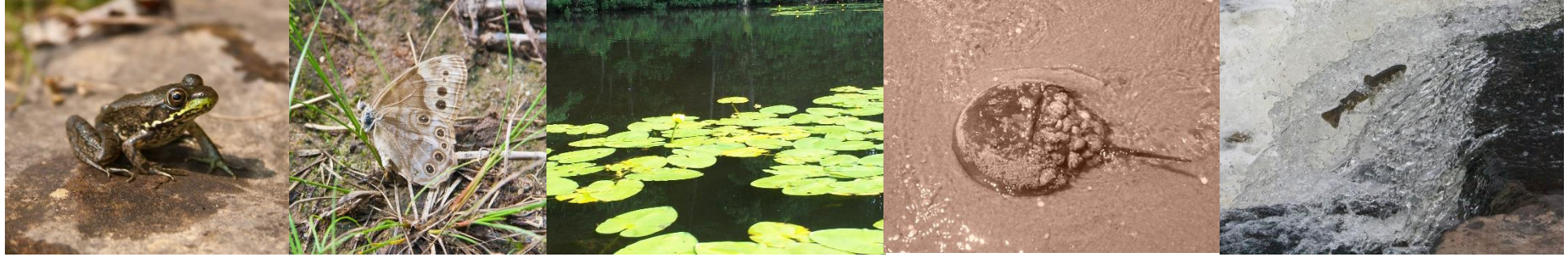
Diversity of Living Things



Biologists have identified and named about 1.8 million species

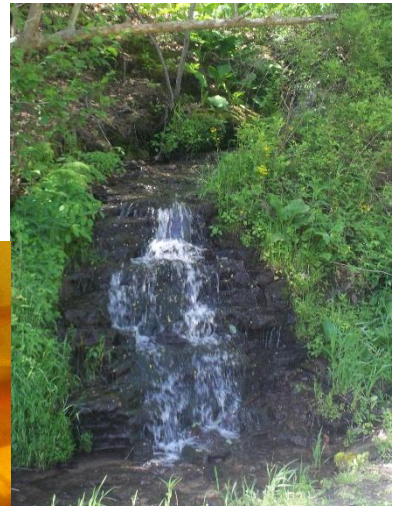
Biologists estimate the total number of species to range from 10 million to over 100 million different species

Uniformity among living things

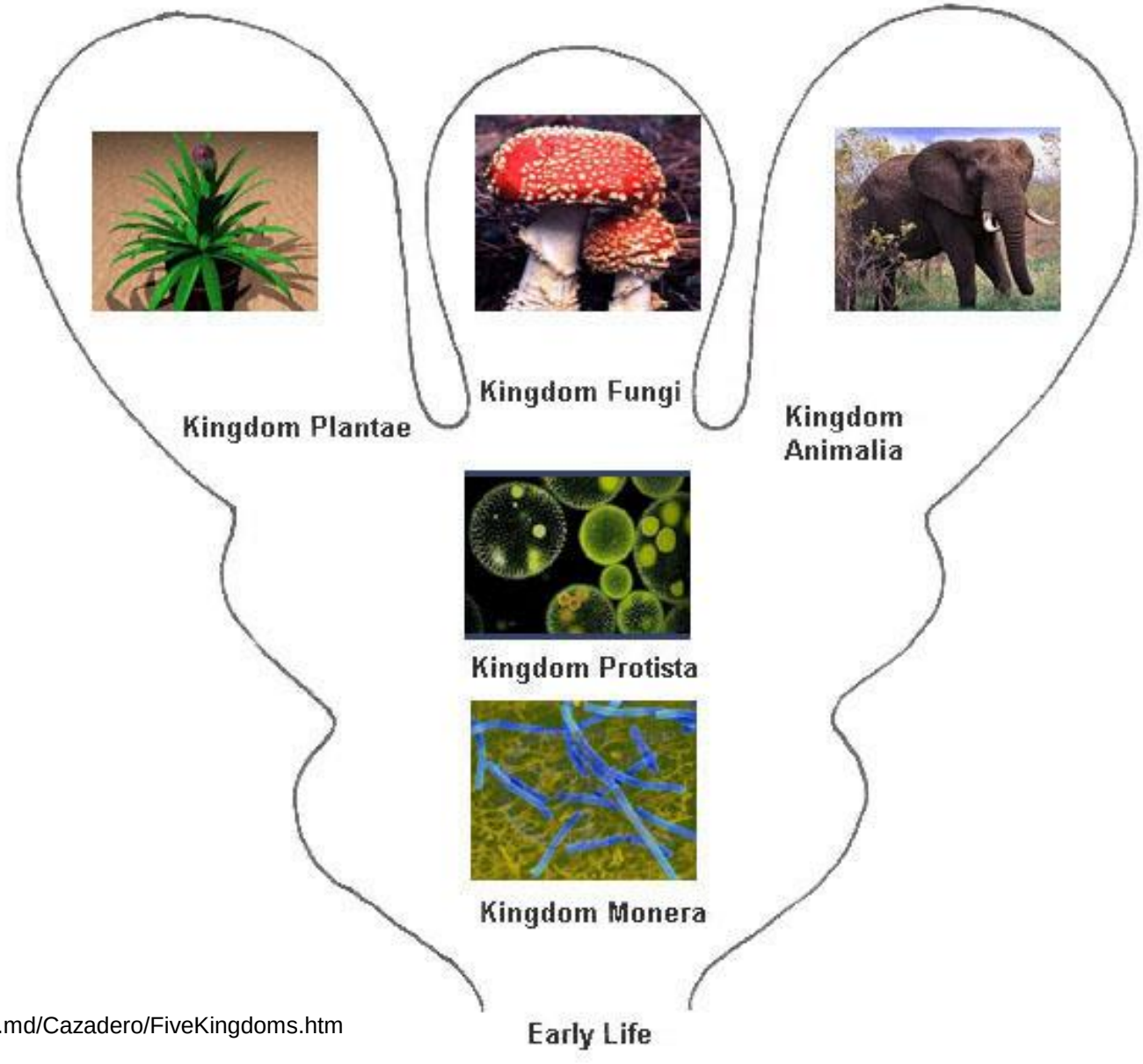
- Made up of cells
- Contain DNA
- Change over time







