



first practice exam is now on NB

# QUESTIONS / COMMENTS on chapters 1 + 2?

Consider the fossil record, at some point in the past you find evidence for organisms with shells; what kinds of plausible model could you make to explain this observation and what type of (fossil) evidence would support your conclusions.



Organisms might develop a shell because...  
explain your logic

- evolution does random things
- for protection from predators
- shells have multiple functions
- shells are pretty

# Chapter 3 Evolution

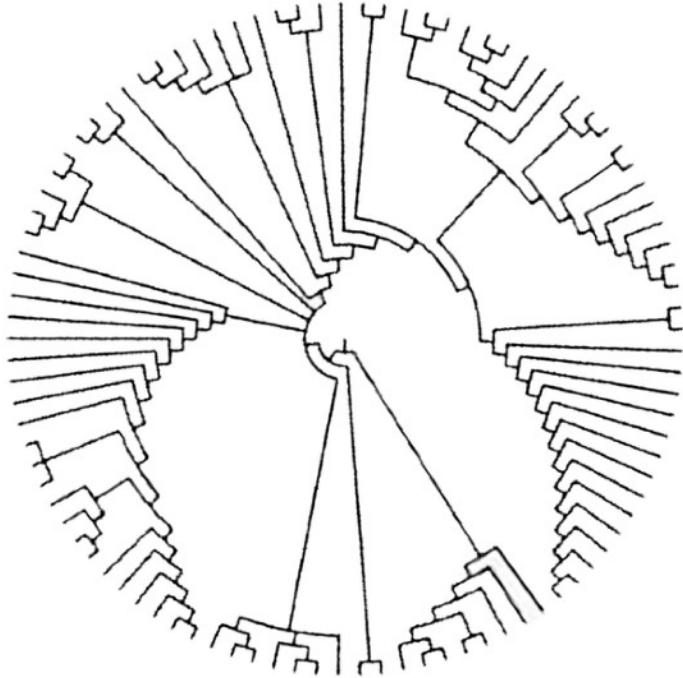
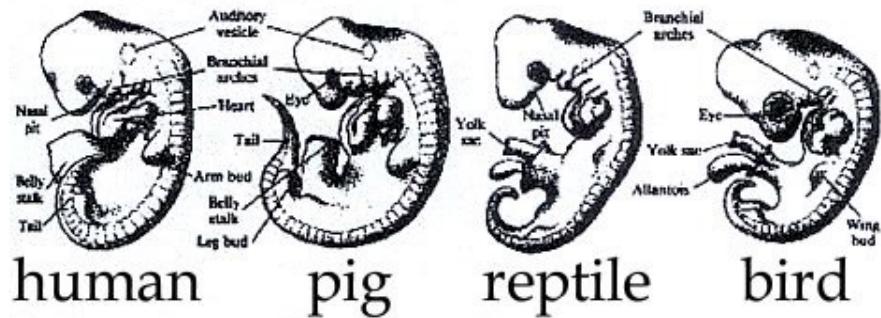
# **roots of modern science:** natural theology

Short group discussion: What is natural theology?

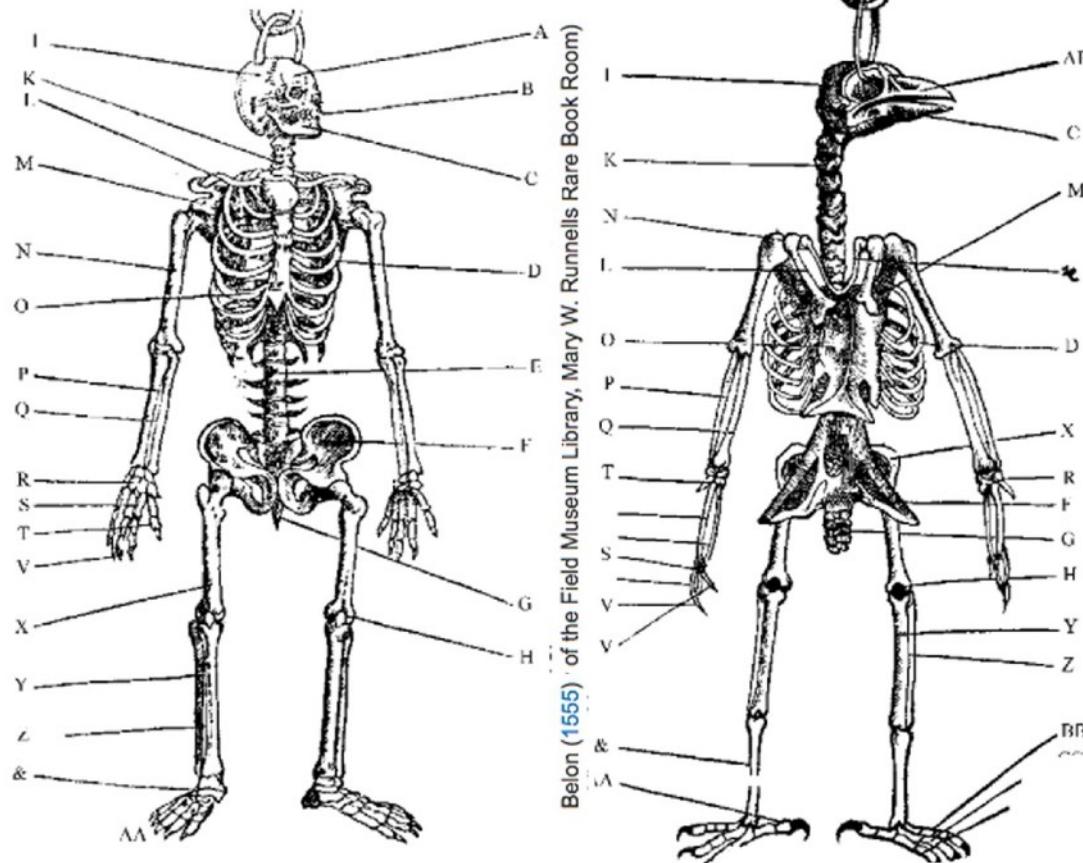
What types of observations made natural theology problematic?

