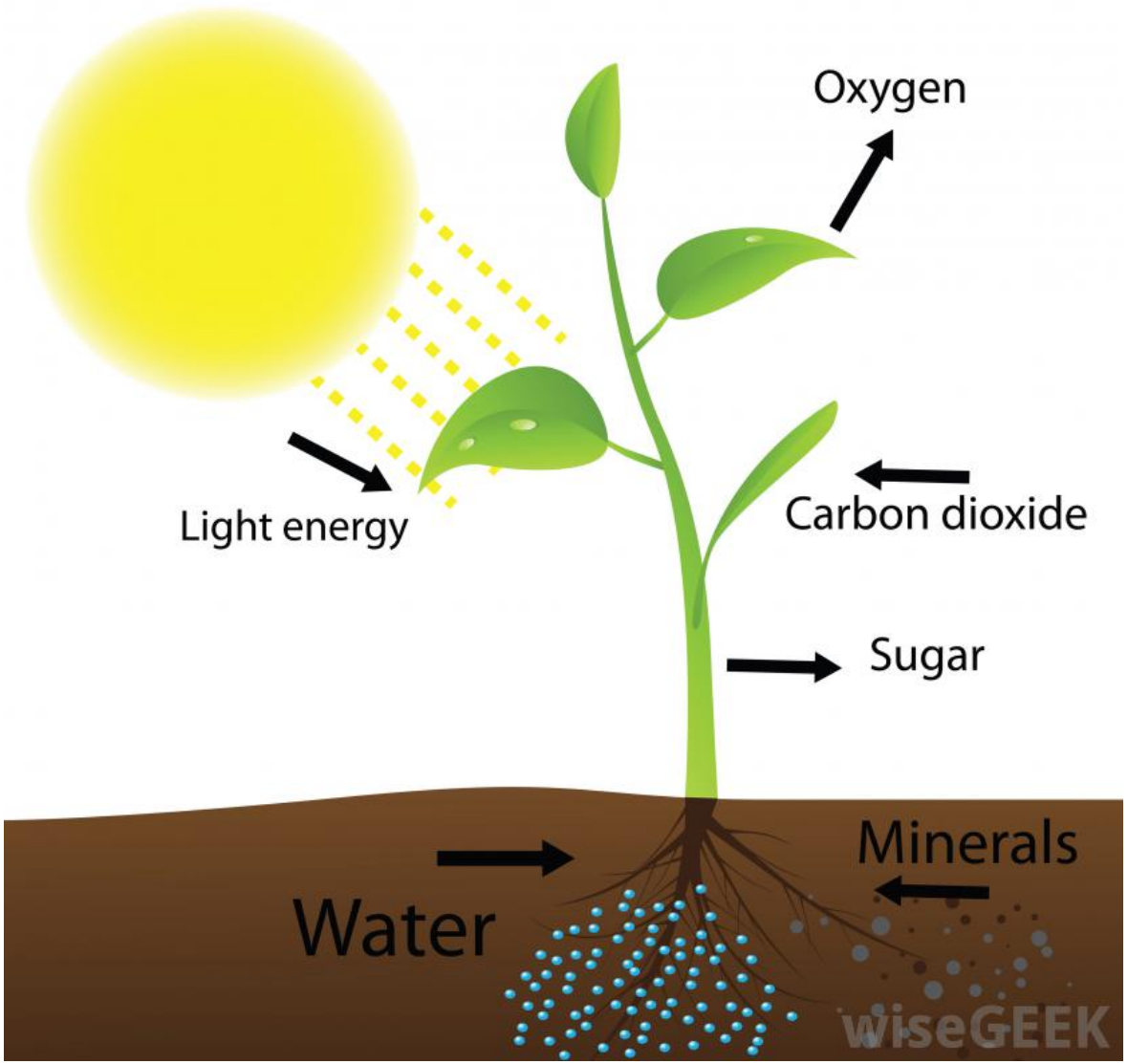
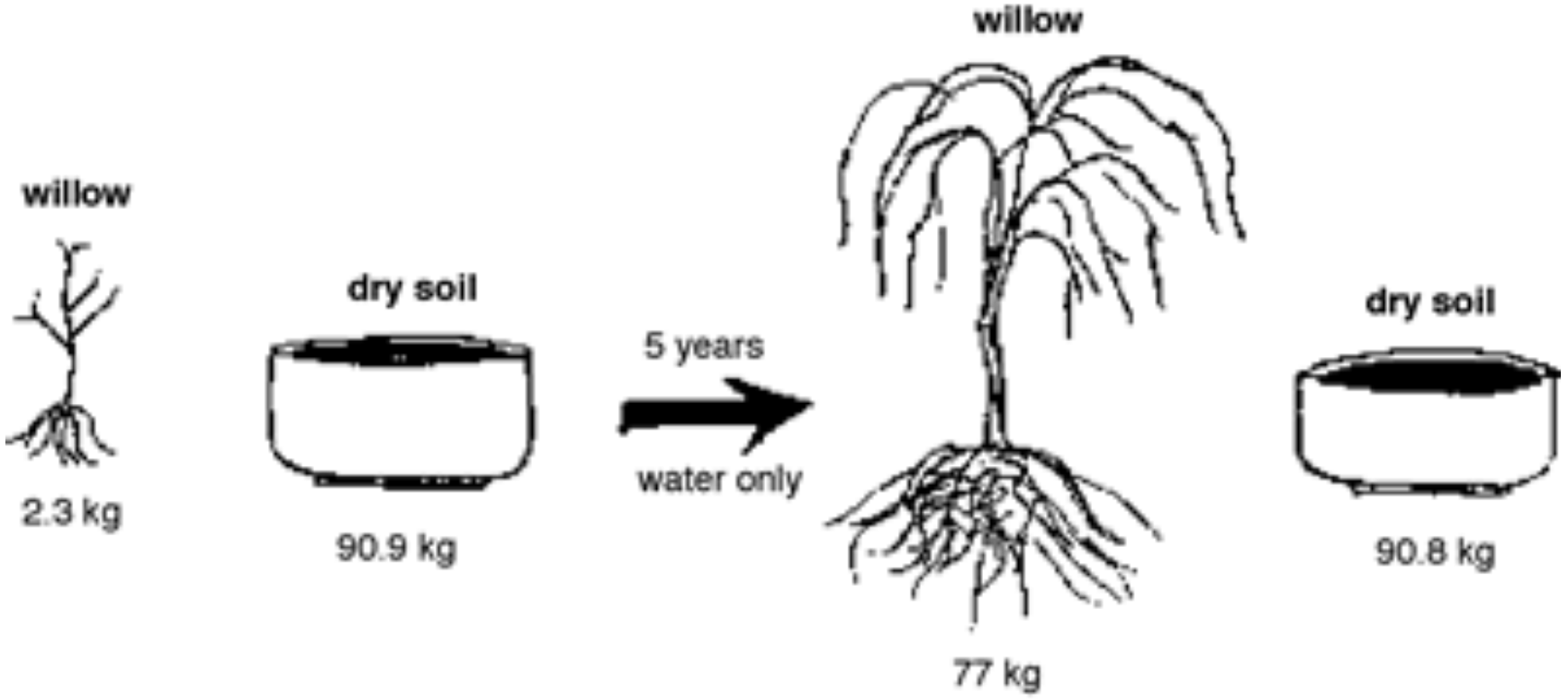
Photosynthesis

