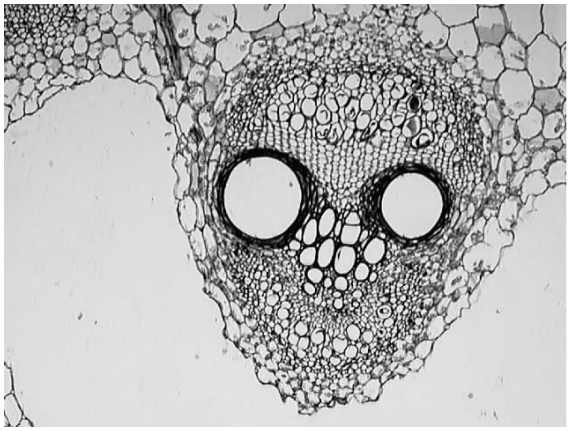
1. What is the function of the root hairs?

2. What cells produce root hairs?

3. How do they accomplish these functions?

4. What conditions should the soil have for optimum growth?

Station 6 – Vascular Bundles



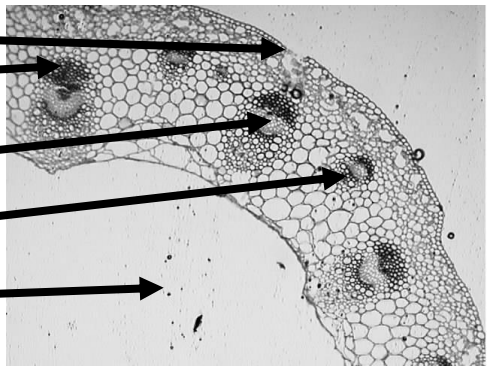
1. What two tissues make up vascular bundles?

2. Which direction does xylem usually face?

3. Which direction does phloem usually face?

Station 7 - Herbaceous Dicot Stems

Stems of herbaceous plants vary in the extent to which secondary tissues are present. In most herbaceous monocots and many dicots, there is only primary tissue. Look at a prepared slide of a cross section (CS) of the herbaceous dicot *Ranunculus*. Identify the following structures**: Vascular bundles, pith, epidermis, fibers, phloem, and xylem**. Be sure to notice the differences in this cross section and that of the root.



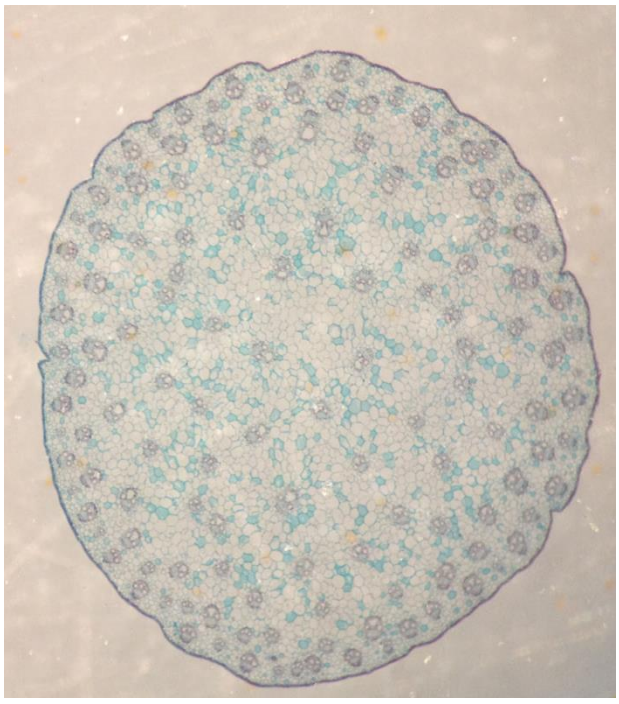
1. How are the vascular bundles arranged?

2. How does it differ from the dicot root structure?

3. What is the function of the fibers?

Station 8 - Herbaceous Monocot Stem

The tissue arrangement in monocots differs from that of the dicots. Look at a prepared slide of a cross section (CS) of the herbaceous monocot *Zea* (Corn). Be able to label the diagram and recognize the difference between a herbaceous monocot and herbaceous dicot stem.



