

# Evolution 8

- send answer to iClicker Question 5A now.
- Phylogeny & demo
- Tree Building Survey comments
- History of the Earth
  - overview
  - phylogeny of life/applications
- iClicker Question 5B

Look at  
handout  
page 8-5.  
Don't look  
at extra  
handout yet.

Due in lab this week:

- ⇒ pre-lab for ~~Skulls & Evolution~~ <sup>Mol Phy</sup> (lab manual p. 13 and on-line)
- ⇒ HMNH lab report (Just answer questions 1 thru 5).
- ⇒ Meet in W-2-030 & -032

Phylogeny - evolutionary history of organisms

assumptions

- ① start simple → get complex
- ② "features" are added sequentially  
(not added, lost, regained)

⇒ parsimony analysis

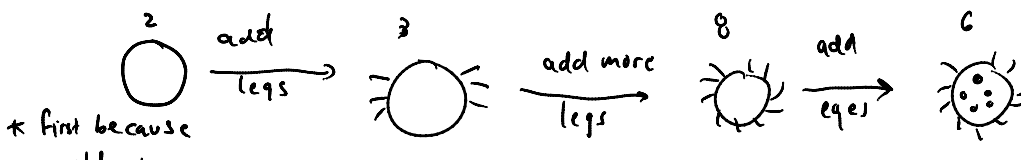
= simplest explanation/interpretation of the data  
- most likely true (campbell fig 26.15)

Phylogeny demo (page 8-5) (Parsimony)

- ① break into major groups (Shape)

round                      oval  
2, 3, 8, 6                      1, 4, 5, 7, 9, 10

- ② take round ones: ·· fewest "features" to most "features"



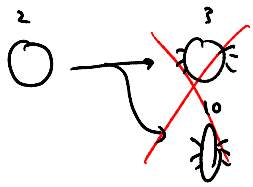
oldest

why not 2 → 8 → 3 ?

unlikely to gain : lose legs

③ oval ones

is it?

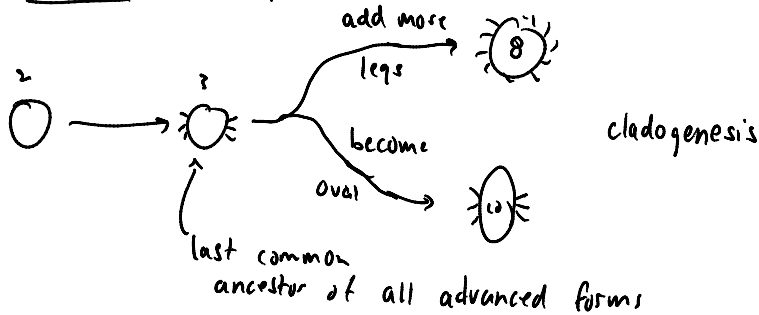


no because independent evolution of very similar legs is unlikely

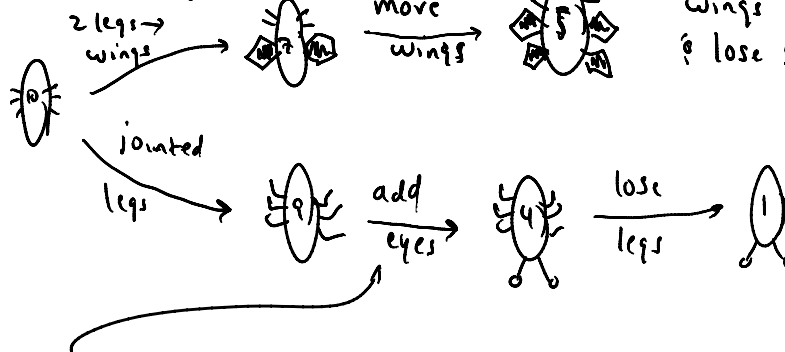
so assume legs are homologous structures

- look alike because of shared ancestry (ex human & cat legs)

therefore more parsimonious



④ keep going

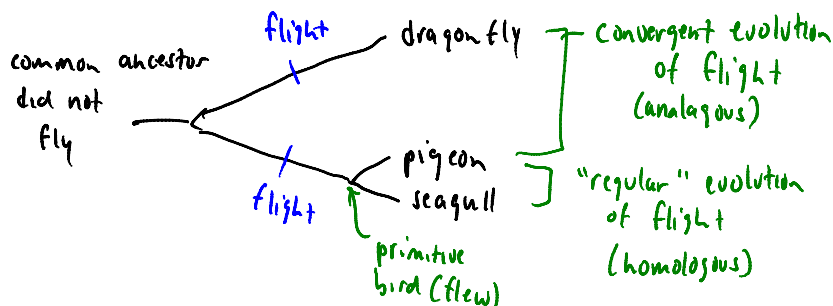


more likely to duplicate wings than to add a lot & lose some

convergent evolution of eyes

\* structures with similar functions and similar structures but not due to shared ancestry are analogous structures

