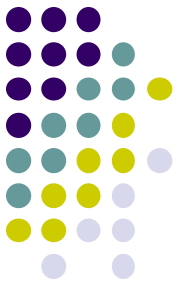


Kingdoms of organisms

Presented by

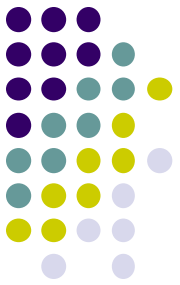
Dr. Ieya Kennedy

2014



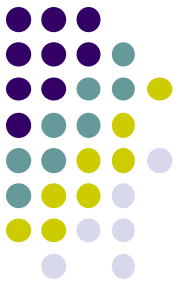
Learning Objectives:

- At the end you should be able to:
 - *Define* biology and distinguish between living and nonliving things by describing the features that characterise living organisms
 - Name the six kingdoms of organisms and briefly describe each
 - Differences between Gymnosperms and Angiosperms plants
 - Differences between monocot and dicot plants
 - How do we divide the animal kingdom?



Introduction

- ❖ As we study Biology we need to know the meaning of Biology.
- ❖ Biology is the study of **life & living organisms**
- ❖ The word biology comes from Greek, **bios means 'life'** and **logos means 'the study of' ('knowledge')**.
- ❖ It is the study of life and living things (organisms).



How do we know is something is 'living'?

- All living things are characterised as being able to do seven things
- These are usually remembered by the mnemonic **MRS NERG**

M

R

S

N

E

R

G

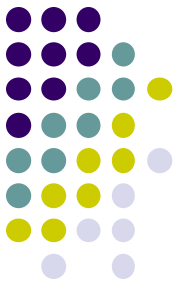
Can you guess what these
letters stand for?

CELLS



- **Cells** are the structural and functional units of all living organisms.
- All living organism are made of **one** or more cells.
- These cells are the building block of life.

The 7 characteristics of Living Things



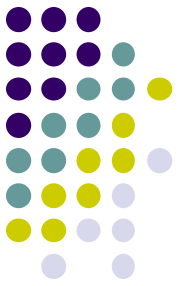
- M**ovement – Animals move to find food and keep away from predators; plants move to face the light
- R**eproduction – the ability to produce offspring to keep the species in existence
- S**ensitivity – responding and reacting to the environment
- G**rowth – Growing larger and stronger → becoming adult size
- N**utrition – Animals need food for respiration, plants need minerals from the soil
- E**xcretion – Getting rid of waste
- R**espiration – Turning food into energy

Flagella

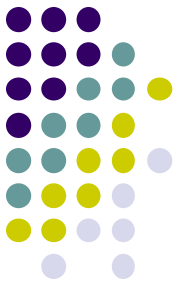
- *Tail like structure the whips around to propel the bacterium*



Cilia



- Miniature flagella surround the cell (bacteria) that helps to “swim”

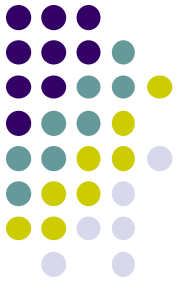


Sexual -

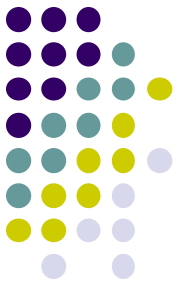
Asexual (or vegetative, in plants)

- a new organism can develop from a part of the original organism – it is therefore identical to the parent.

- Fusion of male sperm with female egg to form a zygote, which then develops into the embryo
 - offspring has a mixture of characteristics of each parent.

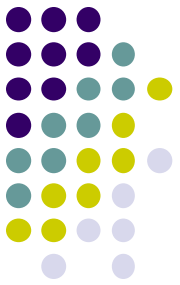


Characteristics of Life 1.flv



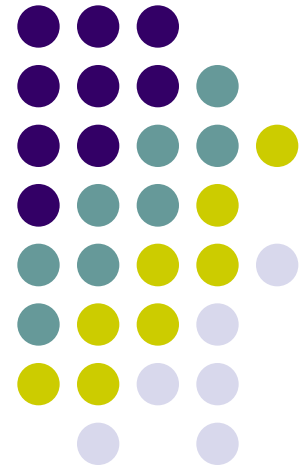
Question

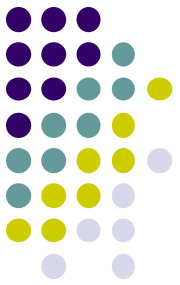
- Define biology.
- What is the smallest possible unit that exhibits all of the characteristics of life?
- What are the characteristics of living things?
- Define Flagella and Cilia.
- Define Asexual and Sexual reproduction.



The Characteristics of Living Things2.flv

Classifying Organisms





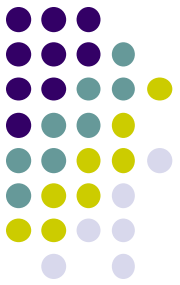
Why do Scientists Classify?

Imagine a grocery store...

How are they organized?

What would happen if they were not organized?

How is your life organized?



Why do Scientists Classify?

Almost 2 million kinds of organisms on Earth

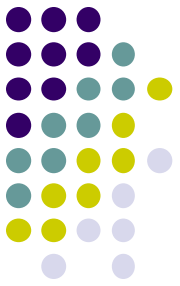
Need to keep organized! (Easier to study!)

Classification

Process of **grouping things based on their similarities**

The science of classifying organisms is known as
taxonomy

Taxonomy



**Taxonomy, the science of
naming, describing and
classifying organisms.**

Why do Scientists Classify?

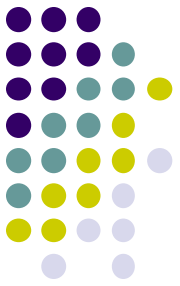


Useful because:

It is impossible to study every living organism from an individual level.

Therefore, classification is necessary to facilitate easy study of organisms.

Once classified, scientists will know a lot about an organism



Carolus Linnaeus

Carolus Linnaeus (1750s) – Father of **TAXONOMY**

Devised naming system for organisms:

Binomial Nomenclature



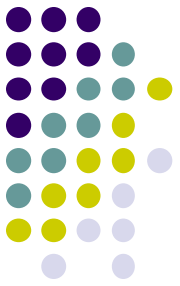
Binomial Nomenclature

- Developed by **Linnaeus**
- Called binomial because two names are used.
- First name is genus, with first name being a **capital**.
- Second name is species, with **no capital**.
- Italics are used **when the name is printed**.
- The name is **underlined if it is handwritten**.

Homo sapiens

Homo sapiens

Human being

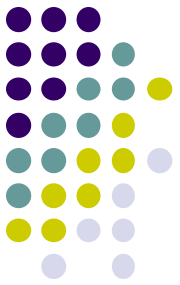


Binomial Nomenclature: “a **two-name system**”

First part of name: **genus** first letter always capitalized

Second part of name: **species** first letter always lowercase

Entire name is underlined and *italicized*



Questions

- What is classification?
- Why is classifying living things important?
- What is taxonomy?
- Describe binomial nomenclature.



