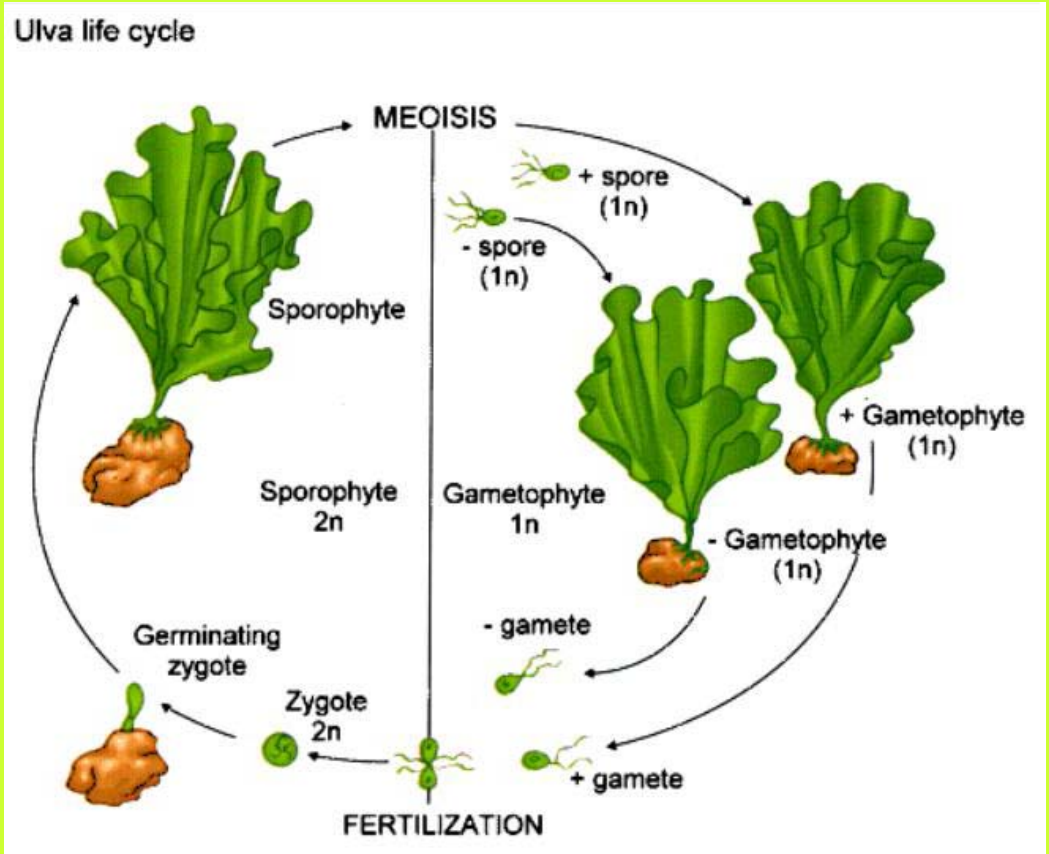
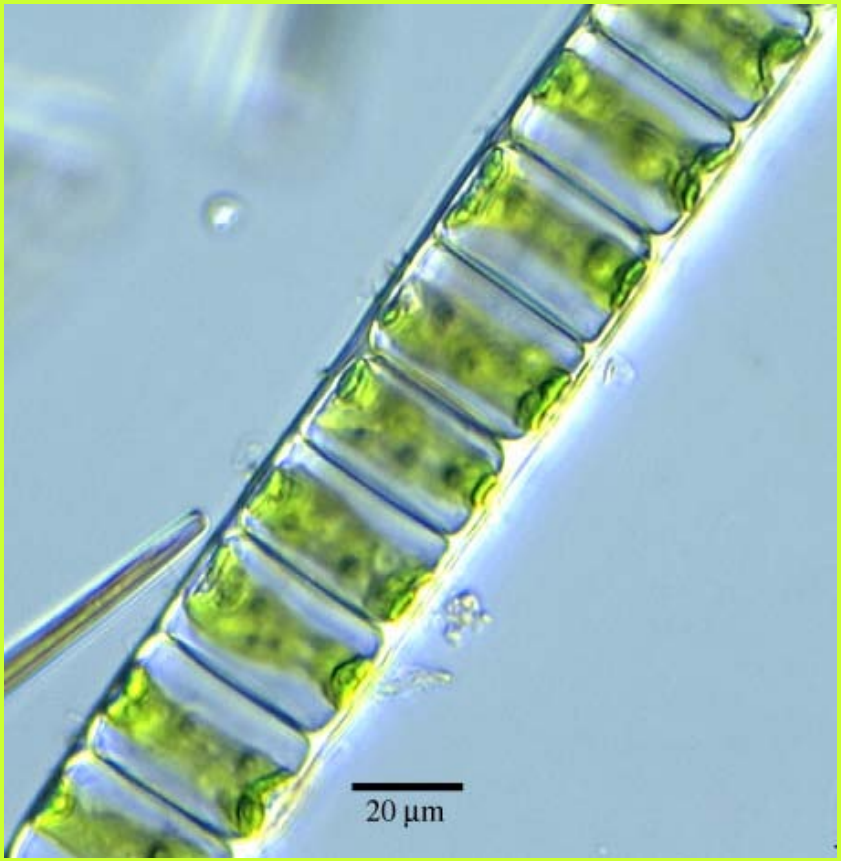
LIFE-CYCLES
and
The Green Algae

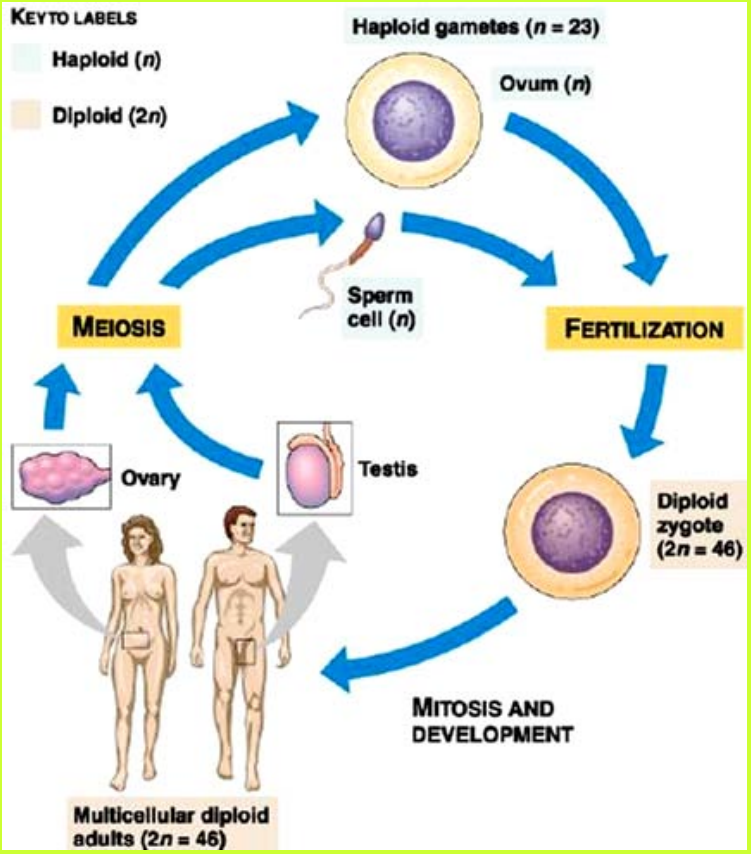


Life-Cycle of the Sea Lettuce (*Ulva*)

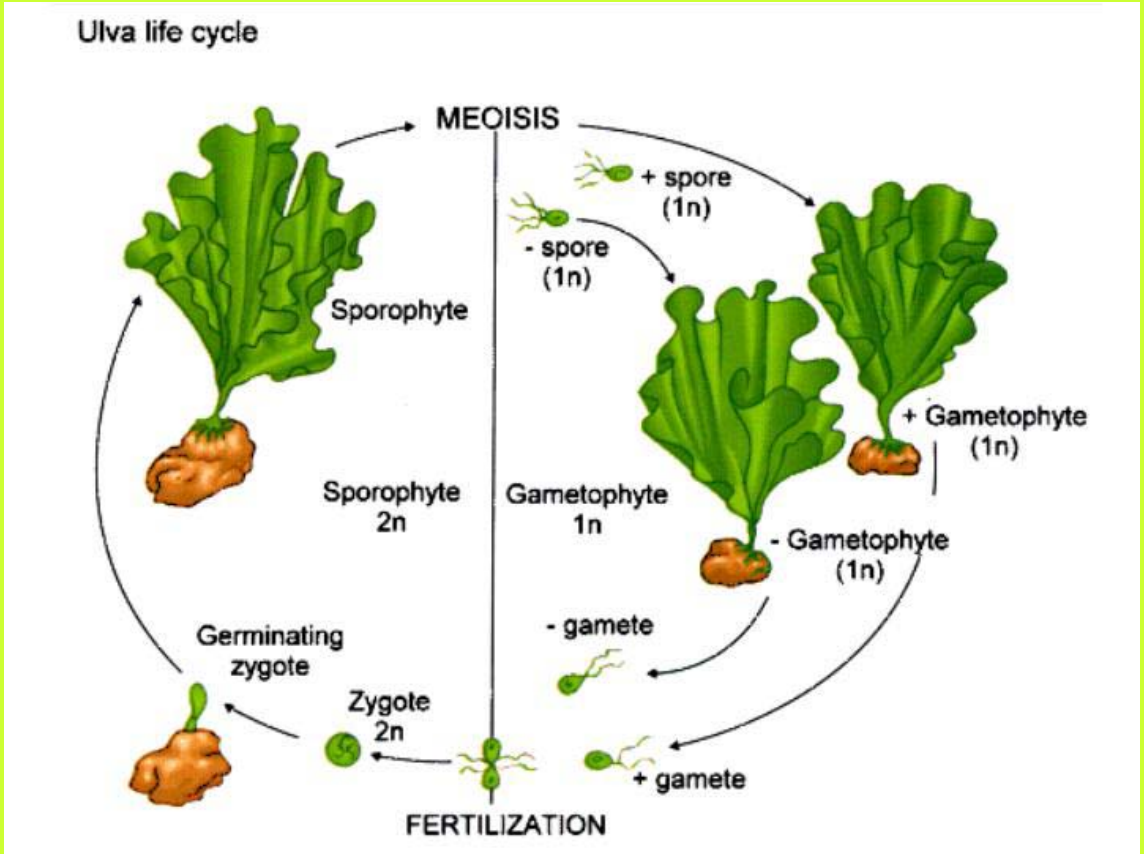


Green Alga (*Ulothrix*)

LIFE-CYCLES



Animals (Humans)



Ulva- A Green Alga

Some Basic Biological Processes

Life Cycle

Reproduction and Biological Reproduction

Sex

Sexual Reproduction

Asexual Reproduction

What Is a Life Cycle?

<u>Life Cycle</u> = Sequence of stages in the growth and development of an organism.

What Is Reproduction?

<u>Reproduction</u> = Process by which something makes copies of itself.

****

What Is Biological Reproduction?

<u>Biological Reproduction</u> = Process of reproduction in organisms; biological copies, i.e., offspring, may be genetically identical to parent or they may be genetically different due to mutation and genetic recombination.

What Is Sex?

Sex = Introduction of some of the genes from one organism into another (prokaryotes) or the combining of all of the genes from two different parts (gametes) of the life cycle of an organism (eukaryotes).

What Is Sexual Reproduction?

Sexual Reproduction = Biological reproduction in which sex is combined with the process of reproduction (most eukaryotes).

What Is Asexual Reproduction?

Asexual Reproduction = Biological reproduction in which sex is not part of the process of reproduction (all prokaryotes and some eukaryotes).

Life Cycle, Reproduction, and Sex

Life Cycle = Sequence of stages in the growth and development of an organism.

Reproduction = Process by which something makes copies of itself; in biological reproduction the copies, i.e., offspring, may be genetically identical to the parent or they may be genetically different due to mutation and genetic recombination.

Sex = Introduction of some of the genes from one organism into another (prokaryotes) or the combining of all of the genes from two different parts (gametes) of the life cycle of an organism (eukaryotes).

Sexual Reproduction = Biological reproduction in which sex is combined with the process of reproduction (most eukaryotes).

Asexual Reproduction = Biological reproduction in which sex is not part of the process of reproduction (all prokaryotes and some eukaryotes).

