

## Biology 8.1 Classification

"And out of the ground the Lord God formed every beast of the field, and every fowl of the air; and brought them unto Adam to see what he would call them: and whatsoever Adam called every living creature, that was the name thereof." Genesis 2:19

### Classification

1. A means of ordering and understanding God's creation of life.
2. **Taxonomy** is the science of identification, classifying, and naming of organisms into various groups (**taxa**) based on similarities and differences in their features.
3. **Systematics** is the study of ancestral-descendent relationships between organisms.
4. Systematics is used by creationists to study ancestral-descendent relationships between organisms and to define the boundary of organism kinds. Referred to as the orchard model.
5. Systematics is used by evolutionists to describe the unsubstantiated **phylogenetic** (evolution) relationships of taxa of all organisms. Referred to as the phylogenic tree.
6. Similarity of characteristics are called **homologies**.
7. The General Theory of Evolution infers that similarity implies phylogenetic relationship.
8. Many error in thinking that similarity means only ancestral relationship and ignore same Designer, common design, and shared resources to explain similarity.
9. **Phenetics**, also called taximetrics, is the classification of organisms based on mathematical models of phenotype similarities.
10. Phenetics collects as much data as possible about organisms and then applies mathematical models to group organisms based on their degree of similarity.
11. **Cladism** groups organisms based on unsubstantiated ancestral similarities of genotype rather than phenetic similarities.
12. Cladism utilizes phenotype and genotype similarities to compare organisms.
13. Genotype similarity does not always reflect phenotype similarity.
14. A **dendrogram** is a cladistic similarity chart produced by computer models after assimilating all data of attributes.
15. Dendrograms are used by evolutionists to describe the unsubstantiated phylogeny of taxa based on similarity.
16. Taxonomy still lacks standardization of terms and computer models to use.
17. The 'species problem' refers to the controversies of naming organisms due to the lack of a universal standard to classify and name organisms.
18. Taxonomy is dominated by evolutionists and thus described often in evolutionary context. However, it is just organization of life. Creation and evolution interpret the organization differently.

### Species

1. Reproduce fertile offspring.
2. Very similar in appearance, though often individually different.
3. Subdivisions include: Sub-species and Races.
4. 1.2 million known species are catalogued. Perhaps over 8.2 million eucaryotic species alive today. 6.5 million on land, and 2.2 million in oceans.
5. Estimated 99% of all species are extinct.

## Phenotype classification system

1. Subject to change due to lack of standardization.
2. Physical appearance can be misleading: E.g. tiger salamanders and axolotls are physically dissimilar; water lilies change physical shape in different conditions.
3. Interbreeding can occur between different species: dogs and coyotes => coydogs.
4. It is the most convenient system available but fallible.
5. Some species produce populations so dissimilar, they are considered different species.

## Genotype of classification

1. Based on genetic similarity, not morphological.
2. Organisms most closely related should be more similar in their DNA.
3. Relying on base pairing leads to faulty relationships.
4. Perhaps nucleotide sequencing will solve the problem.

## Classifying how extinct organisms are fossilized

1. **Fossils** are evidence of a once-living organism.
2. Fossilization involves quick, drastic conditions before decay occurs.
3. Hard body parts such as shell, bones, teeth are more likely preserved than soft tissues.
4. Coal: the carbon remains of plant material.
5. Casts and molds: body parts leave imprint in hardened material.
6. Tracks: foot print impressions in hardened material.
7. Petrification: Dissolved minerals diffuse into cells and harden.
8. Freezing: body parts preserved by freezing.

## Classification ranks

1. Classification of organisms continues to change in attempting to improve organization.
2. Naming of animals began with Adam. Naming is not the same as classifying.
3. Carolus Linnaeus (1707–1778), the father of taxonomy, proposed three kingdoms: plants, animals, and minerals.
4. Linnaeus introduced the binomial nomenclature in his book *Systema Naturae* which is still used today.
5. Linnaeus used the Latin word ‘species’ to reference the Biblical ‘kind’ that produces its own kind.
6. The term ‘species’ no longer refers to the Biblical kind.
7. Classification is used to group organisms by similarity of attributes (genotype & phenotype).
8. Cladists group organisms by clades (groups sharing a common ancestor) according to the General Theory of Evolution.
9. A traditional hierarchical system commonly used is based on seven ranks: 1. kingdom, 2. phylum, 3. class, 4. order, 5. family, 6. genus, 7. species
10. The traditional hierarchical ranks have been further divided into thirty-seven additional ranks including domain, subphylum, and subspecies.
11. The five kingdoms commonly used for classification are 1) monera, 2) protista, 3) fungi, 4) plants, 5) animals

**Scientific Names**

1. **B**inomial nomenclature
2. *Genus species*
3. Always underlined or italicized (p. 225); *Homo sapiens*
4. Always capitalize *Genus*

