Plant Propagation Lab Exercise
Module 2

UF | UNIVERSITY of FLORIDA

PROPAGATION OF SPORE BEARING PLANTS
FERNS

An introduction to plant propagation laboratory exercises by:
Gabriel Campbell-Martinez and Dr. Mack Thetford

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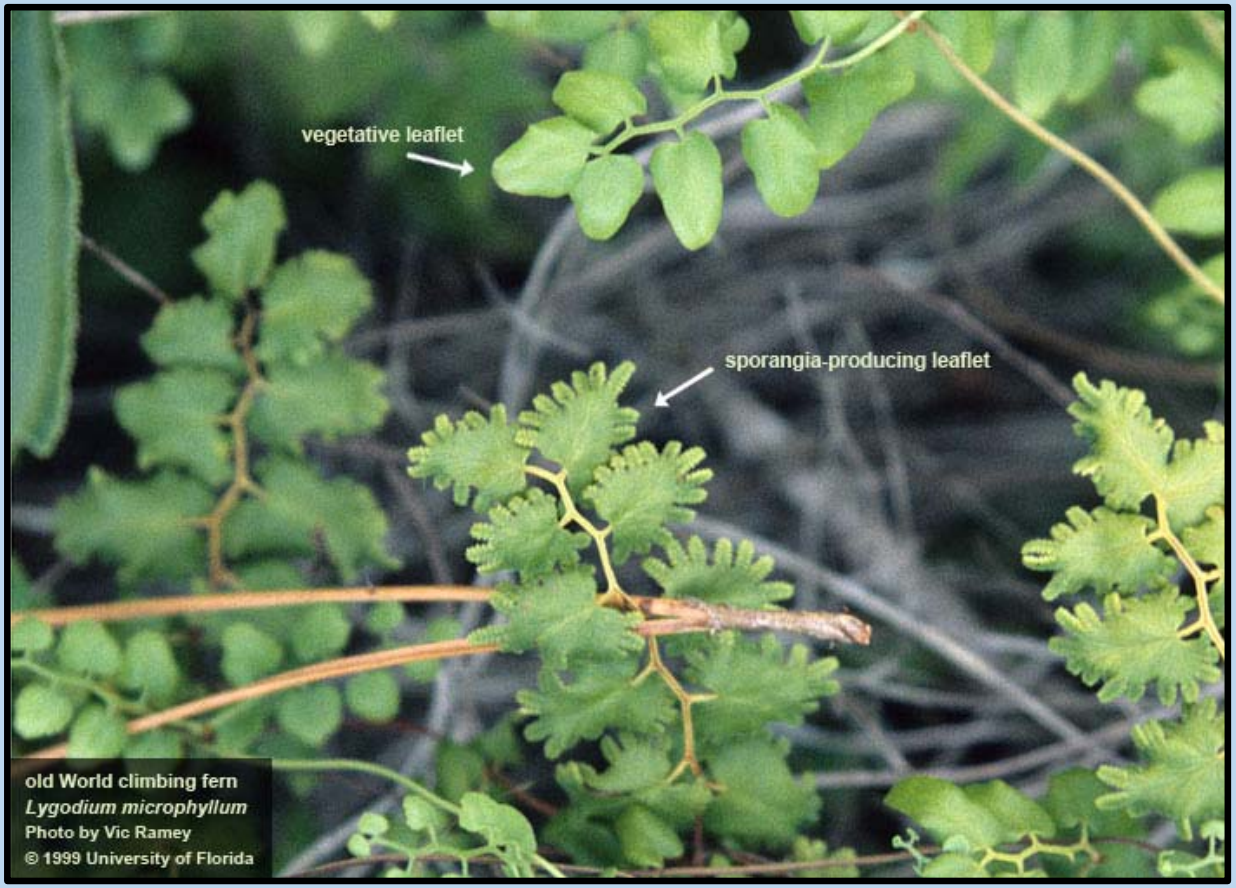
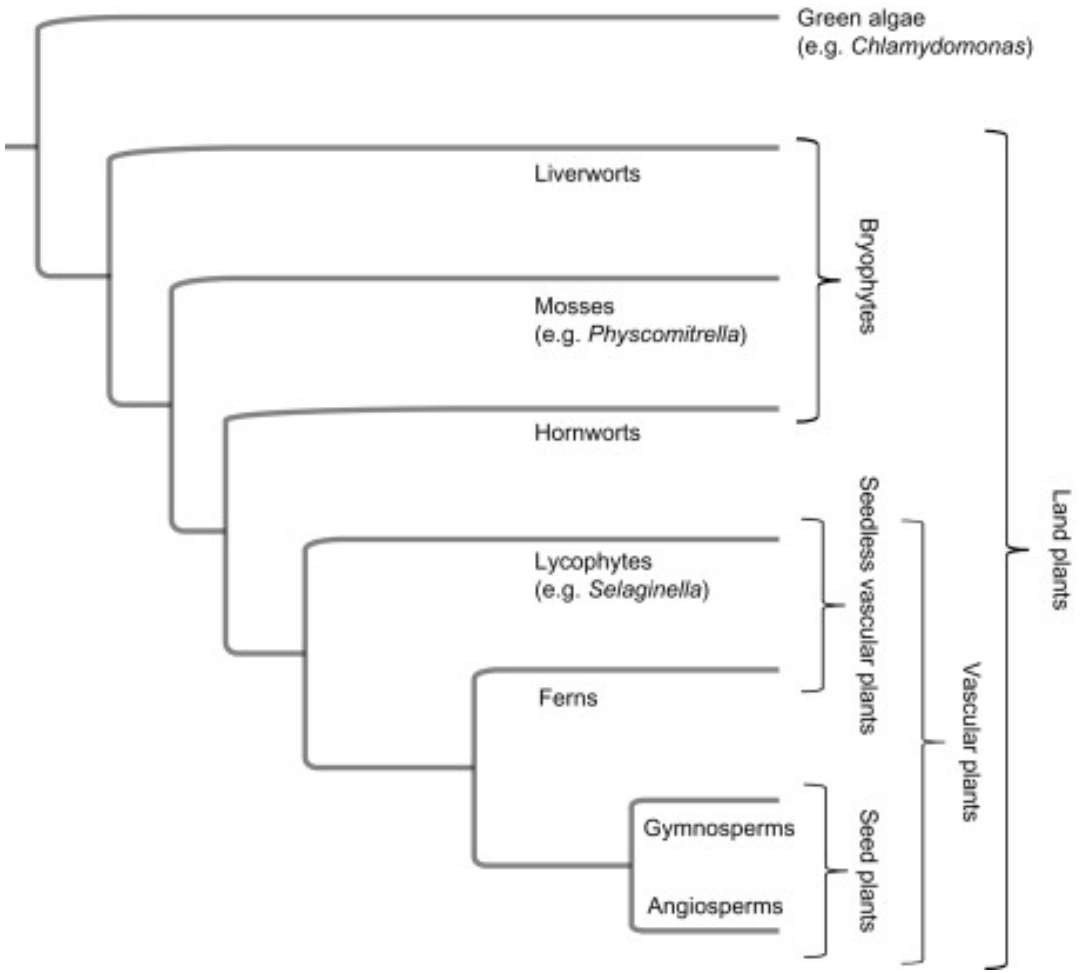
LAB OBJECTIVES