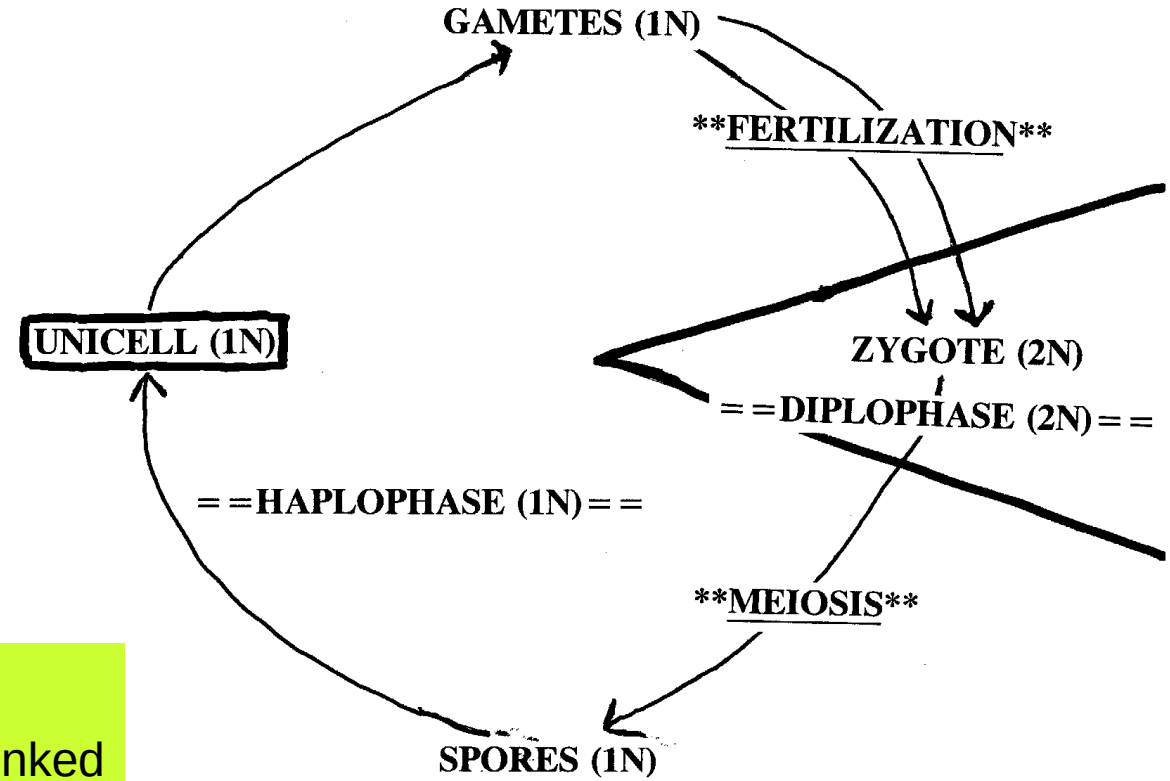
Types of Sex

PROKARYOTIC SEX

CONJUGATION

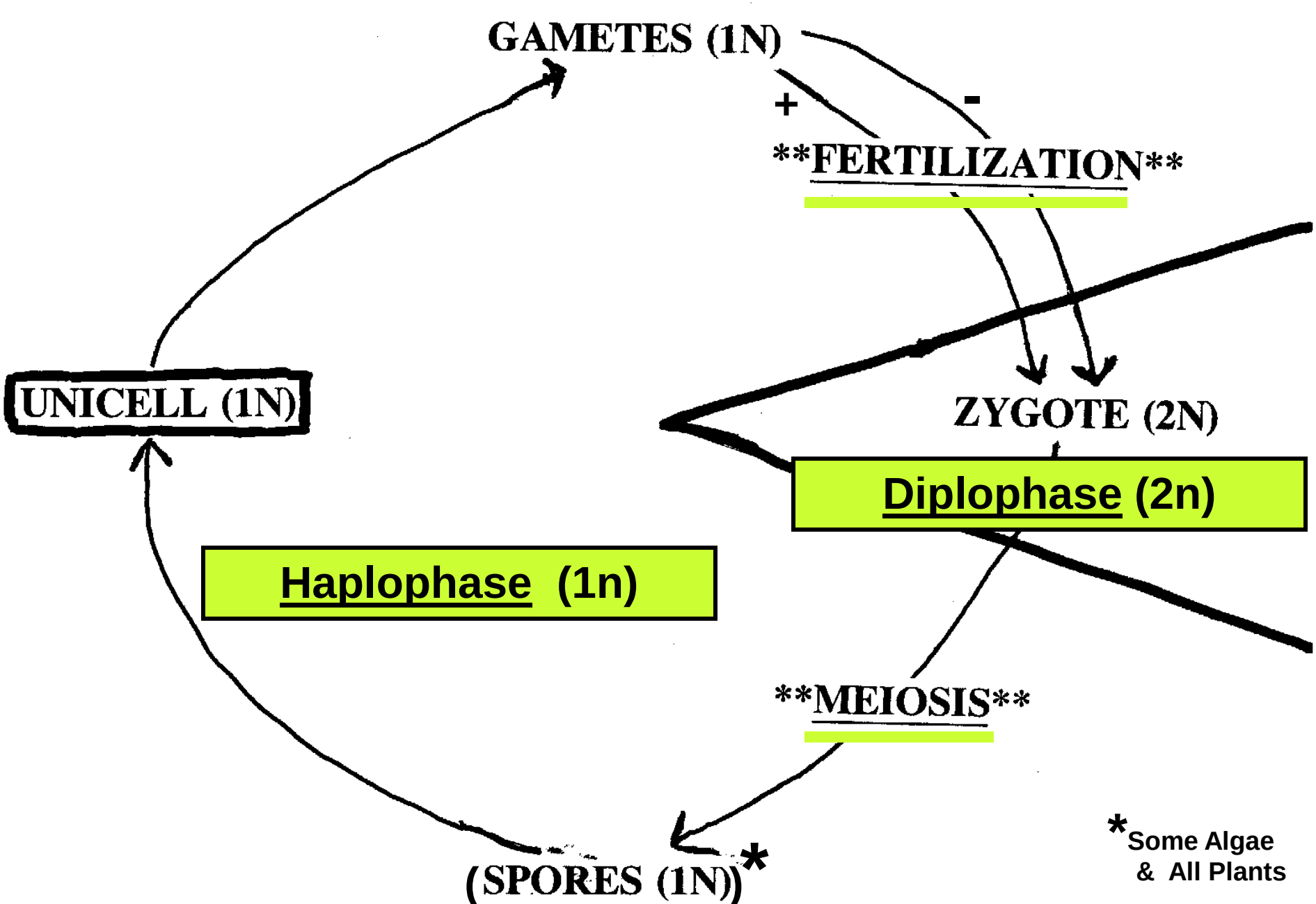
Prokaryotes
Sex Not Linked with Reproduction

EUKARYOTIC SEX



Eukaryotes
Sex and Reproduction Linked

BASIC EUKARYOTIC SEXUAL LIFE-CYCLE



IMPORTANT FEATURES
of
EUKARYOTIC SEX

---

(1) FERTILIZATION & MEIOSIS

(2) GAMETES (and sometimes SPORES) 1n; ZYGOTE 2n

(3) HAPLOIDY & DIPLOIDY

(4) ALTERNATION OF GENERATIONS:
HAPLOPHASE & DIPLOPHASE

THE THREE TYPES of MEIOSIS in EUKARYOTES

Gametic Meiosis- Gametes Produced by Meiosis and are the Only Haploid Part of the Life-Cycle (many Protozoa and all Animals)

Zygotic Meiosis- Zygote undergoes Meiosis and is the Only Diploid Part of the Life-Cycle (many Algae)

Sporic Meiosis- Spores Produced by Meiosis and Develop into a Multicellular Haploid "Gametophyte" (some Algae and all Plants)

EUKARYOTIC SEXUAL LIFE-CYCLES

HAPLOBIONTIC-Diploid= with one Biont* that is Diploid & Gametic Meiosis (many Protozoa and all Animals)

HAPLOBIONTIC-Haploid= with one Biont* that is Haploid & Zygotic Meiosis (many Algae)

DIPLOBIONTIC= with two Bionts* (a Haploid Gametophyte & a Diploid Sporophyte) & Sporic Meiosis (some Algae and all Plants)

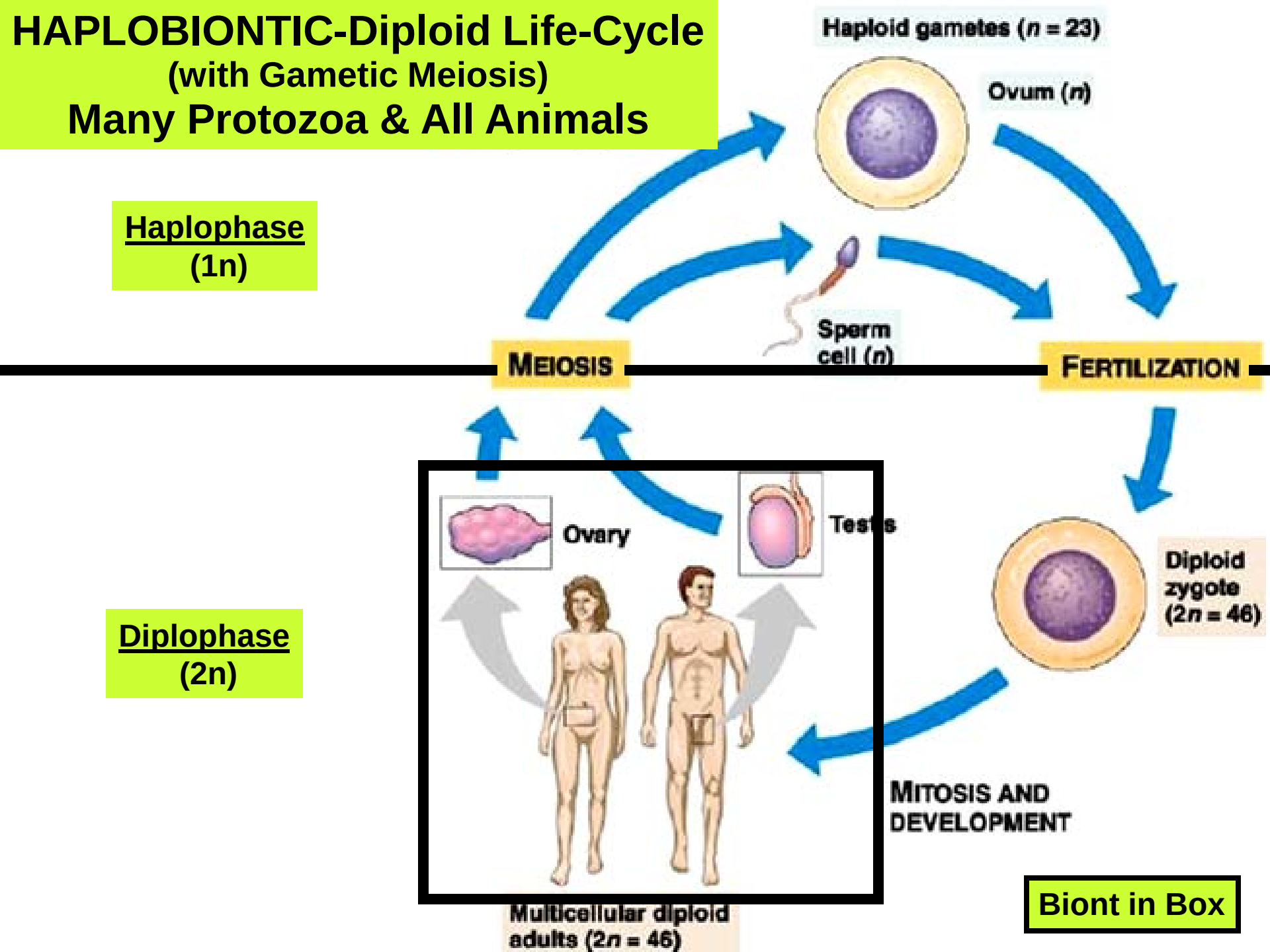
Diplobiontic-Isomorphic= with Bionts* morphologically identical (some Algae)

Diplobiontic-Heteromorphic= with Bionts* morphologically different (a few algae and all Plants)

***An actual organism, not merely stages in a life-cycle, such as gametes or spores.**

HAPLOBIONTIC-Diploid Life-Cycle
(with Gametic Meiosis)
Many Protozoa & All Animals

