

Wetland Plants and Algae

PLB 423

Question?

What are the major photosynthetic pigments found in the algae?

(Take 2 minutes to write down your answer – name at least five pigments)

Chlorophylls

a

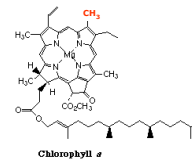
b

c



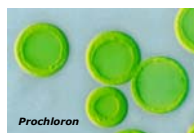
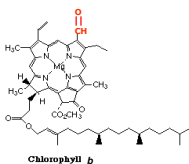
Chlorophyll a

- **All** cyanobacteria, algae and photosynthetic plants have **chlorophyll a**



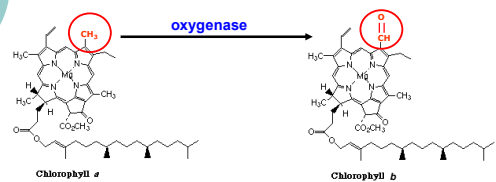
Chlorophyll b

- Present in green algae, euglenoids and higher plants
- *Some* photosynthetic cyanobacteria also have **chlorophyll b**

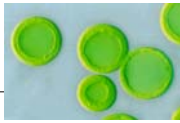


Chlorophyll a vs. chlorophyll b

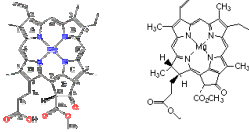
- How different are the two chlorophylls?



Chlorophyll c

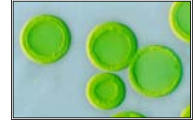


- Present in chromophyte algae and dinoflagellates
- A chlorophyll c-like pigment has been reported in two photosynthetic cyanobacteria

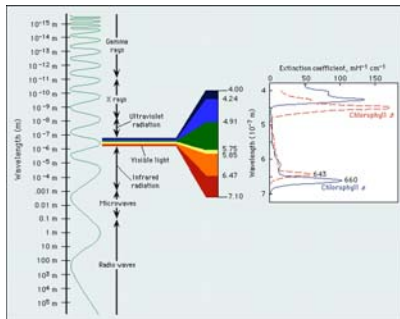


Chlorophylls

- The major chlorophylls,
 - Chl a
 - Chl b
 - Chl c
- found in photosynthetic algae can be found in the cyanobacteria (a, b, c-like)



Why more than one chlorophyll?



Green coloration

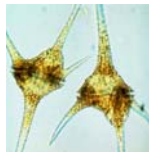
- What causes the green color in algae?



- Chlorophylls

Other colors

- Some algae are orange or brownish
- Some are blue-green in color

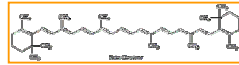


If chlorophyll is green, how do we get the orange, brown and even reddish colors?

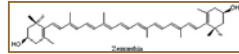
- Carotenoid pigments
 - β -carotene**
 - xanthophylls**

Carotenoids – orange and brown pigments

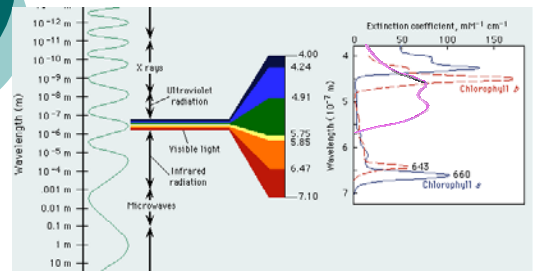
- **β-carotene** - a carotenoid pigment found in many algae



- **Zeaxanthin** – a common xanthophyll



Why do we need carotenoids?



Other uses for β-carotene

- Beta-carotene is the most potent precursor to vitamin A.
- Beta-carotene is also an important antioxidant.
- Beta-carotene has been shown to help prevent heart disease.



Other uses of Zeaxanthin

- **GinkgoSense**
“GinkgoSense combines ginkgo biloba, bilberry, lutein, and **zeaxanthin**, in a synergistic product to maintain your neuro health.”

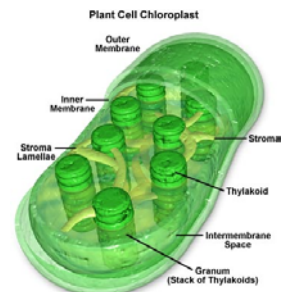


Algal “colors”

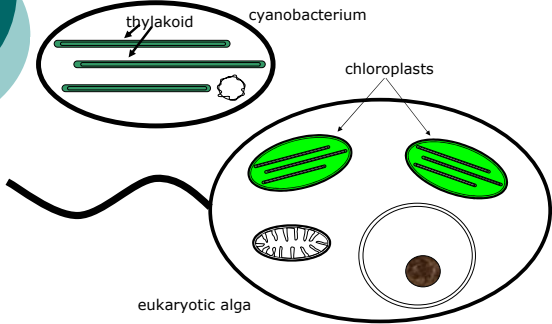
- **Green** - chlorophylls
- **Orange** - carotene
- **Brown** - xanthophylls

How do these pigments function in photosynthesis?

