Classification of Organisms

Dr. A. K.Goudarzi D.V.M. Ph.D

Faculty of veterinary medicine

Department of basic sciences

I.A. University

Introduction

- 1. Why Classify?
  - To study the diversity of life
  - To organize and name organisms
- 2. Why give scientific names?
  - Common names are misleading

jellyfish

silverfish

star fish

None of these animals are fish!

Introduction

- **Why Scientists Assign Scientific Names to Organisms ?**

This cat is commonly known as:

- Florida panther
- Mountain lion
- Puma
- Cougar

Origin of Scientific Names

- By the 18th century, scientists realized that naming organisms with common names was confusing.

- Scientists during this time agreed to use a single name for each **species**.

- They used **Latin** and **Greek** languages for scientific names.

Linnaeus: The Father of Modern Taxonomy

1732: Carolus Linnaeus developed system of classification – **<u>binomial nomenclature</u>**

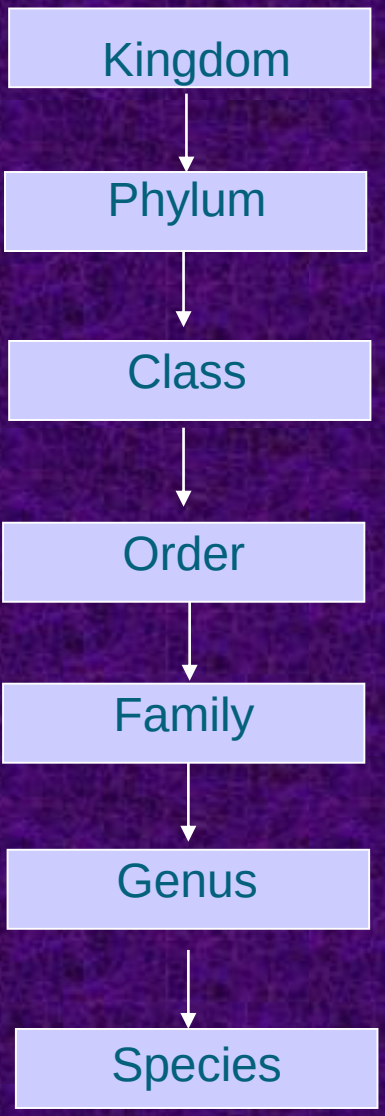
a. Two name naming system
b. Gave organisms 2 names
   Genus (noun) and *species* (adjective)

Rules for naming organisms

1. Written is Latin (unchanging)
2. *Genus* capitalized, *species* lowercase
3. Both names are *italicized* or <u>underlined</u>
   EX: *Homo sapiens*: wise / thinking man