Questions

- Who developed a system for naming living organisms?
- What is a scientific name of an organism and how is it written?



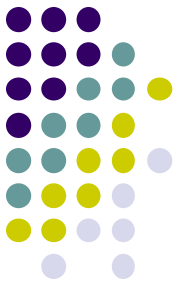
Summary

- Biology is the study of **life and living organisms**.
- All living organisms are composed of **one** or more cells.
- Organisms grow by increasing the size and/or number of their cells.
- The number of species of living organisms which have been discovered runs into millions, so a system of **classification is essential**.



Summary

- An organism's scientific name is composed of the name of the **genus followed by the name of the species**, e.g. Homo sapiens. This is called the **binomial system**.
- Scientific names are essential where precise identification is required, e.g. in agriculture and medicine.



Levels of Classification

-based on contributions of both Aristotle and Linnaeus

There are 8 levels of classification.

Remember the first letter of this sentence:

**Dr. King Philip Came Over For Good
Spaghetti.**

Eight classification groups of living things



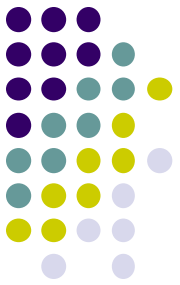
- Domain
- Kingdom
- Phylum
- Class
- Order
- Family
- Genus
- Species

Questions



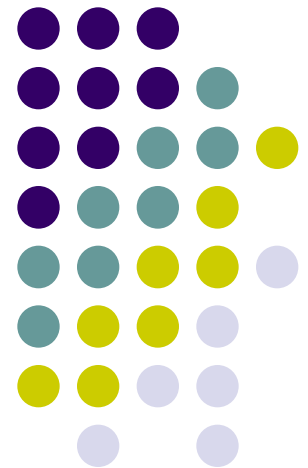
- What are the eight classification groups?

**Dr. King Philip Came Over For Good
Spaghetti.**



Learn Biology Classification- The Taxonomic Hierarchy 4.flv

Classification



The Old System



FIVE KINGDOMS OF ORGANISMS

Monera

Protista

Fungus

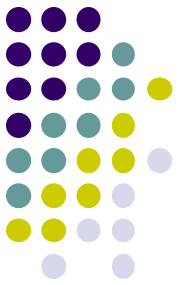
Plantae

Animalia



The New System

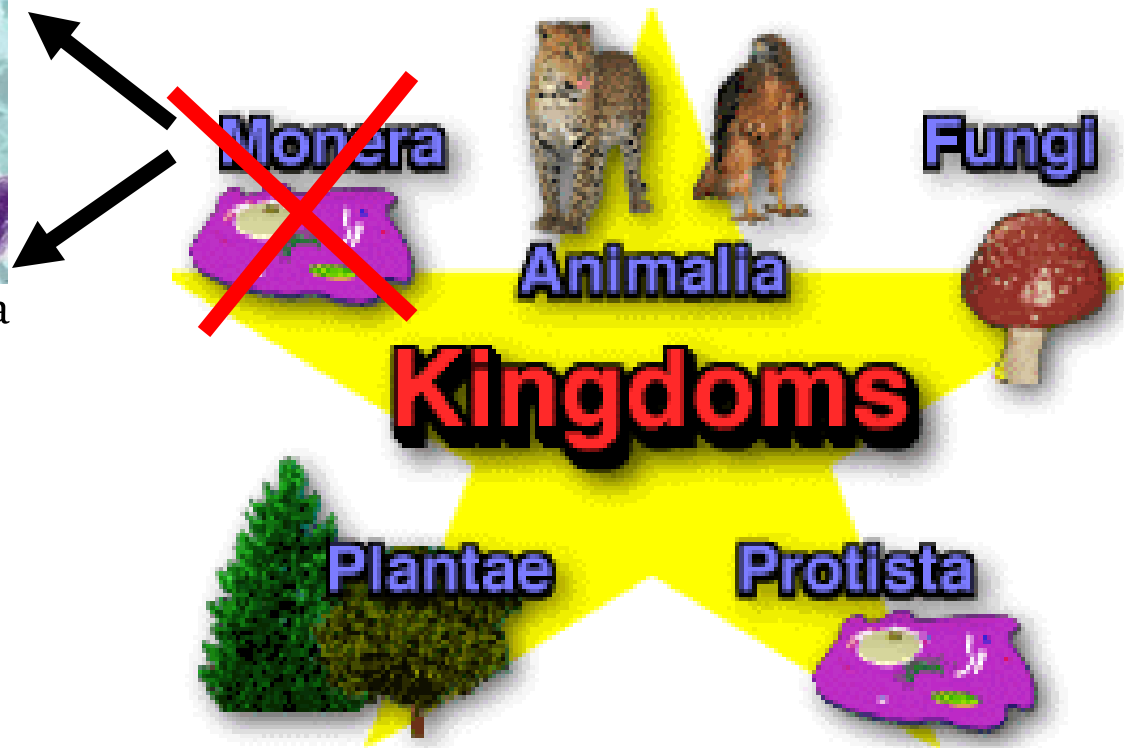
6 Kingdom Proposal



Archebacteria



Eubacteria



Classification of Bacteria

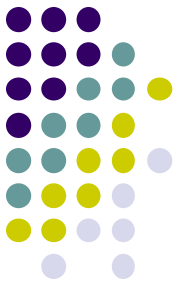


■ **Kingdom Monera** has been replaced with two kingdoms.

■ **Kingdom Archaeobacteria** - primitive bacteria that live in the harsh environments that resemble the conditions of the early earth when life was first evolving.

■ **Kingdom Eubacteria** - larger kingdom -- includes heterotrophic & autotrophic organisms; some of the autotrophs are photosynthetic; others are chemosynthetic. Harmful & beneficial forms.

■ Separated because of biochemical differences.



