07
UNDERSTANDING THE SCIENCE BEHIND DATING
(RADIOACTIVE AND CARBON-14 DATING)

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EMANUEL BAPTIST CHURCH, OCTOBER 30, 2022

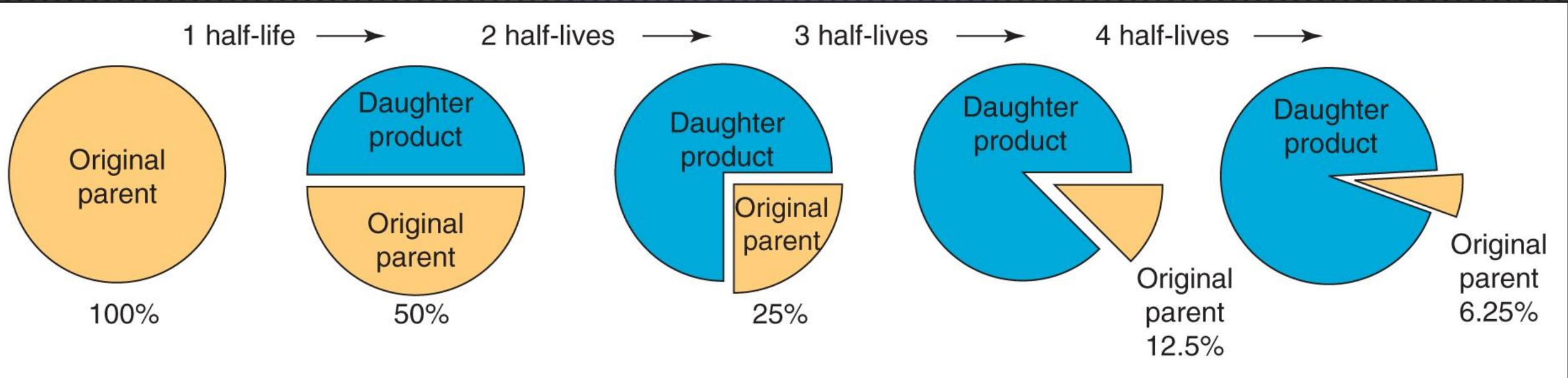
I. The Assumptions Behind All Dating Methods

A. Starting conditions
B. Rates of processes
C. Outside influences

What is the significance of an eyewitness?

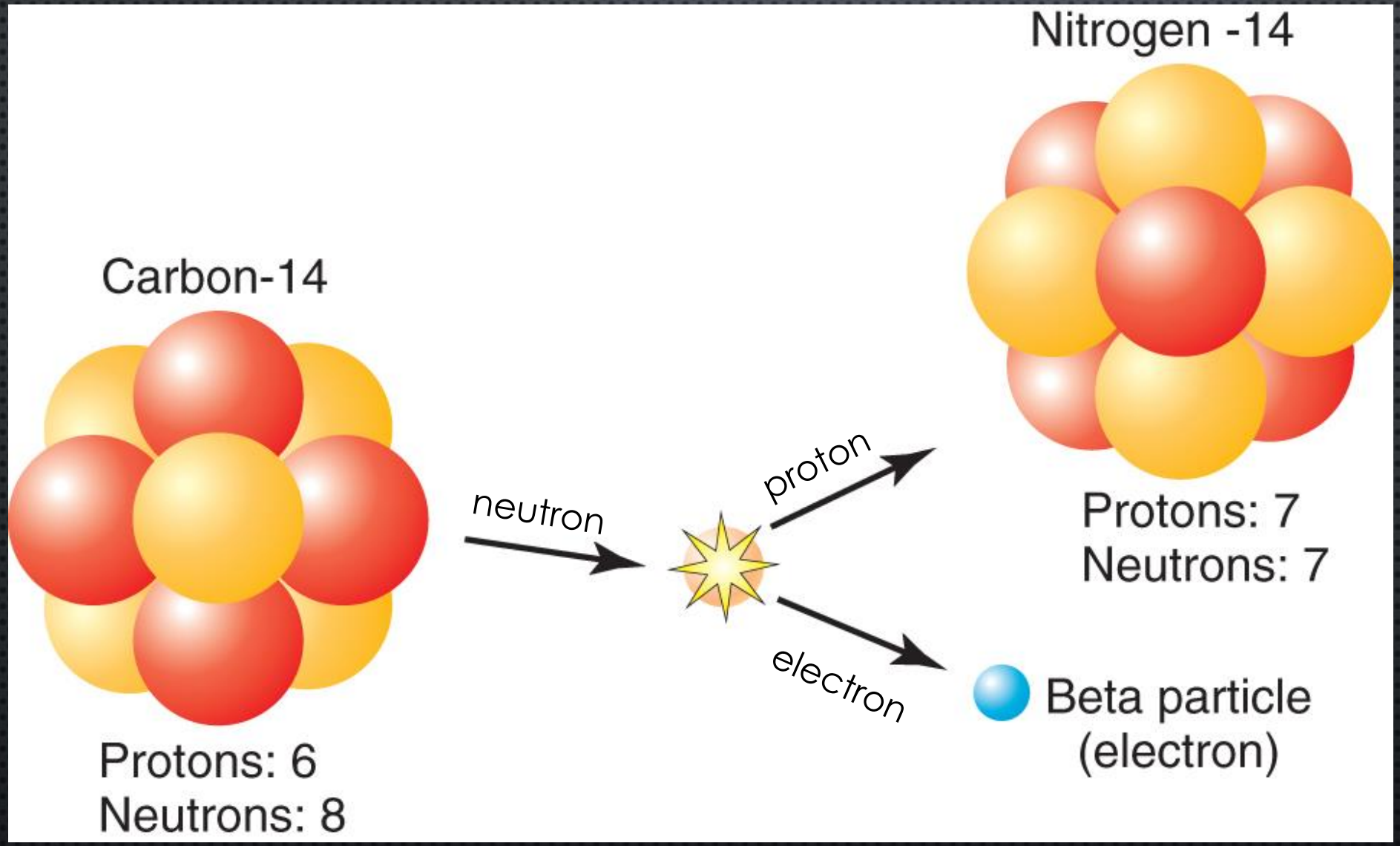
COMMON ISOTOPES AND HALF-LIVES USED FOR GEOLOGICAL DATING