- **Introduce students to the life cycle of ferns.**
- **Demonstrate the appropriate use of terms to describe the morphological characteristics for describing the stages of fern development.**
- **Demonstrate techniques for collection, cleaning, and sowing of fern spores.**
- **Provide alternative systems for fern spore germination in home or commercial settings.**

Fern spore germination

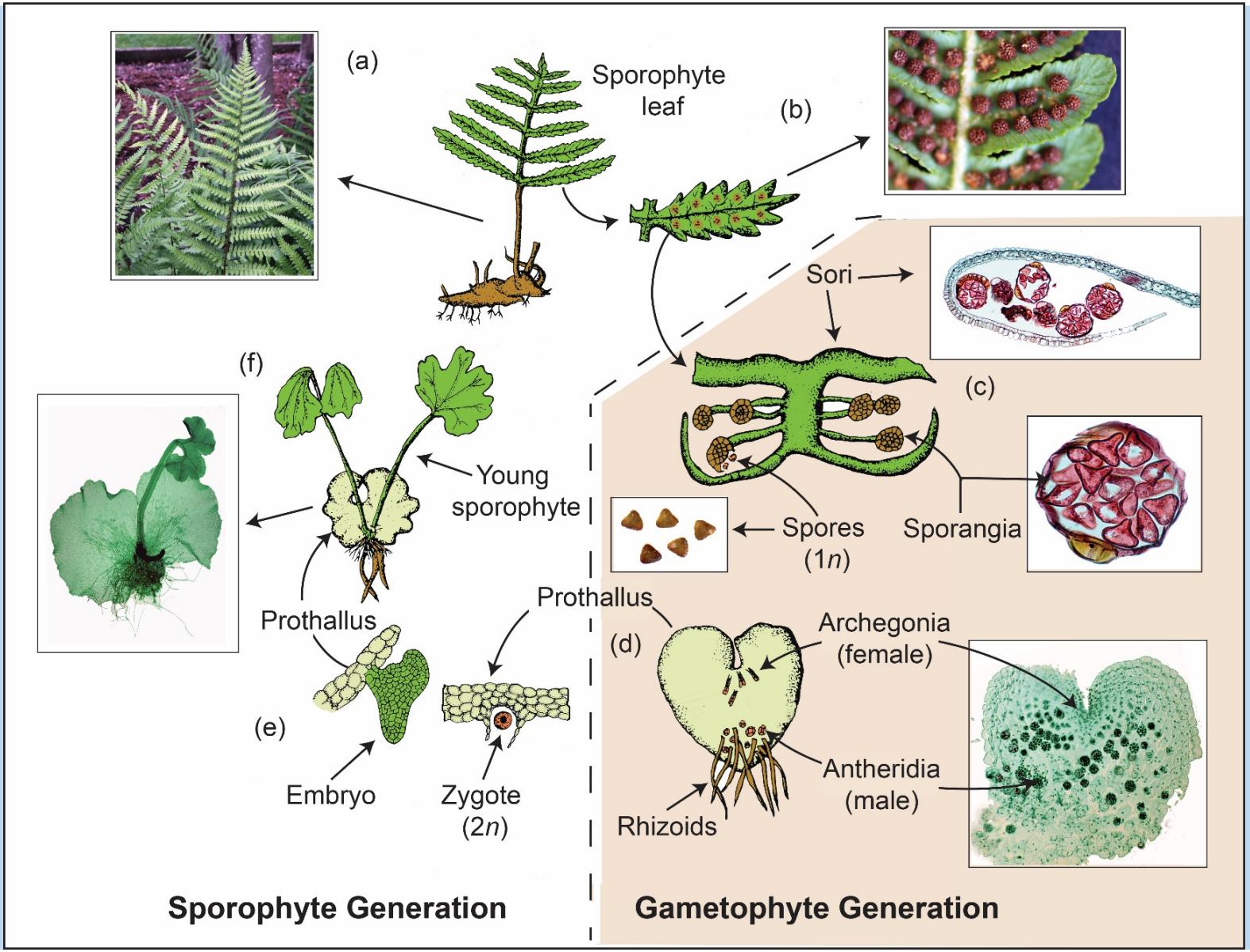




Fern relationship to other vascular plants

Ferns

- Many are rhizomatous and have circinate vernation
- Reproduce sexually by spores
- Eusporangiate ferns
  - ~250 species of horsetails, whisk ferns moonworts
- Leptosporangiate
  - ~10,250 species


(a)
Sporophyte leaf
(b)
Sori
(c)
Spores (1n)
Sporangia
(f)
Young sporophyte
Prothallus
(e)
Embryo
Zygote (2n)
Prothallus
(d)
Archegonia (female)
Antheridia (male)
Rhizoids
Sporophyte Generation
Gametophyte Generation