1. How does a herbaceous monocot stem differ from a herbaceous dicot stem?

2. Do monocot stems have a pith?

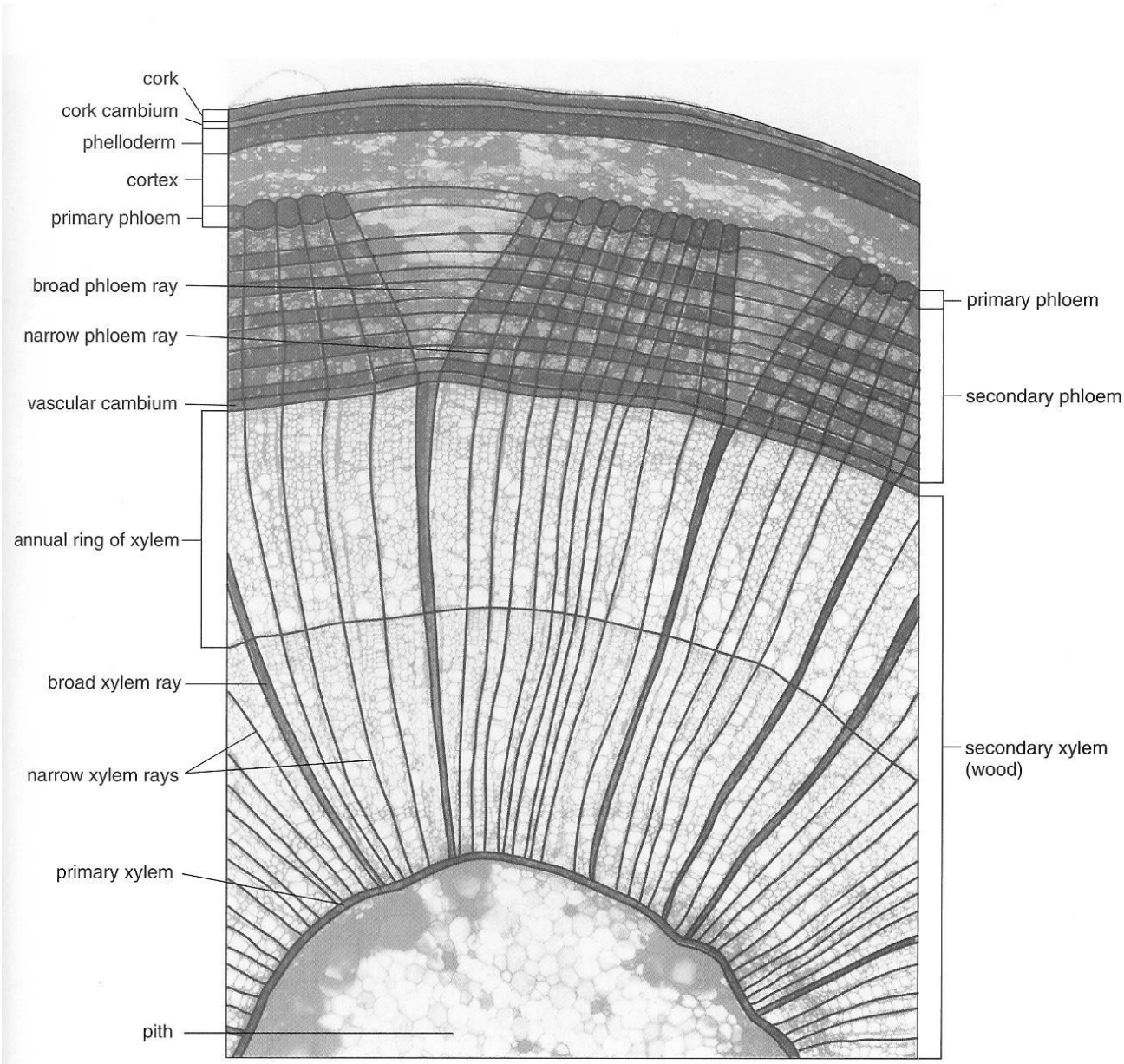
Station 9 – Woody Dicot Stems

1. What is secondary growth?

2. What two tissues produce secondary growth?

3. Fill out the following table.

TISSUE	**Function**
Pith	
Primary Xylem	
Secondary Xylem	
Vascular Cambium	
Secondary Phloem	
Primary Phloem	
Cortex	
Phelloderm	
Cork Cambium	
Cork Cells	



gure 6.6 Continued

Station 10 – Age of a Woody Dicot

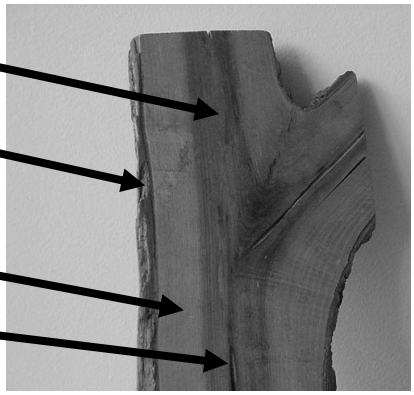
You will be expected to tell the year of a slide by counting the annual rings. You also will be asked the age of particular rings. The oldest xylem is that farthest away from the vascular cambium. The youngest xylem is that right next to the vascular cambium.

