

Simple Plants: Chap 20 & 21

20-1 Characteristics of Algae

Ted-Ed Photosynthesis



I. Introduction

A. Description:

1. Are photosynthetic organisms
2. Live in fresh water (e.g. streams, ponds, lakes, or swamps) and oceans



B. Must live in or near a source of water

1. Reason: *lack internal system of tubes to move materials from one part to another*

2. Water they live in:

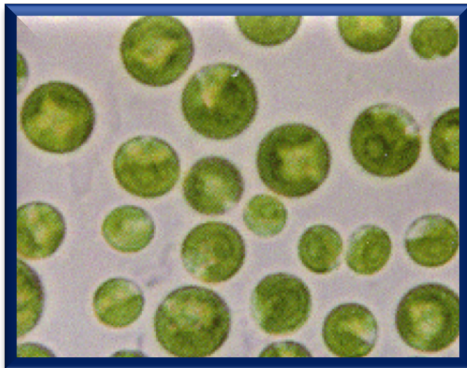
a) Provides: CO₂, O₂, and nutrients and carries away wastes

C. Types of algae

1. Most are multicellular; Giant kelp can grow to 60 m



2. Unicellular are microscopic (also classed as protists)



Chlorella sp.

D. Algae structures

1. Cells have cell walls
2. Never have roots, stems, or leaves like land plants



II. Adaptations of Algae to Life Under Water

How they differ from land plants:

Because they:	This means Algae:
Don't need protection from drying out	Are thin (only <u>2 cells</u> thick!)
Exchange materials directly with surrounding water	Have no <u>vascular</u> tissues
Are supported by water	Don't need stems to keep from <u>falling over</u>
Reproduce in water	Make gametes that <u>swim</u>

II. Chlorophyll and Accessory Pigments

A. Challenges of underwater life:

1. Water *absorbs* much of the energy of sunlight
2. Algae groups have evolved different forms of chlorophyll that absorb different wavelengths of light
3. Some also evolved other light-absorbing compounds called accessory pigments
 - a) They can live in deeper water
 - b) Different reflected wavelengths give algae a wide range of colours

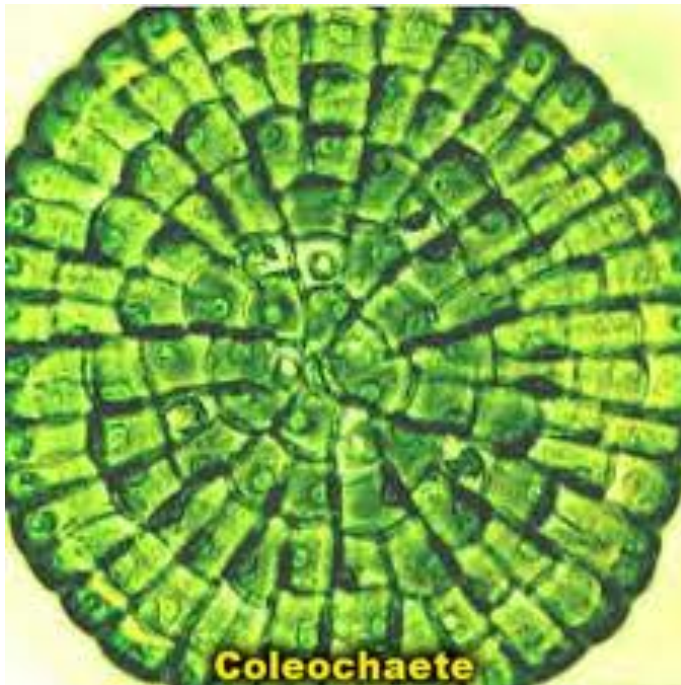


20-2 Groups of Algae

I. Chlorophyta - The Green Algae

A. Habitat:

1. Found mostly on moist land and in fresh water



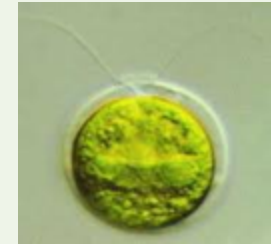
Cell arrangement:

Name:

Sketch:

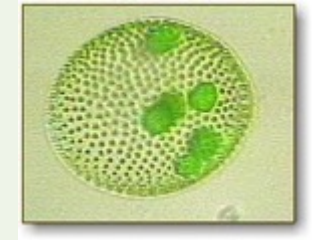
Single-celled

Chlamydomonas



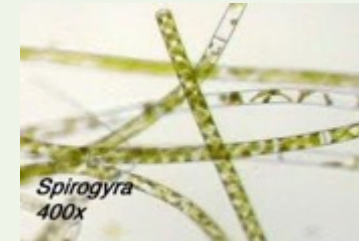
Colonial

Volvox



Filamentous
(threadlike)