# Indisputable biological facts

remarkable diversity of organisms: millions of distinct species



similarities  
between  
organisms



## Homology: A Philosophical and Biological Perspective

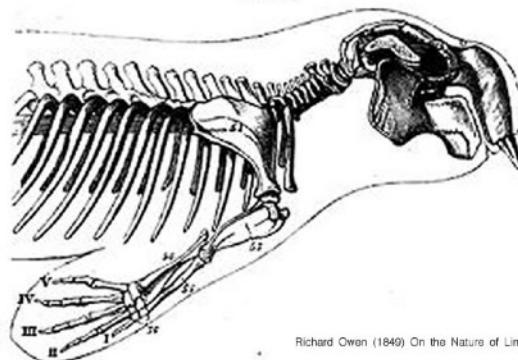
Olivier Rieppel

Handbook of Paleoanthropology

10.1007/978-3-540-33761-4\_6

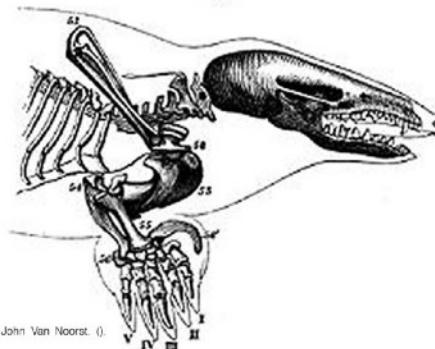
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Fig. 1.



External form and skeleton of the pectoral fin of the Dugong  
(*Halicore indicus*).

Fig. 2.



External form and skeleton of the fore-limb of the Mole (*Talpa Europaea*).

# Linnaean (1750ish) classification scheme

Short group discussion:

What basic features of Linnaean classification?

Is Linnaean classification a law or a theory?

What is a (useful for classification) trait?

Q: You discover life on a planet orbiting another star in another galaxy; would you expect such organisms to fit into the Linnaean classification system?

Genes are also traits (that can be quantified)

is the gene present in an organism?

how different is it from a similar gene in other organisms?

is it in the same genomic neighborhood (synteny)

PLOS BLOG: [link](#)

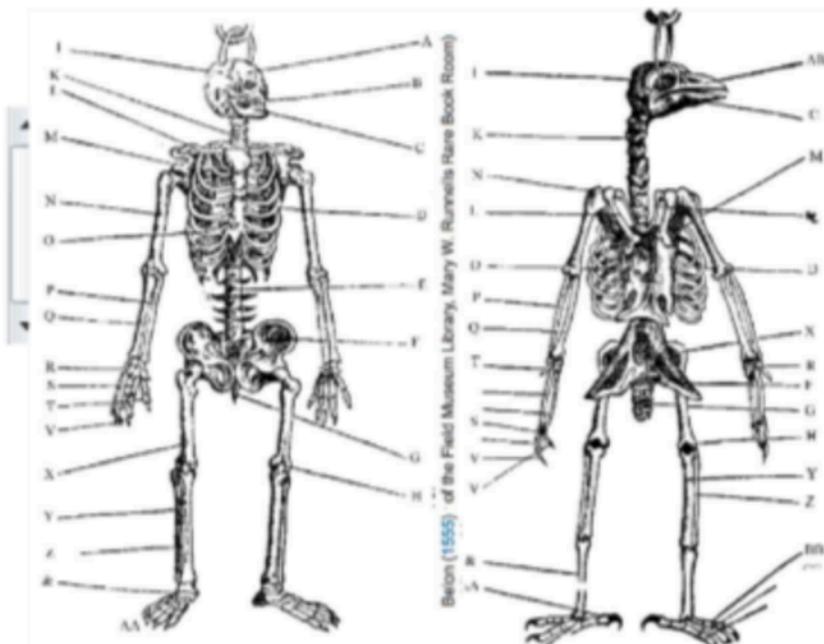
Data from [genomicus](#)

