

Why should we care about taxonomy anyway?

How many eukaryotic species are named and described?

Approximately 1.4 Million

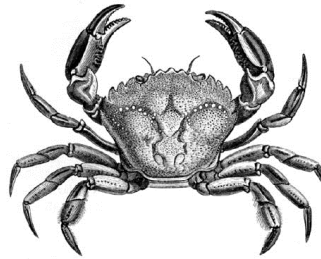
How many are believed to exist?

2-100 Million

How can we classify them?

Taxonomy

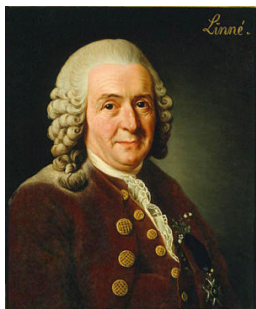
Ok, but why do we need scientific names then?



- English
- Shore crab;
- Common shore crab;
- Harbour crab;
- Green crab
- Portuguese
- Caranguejo verde.
- Spanish
- Cangrejo común;
- Cámbaro
- French
- Crabe vert;
- Crabe enragé
- Dutch
- Strandcrab
- German
- Gemeine Strandcrabbe;
- Dwarlslöper
- Norwegian
- Strandcrabbe

**Carcinus maenas**

Linnaeus 1758



Carolus Linnaeus (1707-1778)

Binomial nomenclature

Scientific names avoid the confusion of  
 - organisms with several common names  
 - common names that are shared by several organisms

Why use Latin?

Some simple rules

*Genus species* or *G. species*

Genus	species
capitalized	not capitalized
can be abbreviated	cannot be abbreviated
	italicized or underlined

Why do we need a classification system?

Organize species into groups

Identify new organisms

Show relationships between organisms

*Ursus americanus* American black



*U. arctos* brown



*U. maritimus* polar



*Panthera leo* lion



*P. tigris* tiger



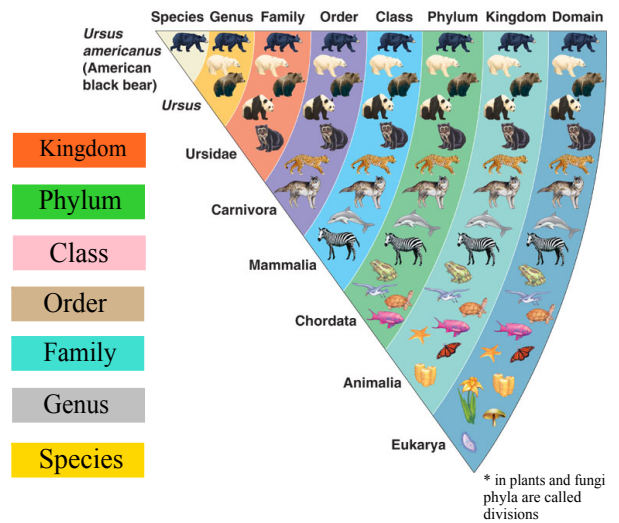
*P. pardus* leopard



*P. onca* jaguar



1. Give three reasons why taxonomy is important.
2. Why is the use of scientific names important?
3. Why is phylogeny sometimes called the foundation of taxonomy?



Kingdom  
Phylum  
Class  
Order  
Family  
Genus  
Species

Animalia	Animalia
Arthropoda	Chordata
Insecta	Mammalia
Coleoptera*	Primates
Geotrupidae**	Hominidae
Geotrupes	Homo
egeriei	sapiens

\* sheathed wings  
\*\* earth borer



4. Many of the classifications used by Linnaeus are still in use today, even though he did not know about evolution. Explain why this is so.

5. What is the relationship between a family and an order?

6. If two animals are in the same class, what other categories must they share?

7. *Panthera leo* (lion), *Canis latrans* (coyote), *Panthera tigris* (tiger), and *Procyon lotor* (raccoon) are all members of the order Carnivora. Which two members are the most closely related?

