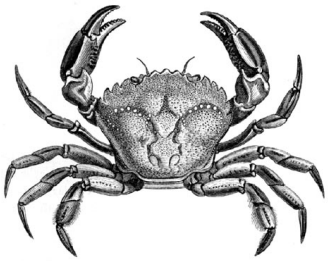
Why should we care about taxonomy anyway?

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
Portugese
Caranguejo verde.
Spanish
Cangrejo comúm;
Cámbaro
French
Crabe vert;
Crabe enragé
Dutch
Strandcrab
German
Gemeine Strandcrabbe;
Dwarlslöper
Norwegian
Strandcrabbe

Carcinus maenas
Linnaeus 1758

What the???

Carolus Linnaeus (1707-1778)

Binomial nomenclature
2 name
Scientific names avoid the confusion of
- organisms with several common names
- common names that are shared by several organisms

Why use Latin?

E. coli

Some simple rules

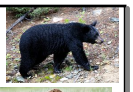
Genus species or *G. species*

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

Linnaeus

Ursus americanus	American black	
U. arctos	brown	
U. maritimus	polar	
Panthera leo	lion	
P. tigris	tiger	
P. pardus	leopard	
P. onca	jaguar	

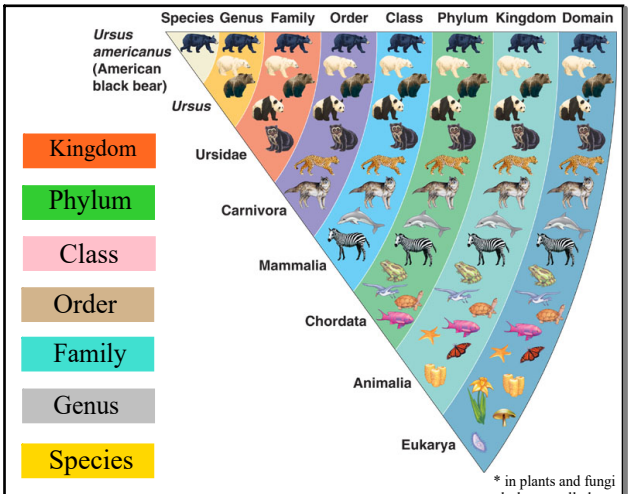
Examples

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?

CQ



* in plants and fungi phyla are called divisions

Taxa

Kingdom	Animalia	Animalia
Phylum	Arthropoda	Chordata
Class	Insecta	Mammalia
Order	Coleoptera*	Primates
Family	Geotrupidae**	Hominidae
Genus	*Geotrupes*	*Homo*
Species	*egeriei*	*sapiens*

* sheathed wings
** earth borer

Classification e.g.

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* (racoon) are all members of the order Carnivora. Which two members are the most closely related?

CQ

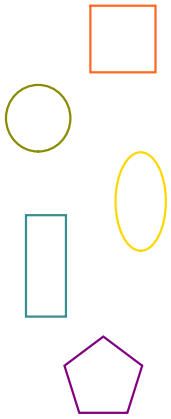
A dichotomous key can be used to identify unknown organisms.
1. Divide objects into two groups by a single contrasting feature.
- start general and get more specific
- try to use opposites
2. Continue to divide each group until each item is by itself.

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



Dichotomous Key

X-Men

In pairs, use the key to discover your character's name.

Step 1	**Appears to be female... go to step 2**
	Does not appear to be female...go to step 3
Step 2	**Has white hair...go to step 4**
	Does not have white hair... step 5
Step 3	**Has wings...Angel**
	Does not have wings...go to step 6
Step 4	**Wears a cape...Storm**
	Does not wear a cape...Rogue
Step 5	**Has blue skin...Mystique**
	Does not have blue skin...Phoenix
Step 6	**Has obvious claws...go to step 7**
	Does not have obvious claws...go to step 8

