THE MIRACLE OF TREES, PLANTS, AND PHOTOSYNTHESIS

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Image 1- Wild flowers

Jesus said:

Matthew 6:28-30
Consider the lilies of the field, how they grow: they neither toil nor spin; 29 and yet I say to you that even Solomon in all his glory was not arrayed like one of these.

Image 2 – Beautiful Nature

Genesis 1:11-13

11 Then God said, "Let the earth bring forth grass, the herb that yields seed, and the fruit tree that yields fruit according to its kind, whose seed is in itself, on the earth"; and it was so. 12 And the earth brought forth grass, the herb that yields seed according to its kind, and the tree that yields fruit, whose seed is in itself according to its kind. And God saw that it was good. 13 So the evening and the morning were the third day.
NKJV

Image 3- nature 3

Genesis 1:31
31 Then God saw everything that He had made, and indeed it was very good.

NKJV

Image 4- Nature -4

Image 5 – Nature 5

Image 6 – nature -6

Image 7 – nature 7

Image 8 – nature 8

Image 9 – nature 9

God is a god of infinite variety and beauty!

Image 10 – nature 10

Image 11- nature 11

THE CONSTRUCTION OF TREES AND PLANTS

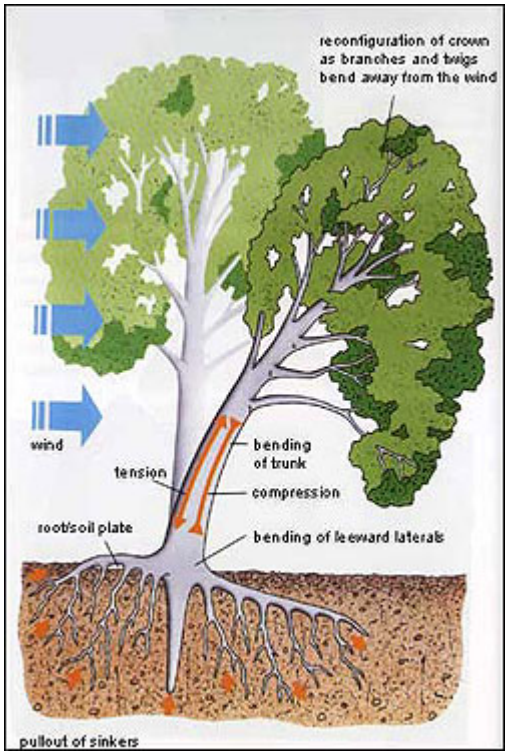
Because all the plants and flowers and trees are so beautiful, it is easy to forget that they are amazing feats of engineering!

Although they look very delicate, in fact trees plants and flowers had to endure extreme heat, cold, and wind!

Image 12 - Tree in high wind

Image 13 – flowers in rain

Image 14- diagram of a tree



- Trees have a single, superbly engineered material—wood
- They are ingeniously designed structures that combine strength and flexibility.
- They can even respond to their environment and change their design accordingly.
- This allows them to support their canopy of leaves using a bare minimum of structural material.
- This diagram demonstrates the forces which are set up and movements which occur when a tree is blown sideways by the wind.
- Trees are ingeniously designed structures that combine strength and flexibility.
- Wood has to be stiff, so that trees do not droop under their own weight;
- Wood has to be strong, so that the sheer force of the wind does not snap the trunk and branches;
- Wood has to be tough, so that when the tree gets damaged it does not shatter;
- Wood has to be light, so that it does not buckle under its own weight.

- plastics are not stiff enough;
- bricks are too weak;
- glass is too brittle;
- steel is too heavy.

- Wood has the best engineering properties of any material.

- Wood's superb properties result from the arrangement of the cells and the microscopic structure of the cell walls.
- Arrangement of cells
- Over 90 percent of the cells in wood are long, thin tubes that are closely packed together, pointing along the branches and trunk.
- As well as helping them to transport water to the leaves, this is ideal for providing support because they point in the direction in which the wood is stressed.
- Trees mainly have to resist bending forces.
- Their branches have to resist being bent down under their own weight.
- Both the trunk and branches have to resist being bent sideways by the wind.
- When it is windy, one side is compressed, while the other side is stretched, which trees are very good at!

- The cells of all trees and plants are hollow.
- Tubular structures are stronger than solid structures.
- This is why tubes are so often used in large engineering structures.

BEAUTY OF DESIGN

The Golden Ratio, otherwise known as the Divine Proportion or Phi, is a mathematical ratio with special properties and aesthetic significance.

An enormous number of things in the universe are engineered around the ratio, ranging from

The Human body
The ark of the covenant
Snail shells
Orbits of the planets

The Golden Ratio is also displayed in the world of pants, as demonstrated in the following images. I will be spending a whole programme on the Golden Ratio, which is one more pointer to God.

An example of the physical manifestation of the golden ratio, also known as phi, can be seen in the coil of this fern.