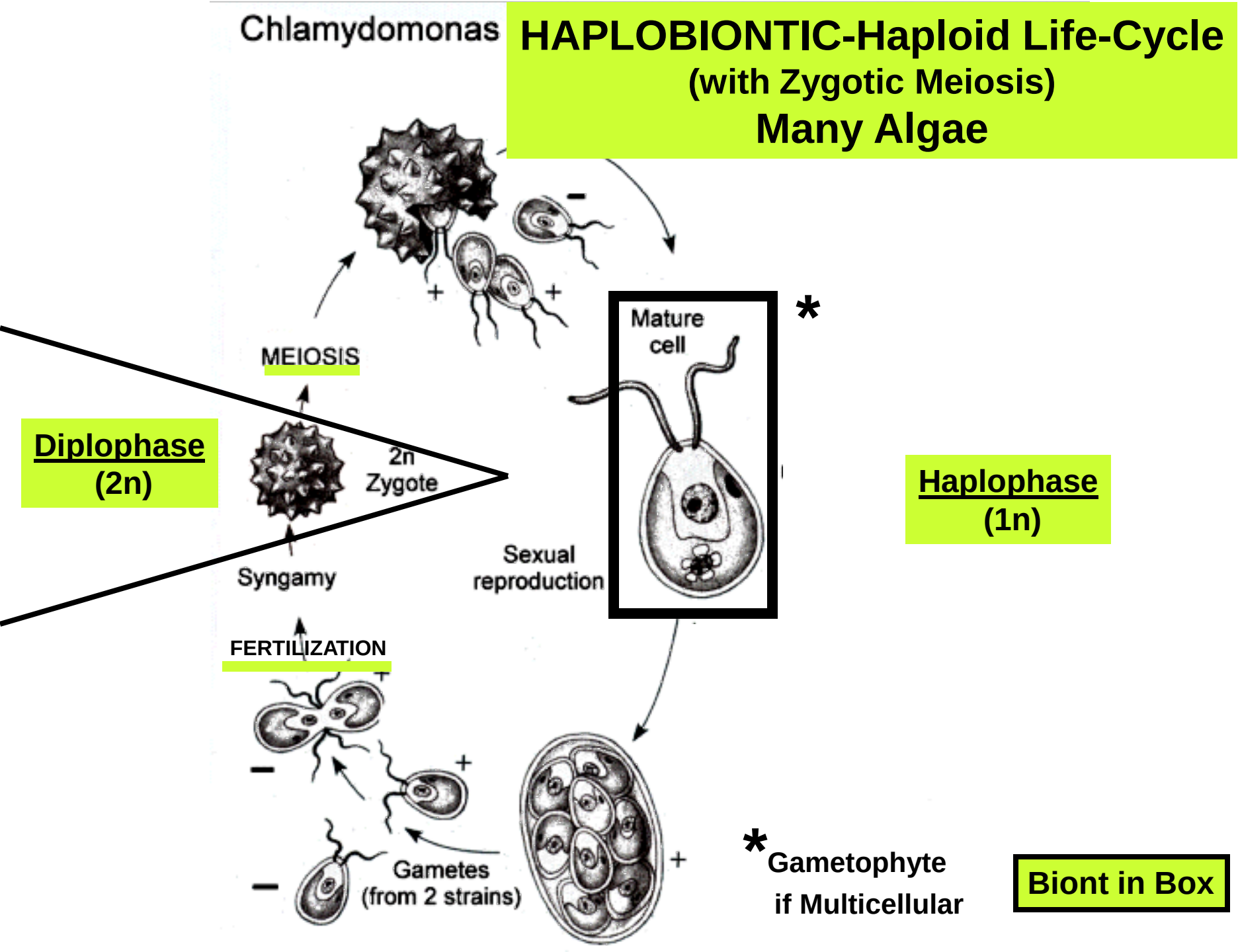
Haplophase
(1n)

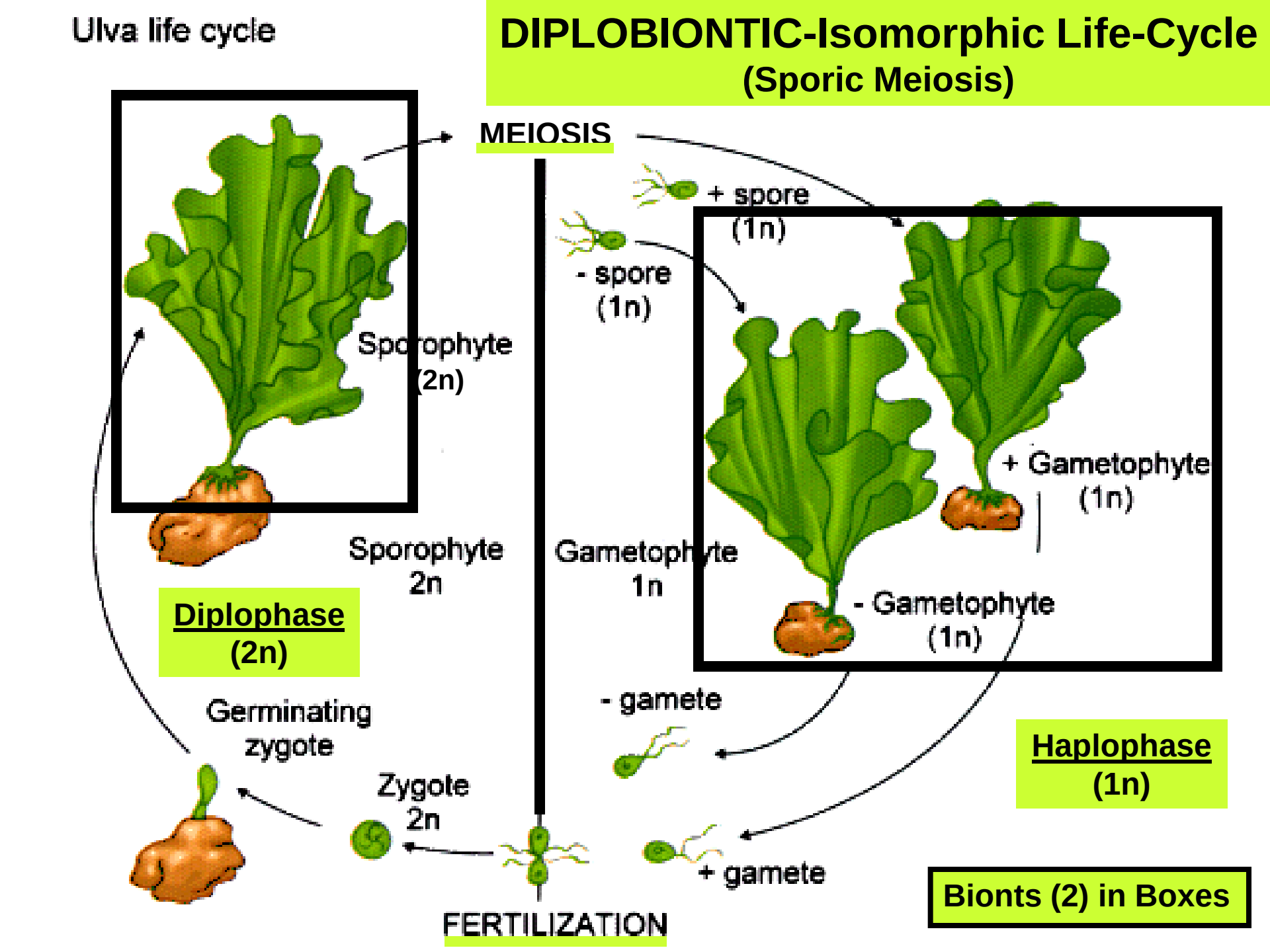


Diplophase
(2n)

Biont in Box

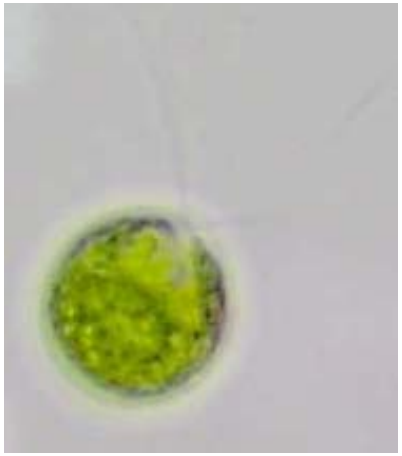
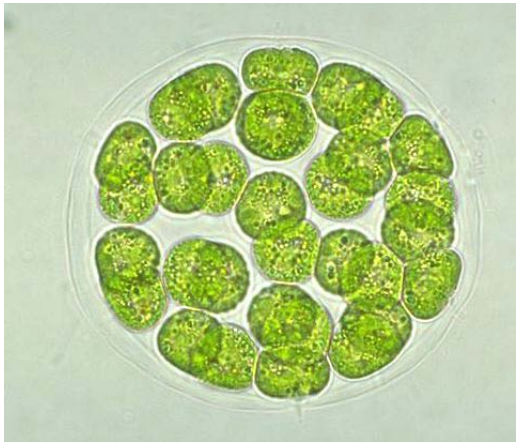
HAPLOBIONTIC-Haploid Life-Cycle
(with Zygotic Meiosis)
Many Algae

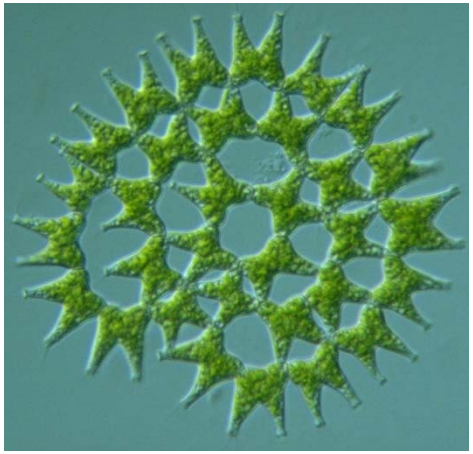


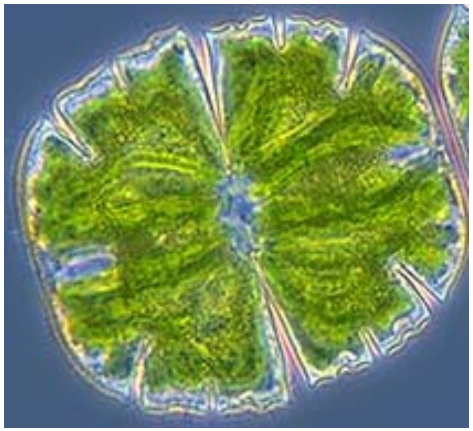
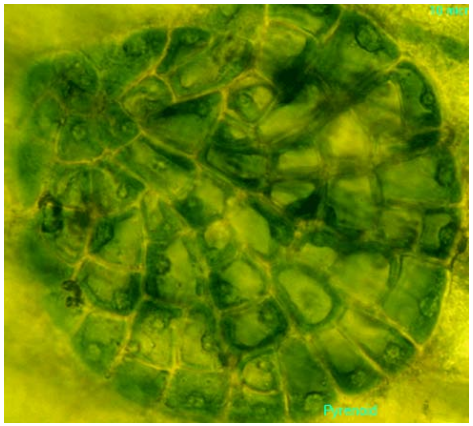

Ulva life cycle
DIPLOBIONTIC-Isomorphic Life-Cycle
(Sporic Meiosis)
MEIOSIS
+ spore
(1n)
- spore
(1n)
Sporophyte
(2n)
Sporophyte
2n
Gametophyte
1n
+ Gametophyte
(1n)
- Gametophyte
(1n)
Diplophase
(2n)
Haplophase
(1n)
- gamete
+ gamete
Germinating
zygote
Zygote
2n
FERTILIZATION
Bionts (2) in Boxes

