Biology   Classification   Unit 10

10:1 Classification and Taxonomy

CLASSIFICATION: process of dividing organisms into groups with similar characteristics

TAXONOMY: the science of classifying living things

TAXON: any particular group within a taxonomic system

DICHOTOMOUS KEY: tool used to identify organisms using their characteristics
- Characteristics are given in pairs
- Read both characteristics and either go to another set of characteristics OR identify the organism

Dichotomous Key of Leaves


Dichotomous Key For Leaves

1. a. Needle leaves	go to 2	
b. Non-needle leaves	go to 3	
2. a. Needles are clustered	Pine	
b. Needles are in singlets	Spruce	
3. a. Simple leaves (single leaf)	go to 4	
b. Compound leaves (made of "leaflets")	go to 7	
4. a. Smooth edged	go to 5	
b. Jagged edge	go to 6	
5. a. Leaf edge is smooth	Magnolia	
b. Leaf edge is lobed	White Oak	
6. a. Leaf edge is small and tooth-like	Elm	
b. Leaf edge is large and thorny	Holly	
7. a. Leaflets attached at one single point	Chestnut	
b. Leaflets attached at multiple points	Walnut	

A. _____

B. _____

C. _____

D. _____

E. _____

F. _____

G. _____

H. _____
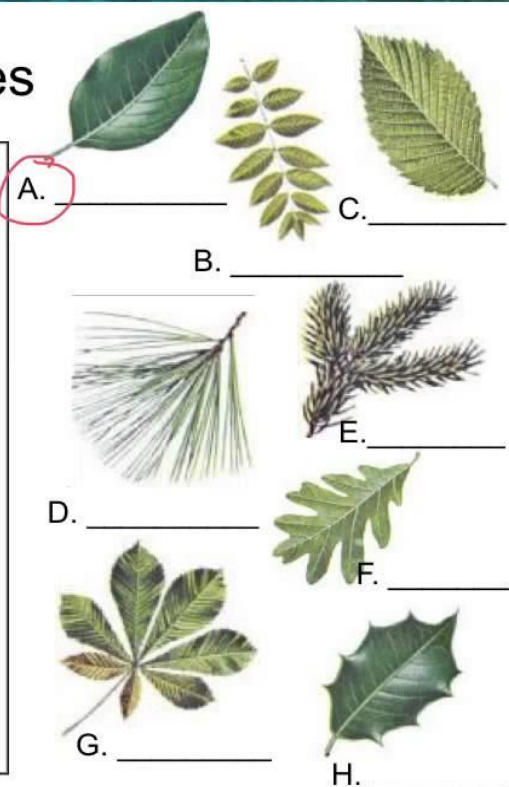
10:2 Development of Taxonomy

- A natural way of classifying organisms is based on the way organisms look and how they live.
- About 2,400 years ago, Aristotle classified organisms into only two taxa—plants or animals
- Swedish botanist Carolus Linnaeus developed a classification system based on structural similarities during the 1700's.

Linnaeus divided all organisms into two major groups called KINGDOMS, which he divided into smaller and smaller groups.

Domain   Less SPECIFIC
Kingdom
Phylum
Class
Order
Family
Genus
Species   More SPECIFIC
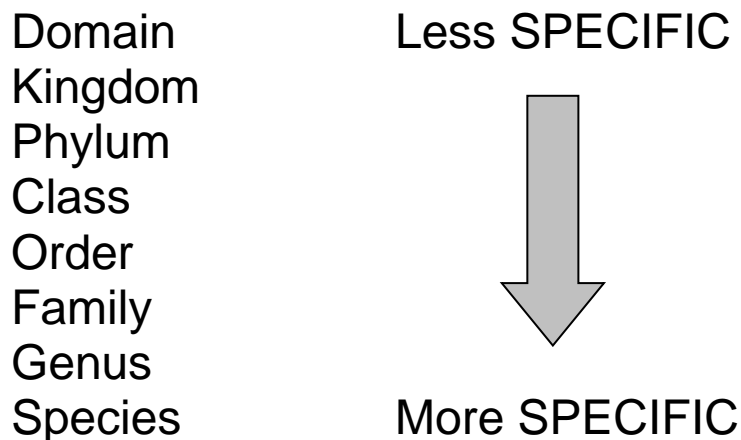
DOMAIN: largest division of taxonomy, based on differences between prokaryotes and eukaryotes.

