Increase in Awareness on Components of Nature

We do not inherit the Earth from our ancestors, we borrow it from our children

What is Nature?

- Nature refers to the phenomena of the physical world and to life in general
- Nature ranges in scale from the subatomic to the cosmic level
- Nature refers to living plants and animals, geological processes, weather, matter and energy

What are the components of nature?

Soil

Atmosphere

Sun radiation

Water

Living organisms

What is Soil?

- A mixture of organic matter, minerals, gases, liquids, and organisms
- All together these elements support life
- Earth's body of soil = pedosphere

What is soil ?

https://www.youtube.com/watch?v=I6HGPoQ3dZY

What is Soil

- **Pedosphere's functions:**
  - Plant growth medium
  - Water storage, supply and purification means
  - Earth's atmosphere modifier
  - Living organisms habitat
  - Protector against water loss

Let us talk about soil !

https://www.youtube.com/watch?v=invUp0SX49g

The soil profile

- Each soil has its own set of characteristics
- Soil is made of layers (horizons: O, A, E, B, C, R).
- The horizons form a soil profile
- Soil profile tells a story about its life

O - organic

A - topsoil

E - eluviated

B - subsoil

C – parent material

R - bedrock

Let us talk about soil !

https://www.youtube.com/watch?v=invUp0SX49g

Protect the soil !

- Prevent soil from eroding – plant grass, flowers, trees in empty places
- Avoid overwatering – protect from erosion
- Use natural nutrients
- Avoid disposal of hazardous chemicals

Protect the soil !

https://www.youtube.com/watch?v=Fzv7fVmHPzs

Atmosphere

- Atmosphere - the gaseous layer enveloping the Earth

- The atmosphere is unique to Earth and sustains life due to oxygen abundance

Atmosphere - composition

- Atmosphere comprises:
  - 78.08% Nitrogen
  - 20.95% Oxygen
  - 0.93% Argon
  - 0.038% carbon dioxide
  - and traces of hydrogen, helium, and noble gases

Elements constituting the atmosphere
https://www.britannica.com/science/atmosphere

Atmosphere – main levels

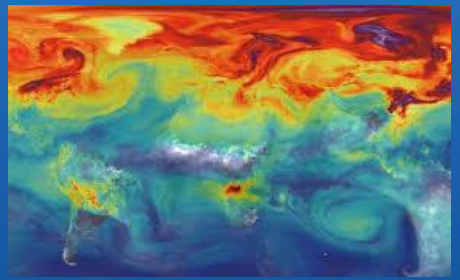
- Earth's atmosphere can be divided into five main layers:
  - Exosphere
  - Thermosphere
  - Mesosphere
  - Stratosphere
  - Troposphere

Atmosphere levels

https://www.youtube.com/watch?v=Y0AOg_fPkog

Protect the atmosphere !

- **Air pollution** - the introduction of chemicals, particulate matter or biological materials that cause harm or discomfort to organisms.
- **Air pollution** causes stratospheric ozone depletion due to ozone-depleting substances.
- **Global warming** - the anthropogenic greenhouse gases accumulating in the atmosphere.

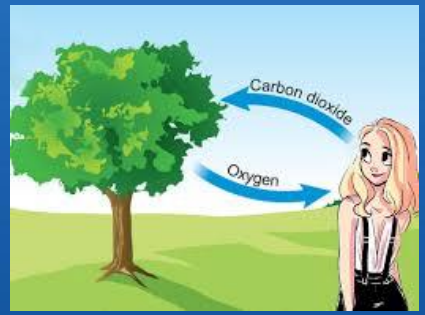


Protect the atmosphere !

- **Reduce pollution** – cut back on fossil fuel combustion and invest in energy efficiency and renewable energy sources.

  https://www.youtube.com/watch?v=ILvm2jxVkRI

- **Monitor air pollution** – people advocate for changes that make the air safer to breathe.
- https://www.youtube.com/watch?v=t7Q7y_xjR5E



