

Ministry education and Science of Republic of Kazakhstan
Karaganda State University named after academician Ye.A.
Buketov

Biological and geographical faculty

Botany Department

Course – Botany

Specialty - 5B011300 – «Biology»

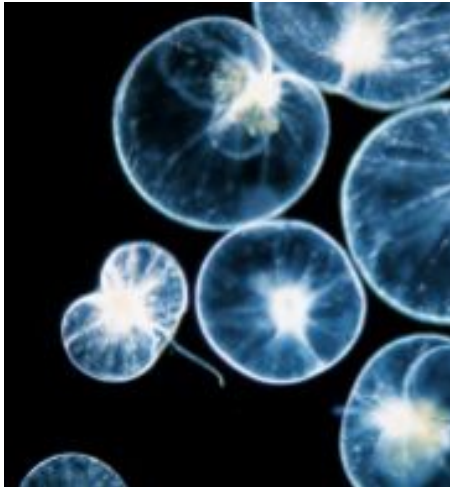
Lecture № 10

Eukaryotes. Algae. Divisions: Pyrrhophyta, Chrysophyta, Xantophyta

(1 hour)

Lecturer: candidate of biological science, associated
professor

Ishmuratova Margarita Yulaevna



Plan of lecture:

- 1 General characteristics of seaweed.
- 2 Division Pyrrhophyta.
- 3 Division Chrysophyta.
- 4 Division Xantophyta.

Basic literatures:

- 1 Еленевский А.Г., Соловьев М.П., Тихомиров В.Н. Ботаника: систематика высших, или наземных, растений. 2 изд. - М.: Academia, 2001. - 429 с.
- 2 Нестерова С.Г. Лабораторный практикум по систематике растений. - Алматы: Қазақ ун-ті, 2011. - 220 с.
- 3 Родман А.С. Ботаника. – М.: Колос, 2001. - 328 с.

Additional literatures:

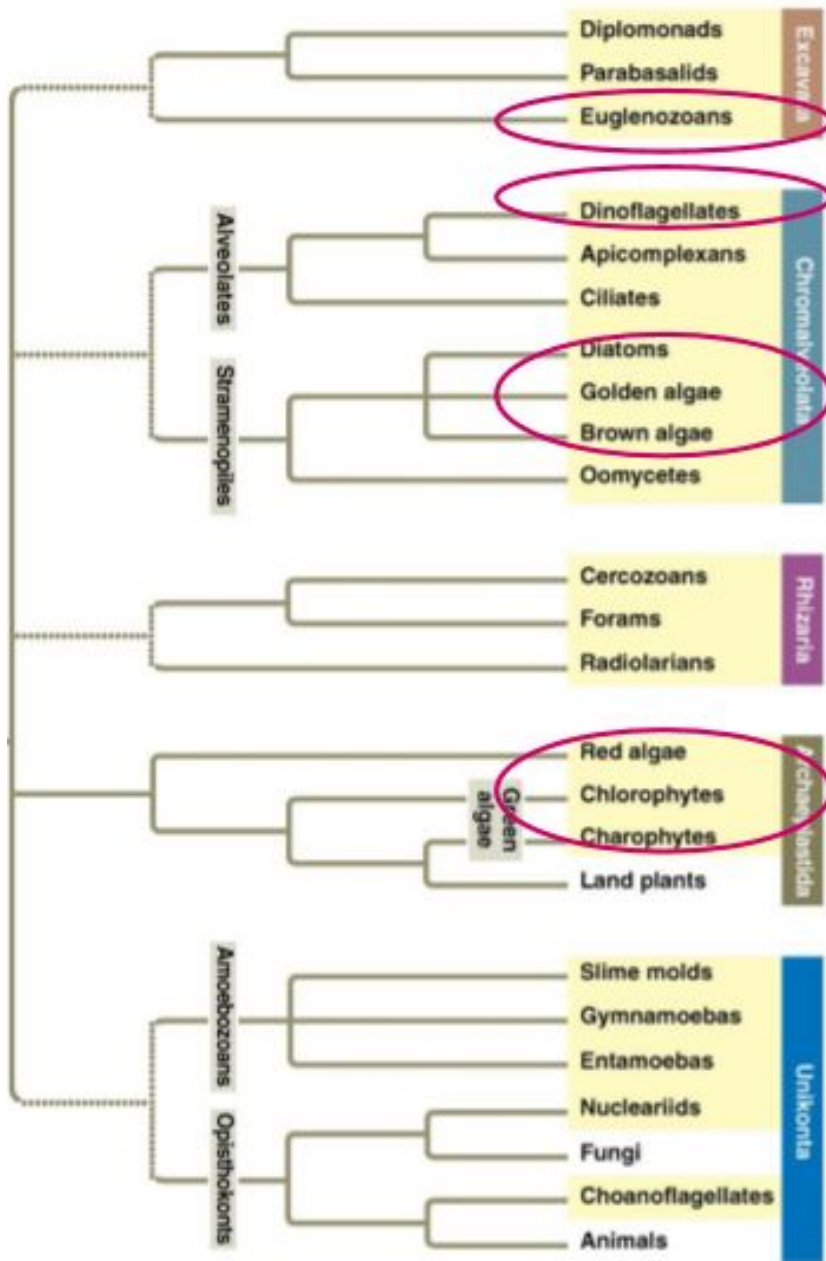
- 1 Абдрахманов О.А. Систематика низших растений. – Караганда: Изд-во КарГУ, 2009. - 188 с.
- 2 Билич Г.Л., Крыжановский В.А. Биология. Т. 2: Ботаника. - М.: Оникс 21 век, 2002. - 543 с.
- 3 Абдрахманов О.А. Практические работы по систематике низших растений. Ч. 2. Грибы и водоросли. – Караганда: Изд-во КарГУ, 2001. - 144 с.
- 4 Абдрахманов О.А. Лабораторный практикум по бактериям и водорослям. Учебное пособие. - Алматы: Казакадем образование, 2000. - 130 с.

