

# TAXONOMY

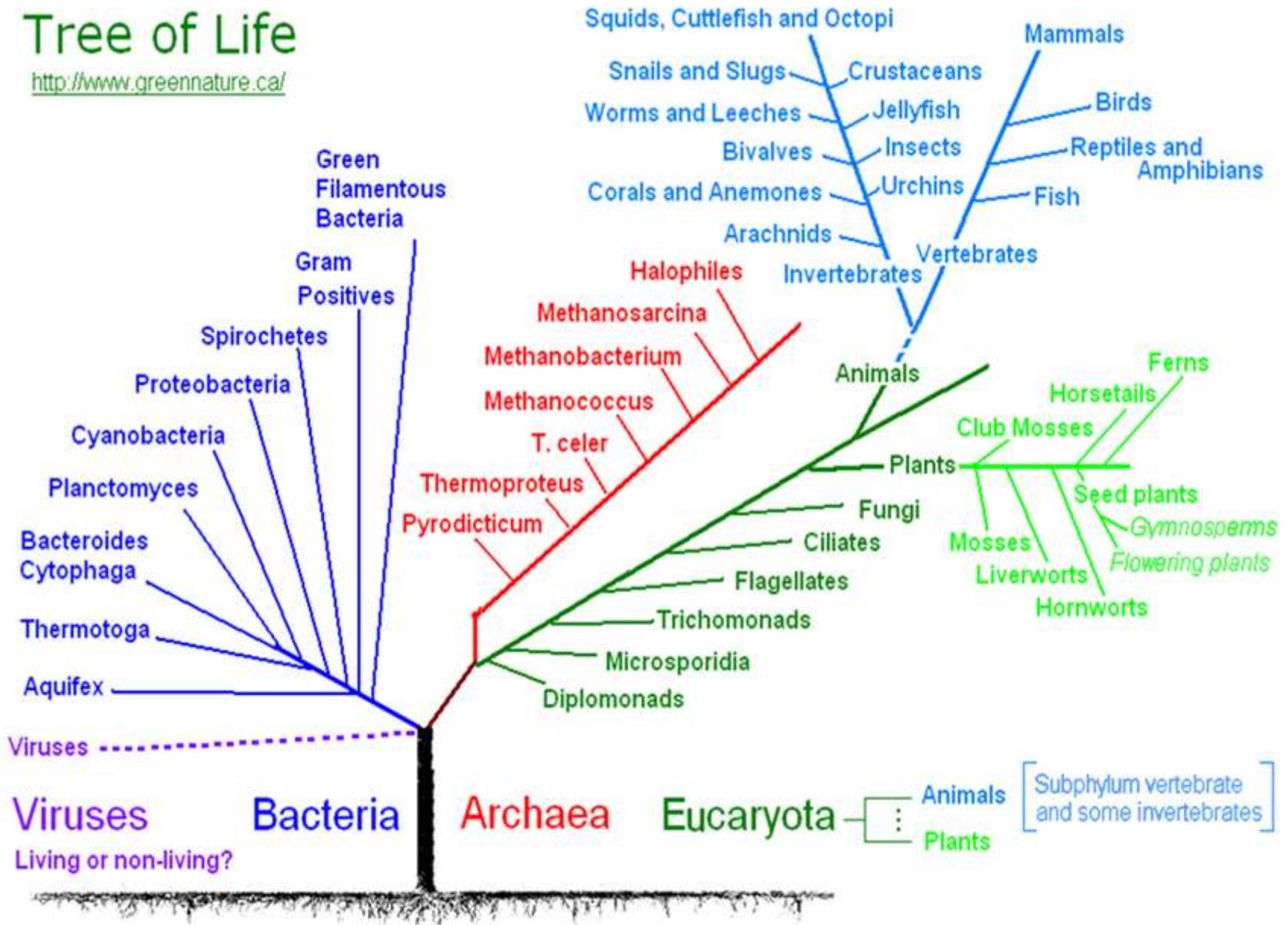
ARRANGEMENTS BY RULES

# Introduction

- **Taxonomy** is the branch of biology that deals with the identification, nomenclature & classification of organisms
- **IDENTIFICATION** – placing of new organism in previously described group
- **NOMENCLATURE** – naming of organism
- **CLASSIFICATION** – ordering of organism into group; can be phenetic or phylogenetic