GREEN ALGAE

Ancestors of the Plant Kingdom



Plant-Like Characters of the Green Algae

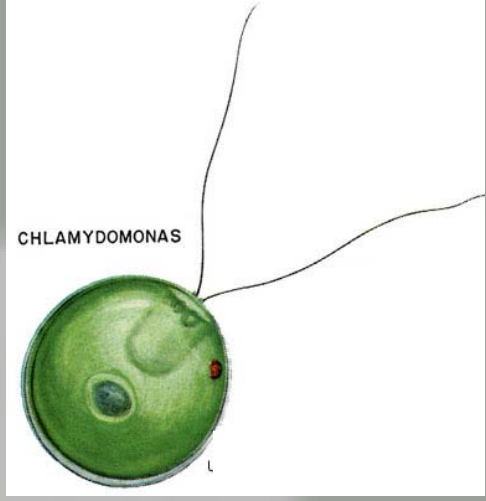
1. Chlorophyll A & B

2. Starch as the Food Reserve

3. Cell Walls with Cellulose

4. Motile Cells with Two Anterior, Whiplash Flagella
   (most Green Algae)

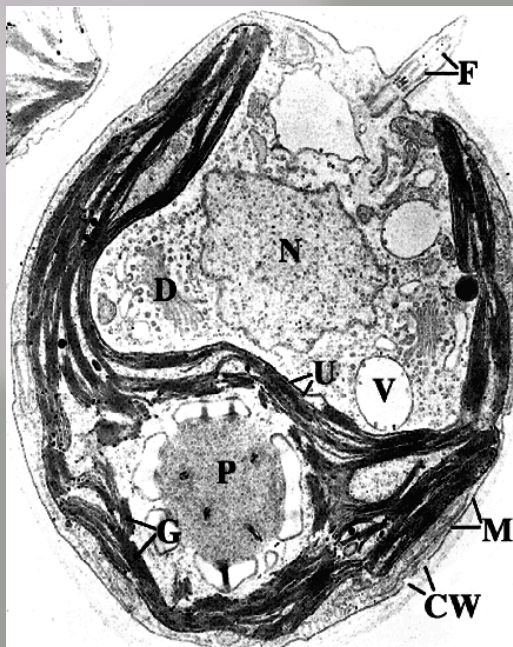
5. Cell Division by Cell Plate Formation Rather than Furrowing
   (some Green Algae)