Once Upon A Time…



http://www.davidlnelson.md/Cazadero/FiveKingdoms.htm

Then…

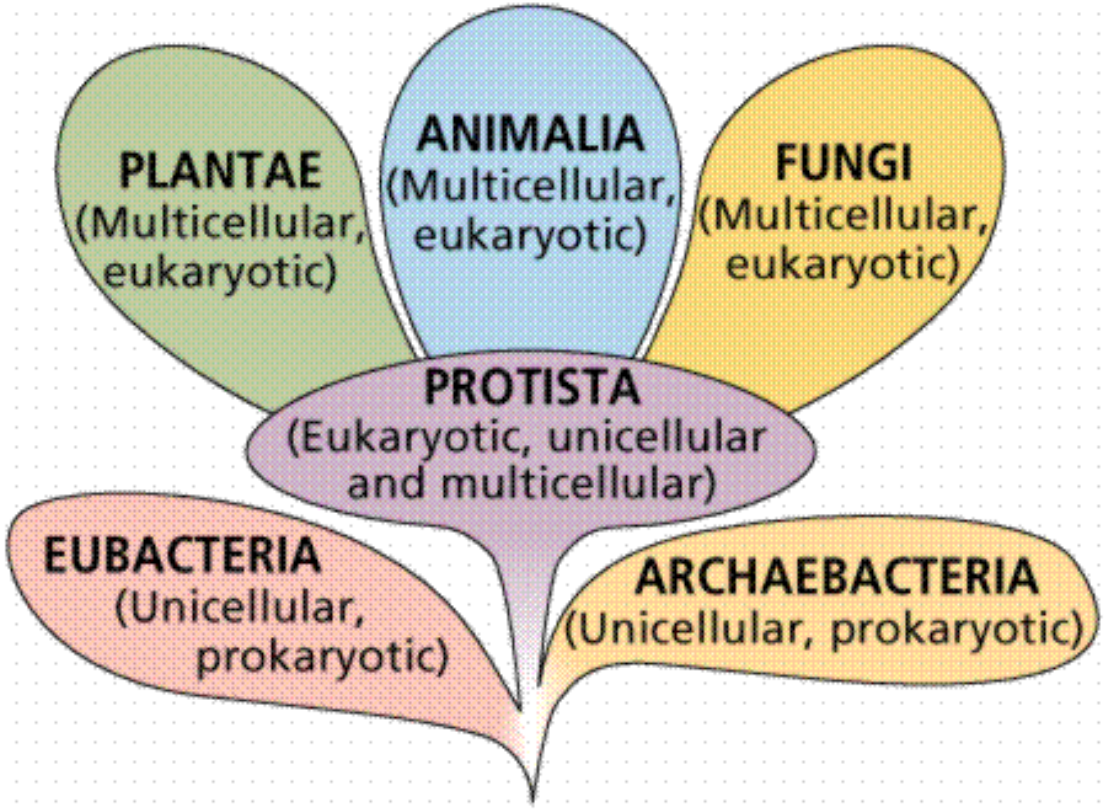
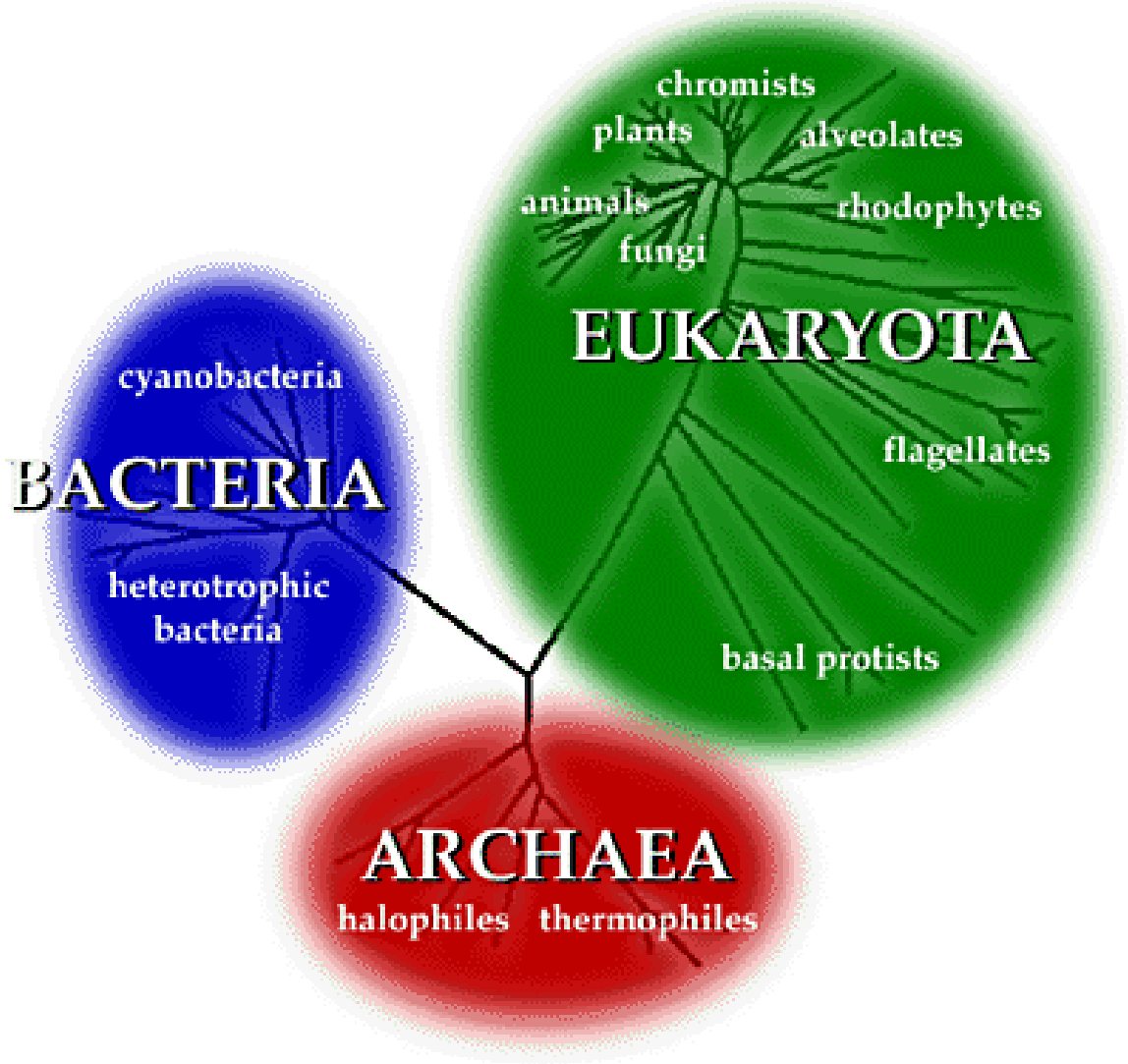