Parent isotope	Daughter isotope	Half life (λ)
Uranium-235	Lead-207	713 million years
Uranium-238	Lead-206	4.6 billion years
Thorium-232	Lead-308	14.1 billion years
Potassium-40	Argon-40	1.3 billion years
Rubidium-87	Strontium-87	48.8 billion years
Carbon-14	Nitrogen-14	5,730 years


1 half-life
2 half-lives
3 half-lives
4 half-lives
Original parent
100%
Daughter product
Original parent
50%
Daughter product
Original parent
25%
Daughter product
Original parent
12.5%
Daughter product
Original parent
6.25%

II. Carbon-14 Dating

A. How does it work?
B. Examples of why it doesn't work
C. Can carbon-14 be redeemed?



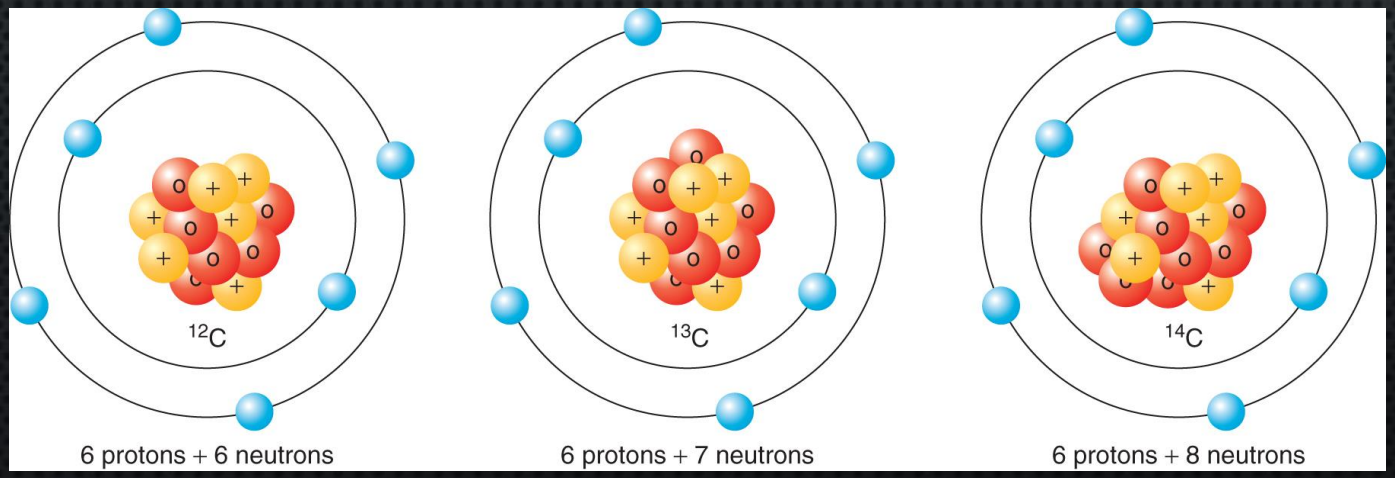
Three types of decay:
1. Alpha particle
2. Beta particle
3. Electron capture