Domain

- Based on fundamental molecular differences among the Eubacteria, Archaeobacteria, and Eukaryotes, many systematists now use a level of classification above the kingdom, called **domain**.
- They classify organisms in three domains: **Archaea** (which corresponds to kingdom Archaeobacteria),
- **Bacteria** (also called *Eubacteria*)
- **Eukarya** (eukaryotes)



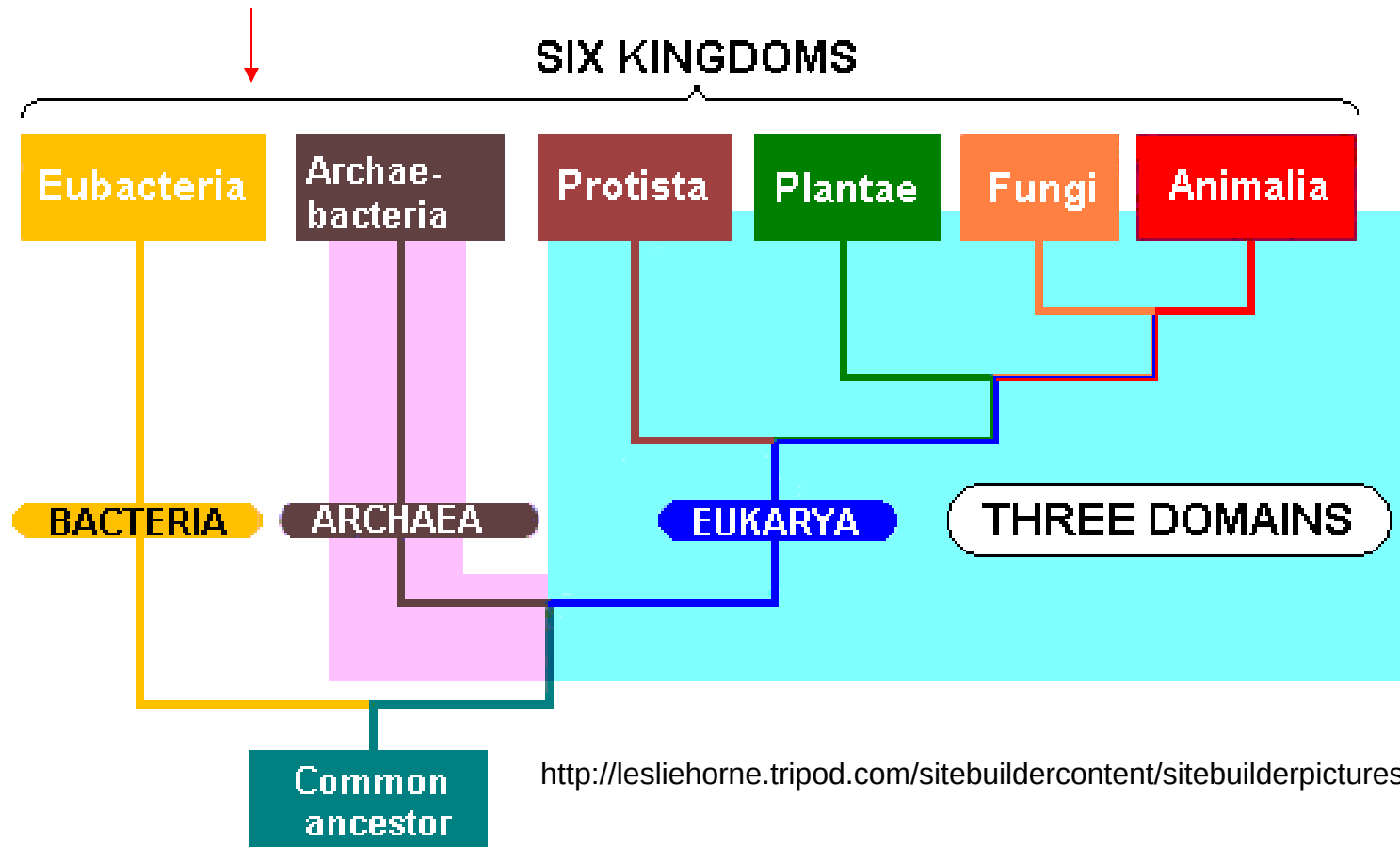
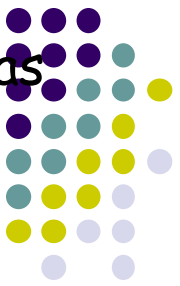
Prokaryotic

- The Archaea and Bacteria domains contain **prokaryotic organisms**. These are organisms that do not have a membrane bound nucleus.

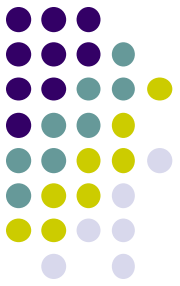
Eukaryotic

- The Eukarya domain includes **eukaryotes**, or organisms that have a membrane bound nucleus.
- This domain is further subdivided into the kingdoms Protista, Fungi, Plantae, and Animalia.

Life's diversity, which was originally divided into five kingdoms, has been expanded to six when Kingdom Monera was divided into two.



New methods of comparison such as DNA sequences have led to an ongoing reevaluation of the number & kinds of kingdoms ranging from six to twelve. Most taxonomists now group kingdoms into a higher classification category called a domain.