***Tilia* (CS) – 1 year** ***Tilia* (CS) – 2 year** ***Tilia* (CS) – 3 year**

Station 11 - Tissues of a Tree Trunk

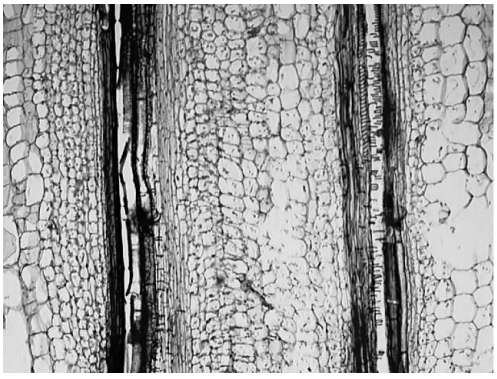
Be able to recognize the following structures: **bark, cambium, wood (sapwood and heartwood), pith (which may be missing), vascular rays and annual rings**.

1. What is heartwood and what is its function?
2. What is sapwood and what is its function?



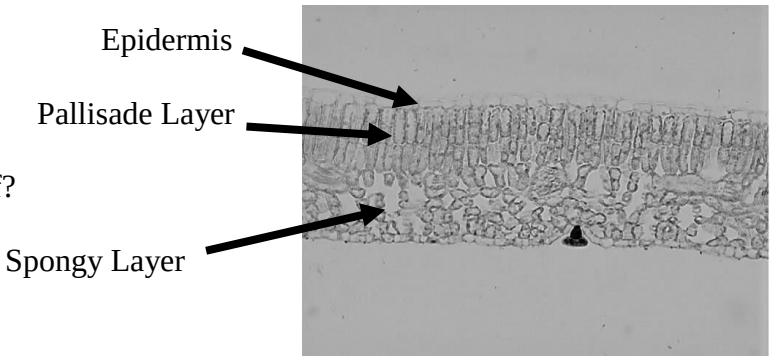
Station 12 - Spiral Xylem Vessels

1. What type of xylem cells do conifers have?
2. What is the common name of the wood that comes from conifers?
3. What type of xylem cells do woody dicots have?
4. What is the common name of the wood that comes from woody dicots?



