

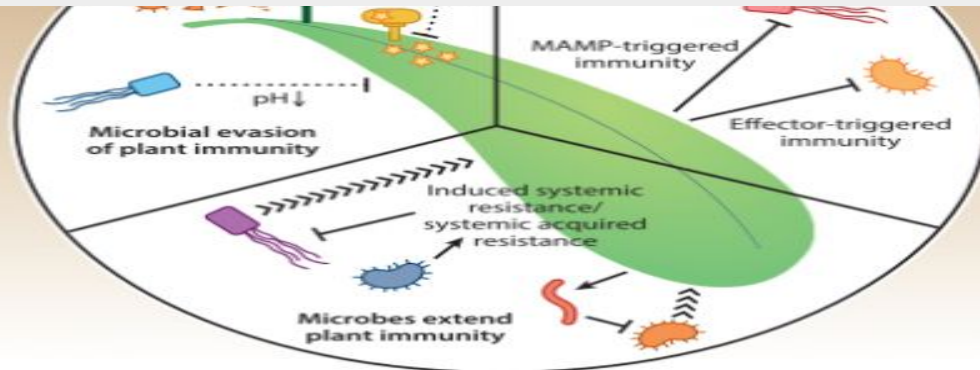
INTRODUCTION TO BIOLOGY

Plants for People and Environment

Lecture 06

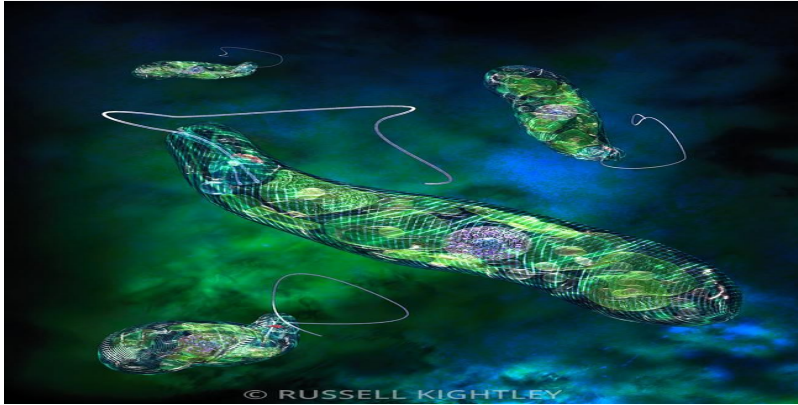


Inspiring Excellence

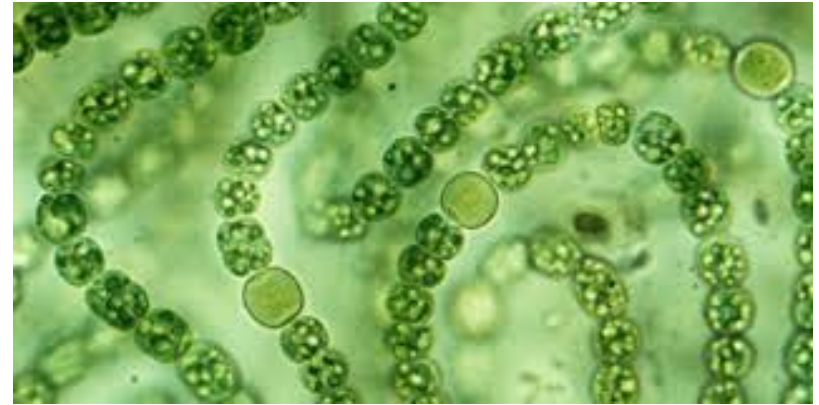


Primary Producers

Green plants and certain types of bacteria and algae are the primary producers because they are the ones that produce usable energy for the rest of the living organisms on earth. They use energy from the sun to make sucrose, glucose, and other compounds that other life forms can eat and "burn" for energy.