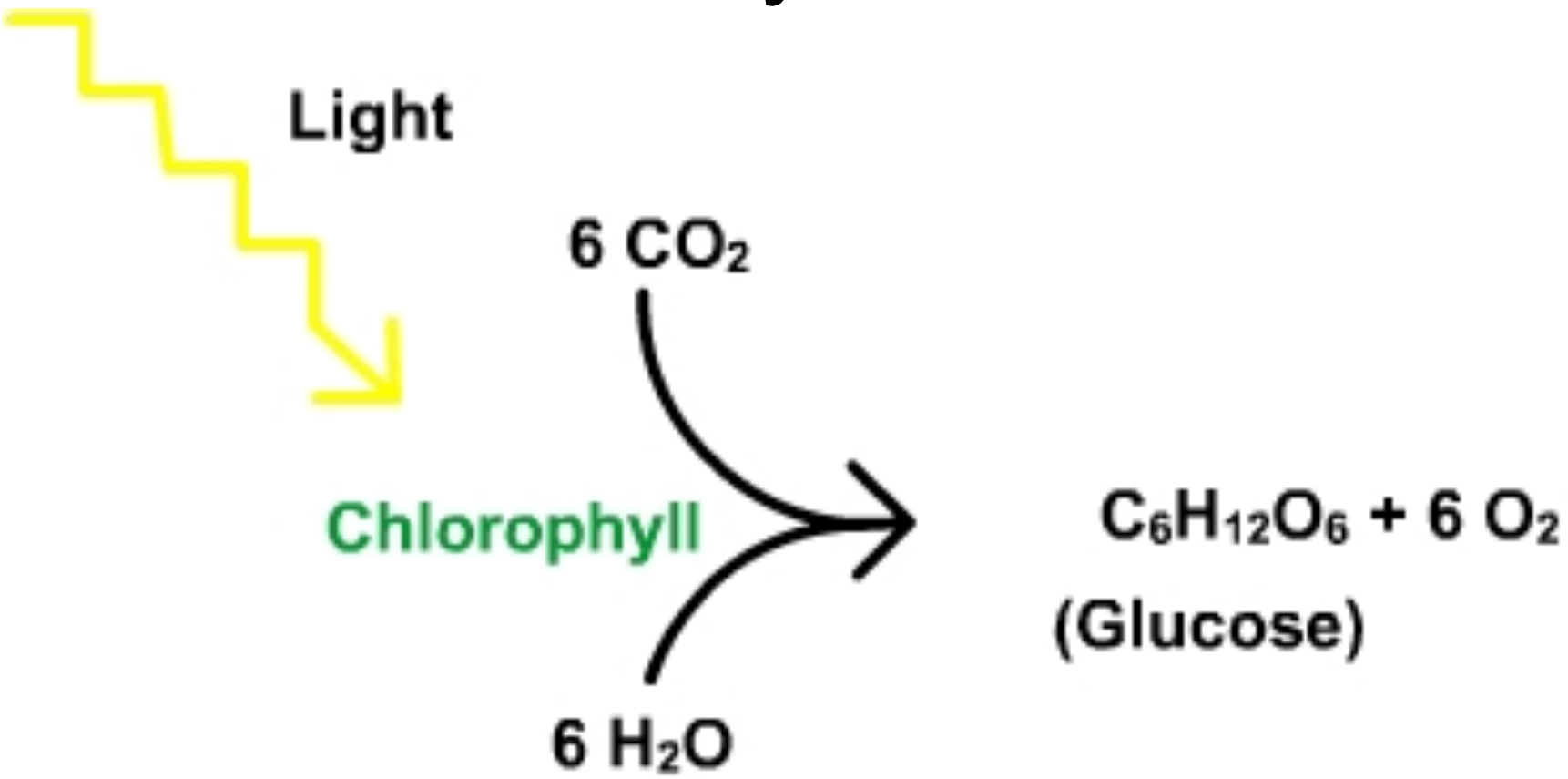
An Introduction



Van Helmont's experiment (1648)