Zygote

Chlamydomonas

Archetypical Basal Green Alga

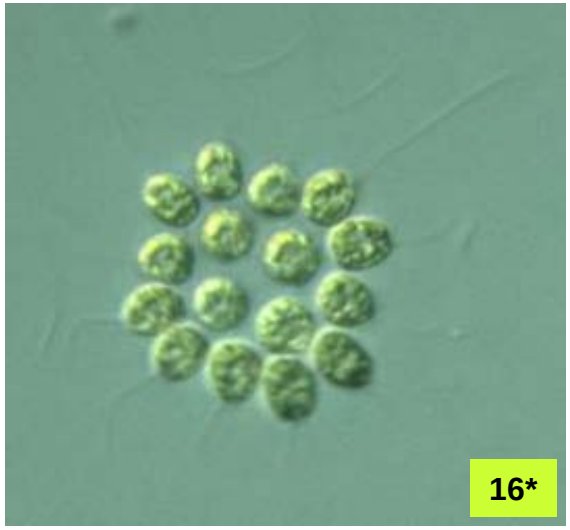


0:24

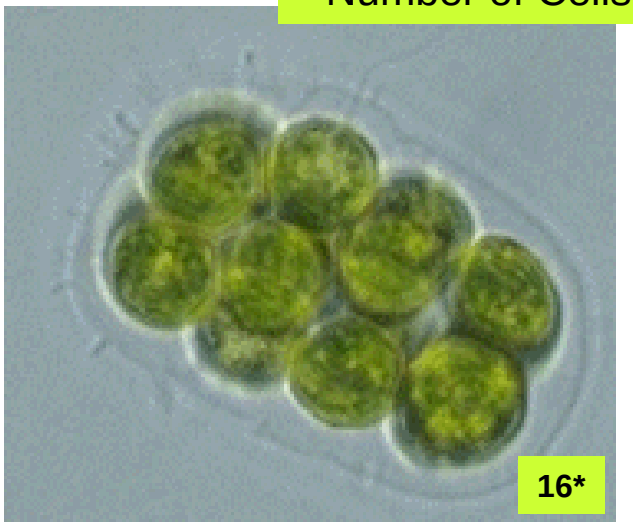
Volvocine Green Algae Evolution

* Number of Cells

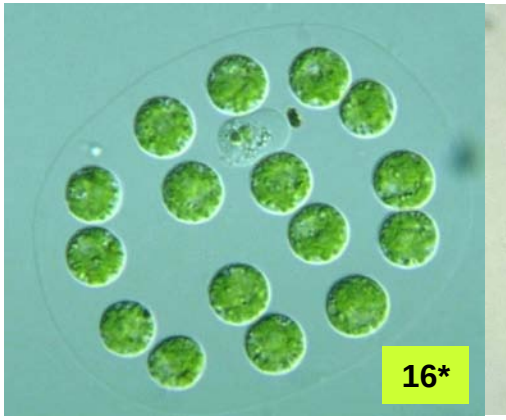
Chlamydomonas
(1)*



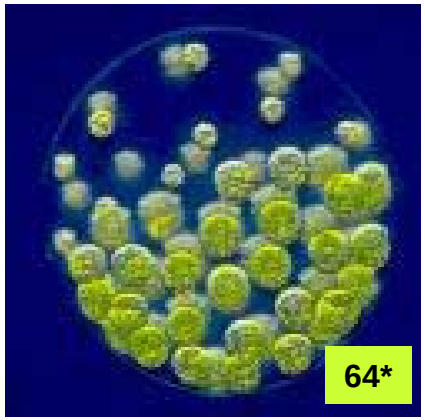
Gonium
(4-16-32)*



Pandorina
(16-32)*



Eudorina
(16-32)*

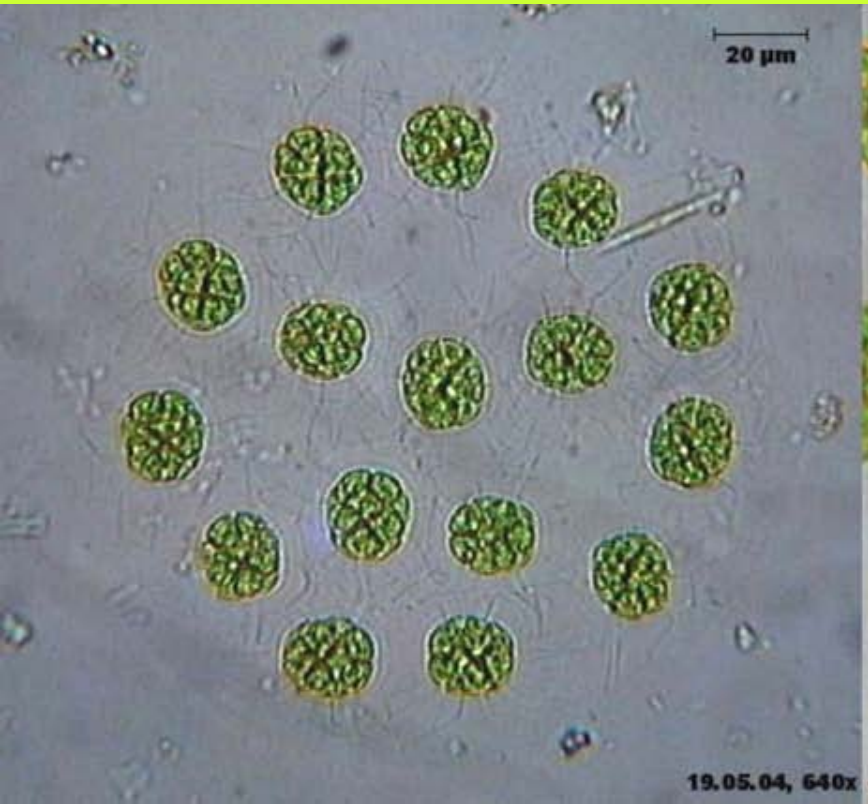


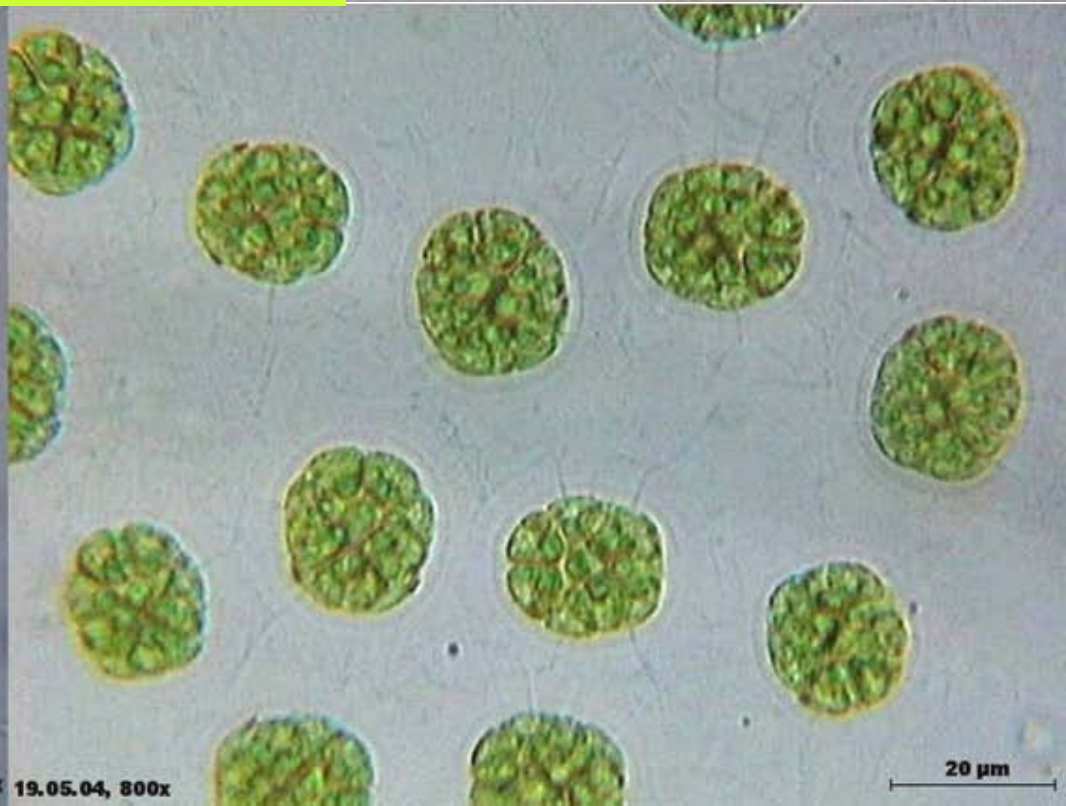
Pleodorina
(32-64-128)*

Volvox
(1,000-50,000)*

Pandorina morum

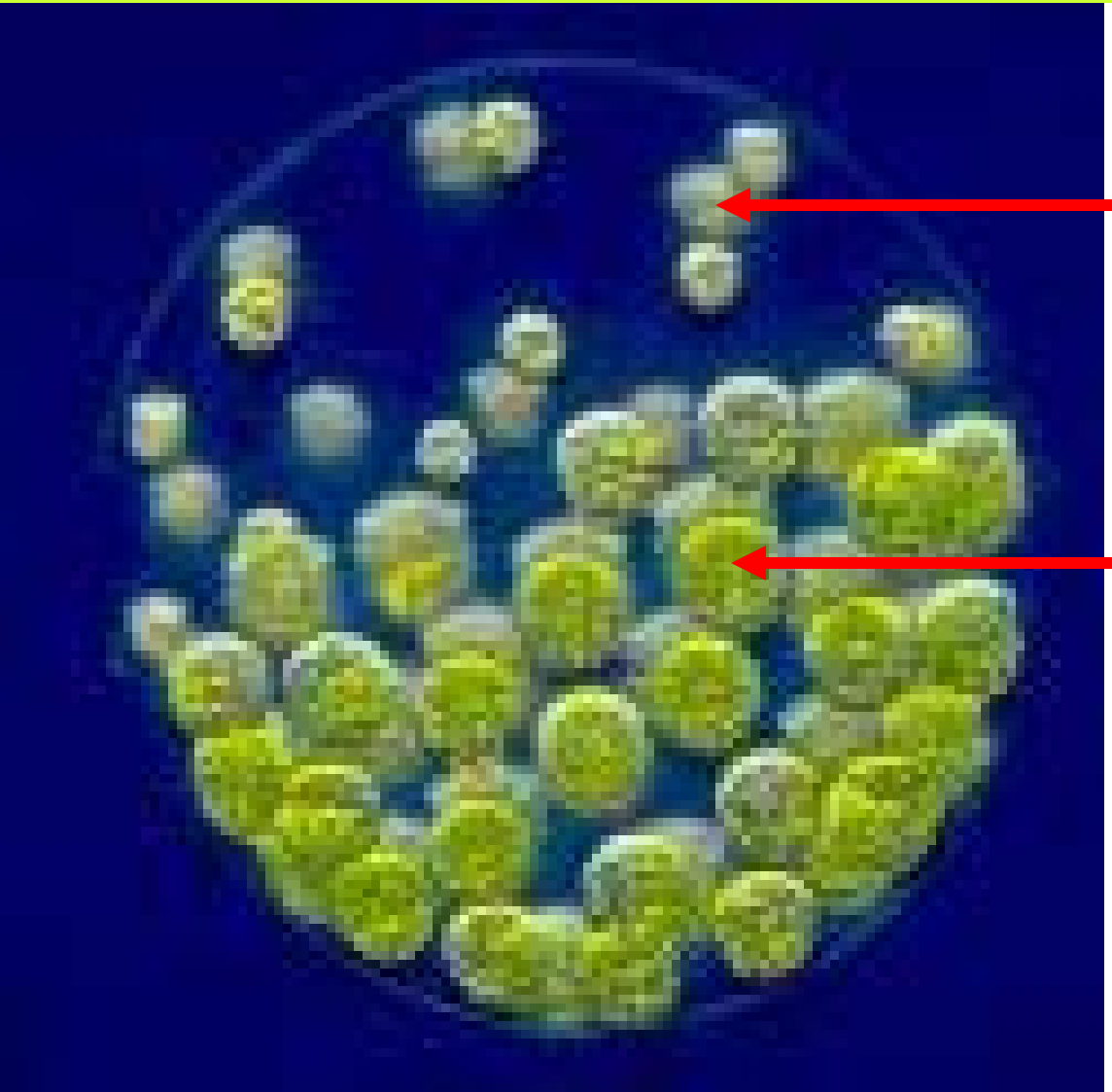
Cells in Colony Similar

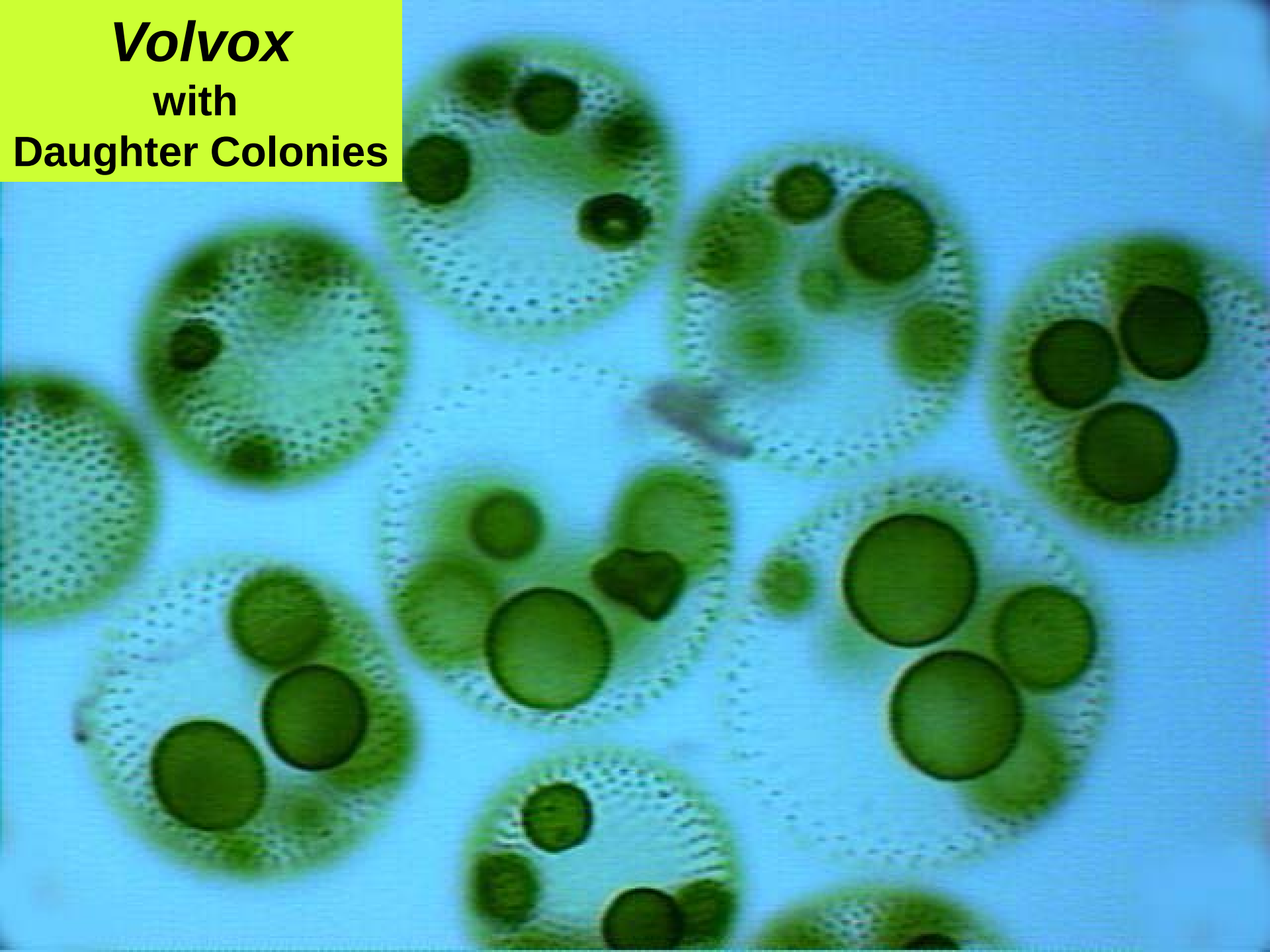




Pleodorina

Cells in Colony Differentiated

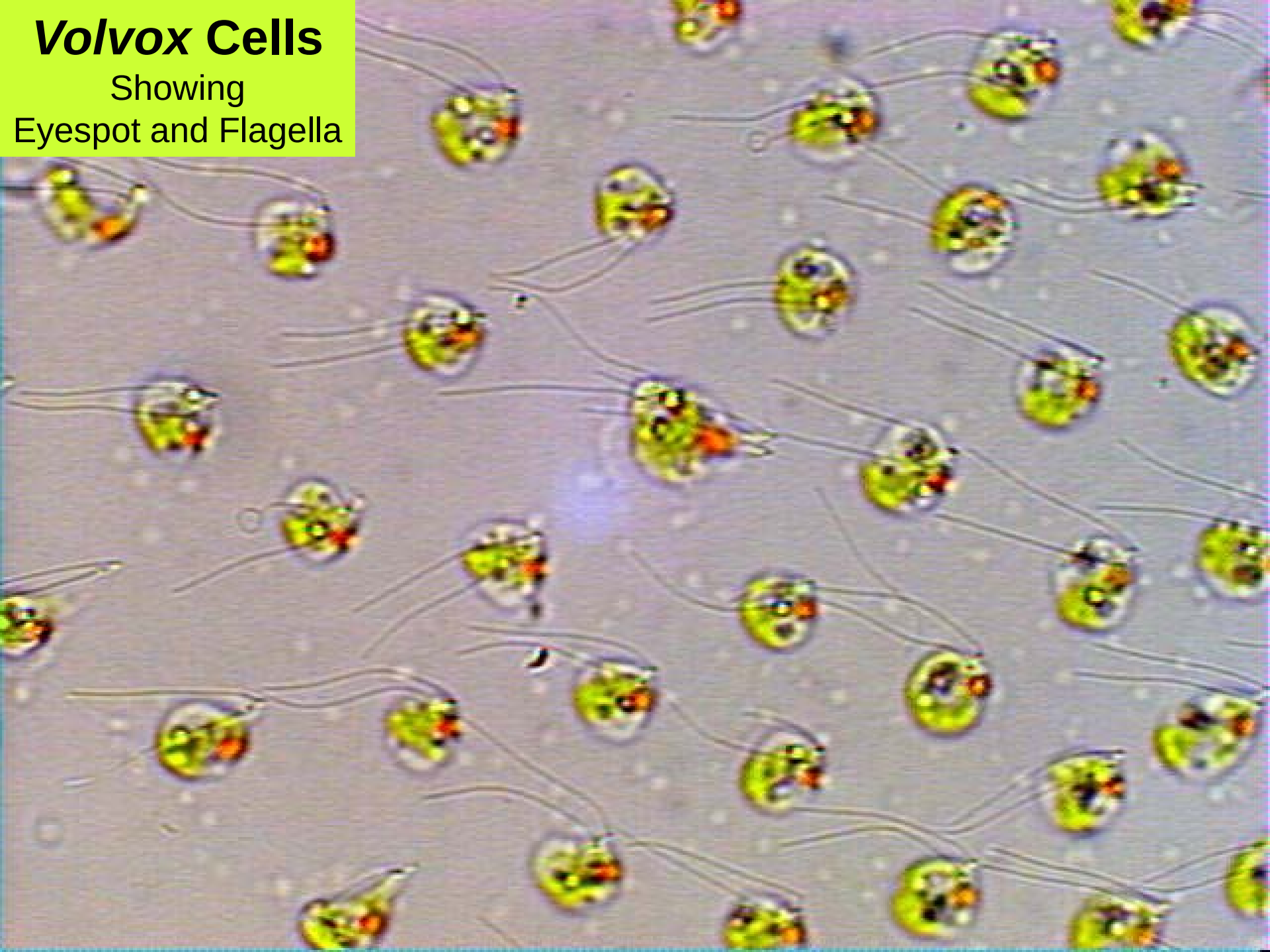



Volvox
with
Daughter Colonies


VOLVOX

Volvox Cells

Showing
Eyespot and Flagella