Linnaeus's System of Hierarchy

Least specific



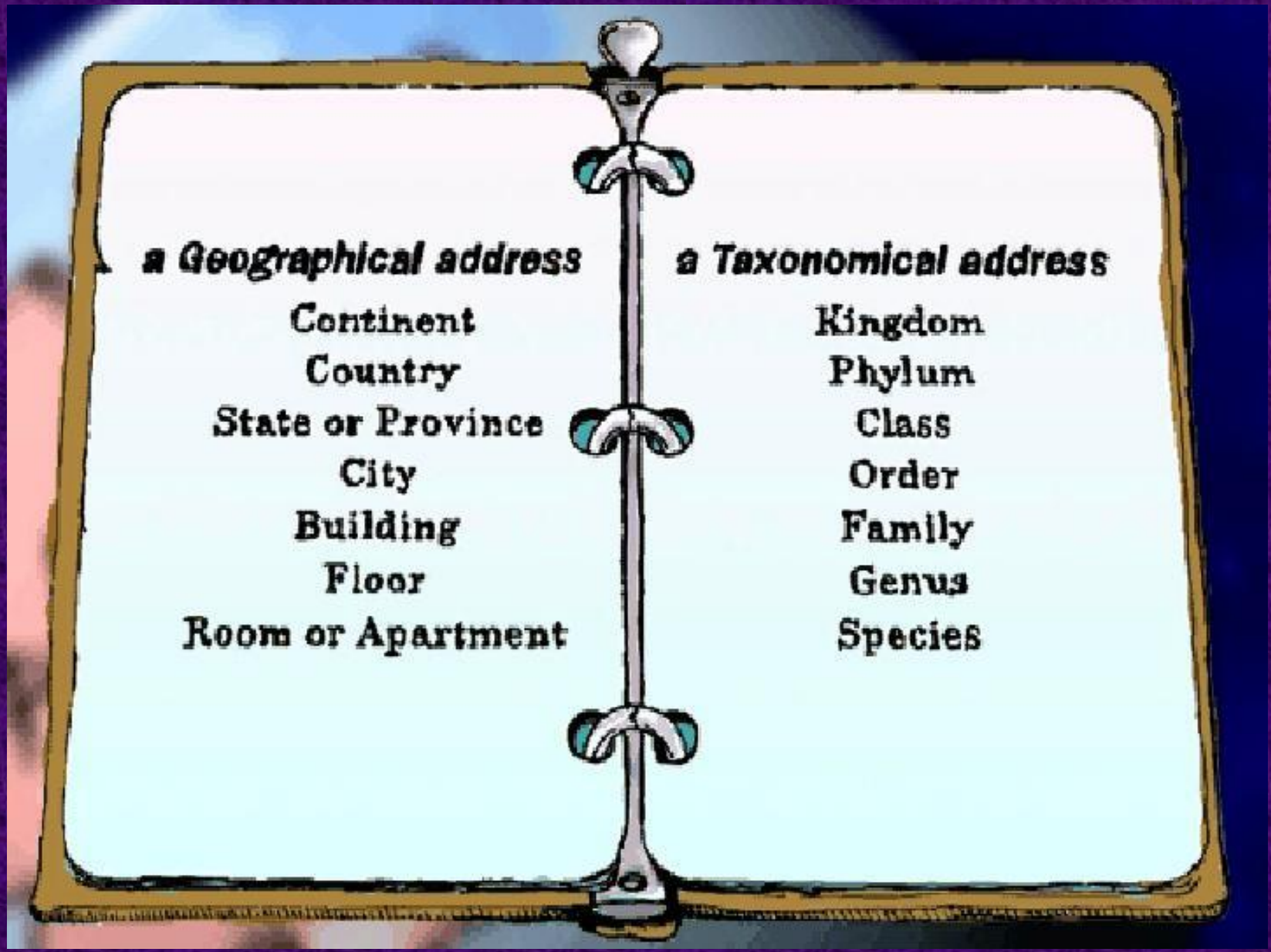
Most specific

1. Which of the following contains all of the others?

   a. Family
   b. Species
   c. Class
   d. Order

2. Based on their names, you know that the baboons *Papio annubis* and *Papio cynocephalus* do <u>not</u> belong to the same:

   a. Family
   b. Genus
   c. Order
   d. Species


a Geographical address
Continent
Country
State or Province
City
Building
Floor
Room or Apartment
a Taxonomical address
Kingdom
Phylum
Class
Order
Family
Genus
Species

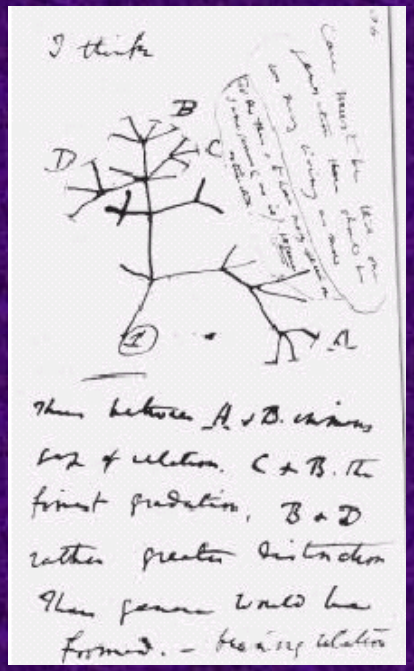
Binomial Nomenclature Example

- For example, the **polar bear** is named *Ursus maritimus*.

- The genus, *Ursus*, describes a group of closely related bear species.
- In this example, the species, *maritimus*, describes where the polar bear lives—on pack ice floating on the sea.

History of Classification

1. Linnaeus grouped species into larger taxa, such as **genus** and family, based on **visible** similarities.
2. Darwin's ideas about descent with **modification** evolved into the study of phylogeny, or evolutionary relationships among organisms.



History of Classification

- Modern biologists group organisms into categories representing lines of **evolutionary** descent.
- Species within a **genus** are more closely related to each other than to species in another genus.