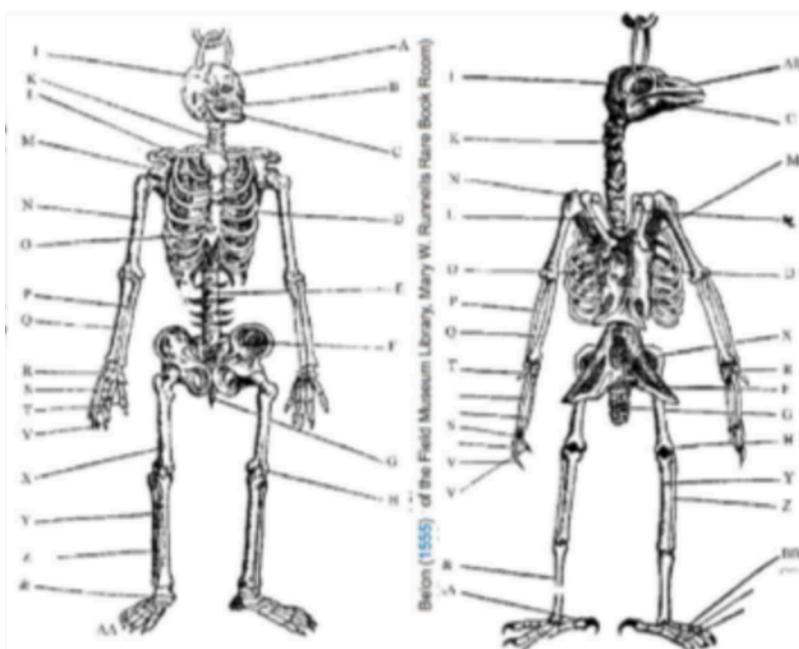
## Chapter 3.1 read pages 42-49 first.

Turns out it is possible to classify organisms into groups based on structural features. What structural features do primates (humans) and birds share?

- hip structure
- four limbs
- skull (cranium)
- mammary glands
- parental care of offspring
- rib cage

Why, do you think, that these traits are shared, why aren't all traits shared?

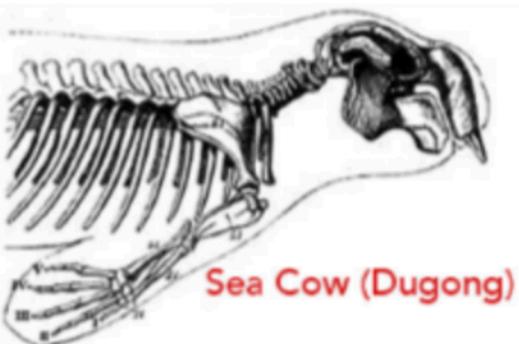




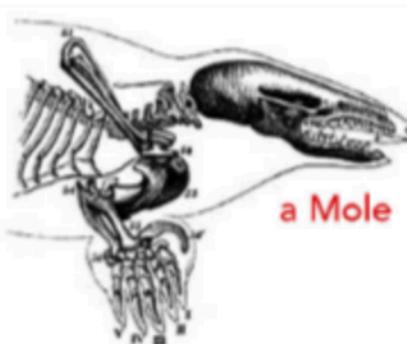
Why are behavioral traits less useful than structural traits in developing a classification scheme?

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How might a creationist (of any sort) explain the skeletal similarities between a mole and a sea cow?

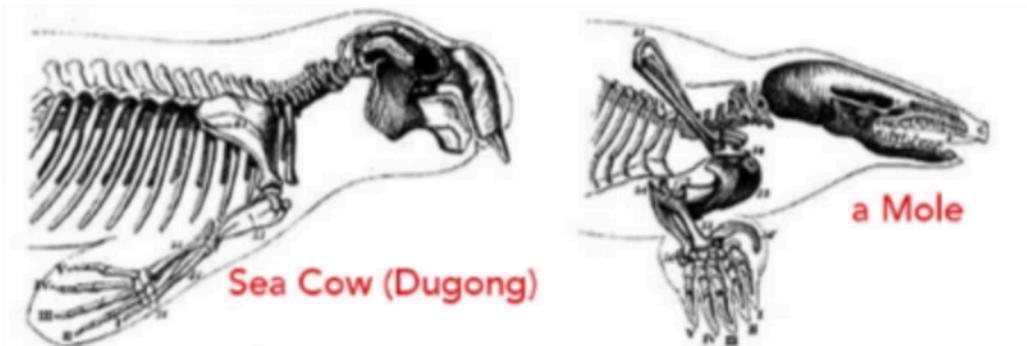


Sea Cow (Dugong)