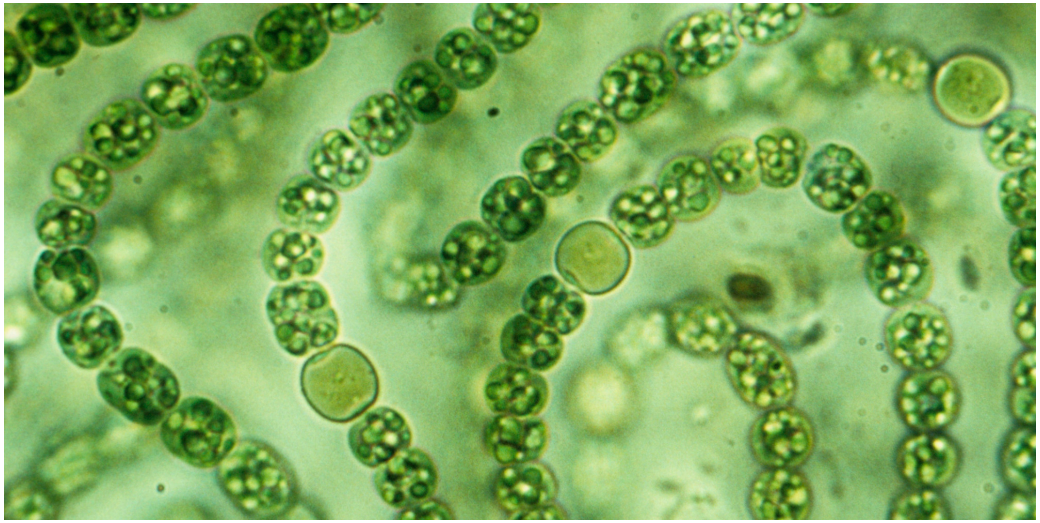
Photosynthesis



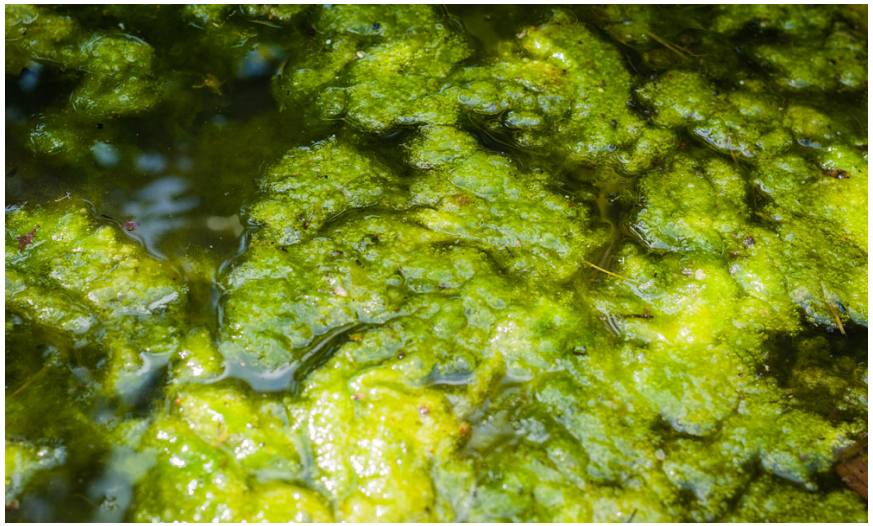
Photoautotrophs

- synthesize complex organic molecules using energy from the Sun
- some examples are…

