Classification of Living Things

Lecture-3

TAKE HOME POINTS

- What is classification
- Early biological classification
- Modern biological classification
- Binomial nomenclature
- The genus and species concept
- Why use scientific names
- The main classification groups (Taxa)
- Various classification system
- Phylogenetic system

Classification of Living Things

- Over **two million** (2,000,000) different kinds of organisms exists
- **1.5 million** (1,500,000) different kinds have been identified
- It has been estimated that for each kind of organism now alive, another **400 kinds** once lived but have since become extinct.
- One billion (1,000,000,000) different kinds of living things may have existed on the earth at one time or another.
- Problems
  - *How can we keep track of such a bewildering number of organisms?*
  - *How can we even name the organisms now alive when no known language has two million words in it?*

What is Classification?

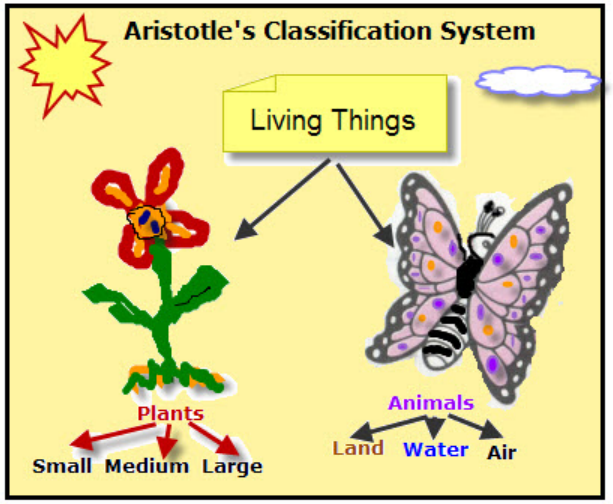
- **Supermarket manager**
- **Stamp collectors**
- **Word listings in a dictionary**

- *The grouping of similar things for a specific purpose is called* ***classification***

- **Early Biological Classification**
- **Modern Biological Classification**

Early Biological Classification

- How Earliest Humans classify living things
  - Plant Vs Animals or Edible Vs Poisonous Plants or Harmful Vs Harmless animals
- 300 BC, ***Aristotle's Classification System***
  - Only about 1000 kinds of organisms were known
  - This classification system survived almost 2000 years

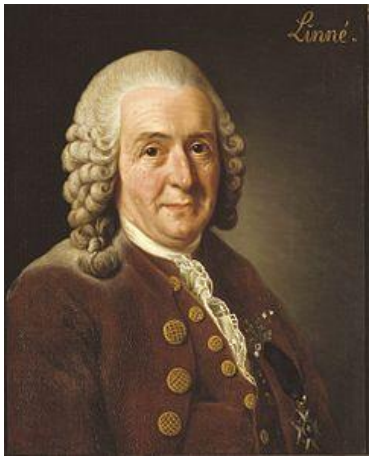


By the beginning of the 18th century, over 10,000 kinds of organisms were known and Aristotle's system was unable to classify them all.

A new system was obviously needed.

Modern Biological Classification

- ***Taxonomy:*** *Taxonomy is the science that deals with the classification of organisms*.
- ***The Contribution of Carolus Linnaeus***
  - ***Diversity:*** *the number of kinds of living things*.
- ***Linnaeus*** grouped organisms according to their **structural similarities**



  - Organisms with very similar structural features were considered to be the same **species**

- Thus all modern-day humans belong to one species, all house cats belong to one species, and all sugar maple trees belong to one species.

Binomial nomenclature

• After classifying, Linnaeus decided to name all the organism.

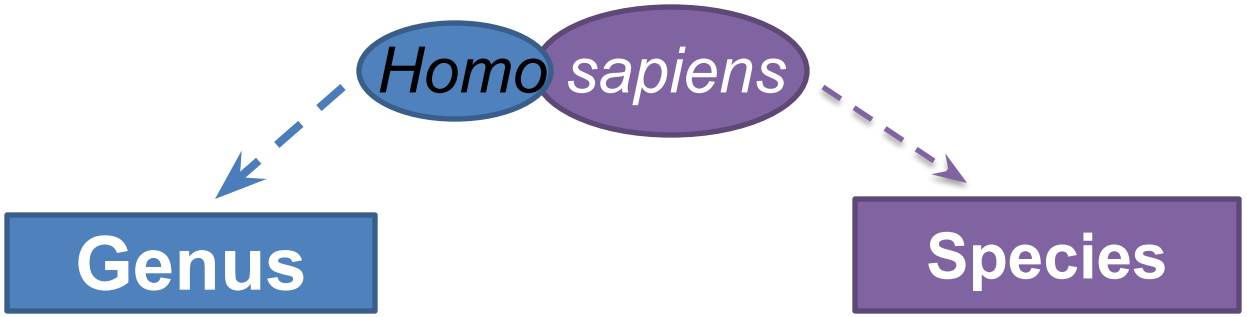
•Every organism's name is consist of **two words** Binomial Nomenclature

•He decided to write all names in *Latin*.

