

PLANT BIOLOGY

Presentation Overview

Learning Outcome Addressed in this Resource

1. *Analyze how the increasing complexity of algae, mosses, and ferns represent an evolutionary continuum of adaptation to a land environment*

- examine green algae and describe the characteristic that unify them
- use examples of unicellular, colonial, and multicellular green algae to illustrate their increasing complexity
- describe alternations of generations in algae
- examine mosses and describe the characteristics that unify them
- describe alternations of generations in mosses
- describe features of mosses that have enabled adaptation to a land environment
- examine ferns and describe the characteristics that unify them
- describe alternations of generations in ferns
- describe features of ferns that have enabled adaptation to a land environment

2. *Analyze how the increasing complexity of gymnosperms and angiosperms contribute to survival in a land environment*

- examine gymnosperms and describe the characteristics that unify them
- explain how gymnosperms are adapted for survival in a land environment with respect to the following: alternations of generations, roots, stems, leaves, seeds pollen, vascular tissue
- examine angiosperms and describe the characteristics that unify them
- use examples to differentiate between monocots and dicots
- describe how angiosperms are adapted for survival in a land environment, with respect to alternation of generations, flowers, pollen, enclosed seeds, fruit, roots, stems, leaves, vascular tissue

Unit Outline

Below is a list of resources included for this presentation package. Please note that each category will show as a separate folder on your desktop once you have selected and opened the unit folder. Each item is listed in the recommended order of presentation.

<u>Powerpoint Presentations</u>	<u>Learning Outcomes and Suggested Achievement Indicators Addressed</u>	
Aquatic Plants - Green Algae	• 1	<ul style="list-style-type: none"> ○ examine green algae and describe the characteristic that unify them ○ use examples of unicellular, colonial, and multicellular green algae to illustrate their increasing complexity ○ describe alternations of generations in algae
Aquatic Plants - The Mosses	• 1	<ul style="list-style-type: none"> ○ examine mosses and describe the

		<ul style="list-style-type: none"> ○ characteristics that unify them ○ describe alternations of generations in mosses ○ describe features of mosses that have enabled adaptation to a land environment
Land Plants – The Ferns	• 1	<ul style="list-style-type: none"> ○ examine ferns and describe the characteristics that unify them ○ describe alternations of generations in ferns ○ describe features of ferns that have enabled adaptation to a land environment
Land Plants – Gymnosperms	• 2	<ul style="list-style-type: none"> ○ examine gymnosperms and describe the characteristics that unify them ○ explain how gymnosperms are adapted for survival in a land environment with respect to the following: alternations of generations, roots, stems, leaves, seeds pollen, vascular tissue
Land Plants - Angiosperms	• 2	<ul style="list-style-type: none"> ○ examine angiosperms and describe the characteristics that unify them ○ use examples to differentiate between monocots and dicots ○ describe how angiosperms are adapted for survival in a land environment, with respect to alternation of generations, flowers, pollen, enclosed seeds, fruit, roots, stems, leaves, vascular tissue

<u>Student Templated Worksheets</u>	<u>Learning Outcome Addressed (refer to descriptions above)</u>
<i>Please note: Achievement indicators addressed are similar to those of the powerpoint presentation above that they correspond with.</i>	

Aquatic Plants: The Green Algae – Student Worksheet	• 1
Aquatic Plants - The Mosses – Student Worksheet	• 1
Land Plants – The Ferns – Student Worksheet	• 1
Land Plants – Gymnosperms – Student Worksheet	• 2
Land Plants – Angiosperms – Student Worksheet	• 2