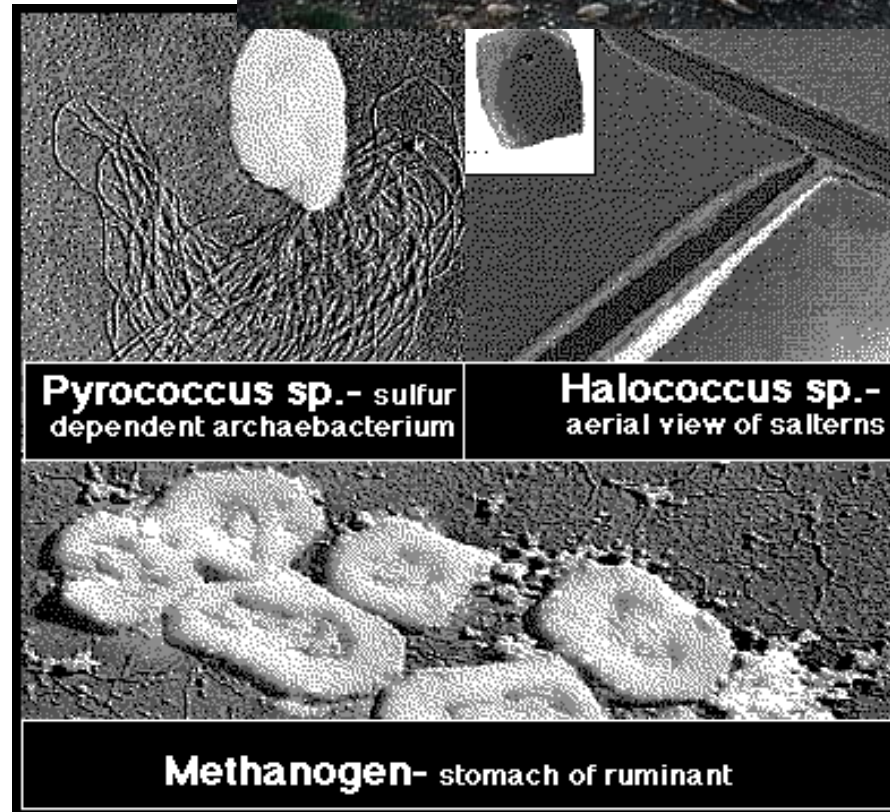


Learn Biology Classification- Domains 3.flv

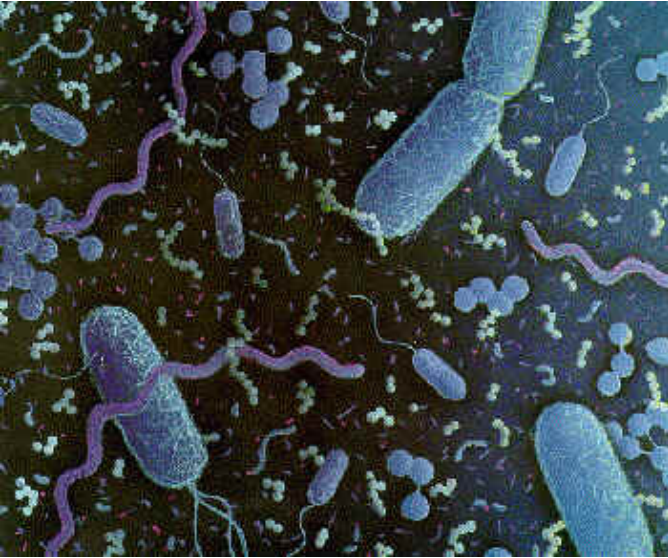
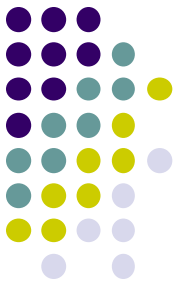
Archaeobacteria



- Microbiologists who study bacteria determined that the DNA of these are much different from other, true bacteria
- Archaeobacteria can live in extremely **harsh environments**
- They do not require oxygen and can live in extremely salty environments as well as extremely hot environments.



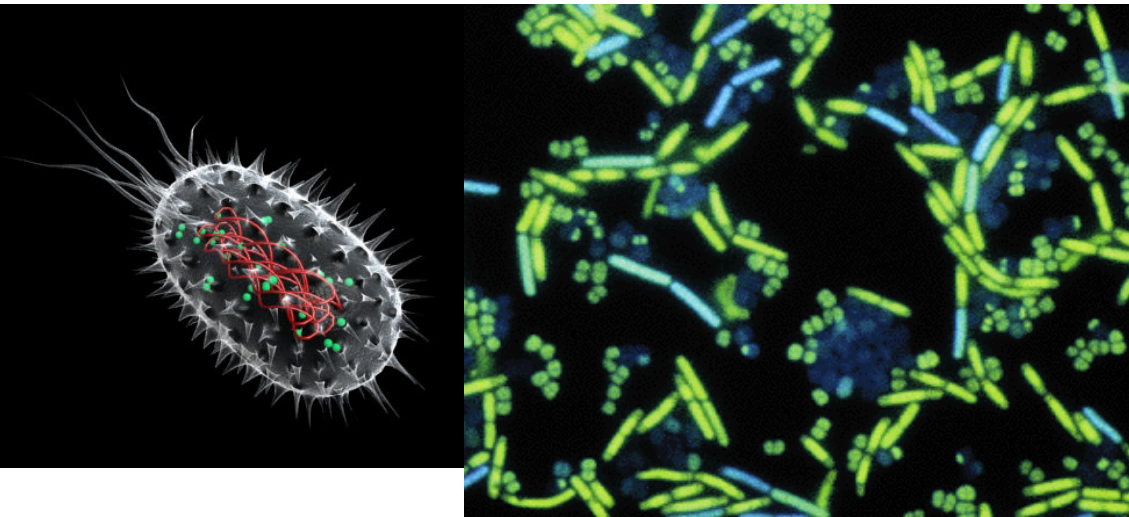
Domain Eubacteria



Formerly a part of the
kingdom monera

Name means “**true
bacteria**”

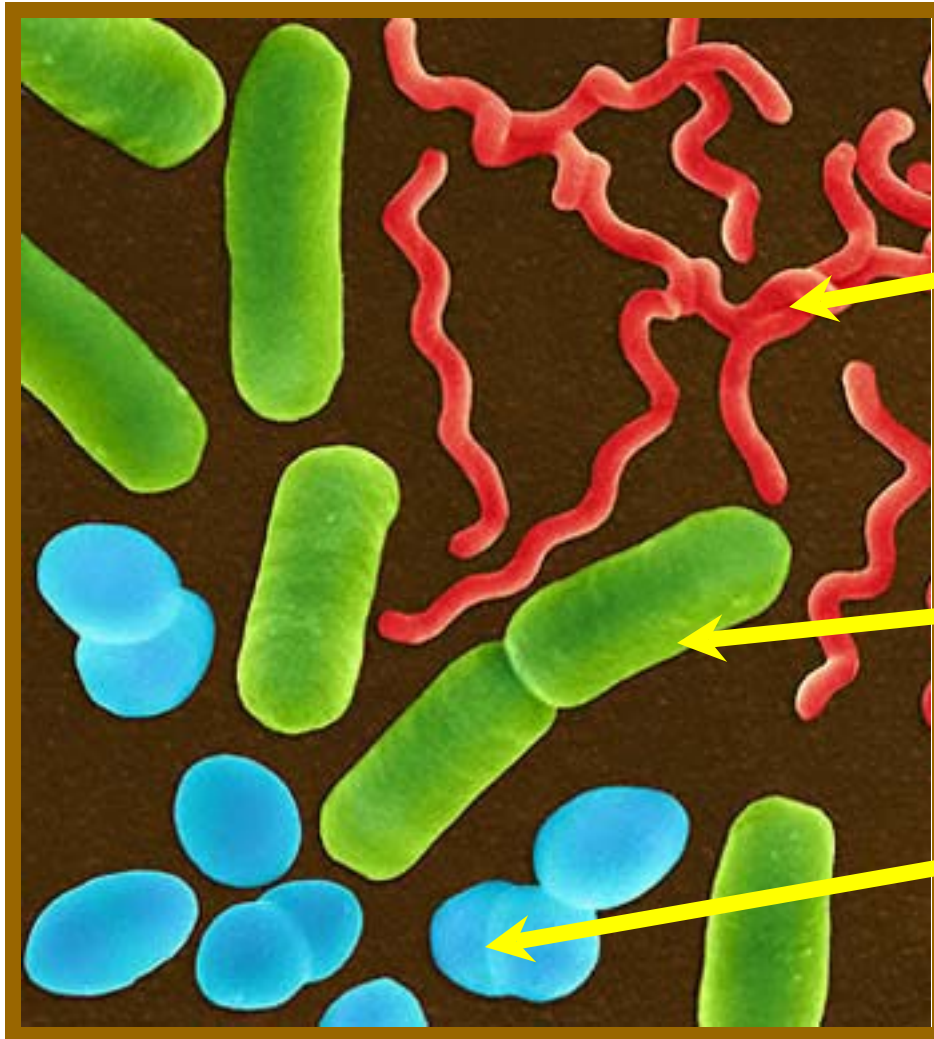
These are the kind of
bacteria likely to make
us sick, live in our gut to
help us digest food, or
be used in the making
of cheese



Shapes of Bacteria



Bacteria are classified by shape into 3 groups:

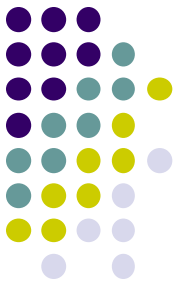
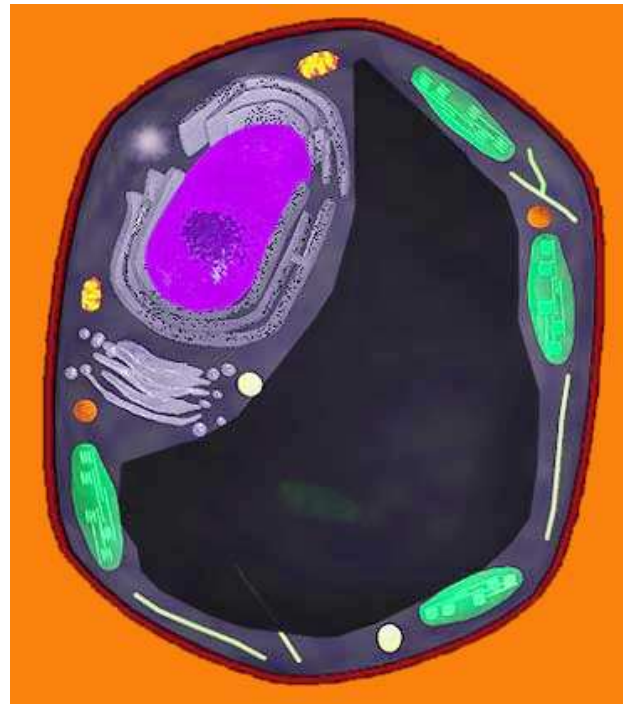


Spiral:
spirilla

rod-shaped:
bacilli,
bacillus

Round:
cocci

Domain Eukarya



Contains all of the eukaryotes
(organisms with a nucleus in their cells)

Protista

Fungi

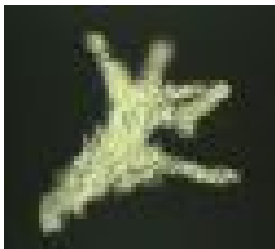
Plantae

Animalia

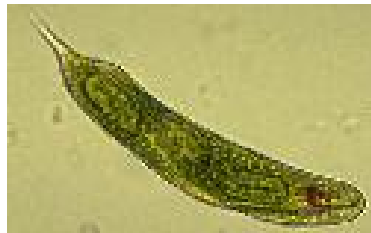
Kingdom Protista



- Eukaryotes
- Single-celled or simple multicellular
- Live in damp places of water
- Subdivided into two groups **Protozoans** and **Algae**



Amoeba



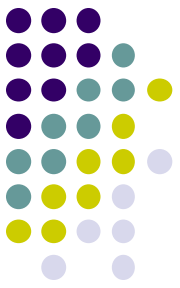
Euglena



Brown Algae



Diatom



Protozoans

- No cell walls or chlorophyll so they are consumers.
- Most can move (locomotion)
- Paramecium



**Animal-Like
(Protozoans)**

Algae

Producers
(chlorophyll)
May live as single
cells or form long
chains



Green Algae

**P
l
a
n
t
-
l
i
k
e**

Fungi Kingdom



- Body is made up of a network of threads called **hyphae**
- The hyphae help to absorb nutrients through their very large surface area.
- Fungi are multicellular, with a cell wall, organelles including a nucleus, but no chloroplasts and **heterotrophic**.
- **Chitin** found in their cell walls,
- They are sessile organisms. E.g **moulds, mushrooms, yeast**

How fungi digest its food?



- A fungus digests its food externally by secreting enzymes onto the food and then absorbing the small nutrients that result from digestion.

Plant Kingdom



- Multicellular – made up of lots of cells
- Organelles including nucleus, chloroplasts are present, and cell walls are present.
- Their cell walls contain **cellulose.**
- Make their own food by **photosynthesis**
 - **Non-mobile** (fixed to one spot).
 - Conifer, ferns, mosses and flowering plants



Plant Kingdom



cones

- Seed plants are divided into two groups **Gymnosperms** and **Angiosperms**.
- Plants that bear flowers and produce seeds are called **flowering plants** (Angiosperms). There are two kinds of flowering plants: **monocotyledons** and **dicotyledons**.



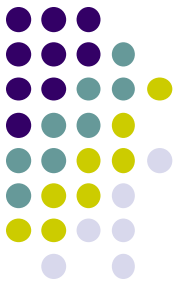
fleshy fruit

Why are fungi and plants classified in different kingdoms?



- Based on the presence of the polysaccharide **chitin** found in their cell walls, rather than the cellulose present in plant cell walls and lack of **chlorophyll**.



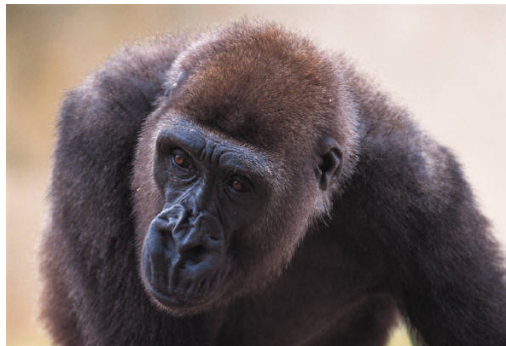


Plants Fungi.flv

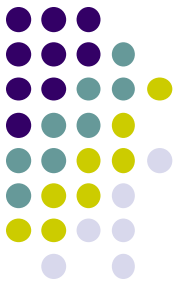
Animal Kingdom



- Multicellular – made up of many specialised cells
- Cannot make own food (heterotrophic)
- They have organelles including a nucleus, but no chloroplast or cell walls.
- They have nerves and muscles in their bodies.
- **Sponges, corals, birds and mammals**
- Can be further classified into **vertebrates** and **invertebrates.**



General Characteristics of animals

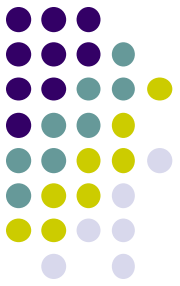


- First, animals are **multi-celled**.
- Second, animals are **heterotrophs**.
- Third, animals require oxygen, for use in **aerobic respiration**.
- Fourth, animals **reproduce sexually** and, in many cases, asexually.
- Fifth, most animals are **motile during** at least part of the life cycle.
- Sixth, their life cycles include stages of **embryonic development**.

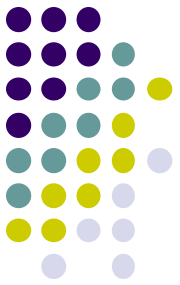


Viruses

- Very small and **cannot be seen** through a light microscope.
- They can only **multiply inside living cells of another organism (host cell)**.
- They contain nucleic acids such as DNA or RNA and must therefore be considered as being on the border between living and non living.