Protist Phylogeny

“Algae” - Not monophyletic

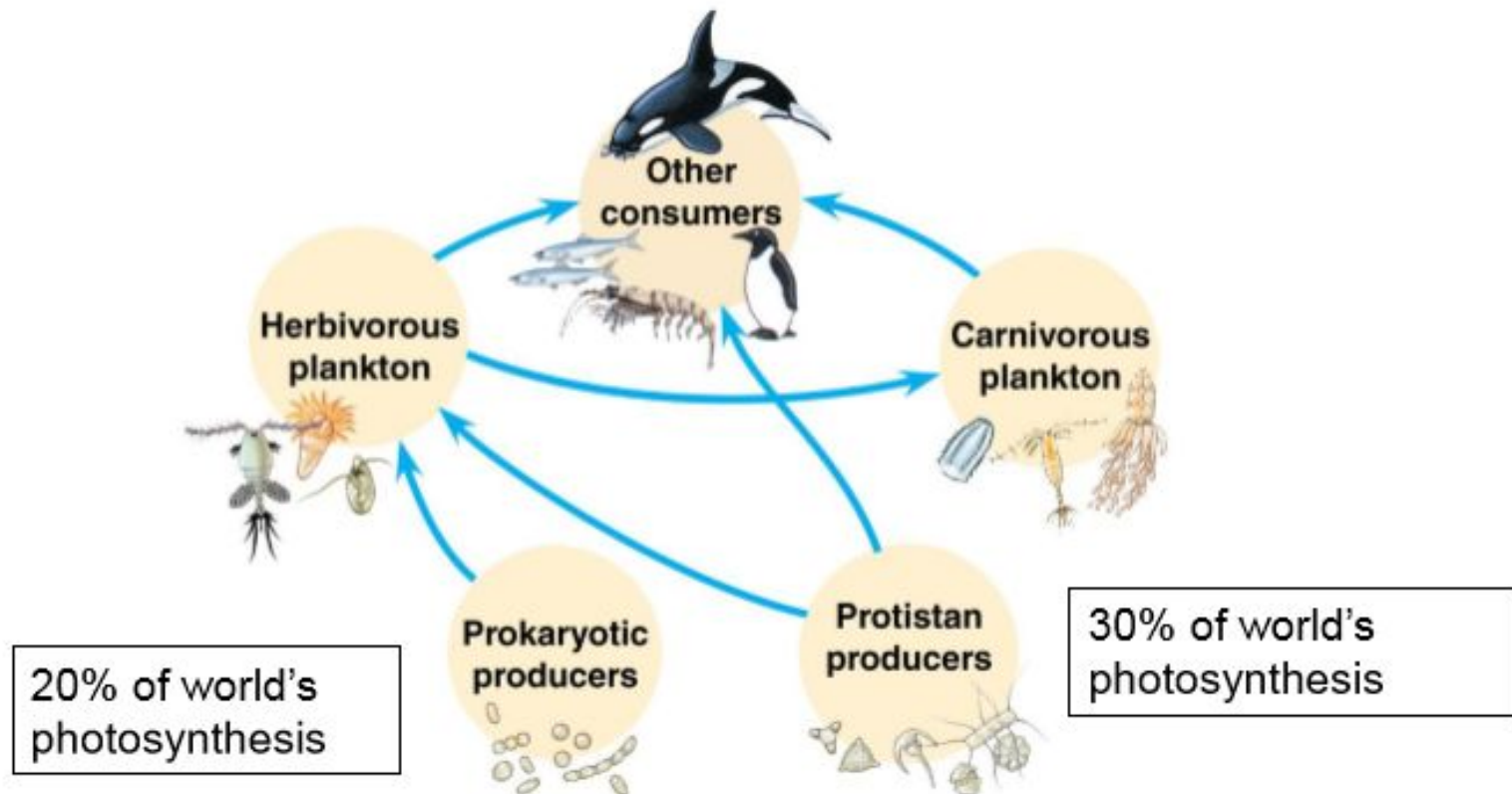
What unites them as a group?

- Range from unicellular to multicellular
- From phytoplankton to kelp forests



Algae: Ecological Roles

- Primary productivity
 - Productivity – *amount of biomass produced in a given area during a given period of time*