Image 15- golden ratio-15

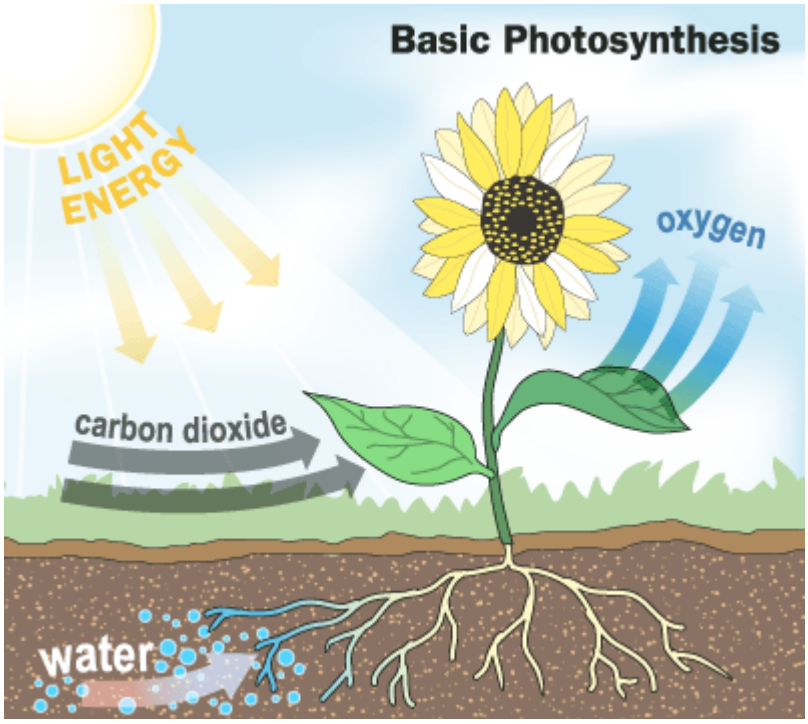
Image 16- golden ratio -16

Image 17- golden ratio in a rose

18- Golden ratio in a sunflower

The Miracle of Photosynthesis

Image 19 – photosynthesis basic



The Earth's atmosphere is mostly composed of nitrogen.

Oxygen makes up just 21 percent of the air we breathe.

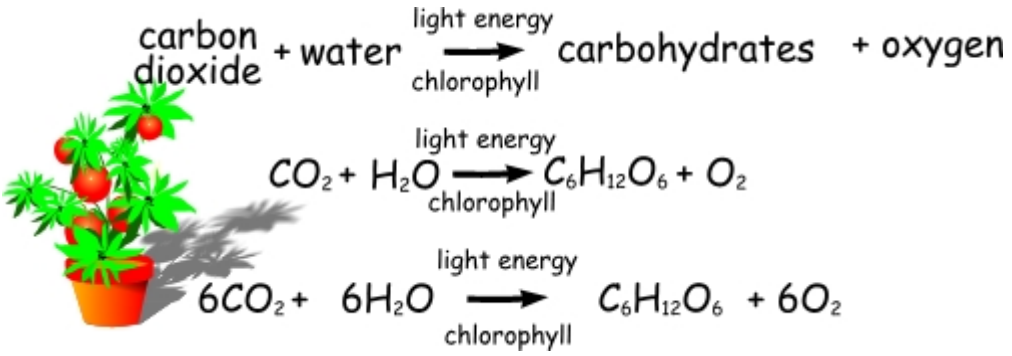
Carbon dioxide, argon, ozone, water vapor and other gasses make up a tiny portion of it, as little as 1 percent.

Plants release oxygen during photosynthesis, the process they use to change water and carbon dioxide into sugar they can use for food.

Photosynthesis is a complex reaction.

Essentially, using energy from the sun, a plant can transform carbon dioxide and water into glucose and oxygen. In chemical terms:

Image 20 – photosynthesis equation



6CO2 + 12H2O + Light -> C6H12O6 + 6O2+ 6H2O

In other words, while we inhale oxygen and exhale carbon dioxide, plants inhale carbon dioxide and exhale oxygen.

Without plants to feed us and the animals most people use for food, we'd also have nothing to eat.

PLANTS ARE ESSENTIAL FOR LIFE

They give us

- Food to eat
- Oxygen to breathe.
- They breathe IN carbon dioxide, a toxic gas, from the air!
- They protect the soil from wind and from water runoff, helping to control erosion.
- They release water into the air during photosynthesis.

The process of photosynthesis is considered of utmost importance for the existence of life on our earth.

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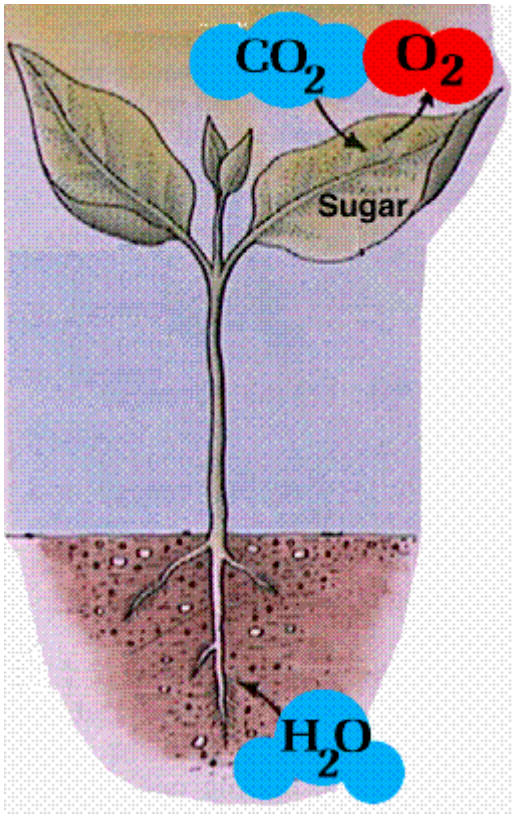
http://www.emc.maricopa.edu/faculty/farabee/BIOBK/BioBookPS.html

What is Photosynthesis?

Image 21 – photosynthesis image



Photosynthesis is the process by which plants use the energy from sunlight to produce sugar and oxygen from water and carbon dioxide.

In the cells of our bodies, sugar and oxygen is converted into ATP, the "fuel" used by all living things.