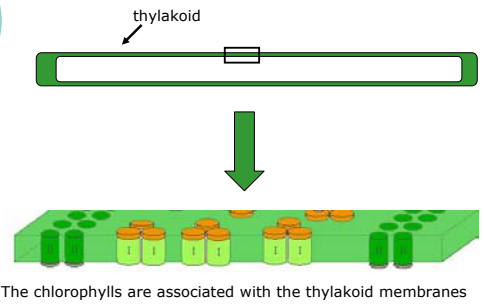
How does it all work?



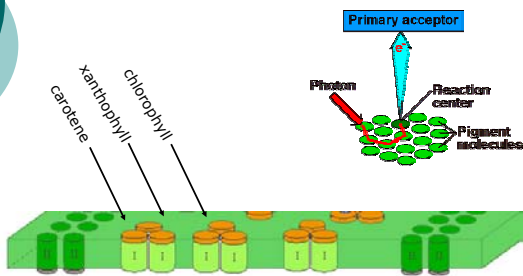
A photosynthetic membrane is called a thylakoid



A thylakoid is a photosynthetic membrane



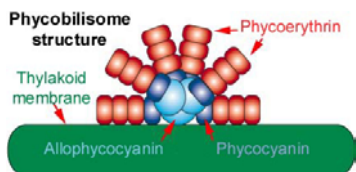
Photosynthesis



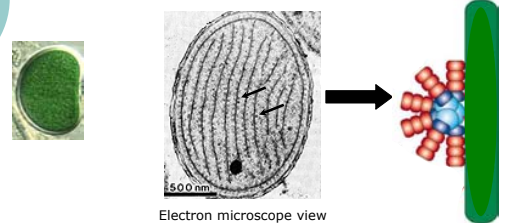
Green, Orange and Brown??

- What about the red and blue?
- Phycobiliproteins
 - Phycocyanin
 - Allophycocyanin
 - Phycoerythrin
- Phycobiliproteins are organized in cyanobacteria in complexes known as **phycobilisomes**

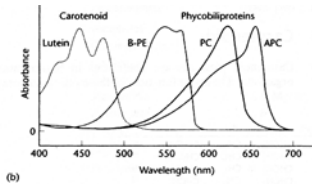
Phycobilisome on a photosynthetic membrane



Phycobilisomes attach to the photosynthetic membranes (thylakoids)



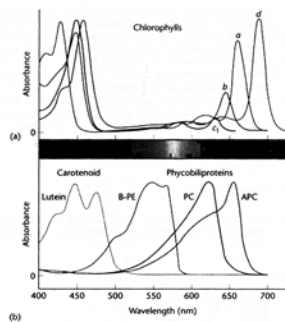
Phycobilins



Pigments

- Chl **a**, **b** and **c**
- Carotenoids
 - **β-carotene**
 - **Xanthophylls**
- Phycobiliproteins
 - **Phycocyanin**
 - **Allophycocyanin**
 - **Phycoerythrin**

Algal Pigments



Cyanobacteria are the oldest algae found on earth and have adapted to nearly every environment on the earth?

1. How have the various pigments found in cyanobacteria helped them to adapt?
2. What is the advantage of having multiple pigments?

Major groups of Freshwater Algae

- Homework for Monday Nov. 10
- For your particular group of algae be able to describe:
 - Type of body forms present (illustrate)
 - Color and Pigmentation present
 - Storage product present
 - Type of cell covering
 - Type(s) of reproduction that occur

Algae to be examined in Lab

- **Chlorophyta - Green Algae:**
 - Closterium
 - Cosmarium
 - Micrasterias
 - Staurastrum
- Filaments
 - Spirogyra
 - Mougeotia
 - Zygnema
 - Oedogonium
- - Hydrodictyon
 - Scenedesmus
 - Pediastrum
 - Pandorina
 - Volvox
 - Coleochaetae

Algae to be examined in Lab

○ Chromophyta – Golden brown Algae:

- Coscinodiscus
- Synedra
- Navicula
- Dinobryon
- Mallomonas
- Synura

Algae to be examined in Lab

○ Cyanophyta – Cyanobacteria:

- Gloeocapsa
- Anabaena
- Fischerella
- Gloeotrichia
- Nostoc
- Oscillatoria

Algae to be examined in Lab

○ Pyrrophyta – Dinoflagellates:

- Ceratium
- Peridinium

○ Euglenophyta – euglenoids

- Euglena
- Phacus
- Trachelomonas

What is the advantage of having multiple pigments?

- A. If one is destroyed the others can still function
- B. Each will absorb different wavelengths of light
- C. They can change colors to hide from predators
- D. They can photosynthesize even on cloudy days

Phycobilisome on a photosynthetic membrane