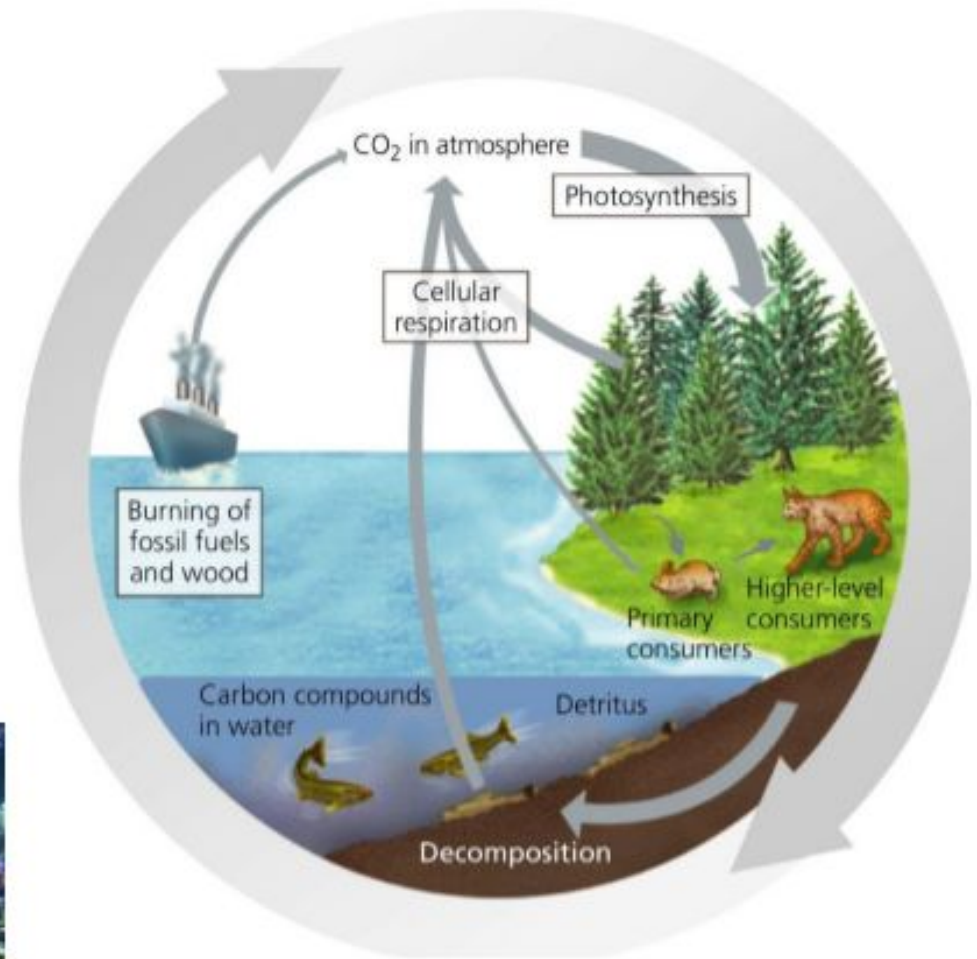


Algae: Ecological Roles

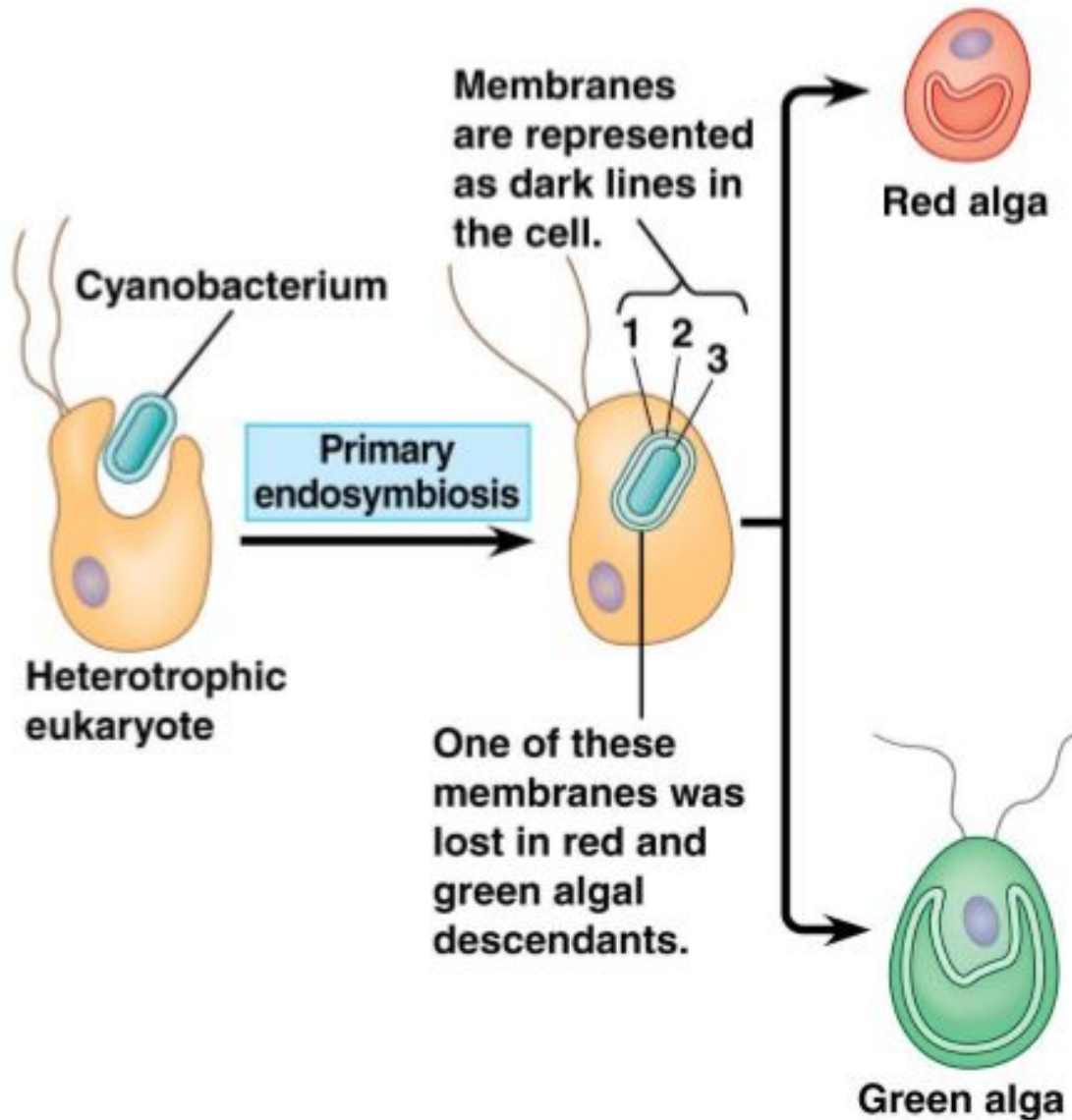
Carbon cycling

– carbon sink

Various mutualistic relationships

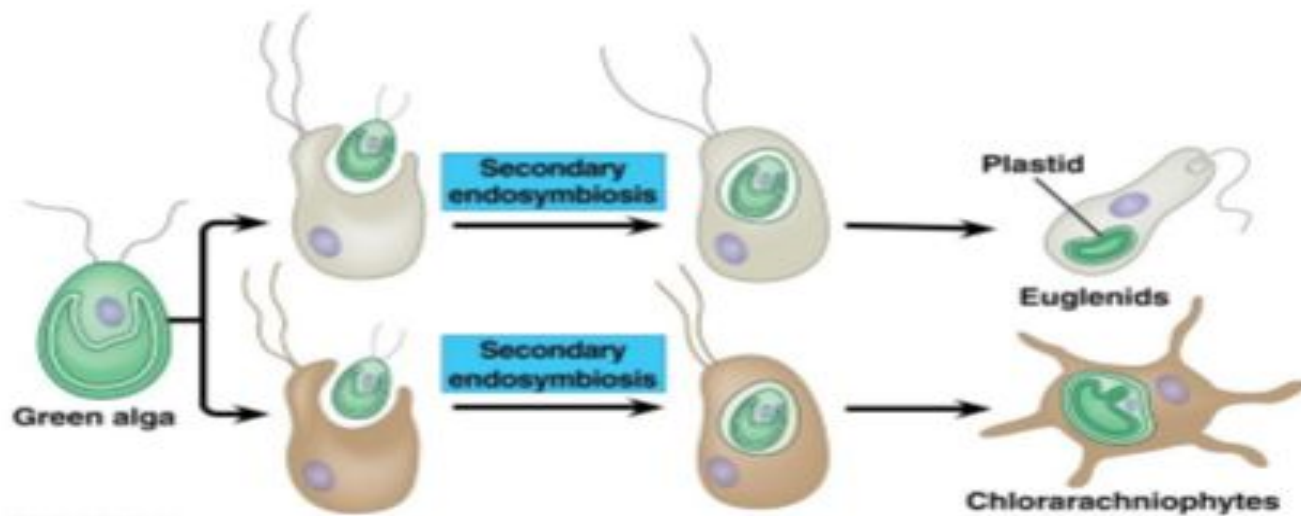
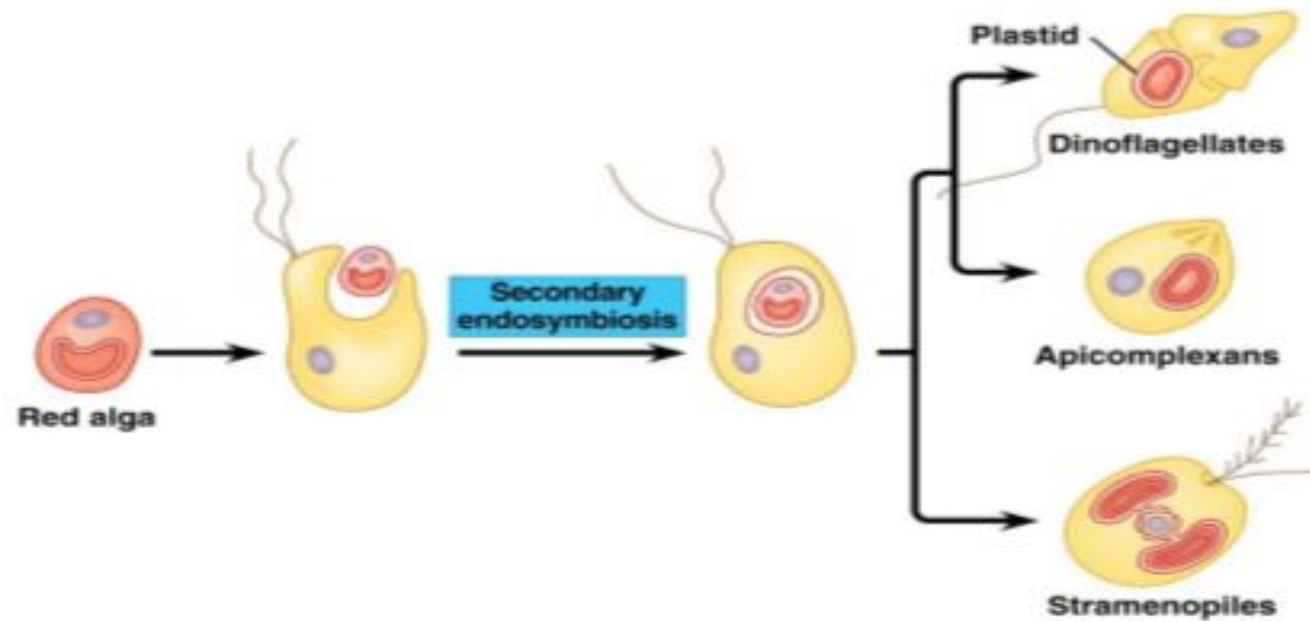


Primary & Secondary Endosymbiosis