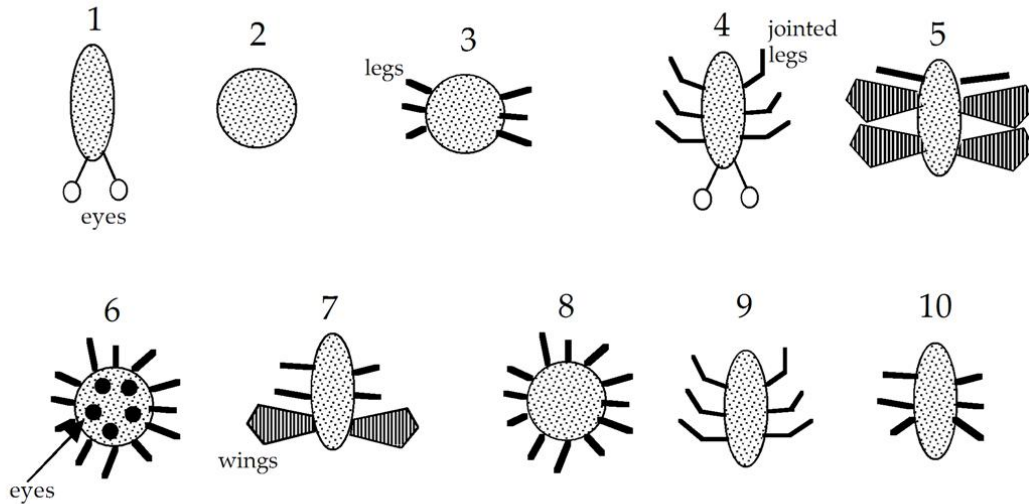
- common ancestor of 4 and 6 lacked eyes



bird (flew)

(homologous)

## Bio 112 Phylogeny Demonstration Problem



### Other info:

- in a layer of rock that is 600 million years old, you only find type 2.
- in a layer of rock 200 million years old, you find 4, 5, and 6 but not 1.

Suppose you found these fossil creatures on Mars. What might you conjecture about their evolutionary history?

# Bio 112: "Tree thinking" handout

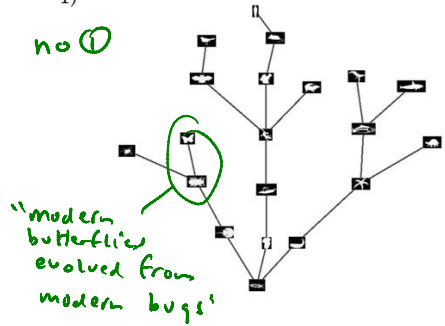
Comments on your responses to the "Diversity of Life Survey":

Important features that all trees must have:

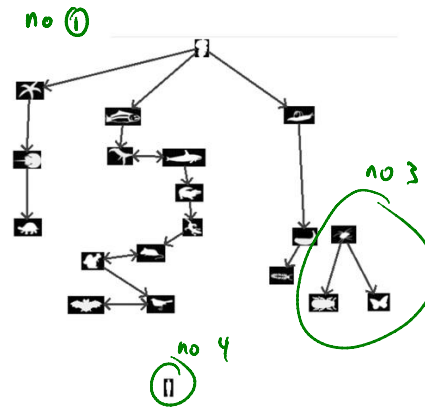
1. Since the tree shows the passage of time from left to right, *extant (currently living) organisms must be at the ends of branches.*
2. Since some organisms fall into groups and these groups have groups within them, *the tree should be hierarchical.*
3. Since all organisms descended from a common ancestor, *the tree should have only one root.*
4. Since humans evolved from animal ancestors, *humans should be part of the tree.*

Some sample Trees:

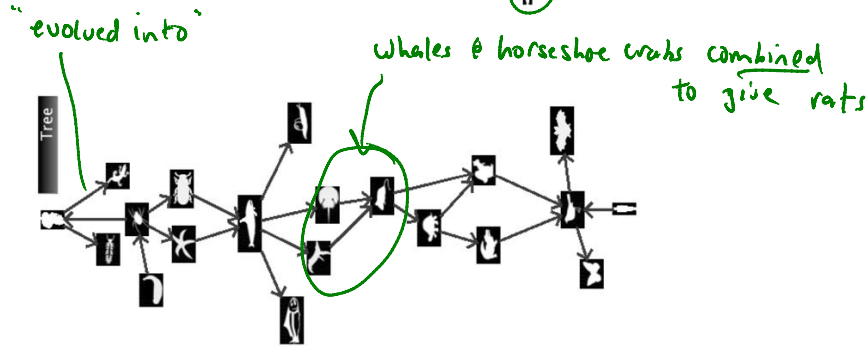
1)



2)

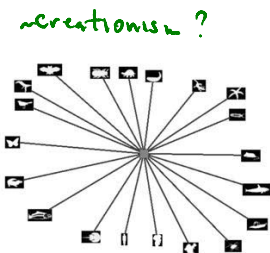


3)

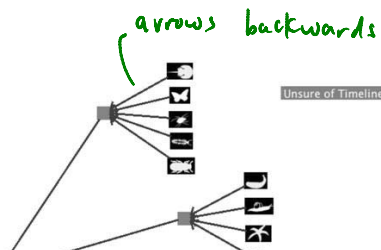


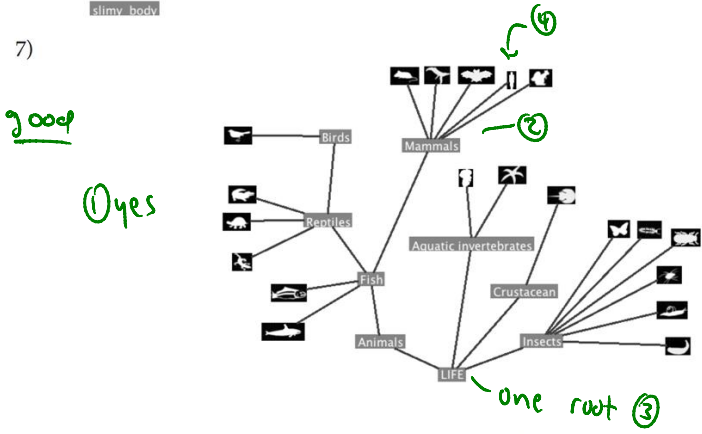
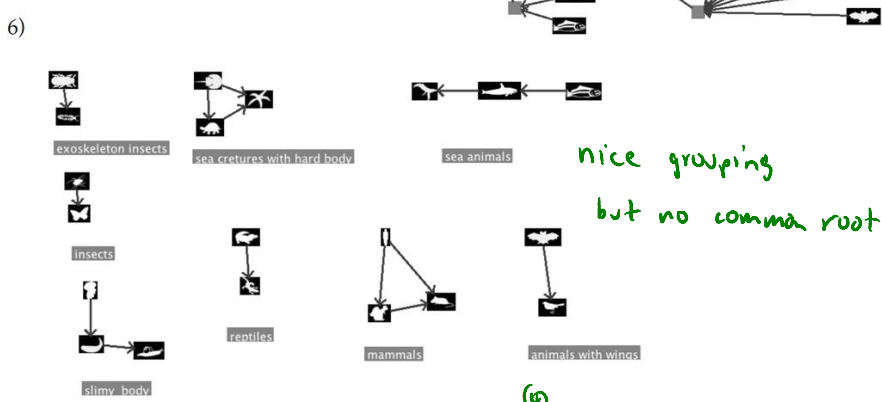
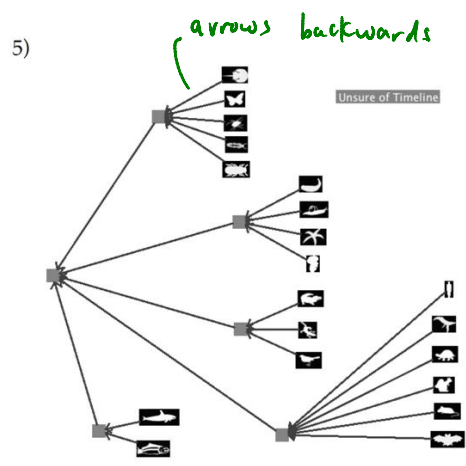
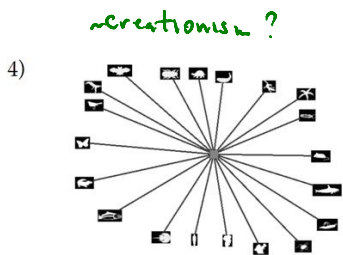
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4)