•Example: **Common name**: Human
•**Scientific name**:
Homo sapiens (Italic if printed)
Homo sapiens (separate underlines if handwritten)

Common name: Cat
Scientific name: *Felis domesticus*

Genus and species concept



- Group of species that are similar.
- Plural is ‘genera’.
- <u>Example</u>: Maple trees are from genus *Acer*. So,
- Sugar maple*: Acer saccharum*
- Silver maple*: Acer saccharinum*
- Red maple: *Acer rubrum*

etc.

- Organisms that are structurally very similar.
- Plural is also ‘species’
- Interbreed under natural condition to produce fertile offspring (children) .
- Example:

Red maple: *Acer rubrum*

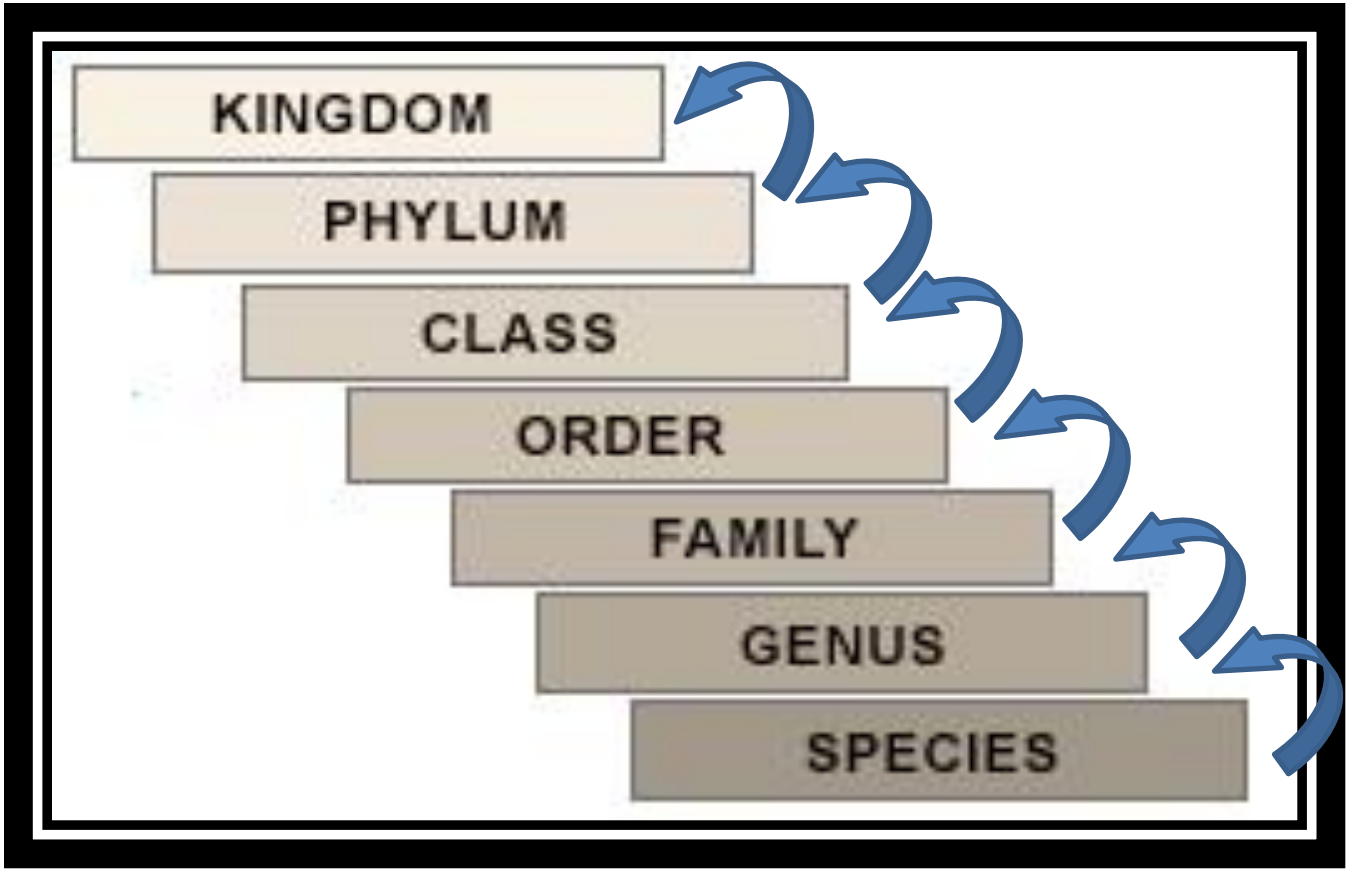
Why Use Scientific Names?