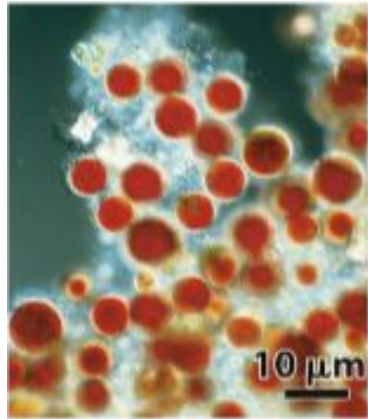
- Primary Endosymbiosis

Secondary Endosymbiosis

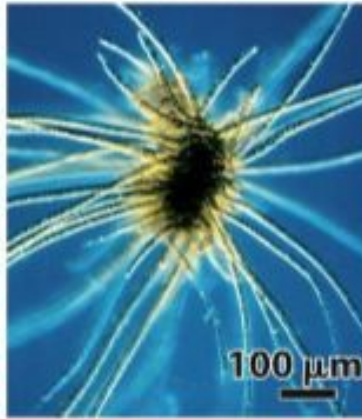


Photosynthetic pigments in chloroplasts

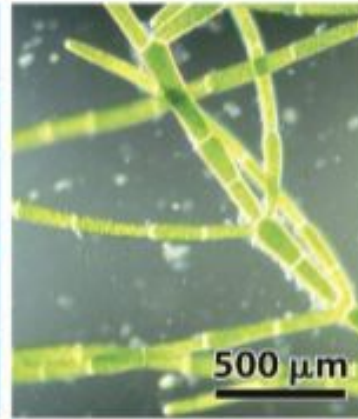
(a) Red:
chlorophyll *a* and
phycoerythrins