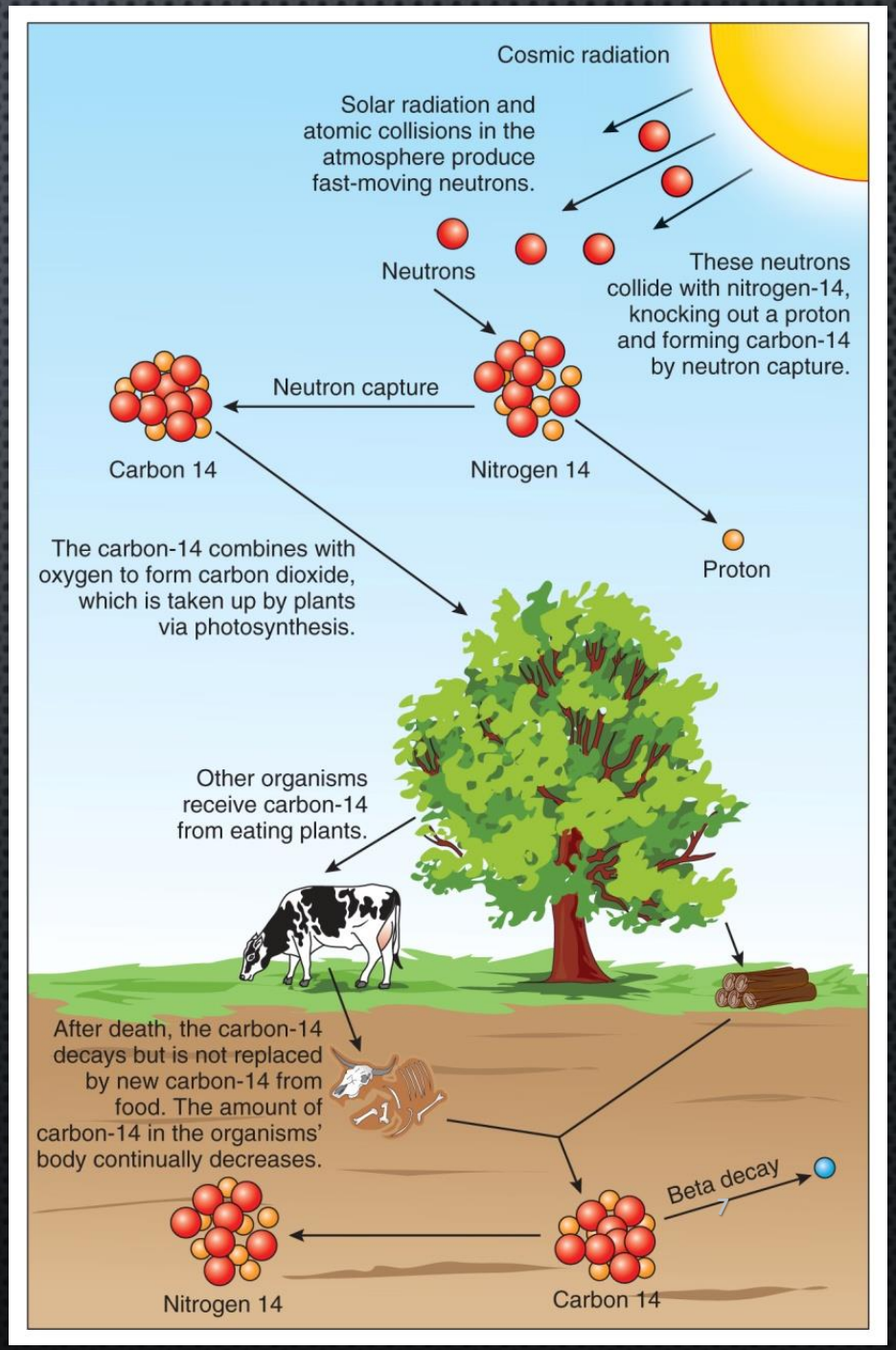
Beta particle decay of ^{14}C to ^{14}N

In this process, a neutron ejects an electron and becomes a proton

The Process of ^{14}C Formation:

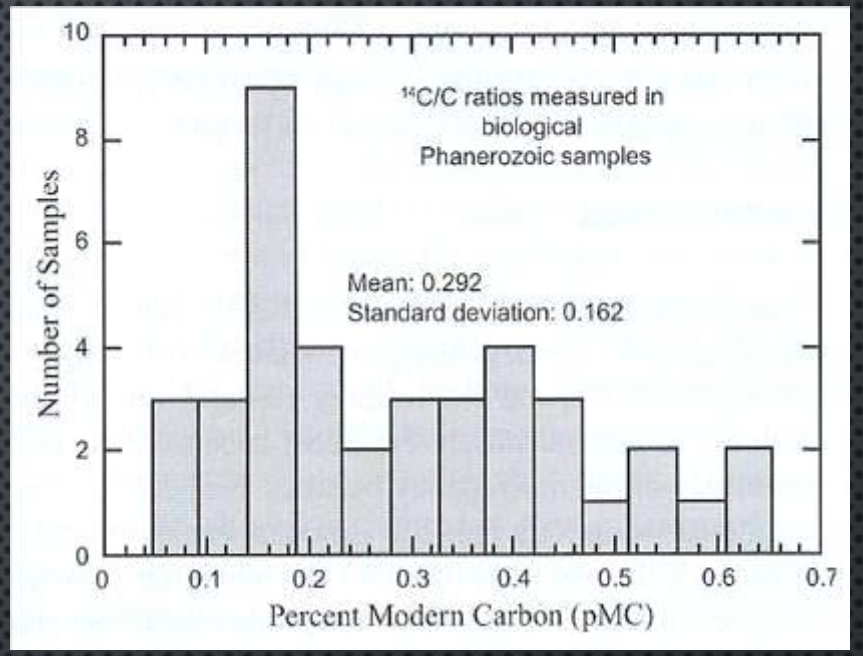
1. Cosmic radiation turns Nitrogen into ^{14}C
2. The ^{14}C combines with oxygen to make radioactive CO_2
3. Plants take in the CO_2 through the process of photosynthesis
4. Animals get the ^{14}C from consuming the plants
5. Every living thing gets a constant ratio of ^{14}C to ^{12}C.
6. A date is obtained by finding the amount of ^{14}C in something compared to modern amounts.