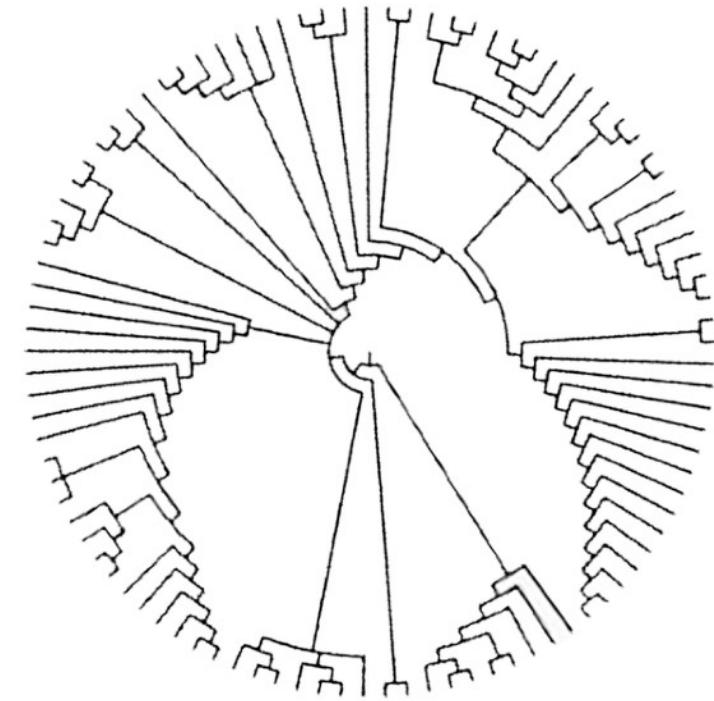
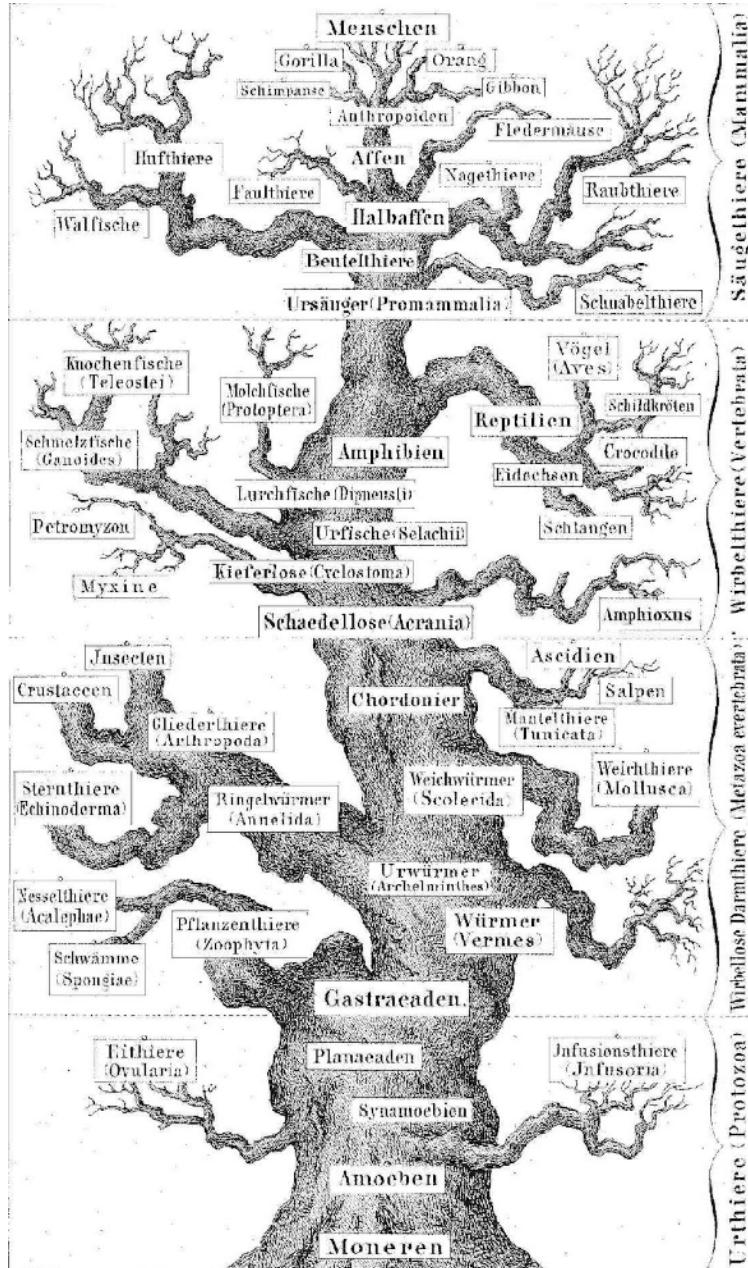
a Mole

From a Linnaean perspective, a sea cow and a mole are both members of larger groups, they are both mammals and vertebrates. Draw a diagram of indicates their relationship to each other, and to a bird and a turtle.