# Tree of Life

<http://www.greennature.ca/>



# Systematics

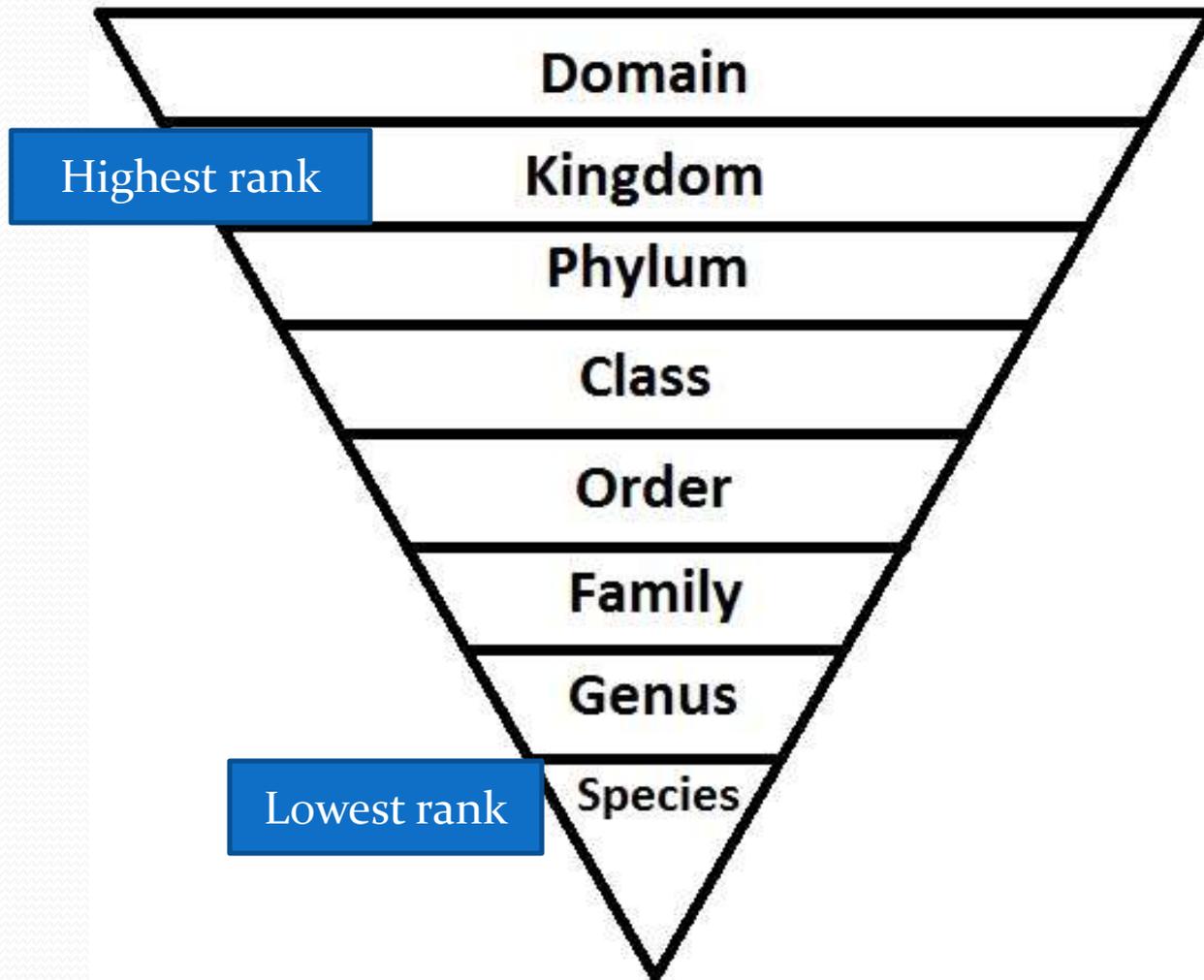
- Organizing the taxonomic information about the organism into a logical classification that provides the framework for all comparative studies
- study of biological diversity and evolutionary history
- Systematics + taxonomy = systematic biology

# Levels of taxonomy

- ALPHA TAXONOMY – includes species description, taxonomic keys, diagnoses
- BETA TAXONOMY – includes identification of natural groups and biological classes
- GAMMA TAXONOMY – includes study of evolutionary processes and patterns

- Organisms – first classified – **ARISTOTLE** (2000 yrs ago) – as plants and animals
- Modern biological classification – **C. LINNAEUS** - developed hierarchy (a ranking system)
  - basis of modern taxonomy
- A **hierarchical system** is used for classifying organisms to the species level.

# Levels of classification



**D**umb

**K**ing

**P**hillip

**C**ame

**O**ver

**F**or

**G**ooseberry

**S**oup!

- Kingdom is the largest unit of classification
- Together they make up taxonomic hierarchy
- Named groups within hierarchy are called **TAXA**  
(single : taxon)
- As one processes down the hierarchy, the number of organisms in each taxon decreases and similarities between them increase
- **Lower the taxa, more are the characteristics that the members within the taxon share.** (The number of similar characters of categories decreases from lowest rank to highest rank.)