- Common names can be confusing or misleading
  - ***Felis concolor*** is called a cougar, mountain lion, puma, panther, painter, and many names
  - Domestic cow is
    - "**la vache**" in French,
    - '**die Kuh**" in German,
    - "**la vaca**" in Spanish, and
    - "**gOrU**" in Bengali

    - ***Scientific Name: Bos taurus***

Main classification groups(taxa)

There are seven main ***taxa*** or classification groups.



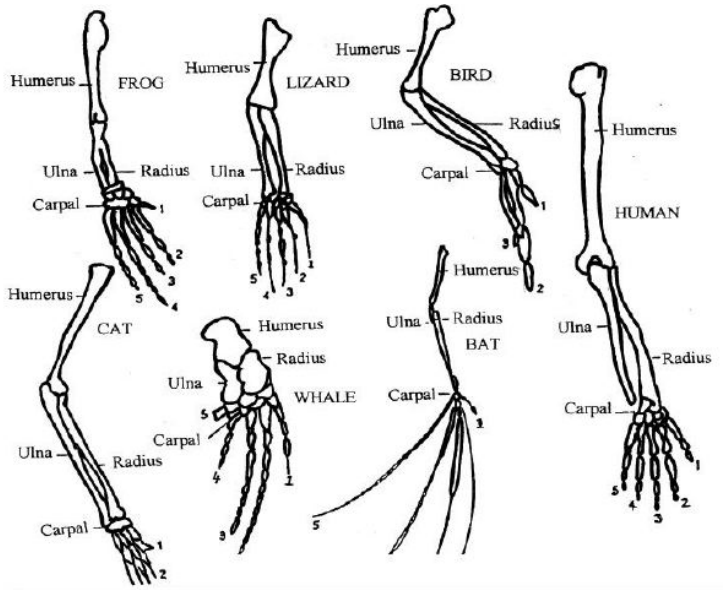
Main classification groups(taxa)

Example:

Taxon	Human	Gorilla
Kingdom	Animalia	Animalia
Phylum or Division	Chordata	Chordata
Class	Mammalia	Mammalia
Order	Primates	Primates
Family	Homonidae	Pongidae
Genus	*Homo*	*Gorilla*
Species	*sapiens*	*gorilla*

Modern Basis for Classification

- **Homologous Structure**
  - *show the same basic pattern, the same general relationship to other parts, and the same pattern of development*.
- **Similar Biochemistry**
  - *closely related organisms form similar chemical compounds in their body. They use this belief to help classify organisms*
- **Genetic Similarity**
  - *the greater the similarity of DNA among organisms, the more closely they may be related*.