Ulothricine Green Algae

Freshwater Filamentous Green Algae

I. **Unbranched Filaments**

Ulothrix

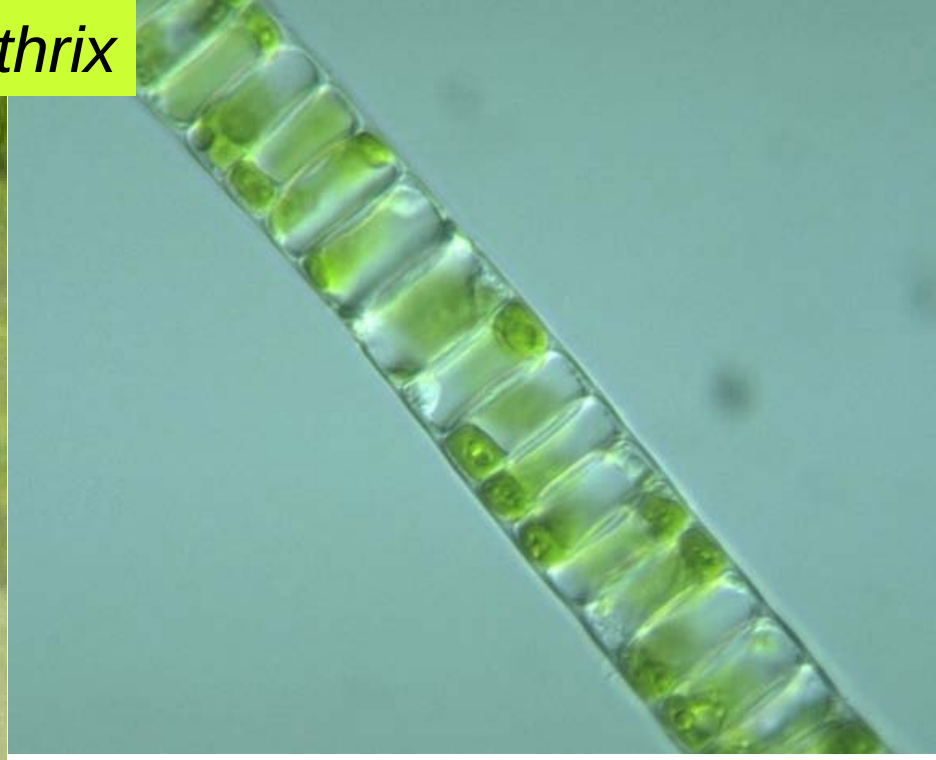
Oedogonoum

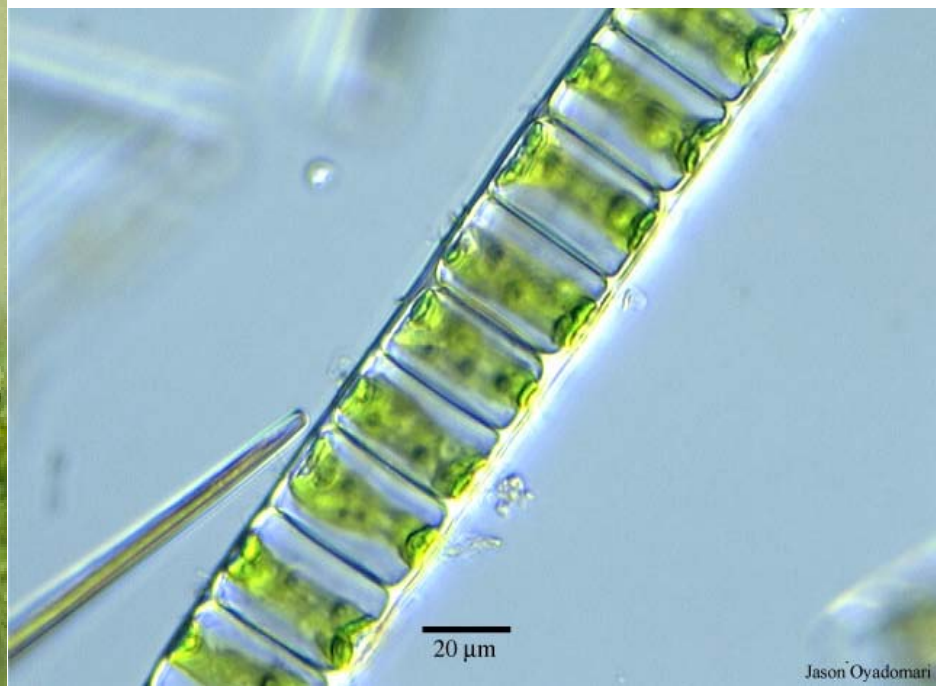
II. **Branched Filaments**

Stigeoclonium

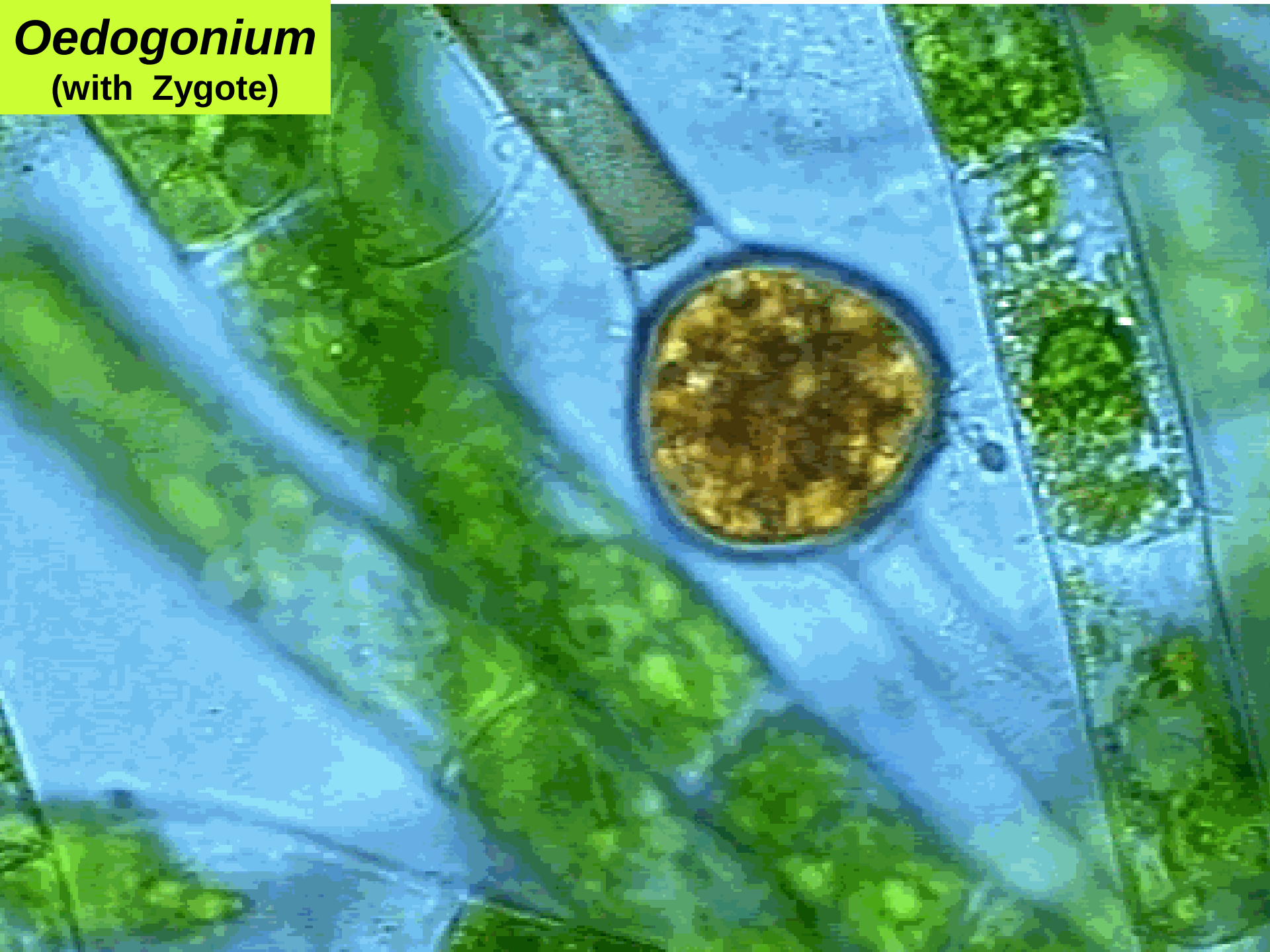
Fritschiella

Ulothrix

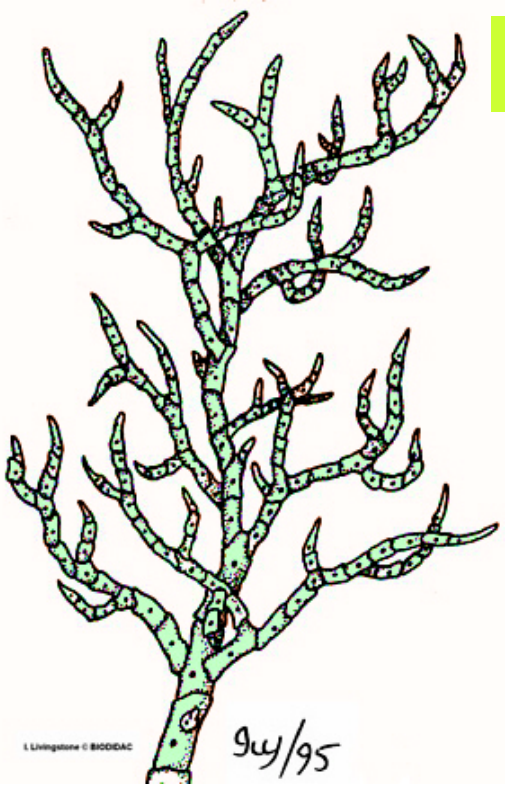




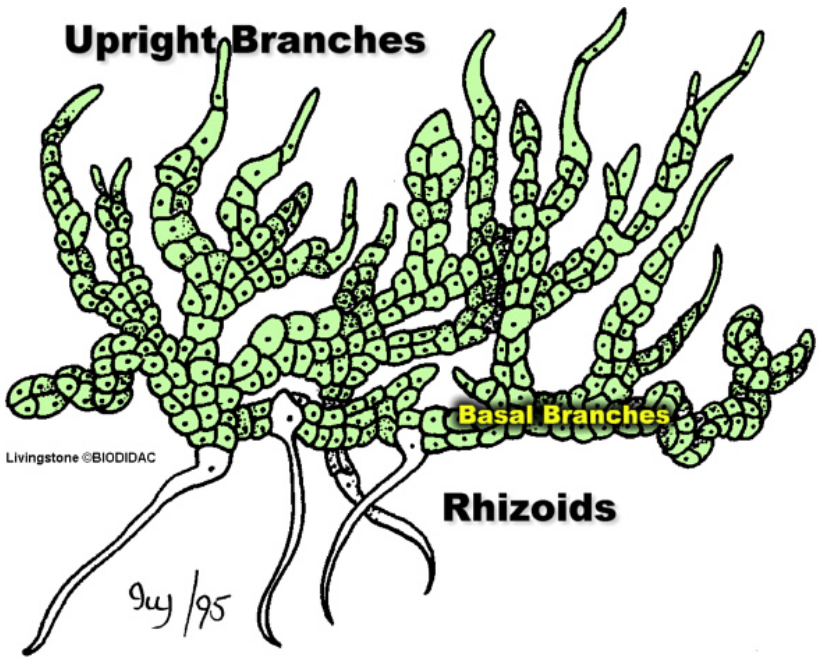
Oedogonium
(with Zygote)



Stigeoclonium



Fritschiella



ULVOPHYTES

Marine Coenocytic or Membranous Green Algae

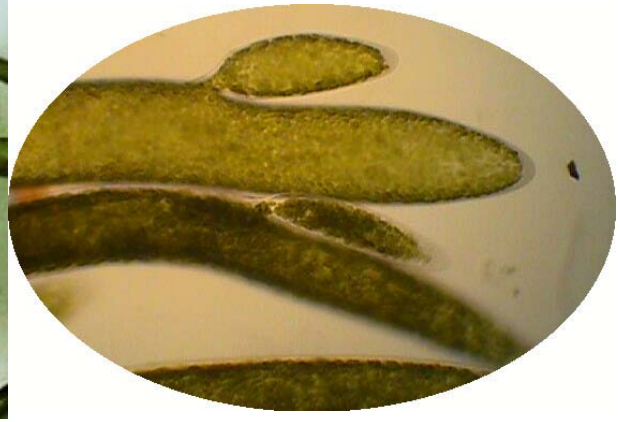
I. **Siphonaceous (Coenocytic, i.e., Multinucleate)**

Bryopsis, Caulerpa

Acetabularia

II. **Membranous**- *Ulva*

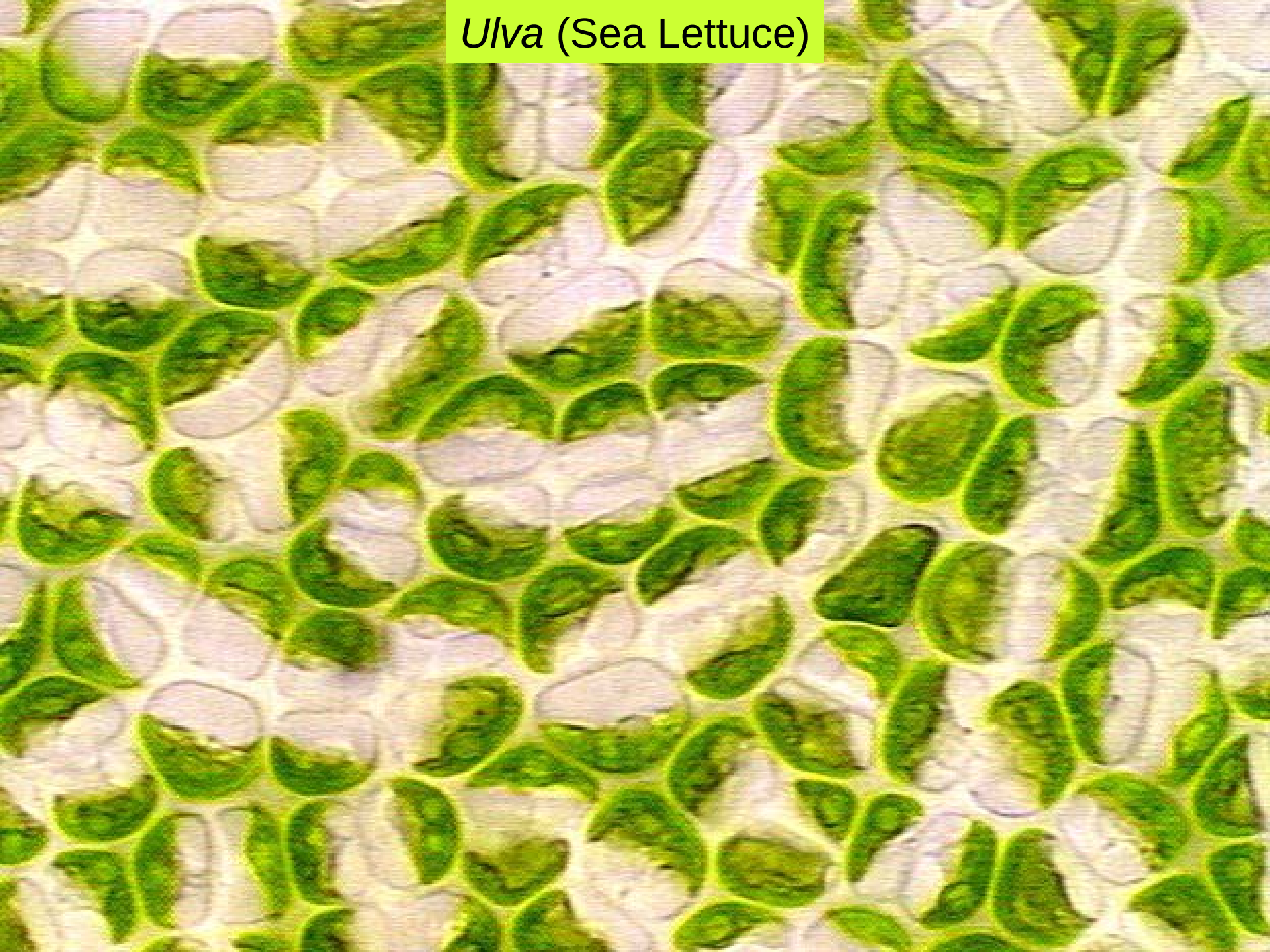
Bryopsis



Caulerpa paspaloides

Acetabularia
(Mermaid's Wine Glass)