(b) Brown:
chlorophyll *a*,
chlorophyll *c*,
and xanthins



(c) Green:
chlorophyll *a* and
chlorophyll *b*

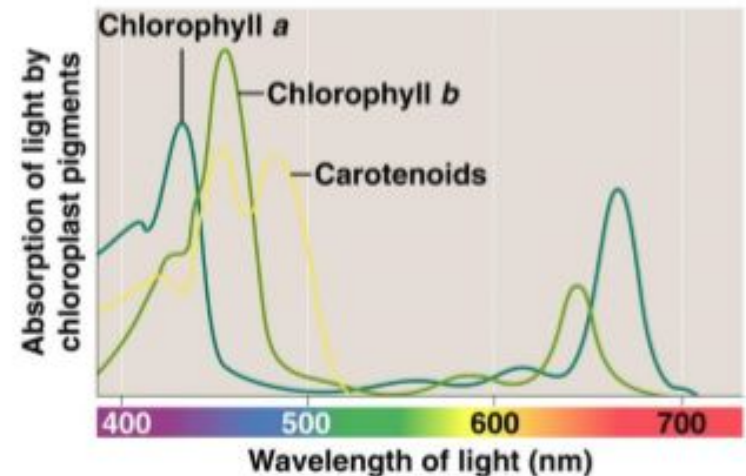


Chlorophyll *a*

- Required for photosynthesis

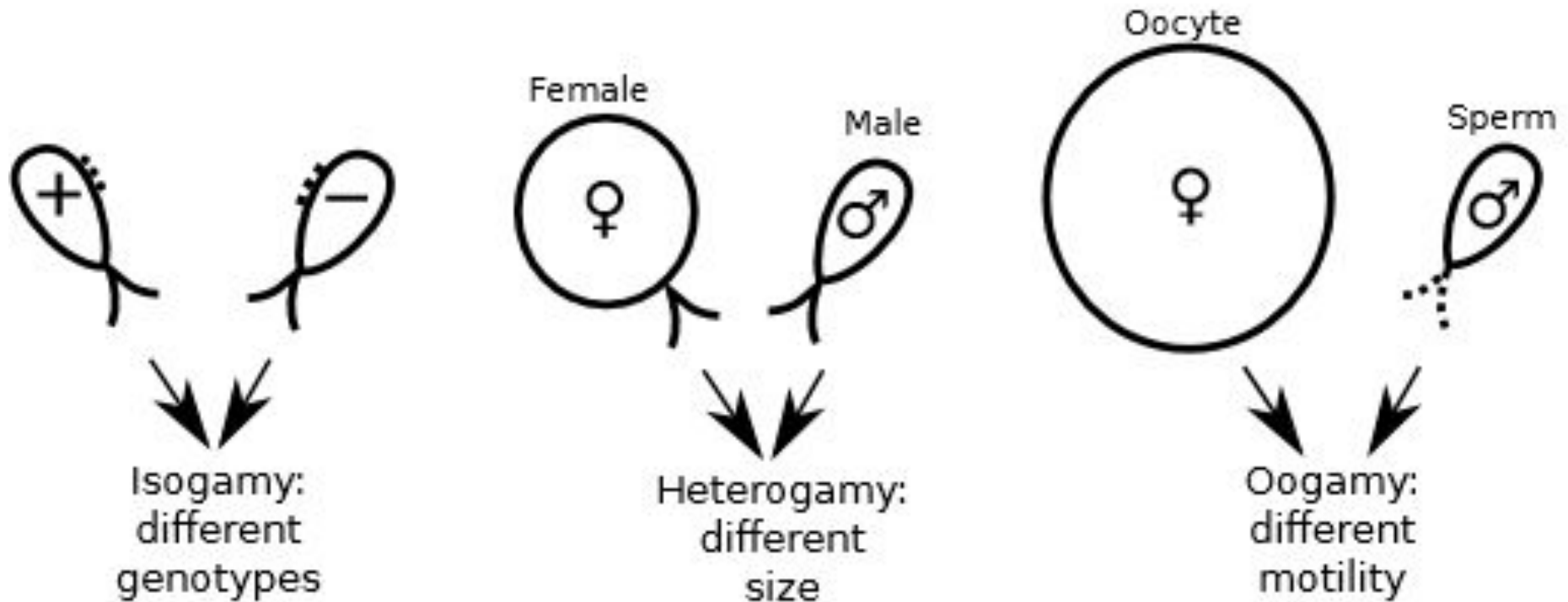
Accessory pigments

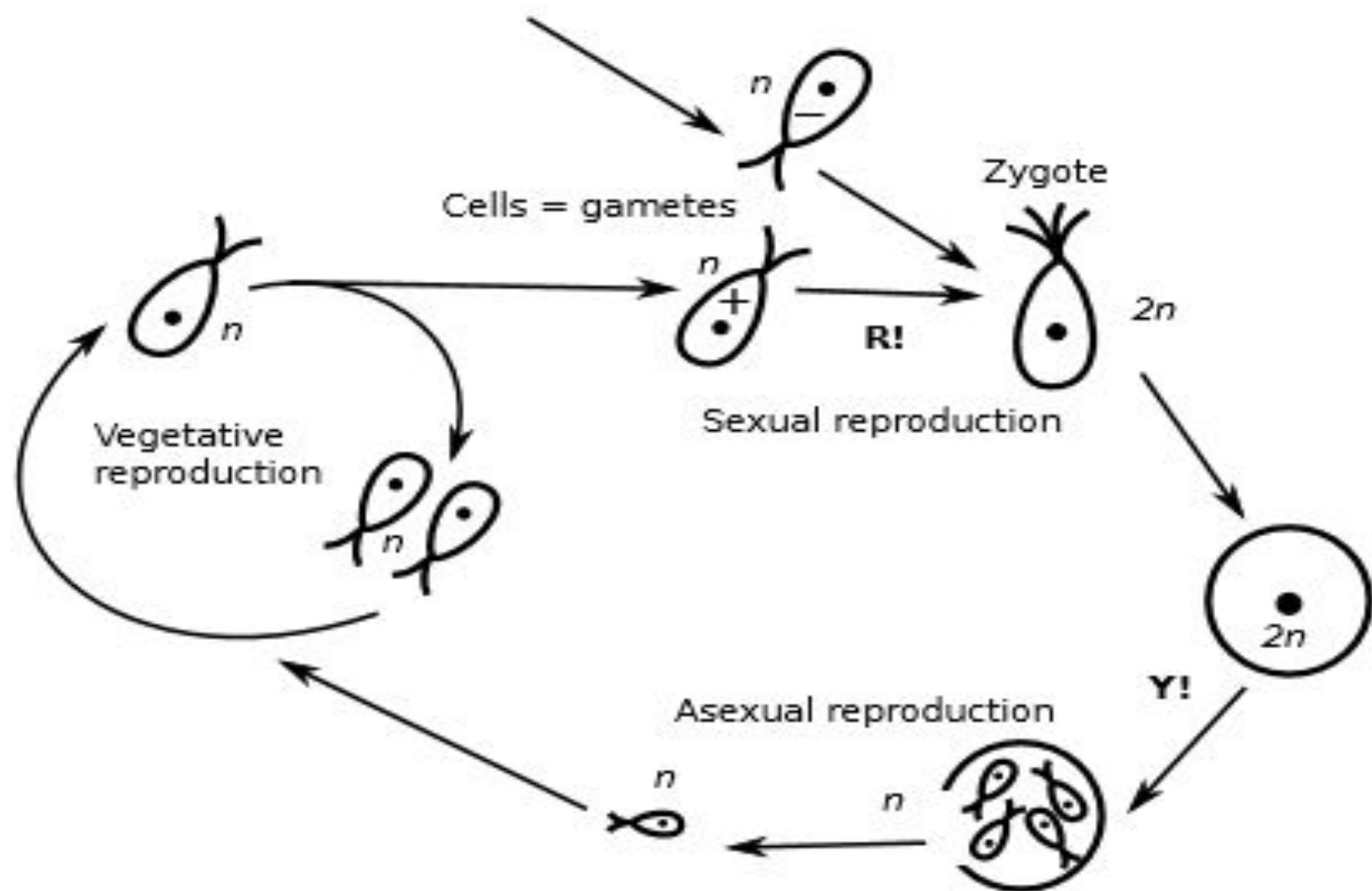
- Broadens the spectrum of light that can be absorbed