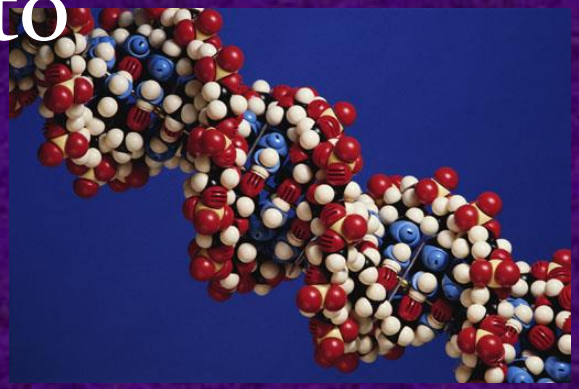
Genus: Felis

Genus: Canis

History of Classification

3. Scientists use similarities and differences in **DNA** to determine classification and evolutionary **relationships**.

- They can sequence or "read" the information coded in DNA to compare organisms.

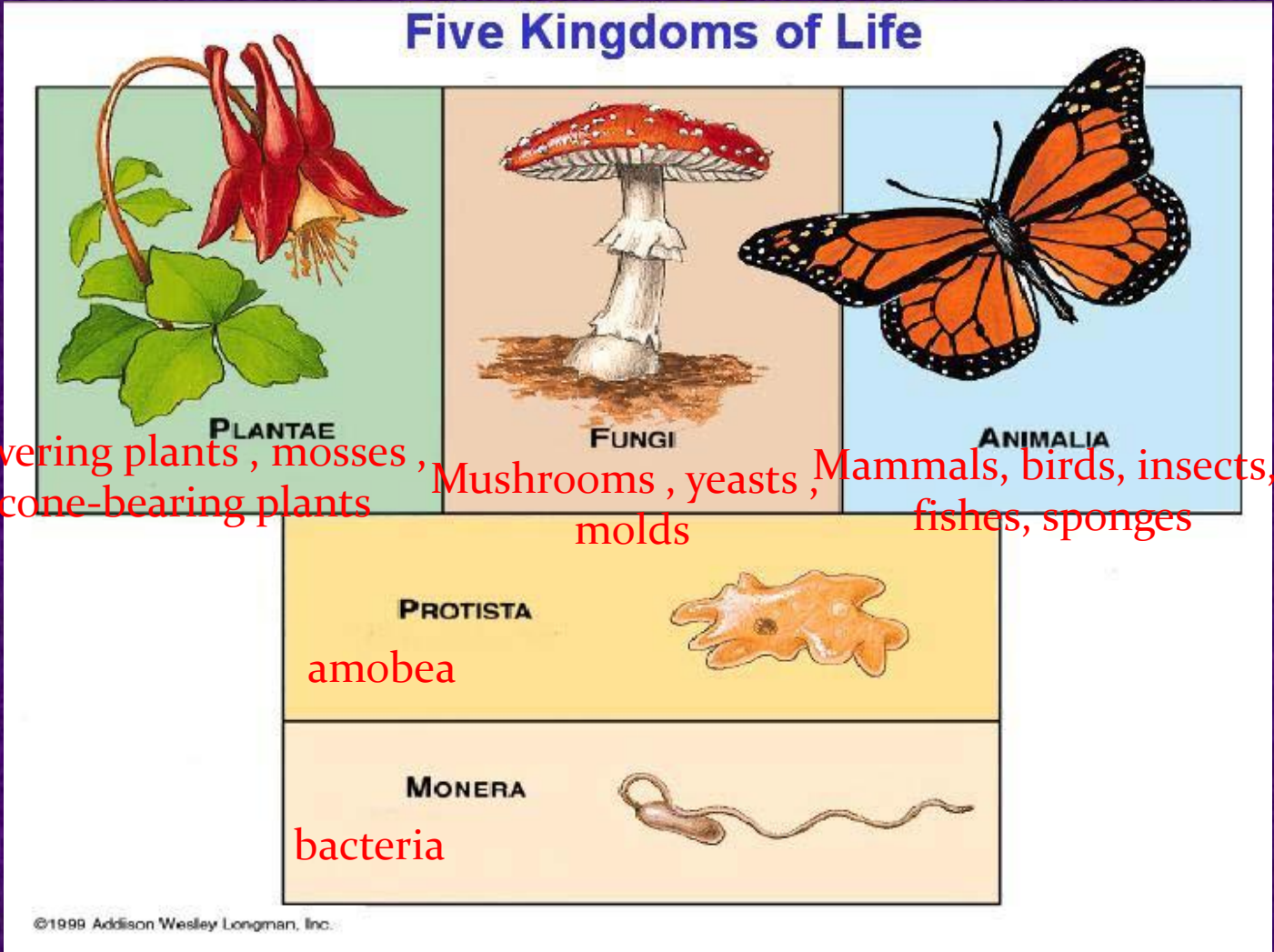


Kingdoms and Domains

- In the 18th century, Linnaeus originally proposed two kingdoms: Animalia and Plantae.