Ulva (Sea Lettuce)


Ulva (Sea Lettuce)

CHAROPHYTES

Group That Gave Rise to the Plant Kingdom

I. **Filamentous to Secondarily Unicellular**

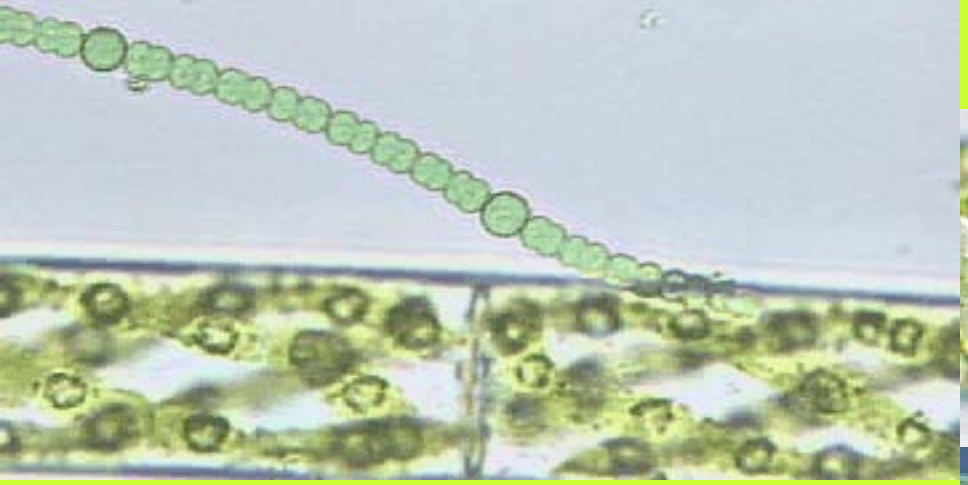
A. **Filamentous (Unbranched)**- *Spirogyra*

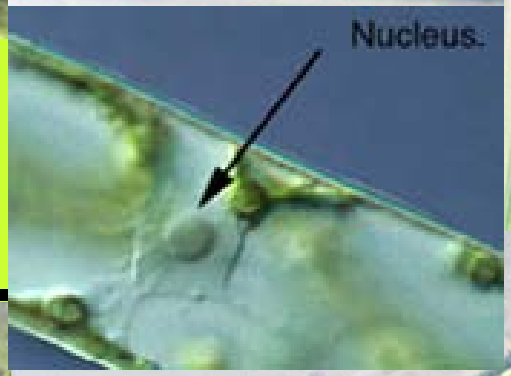
B. **Secondarily Unicellular**- Desmids

II. **Parenchymatous**- *Coleochaete*

III. **Stoneworts**- *Chara*, *Nitella*

Spirogyra



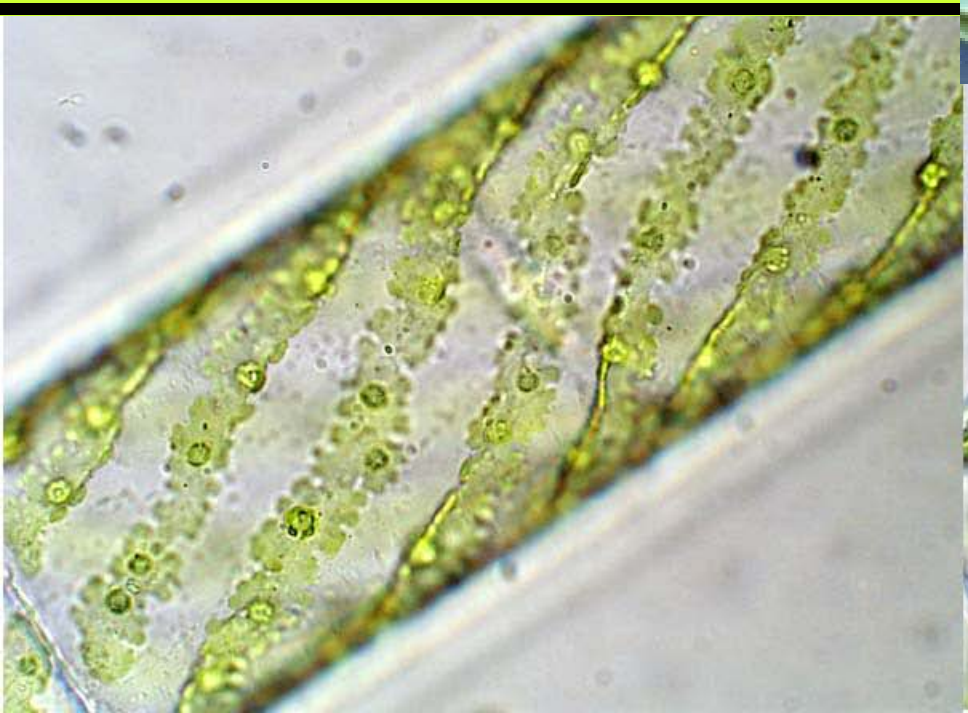


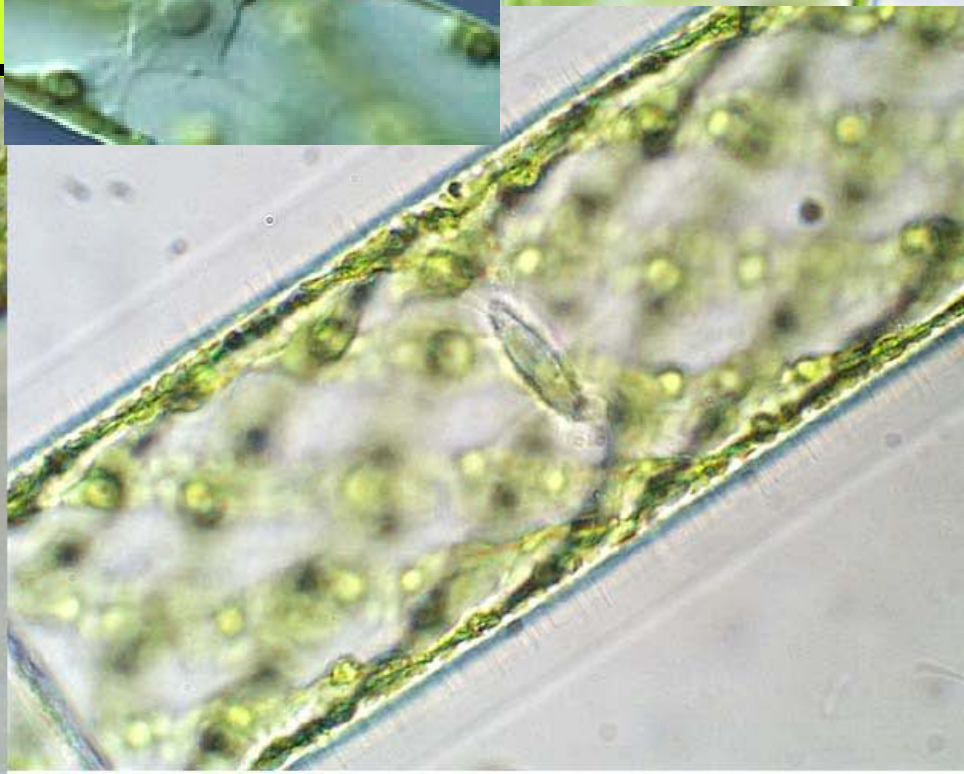
Green Alga *Spirogyra* (lower):

Note Grass Green Color

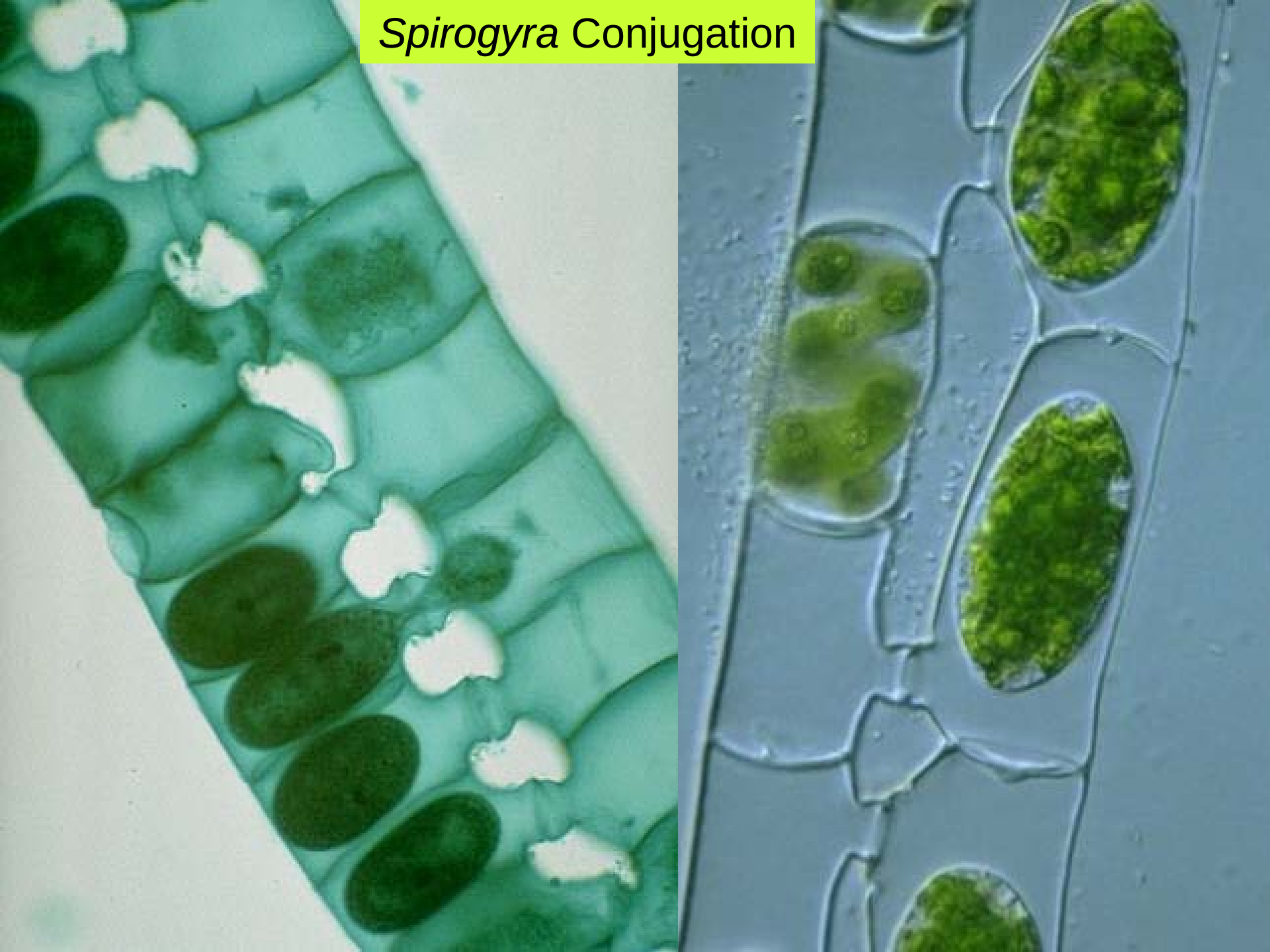
Cyanobacterium *Anabaena* (upper):