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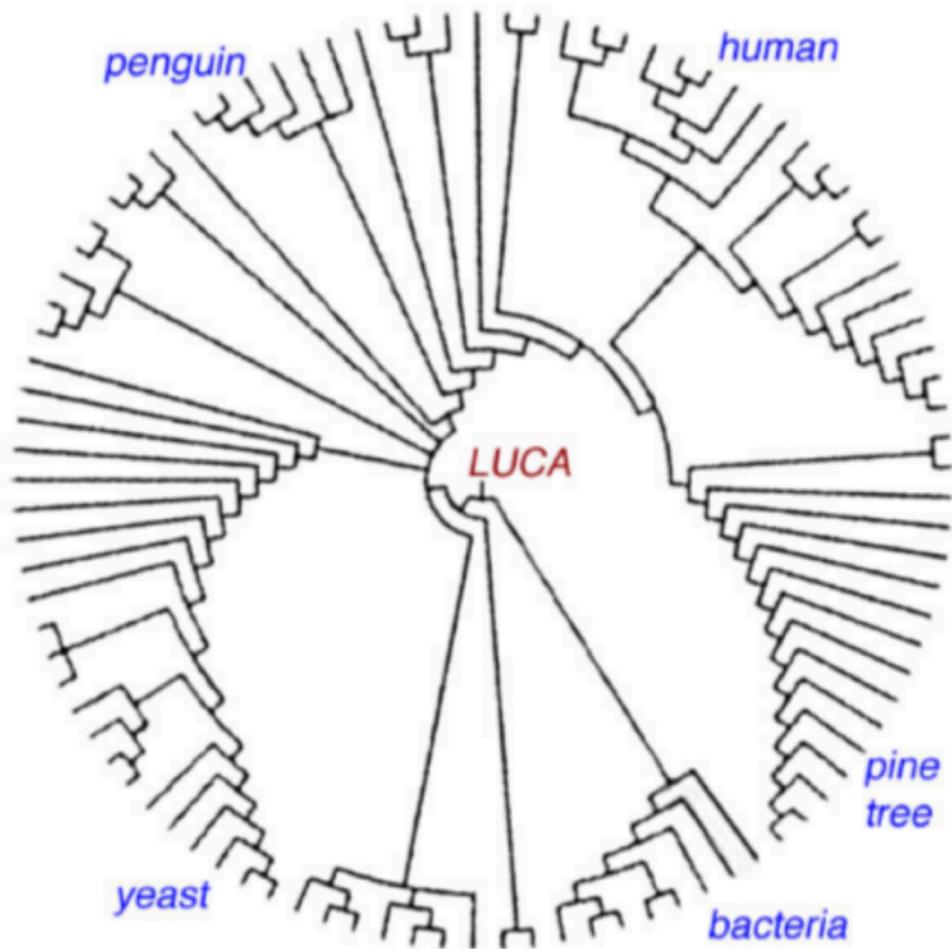
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Which is a more "realistic" depiction of the diversity of life and why?

Hillis Tree pdf

Here is a circular phylogenetic tree. Draw a circle around what might be considered a genus and a square around what you might consider a larger group (like an order or a phylum).



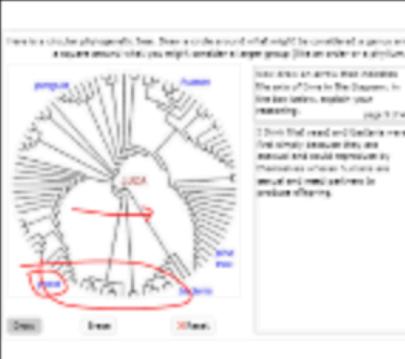
Now draw an arrow that indicates the axis of time in the diagram; in the box below, explain your reasoning.