Cyanobacteria



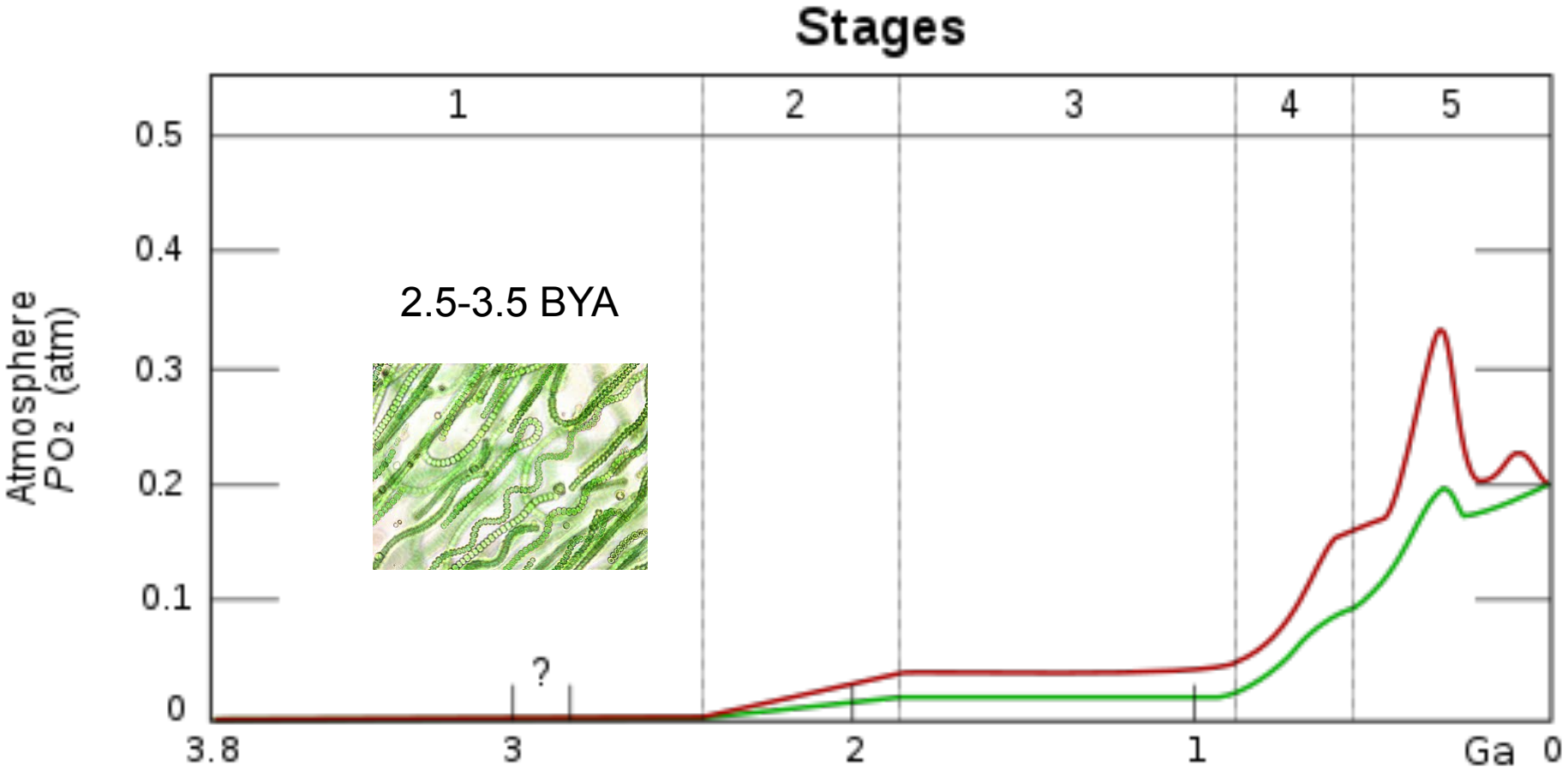
Algae- Protista



Plants

The Effects of Cyanobacterium

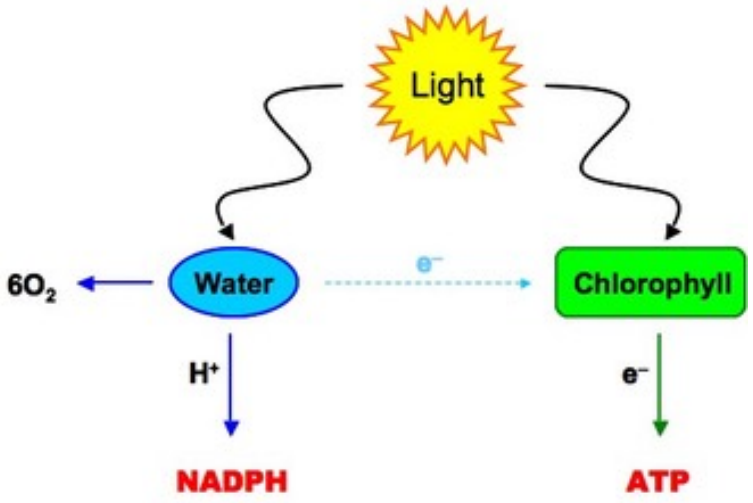
Oxygen production



Photolysis

- Photosynthesis involves oxidizing chlorophyll pigments (loss of electrons)
- Chlorophyll that is oxidized by sunlight becoming an agent that splits water to gain back electrons lost

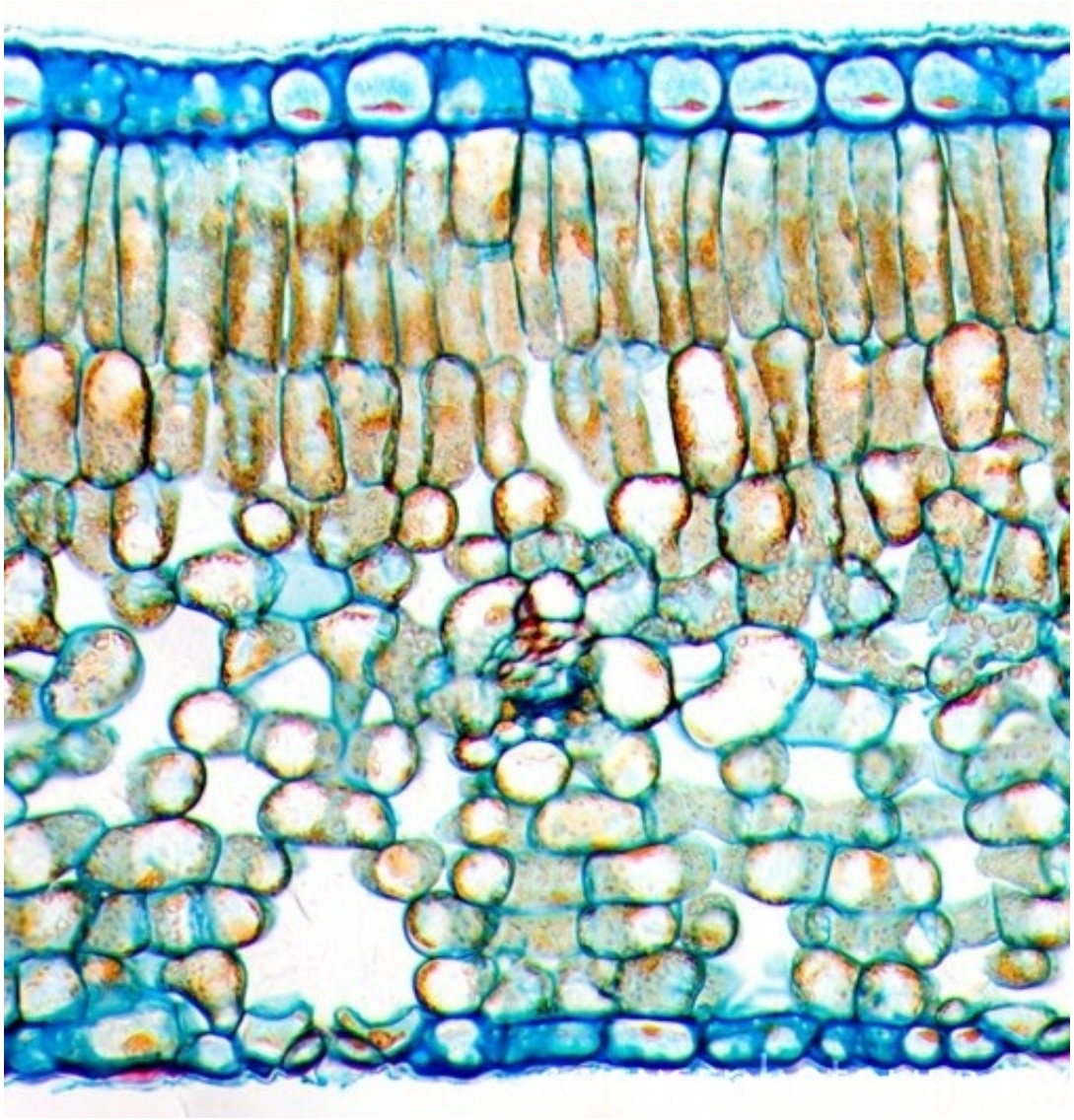
$2\ H_2O \longrightarrow O_2 + 4H^+ + 4e^-$