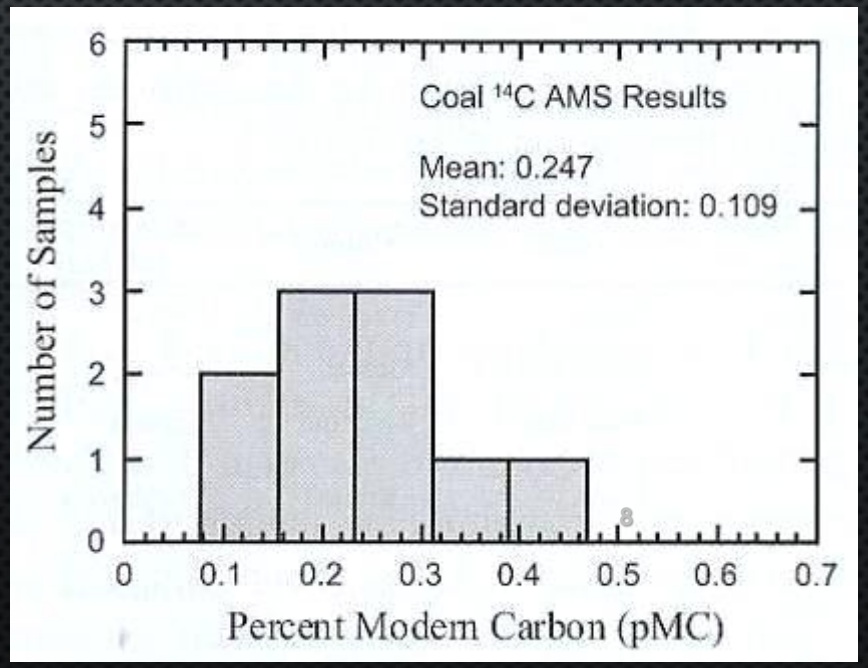




^{14}C in Coal and Diamonds

Dr. John Baumgardner





Radioisotopes and the Age of the Earth, Vol. 2, p. 754, 606, 2005.