Figure 1.16

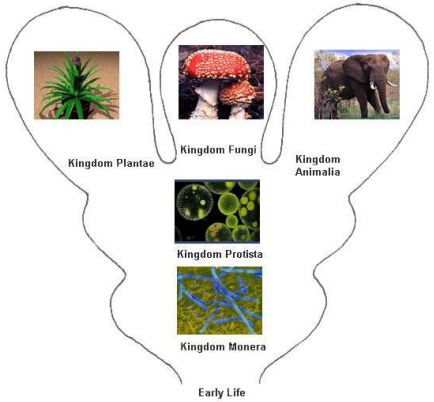
http://harmonscience7.wikispaces.com/Classification

Now…



http://www.biology.iupui.edu/biocourses/N100/2k23domain.html

And they lived happily ever after???



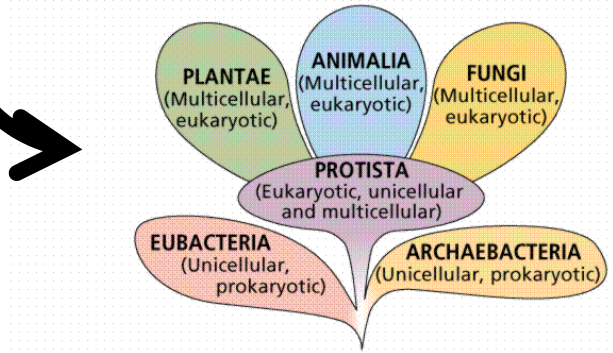
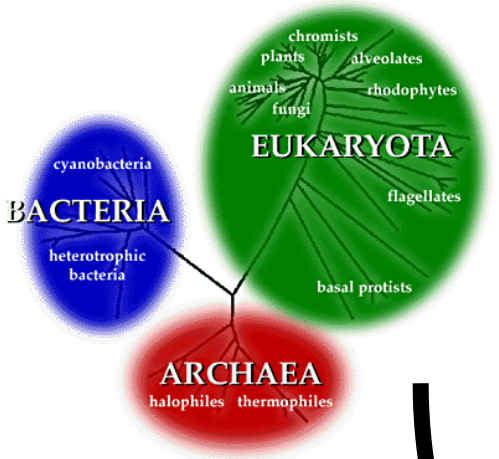


Figure 1.16



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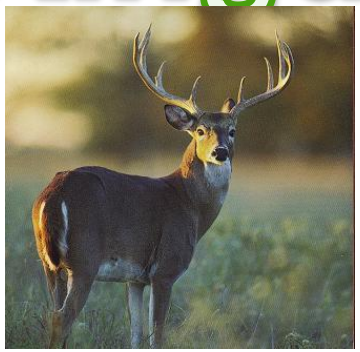
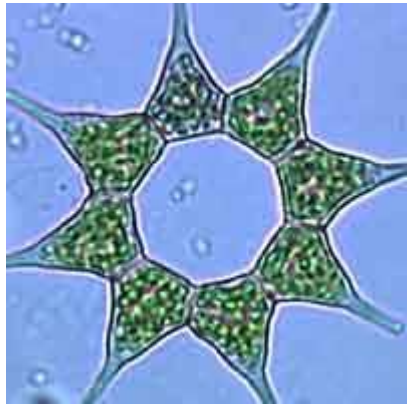
http://harmonscience7.wikispaces.com/Classification

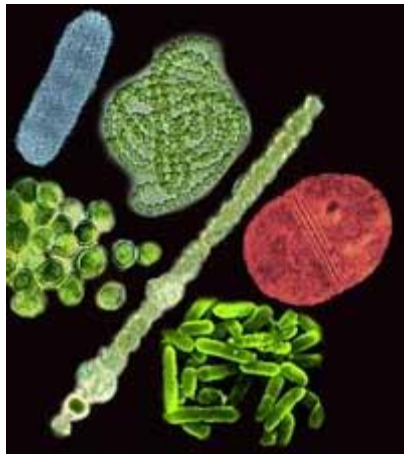
http://www.davidlnelson.md/Cazadero/FiveKingdoms.htm

http://www.biology.iupui.edu/biocourses/N100/2k23domain.html

The Kingdoms







Some Vocabulary…

Prokaryote	No formal nucleus or other organelles
Eukaryote	Membrane-bound organelles; nucleus; Peptidoglycan
Unicellular	One Cell
Multicellular	Many Cells
Sessile	Stationary; Does Not Move
Motile	Moves
Autotrophic	Makes Own Energy; Producer
Heterotrophic	Cannot Make Own Energy; Consumer
Microscopic	Small; Not able to be seen without magnification
Macroscopic	Big; Able to be seen without magnification

Archaebacteria

Archae = ancient

Base of some food chains
- Primary Producers
- Chemosynthesis

Single Cell

Prokaryotic

Only life in some extreme environments
- Sea Floor Vents/Volcanoes
- Salt Mines
- Anaerobic Environments

Biotechnical and commercial applications

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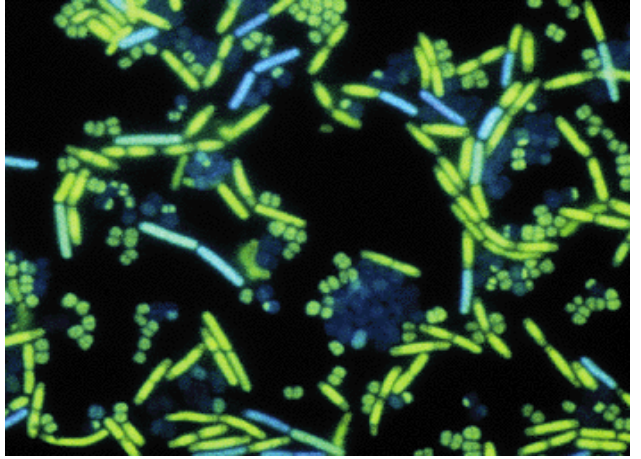
Eubacteria