Land Plants – The Ferns

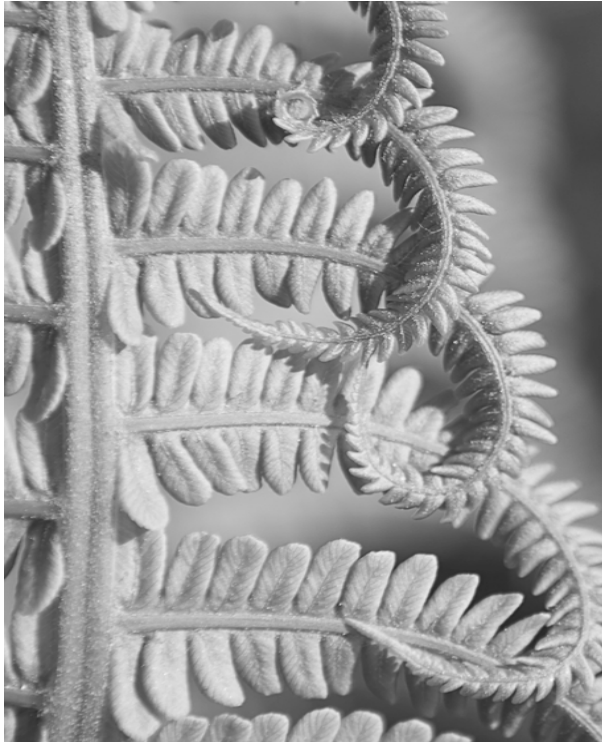
NAME _____

DATE _____

In this presentation of notes we will:

- examine ferns and describe the characteristics that unify them
- describe alternations of generations in ferns
- describe features of ferns that have enabled adaptation to a land environment

Phylum Pteridophyta – The Ferns



Characteristics

- Over _____ known species
- _____ plants
- Have _____ but _____ flowers or seeds
- Display _____ in reproduction
- Live in a wide variety of habitats such as _____
 _____ (bogs, swamps) and as

What does it mean to be a vascular plant?

Vascular plants _____.

Vascular plants are _____ dependant upon _____.

Xylem:

Phloem:



How are vascular plants adapted for life on land?



- Have well adapted _____ that aid in _____
- Have _____ of water and food (_____ and _____)
- Xylem has _____ in the cell walls that help _____
- Have _____ which are dead cells with thick walls that _____
- Have _____ that are thin walled and function as _____

General Structure of Ferns

STEMS

- Most commonly _____
- Can be an above ground _____ or and above ground _____

LEAVES (FRONDS)

- _____
- New leaves typically expand by the _____ (see photo at right)
- Can produce _____

ROOTS

- _____
- Take up _____ from the soil
- Are _____, look like the roots of a seed plant



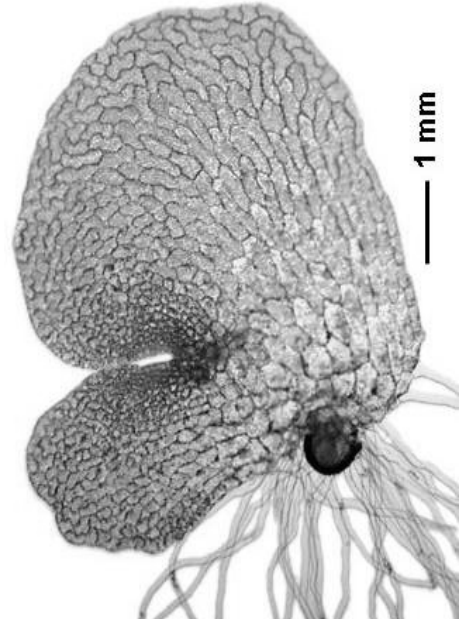
The Fern Gametophyte

PROTHALLUS

-
-
-
-
-

RHIZOIDS

-
-
-



Note: Water and mineral salts are _____

Gamete Production

The gametophyte stage of the fern lifecycle is responsible for the _____.

A _____ and _____ are found on the prothallus structure

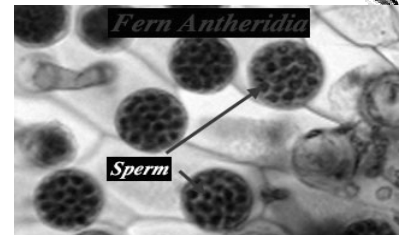
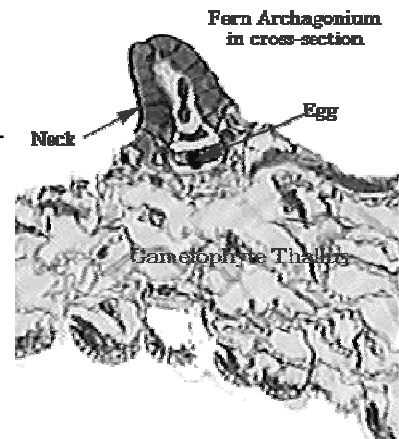
Archegonium (singular)