Image 22- Krebs Cycle in the human body

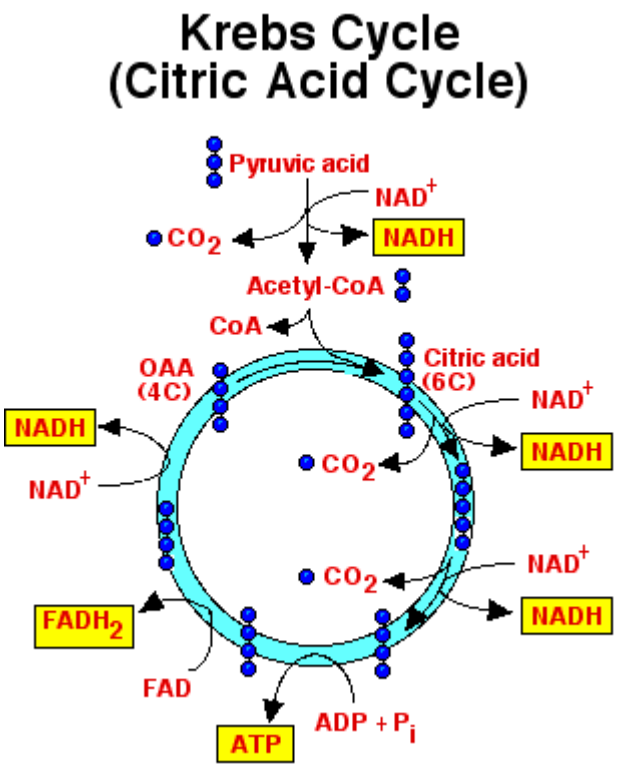
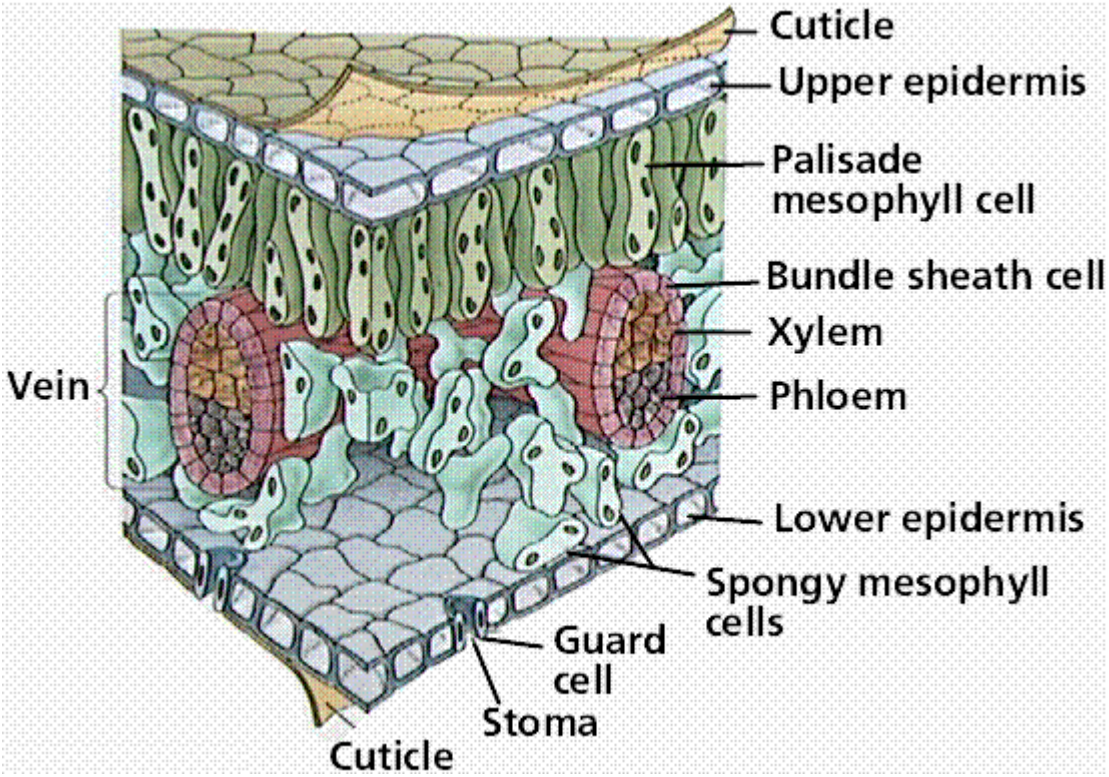


Image 23 - Leaves and Leaf Structure



A leaf may be thought of as a fantastically efficient power station for generating oxygen and food from carbon dioxide and water!

Plants are the only power factory that can convert the energy from the sun to usable energy in the form of oxygen and food with 100% efficiency!

Image 24 - Solar panels

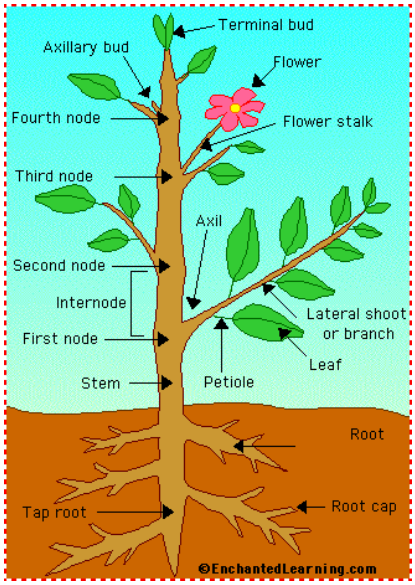
Solar panel efficiency –

how much of the sun's energy a solar panel can convert into electrical energy – is at around 22%.

This means that a fairly vast amount of surface area is required to produce a lot of electricity!