Sporophyte Generation

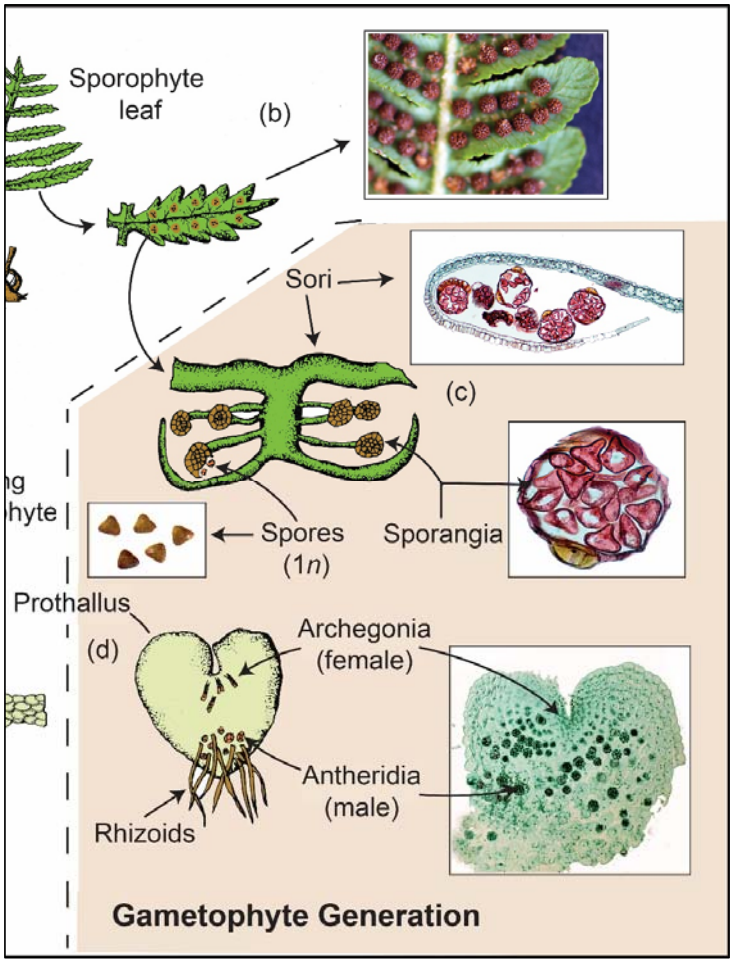
Spores are produced on the mature leaves (fronds) of the sporophyte generation of ferns.

The spores are arranged in sporangia which are often inside a structure called a sorus.

The sori often have a protective covering of living leaf tissue over them that is called an indusium.

As the spores begin to mature the indusium may also go through physical changes such as a change in color or desiccating and becoming smaller as it dries to allow an opening for dispersal.

The spores (1n) may be wind dispersed or they may require rain (water) to aid in dispersal.



Gametophyte Generation

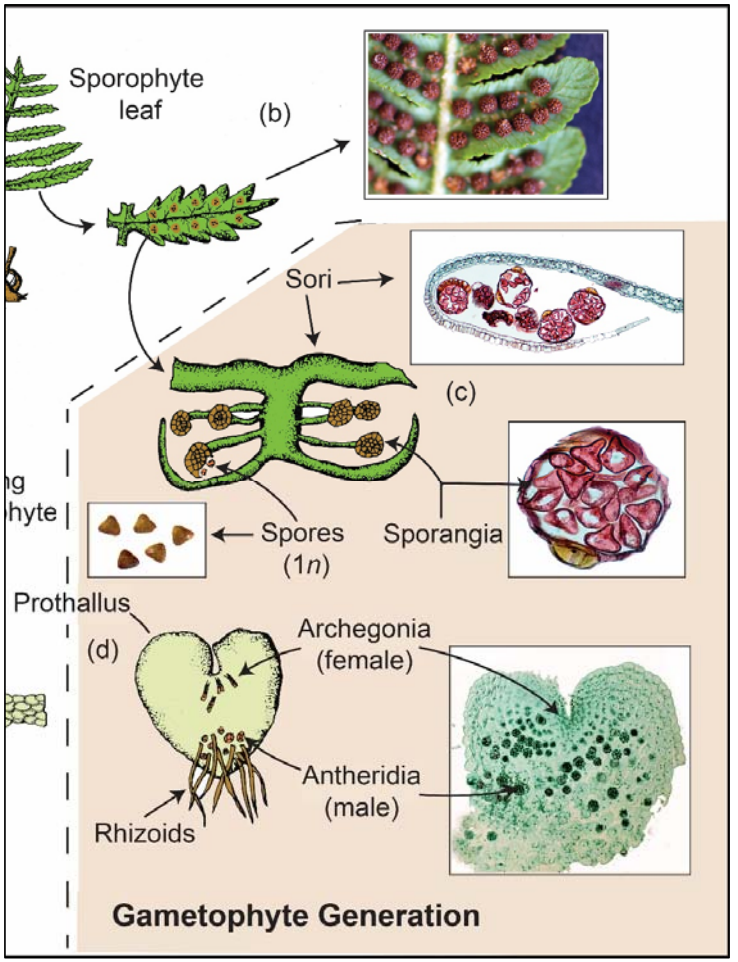
The gametophyte generation is initiated with the germination of the spore (1n).

