Evidence for Evolution

Part 1: Fossil record

Ms. Gill

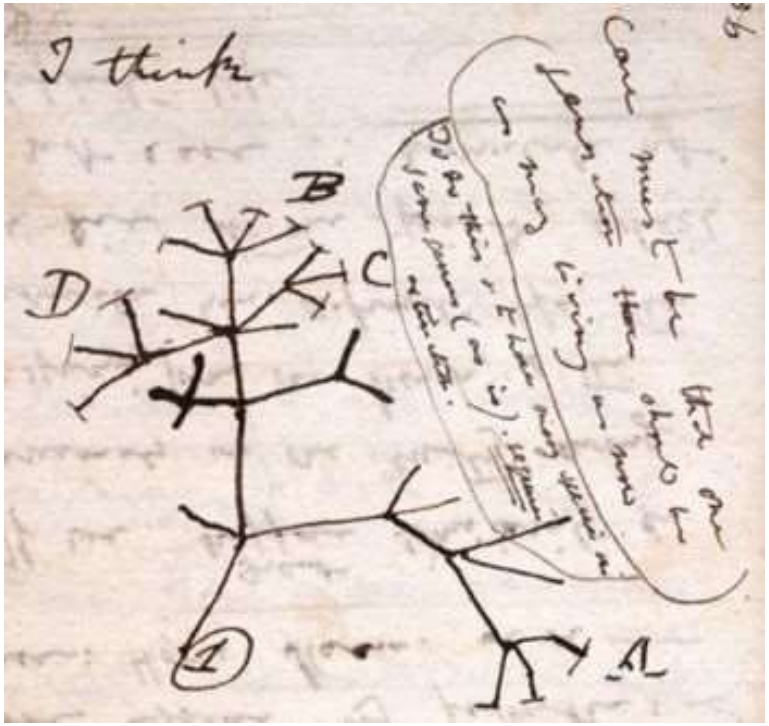
Honors Biology

Agenda

- “Just a Theory”: A Cartoon Discussion
- Notes
  - Evidence for evolution overview
  - Fossil record
- Fossil stations

- HW: Complete fossil station activities

“Just a Theory”: A Cartoon Discussion



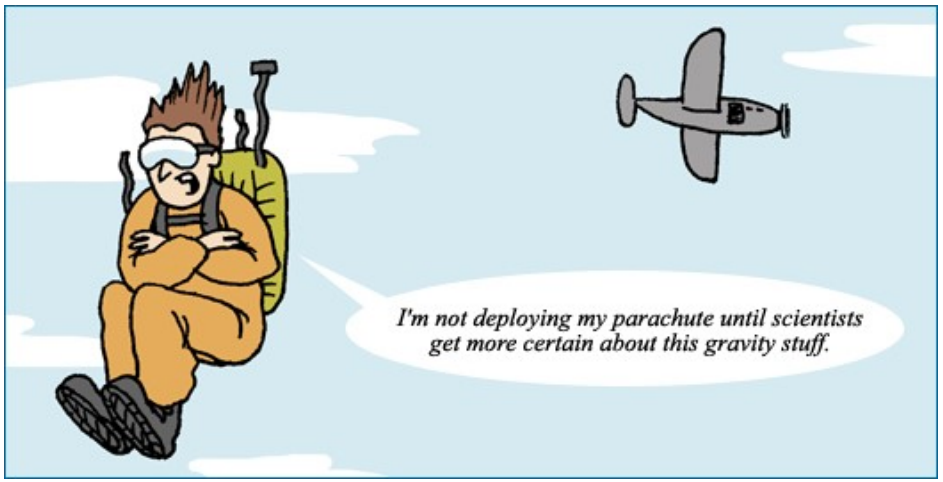
Charles Darwin’s sketch that launched a revolution

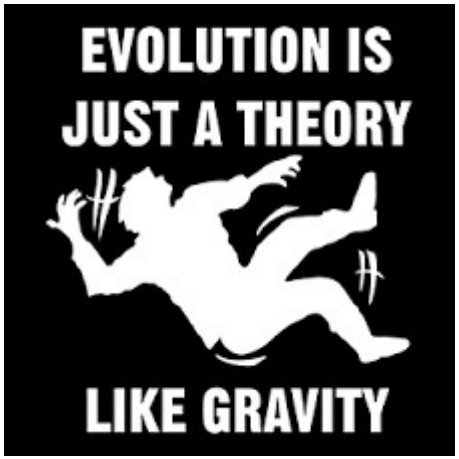
Evolution: “Just a theory”?