 - Chlorophyll *b*
 - Chlorophyll *c*
 - Carotenoids (e.g. fucoxanthin, phycoerythrin, others)
 - sunscreen, coloration



(a) Absorption spectra

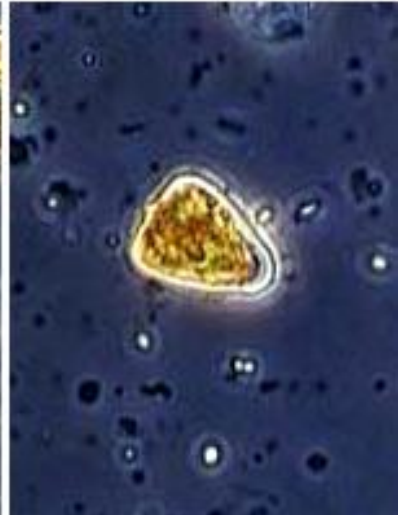
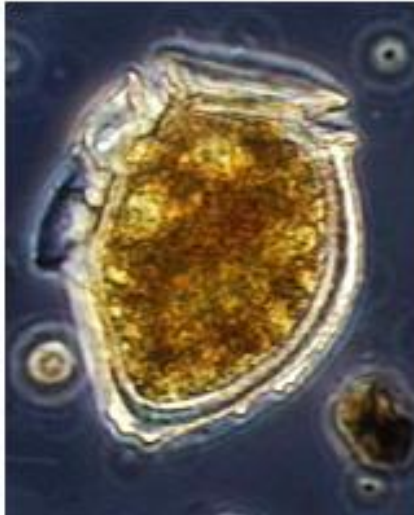
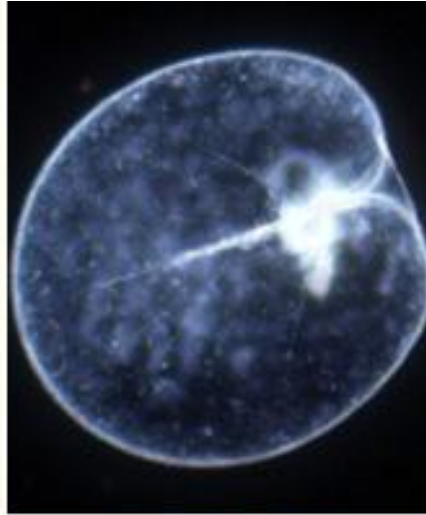
Types of sexual reproduction





The life cycle of unicellular eukaryote.