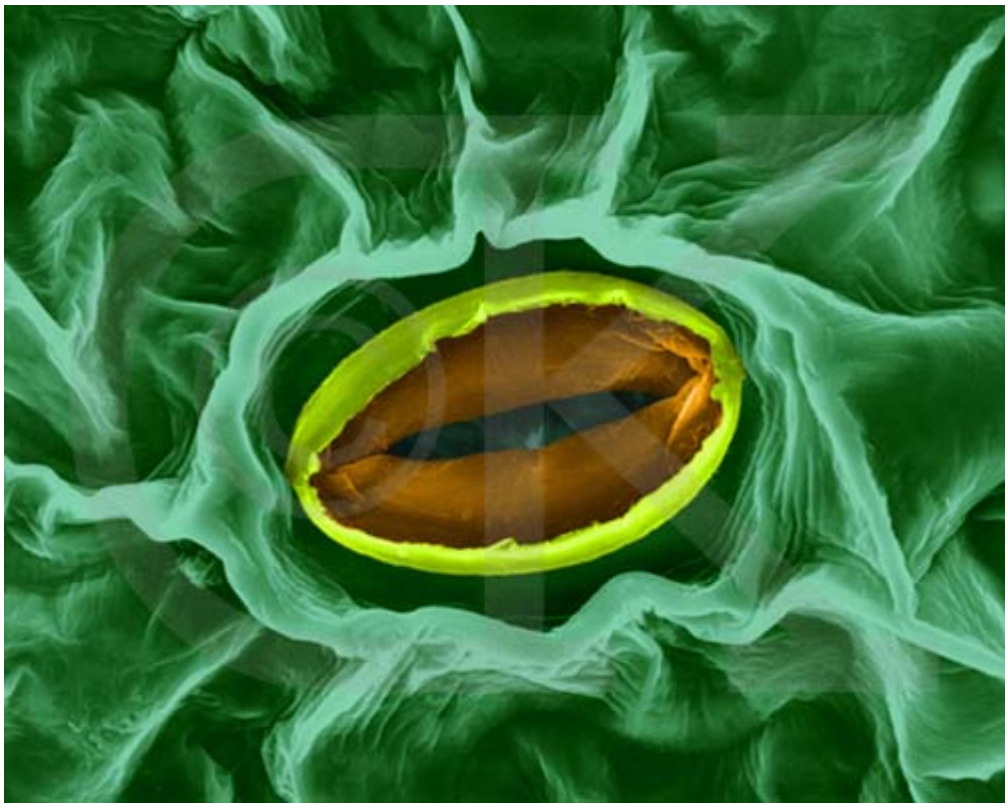
Leaves are tiny, by comparison, and use their own energy to grow and repair themselves!

Image 25 – anatomy of a plant



Water enters the root and is transported up to the leaves through specialized plant cells known as xylem

Image 26 - Stomata



Land plants must be guarded against drying out.

God has carefully designed all leaves to have stomata to allow gas to enter and leave the leaf.

Oxygen and Carbon dioxide cannot pass through the cuticle of the leaf – the protective waxy layer covering the leaf

Carbon dioxide enters the leaf through the stomata, which have two specialised guard cells.

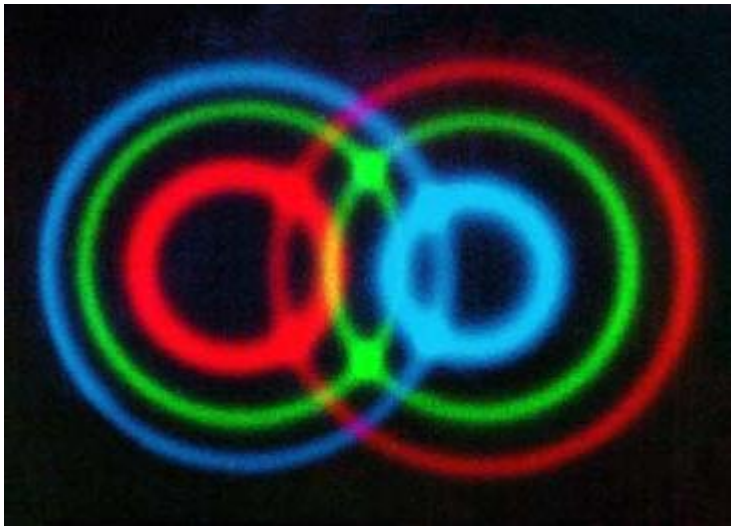
Oxygen leaves the leaf through the same stomata.

Unfortunately for the plant, while these gases are moving between the inside and outside of the leaf, a great deal water is also lost, which is why al plants need regular rain or watering!

The Nature of Light

Light is actually photons moving in a wave form .