What does <u>theory</u> mean in science?
Is it different from what theory means in other contexts?

Other <u>scientific theories</u> include GRAVITY and:

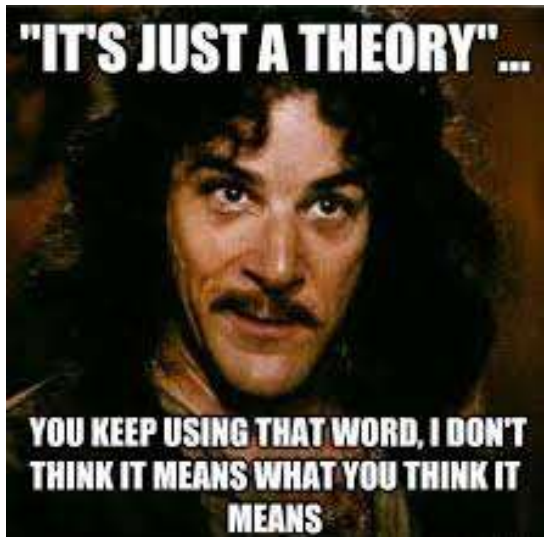
- Cell theory
- Atomic theory
- Genetics
- Heliocentric theory (planets orbit the sun)
- Germ theory (germs cause diseases)

