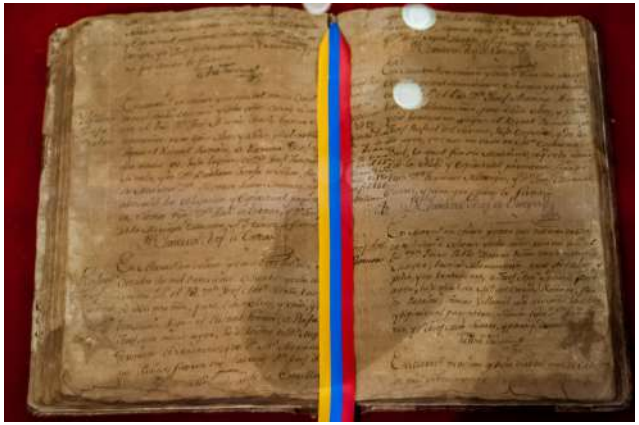
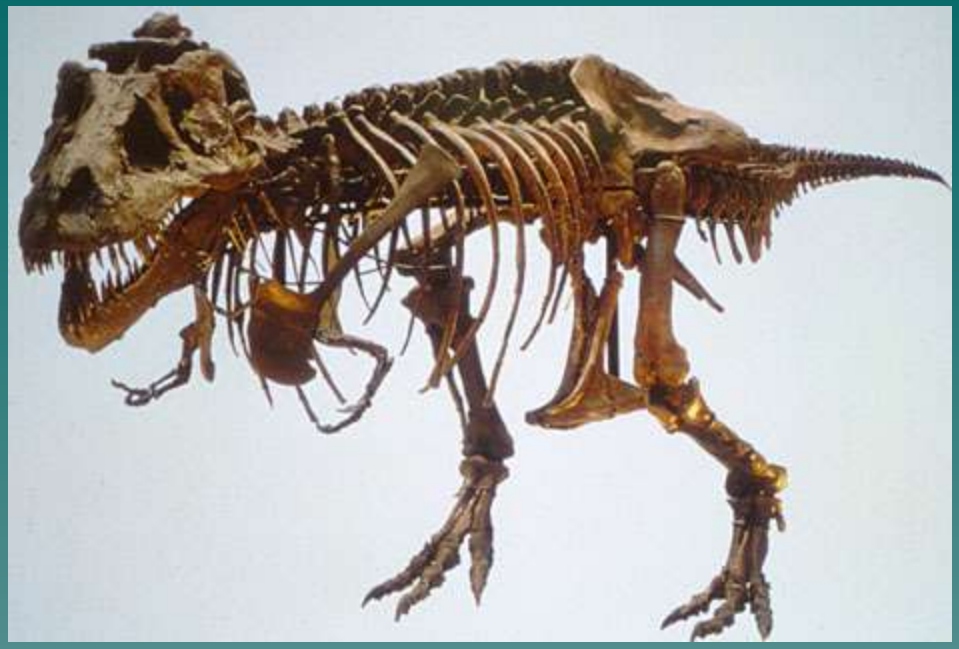
Geologic Timeline

Main Idea= Rocks tell us about Earths Past





Radioactive Dating

How do they figure out how old rocks and fossils are?

Relative Age
Tells which is older

Law of Superposition:

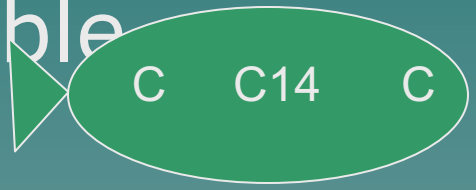
Oldest fossils are on the bottom layer

Absolute Age
Gives age in years

- Radioactive dating
  - Radiocarbon dating – for samples less than 50K years old
  - Potassium argon dating – for rocks with very old fossils

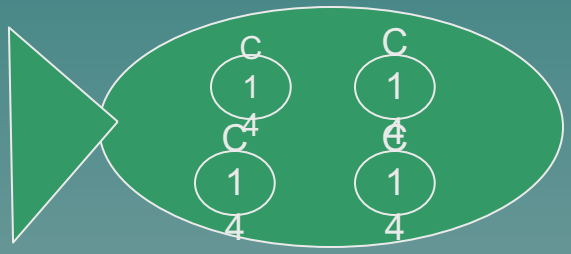
Radiocarbon dating
How does it work?