# Species

- Species (used both as singular and plural) is a natural population of individuals or group of population which resemble one another in all essential morphological and also reproductive characters so that they are able to interbreed freely and produce fertile offspring.
- Mango is species *indica* of genus *mangifera* (*mangifera indica*). Potato is species *tuberosum* of genus *solanum* (*solanum tuberosum*).

# Genus

- it is a group or assemblage of related species which resemble one another in certain correlated characters.
- **Correlated Characters** are those similar or common features which are used in delimitation of a taxon above the rank of species.
- All the species of genus are presumed to have evolved from a common ancestor.

# Family

- it is taxonomic category which contains one or more related genera.
- All the genera of a family have some common features or correlated characters.
- They are separable from genera of a related family by important and characteristic differences in both vegetative and reproductive features.
- Thus the genera of cats (*felis*) and leopard (*panther*) are included in the family **felidae**.

# Order

- the category includes one or more related families.
- Thus the family solanaceae is placed in the order **polemoniales** along with four other related families (convolvulaceae, boraginaceae, hydrophyllaceae and polemoniaceae).
- Similarly, the families felidae and canidae are included under the order **carnivore** alongwith hyaenidae (hyaenas) and ursidae (bears).

# Class

- a class is made of one or more related orders.
- For example, class **dicotyledoneae** (dicotyledonae, dicotyledons) of flowering plants contains all dicots which are grouped into several orders (e.g. Rosales, passiflorales, polemoniales, sapindales, ranales, etc.) likewise, class **mammalian** of animals includes all mammals which range from bats (order chiroptera), kangaroos (order marsupialia).
- Rodents (order rodentia), whales (order cetacean), carnivores (order carnivora) to great apes and man (order primate).

# Division or phylum

- it is a category higher than that of class.
- The term phylum is used for animals while division is commonly employed for plants.
- A division or phylum is formed of one or more classes.
- The phylum **chordate** of animals contains not class mammalian but also aves (birds), reptilian (reptiles), amphibian (amphibians), cyclostomata, chondrichthyes, osteichthyes (fishes) etc.

# Kingdom

- it is the highest taxonomic category. All plants are included in kingdom plantae while all animals belong to kingdom animalia.

# Binomial nomenclature

- Linnaeus
- Include – genus and species name

*Mangifera indica*

- The binomial scientific name in which name of the genus and that of the species is similar  
- **TAUTONYM**

# Biological species concept

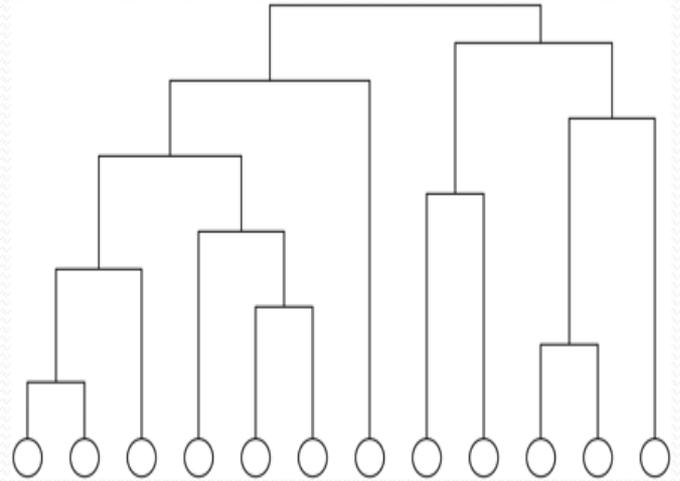
- Ernst mayr – “*species are groups of interbreeding natural population that are reproductively isolated from other such groups*”
- Two organisms breed within the species – gene are passed to offspring – process is repeated – gene are constantly shuffled around the species gene pool – **this shared gene pool gives species its identity**
- **Cryptic species** – two species very similar morphologically but reproductively isolated

# Subspecies

- Taxonomic subdivision of species – by phenotypic characters, origin or geographical region
- Allopatric
- Race is different from subspecies – used only in case of human
- Species with uniform population – monotypic and if divided into two or more subspecies – polytypic
- Species population with no genetic variation – monomorphic and if two or more genetic variation for particular gene – polymorphic

# Numerical taxonomy

- Classified based on numerous characteristics
- Total number of characters they have in common
- Characteristics may be – physiological, morphological, biochemical, behavioural
- Such classification is called **phenetic classification**
- Various groups are linked together according to the degree of similarity between them – this gives tree like diagram called **DENDROGRAM**



# Phylogenetic Systematics

- Classification based on ancestry
- Know as cladistics or phylogenetic analysis
- Most widely used method
- Clades – defined by possession of unique features (groups with the shared features )
- A **CLADOGRAM** is used by a scientist studying phylogenetic systematics to visualize the groups of organisms being compared, how they are related, and their most common ancestors