5. What is the function of spiral vessel elements?

Station 13 – The Leaf *Ligustrum* (CS)



1. What is the function of the leaves?

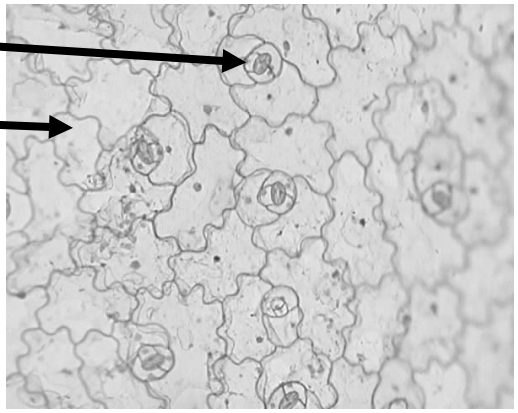
2. What are the three major regions of a leaf?

3. Fill in the following table.

REGION	STRUCTURE	Function
Epidermis	Cuticle	
	Upper Epidermal Cells	
	Lower Epidermal Cells	
	Guard Cells	
	Stomates	
Mesophyll	Pallisade Layer	
	Spongy Layer	
Veins	Vascular bundles	

Station 14 - Lower Epidermis

Look at the prepared slide of the lower epidermis (*Sedum* – CS). Be able to recognize the following structures: **guard cell, stomate, lower epidermal cells.**



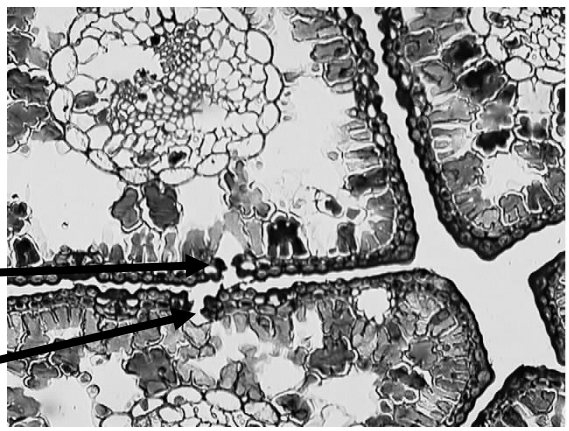
1. What regulates the guard cells?

2. What is occurring in the guard cells when the stomates are closed?

3. What is occurring in the guard cells when the stomates are open?

Station 15 -Pine Needles

Observe a cross section (CS) of a pine needle and be able to recognize the following structures: **guard cells, stomates**.



1. Why are pine needles shaped this way?

2. What adaptation do they have to minimize water loss?

Station 16 – Minerals and Plant Nutrition

Plants need macronutrients like nitrogen (N), phosphorous (P), and potassium (K). Observe the following plants and observe the effects of missing nutrients.

1. What causes the following symptoms?

   Chlorosis (yellowing of leaves) –

   Deep green or purple pigmentation –

   Stunted growth –

   Necrosis (death of plant tissue) –

Station 17 – Carnivorous Plants

Fill out the following Table.

	Distribution	Capture and Type of Prey	Nutrition Need
Pitcher Plant			
Sundew			
Venus Fly Trap			

Station 18 – Gibberellins and Seed Germination

1. Which seed germinates quicker? (treated seeds or the control)

2. What does this promote?

Station 19 - Gibberellins and Stem Growth

1. Which plant grows quicker? (treated plants or the control)

2. What does this promote? Describe an area where this can be a benefit.

3. Is this always an advantage?

Station 20 – Phototropism

1. What part of the plant detects the light?

2. What part of the plant actually has the bending response?

3. What hormone is thought to be responsible for the bending response?

4. What is actually happening at the cellular level to cause this bending response?

Station 21 – Gravitropism

1. Does the shoot represent positive or negative gravitropism?

2. How do plants tell up from down?

3. What hormone is thought to be responsible for the bending response?

4. What is actually happening at the cellular level to cause this bending response?

Station 22 – Rapid Leaf Movement

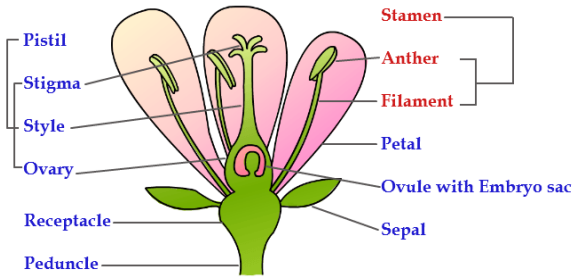
1. What is the name of the specialized cells that allow for this movement?