- By the 1950s, scientists expanded the kingdom system to include five kingdoms.

Kingdoms and Domains



Flowering plants , mosses , cone-bearing plants

Mushrooms , yeasts , molds

Mammals, birds, insects, fishes, sponges

amobea

bacteria

The Six Kingdom System

- In recent years, biologists have recognized that the Monera are composed of two distinct groups.

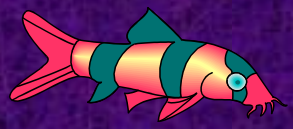
- As a result, the kingdom Monera has now been separated into two kingdoms: Eubacteria and Archaebacteria, resulting in a **six-kingdom** system of classification.

Kingdoms and Domains

- Scientists can group modern organisms by comparing ribosomal RNA to determine how long they have been evolving independently.
- This type of molecular analysis has resulted in a new taxonomic category—the domain.

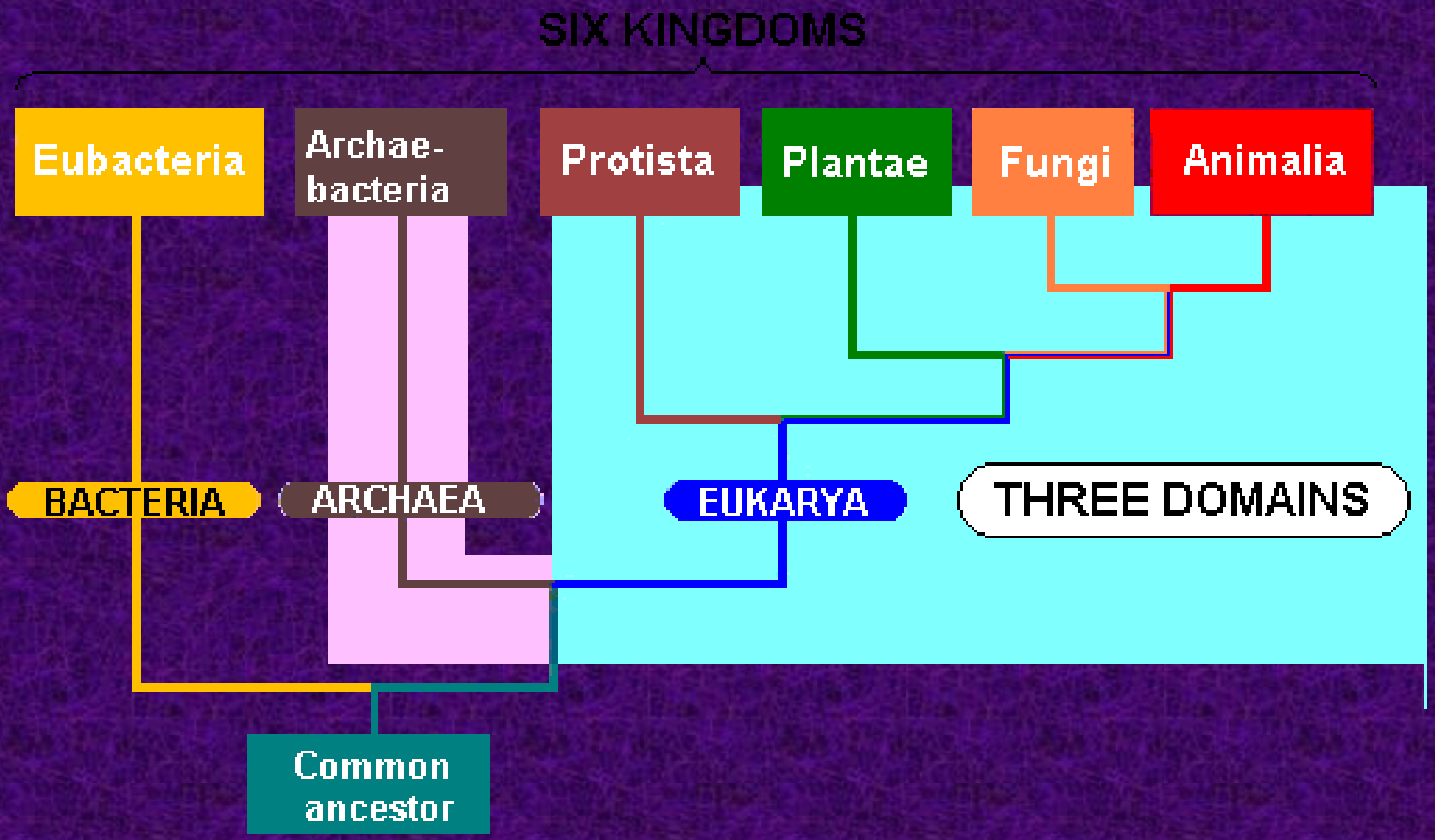
The Three Domains

- The three domains, which are larger than the kingdoms, are the following:
- **Eukarya** – protists, fungi, plants and animals