Some Pyrrophytes (Dinoflagellates) seaweeds



Dinoflagellates

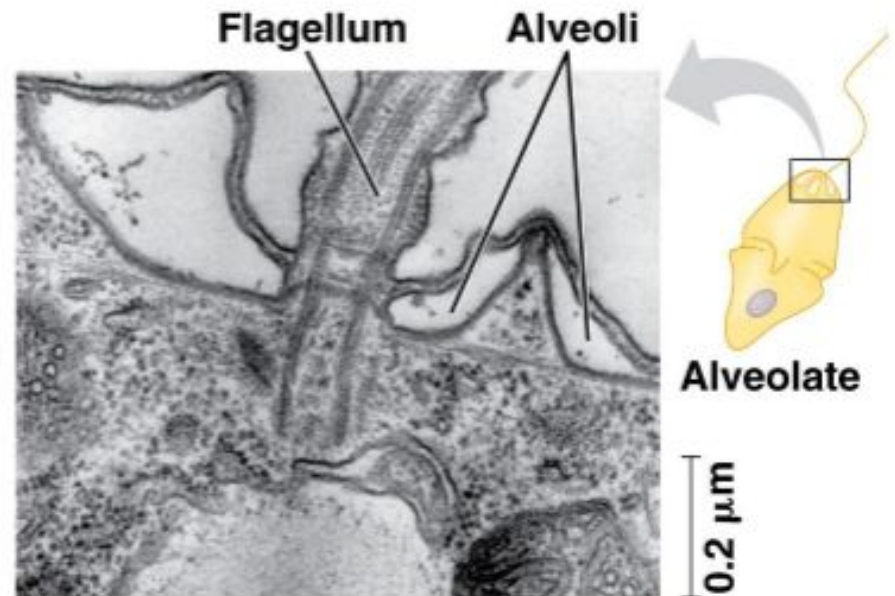
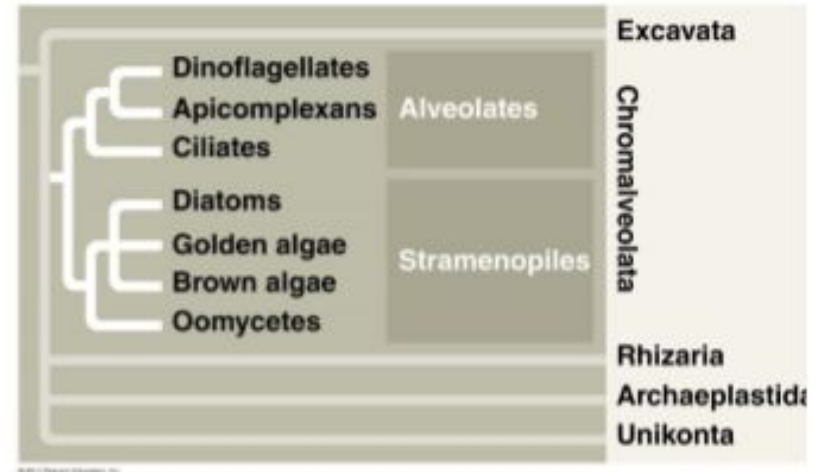
Supergroup Chromalveolata

Clade Alveolata

Key trait of clade: membrane bound sacs (alveoli) beneath the plasma membrane

Phylum Dinophyta

- ~4000 described species
- Photosynthetic, mixotrophic & heterotrophic
- Unicellular
- Solitary & colonial

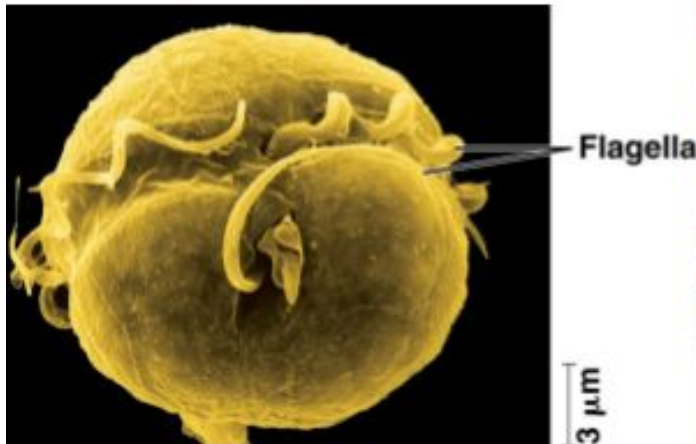


Dinoflagellates

Phylum Dinophyta

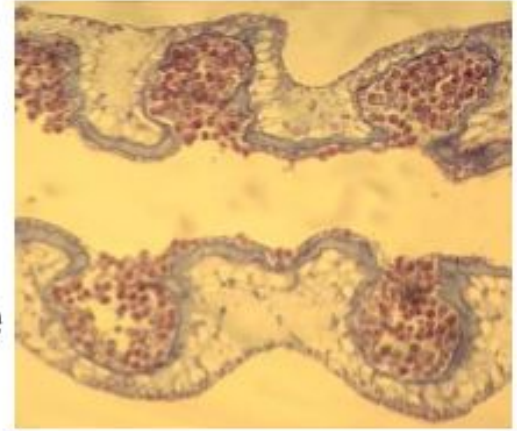
Key traits:

- 2 flagella
 - positioning of flagella causes organism to spin
- Plates of cellulose – “armored”