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Eu = True

Single Celled Prokaryotes

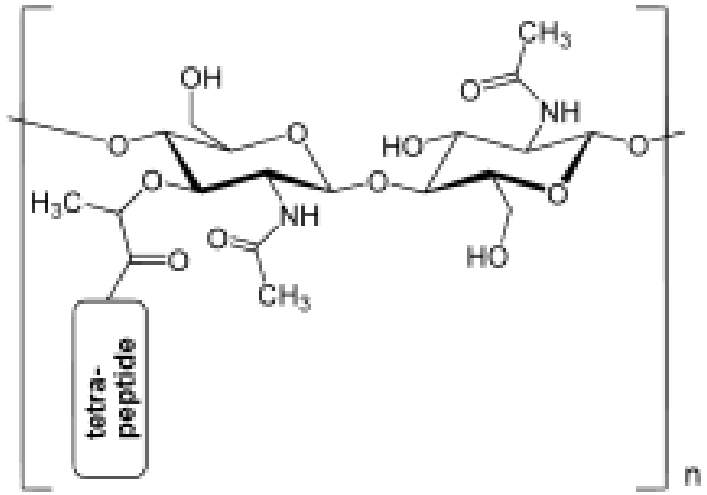
Various Ways of Obtaining Energy

- Primary Producers
  - Photosynthesis
  - Chemosynthesis
- Decomposers

Nitrogen fixation

Control and production of toxins

Biotech and commercial applications



Peptidoglycan

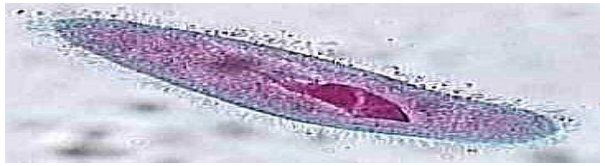
Protist

Fill all niches, depending on type of protist

May be animal-like, plant-like, or fungi-like

Generally single celled organisms may be form large colonies

Eukaryotes



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Protist

http://comenius.susqu.edu/bi/202/EXCAVATA/EUEXCAVATAE/PARABASALA/Trichonympha1.jpg

Fill all niches, depending on type of protist

Animal-like Protists

- Predatory consumers
- Scavengers
- Disease-causing parasites
- Symbiotic Relationships

http://static.howstuffworks.com/gif/rd/spot-termite-damage0.jpg

Protist

- Plant-like Protists
  - Primary Producers – Half of all photosynthesis on Earth
  - Important in aquatic food chains
  - Algal Blooms
    - Eutrophication
    - Red Tides

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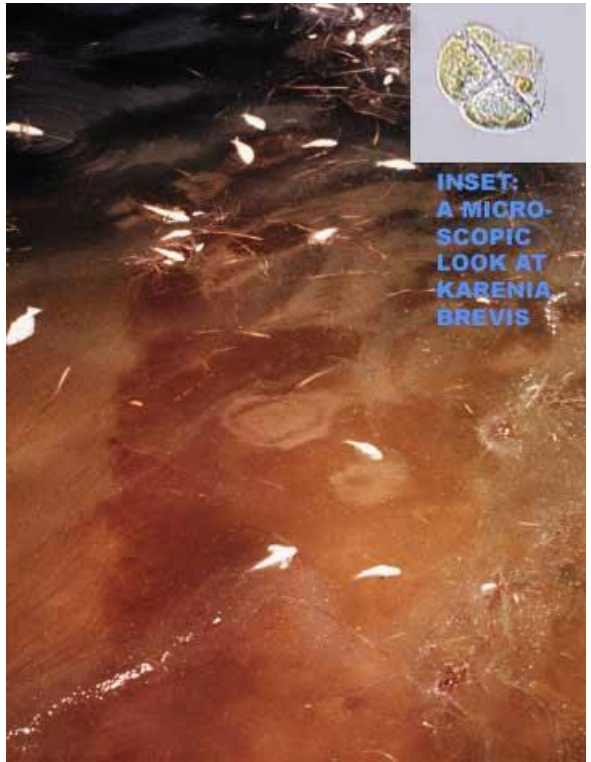
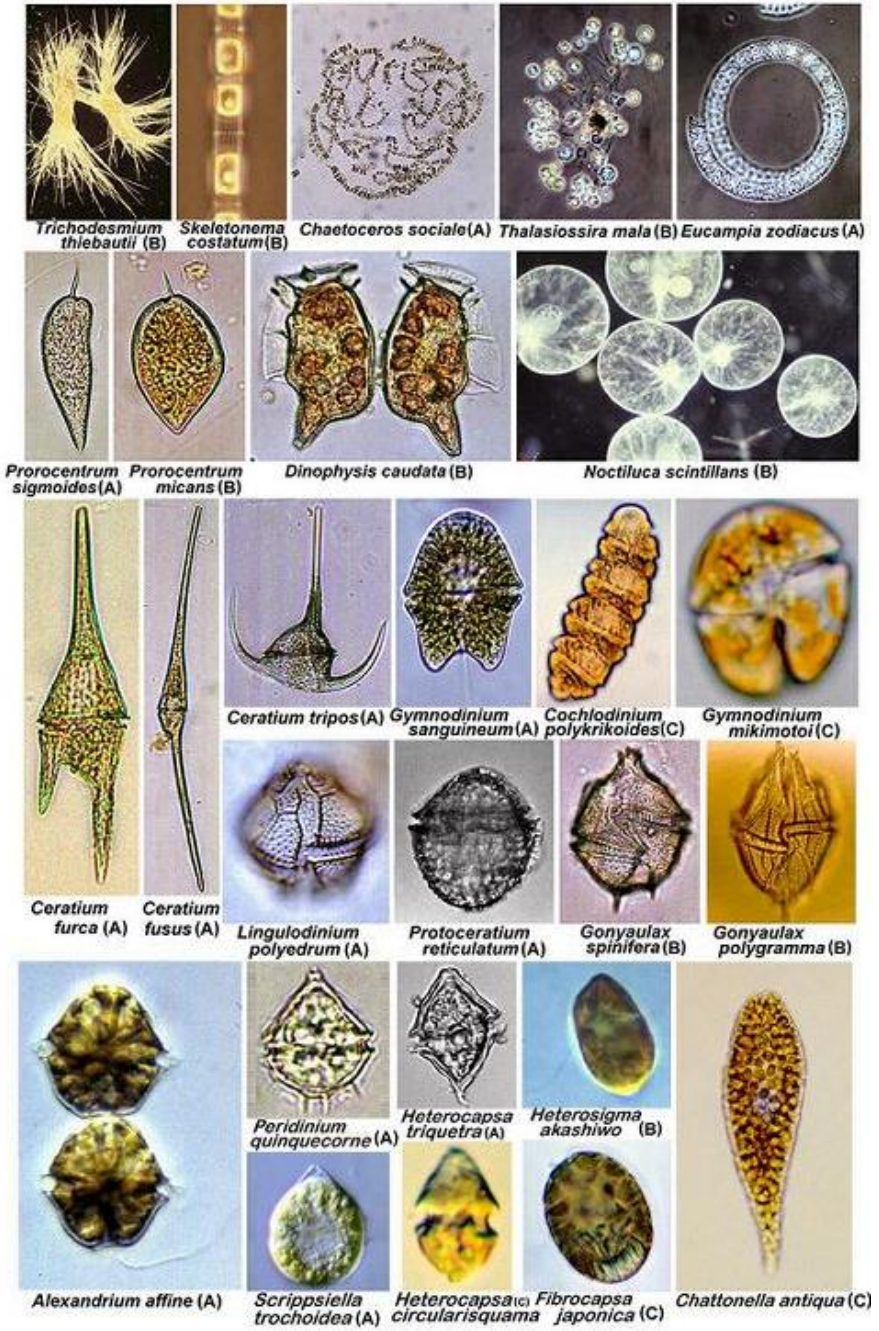