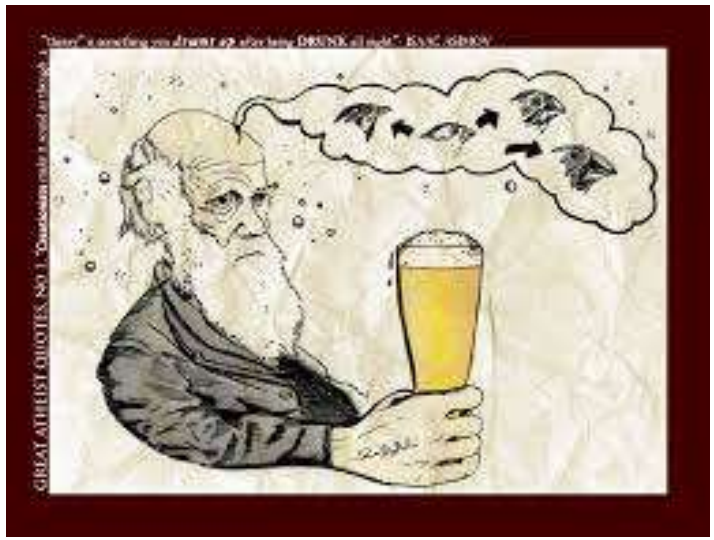




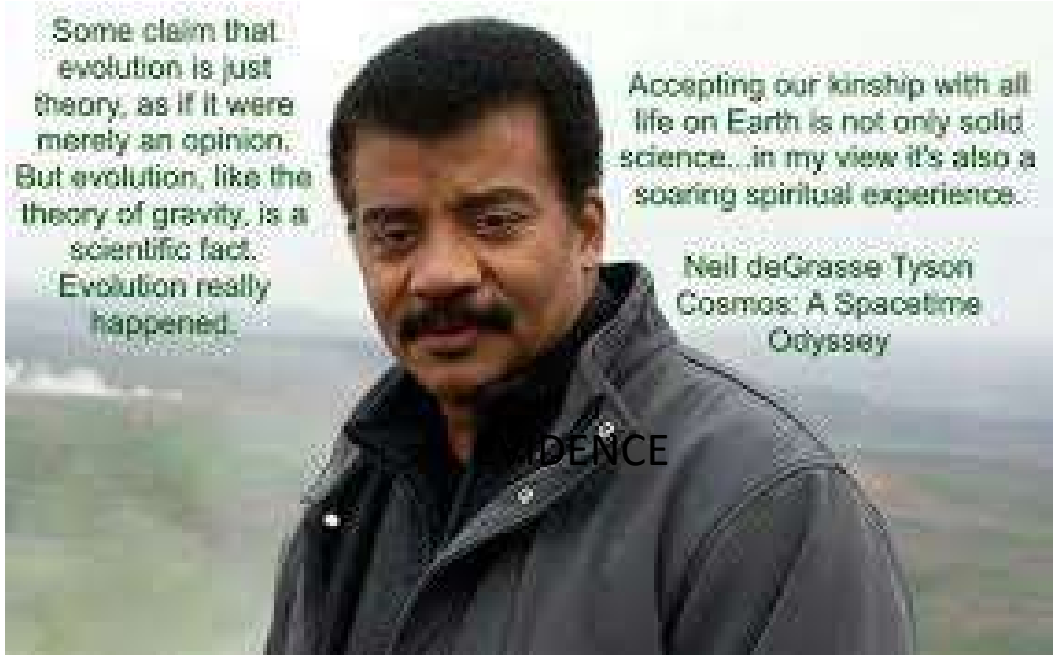
What do you think "theory" means in science after hearing these examples?

Scientific theory: a unifying explanation of an aspect of the natural world that has been repeatedly tested and confirmed by experiments and observations





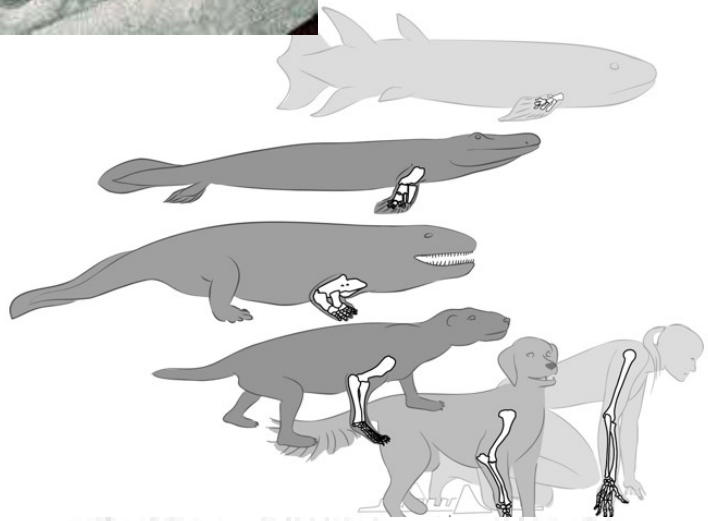
- The best explanation we have for boatloads of data
- Implied meaning of “theory” is more like hypothesis – untested, no evidence yet

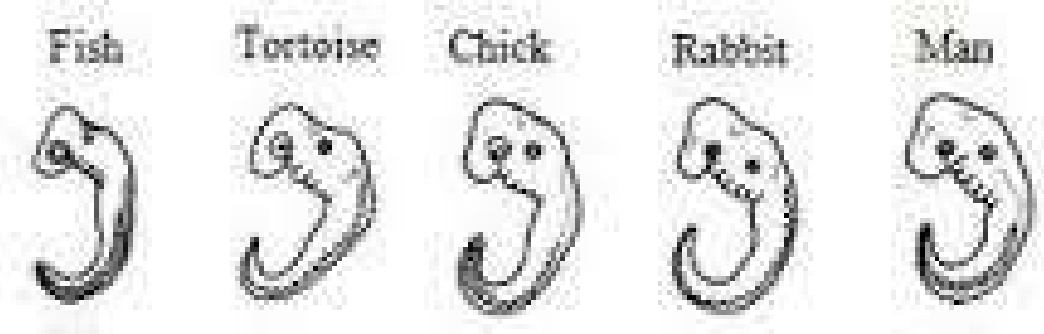


But how do we know evolution really happened?