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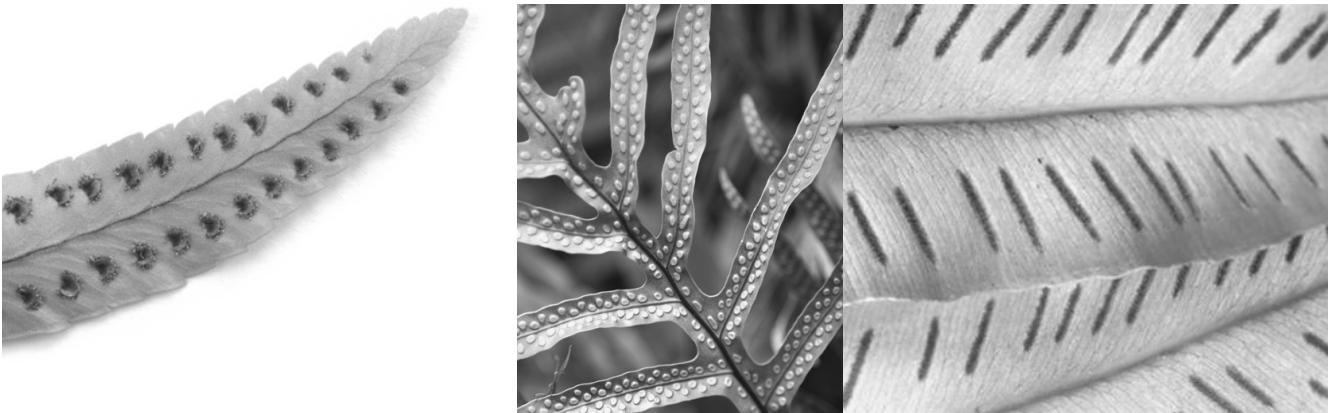
Antheridia (plural)

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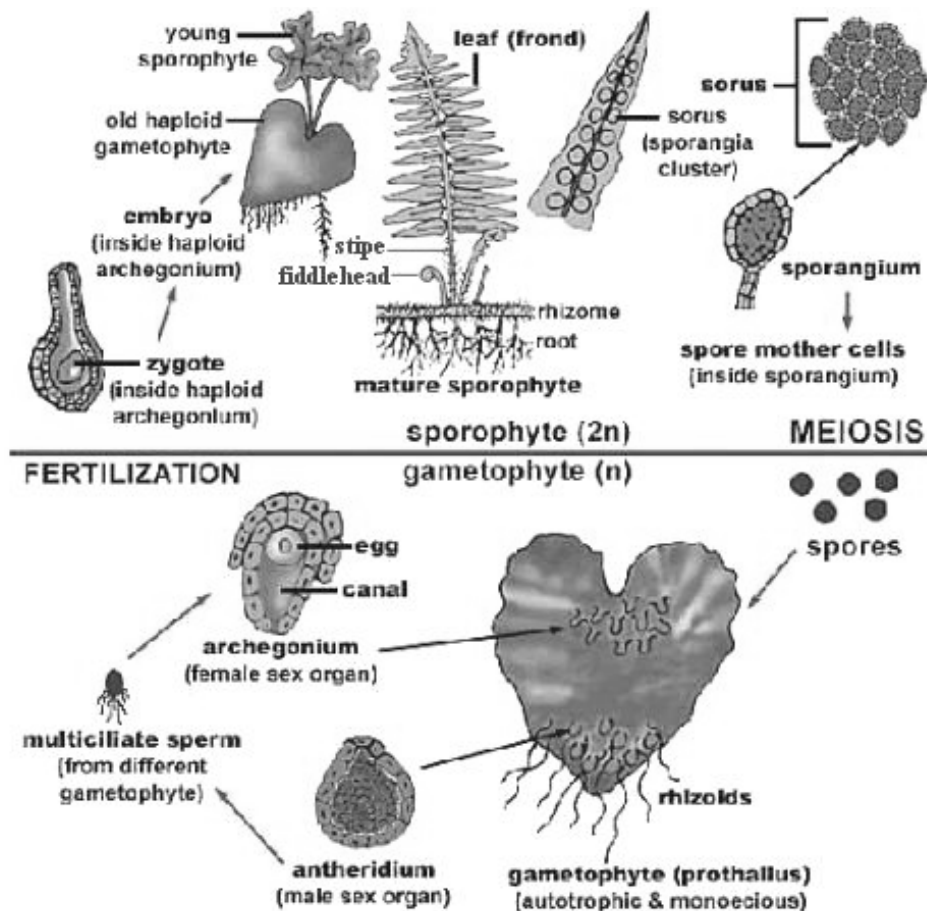


Fern Life Cycle



The _____ is the typical fern plant and is _____.
 Leaflets of the fronds can bear _____ on the lower surfaces
 which are found in _____. These sori undergo
 _____ and produce _____.