III. Dating of Rocks

A. Many different methods
B. Theory of how it's supposed to work
C. Examples showing that it doesn't work

COMMON ISOTOPES AND HALF-LIVES USED FOR GEOLOGICAL DATING

Parent isotope	Daughter isotope	Half life (λ)
Uranium-235	Lead-207	713 million years
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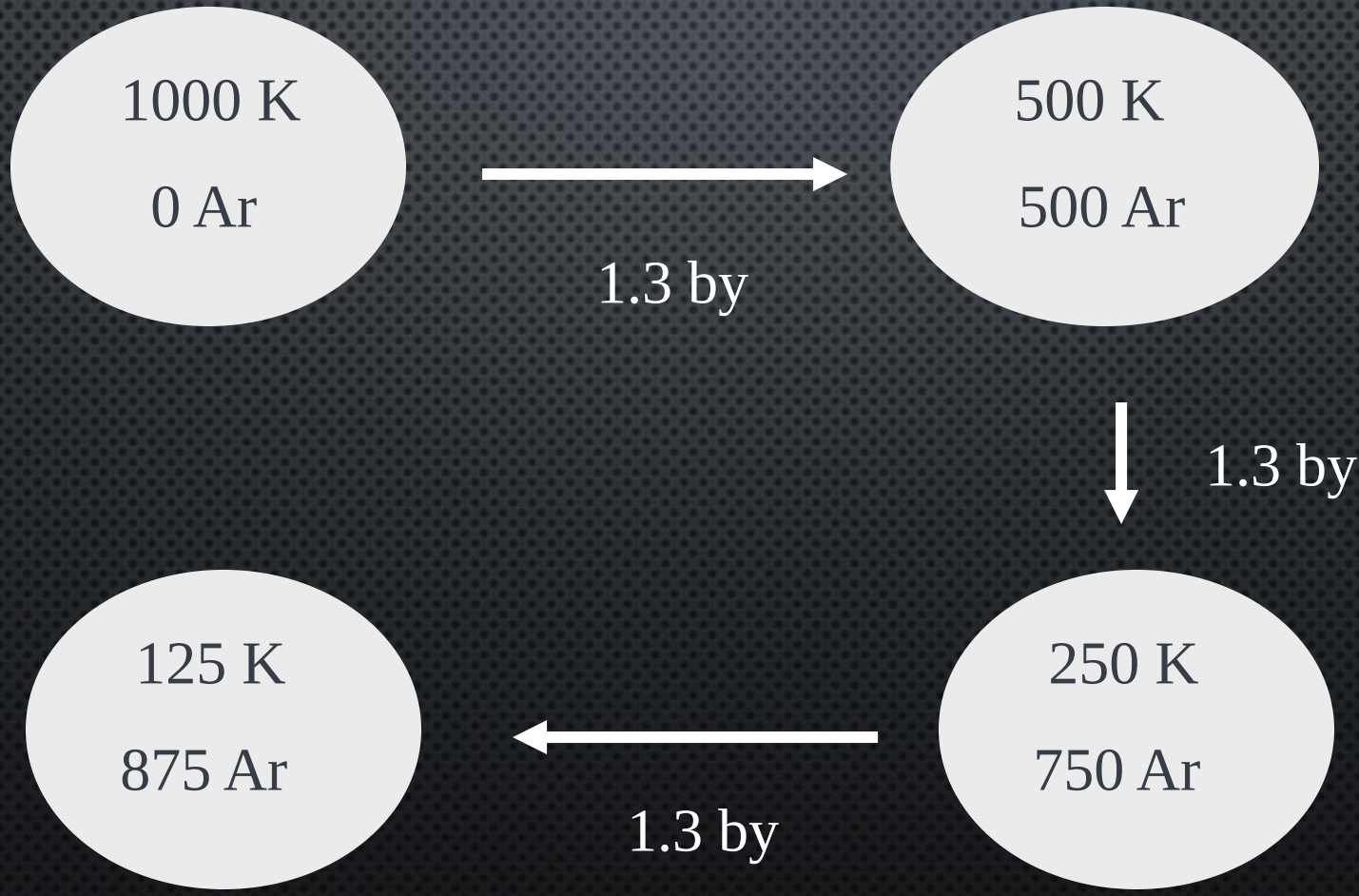
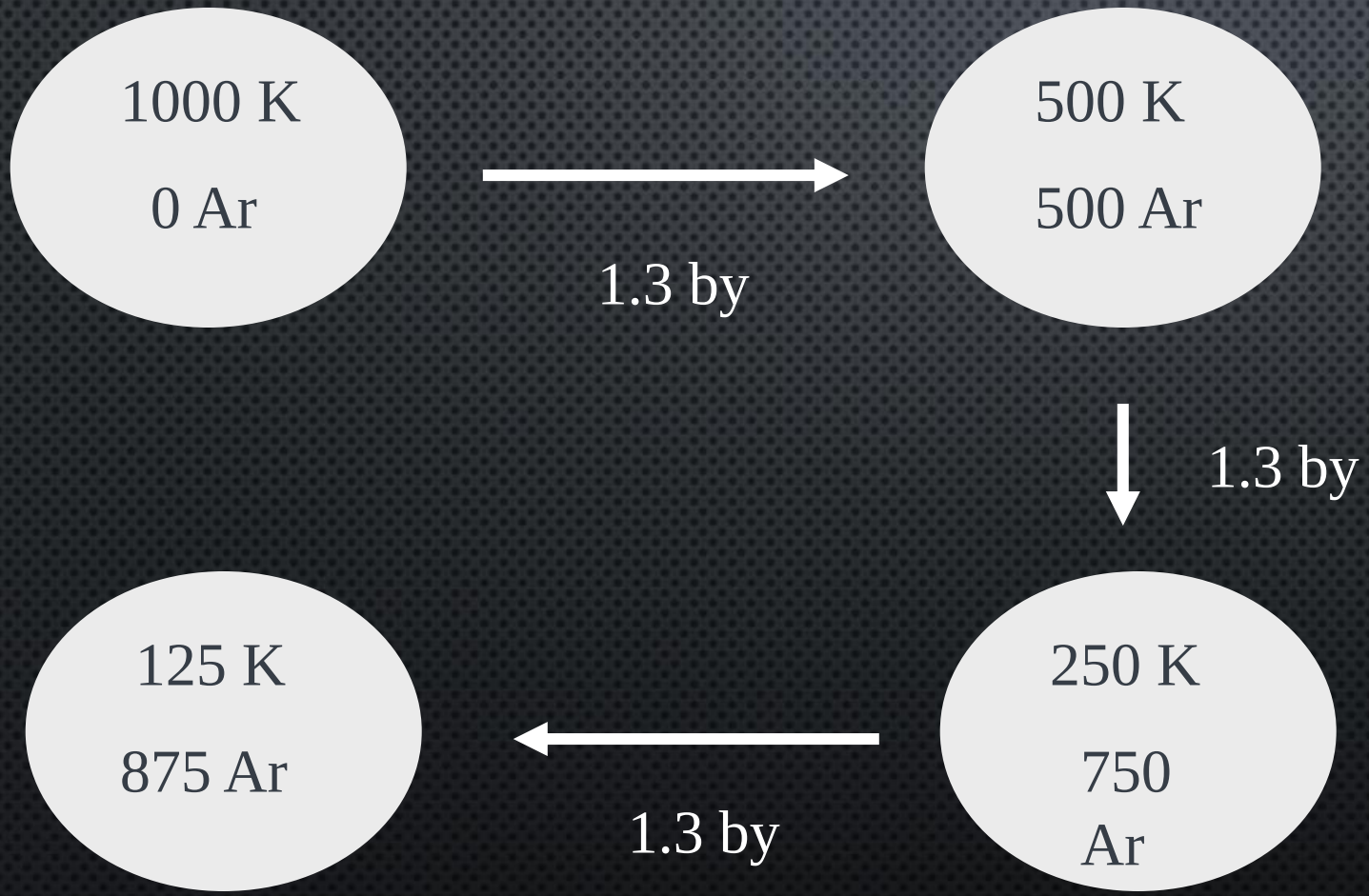
RADIOACTIVE DECAY



WHAT ASSUMPTIONS ARE MADE IN THE DATING PROCESS?