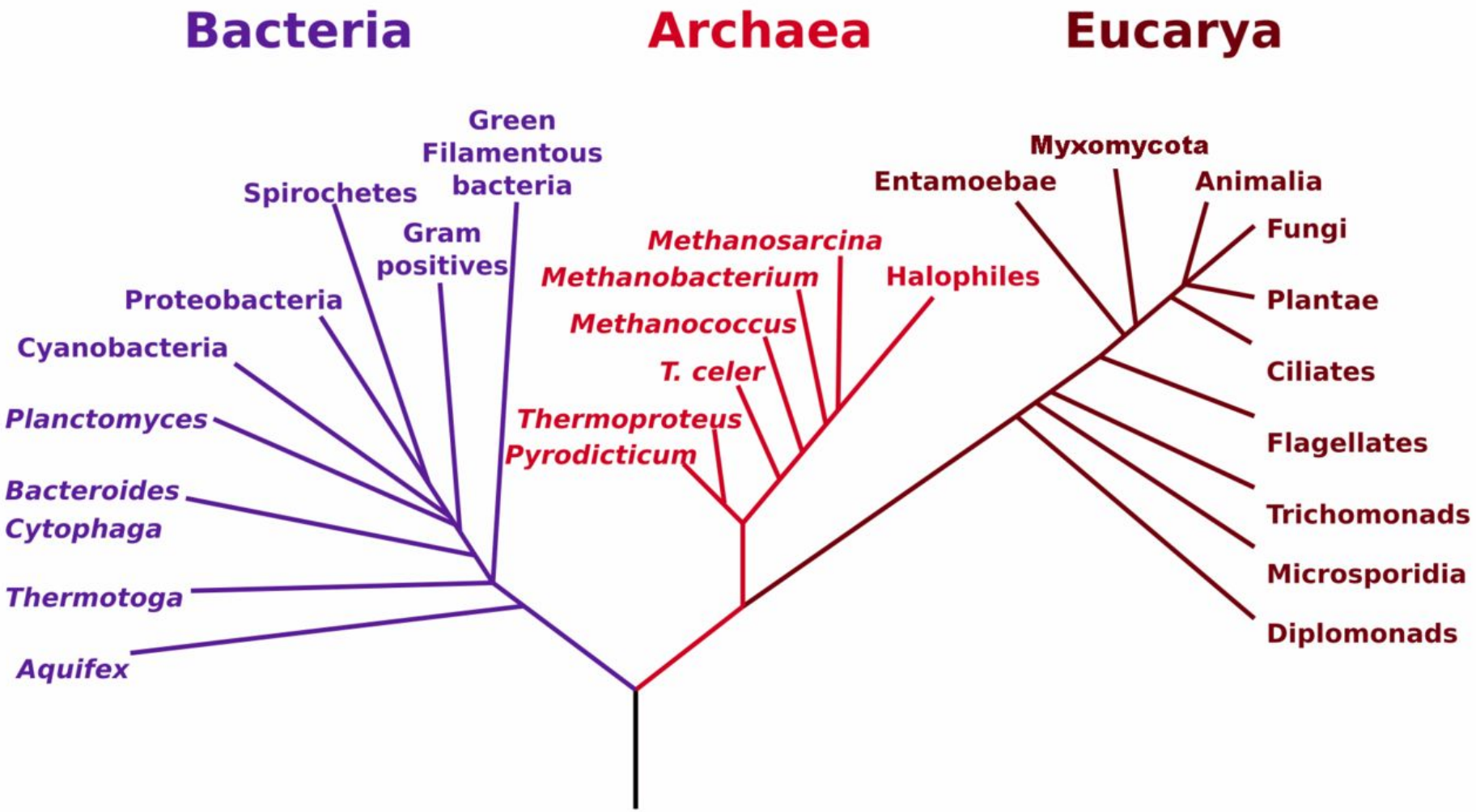


Phylogenetic System

- **Carl R Woese** completely new approach in classification.
- Used rRNA sequences which are very conserved.
- **Based on Evolution**: Genetic materials (rRNA) were examined and used in revealing evolutionary relationships.
- Organisms are classified into three major **DOMAINS**

1. Eukarya
2. Bacteria
3. Archaea

Phylogenetic Tree of Life



Summary of Various classification system

Classification	System Kingdom
2- Kingdom System	1. Plantae 2. Animalia
3- Kingdom System	1. Plantae 2. Animalia 3. Protista
4- Kingdom System	1. Plantae 2. Animalia 3. Protista 4. Monera
5- Kingdom System	1. Plantae 2. Animalia 3. Fungi 4. Protista 5. Monera
6- Phylogenetic system	1. Archaea 2. Bacteria 3. Eukarya

Meet your human taxonomy

KINGDOM
Animalia
(all multicellular organisms that ingest nutrients rather than synthesize them)

PHYLUM
Vertebrata
(all animals with a vertebral column or **dorsal hollow notocord**—a structure along the top of animals—protecting their central nervous system)

Meet your human taxonomy

CLASS
Mammalia
(all vertebrates with placental development, mammary glands, hair or fur, and a tail located behind the anus)