X-Men Key

Step 7	**Walks upright...Wolverine**
	Does not walk upright...go to step 9
Step 8	**Has a tail...Nightcrawler**
	Does not have a tail...go to step 10
Step 9	**Has blue fur...Beast**
	Does not have blue fur...Sabretooth
Step 10	**Wears a helmet...Magneto**
	Does not wear a helmet...go to step 11
Step 11	**Is paralysed from the waist down...Xavier**
	Is not paralysed from the waist down...go to step 12
Step 12	**Wears eye protection...Cyclops**
	Does not wear eye protection...Iceman

X-Men Key

8. Explain how a classification key is organized?

CQ

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

6 Kingdoms History

Characteristics Shared by all Animals

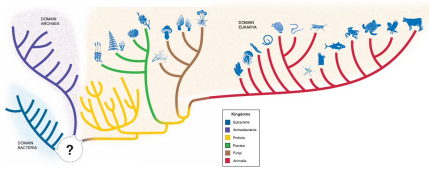
move

eat

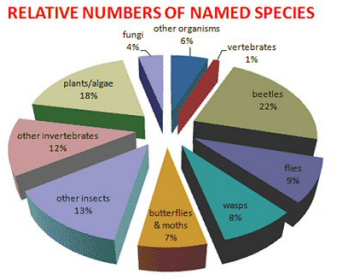
Pull

1. Eukaryotic
2. Multicellular
3. Heterotrophic
4. Sexually reproducing
5. Motile at some stage

Characteristics of animals



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



Representation of animals

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?

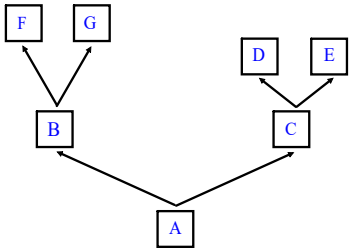
17. What similarities and differences exist between plants and protists?

18. What similarities and differences exist between plants and fungi?

19. What are the major characteristics that distinguish animals from plants?

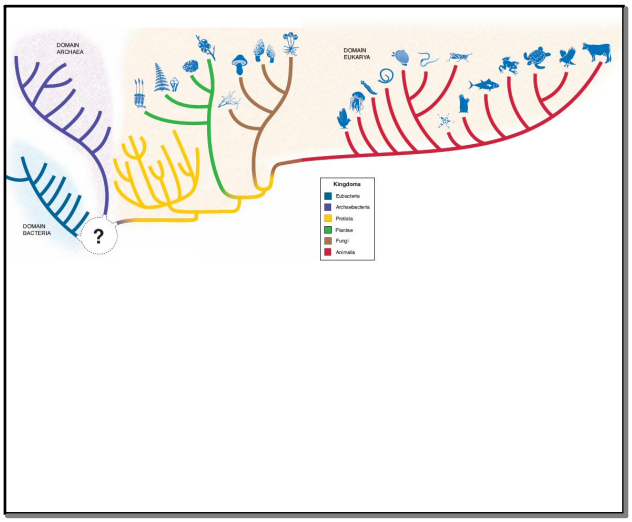
20. Why is it not sufficient to classify animals simply as multicellular heterotrophs?

CQ



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?

Phylogenetic tree



Phylogenetic Tree

Build a cladogram

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

1. Which organism is least closely related to the others?

2. Construct a cladogram of these organisms.

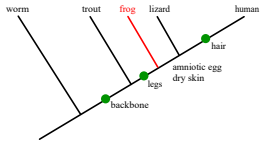
3. What trait separates the least closely related organism from the other animals?

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?

1. Earthworm

2.



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.

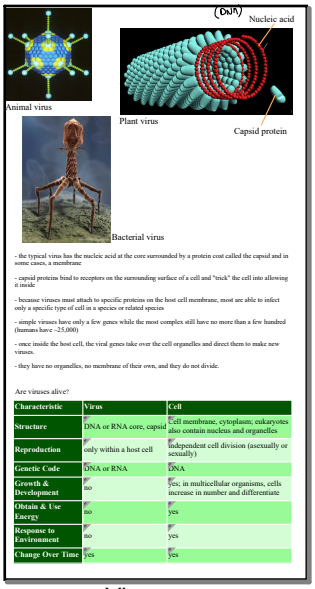
Build a cladogram

21. 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?

22. 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?