Fern Life Cycle



Ecological and Economical Roles of Ferns

Ecological

- Holds and _____
- Prevents _____

Economical

- _____ (fiddleheads, see right)
- *Azolla* (mosquito fern) is used as _____
_____ in southwest Asia.
It is able to _____

- _____

- Useful in removing _____
from the soil
- Decomposed ferns are a component of _____



Interesting Fern Facts



Sword fern fronds (commonly found on the west coast of Canada) can be used to _____ by rubbing the affected area with the frond _____.

_____ in the tropics can grow from _____ and have fronds that are _____!

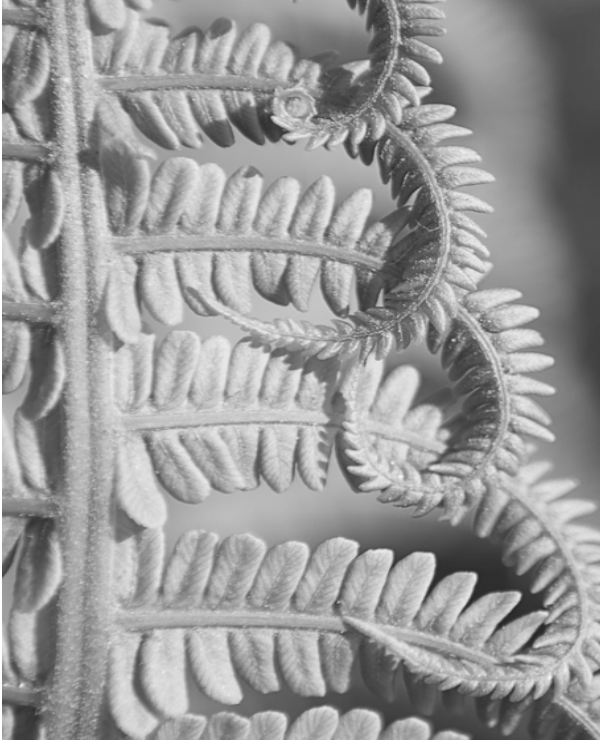
Land Plants – The Ferns

NAME _____
DATE _____

In this presentation of notes we will:

- examine ferns and describe the characteristics that unify them
- describe alternations of generations in ferns
- describe features of ferns that have enabled adaptation to a land environment

Phylum Pteridophyta – The Ferns



Characteristics

- Over **20,000** known species
- **Vascular** plants
- Have **true leaves** but **lack** flowers or seeds
- Display **alternation of generations** in reproduction
- Live in a wide variety of habitats such as **moist, shady forests, crevices in rock faces, acid wetlands** (bogs, swamps) and as **epiphytes on tropical trees**

What does it mean to be a vascular plant?

Vascular plants have transportation systems for water, nutrients, and food **Vascular plants are not dependent upon water for circulation.**

Xylem: non-living, tube shaped cells that carry water and minerals from the roots to the rest of the plant

Phloem: living, elongated tubes that transport sugar and other organic nutrients through the plant



How are vascular plants adapted for life on land?



- Have well adapted **waxy cuticles** that aid in **reducing water loss**
- Have **tissues for transport** of water and food (**xylem** and **phloem**)
- Xylem has **lignin** in the cell walls that help **provide support**
- Have **fiber cells** which are dead cells with thick walls that **provide support**
- Have **parenchyma cells** that are thin walled and function as **storage cells**

General Structure of Ferns

STEMS

- Most commonly **underground, creeping rhizome**
- Can be an above ground **stolon** or and above ground **trunk**

LEAVES (FRONDS)

- **green and photosynthetic**
- New leaves typically expand by the **unrolling of a fiddlehead** (see photo at right)
- Can produce **spores on the underside**