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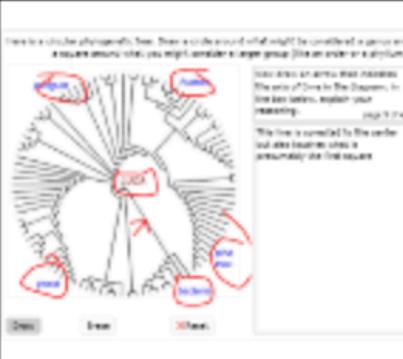
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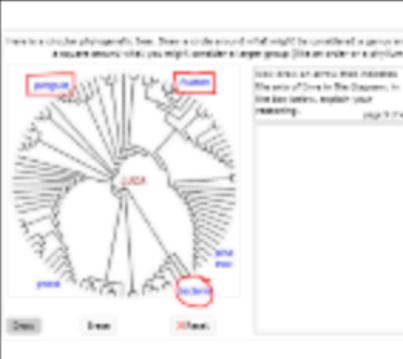
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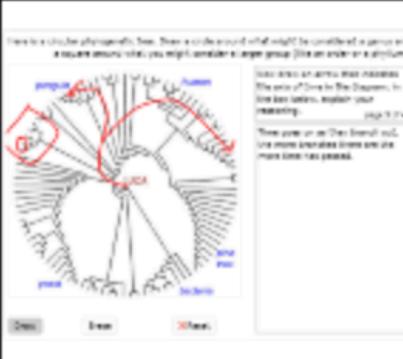
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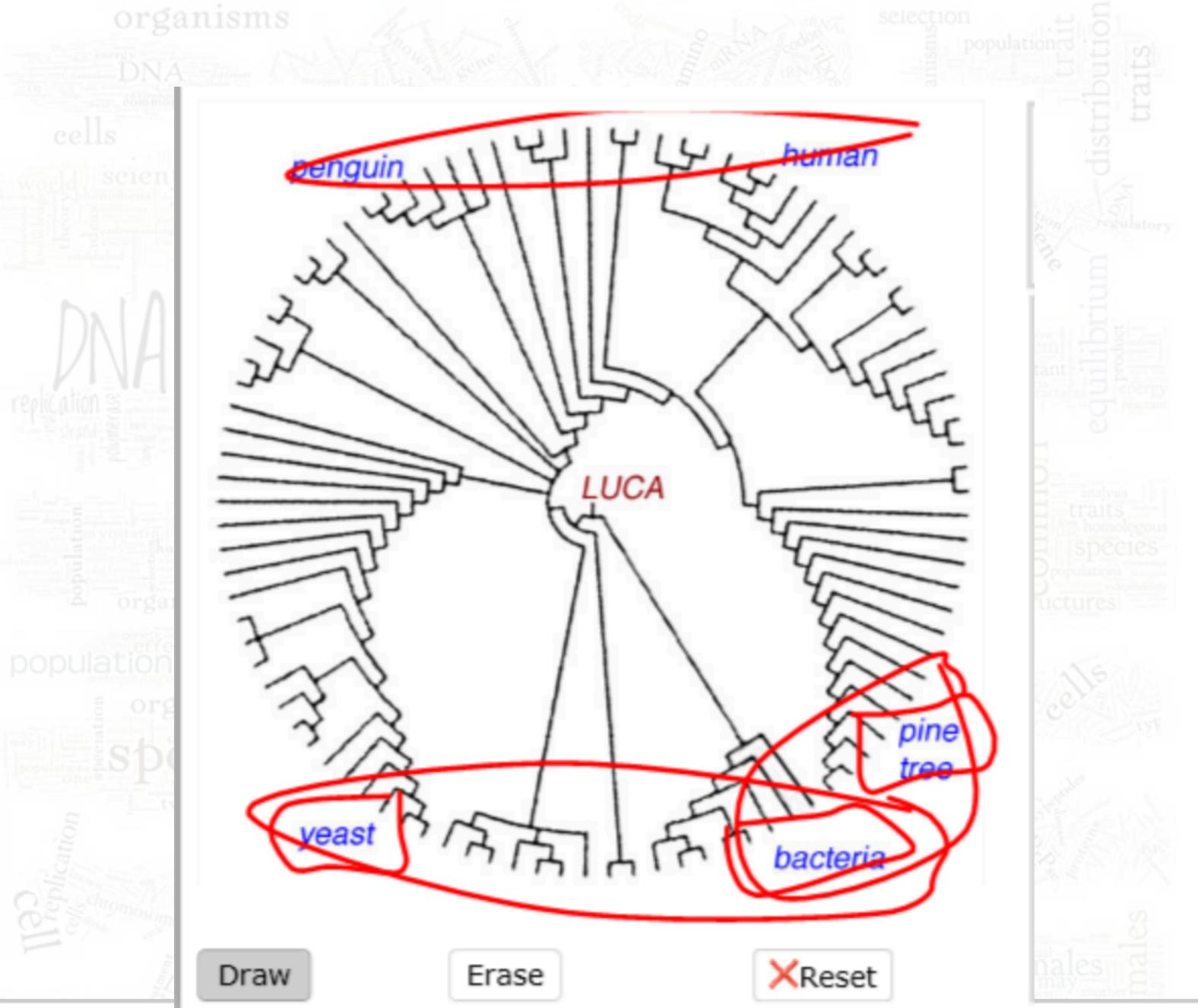
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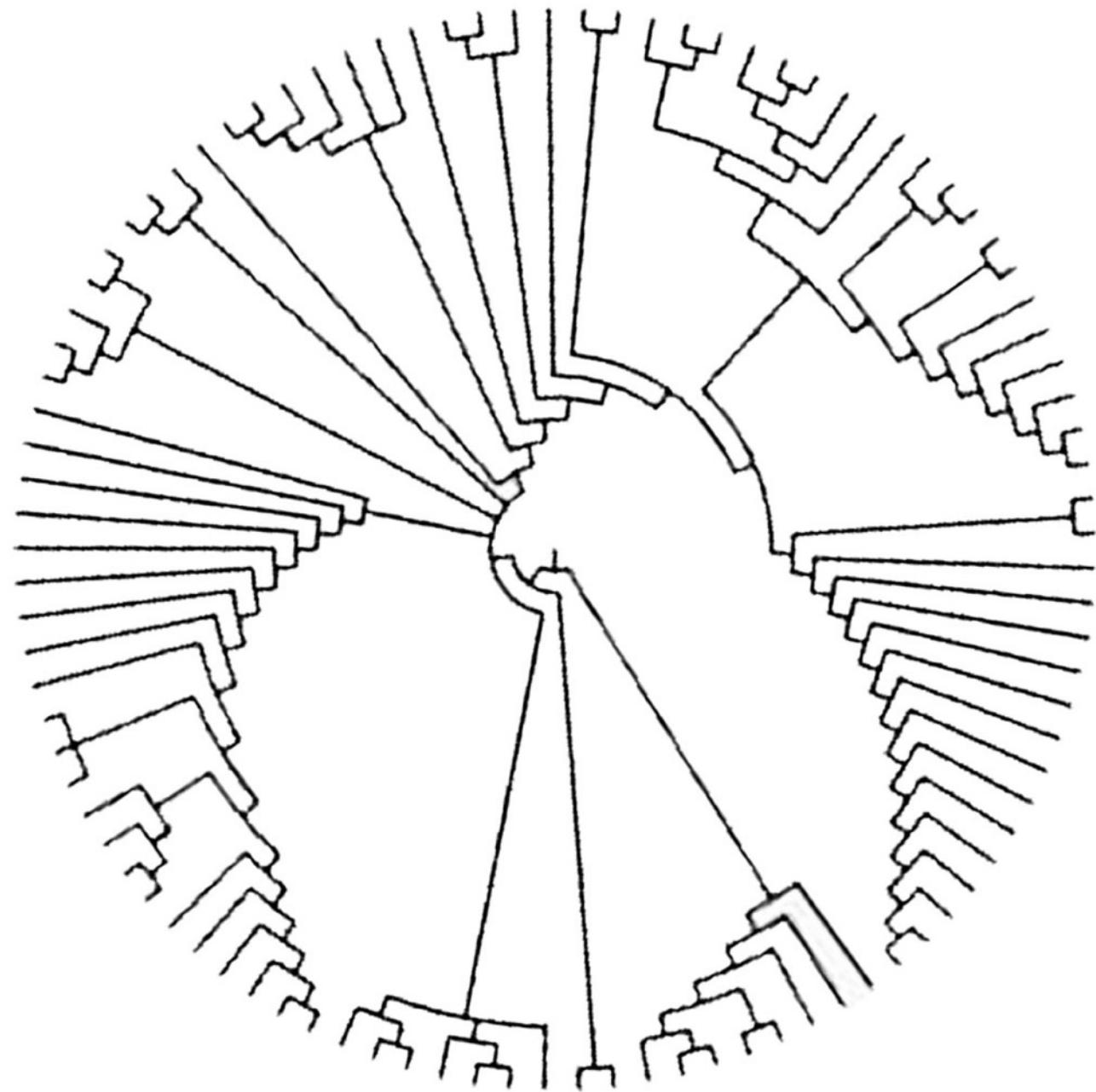