http://earthobservatory.nasa.gov/Newsroom/NasaNews/ReleaseImages/20040831/01_REDTIDE-composite.jpg



http://dinos.anesc.u-tokyo.ac.jp/Small/red_tide-v14-s.jpg

Protist

Fungus-like Protists

Decomposers

Recyclers of organic material

Agents of Disease

http://www.plantpath.iastate.edu/pdc/files/Image/slime%20mold%20on%20turf%20copy.jpg

http://www.thicketofdiversity.org/BTA/Photo_Galleries/images/SlimeMolds/Slime_mold_640.jpg

http://pseudomonas-syringae.org/Outreach/outreach-images/potato-famine-2.jpg

http://www.physorg.com/newman/gfx/news/sporangiumof.jpg

http://www.ssss.cz/files/kpucebnice/images/pv/3365.jpg

Fungi

May be unicellular or multicellular depending on species

Fungi fossils pre-date plants

Fungi helped early plants obtain nutrients from ground

Fungi may have been essential to terrestrial plant life

Fungi are an important part of all ecosystems

All fungi are heterotrophic

Fungi

Some fungi get their nutrients from dead and decaying organic matter

Some fungi are parasites

Some fungi have a symbiotic relationship with host

Play essential role in maintaining ecosystem equilibrium by recycling nutrients and breaking down waste

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Plants

There are over 260,000 species of plant

Plants have adapted over time and can be found in every biome and every ocean around the world

On a limited basis, plants can respond to their environment

For the most part, plants are producers, creating the basic sugars and releasing oxygen that other organisms need to survive


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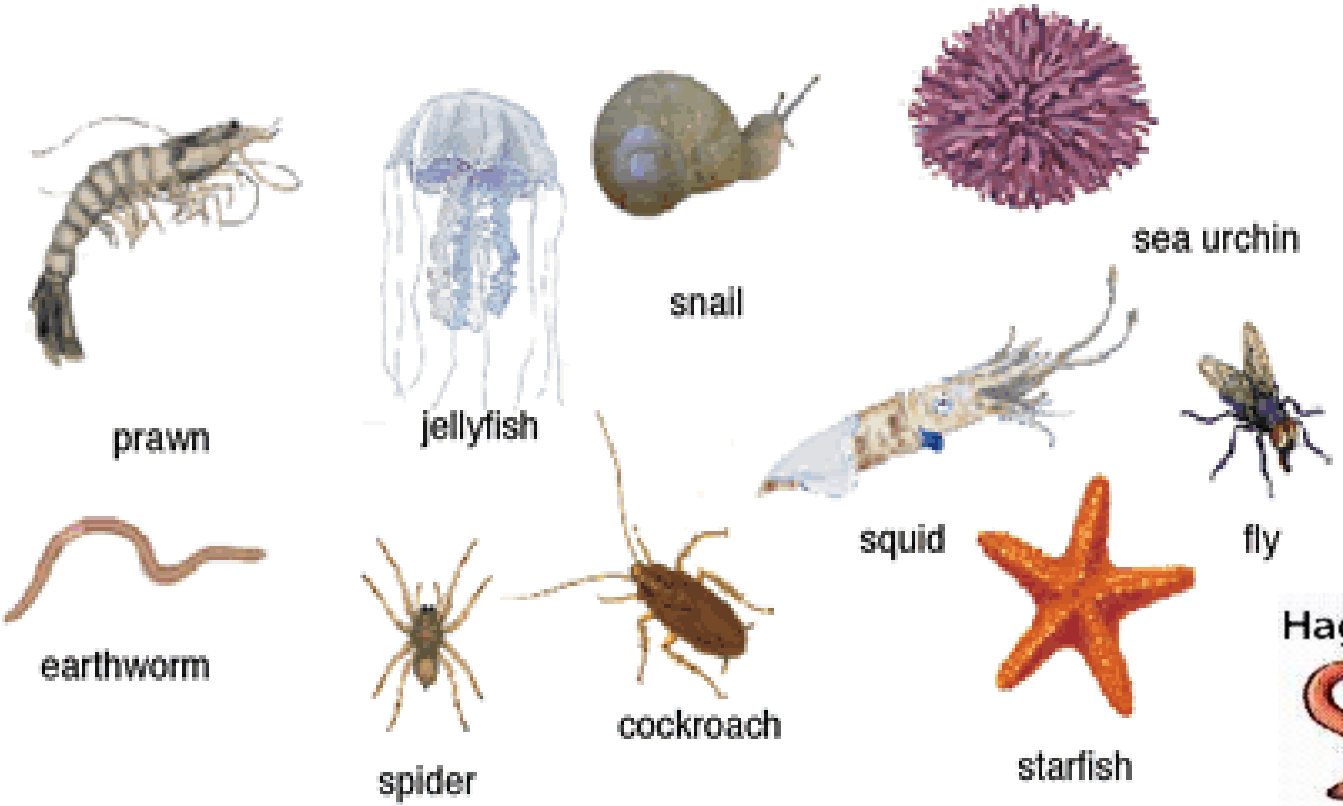
Utricularia
longifolia
Bladderwort