Image 27 – photons



Photons look like this

Image 28- wavelengths of light

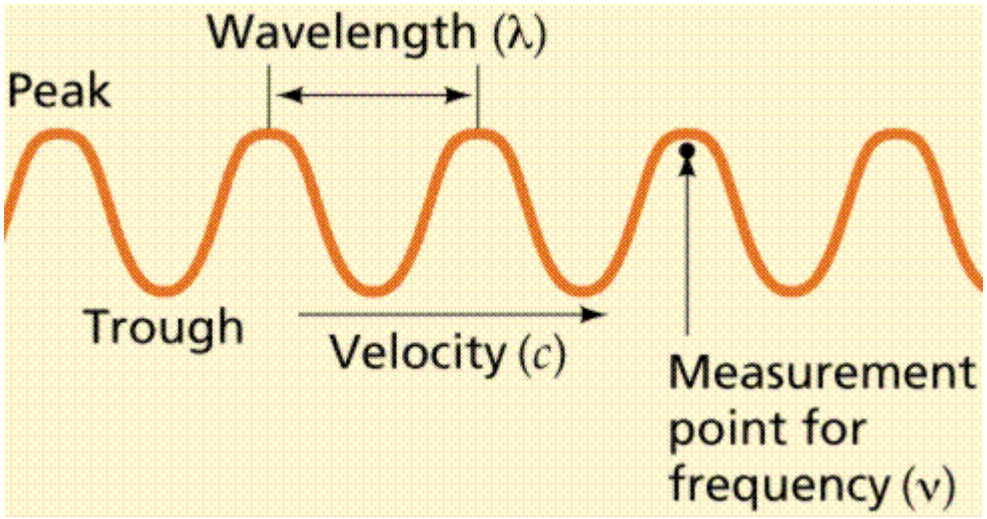
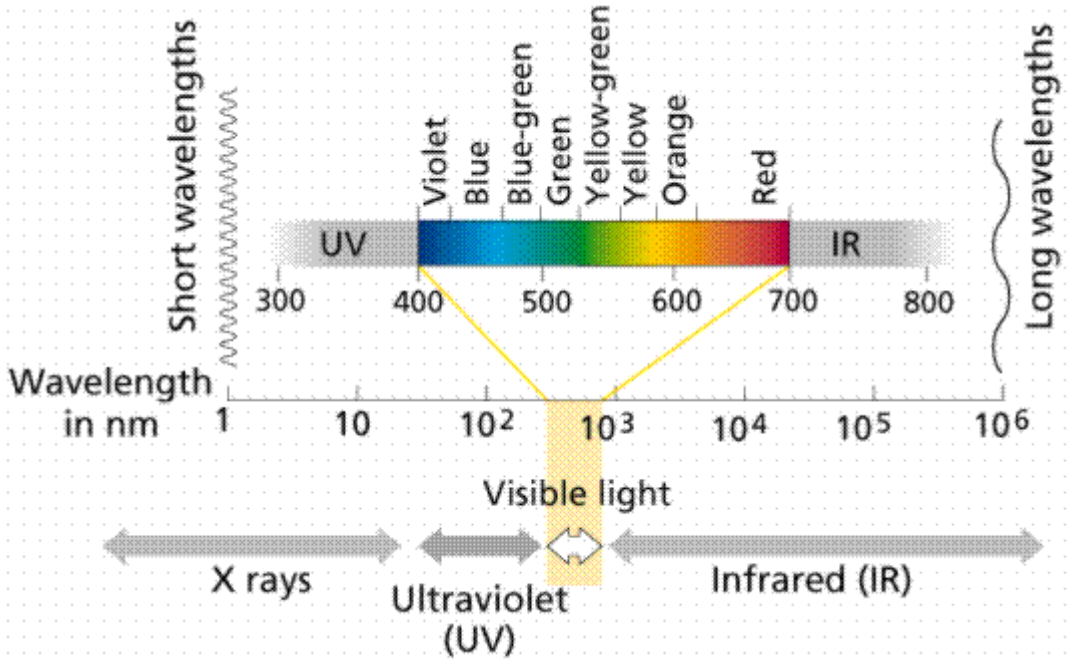


Image 29 – the electromagnetic spectrum of light



- We can only see a small part of electromagnetic spectrum.
- The longer wavelengths compose the infrared spectrum.
- The shorter wavelengths are called the ultraviolet spectrum.

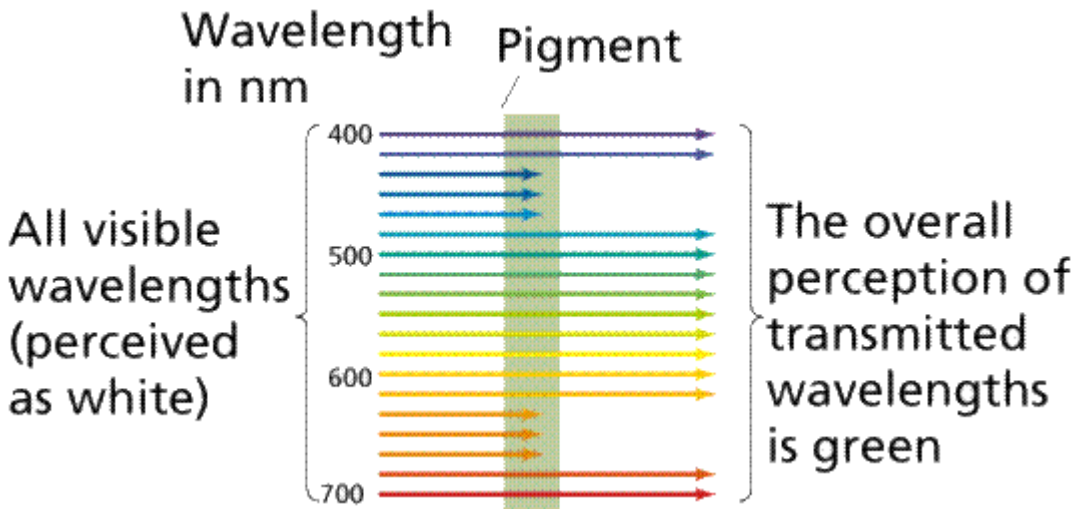
The particle properties of light

The particle properties are demonstrated by the photoelectric effect.

The critical wavelength is the maximum wavelength of light (visible or invisible) that creates a photoelectric effect.

Chlorophyll and Accessory Pigments absorb different spectrums of light

Image 30 – different pigments absorb different light wavelengths



A pigment is any substance that absorbs light.

The colour of leaves comes from the wavelengths of light reflected (in other words, those not wavelengths NOT absorbed).

Chlorophyll, the green pigment in leaves, absorbs all wavelengths of visible light except green, which it reflects to our eyes. That is why leaves look green!