2. What reason do plants do this?

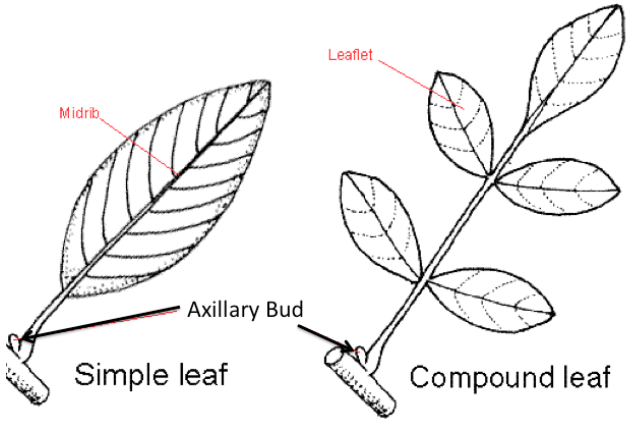
Bio 2 Lab – Plant Families
Greenhouse (Building 60)

For this section, you are responsible for knowing the following: The plant structures and features listed on this handout. The scientific and common names for each plant family. The leaf, flower, and other characteristics of each family. The approximate number of species in each family (rounded to the nearest 1000). The rank in terms of number of species.

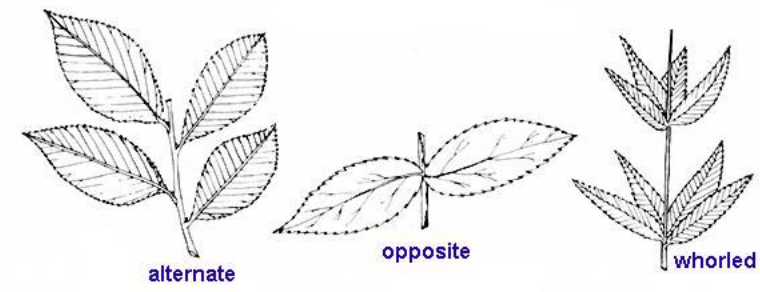
Station 1 - Plant Structures – Flowers. Review the parts of a flower from the previous lab.



Station 2 – Simple vs. Compound Leaves. Review the difference between simple and compound leaves. Note the position of the axillary bud.

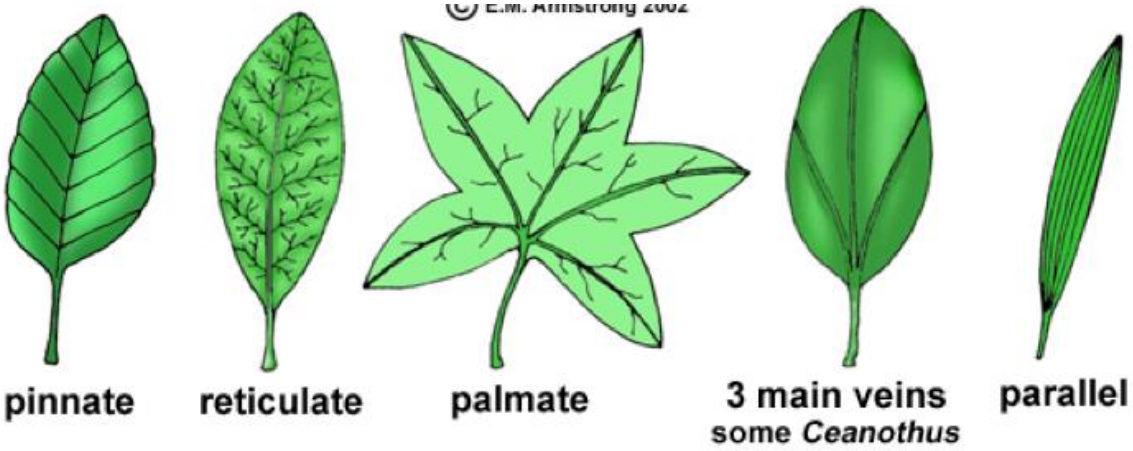


Station 3 - Plant structures – Leave arrangements. Review the difference between alternate, opposite, and whorled leaves.