Animals

Animals are diverse, adaptable, and easily respond to their environments

Ecology and animal behavior are often characteristics used to differentiate different species

Animals are motile and heterotrophic



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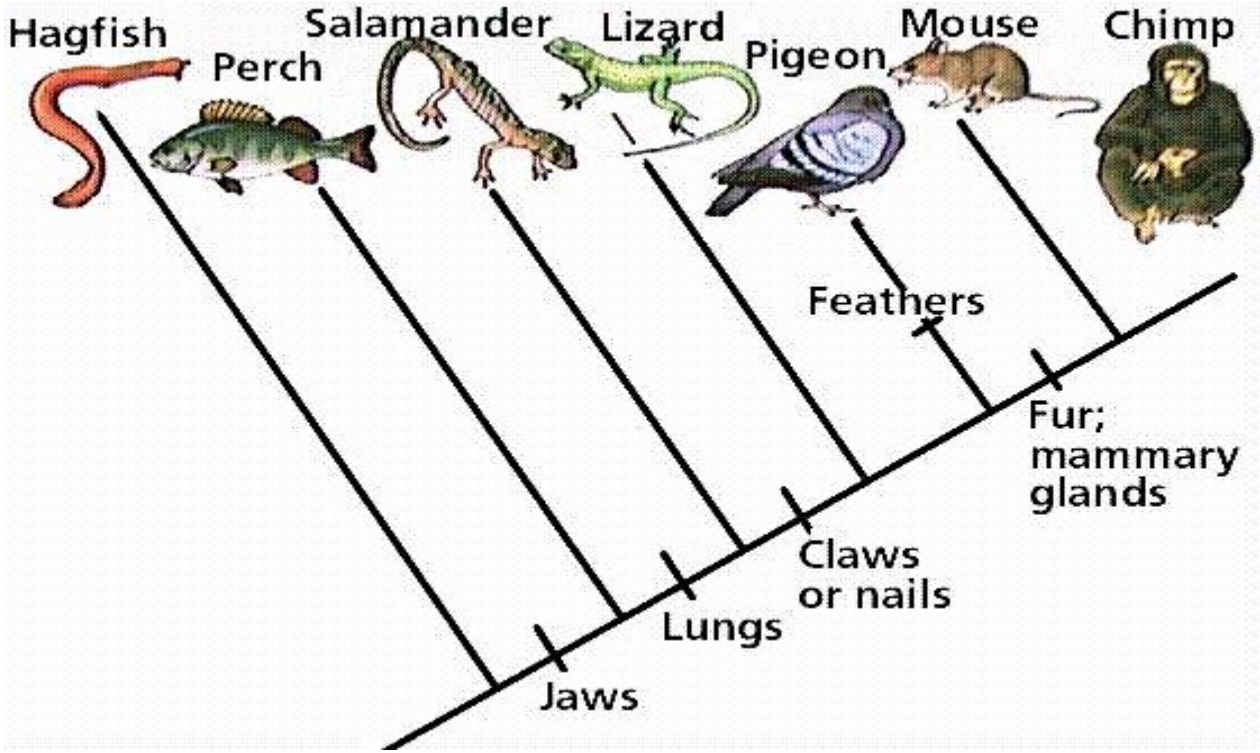


Kingdom	Type of Cell	# Cells	Movement	Energy	Size
Archaebacteria	Prokaryotic	Unicellular	Sessile or Motile	Autotrophic or Heterotropic	Microscopic
Eubacteria	Prokaryotic (peptidoglycan)	Unicellular	Sessile or Motile	Autotrophic or Heterotropic	Microscopic
Protist	Eukaryotic	Unicellular or Multicellular	Sessile or Motile	Autotrophic or Heterotropic	Microscopic but forms colonies
Fungi	Eukaryotic	Unicellular or Multicellular	Sessile	Heterotrophic	Microscopic or Macroscopic
Plant	Eukaryotic	Multicellular	Sessile	Autotrophic	Macroscopic
Animal	Eukaryotic	Multicellular	Motile	Heterotrophic	Macroscopic

Classification And Taxonomy

What is Classification

Classification is the grouping of things according to like or similar characteristics

Taxonomy is the classifying of organisms

Aristotle had two groups – plants and animals

Later systems based the classification on the appearance of the organisms

Linnaean System

In the 18th century, Carolus Linnaeus organized all living things into groups and then into levels based on **physical characteristics**

Kingdom	Family
Phylum	Genus
Class	Species
Order	

He was the first to develop a uniform naming system – we call it binomial nomenclature