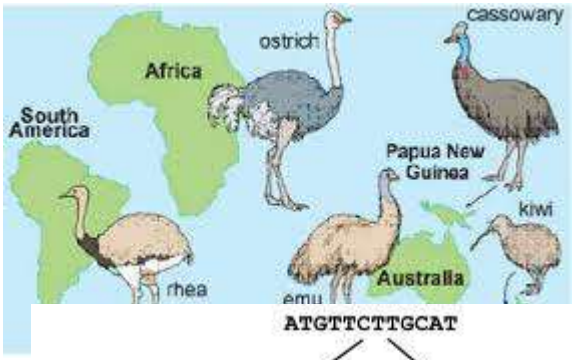
<u>EVIDENCE</u>

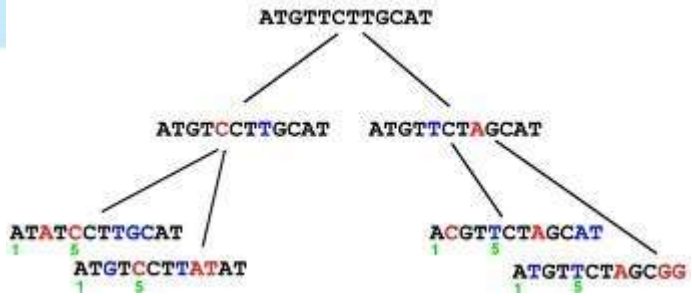
Evidence for Evolution



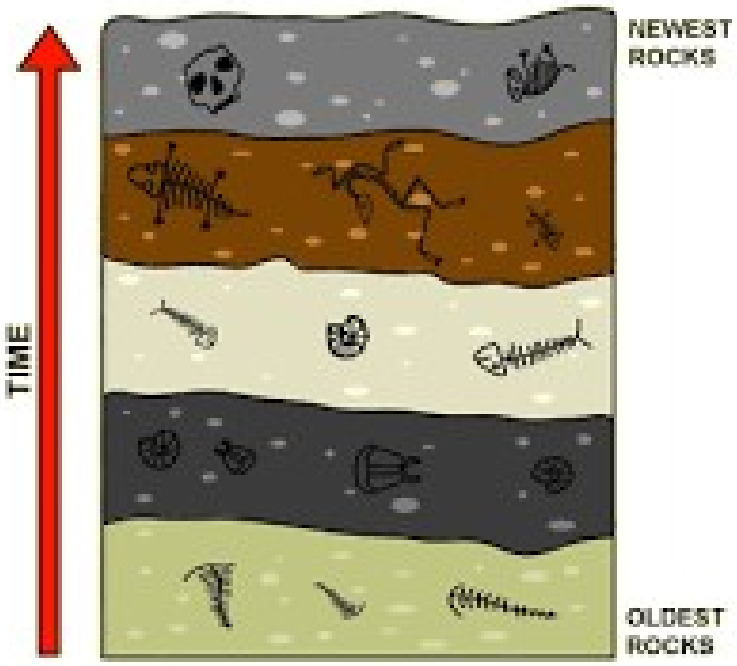


- Fossil record
- Anatomy
- Embryology
- Biogeography
- Molecular biology





The fossil record tells us what organisms lived when and how they lived



- When species appeared and disappeared
- When anatomical features evolved
- Details about lifestyle and climate