KINGDOM: second highest taxonomic rank below domain

SPECIES: organisms that are similar in structure and appearance, can breed successfully, and have the same number of chromosomes.

	HUMAN
DOMAIN	Eukarya
KINGDOM	Animalia
PHYLUM	Chordata
CLASS	Mammalia
ORDER	Primate
FAMILY	Hominidae
GENUS	*Homo*
SPECIES	*sapien*

VARIETIES or BREEDS: groups of slightly different organisms in the same species.

10:3 Binomial Nomenclature
Linnaeus also introduced a system of naming organisms called BINOMIAL NOMENCLATURE.
- In binomial nomenclature the first name is the genus to which the organisms belongs, the second name is the species name of that organism.
- The genus name is capitalized; the species name is lower case.
- Scientific names are always underlined or *italicized*.

       EXAMPLE→ Genus species
             Homo sapien OR *Homo sapien*   (man)

Linnaeus used Latin names because:
1. It is the language of scientists around the world.
2. It is studied and written, but not spoken.
3. It is descriptive and the root of many other languages.

EXAMPLES of scientific names→
    Canis familiaris   →   domestic dog
    Canis lupus   →   wolf
    Canis latrans   →   coyote

Dog   Wolf   Coyote

Which TWO are more closely related? _____

Polar Bear
Ursus maritimus

Grizzly Bear
Ursus arctos

Giant Panda
Ailuropoda melanoleuca

<u>Common names are confusing because</u>:
1. The same organism may have many common names.
2. Common names are misleading.
   - A jellyfish is not a fish, but a seaHORSE is!
3. Common names vary with different languages.
   - Example: Chipmunk: Streifenhornchen (German); Tamia (Italian); Ardilla Listada (Spanish)

Common names: mountain lion, puma, cougar, panther.
Scientific name: <u>Felis concolor</u>


Cougar

Mountain Lion

10.4 Modern Taxonomy

- Modern taxonomy is based on genetic similarities and the theory of evolution.
- If two organisms have the same number of chromosomes and the chromosomes are similar in form, then the organisms are closely related.
- The greater similarities in DNA, the closer relationship between organisms.

The THREE DOMAINS:
1. DOMAIN ARCHEA: (Kingdom Archeabacteria) prokaryotic organisms that live in extreme environments; halophiles (organisms which thrive in highly salty environments) and hyperthermophiles (organisms which thrive in extremely hot environments) are examples.

2. DOMAIN BACTERIA: (Kingdom Eubacteria) common prokaryotic organisms found almost everywhere; bacteria (heterotrophic carbon-eating prokaryotes) and cyanobacteria (autotrophic photosynthetic prokaryotes) are examples.