Name consists of genus and species

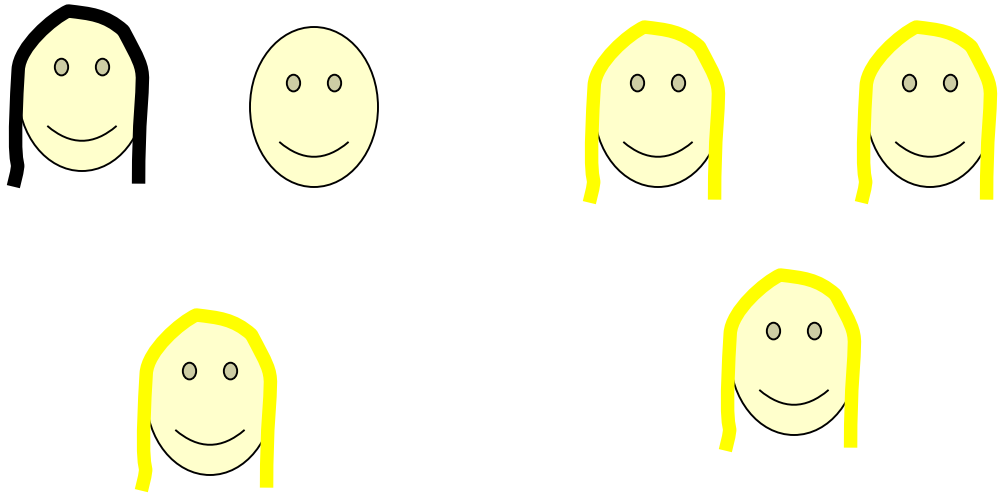
Canis lupus or Canis lupus

Modern System

Evolutionary Characteristics

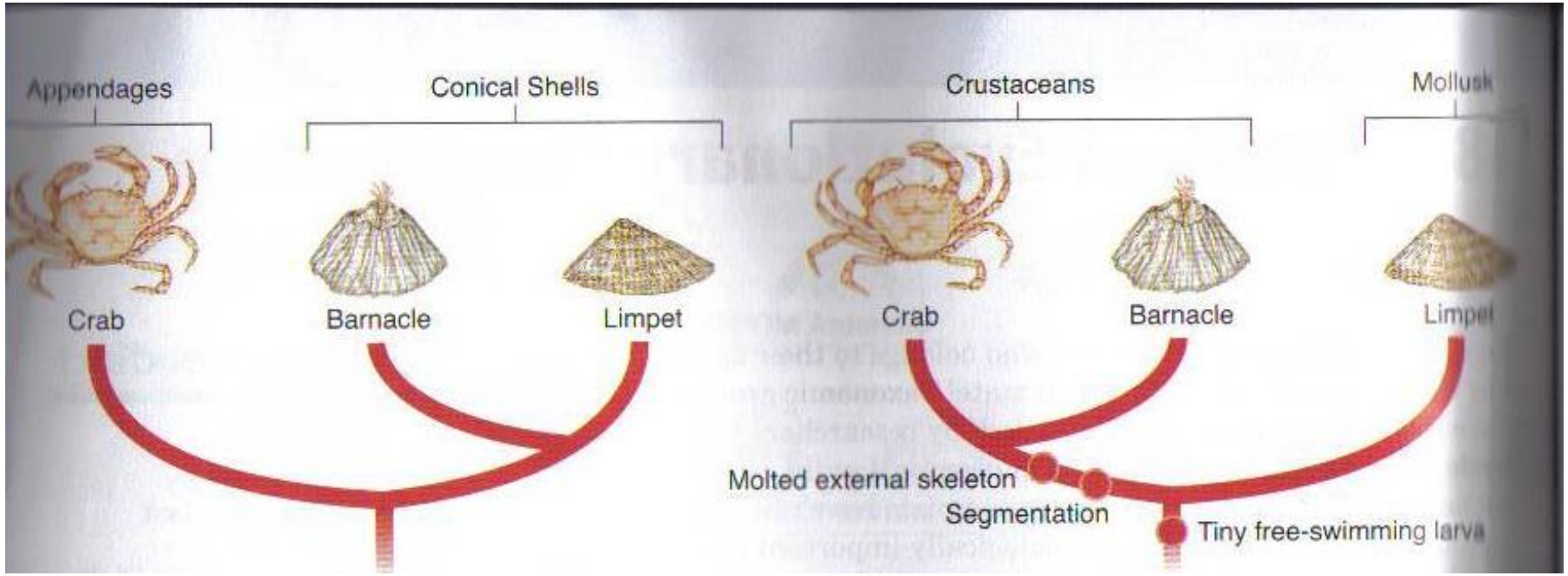
Lines of evolutionary descent

Asks the question “Which characteristics are most important?”



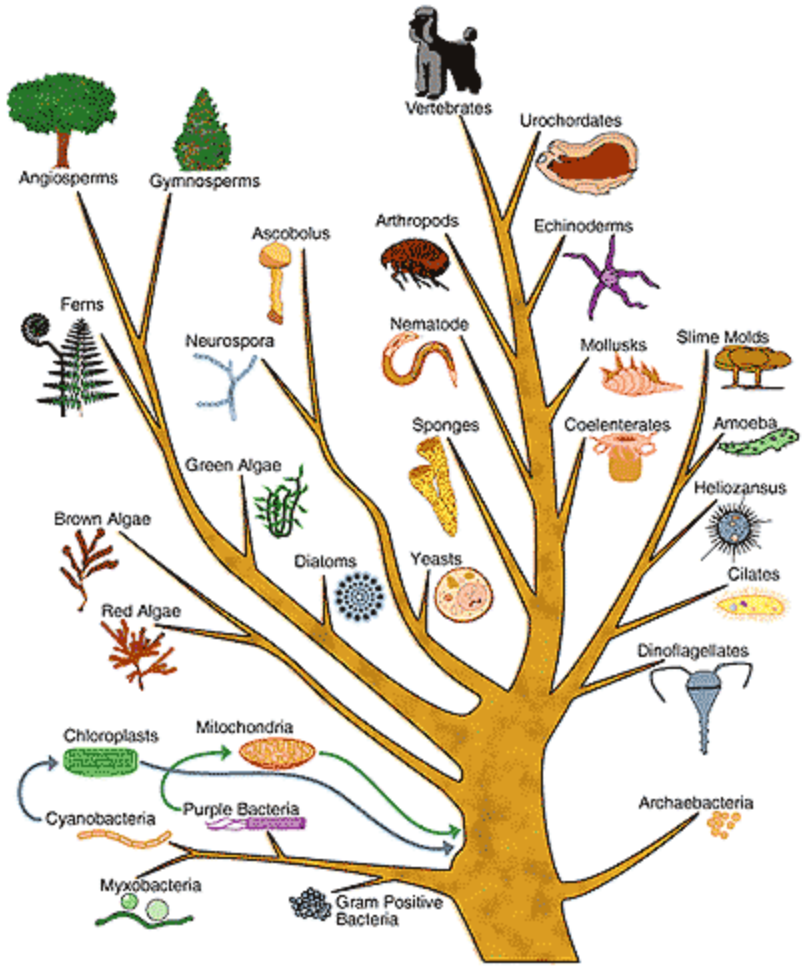
Physical characteristics, genetics, and molecular clocks