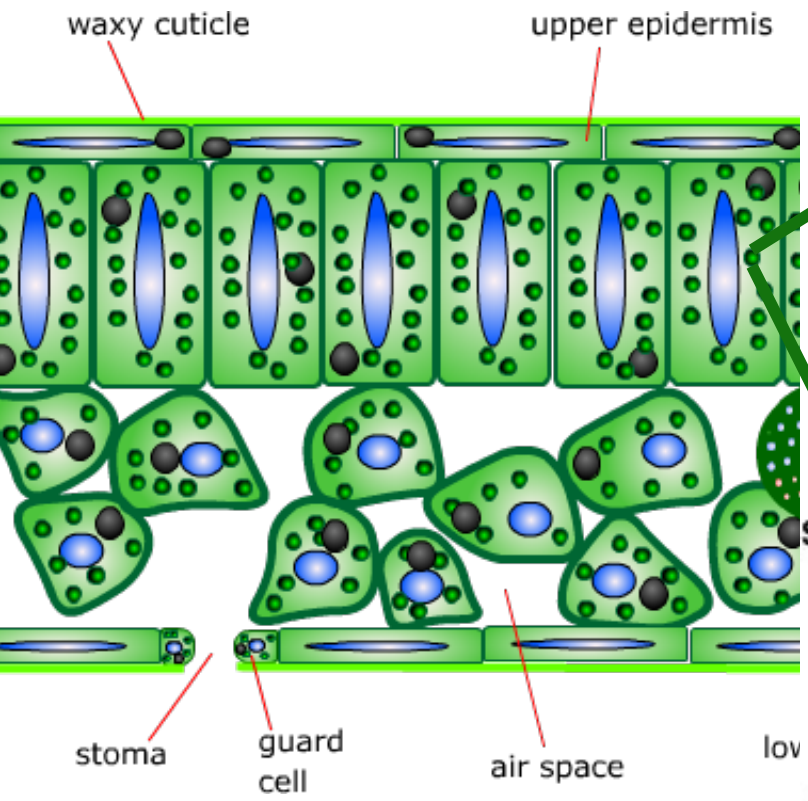
First Photosynthesis

- occurring the earliest around 3.5 billion year ago
- progressed to the Great Oxygen Event ≈ 2.4 b.y.a. when the atmosphere became 2% O_2
- caused iron oxide around the planet
- O2 rose to as high as 30% 750 m.y.a. (probably from the evolving algae and plants)