The germinated spore begins to grow and form a heart-shaped structure called a prothallus.

The prothallus contains root-like structures called Rhizoids.

As the Prothallus matures the Antheridia (male) and Archegonia (female) develop.

Antheridia contain male sperm (1n) which are mobile in water. Under wet conditions the sperm fertilize the female eggs (1n) when they enter the Archegonium thereby resulting in the formation of the zygote (2n).



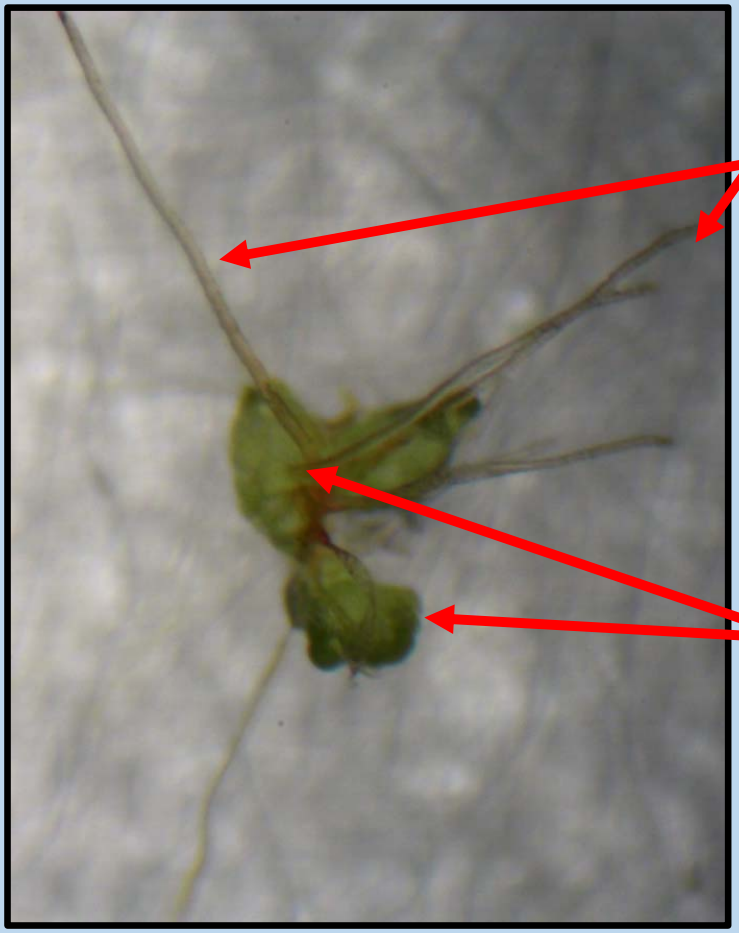
Japanese climbing fern spore germination (40X)

Young gametophyte

Spore

Rhizoid

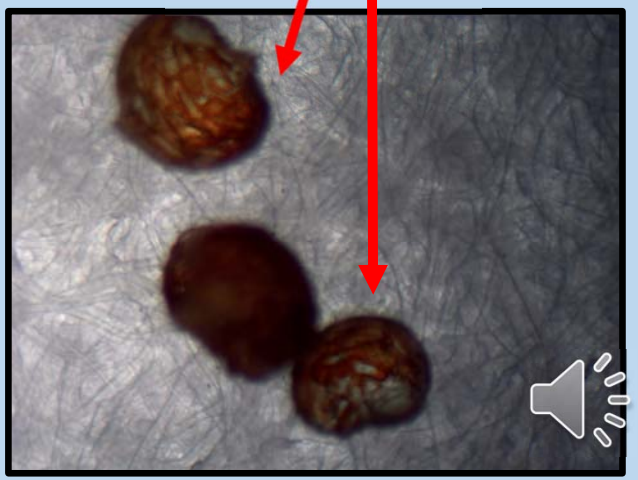
Cinnamon fern spore germination (40X)