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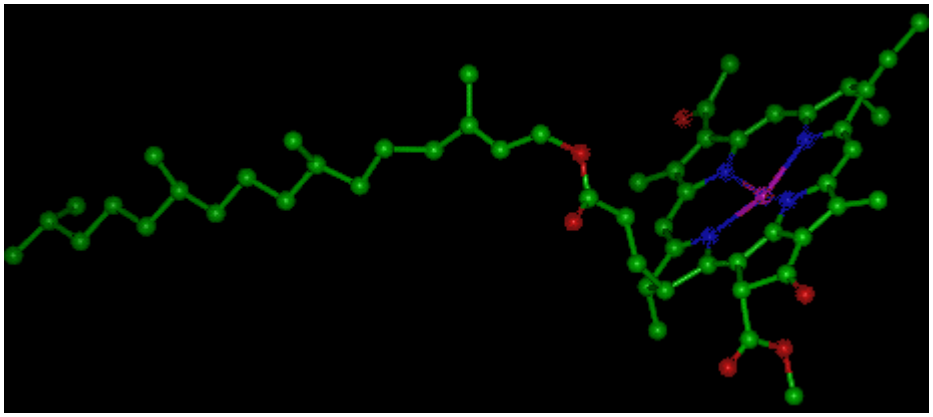
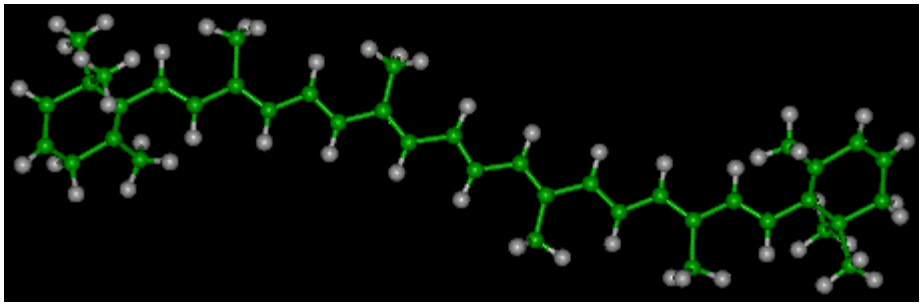
31 - Molecular model of chlorophyll.



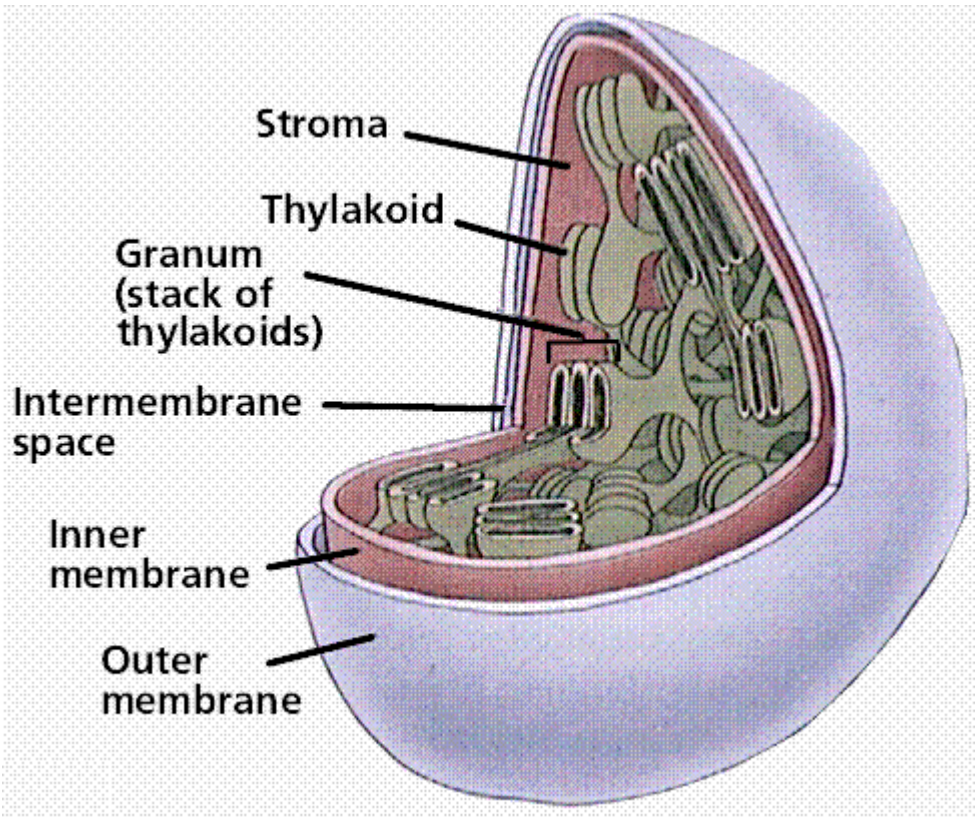
Other pigments, such as Carotenoids and chlorophyll b absorb some of the energy in the green wavelength.

32-Molecular model of carotene



The structure of the chloroplast and photosynthetic membranes

33- structure of the chloroplast



The thylakoid is the structural unit of photosynthesis.

Thylakoids are stacked like pancakes in stacks known collectively as grana.

The areas between grana are referred to as stroma.

While the mitochondrion has two membrane systems, the chloroplast has three, forming three compartments.

In other words the construction of a leaf is incredibly complicated!

34 – DNA in plants

In the centre of every plant cell – from algae to orchids – and in the centre of every animal cell – from jellyfish to you and me – there's a copy of the organism's genetic material.

This DNA carries a complete blueprint of the organism. It's what transfers characteristics from one generation to the next.

There are pretty obvious differences between plants and animals, but – at the chemical level – the cells of all plants and all animals contain DNA in the same shape – the famous "double helix" that looks like a twisted ladder.

All DNA molecules – in both plants and animals – are made from the same four chemical building blocks – called nucleotides.