ROOTS

Underground

- Take up **water and nutrients** from the soil
- Are **fibrous**, look like the roots of a seed plant

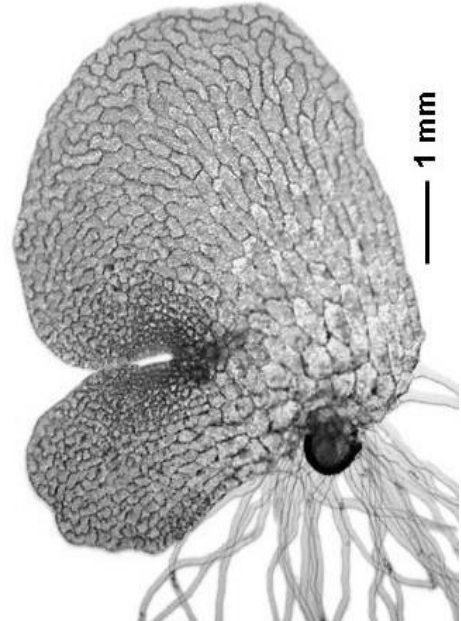
The Fern Gametophyte

PROTHALLUS

- **Green, photosynthetic**
- **One cell thick**
- **Heart or kidney shaped**
- **3 -10mm long, 2-8 mm broad**
- **Produces gametes**

RHIZOIDS

- **Root-like structures**
- **Single, greatly elongated cells**
- **Anchor the prothallus**



Note: Water and mineral salts are **absorbed over the entire structure**

Gamete Production

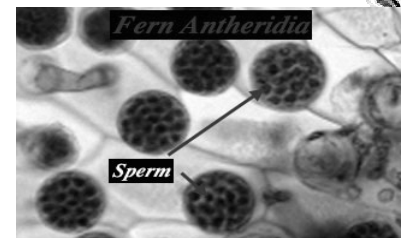
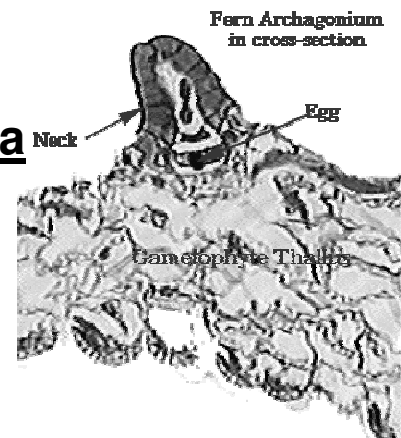
The gametophyte stage of the fern lifecycle is responsible for the **production of gametes**. A **single archegonium** and **many antheridia** are found on the prothallus structure

Archegonium (singular)

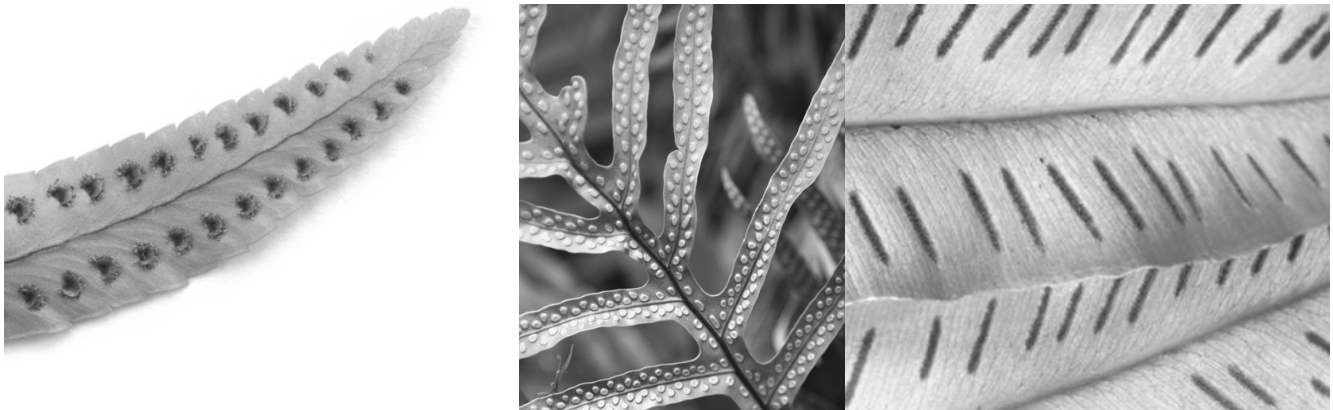
- **Flask shaped and produces an egg at the bottom**