Five Kingdoms.flv



Question

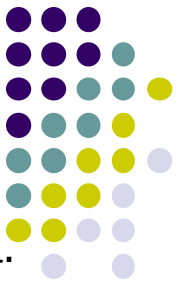
- Why is a mushroom regarded as fungus rather than a plant?
- Contrast how fungi digest and absorb their food with your own digestion.
- List the general features that characterize protista.
- List the six main features that characterize animals.

Summary

Comparison of Classification Systems

Six Kingdom System

Kingdoms: Archaeobacteria, Eubacteria, Protista, Fungi, Plantae, and Animalia.



Three Domain System

Archaea Domain

Archaeobacteria Kingdom (ancient bacteria),

Bacteria Domain

Eubacteria Kingdom (true bacteria),

Eukarya Domain

Protista Kingdom

Fungi Kingdom

Plantae Kingdom

Animalia Kingdom

Summary

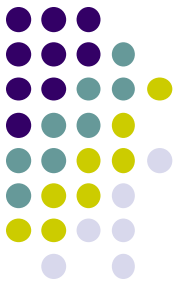


The [Archaea](#) and [Bacteria](#) domains contain **prokaryotic** organisms. These are organisms that do not have a membrane bound [nucleus](#).

Eubacteria are classified under the **Bacteria** domain and archaeobacteria are classified as **Archaeans**.

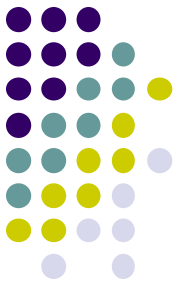
The Eukarya domain includes **eukaryotes**, or organisms that have a [membrane bound nucleus](#).

This domain is further subdivided into the kingdoms Protista, Fungi, Plantae, and Animalia.



Summary

- Bacteria are **single cells** and microscopic organisms; they have no proper nucleus; they have a cell wall, cytoplasm and a single chromosome.
- Bacteria produce enzymes which digest the surrounding medium
- Bacteria reproduce by cell division.
- Protoctista are single-celled organisms containing a nucleus



Summary

- Viruses are not included in the six kingdom system since many biologists consider them to be non living.
- Viruses are smaller than bacteria and cannot, strictly, be classed as living organisms.
- Each virus particle consists of a DNA or RNA core enclosed in a protein coat.
- Viruses take over the host cell's physiology and make it produce new virus particles



- The fungus kingdom contains multicellular, eukaryotes which have heterotrophic nutrition.
- Fungi are formed from thread-like **hyphae** rather than cell
- The branching hyphae produce a network called a **mycelium**.
- Fungi secrete enzymes into their food and absorb the digested products.



- The plant kingdom contains multicellular, eukaryotes that have **autotrophic** nutrition by **photosynthesis**.
- Animals get their food by eating plants or other animals.
- Most animals are invertebrates - animals without backbones. Vertebrates have backbones.
- The animal kingdom contains multicellular, eukaryotes which are usually motile and feed heterotrophic.

Gymnosperms



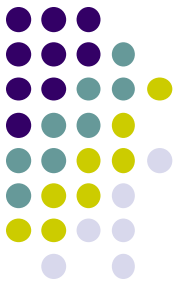
- “Gymnosperm” means **naked seeds** and is from the Greek words *gymno* meaning **naked** and *sperm* meaning **seed**.
- In biology, the plants that grow cones are called ***gymnosperms***.
- These are cone-bearing plants which **lack flowers** and **fruits**
- Gymnosperms are **non-flowering** plants.



Gymnosperms

1. Most common gymnosperms are **Conifers**
2. Conifers have leaves called **needles** or **scales** have a reduced surface area and thick waxy coat on the needle to reduce water loss and prevents freezing.

scaly cones



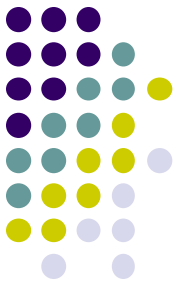
Conifer Reproduction

1. Most conifers are **monoecious**
2. Male cones produce **pollen** and the female cone produces **eggs** and **seeds**.
3. **Male cones** are normally **smaller** than female cones.
4. **Pollen** is inefficiently transferred by the wind.

Separate male and female reproductive parts in different locations on the **same plant**



Other gymnosperms

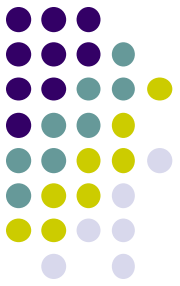


- **Welwitschia** – a bizarre gymnosperm plant that grows in Namib desert (So. Africa).
- Live up to 2000 years in these extreme conditions!
- Only makes two leaves throughout its life. It takes water from sea mist



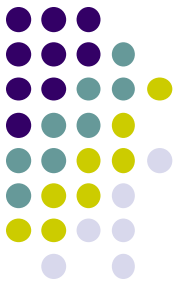
Economic importance

- Ecologically, conifers contribute food and shelter to animals and other organisms, and their roots hold the soil in place and help prevent soil erosion.
- Used for wood, paper, furniture, etc.
- Ornamental plants (trees, landscaping, Certain conifers provide Christmas trees)
- Food – pine nuts (pesto, etc.)
- In South Africa pine are planted for timber.



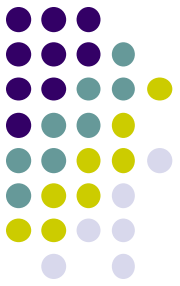
Gymnosperms - YouTube.flv

Angiosperms- “enclosed seeds”

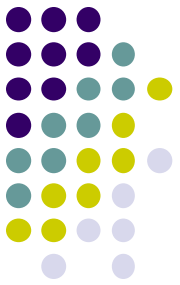


- Angiosperm means “**covered seed**”
- Have **flowers, fruits with seeds**
- Live everywhere – dominant plants in the world
- 260,000 species (88% of Plant Kingdom)
- Angiosperms are the most successful and advanced plants on earth