1. Starting conditions
2. Constant rate
3. Closed system

It can be shown that each one of these assumptions has led to faulty dating of rocks.

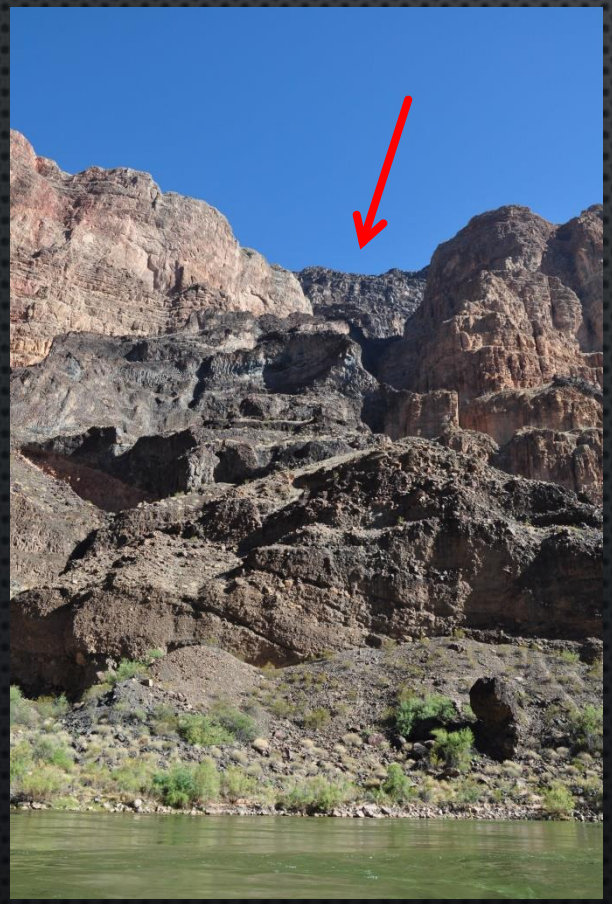
RADIOACTIVE DATING AT MT. ST. HELENS

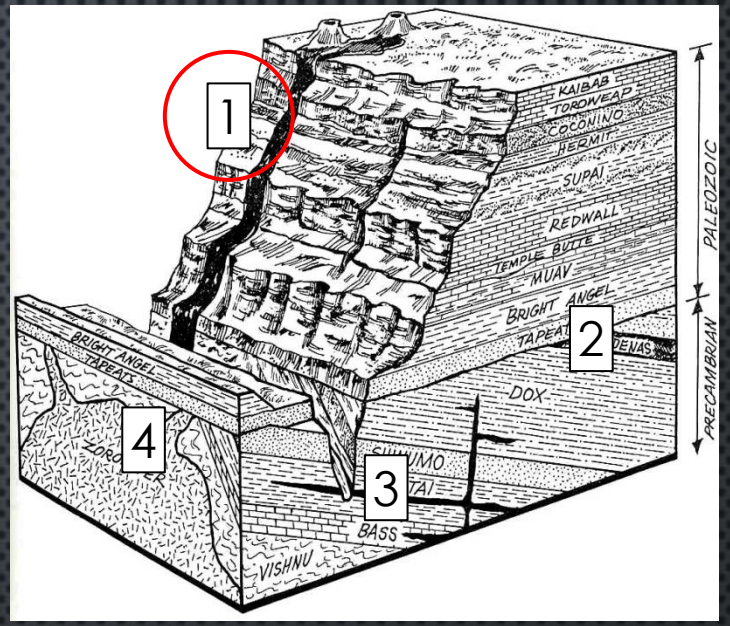
- The conventional K-Ar dating method was used on the 1986 dacite lava dome at Mt. St. Helens
- Five different dates on the same rock:
  - 0.35 ± 0.05 Ma
  - 0.34 ± 0.06 Ma
  - 0.9 ± 0.2 Ma
  - 1.7 ± 0.3 Ma
  - 2.8 ± 0.6 Ma
- Dates range from 350,000 to 2.8 million years old