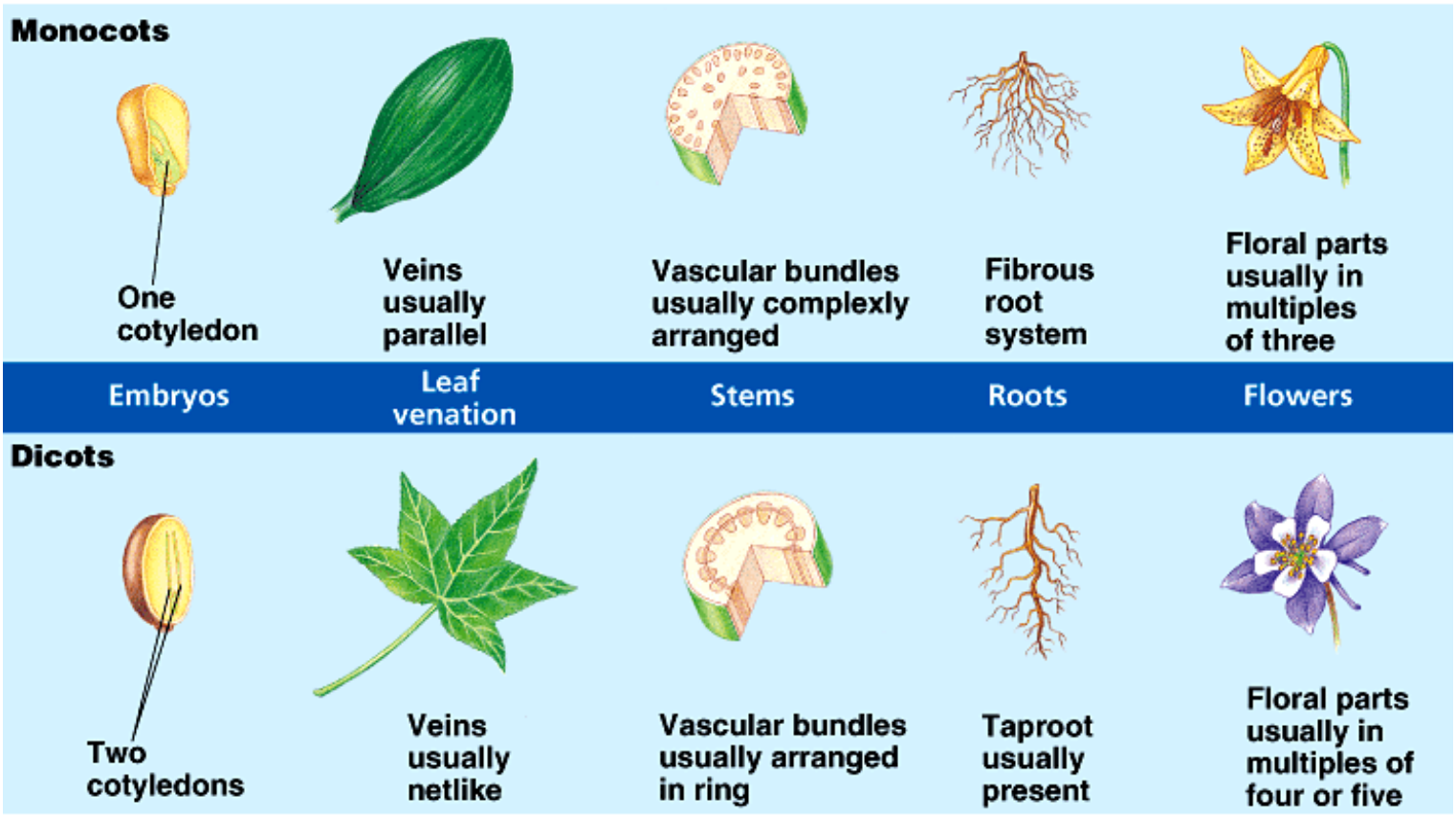


Note: The largest 6 families are represented in this collection as well as some medium-sized families. Some families, although large in size are not able to survive in our greenhouse and therefore not represented.