Spirogyra &
Oedogonium



Multicellular

Ulva “sea lettuce”



II. Phaeophyta - The Brown Algae

A. Habitat:

1. Marine: especially cool, shallow waters in temperate or arctic oceans



B. Most “sea weeds” are: species of brown algae

1. Giant kelp

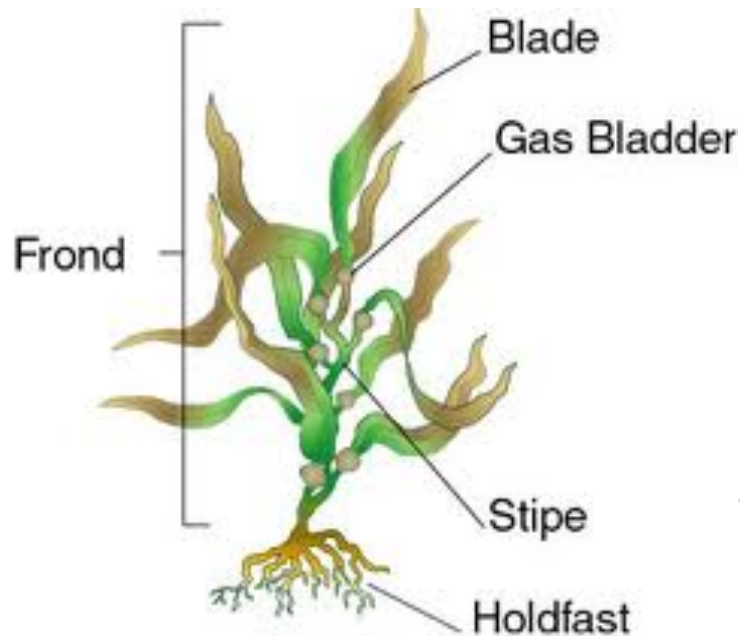
2. *Fucus* (common name: Rockweed):

a) Make a labeled sketch:

b) Give function of:

i) Holdfast: attach plant to ocean bottom

ii) Bladders: keep plant floating upright in water





III. Rhodophyta - The Red Algae

A. Habitat:

1. Marine: from arctic to tropics, from surface to *170 m* deep due to accessory pigments



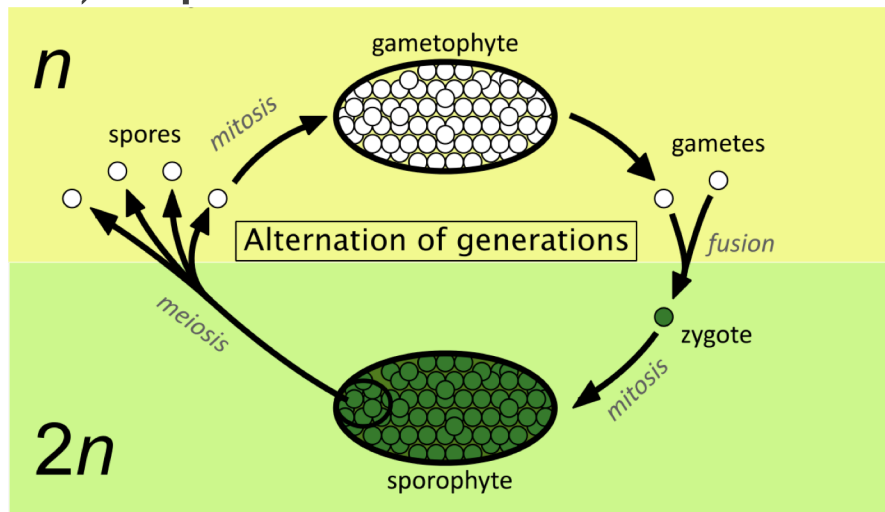
B. Example:

1. *Porphyra* (dried, it's called nori and used to make sushi)