Austin, Mt. St. Helens Slide Collection, 1992

RADIOACTIVE DATING IN GRAND CANYON

1. Dates on the Plateau lava flows (Austin 1994)





Austin, 1994, *Grand Canyon Monument to Catastrophe*

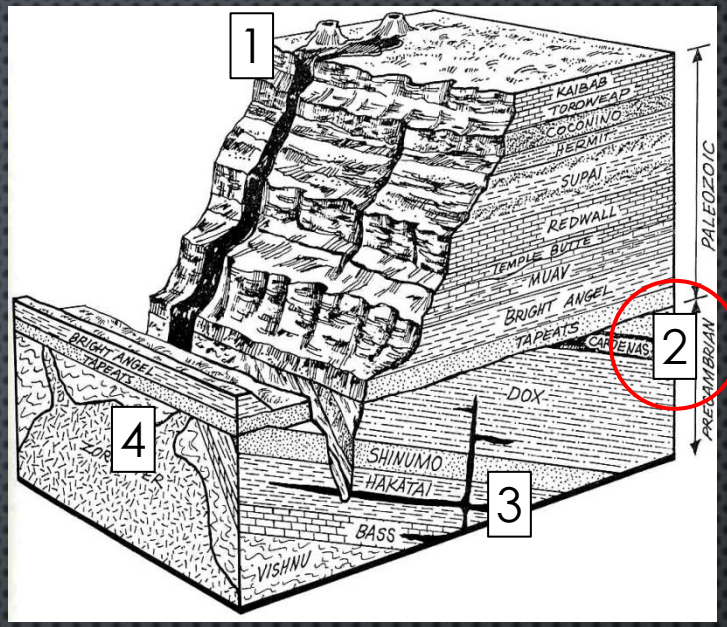
Same Rock, Four Dates

- 6 K-Ar model ages 0.01 to 117 Ma
- 5 Rb-Sr model ages 1270 to 1390 Ma
- Rb-Sr isochron age 1340 Ma
- Pb-Pb isochron age 2600 Ma

RADIOACTIVE DATING IN GRAND CANYON

2. Dates on the Cardenas Lavas

(Austin 1994)



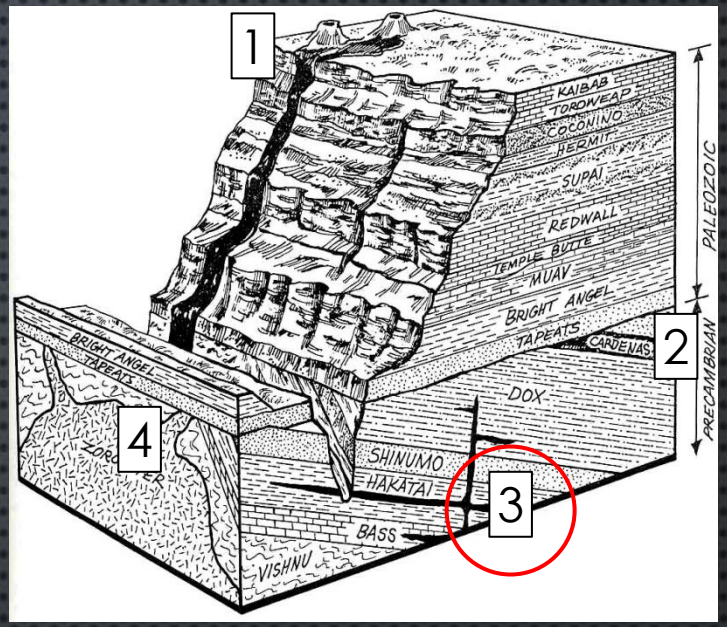
Austin, 1994, *Grand Canyon Monument to Catastrophe*

Same Rock, Four Dates

5 K-Ar model ages	791 to 853 Ma
6 Rb-Sr model ages	980 to 1100 Ma
K-Ar isochron age	715 Ma
Rb-Sr isochron age	1070 Ma

RADIOACTIVE DATING IN GRAND CANYON

3. Dates on the diabase sills
(Snelling et al., 2003)



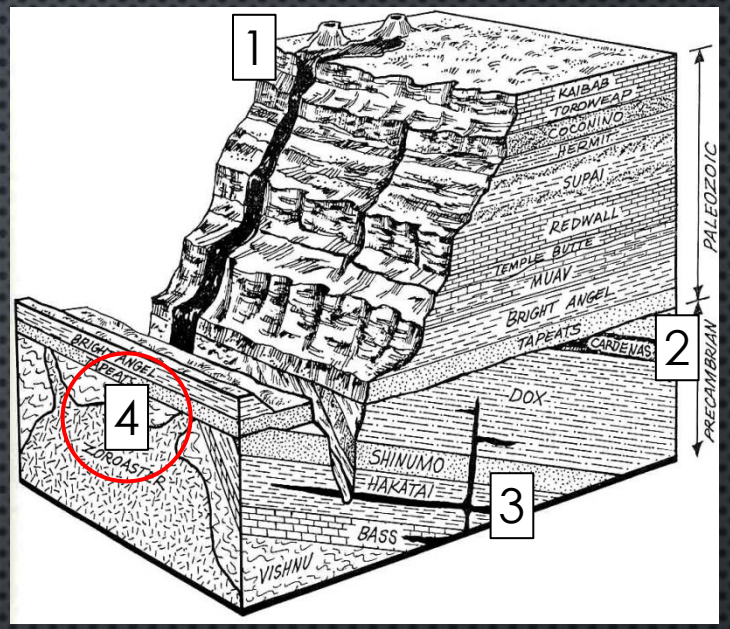
Austin, 1994, *Grand Canyon Monument to Catastrophe*

Same Rock, Five Dates

K-Ar model ages (n=11)	656 to 1053 Ma
K-Ar isochron age (n=11)	841 Ma
Rb-Sr isochron age (n=11)	1055 Ma
Sm-Nd isochron age (n=11)	1375 Ma
Pb-Pb isochron age (n=11)	1249 Ma

RADIOACTIVE DATING IN GRAND CANYON

4. Dates on Amphibolites
(Snelling, 2008)



Austin, 1994,
Grand Canyon Monument to Catastrophe

<u>Same Rock, Four Dates</u>

27 K-Ar model ages	405 to 2574 Ma
Rb-Sr isochron age (n=19)	1240 Ma
Sm-Nd isochron age (n=21)	1655 Ma
Pb-Pb isochron age (n=20)	1883 Ma