Note Blue-Green Color





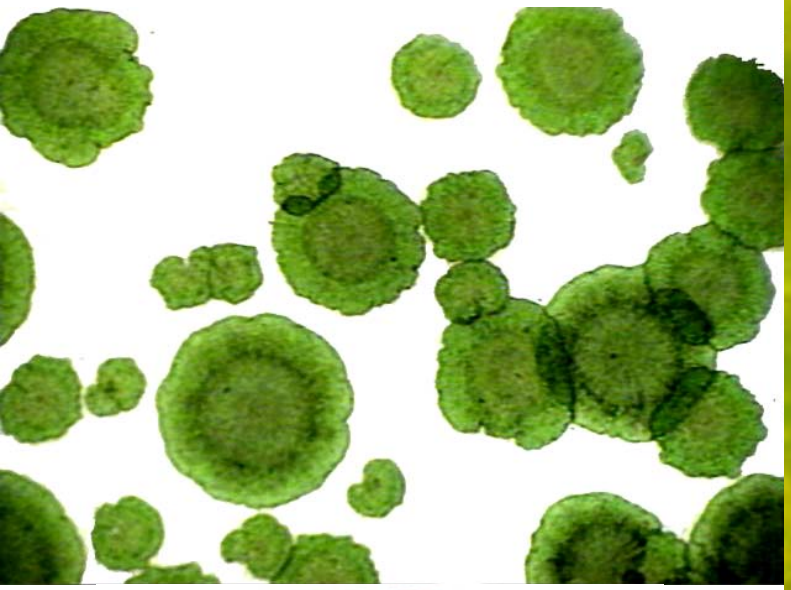
Spirogyra Conjugation

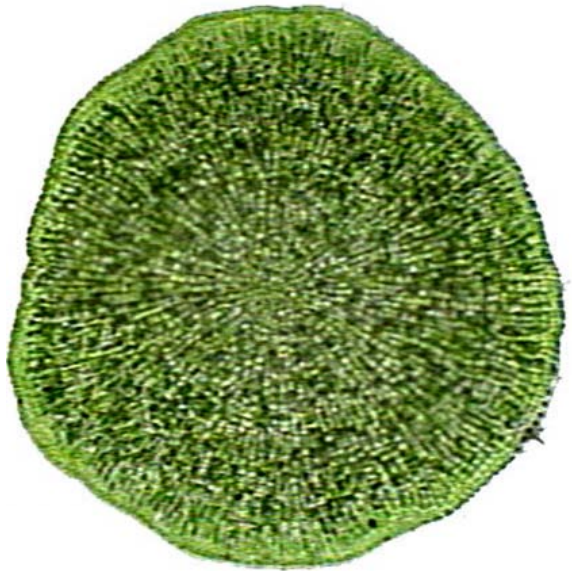


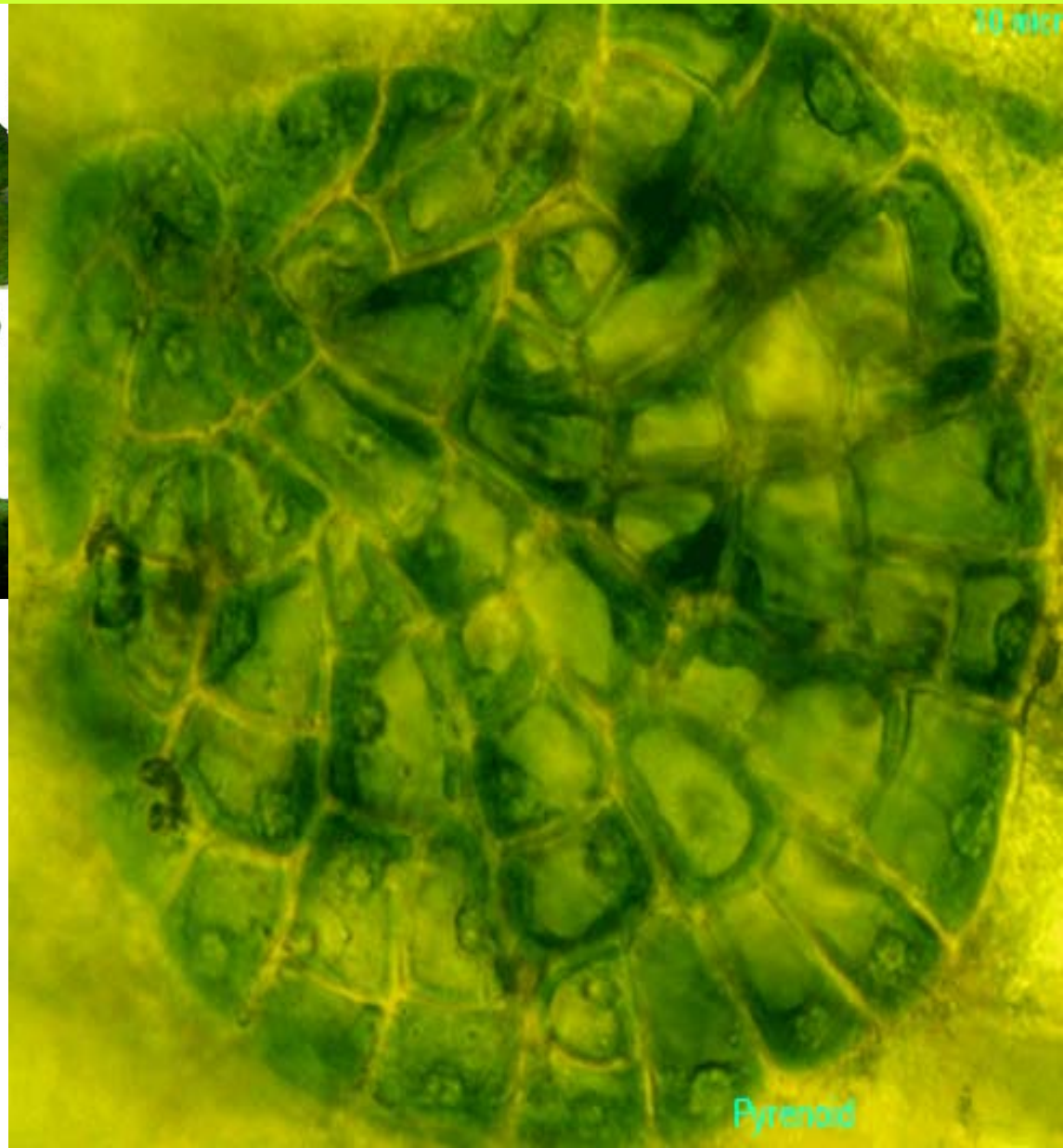
Desmids

Coleochaete

One of the Green Algae Most Closely Related to Plants

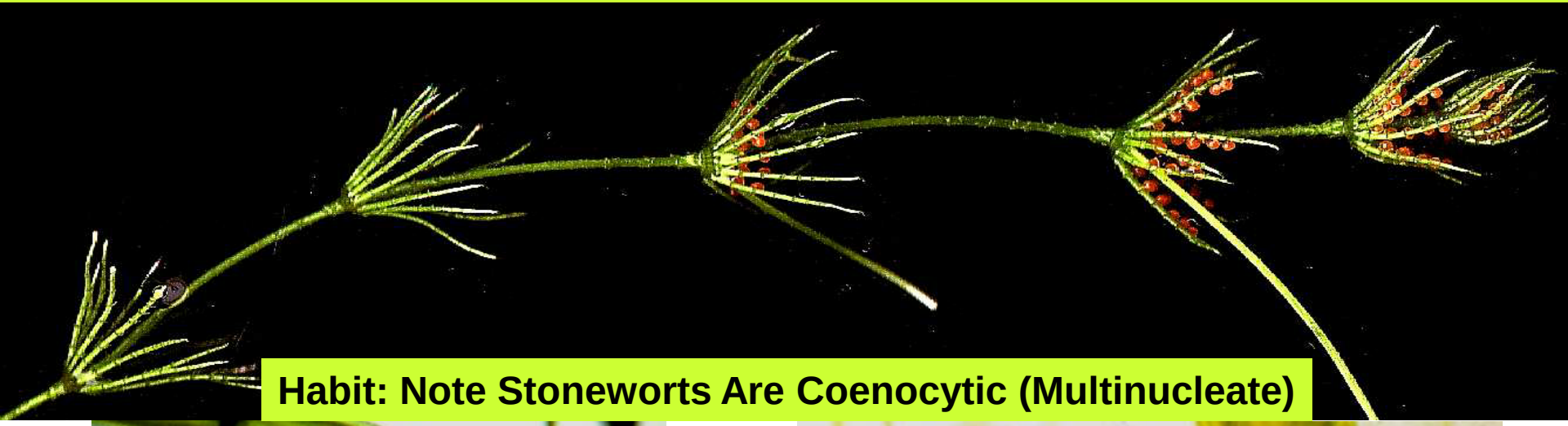




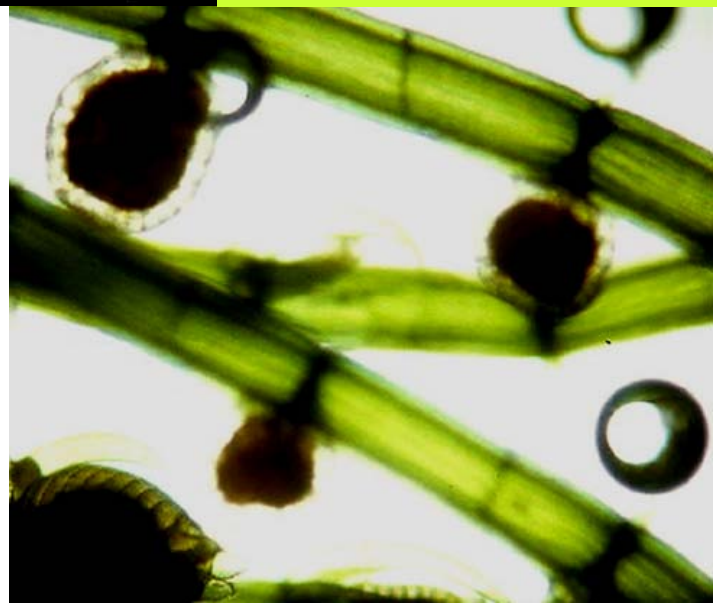


Stoneworts

(*Chara*)

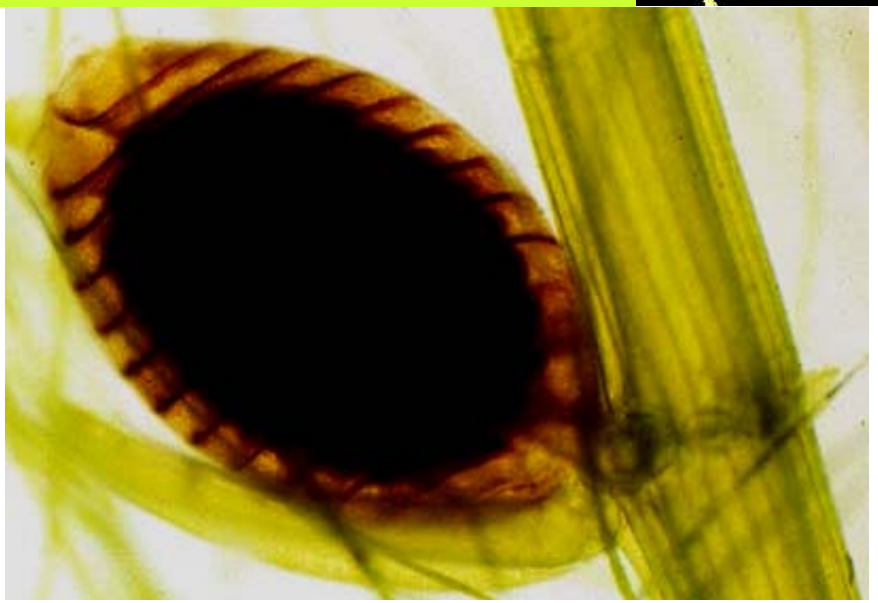


Habit: Note Stoneworts Are Coenocytic (Multinucleate)



Male Gametangia (with sperm)

0:13



Female Gametangium (with egg)

Chara Sex Organs

Male (left), Female (right)