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Circle for species,  
square for genus

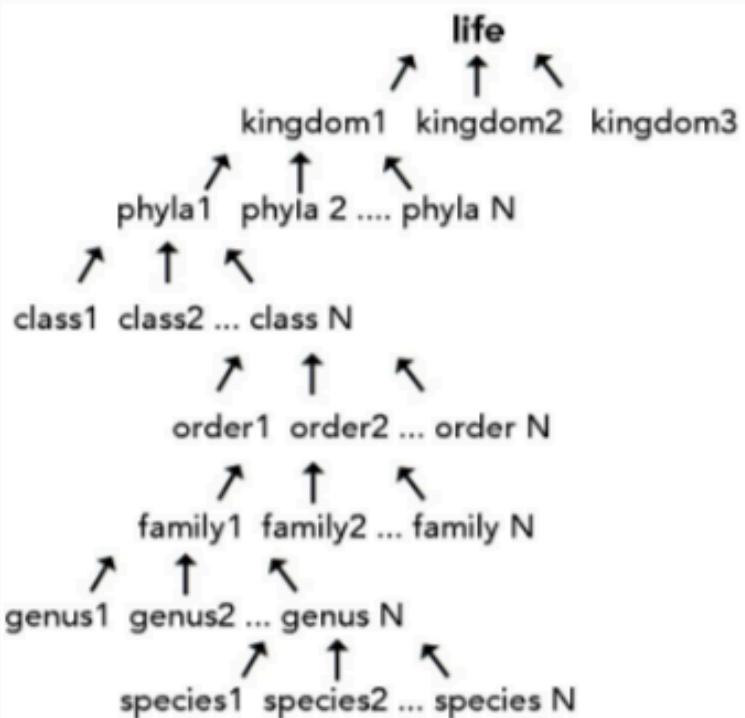
Q: How does an extinct species fit into the same classification scheme as used for living (observable) organisms.



The Linnaean classification scheme is useful because...

- it lets us identify the number different origin of life events that have occurred during Earth's history
- it provide a unique identifier for every "type" of organism
- organisms of the same type remain the same type in the past, it helps classify fossils
- I don't know, doesn't seem that useful to me!