Stages of Photosynthesis

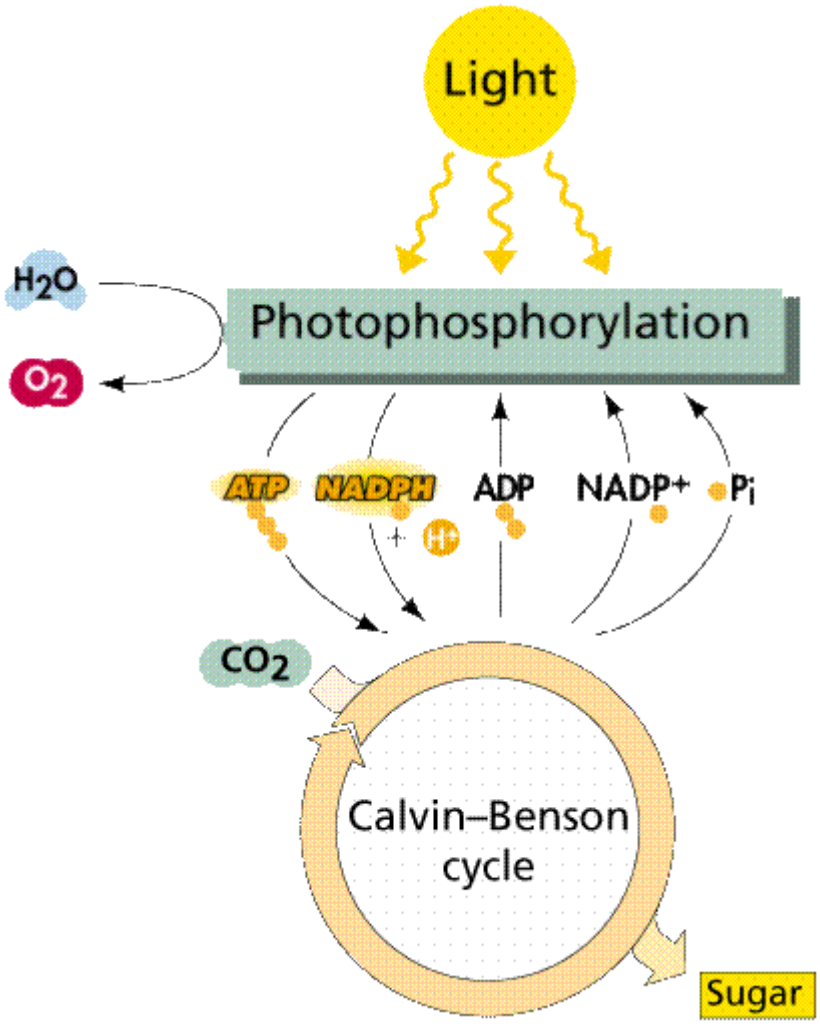
I am not going to attempt to explain to you the exact details of the chemical processes that take place during photosynthesis.

Unless you are taking a degree in botany, you do not have to understand the processes and in detail.

There are however incredibly complex, and only God could have created such an amazing process!

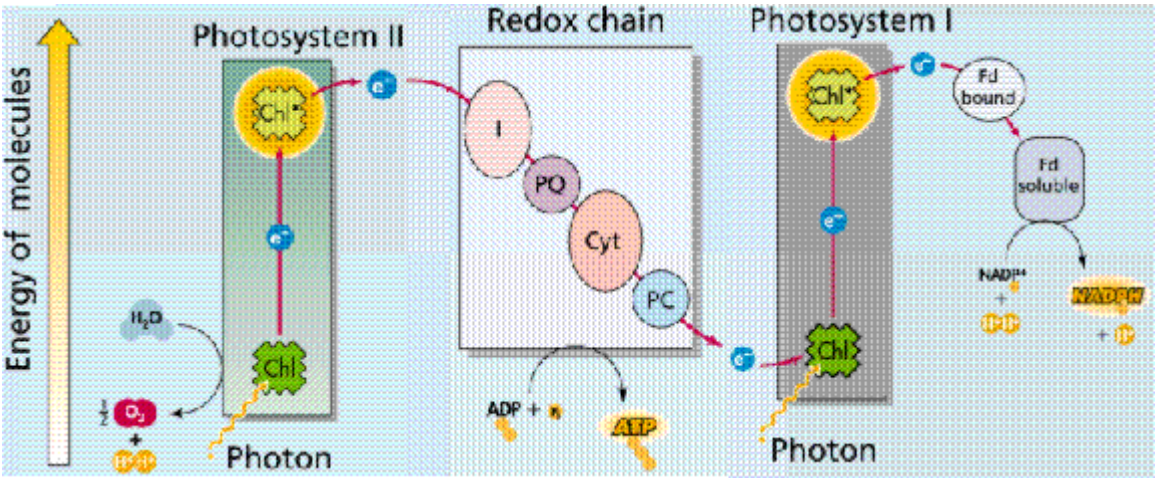
The following images will give you some idea of the complexity within all plants as photosynthesis takes place.

35 - Overview of the two steps in the photosynthesis process



The Light Dependent Processes (Light Reactions)

36 - Noncyclic photophosphorylation

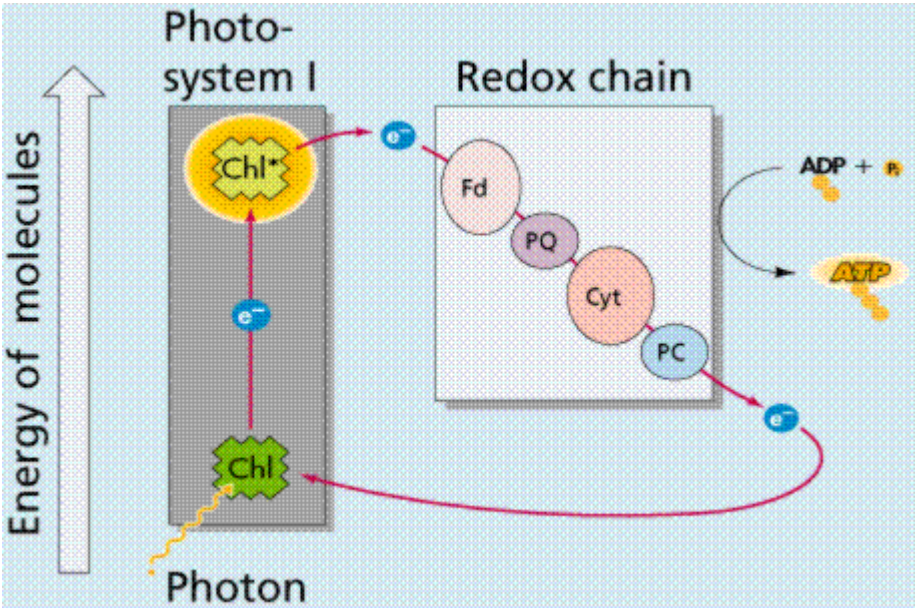


Light strikes chlorophyll a in such a way as to excite electrons to a higher energy state.