Sun radiation

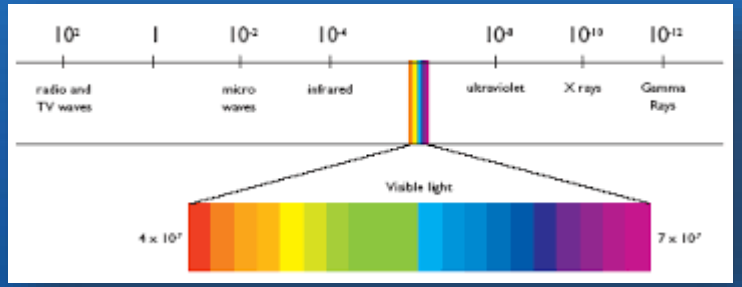
- Sun - the ultimate source of the heat energy reaching the Earth
- Sunlight (solar radiation) - the electromagnetic radiation arriving at the Earth's surface due to direct illumination by the sun
- Sun radiation Includes ultraviolet, visible and infrared components

Sun radiation - properties

- Sun radiation intensity varies by season and time of day due to the orbit of the Earth around the sun and the Earth's rotation
- Sun radiation drives photosynthesis in plants to fuel all life
- Sun radiation is responsible for maintaining the temperature of the Earth at levels hospitable to life on Earth as we know it.
- Sun radiation is also the energy source for almost all life on planet Earth

Sun radiation spectrum

- UV: 100 – 400 nm
  - 100 - 280 nm: undetectable by the unaided eye; mutagenic, carcinogenic and germicidal
  - 280 – 315nm: responsible for the photochemical reaction leading to the production of the ozone layer
  - 315 – 400 nm: sun tanning and therapy for psoriasis
- Visible: 400 – 700 nm: detectable to the human eye
- IR: > 700 nm

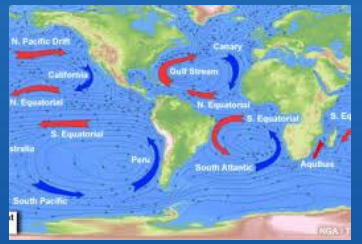


Sun radiation – the power supply of the biosphere

- Sun radiation - the source of most biological energy needed to sustain life on the planet Earth
- The chief mechanism for conversion of solar power to biological energy is photosynthesis
- Approximately 10^{14} watts of sun radiation are converted to photosynthetic resulting in about 10^{11} tons of biomass production annually

In addition to photosynthesis ….

- Sun radiation
  - Powers the ocean and atmospheric currents
  - Determines circadian rhythm impulses that govern many diurnal biological processes
  - Cues to fauna that perform seasonal migration
  - Directs finding capabilities for bees and other fauna that use the sun location as a means of navigation.



Sun radiation – beneficial & deleterious

- Benefits to human health
  - Manufacture of vitamin D
- Danger effects
  - Sunburn and the possibility of carcinoma or other genetic mutation
  - Green house effect - ozone layer has been punctured

- How the sun heat the earth?

  https://www.youtube.com/watch?v=dg_DOM1OQoo

- Here Comes the Sun!

  https://www.youtube.com/watch?v=6FB0rDsR_rc

- Green house effect

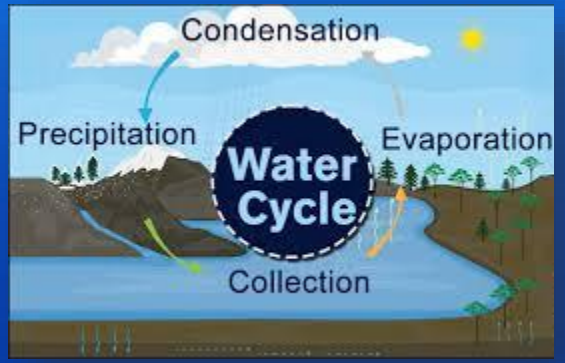
  https://www.youtube.com/watch?v=x_sJzVe9P_8

WATER

- The basic building block for all life on Earth
- The most plentiful natural resource on the planet - over two-thirds of the Earth is covered by water
- 97 percent is held in the oceans, while only 3 percent is freshwater
- Of the freshwater, only 1 percent is easily accessible as ground or surface water, the remains are stored in glaciers and icecaps
- There are a number of heavily populated countries located in arid lands where fresh water is scarce.

WATER CYCLE

- Continuous exchange of water within the hydrosphere, between the atmosphere, soil water, surface water, groundwater, and plants.
- Basic transfer processes:
  - Evaporation from oceans and other water bodies into the air and transpiration from land plants and animals into the air.
  - Precipitation, from water vapor condensing from the air and falling to the earth or ocean.
  - Runoff from the land usually reaching the sea.



