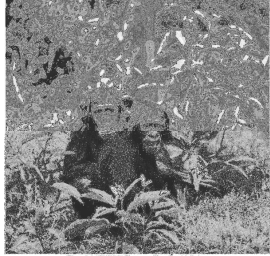


Systematics: Seeking Order Amidst Diversity

Chapter 18



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Naming and classification

- **System devised by Carolus Linnaeus**
 - ❖ Originally based on similarities
- **After Darwin, systematists sought to classify based on phylogeny**
 - ❖ relatedness/ ancestry
- **Note how genus and species are written**
 - ❖ Genus only is capitalized
 - ❖ Entire name is underlined or italicized

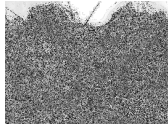
	Wolf
Domain	Eukarya
Kingdom	Animalia
Phylum	Chordata
Class	Mammalia
Order	Carnivora
Family	Canidae
Genus	<i>Canis</i>
Species	<i>lupus</i>

Why give latin names to new species?

- **Common names are often descriptive and confusing.**

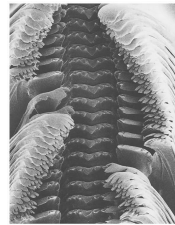
❖ Daddylong legs

- UK = fly
- US = arachnid
- Australia = spider

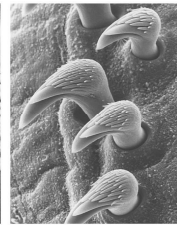


Naming and classification

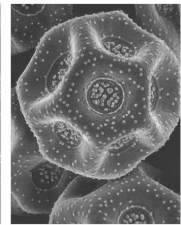
- **Anatomy, often at the microscopic level, is important in systematics**



Snail's "radula"



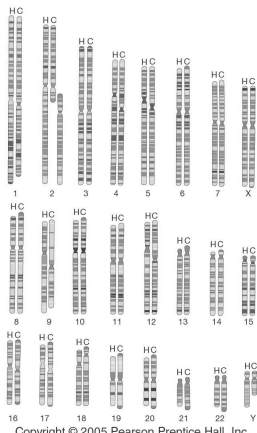
Setae of marine worm



Pollen grains

Naming & classification

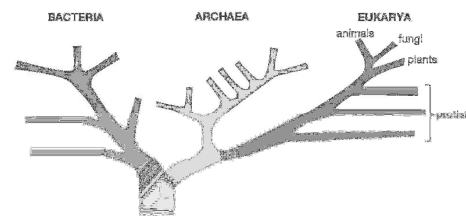
- **Molecular similarities are useful in reconstructing phylogenies**
- **Example: comparison of human and chimp chromosomes.**
 - ❖ Similarities in banding patterns note similarity in genes present.



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What are the domains of life?

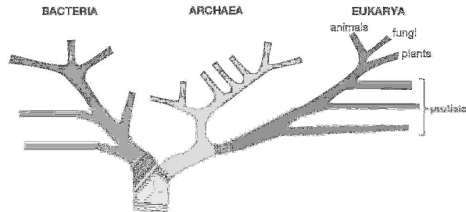
- **Three domains are now well-accepted**
 - ❖ The two groups of prokaryotes are considered different enough to place in two separate domains.
 - Molecularly, more different from each other than each group within the Eukarya



What are the domains of life?

- Kingdoms are represented by the branches off the main trunks.

❖ Kingdom level classification still controversial.



Tree of Life

- Tree of life link

- Created by evolutionary scientists Wayne and David Maddison



Why do classifications change?

- New information is discovered.

❖ Especially DNA-based information

❖ Example: Red wolves

- DNA analysis shows this "species" is likely a cross between gray wolves and coyotes.



Image courtesy of Defenders of Wildlife

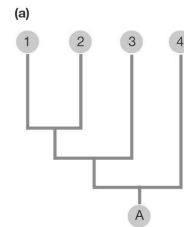
Why do classifications change?

- Biological species concept is difficult to apply...

❖ The phylogenetic species definition is an alternative:

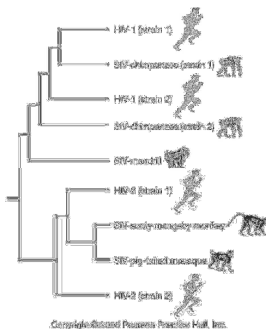
- The smallest diagnosable group that contains all the descendants of a single common ancestor.

- Each branch of the diagram is a species



Proposed phylogeny of HIV

- Based on analysis of RNA sequences (HIV has RNA but no DNA)
- Note the two distinct groupings of HIV in humans
 - ❖ HIV-1 is a somewhat distant relative of HIV-2.
 - ❖ Each is more closely related to different SIVs in different primates.
- How could this information be useful to humans?



Forensic science

- Phylogenetic trees have been used in court cases.

❖ Used to determine if defendant infected partner with HIV

❖ Determined if Palo verde seeds in man's truck matched those found on a murdered woman.



Palo verde seeds

How many species exist?

- **Mean estimate: 7-10 million**
- **High estimate: 100 million**
- **Current named species: 1.5 million**
 - ❖ 5% prokaryote and protists
 - ❖ 22% plants and fungi
 - ❖ 73% animals