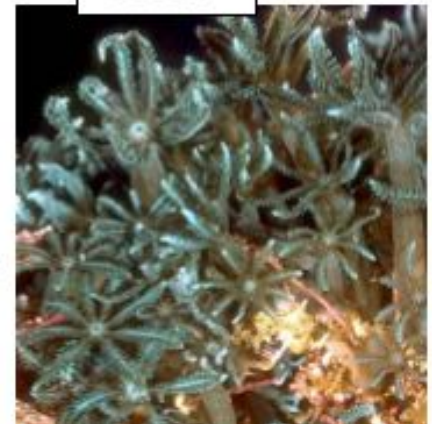
Dinoflagellates: Ecological Roles

- Marine and freshwater phytoplankton
 - Important primary producer
- Some mutualistic
 - **zooxanthellae** - symbiotic dinoflagellate
 - lacks armored plates
 - Corals, sponges, jellyfish, octopuses and squids, snails, etc.
- Very important in coral reef ecosystems
- “red tides”
 - Carotenoid pigments
 - 20% of known dinoflagellates release toxins

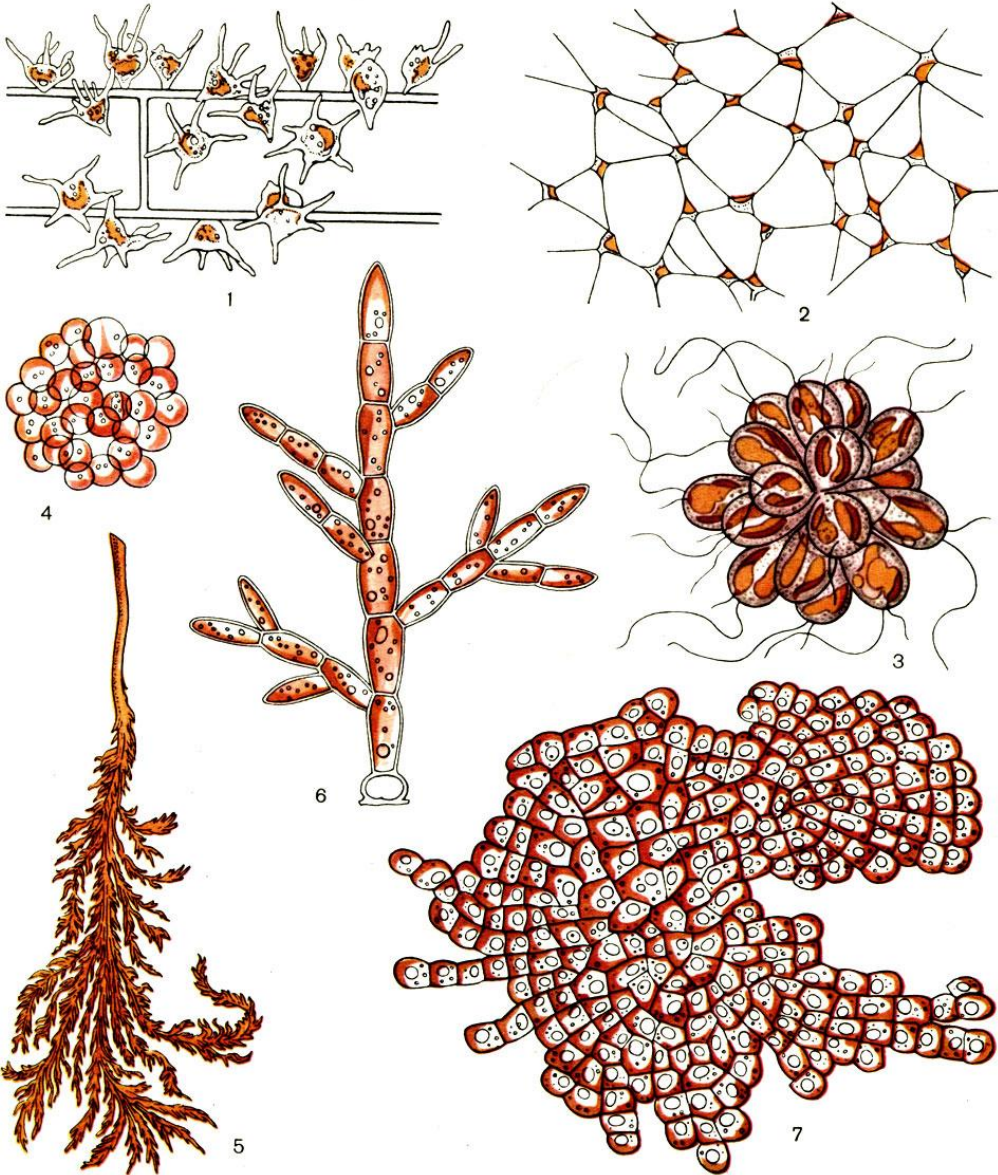


Cross section of coral polyp w/zooxanthellae

Coral



Some Chrysophytes seaweeds (Golden algae)



Golden Algae

Phylum Chrysophyta

- ~1,000 described species
- Unicellular & solitary (most)
- Colonial (some)
 - Some w/silica covering
- Cells w/two flagella, attached near one end
- Some mixotrophic
- Yellow & brown carotenoids



Golden Algae

Lifestyle

- Many planktonic
- Most freshwater, some marine
- Asexual & sexual reproduction

Resting spores (cysts)

- Resistant stage
- Cyst made of silica



Some Xantophyta seaweeds



Control questions:

- 1 Which is ecological role of seaweeds?
- 2 Create the schemes of isogamy, heterogamy and oogamy.
- 3 How do people use algae?
- 4 Which signs do lie in the base of systematic of algae?
- 5 Describe main signs of algae.
- 6 Which pigment did open in different groups of algae?

Test questions:

Peculiarities of structure of golden algae:

- A) multicellular tallom
- B) carotinoids
- C) chlorophyll A and E
- Д) hetero trophy
- E) presence of gantonema
- F) Unicellular structure

Individual from golden algae:

- A) chrysomonad
- B) cryptomonad
- C) botridium
- Д) euglena
- E) ameba