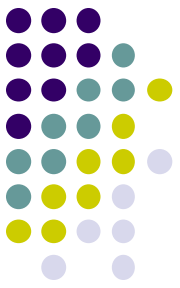


`gymnosperms and angiosperms.flv`



Monocot vs. dicot

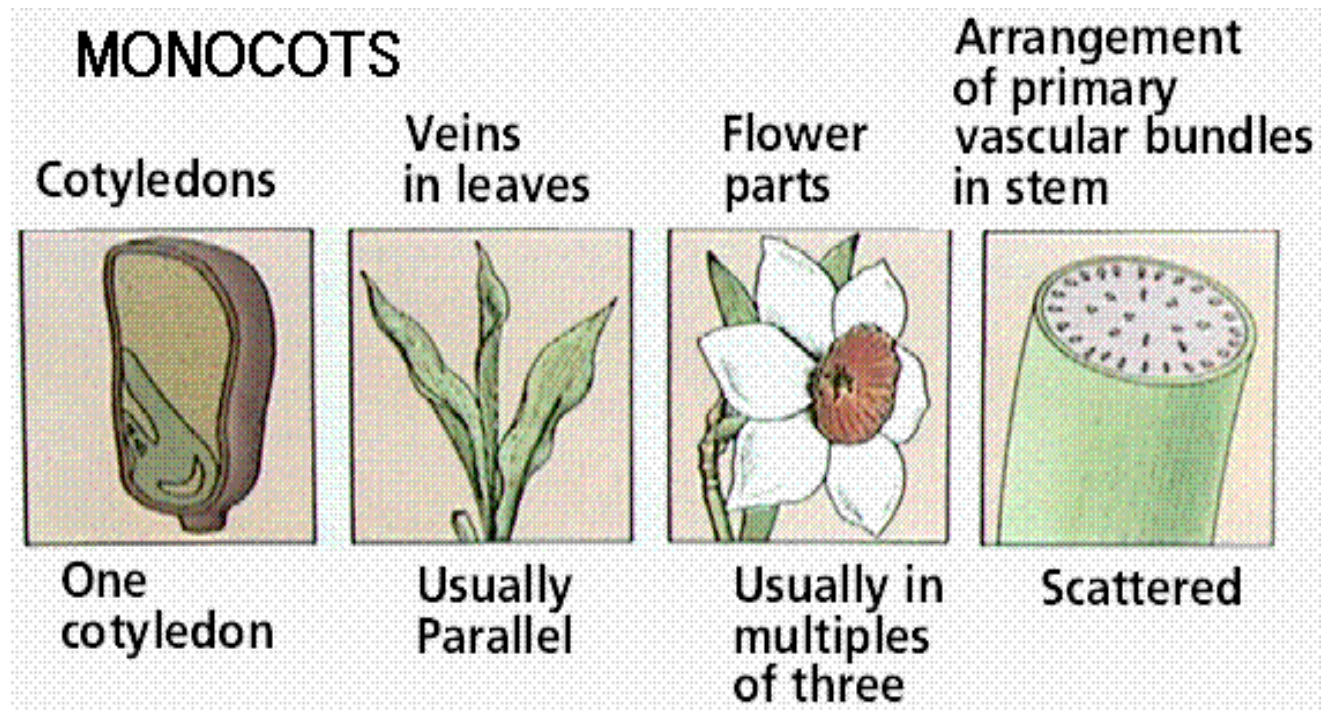
- Angiosperms are divided into **monocots** and **dicots**
- Monocots have **one cotyledon** (corn, lily, etc).
- Dicots have **two cotyledons** (bean, oak, etc).



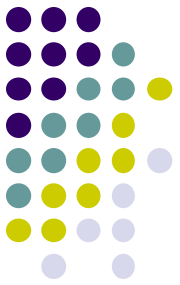
Monocot characteristics

Monocots have 1 cotyledon, herbaceous with long, narrow leaves that have parallel veins, flower parts in multiples of 3 and scattered vascular bundles throughout the stem. They have an adventitious or fibrous root system.

Examples of monocots are corn and grasses.

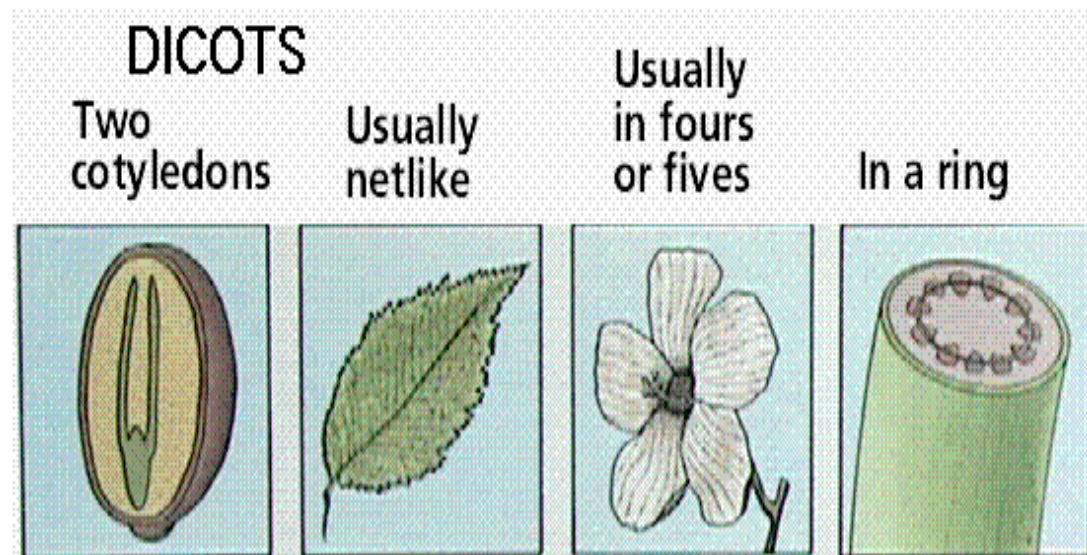


Dicot characteristics

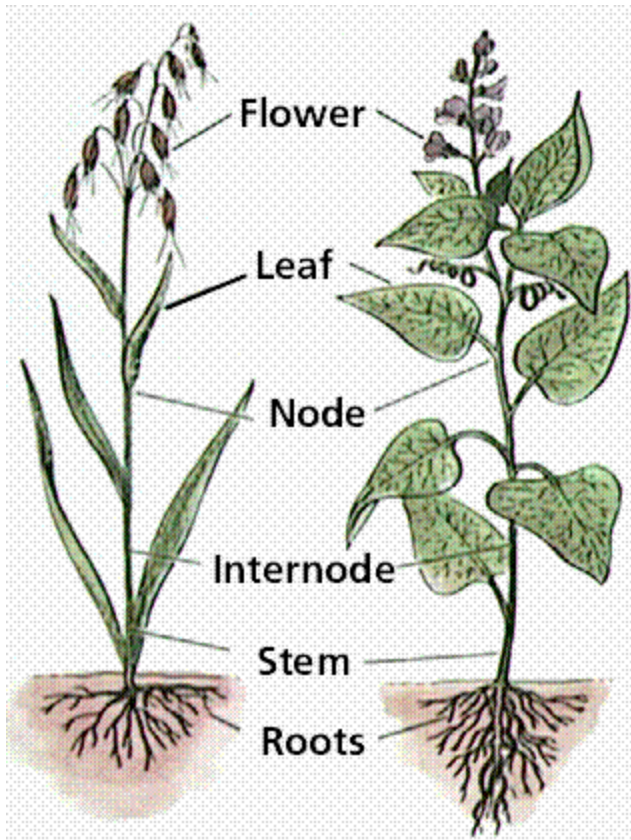
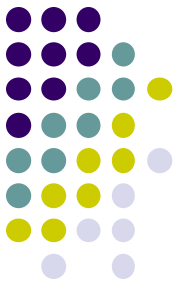


Dicots contain 2 cotyledons, have a network vein pattern in their leaves, have flower parts in multiples of 4 or 5 and have their vascular bundles in a ring around the edge of the stem. The root system comprises a main root called **the tap-root**.