Water is precious !

- Water regulates the temperature of the planet
- Water cycles essential nutrients through the land, air, and all living things
- Water is both the most abundant natural resource on our planet and a basic element of life
- Water is fundamental to photosynthesis and respiration.

Water is dangerous !

- Water is one of the most destructive forces on earth
- Water carves breath taking gorges and valleys, yet disasters related to water are responsible for large scale loss of life as well
- Water-related hazards like floods are the results of complex interactions in the ocean atmosphere-land process cascade; floods are expected to increase due to global warming.

Water types

- See water - contains about 3.5% sodium chloride and unique physical properties
- Fresh water - as stocks and flows in lakes, water vapor, groundwater, ice and snow

Water is life !

- All known forms of life depend on water
- Water is vital both as a solvent in which many of the body's solutes dissolve
- Water is essential part of metabolic processes and enzyme function
- Water is fundamental to photosynthesis and respiration

Who lives in the water?

- The marine life - the plants, animals and microorganisms (incl. viruses) that live in the salt water of the sea or ocean, or the brackish water of coastal estuaries
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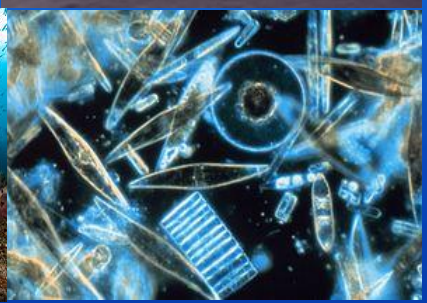


Water in use

- For drinking
- Agriculture
- Washing
- Transportation
- Heat exchange
- Chemical & industrial applications
- Water industry
- Food processing
- Recreation

Value the water, preserve the water…

- Water and everyday life – we use water to produce the food we eat and the beverages we drink, to clean and sustain us
- Water and the environment – produce thermoelectric power, for irrigation, transport
- Water and the economy – needs of reliable and clean source of water
- Water and the community – water connects people

- Importance of water

https://www.youtube.com/watch?v=qkIEjgynmYY

- Where does water come from?

https://www.youtube.com/watch?v=R0K7VKkksyc

- Preserve the water

https://www.youtube.com/watch?v=bGWr5jXJfbs

Living organisms

- What are the main characteristics of the living organism?
  - Sensitivity – be responsive to the environment
  - Growth - capable of growth and change
  - Reproduction - able to reproduce
  - Respiration - able to metabolize and breathe
  - Nutrition and excretion - able to maintain homeostasis
  - Made of cells
  - Able to pass traits onto offspring

Living organisms - animals

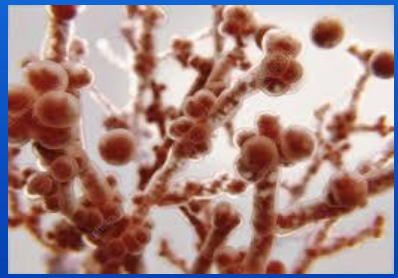
- Animals are:
  - Multicellular organisms
  - Usually have nerves or nervous systems for coordination, and they are able to move from place to place.
  - Do not have cell walls
  - Do not contain chloroplasts, so animals cannot carry out photosynthesis
  - May store carbohydrate as **glycogen**
  - The main parts of an animal cell are the nucleus, cell membrane and cytoplasm

Living organisms - plants

- Plants are:
  - Multicellular organisms
  - Are not able to move
  - Do not have cell walls
  - Contain chloroplasts, so can carry out photosynthesis
  - May store carbohydrate as starch or sucrose
  - Plant cells contain the same parts as animal cells, and the additional chloroplasts, cell wall made of cellulose and permanent vacuole

Living organisms - fungi

- Fungi are:
  - Multicellular organisms, besides yeasts (unicellular)
  - Use saprotrophic nutrition
  - Secrete enzymes onto their food so that digestion happens outside the fungal cells
  - Do not have cell walls
  - Organized into a mycelium - which is made from thread-like structures, hyphae
  - The hyphae contain many nuclei
  - May store carbohydrate as glycogen