- **Bacteria** – which corresponds to the kingdom **Eubacteria**.
- **Archaea** – which corresponds to the kingdom Archaebacteria.

Classification of Living Things



Hierarchical Ordering of Classification

KINGDOM Animalia

PHYLUM Chordata

CLASS Mammalia

ORDER Carnivora

FAMILY Ursidae

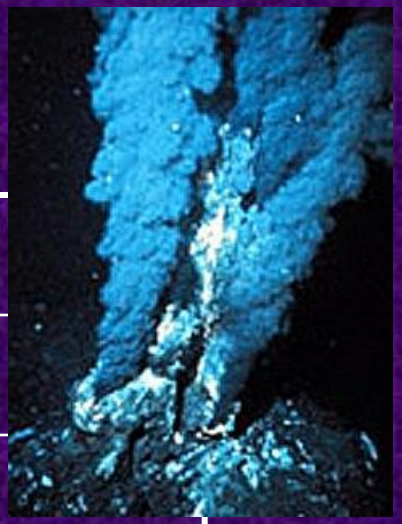
GENUS Ursus

SPECIES *Ursus arctos*

As we move from the kingdom level to the species level, more and more members are removed.

Each level is more specific.

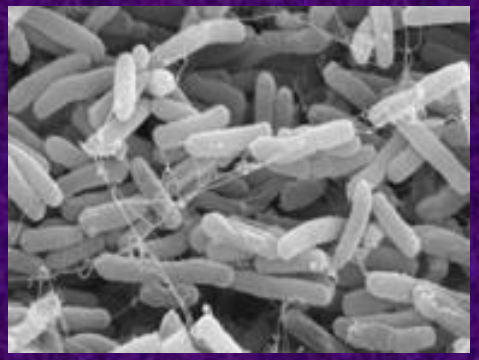
Kingdom Archaebacteria



Cell Type	Prokaryote
Number of Cells	Unicellular
Nutrition	Autotroph or Heterotroph
Location	Extreme Environments Volcanoes, Deep Sea Vents, Yellowstone Hot Springs
Examples	Methanogens Thermophiles

Kingdom Eubacteria

Cell Type	Prokaryote
Number of Cells	Unicellular
Nutrition	Autotroph or Heterotroph
Examples	*Streptococcus, Escherichia coli (E. coli)*

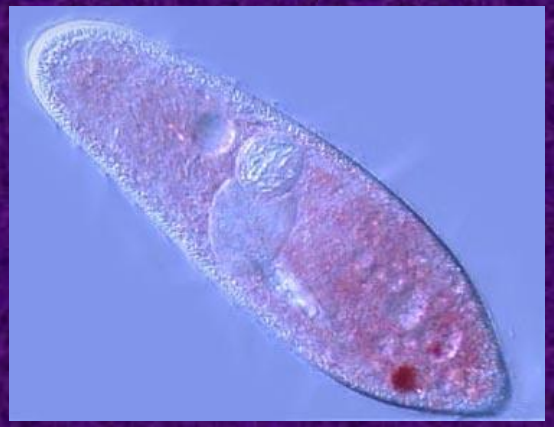


E. coli

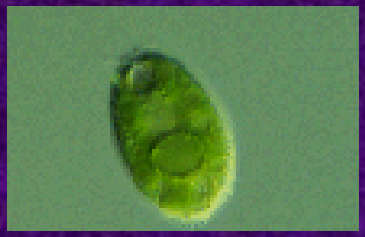
Streptococcus

Kingdom Protista

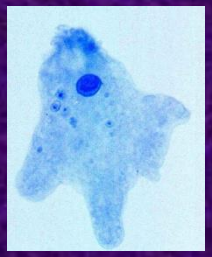
Cell Type	Eukaryote
Number of Cells	Most Unicellular, some multicellular
Nutrition	Autotroph or Heterotroph
Examples	Amoeba, Paramecium, Euglena,