3. DOMAIN EUKARYOTE: eukaryotic organisms that are most of the world's visible living things; the kingdoms Protista, Fungi, Plantae, and Animalia are examples.
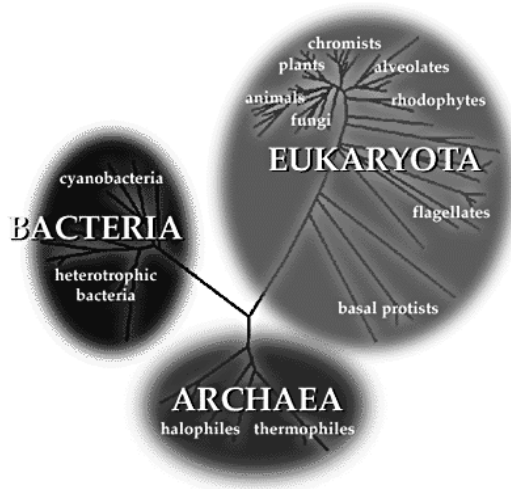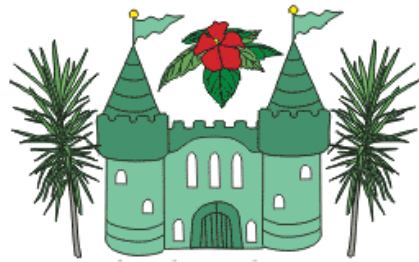
The FOUR KINGDOMS of the DOMAIN EUKARYOTA

KINGDOM PROTISTA: eukaryotic unicellular organisms (cells have nucleus); protozoa and simple algae.
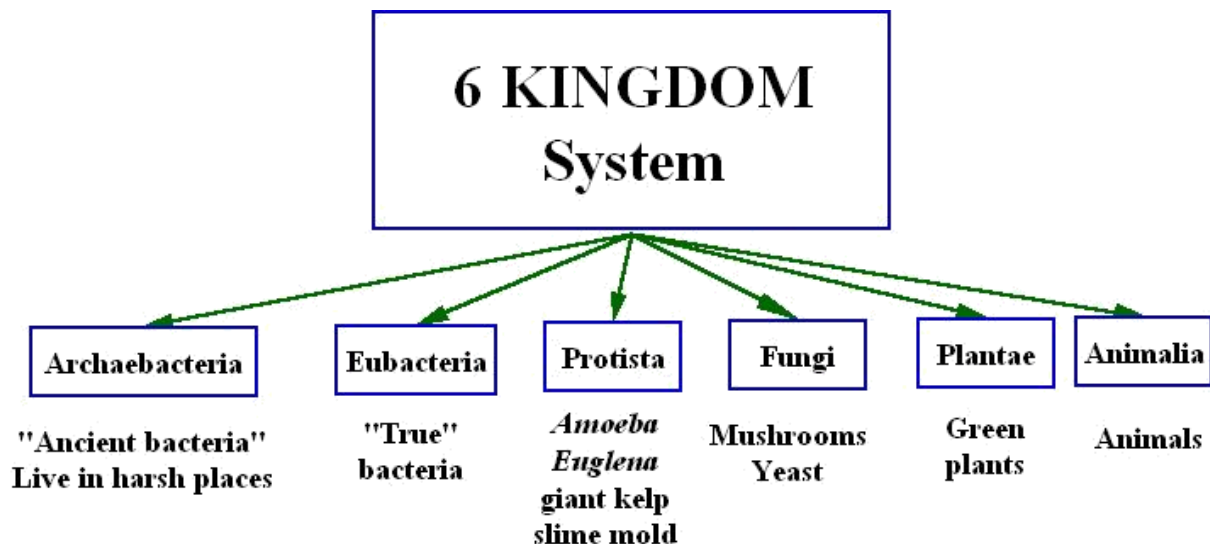

KINGDOM FUNGI: multicellular eukaryotic organisms that are plant like in structure but cannot make their own food; molds and mushrooms.

KINGDOM PLANTAE: multicellular eukaryotic organisms which can make their own food through photosynthesis; grasses, trees and flowering plants.