Station 4 - Plant structures – Leaf Venation. Review the different types of leaf venation.



Station 5 - Plant structures – Monocotyledons vs. Dicotyledons. Review the differences between monocots and dicots.



Station 6 – Asteraceae (Composite Family)

1) How many species are in this family? _____

2) Based on number of species, this family is ranked? _____

3) What type of leaves do these plants have?

4) What are the characteristics of the flowers of these plants?

5) Are these plants Dicots or Monocots?

Station 7 – Orchidaceae (Orchid Family)

1) How many species are in this family? _____

2) Based on number of species, this family is ranked? _____

3) What type of leaves do these plants have?

4) What are the characteristics of the flowers of these plants?

5) Are these plants Dicots or Monocots?

Station 8 – Fabaceae (Pea Family)

1) How many species are in this family? _____

2) Based on number of species, this family is ranked? _____

3) What type of leaves do these plants have?

4) What are the characteristics of the flowers of these plants?

5) Are these plants Dicots or Monocots?

Station 9 – Rubiaceae (Coffee or Madder Family)

1) How many species are in this family? _____

2) Based on number of species, this family is ranked? _____

3) What type of leaves do these plants have?

4) What are the characteristics of the flowers of these plants?

5) Are these plants Dicots or Monocots?

Station 10 – Poaceae (Grass Family)

1) How many species are in this family? _____

2) Based on number of species, this family is ranked? _____

3) What type of leaves do these plants have?

4) What are the characteristics of the flowers of these plants?

5) Are these plants Dicots or Monocots?

Station 11 – Lamiaceae (Mint Family)

1) How many species are in this family? _____

2) Based on number of species, this family is ranked? _____

3) What type of leaves do these plants have?

4) What are the characteristics of the flowers of these plants?

5) Are these plants Dicots or Monocots?

Station 12 – Apocynaceae (Dog Bane Family)

1) How many species are in this family? _____

2) Based on number of species, this family is ranked? _____

3) What type of leaves do these plants have?

4) What are the characteristics of the flowers of these plants?

5) Are these plants Dicots or Monocots?

Station 13 – Xanthorrhoeaceae (Aloe Family)

1) How many species are in this family? _____

2) Based on number of species, this family is ranked? _____

3) What type of leaves do these plants have?

4) What are the characteristics of the flowers of these plants?

5) Are these plants Dicots or Monocots?

Station 14 – Bromeliaceae (Bromeliad Family)

1) How many species are in this family? _____

2) Based on number of species, this family is ranked? _____

3) What type of leaves do these plants have?

4) What are the characteristics of the flowers of these plants?

5) Are these plants Dicots or Monocots?

Station 15 – Cactaceae (Cactus Family)

1) How many species are in this family? _____

2) Based on number of species, this family is ranked? _____

3) What is unique about the “leaves” and “stems” of a cactus?

4) What are the characteristics of the flowers of these plants?

5) Are these plants Dicots or Monocots?

Station 16 – Euphorbiaceae (Spurge Family)

1) How many species are in this family? _____

2) Based on number of species, this family is ranked? _____

3) What type of leaves do these plants have?

4) What are the characteristics of the flowers of these plants?

5) Are these plants Dicots or Monocots?

Station 17 – Crassulaceae (Stonecrop Family)

1) How many species are in this family? _____

2) Based on number of species, this family is ranked? _____

3) What type of leaves do these plants have?

4) What are the characteristics of the flowers of these plants?

5) Are these plants Dicots or Monocots?