

## **Chpt 26: Phylogeny and the Tree of Life**

**Biodiversity: there is an incredible variety of life forms on earth**

**scientists have described & classified >3 million different life forms**

**and scientists estimate there are several million more to be discovered**

**So where are these life forms?**

**Taxonomy is the science we are studying in this chpt**

**taxo: to arrange or put in order**

**nomy: law of**

**the law of arrangement or science of classification**

**We classify or group things all the time**

**Examples of classification systems used everyday:**

**Why do we classify things?**

**1st classification system: Aristotle**

**he recognized 2 main life forms: plants vs animals**

**Plants: 3 grps**

**herbs**

**shrubs**

**trees**

**1 fleshy stem**

**sev woody stems**

**1 woody stem**

**Animals: 3 grps**

**water dwellers**

**land dwellers**

**air dwellers**

**what are problems w/sys above?**

**Carolus Linnaeus: Father of Taxonomy**

**developed system of classification in 1700's based on  
structural similarities**

**came up w/hierarchical sys consisting of 7 diff taxa**

**this system is still in use by most scientists today, however,  
we are in a period of change, some scientists feel the  
Linnaean system is outdated**

**Linnaeus' system, taxa go from broadest to most specific**

**Kingdom**

**Phylum**

**Class**

**Order**

**Family**

**Genus**

**Species**

**Linnaeus also addressed a naming problem**

**what kind of names does the general pop use?**

**common names: mountain lion, white oak, crayfish**

**there are problems w/common names**

**1-confusing: w/in the same country, we have different names  
for same organism**

**mtn lion =**

**crayfish =**

**common name problems**

**2-misleading: name given may make you think it is  
different organism**

**ex:**

**how can scientists from different areas of same country &  
different areas of world communicate?**

**Linnaeus gave us binomial nomenclature**

**bi=2 nom=name clature=system**

**system of using 2 names to name an organism**

**scientific name uses the last 2 taxa to name organisms**

***Genus species***

**genus is always capitalized, species is lower case**

**both words *italicized* or underlined**

**why? b/c we use Latin words**

## **Why choose Latin?**

**1-dead language**

**the meanings will never change**

**2-all educated people of day knew Latin**

**3-very descriptive language**

**4-roots of most modern languages**

***Canis*: dog genus**

***Canis familiaris*: "of the household"      dog**

***C. latrans*: "to bark"      coyote**

***C. lupus*: "wolf"      wolf**

**trivia: Linnaeus from Sweden, born Carl von Linne  
he latinized his own name**

**So what is a species?**

**first, species always includes genus name**

**species name alone gives no real info**

**genus is like last name, species is like first name**

**members of same species are structurally similar and can interbreed and produce fertile offspring**

**today's definition adds: have same # chromosomes**

**there are also divisions beneath species level**

**subspecies**

**in plants, called varieties**

**in animals, called breeds**

**members of subspecies can mate & produce fertile offspring**

**w/others of same species, but there are subtle differences**

**btw groups: think dog breeds**

**all dog breeds can mate theoretically**

**in actuality, Great Dane & Chihuahua?**

**there are 3 main types of variations in members of same species**

**1-polymorphism**

**when 2 or more distinct forms exist in population**

**males/females**

**moths p. 424: peppered moth, light/dark**

**flowers: impatiens**

**2-geographic variations**

**when species occupies large geographic range w/distinct**

**local environments, populations have evolved unique**

**physical characteristics**

**human races: skin color, body build**

**American Eskimo or Inuit: short limbs, stocky**

**races near equator**

**3-individual variations**

**due to genes inherited from parents**

## **Problems with species concept**

**Taxonomy is human-made construct, so species concept is human-made category, but it is based on what we see in nature**

**How does one species recognize its own members?**

**many animals in backyard - rabbits, squirrels, mice**

**many animals in Yellowstone - deer, elk, bison, wolves**

**yet they remain separate, this is due to pre-mating mechanisms that keep them from mating**

- chemical cues - pheromones**

- behavior cues - mating rituals, songs, displays**

- anatomical differences - prevention of mating**

- range differences - the ranges do not naturally overlap**

**ex. - polar bear, *Ursus maritimus*, & grizzly bear, *U. arctos horribilis***



**Post-mating mechanisms: Some very closely related species can mate, meaning the sexual parts fit together, but**

- the sperm may not be able to fertilize the egg  
due to differences in chemistry**
- the sperm fertilizes the egg, but there are problems with development, embryo is miscarried**
- the sperm fertilizes the egg, development proceeds normally, a living offspring is produced, but it is sterile,  
horse & donkey -----> mule  
zebra & donkey -----> zonkey**

**Speciation: the formation of a new species**

**so if there are all these mechanisms to keep species separate,  
how do we get new species?**

**there are > 3 million different species, life began in the seas  
with single-celled organisms, so lots of speciation has  
occurred**

**but speciation does not happen before our eyes, it takes time**

**2 possible examples occurring now:**

**1- let's go back to polar bear & grizzly bear**

**these 2 species look totally different and their  
ranges do not naturally overlap, so we have  
designated them as different species, *but*  
*guess what?* they can mate and produce  
fertile offspring in captivity**

**and what is happening environmentally right now?  
climate change - what is the effect on organisms?**

**2- let's go back to the horse & donkey**

**in 1984, a mule gave birth to a colt  
so there was a mule born that was not sterile**

**could we be seeing speciation in the works?**