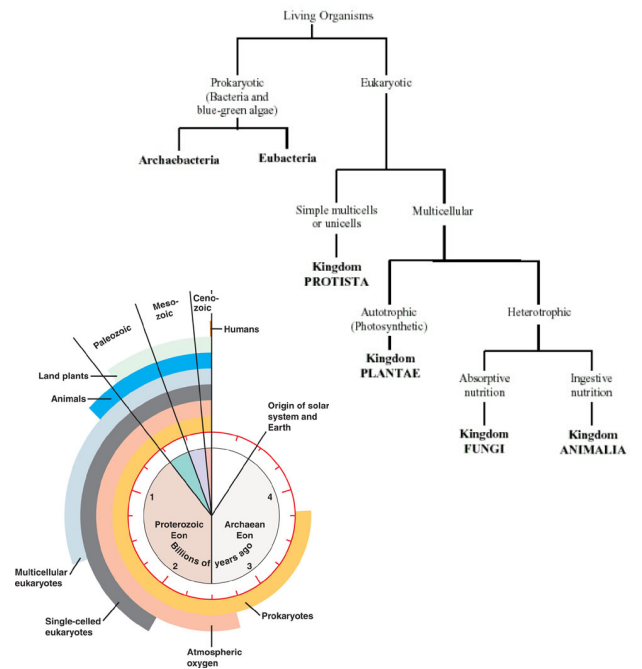
A dichotomous key can be used to identify unknown organisms.

1. Divide objects into two groups by a single contrasting feature.
  - start general and get more specific
  - try to use opposites
2. Continue to divide each group until each item is by itself.

1. corners . . . . . go to 2  
no corners . . . . . go to 3
2. 4 corners . . . . . go to 4  
5 corners . . . . . pentagon
3. round . . . . . circle  
elongated . . . . . oval
4. box . . . . . square  
elongated . . . . . rectangle



8. Explain how a classification key is organized?



THE SIX KINGDOM (THREE DOMAINS) SYSTEM

- Originally there were only two kingdoms recognized: animals and plants.



Kingdom Plantae

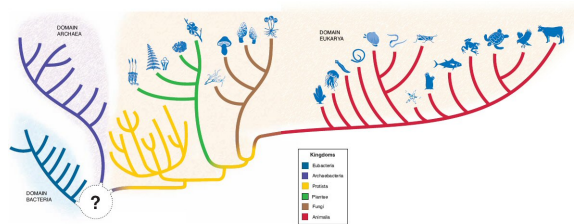


Kingdom Animalia



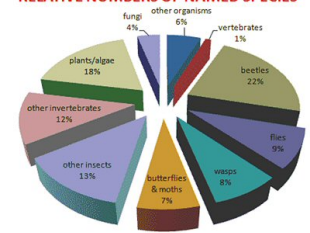
	Names of Kingdoms				
1700s	Plantae				
late 1800s	Protista			Plantae	Animalia
1950s	Monera	Protista	Fungi	Plantae	Animalia
1990s	Eubacteria	Archaeobacteria	Protista	Fungi	Plantae
Domain	Bacteria	Archaea	Eukarya		

Characteristics Shared by all Animals

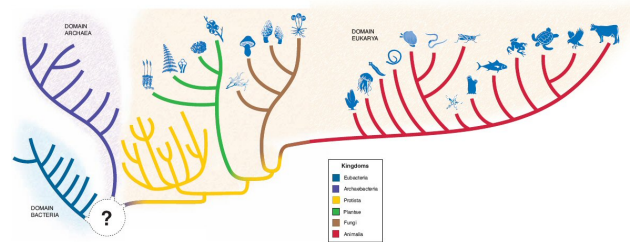


Try this:  
Think of an animal.  
- did you think of a vertebrate?  
- was it a mammal?

RELATIVE NUMBERS OF NAMED SPECIES

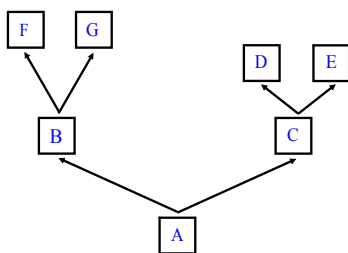


9. What things seem to be the most important for determining which kingdom an organism will be placed in?
10. How has technology affected classification?
11. In addition to physical appearance, what else do modern taxonomists consider?
12. Why are bacteria classified in their own kingdoms and not with plants, animals, protists, or fungi?
13. a) Why is kingdom Protista considered the "odds and ends" kingdom?  
b) Although kingdom Protista contains organisms which do not seem to fit in any other kingdom. Do they actually have any characteristics in common?
14. What is the evolutionary significance of the three groups of protists?
15. What characteristics are shared by all plants?
16. Suppose you were a microbiologist who had just discovered a new organism. The organism was unicellular, lacked chloroplasts, and had no cell wall. Which kingdom would you place it in?
17. What similarities and differences exist between plants and protists?
18. What similarities and differences exist between plants and fungi?
19. What three important features are used by botanists to divide plants into four groups?
20. What are the major characteristics that distinguish animals from plants?
21. Why is it not sufficient to classify animals simply as multicellular heterotrophs?



There are greater differences between prokaryotes and eukaryotes than between plants and animals.