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

CQ



- 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)

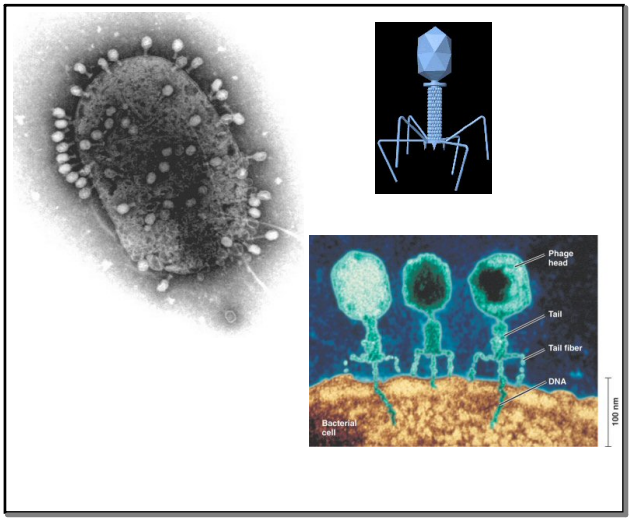
- once inside the host cell, the viral genes take over the cell organelles and direct them to make new viruses.

- they have no organelles, no membrane of their own, and they do not divide.

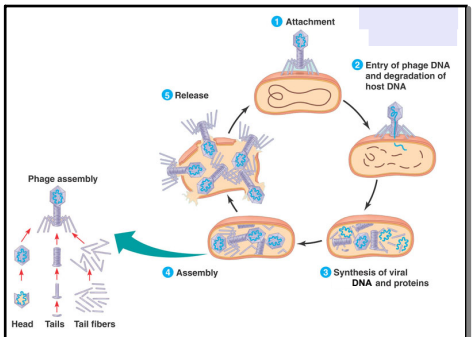
Are viruses alive?

Characteristic	Virus	Cell
Structure	DNA or RNA core, capsid	Cell membrane, cytoplasm; eukaryotes also contain nucleus and organelles
Reproduction	only within a host cell	independent cell division (asexually or sexually)
Genetic Code	DNA or RNA	DNA
Growth & Development	no	yes; in multicellular organisms, cells increase in number and differentiate
Obtain & Use Energy	no	yes
Response to Environment	no	yes
Change Over Time	yes	yes

Viruses



Phage infection



-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.

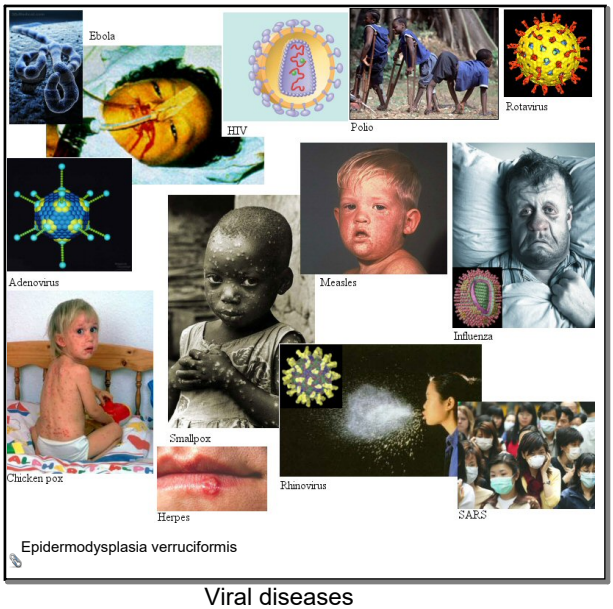
- viruses cause disease by attacking and destroying certain cells in the body, causing the symptoms of the disease.

- 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 — food
Direct Contact
Vector transmission

Lytic cycle



Viral diseases

24. Why is there controversy as to whether a virus is living or non-living?

25. Could you accept the hypothesis that viruses were the precursors to life on this planet? Explain.

26. 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?

27. Describe how viruses can be spread.

28. Do viruses and bacteria cause disease in the same way? Explain.

29. Why are viral infections difficult to treat?

CQ

Attachments

- Animal Virus Infection.flv
- Tree man - Epidermodysplasia verruciformis.mp4