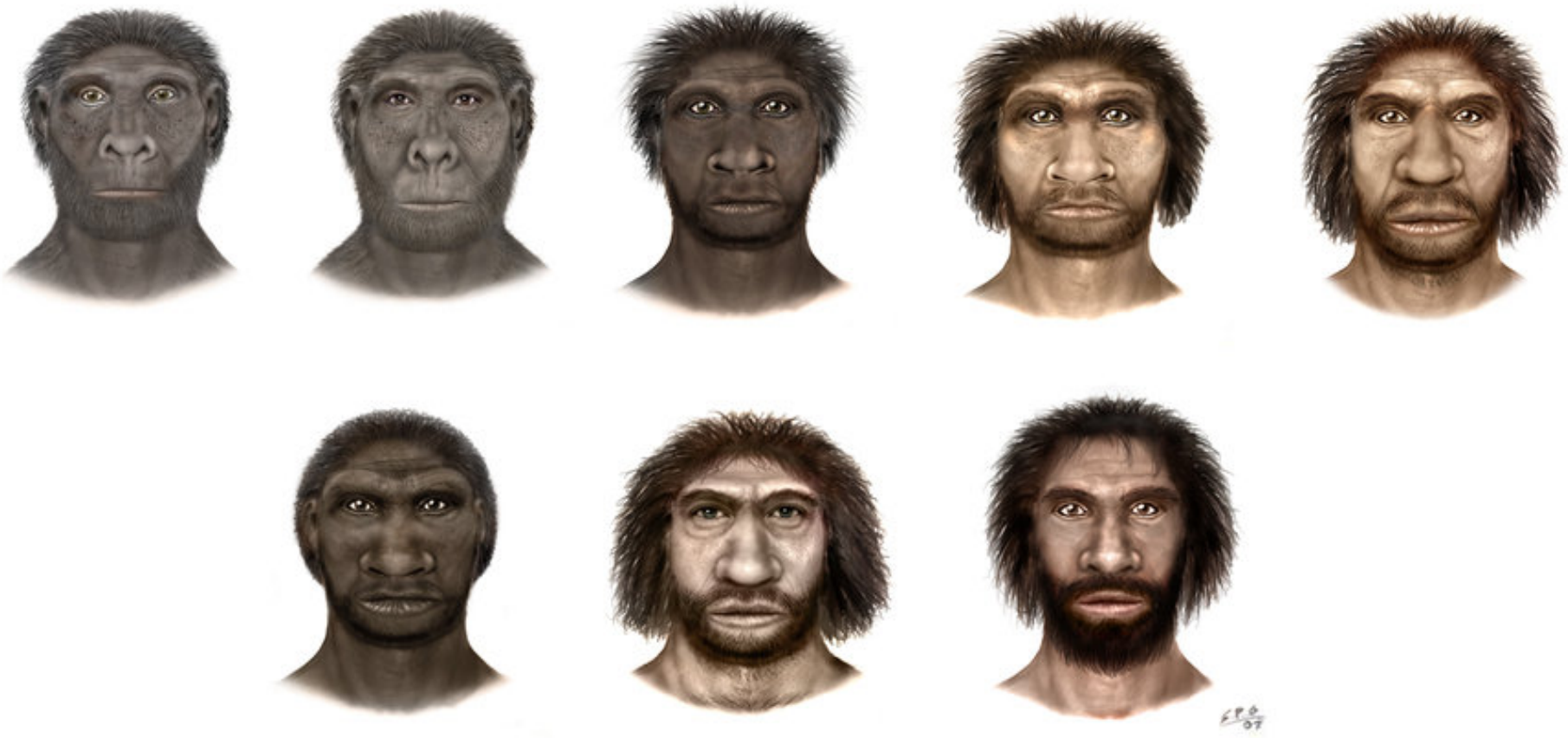
ORDER
Primates
(mammals adapted to life in trees, with opposable thumbs)

Meet your human taxonomy

FAMILY
Hominidae
(primates that move primarily with bi-pedal—two-footed—locomotion)

GENUS
Homo
(hominids with large brain cases, or skulls)

Meet your human taxonomy



-Homo habilis (have long hands)***-H. rudolfensis -H. ergaster*** (African upright man) ***-H. erectus*** (upright man) ***-H. heidelbergensis -H. rhodesiensis –H. neanderthalensis -H. sapiens***

Meet your human taxonomy

SPECIES

H. sapiens

(the largest brain case of the genus *Homo*, giving us the capacity for complex speech; "*sapiens*" loosely translates as "knowing")

We are the only living organisms in our species, with a unique set of combined characteristics from our family (bipedal), order (opposable thumbs), and genus (large brain case).

thank you!