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Here is a Linnean classification scheme for **current** organisms. If you went back in time, say millions of years), how would it change? You draw out your ideas and explain in words below

Draw

Erase

Reset

**Q:** Why are differences between organisms significantly less informative in determining phylogenetic relationships than similarities?

How would you answer this?

# Is there a theory behind the Linnaean classification scheme (law)?

What (empirically-based) assumptions lead to (and are necessary for) a Darwinian theory of evolution?

- the existance of different types of organisms
- hereditable variation between organisms of the types
- the Linneanean replationship between organism types
- the ability of organisms to produce many offspring
- the limited lifespan of organisms
- the presence of predators and pathogens
- the limits on population size present in the enviornment
- groups of organisms migrate from place to place

## **Questions to answer:**

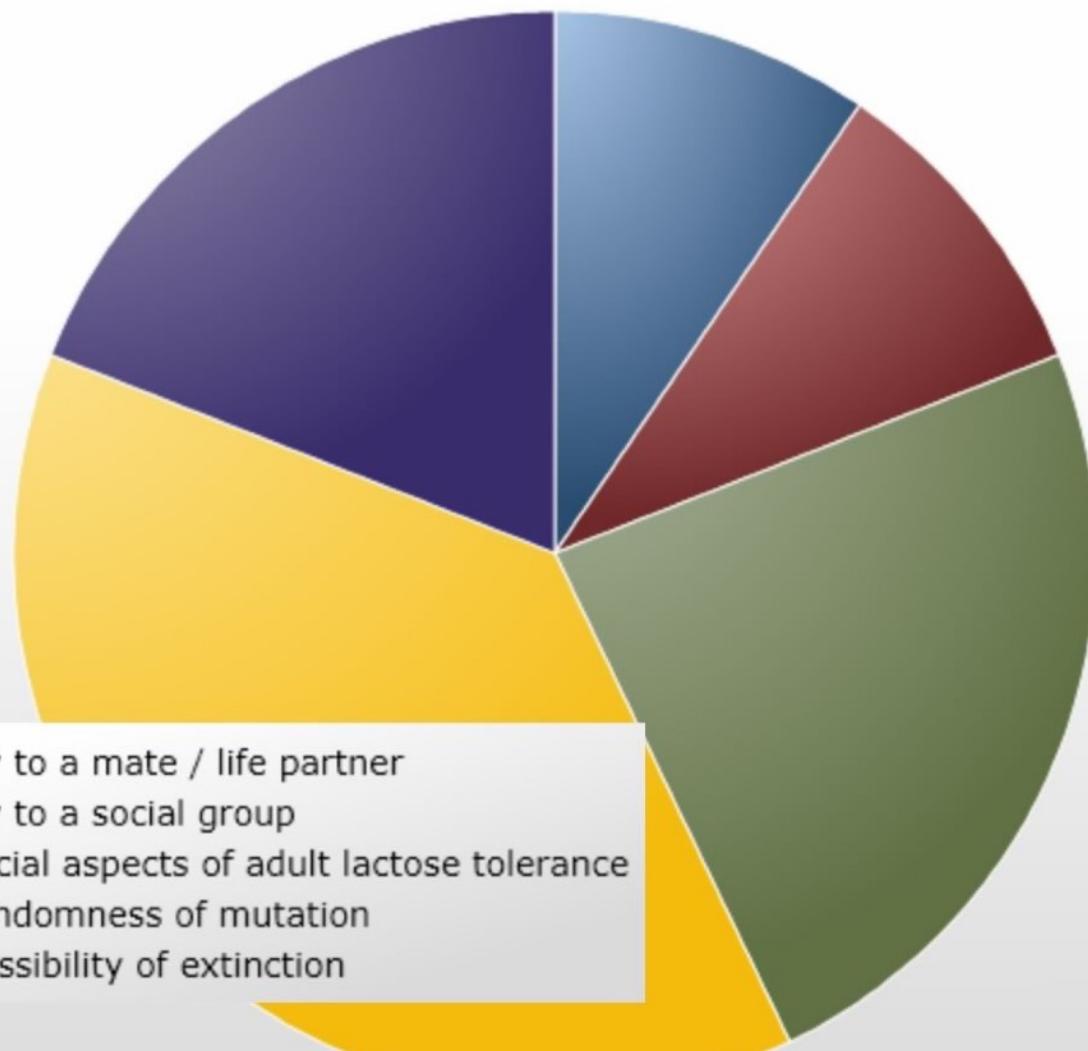
What factors would influence your decision as to whether a trait found in two different organisms was present in their common ancestor?

**4:** Which of these traits do you find the **MOST** difficult to accept as a product of evolutionary mechanisms?

- loyalty to a mate / life partner
- loyalty to a social group
- the social aspects of adult lactose tolerance
- the randomness of mutation
- the possibility of extinction



**4:** Which of these traits do you find the **MOST** difficult to accept as a product of evolutionary mechanisms?



Wed.  
13 Sept Chapter 3.2 Evolutionary mechanism 49-57 Complete [beSocratic #6](#)