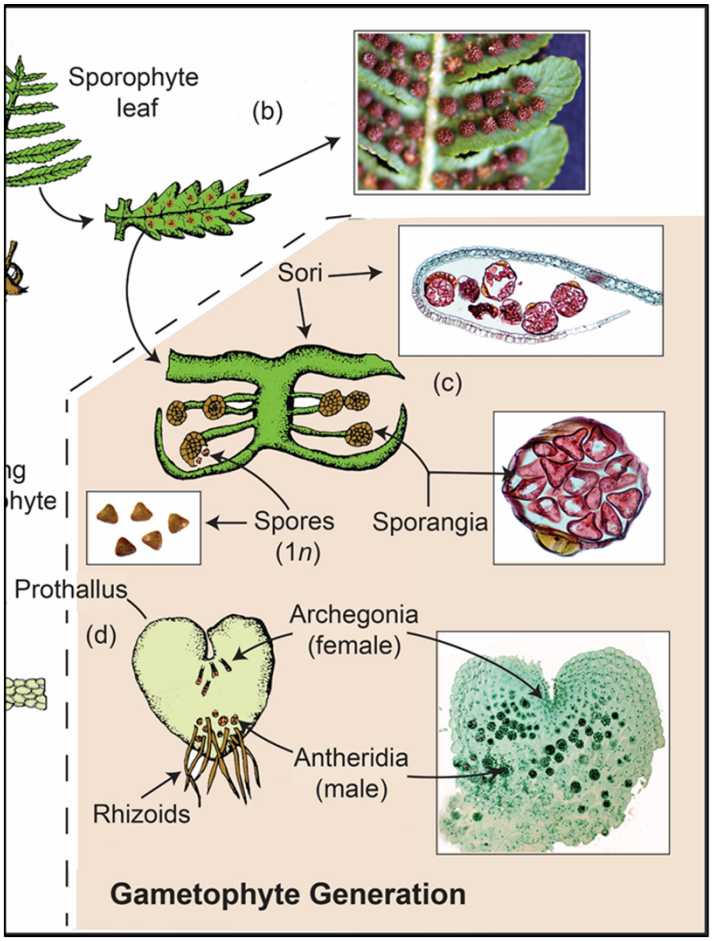


Rhizoid

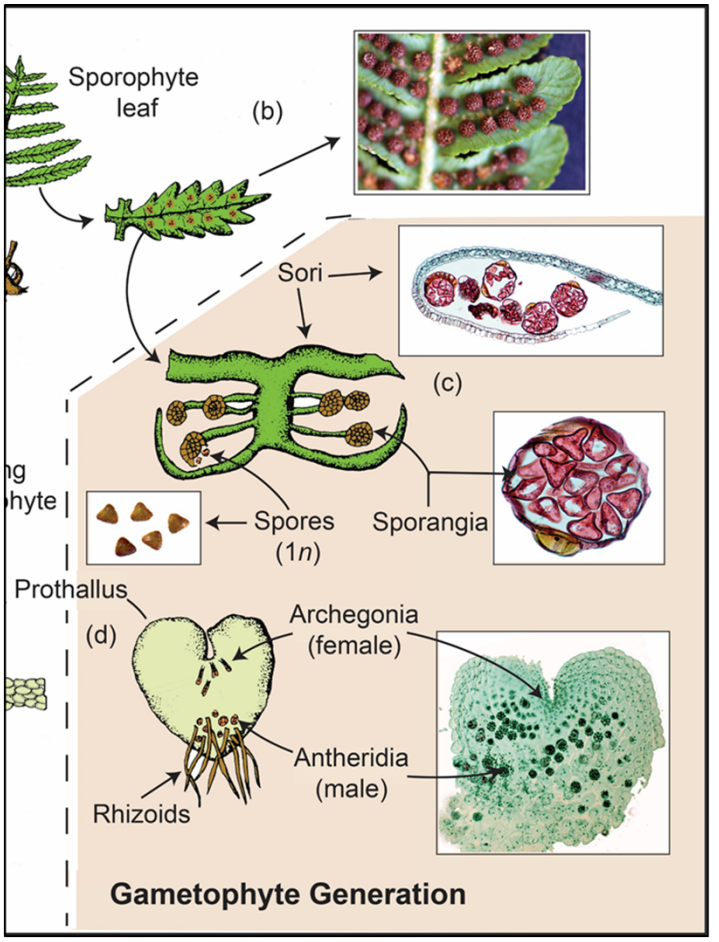
Young gametophyte

Spore case

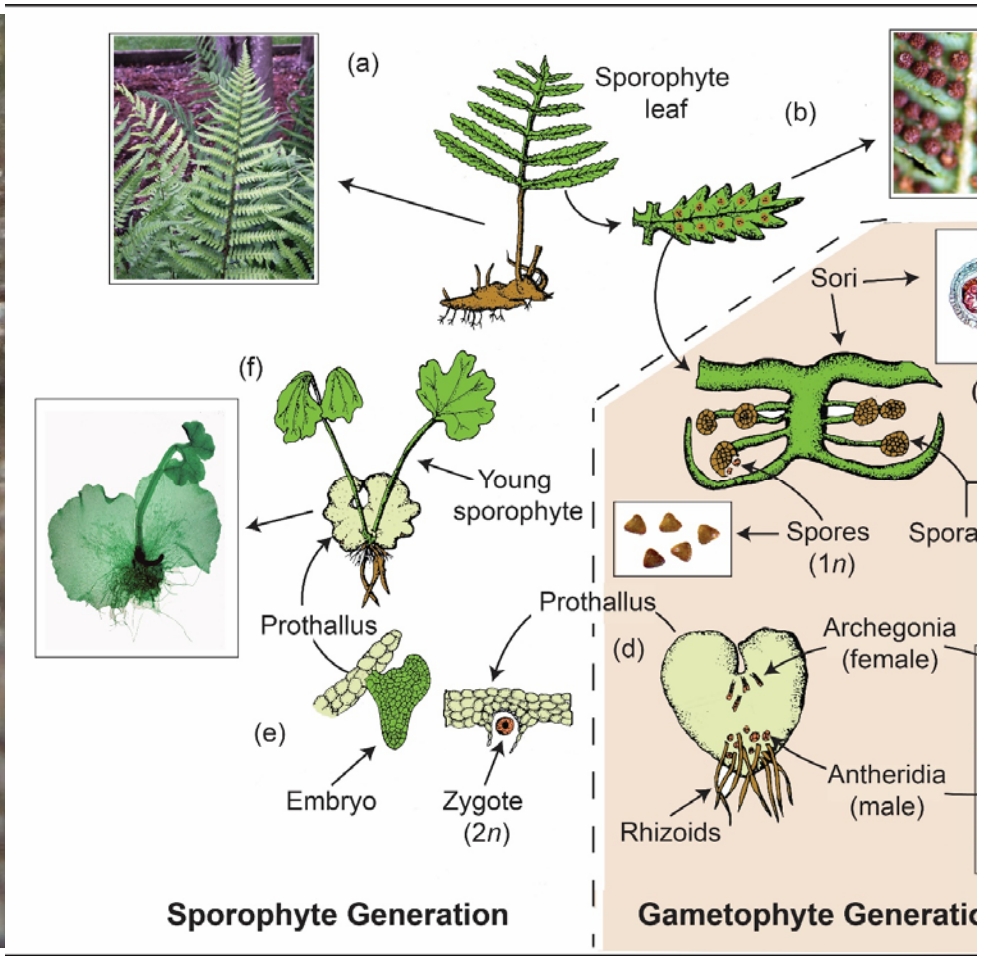




Japanese Climbing Fern - prothallus



Japanese Climbing Fern – Prothallus with initial growth of sporophyte



Japanese Climbing Fern with established sporophyte and necrotic prothallus

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Lab Exercise

- Materials
  - Mature fern fronds with sporangia containing ripe spores
  - Clear plastic container with a tight sealing lid
  - Small pot of sterilized potting mix (peat, coir, or very fine bark) and clean water
  - Clean piece of paper and/or envelope

- Procedure
  - Place the mature fern frond on the clean sheet of paper with the sporangia facing down – allow to dry for a few days – tap the frond a few times until you observe spores (looks like dust) on the white paper.
  - Place moistened potting mix in your container and distribute spores over the surface of the potting mix.
  - Place the cover on the container and place in a bright but not hot window and observe the soil surface weekly for growth of gametophytes and keep observing until you see the sporophytes develop.

Lab Exercise

- View the following videos
  - The dark art of propagating ferns from spores | Wow to | Gardening Australia
  - https://youtu.be/Okvz09DpL_w

  - Growing Ferns from Spore
  - https://youtu.be/IX3HA9QQZ2s

  - growing ferns from spore
  - https://youtu.be/4tYTz7ONMXU

1. Prepare a short report that will compare/contrast the differences between the approaches to fern production. Are there any incorrect uses of the fern reproductive terms?
2. Provide a conclusion that summarizes the steps you determine to be the most critical for developing and implementing your own fern spore germination experience.