Cross-section of leaf



Chloroplasts



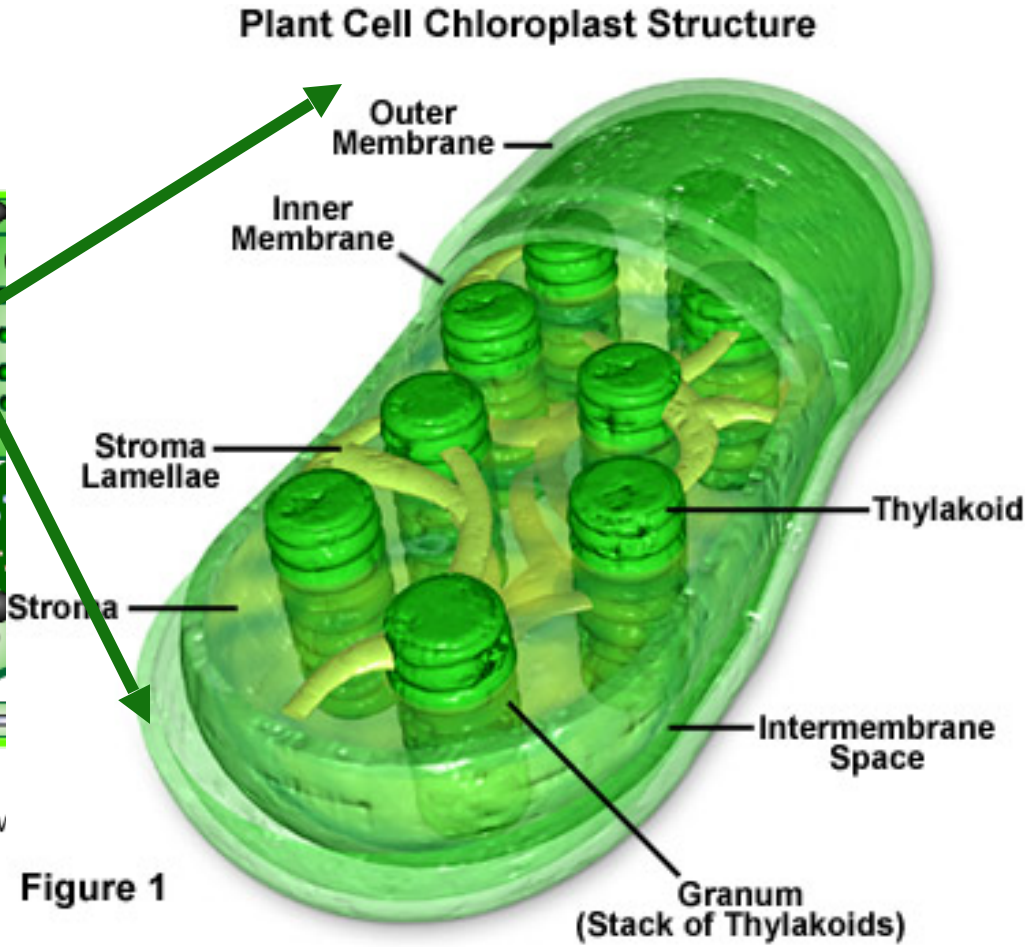
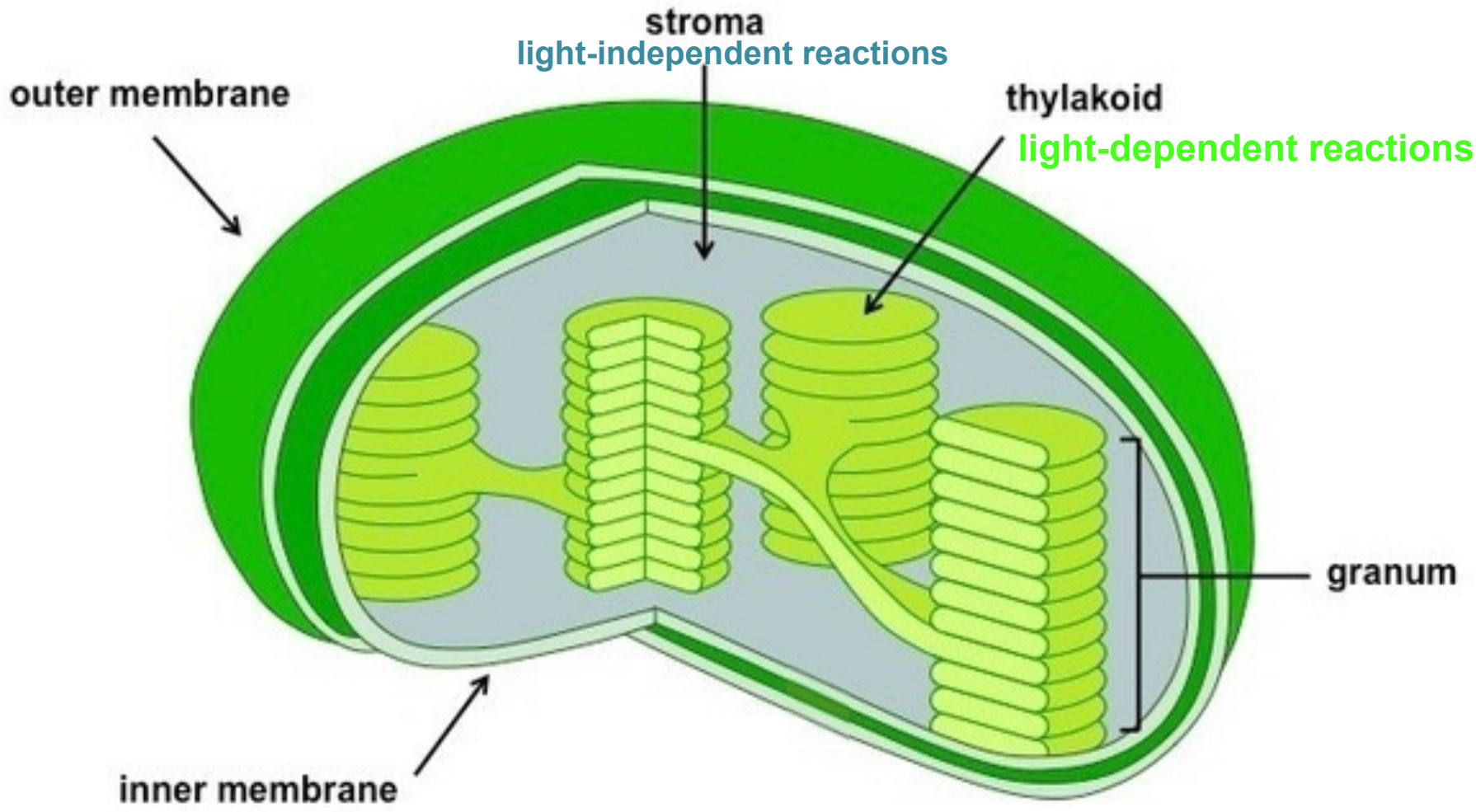
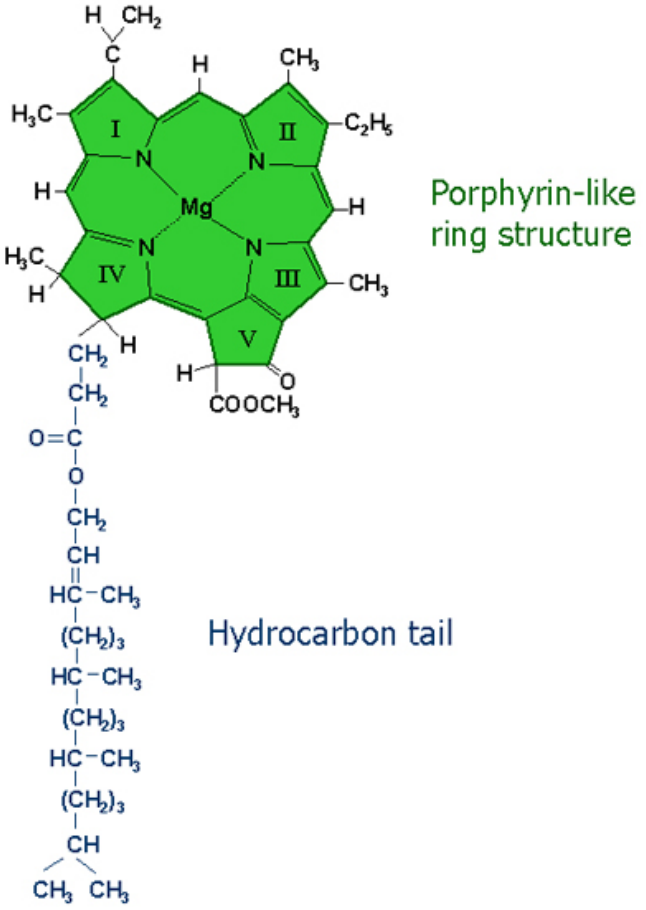


Figure 1


stroma
light-independent reactions
outer membrane
thylakoid
light-dependent reactions
granum
inner membrane