- Animals eat food containing carbon and/or breathe air containing carbon.
- Some carbon is unstable radioactive carbon (Carbon 14)

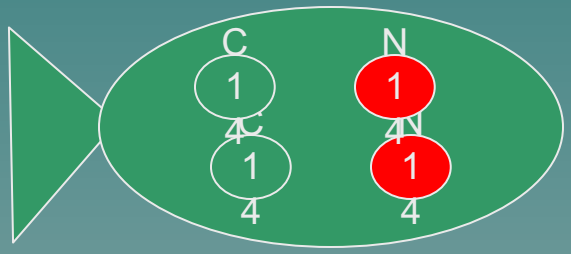


- The animal dies
- Carbon 14 starts to change to Nitrogen 14

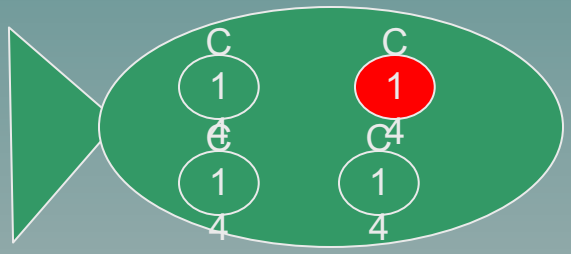
It takes 5,730 years for half of the C14 to change to C12. This is its **half life**!



Fossil A



Fossil B



Fossil C

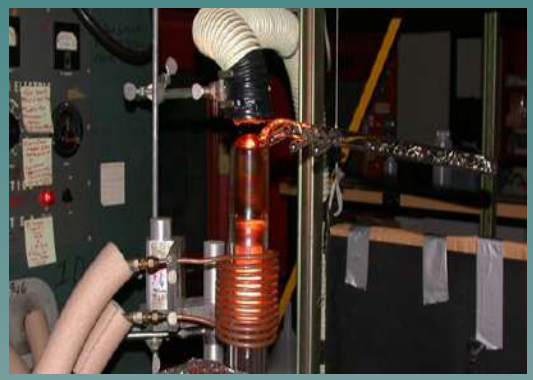
How old are these fish fossils?

Test yourself!

- The more carbon 14 the _____ the fish.
- The less carbon 14 the _____ the fish.
- The more nitrogen 14 the _____ the fish.
- The less nitrogen 14 the _____ the fish.

Equipment used for carbon 14 dating

Potassium Argon Dating
- another form of radioactive dating
Its half life is 1,300,000,000 years, so it can be used to date very old rocks!



Equipment to remove gas from samples

Samples waiting for analysis

Some of the method for running a sample

- K/Ar Instructions Manual for Jim Aronson's Conventional K/Ar dating system
- Ed Meyer and Jim Aronson
- 5/2/2003
- These instructions assume that the system is started, and any old sample is pumped out.
- 1. Record your tracer number in the tracer note book. Record Mass spec operating parameters, date, sample # etc.
- 2. With GP open do the following:
- 3. Close VN (55inch-lbs)
- 4. Close VH
- 5. Close V1 (use torque wrench 55inch-lbs)
- 6. CLOSE P2 (55inch-lbs)!!
- 7. Draw out Ar38 by opening P1 (be sure P2 is closed)
- 8. Leave open for three minutes (set black fisher timer…turn past 10 to activate timer, then to 3 minutes).
- 9. Get small metal dour and fill with liquid N while waiting.
- 10. Place liquid N under the charcoal glass tube above V1. Use jack stand to hold it in place
- 11. CLOSE P1 (55-inch lbs)!
- 12. Open P2 for 3 minutes.
- 13. Plug in Ti heaters and turn full up (past the indicated numbers on the panel) – Brown into high, White into low voltage.
- 14. CLOSE P2.
- 15. Wait 15 minutes then close V3
- 16. While waiting 15 minutes, Turn on blower for sample tube
- 17. Fire up the Induction furnace (IF) by pressing the green button to de-gass the crucible.
- 18. Turn up the power control dial on the IF…about 0.15 and then (waiting 1 minutes between each increase), then increase to 0.20, then to 0.25 then to 0.35, and then to 0.60.
- 19. Hold this at 0.60 for 10 minutes.
- 20. Close V3 (if 15 minutes has elapsed and you did not already do so).
- 21. Increase power on IF to 0.65 and hold for 2 minutes.
- 22. Turn IF power all the way down.
- 23. Turn Low temp control (right side on front bottom panel) to 60.
- 24. Close GP and torque to 160 inch-lbs.
- 25. Drop sample with magnet and ball (don't drop the ball).
- 26. Turn IF power to 0.15 and watch for pressure rise.
- 27. Turn IF power to 0.25 and watch pressure rise. Wait till pressure falls back to a static level to heat again
- 28. Remove Liquid N bath from the near charcoal collector.
- 29. After frost is gone, place charcoal collector in warm water bath.
- 30. Turn IF power to 0.33 (just below jump)
- 31. Open V1 (¼ inches open)