Modern System



Miller & Levine 2006

Phylogenetic Tree vs. Cladogram



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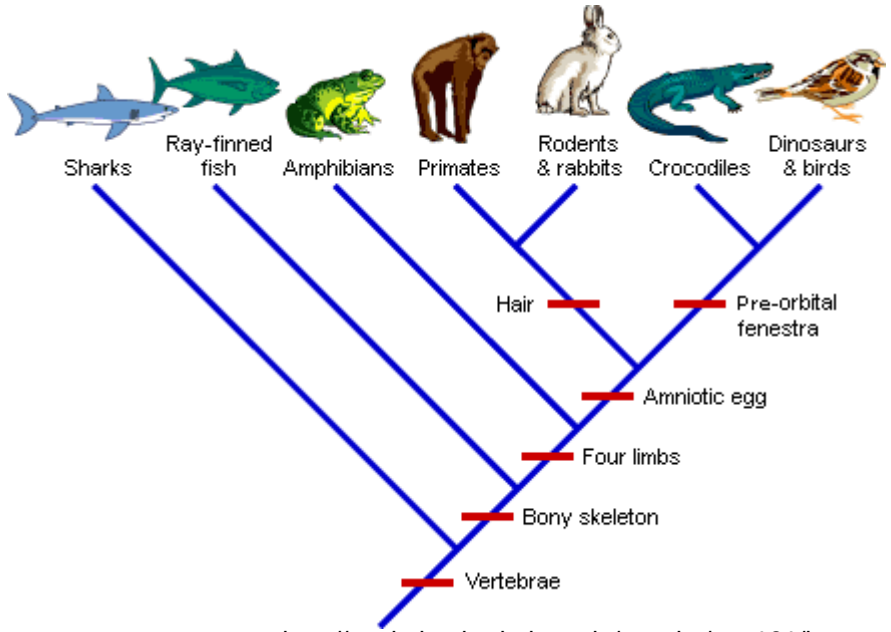


http://evolution.berkeley.edu/evosite/evo101/images/patterns_intro.gif

Scientific Names

- Genus and Species
- Italicized
- Genus is capitalized and species is lowercase

Homo sapiens

Taxonomy Packet

Naming of Organisms

The scientific name for organisms is used to identify species to scientists around the world.

For example, this animal is called a skunk in Pennsylvania but people from Georgia call it a polecat. If you are not familiar with all of the localized names of an organism, you cannot be sure two people are talking about the same thing. It becomes even more confusing when German scientists attempt to communicate with American scientists. By using the name *Mephitis mephitis*, all scientists know they are talking about the same animal.

The scientific name also serves to provide information about the organism. For example, in Latin, mephit means foul odor and -itis means having the character of something. Note that the name does not always reference the characteristics. Sometimes the species name is based on who discovered the species (i.e. Jefferson salamander is called *Ambystoma jeffersonianum*) or where it was first described (i.e. the meadow vole *Microtus pennsylvanicus* was first found in Pennsylvania).

See if you can match the following common names with the scientific names.

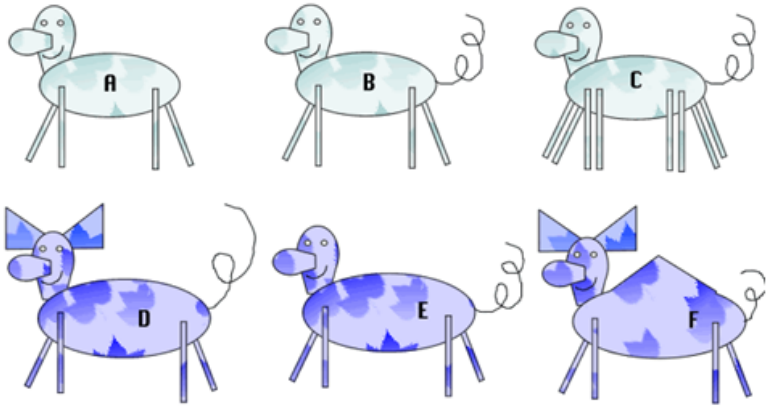
1. Canada Goose	____	A. *Passer domesticus*
2. Eastern Chipmunk	____	B. *Sorex vagrans*
3. Two-lined Salamander	____	C. *Eurycea longicauda*
4. Longtail Salamander	____	D. *Branta canadensis*
5. Fowler's Toad	____	E. *Erethizon dorsatum*
6. Wood Frog	____	F. *Bufo fowleri*
7. Stinkpot (a turtle)	____	G. *Sternotherus odoratus*
8. Pine Siskin (a bird)	____	H. *Canis familiaris*
9. Domestic Dog.	____	I. *Tamias striatus*
10. House Sparrow (another bird)	____	J. *Rana sylvatica*
11. Porcupine	____	K. *Carduelis pinus*
12. Vagrant Shrew (a rodent)	____	L. *Eurycea bislineata*

Hints: Tamias means collector of things
Striatus refers to stripes
Erethizo means "I rise to anger"
Dorsatum means dorsal or back area
Cauda refer to the tail
Pennsylvania means "Penn's Woods"

Using Dichotomous Keys

A dichotomous key is a written set of choices that leads to the name of an organism. Scientists use these to identify unknown organisms.

Consider the following animals. They are all related, but each is a separate species. Use the dichotomous key below to determine the species of each.



1.	Has green colored body .....go to 2
	Has purple colored body ..... go to 4
2.	Has 4 legs .....go to 3
	Has 8 legs ..... *Deerus octagis*
3.	Has a tail ..... *Deerus pestis*
	Does not have a tail ..... *Deerus magnus*
4.	Has a pointy hump ..... *Deerus humpis*
	Does not have a pointy hump.....go to 5
5.	Has ears .....*Deerus purplinis*