5)

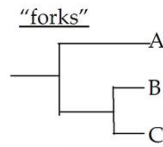
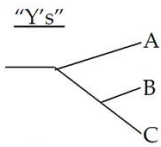




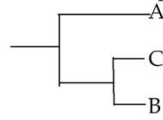
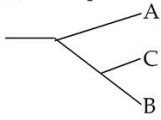
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Other notes:

a) There are two equivalent ways to show a tree, but they can be confusing:



**In both:** the top-to bottom order does not matter. These are equivalent trees:



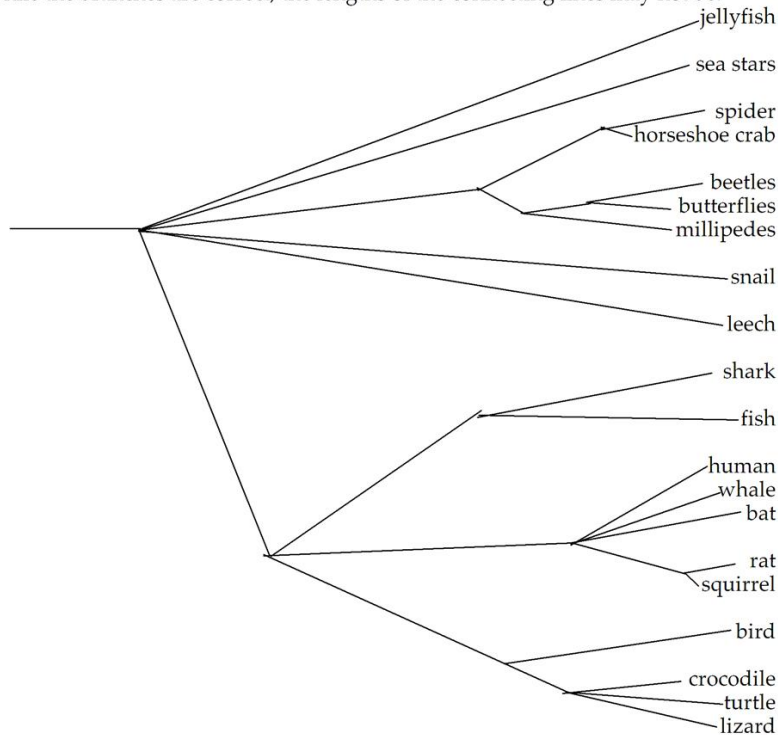
There are differences between the two representations:

Here, the "evolutionary distances" are measured as though you drove a car from A to B and measured the road miles of the entire trip.

Here, the "evolutionary distances" are measured only horizontally. The vertical spacing is meaningless.

The most correct answer to the survey is:

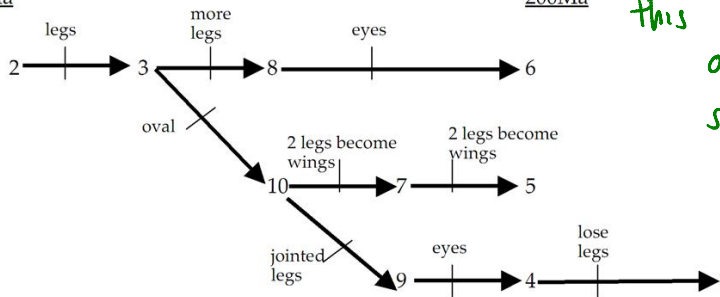
- note that, while the branches are correct, the lengths of the connecting lines may not be.



Here is the complete tree for the "Martian organisms":

600 Ma

200 Ma



this contains extinct organisms so ok to violate ①

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What can you learn from phylogeny? (see handout)

① common ancestors

② intermediate forms "missing links" - lead to testable hypotheses

- there should be intermediate between ape-like animals & humans & there is (see skulls lab)

- "dinosaurs & birds = a feathered dinosaur



there is Archaeopteryx

- shouldn't be human-insect intermediate form  
(animals split before this)  
exo-endo skeleton, etc. - there isn't.