Paramecium



Green algae



Amoeba

Kingdom Fungi

Cell Type	Eukaryote
Number of Cells	Most multicelluar, some unicelluar
Nutrition	Heterotroph
Example	Mushroom, yeast, mildew, mold

Mildew on Leaf

Mushroom

Most Fungi are
DECOMPOSERS

Kingdom Plantae

Cell Type	Eukaryote
Number of Cells	Multicellular
Nutrition	Autotroph
Examples	Mosses, ferns, conifers, flowering plants

Ferns : seedless vascular

Douglas fir: seeds in cones

Mosses growing on trees

Sunflowers: seeds in flowers

Kingdom Animalia

Cell Type	Eukaryote
Number of Cells	Multicellular
Nutrition	Heterotroph
Examples	Sponges, worms, insects, fish, mammals

Bumble bee

Jellyfish

Sage grouse

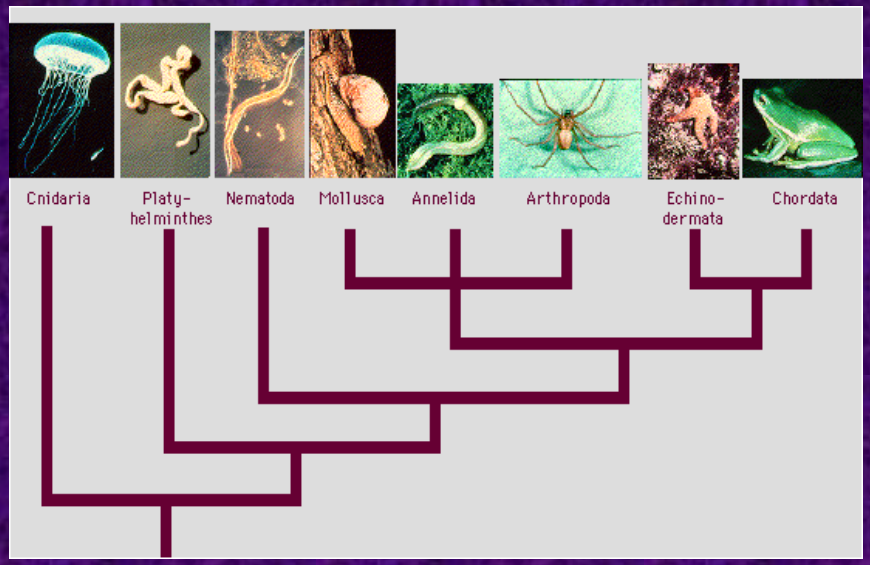
Hydra

Poison dart frog

Sponge

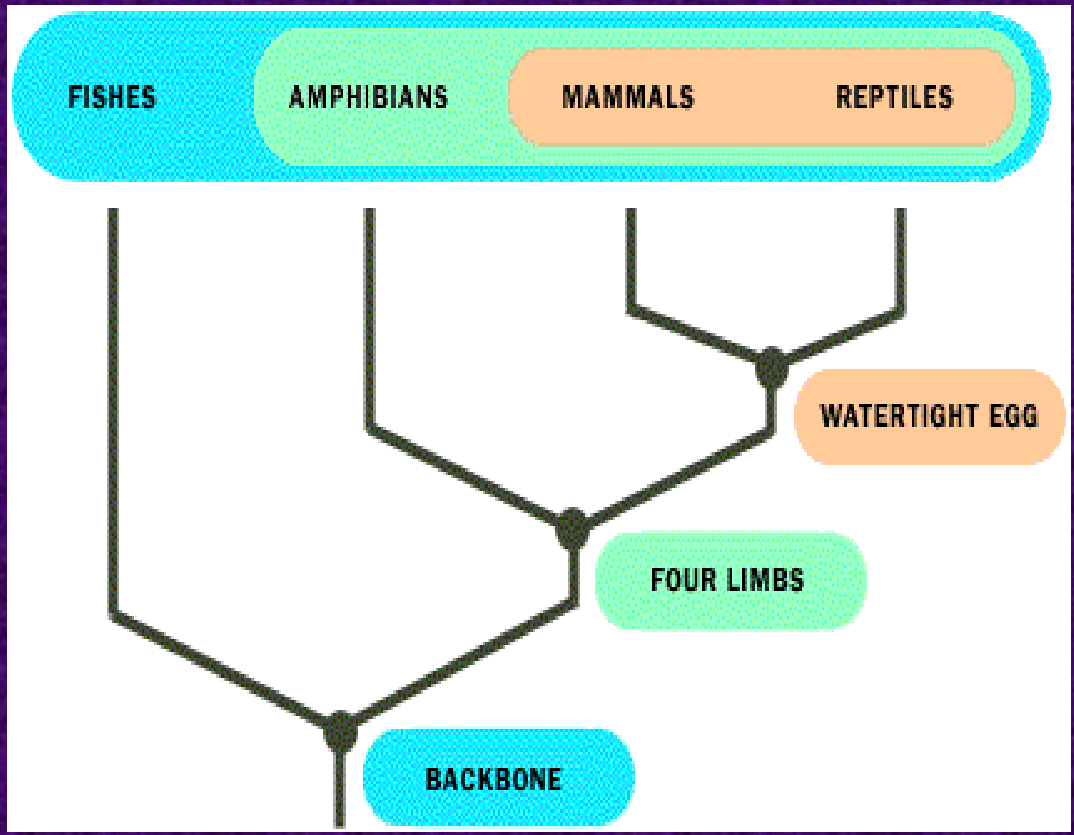
Terminology

- Classification
  - Assigning organisms to different catagories based on their relationship
- Taxonomy
  - The science of naming organisms
- Systematics
  - Determining evolutionary relationships of organisms
- Phylogeny
  - Evolutionary history

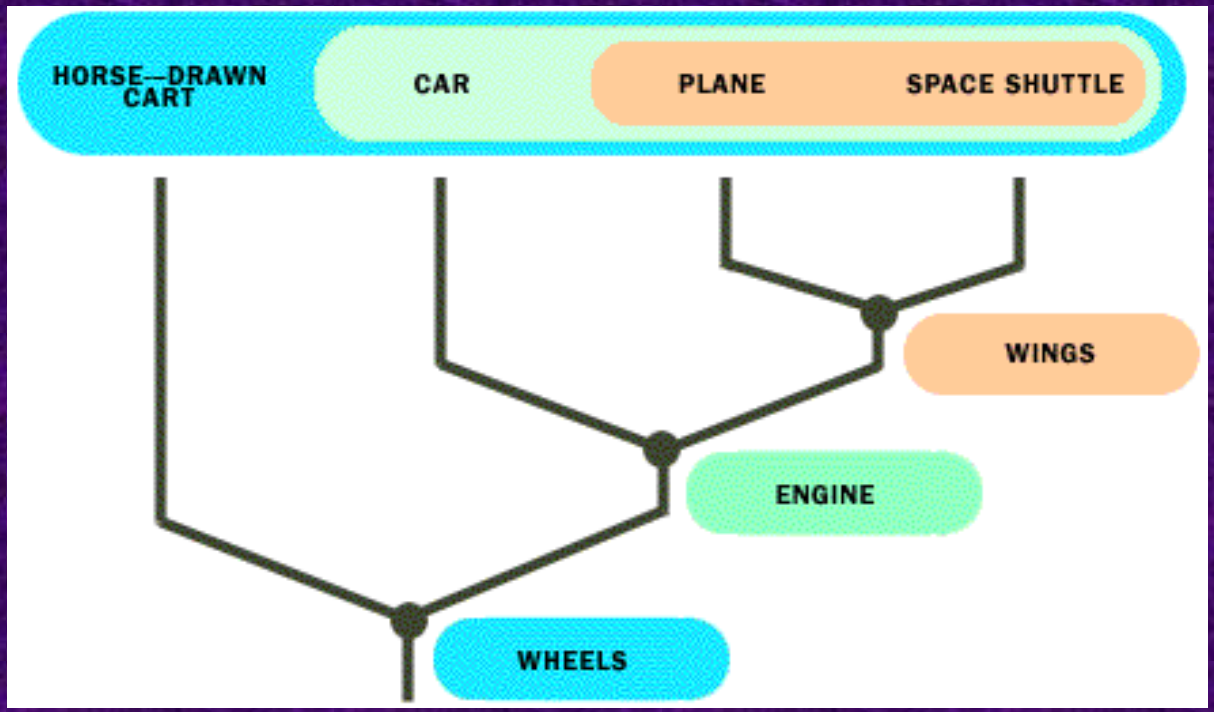


Cladogram

- Evolutionary relationship of a group of organisms
- Each clad (group) share something in common
- Ancestral traits are the oldest
- Derived traits evolved later