Examples of dicots are roses and maple trees.



Comparison of Plants

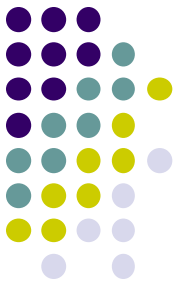


Monocot is on the left
Oat plant

Dicot is on the right
Bean plant

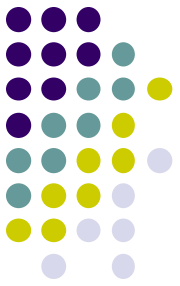
Notice the difference in the
two plants

Differences between monocot and dicot plants

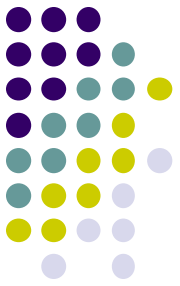


Feature	Monocot	Dicot
Seeds	One cotyledon	Two cotyledons
Flower parts	multiples of three	multiples of four or five
Leaf venation	parallel	Netted
Roots	Fibrous roots	Tap roots

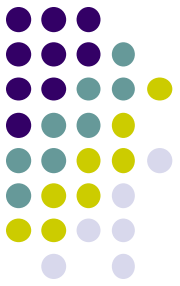
Differences between Gymnosperms and Angiosperms



Gymnosperms	Angiosperms
Bear exposed seeds and do not have flowers or fruits.	Grow flowers and fruits, also forms seeds inside an ovary.
Trees, shrubs, no herbs.	Trees, shrubs and herbs.



moncots vs. dicots.flv



Angiosperms

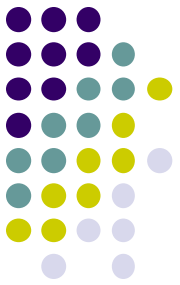
- Identify the following pictures as an example of a monocot or dicot. Justify your reason.



Flower A



Flower B

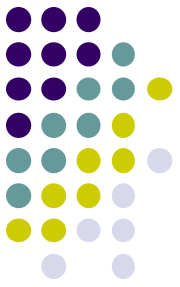


Angiosperms

- Identify the following pictures as an example of a monocot or dicot. Justify your reason.



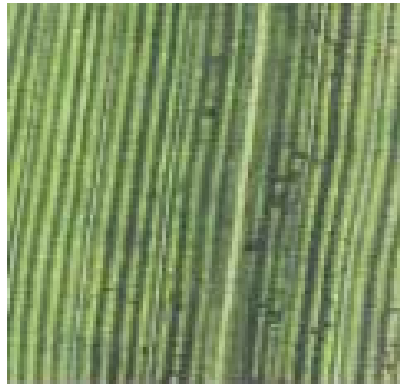
Angiosperms



- Identify the following pictures as an example of a monocot or dicot. Justify your reason.



Leaf A



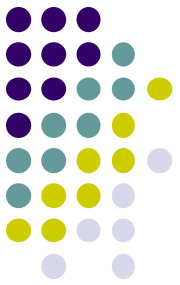
Leaf B



Leaf D



Leaf C



Question

- List the general features that characterize dicots and give two examples of a dicot plant.
- Explain the reproduction organ of Gymnosperm.
- How is gymnosperm ecologically useful?
- Give an example of the well-known only gymnosperm in Namibia and is endemic to the Namib Desert.

Summary

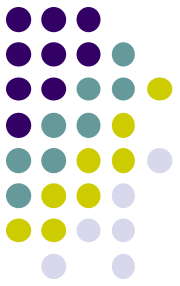


- Plants make their food by **photosynthesis**.
- Seeds are the primary means of reproduction and dispersal of gymnosperms and angiosperms (flowering plants).
- Gymnosperms are higher plants with seeds that are totally exposed and borne on the scales of cones or their seeds are not enclosed in an ovary
- Flowering plants (angiosperms) produce seeds enclosed within a fruit or their seeds are in an ovary which forms a fruit. There are two classes of flowering plants.

Summary

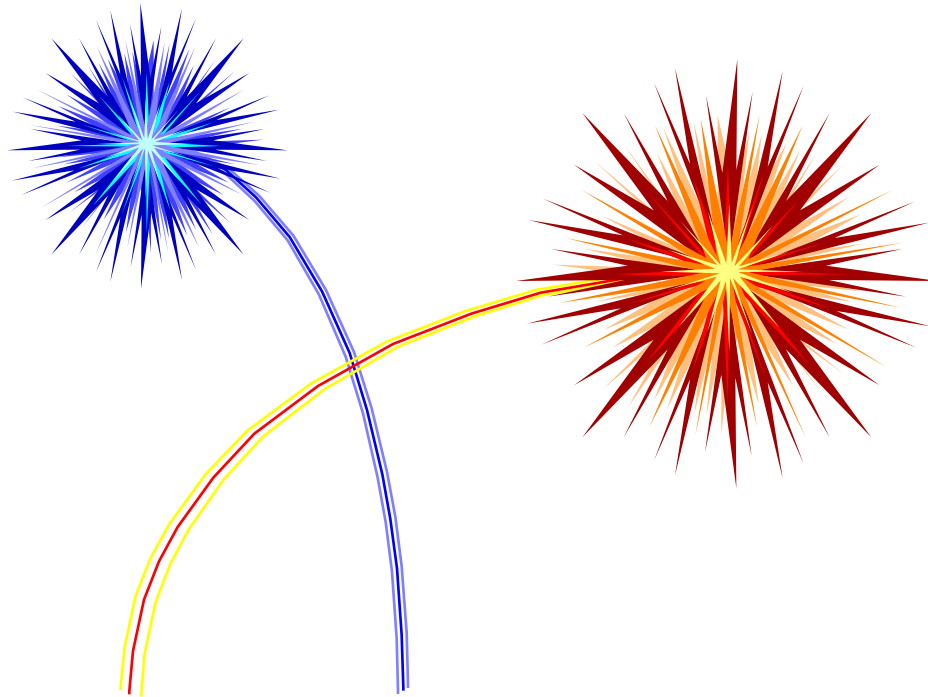
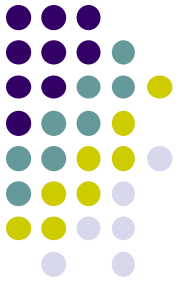


- Monocot and dicot leaves can be distinguished based on their external structure. Monocot leaves have parallel venation, whereas dicot leaves have netted venation.
- Most monocots have floral parts in multiples of three, and their seeds each contain one cotyledon.
- Dicots usually have floral parts in multiples of four or five, and their seeds each contain two cotyledons.



Summary

- **Dioecious plants** have male (staminate) flowers on one plant, and female (pistillate) flowers on another plant.
- **Monoecious plants** have separate male and female flowers on the same plant.



The End!