There is greater diversity between the two prokaryotic groups than among all eukaryotic groups.

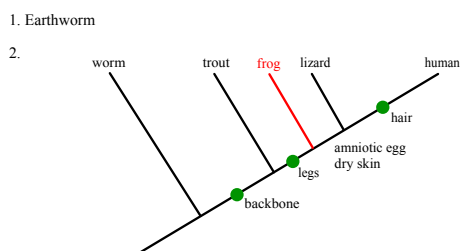


1. Which species appeared the earliest?
2. Which species are the most recent?
3. Are species F and G more closely related than A and G?

Organism	Derived Character		
	Backbone	Legs	Hair
Earthworm	Absent	Absent	Absent
Trout	Present	Absent	Absent
Lizard	Present	Present	Absent
Human	Present	Present	Present

Build a cladogram

1. Which organism is least closely related to the others?
2. Construct a cladogram of these organisms.
3. What trait separates the least closely related organism from the other animals?
4. Does your cladogram indicate that lizards and humans share a more recent common ancestor than either does with an earthworm? Explain.
5. Where would you insert a frog if you added it to the cladogram?

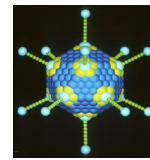


3. Backbone
4. Yes. lizards and humans shared an ancestor that had legs and a backbone
5. A frog would occupy a branch between the trout and the lizard because it has legs. We would have to add a character like dry skin to separate it from the lizard.

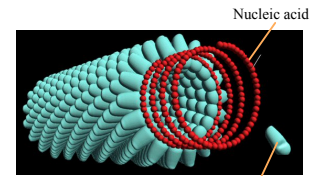
22. Both snakes and worms are tube-shaped with no legs. How could you determine whether the similarity in shape means that they share a recent common ancestor?

23. You are hanging out in the rain forest of Costa Rica and you notice some beetles. Beetles A and B are quite similar but have different markings on their wings. Also, both beetles resemble a third beetle, beetle C that has been previously described. How could you use DNA to determine whether beetles A and B are more closely related to one another or to beetle C?

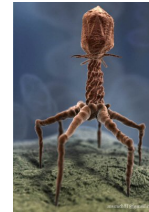
24. Of course, we're animals. Thinking about your own personality, which kingdom do you see yourself identifying with? Why?



Animal virus



Plant virus



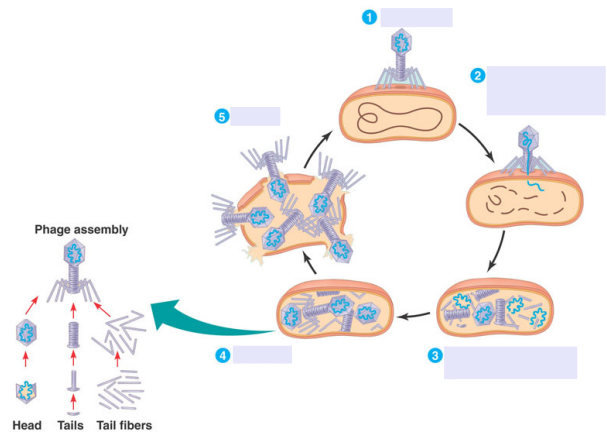
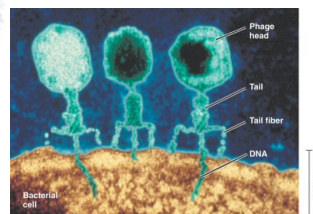
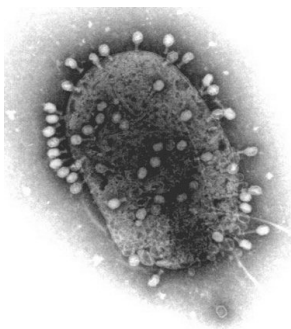
Bacterial virus

Nucleic acid  
Capsid protein

- the typical virus has the nucleic acid at the core surrounded by a protein coat called the capsid and in some cases, a membrane
- capsid proteins bind to receptors on the surrounding surface of a cell and "trick" the cell into allowing it inside
- because viruses must attach to specific proteins on the host cell membrane, most are able to infect only a specific type of cell in a species or related species
- simple viruses have only a few genes while the most complex still have no more than a few hundred (humans have ~25,000)
- once inside the host cell, the viral genes take over the cell organelles and direct them to make new viruses.
- they have no organelles, no membrane of their own, and they do not divide.

Are viruses alive?