KINGDOM ANIMALIA: mobile, multicellular, eukaryotic organisms that ingest food; sponges, insects, worms, fish, reptiles, birds, mammals.

| 6 KINGDOM System					
Archaebacteria	Eubacteria	Protista	Fungi	Plantae	Animalia
"Ancient bacteria" Live in harsh places	"True" bacteria	*Amoeba* *Euglena* giant kelp slime mold	Mushrooms Yeast	Green plants	Animals

10:5 Phylogenetic Trees and Cladograms

PHYLOGENY: the study of evolutionary relationships or ancestral relationships among organisms

PHYLOGENTIC TREE: a diagram showing how species are related to each other through common ancestors
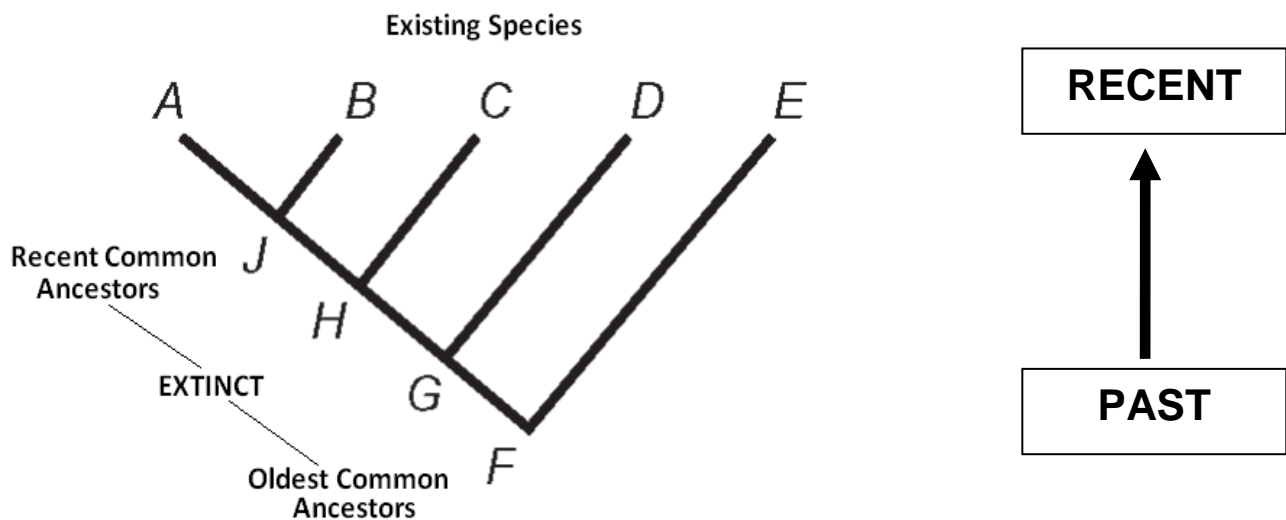
Phylogenetic trees show which organisms are extinct and which are still living. It also gives the relative times when the organisms were alive.

CLADOGRAM: a diagram that depicts the degree of evolutionary relationships among organisms, based on related structures and adaptations
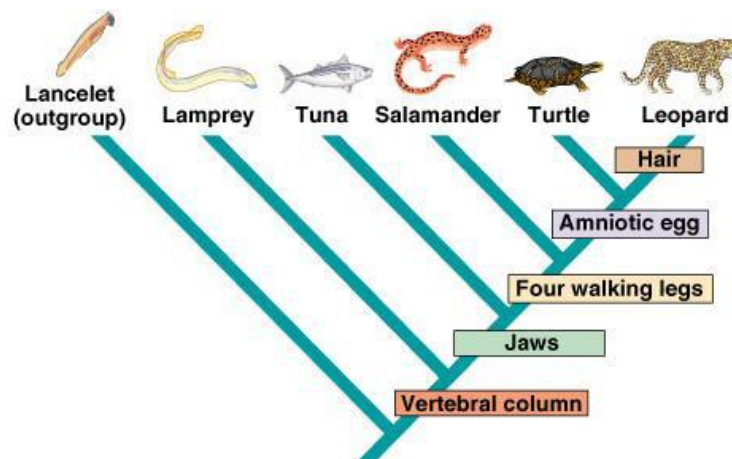
Derived characteristics appear at branches of the cladogram showing where they first arose.

Cladograms DO NOT show the relative times that organisms lived and do not show common ancestors.