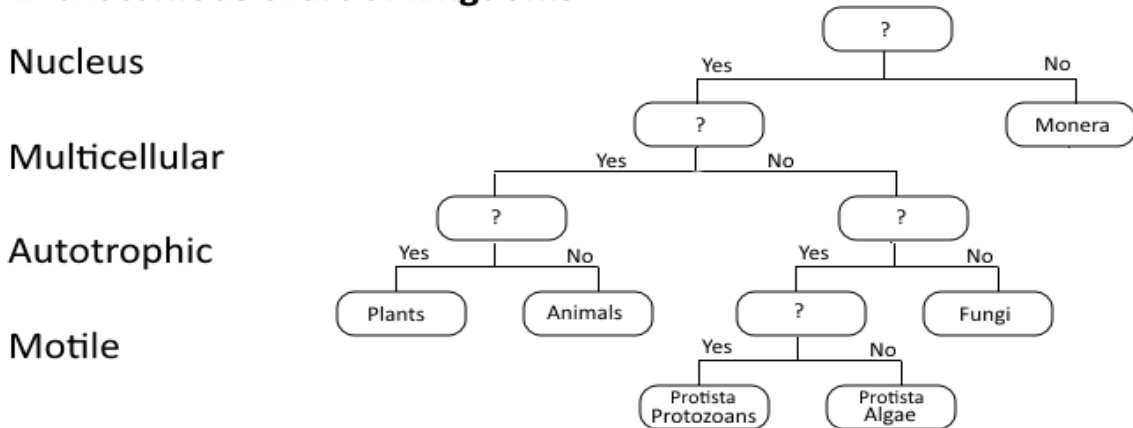
**Number of organisms known and estimated**

1. Discovery Communications reported in 2011 that 1.2 million species in the world have been catalogued.
2. The California Academy of Science estimated in 2011 that there are 8,700,00 species on earth. There are an estimated 6.5 million terrestrial species and 2.2 million aquatic species. This estimate is based on taxonomic organization patterns.
3. A 2011 article in PLOS Biology journal estimated 86% of land species and 91% of sea species have not been discovered yet.
4. It has been estimated that 99.9% of all organisms that ever lived are now extinct.
5. An estimated 27,000 extinctions every year. However, “The most widely used methods for calculating species extinction rates are ‘fundamentally flawed’ and overestimate extinction rates by as much as 160 percent, life scientists report May 19, 2011 in the journal Nature.”
6. Dozens of ‘Lazarus species’ are rediscovered organisms thought to be extinct.
  - a. Coelacanth (a lobe finned fish)
  - b. Cuban solenodon (a shrew-like mammal)
  - c. Ivory-billed woodpecker (possibly seen alive in Arkansas swamp area)

**Dichotomous key**

1. A dichotomous key is a tool used to classify and identify items.
2. Each level of classification is separated into two groups in answer to a *yes* or *no* question.
3. Separating two items requires one question.
  - a. Separating three items requires two questions.
  - b. Separating ten items requires nine questions.
  - c. Separating one hundred items requires ninety-nine questions.
4. Grouping organisms with a dichotomous key is called **circumscription**.
5. The final question of circumscription identifies the item.

**Dichotomous chart of kingdoms**



### Kingdom distinctions

1. Procaryotic - Monera
2. Eucaryotic, single cell, autotrophic – **Protista**/algae
3. Eucaryotic, single cell, heterotrophic, motile – **Protista**/protozoans
4. Eucaryotic, single cell, heterotrophic, sessile - Fungi
5. Eucaryotic, multicellular (tissues), autotrophic - Plants
6. Eucaryotic, multicellular (tissues), heterotrophic - Animals

### Kingdom circumscription with a dichotomous key

- |                       |   |
|-----------------------|---|
| 1a. Nucleus           | go to 2.  |
| 1b. No nucleus        | <b>Monera</b>                                   |
|                       |   |
| 2a. Multicellular     | go to 3   |
| 2b. Not multicellular | go to 3   |
|                       |   |
| 3a. Autotrophic       | 2a = <b>Plant</b><br>2b = <b>Protista/algae</b> |
| 3b. Not autotrophic   | 2a = <b>Animals</b><br><br>2b go to 4.          |
|                       |   |
| 4a. Motile            | 3b = <b>Protista/protozoans</b>                 |
| 4b. Not motile        | 3b = <b>Fungi</b>                               |

### Taxonomic descriptions

1. Refer to Classification handout.
2. Organisms to classify as homework. Use N/A if an attribute does not apply.
  - a. *P22-like viruses: enterobacteria phage P22*
  - b. *Gamma papillomavirus: human papillomavirus 31*
  - c. *Enterovirus rhinovirus A*
  - d. *Escherichia coli*
  - e. *Acanthamoeba polyphaga*
  - f. *Paramecium sonneborni*
  - g. *Euglena gracilis*
  - h. *Terpsinoë musica*
  - i. *Volvariella volvacea*
  - j. *Saccharomyces cerevisiae*
  - k. *Ophiocordyceps unilateralis*
  - l. *Penicillium chrysogenum*
  - m. *Pendulothecium auriculatum*
  - n. *Polystichum acrostichoides*
  - o. *Pinus strobus*
  - p. *Hibiscus schizopetalus*
  - q. *Cucurbita maxima*
  - r. *Lagerstroemia indica*
  - s.