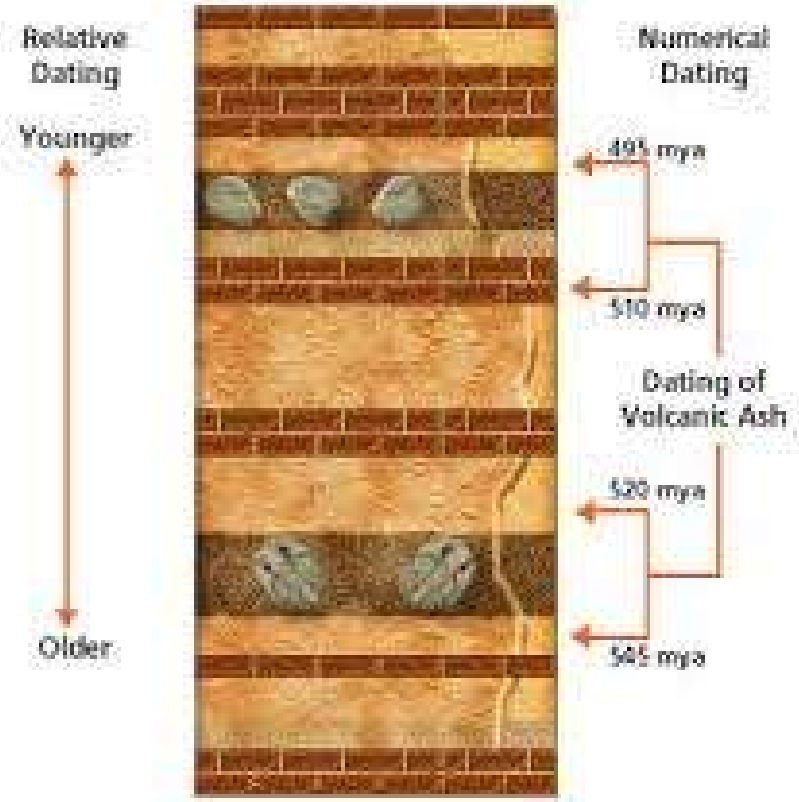
- Newest rocks have creatures most closely resembling modern ones
- Most species are extinct
- Transitional fossils have features of two now distinct groups

How can we tell how old a fossil is?

RELATIVE DATING

Compare to rock layers we know age of

Younger rocks on top of older rocks



ABSOLUTE DATING

Use <u>radiometric dating</u> to find exact age of rock

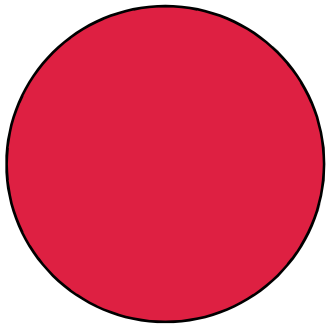
Requires calculations based on half-life of chemicals

Radiometric dating and half-life

- Radioactive atoms decay at a set rate, defined by half-life
- Half-life: Time it takes for half of a radioactive sample to decay
- Half-life is always constant
  - Doesn't matter how much you start with
  - Environment doesn't matter
- Very useful for determining age of objects
- Carbon-14 dating is the most common in biology

Radiometric dating M&M mini-lab: modeling half-life

Radioactive
(keep in bag and count)



Stable
(remove and don't count)

- Groups of 2-3 (10 groups in the class)
- Follow the lab procedure – 10 candies/group
- Use Skittles if you prefer (look for "s" instead of "m")

Transitional fossil

- Has characteristics of two currently distinct groups
- Likely some sort of relative…odds are they are not direct ancestors, or “THE missing link”, but they are still strong evidence for evolution

Tiktaalik: fish to land tetrapod

Archeopteryx: dinosaur to bird

Ambulocetus: walking mammals to whales

Fossil stations! (approx. 10-15 min each)

- Radiometric dating mini-lab questions
- Fosssil record and relative dating worksheet
- NOVA: Transitional Tetrapod Fossil guided viewing
- Transitional fossils worksheet

You MUST complete at least two stations in class in order to retain group choice privileges tomorrow! Check with Ms. Gill when you finish a station.

***mini lab must be done in class

All work due on Schoology at beginning of class tomorrow.