Characteristic	Virus	Cell
Structure	•	•
Reproduction	•	•
Genetic Code	•	•
Growth & Development	•	•
Obtain & Use Energy	•	•
Response to Environment	•	•
Change Over Time	•	•



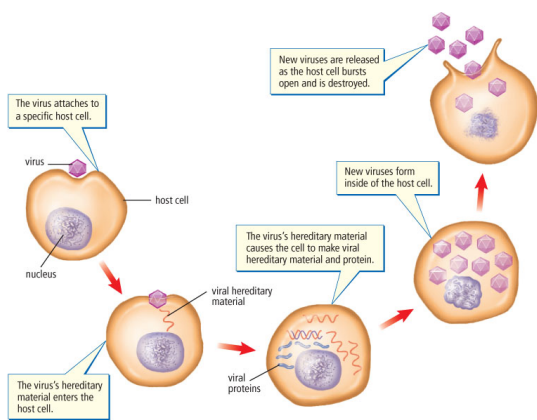
- some viruses cause the cell to burst so that the new virus particles can escape to infect surrounding cells.
- other viruses remain hidden inside the host cell indefinitely and become active only when the right conditions trigger them.
- viruses cause disease by attacking and destroying certain cells in the body, causing the symptoms of the disease.
- vaccines can be used to prevent viral infections but once infection occurs, it is normally quite difficult to treat.

What are some ways that we transfer viruses between people?

- Airborne
- Water
- Direct Contact
- Vector transmission

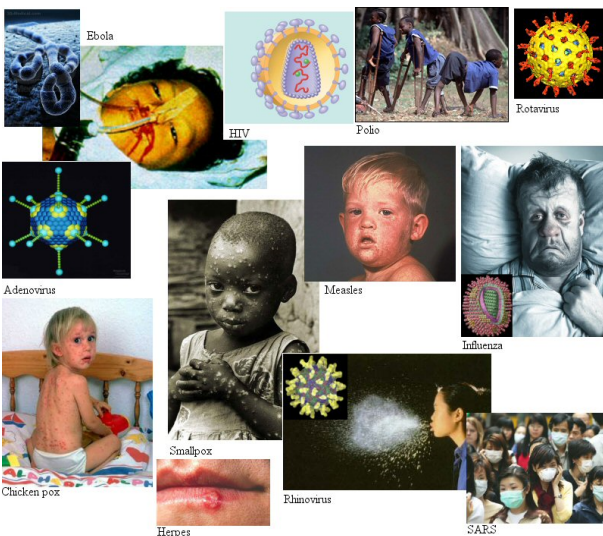
Epidermodysplasia verruciformis

Animal virus infection



### Viral infections

<b>Encephalitis/meningitis</b>	<b>Common cold</b>	<b>Eye infections</b>
- JC virus	- Rhinoviruses	- Herpes simplex virus
- Measles	- Parainfluenza virus	- Adenovirus
- LCM virus	- Respiratory syncytial virus	- Cytomegalovirus
- Arbovirus		
- Rabies		
<b>Pharyngitis</b>	<b>Gingivostomatitis</b>	<b>Parotitis</b>
- Adenovirus	- Herpes simplex type 1	- Mumps virus
- Epstein-Barr virus		
- Cytomegalovirus		
<b>Cardiovascular</b>		<b>Pneumonia</b>
- Coxsackie B virus		- Influenza virus, Types A and B
		- Parainfluenza virus
		- Respiratory syncytial virus
		- Adenovirus
		- SARS coronavirus
<b>Hepatitis</b>		<b>Myelitis</b>
- Hepatitis virus		- Poliovirus
types A, B, C, D, E		- HTLV-I
<b>Skin infections</b>		<b>Gastroenteritis</b>
- Varicella zoster virus		- Adenovirus
- Human herpesvirus 6		- Rotavirus
- Smallpox		- Norovirus
- Molluscum contagiosum		- Astrovirus
- Human papillomavirus		- Coronavirus
- Parvovirus B19		
- Rubella		<b>Sexually transmitted diseases</b>
- Measles		- Herpes simplex type 2
- Coxsackie A virus		- Human papillomavirus
		- HIV
		<b>Pancreatitis</b>
		- Coxsackie B virus



Epidermodysplasia verruciformis

25. Why is there controversy as to whether a virus is living or non-living?
26. Could you accept the hypothesis that viruses were the precursors to life on this planet? Explain.
27. a) How is it that a virus is quite specific in the type of cell that it can infect?  
b) Suppose you were trying to develop a way to stop a virus from infecting a cell. How could this be done?
28. Describe how viruses can be spread.
29. Do viruses and bacteria cause disease in the same way? Explain.
30. Why are viral infections difficult to treat?