Chlorophyll

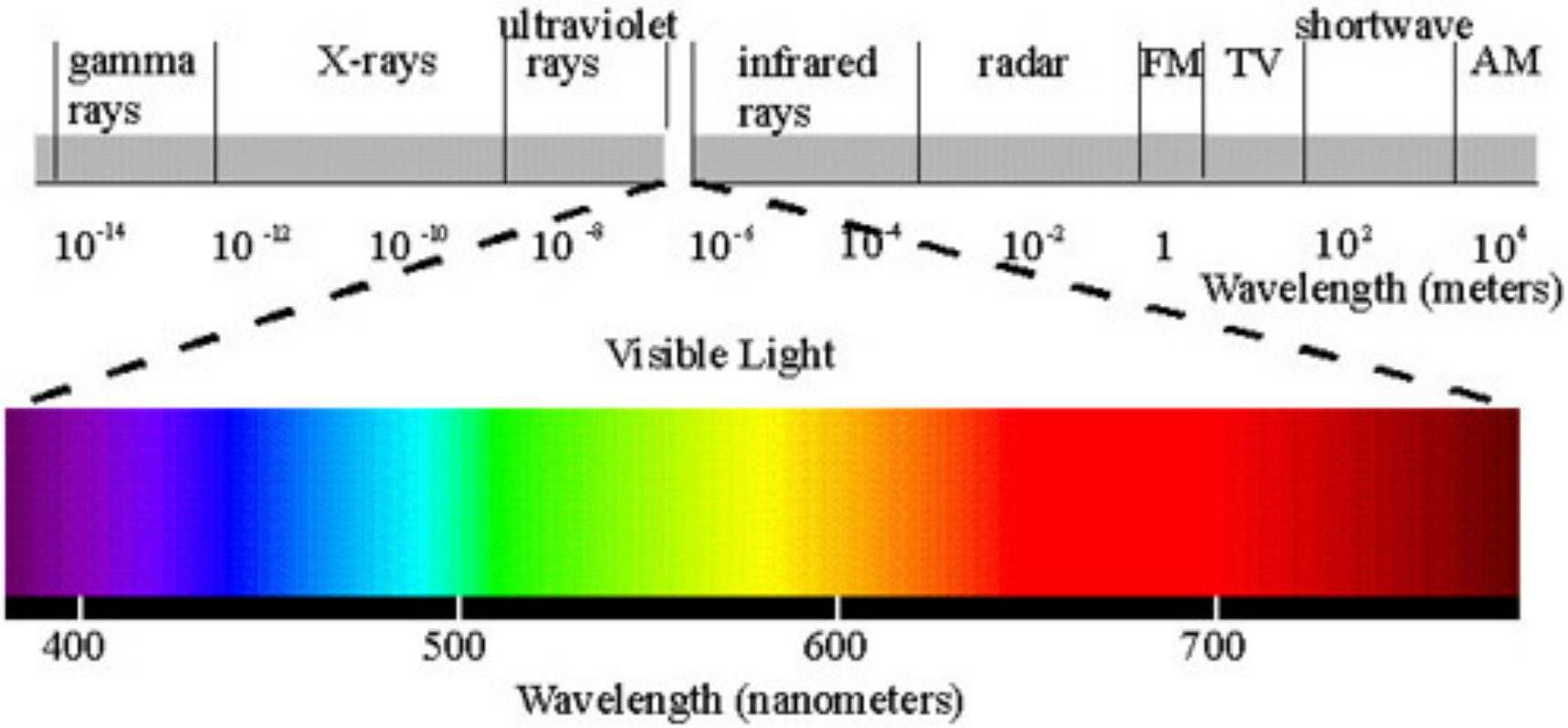
- all photosynthetic organisms contain **chlorophyll**
- chlorophyll *a* is the primary photosynthetic pigment
- it gives plants a green colour



Other Plant Pigments

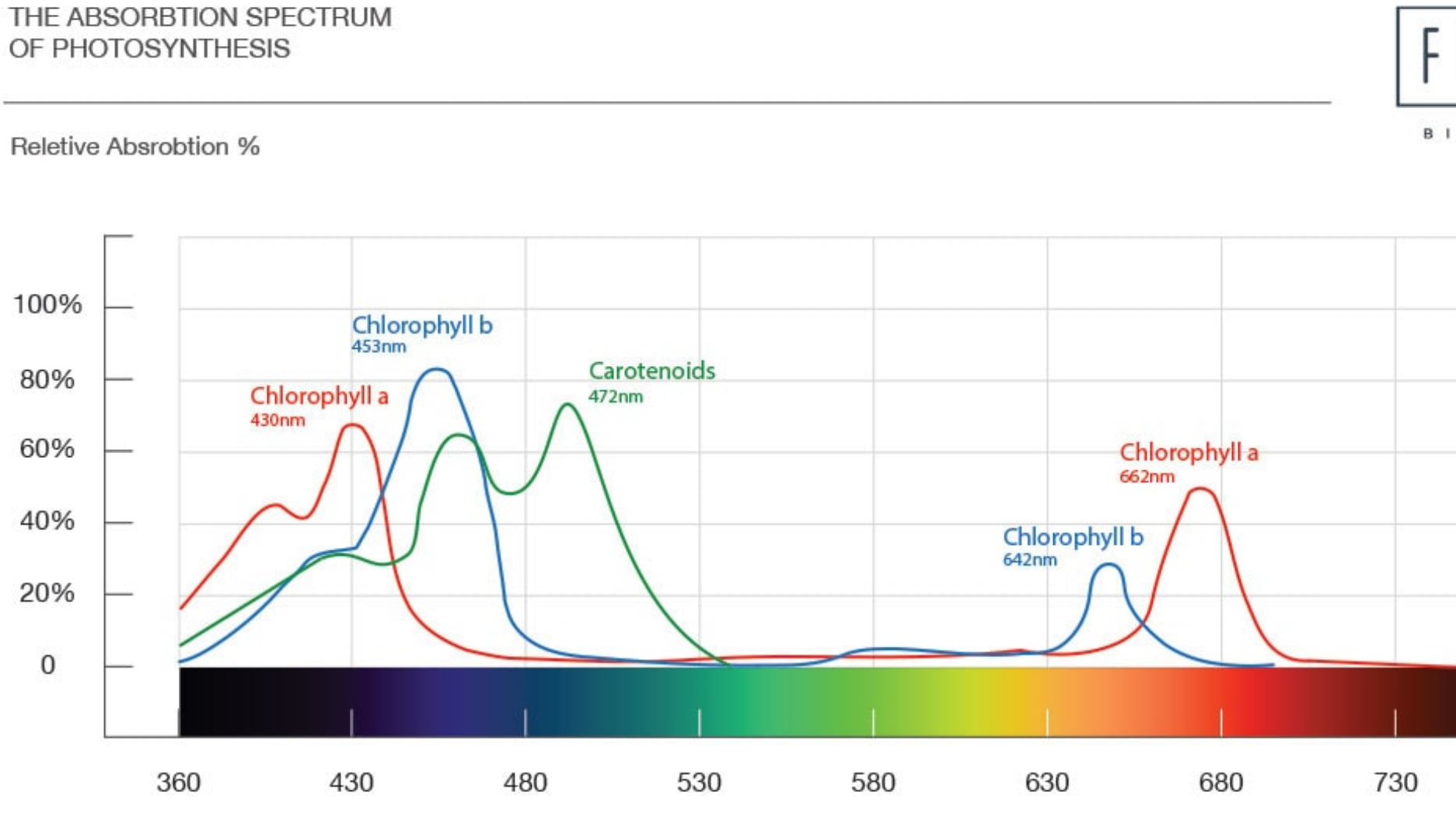
- absorb different wavelengths of light than chlorophyll *a* (light green)
- carotenoid (orange & yellow)
- chlorophyll *b* (green)