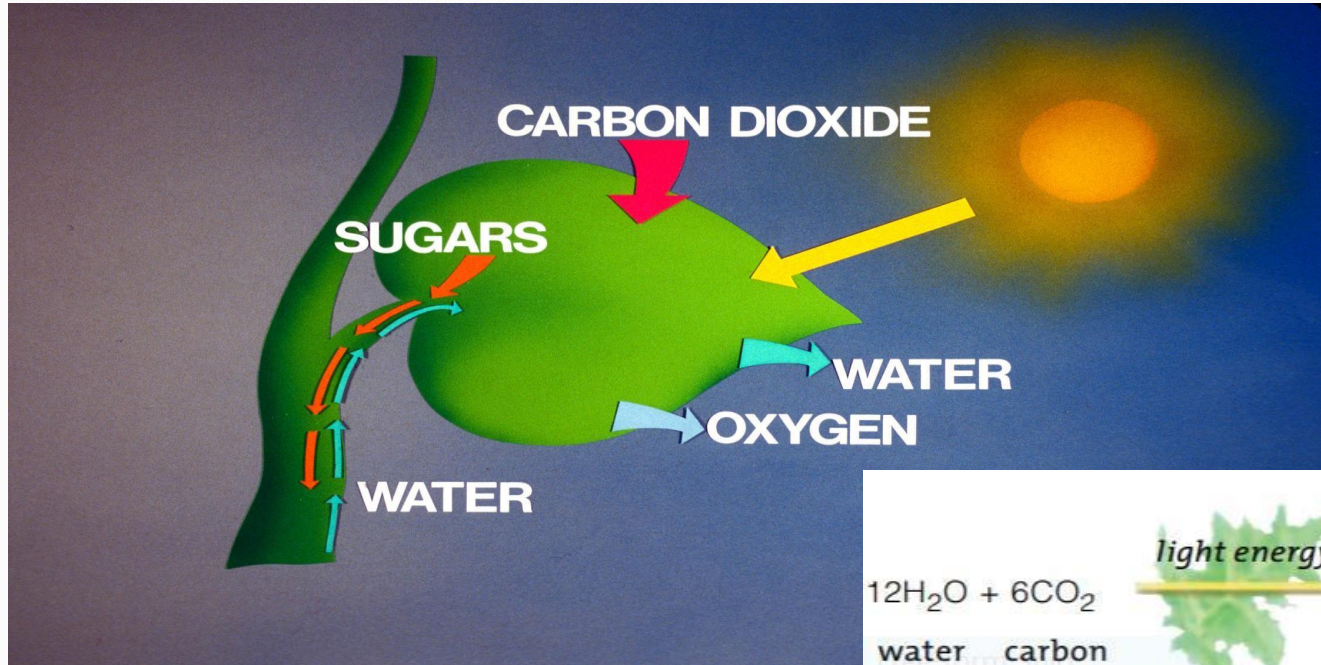


Euglena, a protist with some animal (it moves about using a flagellum and can eat things) and plant (it can photosynthesise in its chloroplasts) characteristics



Cyanobacteria (also known as 'blue-green algae') are bacteria capable of oxygenic photosynthesis

Light Energy Harvested by Plants & Other Photosynthetic Autotrophs



Light

Light is made of photons, which are individual packets of electromagnetic energy traveling in waves. The shorter a photon's wavelength, the higher its energy.

For example, blue light has a shorter wavelength and more energy than red light.

Pigments

Pigments are a class of molecules that absorb photons with particular wavelengths. Photons that a pigment cannot absorb bounce off or continue on through it; they are reflected or transmitted.

Chlorophyll a is the most abundant type in plants, green algae, and a number of photoautotrophic bacteria.

Variety of Pigments

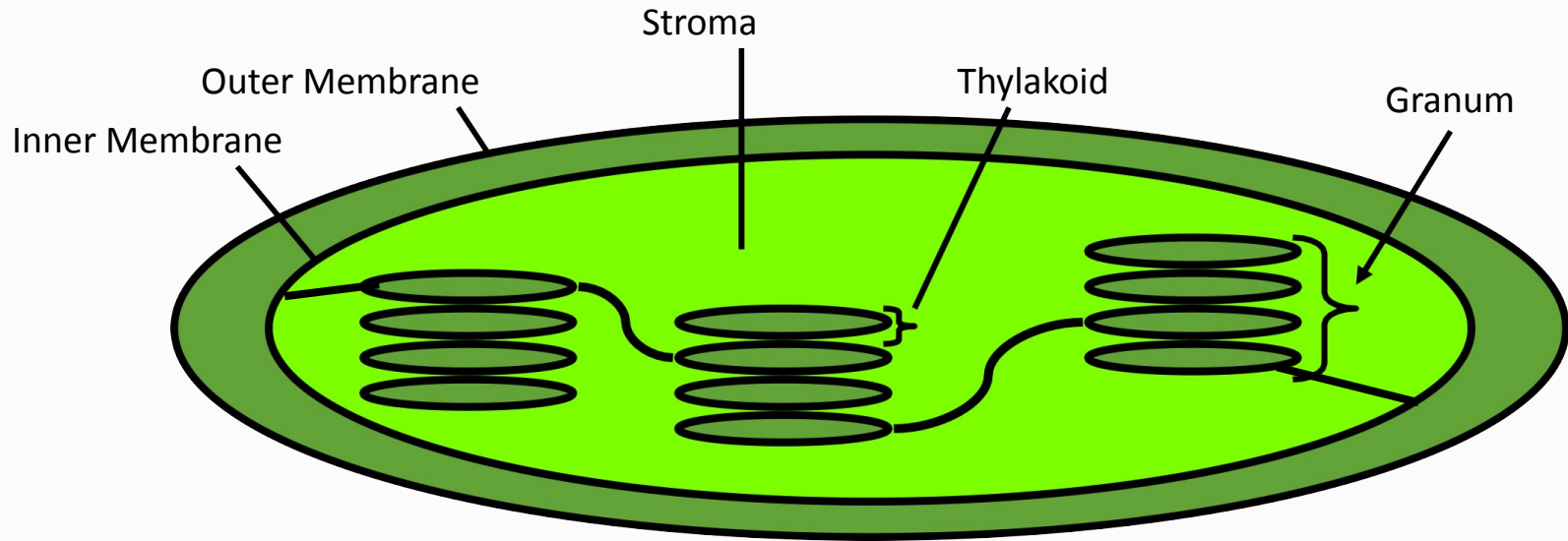
Pigment	Colour reflected	Found in
Chlorophyll a	Green-yellow	Plants, algae, cyanobacteria
Chlorophyll b	Green	Plants
Carotenoids	Yellow, orange, red	Plants, algae, bacteria, fruits, vegetables, flowers
Anthocyanins	Red, purple, blue	Plants, fruits, flowers
Phycobillins	Blue, green, yellow, brown, black, red	Algae