Antheridia (plural)

- **Small and circular in shape**
- **Produce sperm**

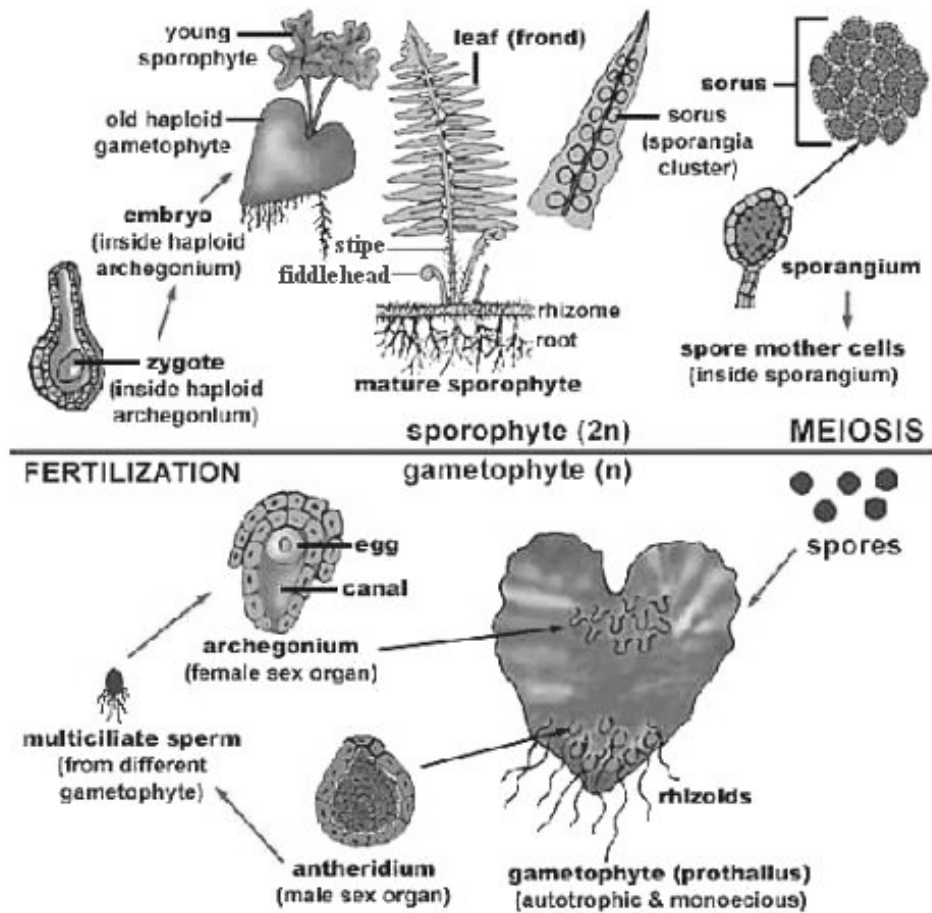


Fern Life Cycle



The **fern sporophyte** is the typical fern plant and is **diploid (2N)**. Leaflets of the fronds can bear **sporangia** on the lower surfaces which are found in **clusters called sori**. These sori undergo **meiosis** and produce **haploid spores (N)**.

Fern Life Cycle



Ecological and Economical Roles of Ferns

Ecological

- Holds and **forms the soil**
- Prevents **soil erosion**

Economical

- **Food** (fiddleheads, see right)
- *Azolla* (mosquito fern) is used as **biological fertilizer for rice paddies** in southwest Asia. It is able to **fix nitrogen in the air to be used by other plants.**
- **Landscaping, horticulture and the florist industry**
- Useful in removing **heavy metals like arsenic** from the soil
- Decomposed ferns are a component of **coal formation.**



Interesting Fern Facts



Sword fern fronds (commonly found on the west coast of Canada) can be used to **alleviate the sting from stinging nettle** by rubbing the affected area with the frond **spore side down**.

Tree ferns in the tropics can grow from **20 to 60 feet in height** and have fronds that are **6-12 feet long!**