The energy is converted (along an electron transport process) into ATP and NADPH.

Water is split in the process, releasing oxygen as a by-product of the reaction.

37 -Cyclic photophosphorylation



The Light Independent Process (the so called Dark Reaction)

The ATP and NADPH are used to make Carbon bonds in the Light Independent Process (Dark Reactions).

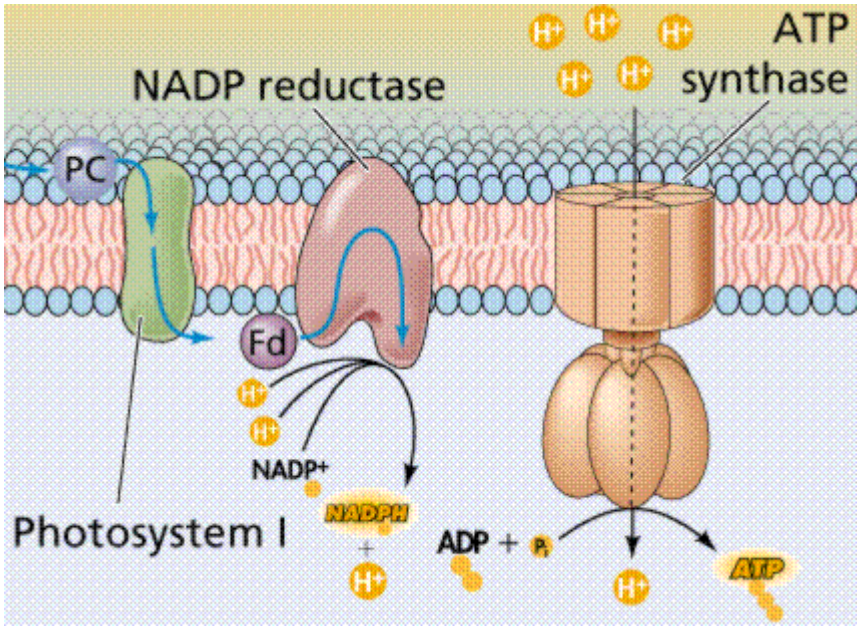
In the Light Independent Process, carbon dioxide from the atmosphere is captured and modified by the addition of Hydrogen to form carbohydrates.

The incorporation of carbon dioxide into organic compounds is known as carbon fixation.

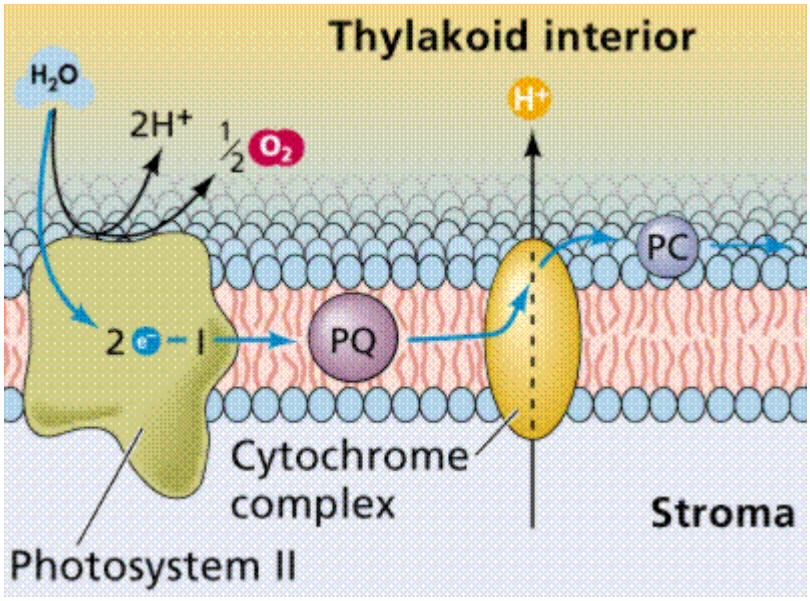
The energy for this comes from the first phase of the photosynthetic process.

Chemiosmosis as it operates in photophosphorylation within a chloroplast

Slide 38 – photosystem 1



Slide 39 – photostsytem 2



The Carbon Cycle

Plants remove carbon dioxide from the atmosphere and oceans by fixing it into organic chemicals, which we use as food.

Plants also generate our oxygen for us.

THIS IS ONE OF THE MOST COMPLICATED SUBJECTS I HAVE EVER STUDIED.

Quite simply, plants are as complicated as human beings, and also contain DNA!

Anyone who thinks that that all plants happened by chance is a complete idiot, who has simply not understood the problem!

Psalms 53:1
The fool has said in his heart,
"There is no God."
NKJV

Isaiah 40:28
Have you not heard?
The everlasting God, the Lord,
The Creator of the ends of the earth,
Neither faints nor is weary.
His understanding is unsearchable.
NKJV

Isaiah 55:12
12 You will go out in joy
and be led forth in peace;
the mountains and hills
will burst into song before you,
and all the trees of the field
will clap their hands.

Maybe the trees really will clap their hands!

Plants are so beautifully constructed, and their mechanism so profound, that only an Intelligence of unimaginable power could create something so beautiful, and yet so complicated!

In closing, here is a human nuclear factory, which is highly inefficient, and produces nuclear waste!

Slide 40 – nuclear factory made by man for making electricity (japan)

Slide 41- Gods power plants for making food and oxygen