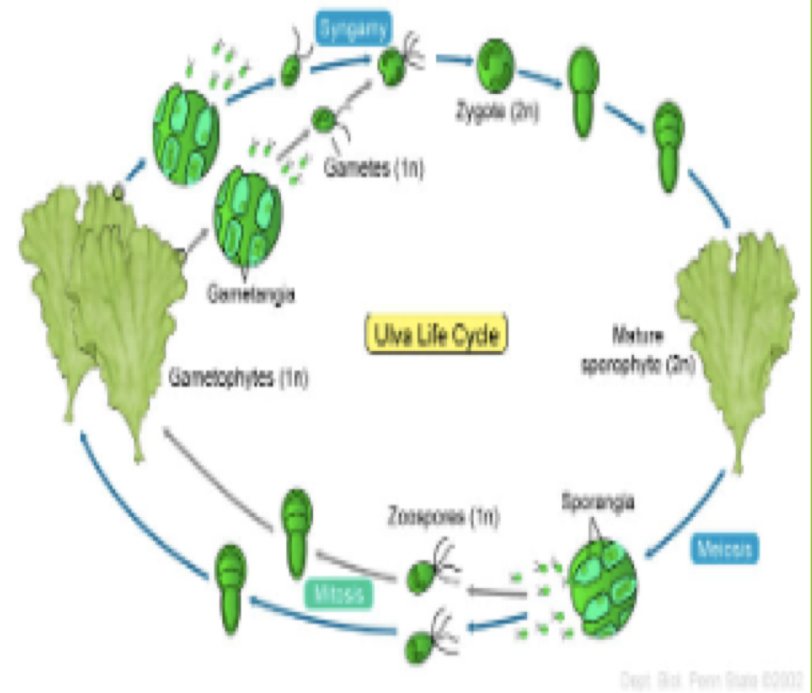
20-3 Algae Lifecycle (not in notes)

- ▶ Include diploid ($2n$) and haploid (n) generations
- ▶ Switching back and forth is known as *Alternation of Generations!*
 - ▶ This is characteristic of the plant kingdom
- ▶ Algae also shift between sexual (gametes) and asexual (zoospores) reproduction



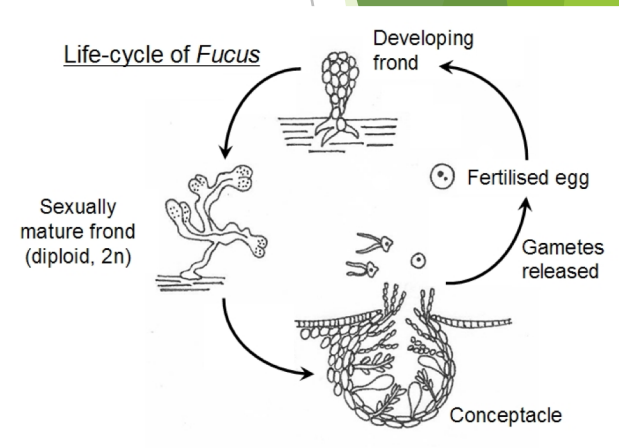
Reproduction in Ulva (Sea Lettuce)

- ▶ Diploid and haploid stages are multicellular
- ▶ Diploid plant is called the sporophyte
- ▶ Haploid plant is the gametophyte
- ▶ When two gametes fuse, the diploid sporophyte forms
- ▶ The sporophyte undergoes meiosis and releases haploid zoospores (+ and -) which in turn form the gametophytes.
- ▶ The gametophytes release gametes (+a and -) which fuse to form sporophytes
- ▶ Typical of most algae and most organisms in Kingdom Plantae



Reproduction in Fucus

- ▶ Alternation of generations, but multicellular gametophyte is missing...this is an exception in the Kingdom Plantae!
- ▶ Diploid sporophyte is present with specialized reproductive areas on the tips
- ▶ One area produces female gamete - egg
- ▶ One Area produces the male gamete - motile sperm
- ▶ Fertilization occurs, the zygote sinks, attaches to a rock and forms the diploid sporophyte.
- ▶ This is similar to how most Animals reproduce...but remember, this is unusual in Kingdom Plantae.



20-4 Where Algae Fit into the World

A. Ecological role:

1. In food chains: called the “grasses of the seas”



2. Habitat for others:

e.g. the kelp forests of North American coasts



3. Oxygen providers:

a) Life could not have evolved without the O_2 they release in *photosynthesis*

[Ted-Ed: Killer Algae?](#)

b) Algae do 50 - 70% of all photosynthesis on Earth

B. Uses by humans

1. Sources of chemicals used in:

- a) Drugs
- b) Food additives
- c) Industrial products
- d) Agar used to make plates for microbiology



Biofuel algae



Carageenan Containing Products



[Ted-Ed: Aquaculture Pros and Cons](#)