Question:

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**Where does photosynthesis
take place?**

CHLOROPLAST



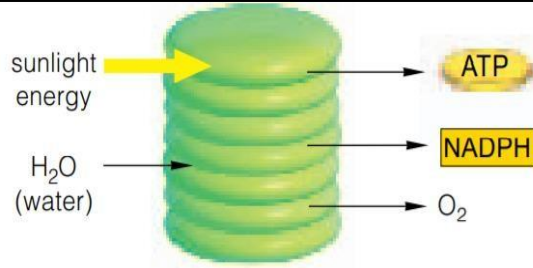
Thylakoid stacks are connected together

Question:

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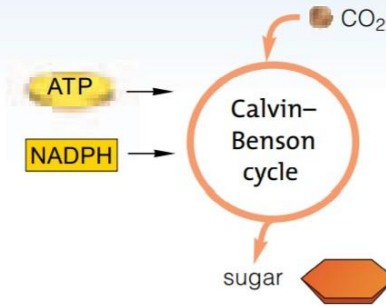
**How does photosynthesis
take place?**

AN OVERVIEW OF PHOTOSYNTHESIS



Making ATP and NADPH

In the first stage of photosynthesis, sunlight energy becomes converted to chemical bond energy of ATP. Water molecules are broken apart, NADPH forms, and oxygen escapes into the air.



Making Sugars

The second stage is the "synthesis" part of photosynthesis. ATP delivers energy to reaction sites where sugars are built with atoms of hydrogen (delivered by NADPH), carbon, and oxygen (from carbon dioxide in the air).

AN OVERVIEW OF PHOTOSYNTHESIS

Photosynthesis occurs in two stages in chloroplasts. Energy from the sun is converted to chemical energy and stored in ATP and NADPH. These molecules are later used to assemble sugars from carbon dioxide and water.

Chloroplasts split H_2O into hydrogen and oxygen using light energy, incorporating the electrons of hydrogen into sugar molecules and releasing oxygen as a by-product.

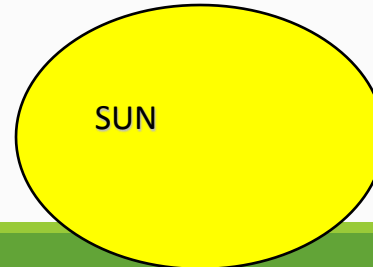
Two Parts of Photosynthesis

Two reactions make up photosynthesis:

1. Light Reaction or Light Dependent Reaction

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Produces energy from solar power (photons)
in the form of ATP and NADPH.



Two Parts of Photosynthesis

2. Calvin Cycle or Light Independent Reaction

- Also called Carbon Fixation or C_3 Fixation
- Uses energy (ATP and NADPH) from light reaction to make sugar (glucose).

Remember!

- Photosynthesis creates glucose from carbon dioxide, water and light
- Plants need glucose to store energy and to build cellulose
- However, photosynthesis does not produce enough ATP for the cell's purposes
- Plant cells also have mitochondria to produce ATP through respiration

Why should we care about the study of PLANTS?

- Without plants, most of **life** on earth as we know it would not exist
- Plants comprise about **98%** of the earth's biomass!
- Plants are primarily responsible for creating our **oxygen-rich** atmosphere via the light reactions of photosynthesis
- Plants are the earth's main **autotrophs and fixers** of carbon and nitrogen

Why should we care about the study of PLANTS?

- Plants provide the **habitat and food** upon which almost all other living things ultimately depend
- Plants are responsible for most of the **products** on which you rely to survive (vegetable and animal matter), have a good quality of life (fabric for clothing, medicines), as well as the more frivolous ones (spices, perfumes, dyes, dissolvable sutures, food stabilizers, emulsifiers, Starbuck's, etc.). And don't forget the potential of biofuels (ethanol produced from food crops)
- Almost every living (terrestrial, and many aquatic) thing interacts with plants in some way. Plants are involved in every type of **symbiotic community** interaction known