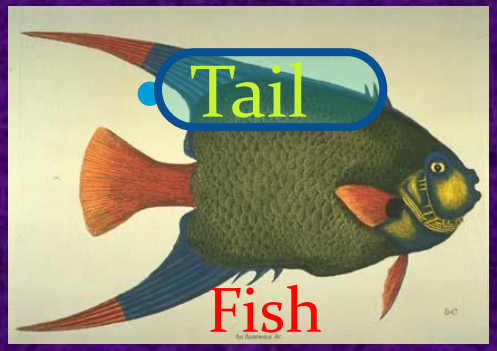


Cladogram for Transportation



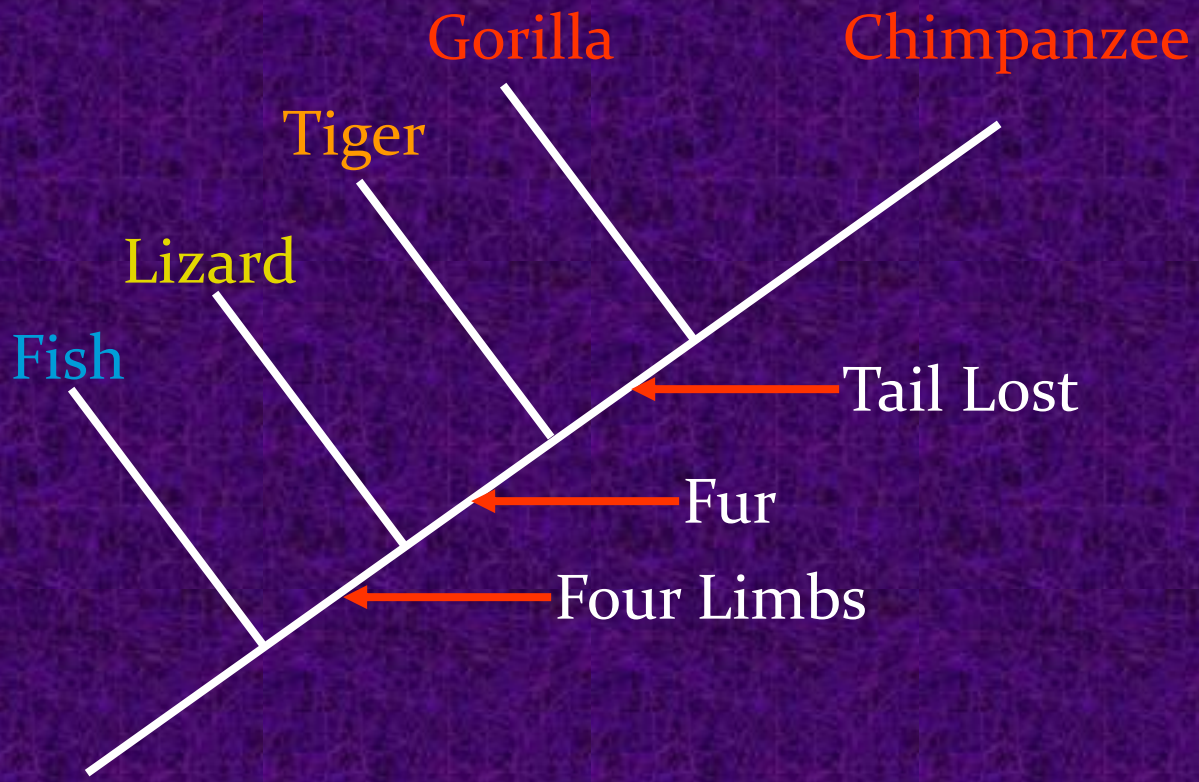
- Wheels are the most ancestral
- Wings are the most derived

Construct a Cladogram



Characteristics for Constructing Cladogram

- Tail is the most ancestral
- Four limbs is the oldest derived trait
- Fur is a later derived trait
- Loss of tail is the most derived trait


Gorilla
Chimpanzee
Tiger
Lizard
Fish
Tail Lost
Fur
Four Limbs

Birds

- 4 limbs
- Vertebrae
- Amniotic egg
- No teeth
- Feathers
- Endothermic

Mammals

- 4 limbs
- Vertebrae
- Amniotic egg
- Heterodont teeth
- Fur or hair
- Endothermic

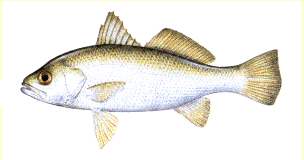
Reptiles

- 4 limbs
- Vertebrae
- Amniotic egg
- Homodont teeth

Amphibians

- 4 limbs
- Vertebrae
- Simple egg
- Homodont teeth

Fish



- Fins
- Vertebrae
- Simple egg
- Homodont teeth

Phylogenetic Tree