Electromagnetic Spectrum



Absorption Spectra

» A plot of Wavelength vs the Absorption of light (usually by % of light)

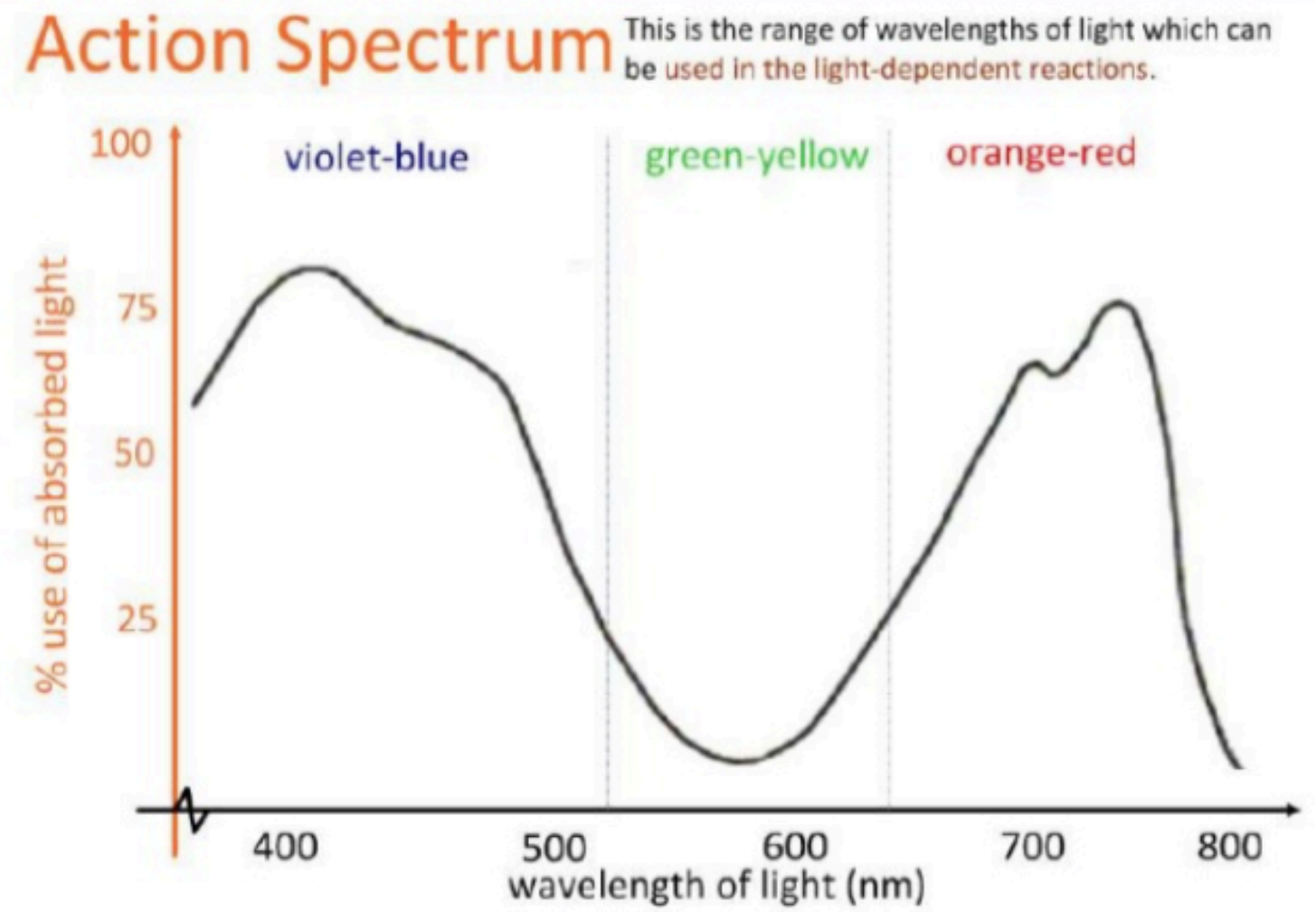


Absorption Spectra

- A plot of Wavelength vs the Absorption of light (usually by % of light)
- chlorophylls absorb mostly red and blue visible light (a and b chlorophyll)
- Green is not absorbed but instead reflects off to give chlorophyll is typical green colour

Action Spectra

» A plot of Wavelength vs the light used in photosynthesis



Action Spectra

- A plot of Wavelength vs the light used in photosynthesis
- Photosynthesis involves utilizing mostly blue light (largest peak) and red light a second peak (a and b chlorophyll)
- Green is less effective (some used) even though little is absorbed

Fall Plant Pigments

investigating limiting factors

- On light source (LED LIGHT bulbs) Limited
- Stop watch
- Baking soda Sodium hydrogen carbonate (sodium bicarbonate)
- Scale (shared)
- 250 ml beaker
- pond plant
- water bath (your white bin at set to 25°C)
- temperature probe
- textbook with instructions pg.