Living organisms - Bacteria

- Bacteria
  - ✓ Are microscopic single-celled organisms
  - ✓ Have a cell wall made of polysaccharides and proteins
  - ✓ Do not have a nucleus, but instead they have a circular chromosome of DNA.
  - ✓ May also have small extra circles of DNA called plasmids.
  - ✓ Some bacteria can carry out photosynthesis, but most bacteria feed from other organisms

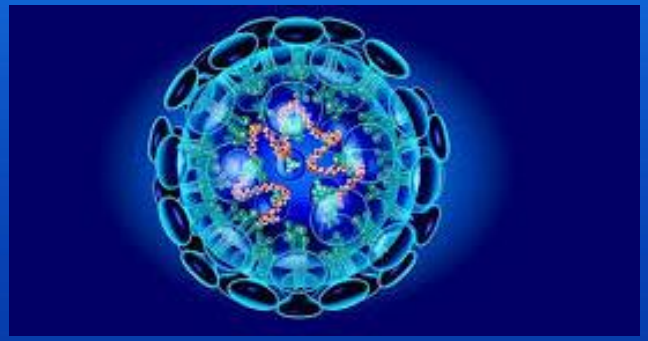
Living organisms - Bacteria

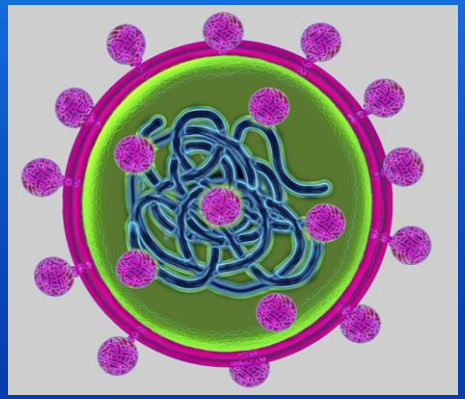
Lactobacillus bulgaricus - a rod-shaped bacterium used to make yoghurt from milk

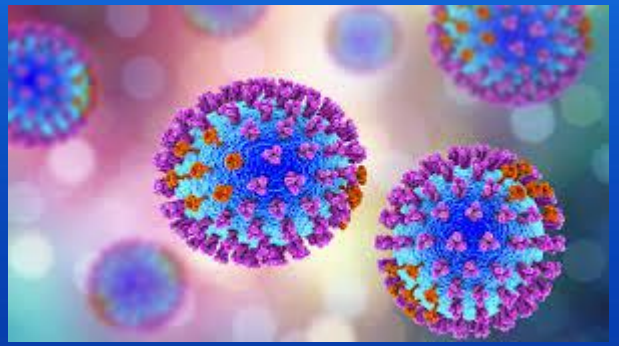
Pneumococcus - a spherical bacterium causes pneumonia

Living organisms - Viruses

- Viruses are very small particles capable of infecting every type of living organism. They are parasitic and can only reproduce inside living cells.
- Virus particles have a variety of shapes
- Viruses do not have a cellular structure: they have a core of genetic material surrounded by a protein coat. Their genetic material can be **DNA** or **RNA**, but not both.







Living organisms - Biosphere

- All the regions on Earth where life exists is called **Biosphere**.
- The ecosystems that support life could be in soil, air, water or land.
- Biosphere refers to the sum total of all living matter, the biomass or biota
- Biosphere extends from the polar ice caps to the equator, with each region harboring some life form suitable to the conditions there.

Living organisms - Biodiversity

- Biodiversity - the variety of all living organisms including ecosystems, plants, animals, their habitats and genes—
- Protect biodiversity
    - Government legislation
    - Nature preserves
    - Reducing invasive species
    - Habitat restoration
    - Captive breeding and seed banks
    - Research
    - Reduce climate change
    - Purchase sustainable products

Living organisms

Protect biodiversity !
https://www.youtube.com/watch?v=kHhspf5IfdE

How the EC protect living organisms?
https://www.consilium.europa.eu/en/policies/biodiversity/

Living organisms around us
https://www.youtube.com/watch?v=TnwgIHfgGtw

- Promote environmental awareness
  - Get outdoors: visit a park, make a garden
  - Science: develop energy awareness, practice water cycle, watch birds
  - Healthy lifestyle: go to farmer's market
  - Reading: read about environment
  - Connect environment and art: be creative with recyclables