IV. Examples Showing the Earth is Young

A. Population sizes
B. Erosion of continents and filling of ocean basins
C. Helium in zircons
D. Folds in rocks

Population Sizes

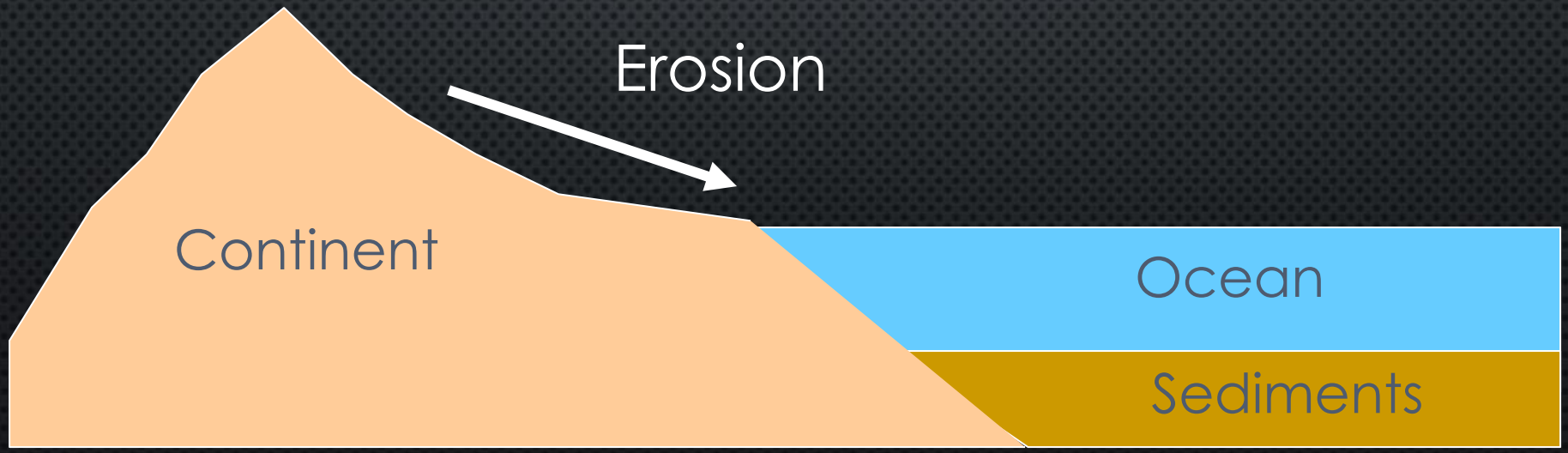
- How long would it take to produce today's world population (currently 7 billion)?
  - See http://wardricker.com/timegrowth.php
  - Assume 35-year generations
  - Assume 2.8 children per set of parents
  - Start with 6 people, 4,500 years ago (128 generations)
  - Assume 85% of children survive to reproduce

  - Answer:
  - 28,064,823,070 (28 billion people!)

EROSION OF THE CONTINENTS AND FILLING OF THE OCEAN BASINS

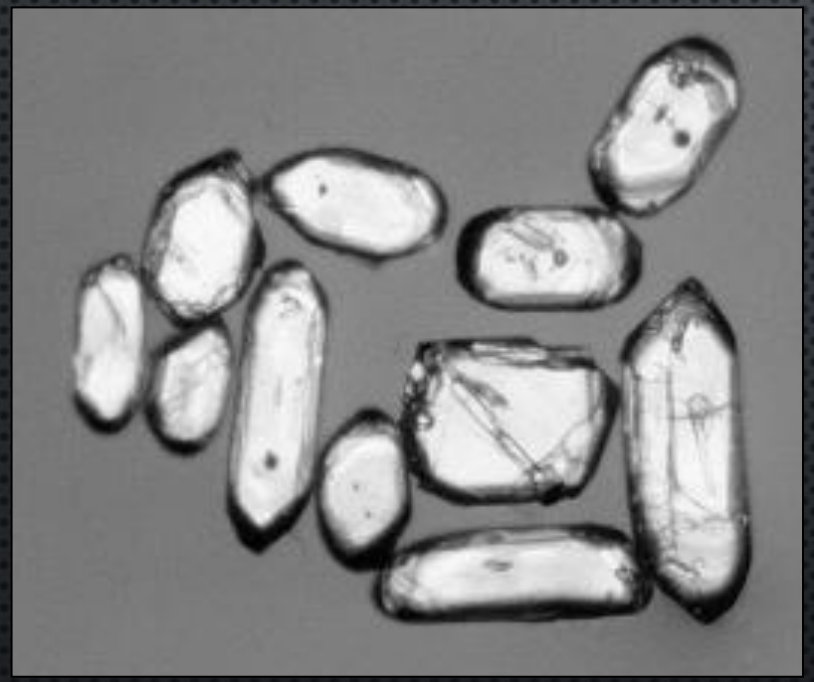
At present rates, the continents could be completely eroded to sea level in just 14 million years.

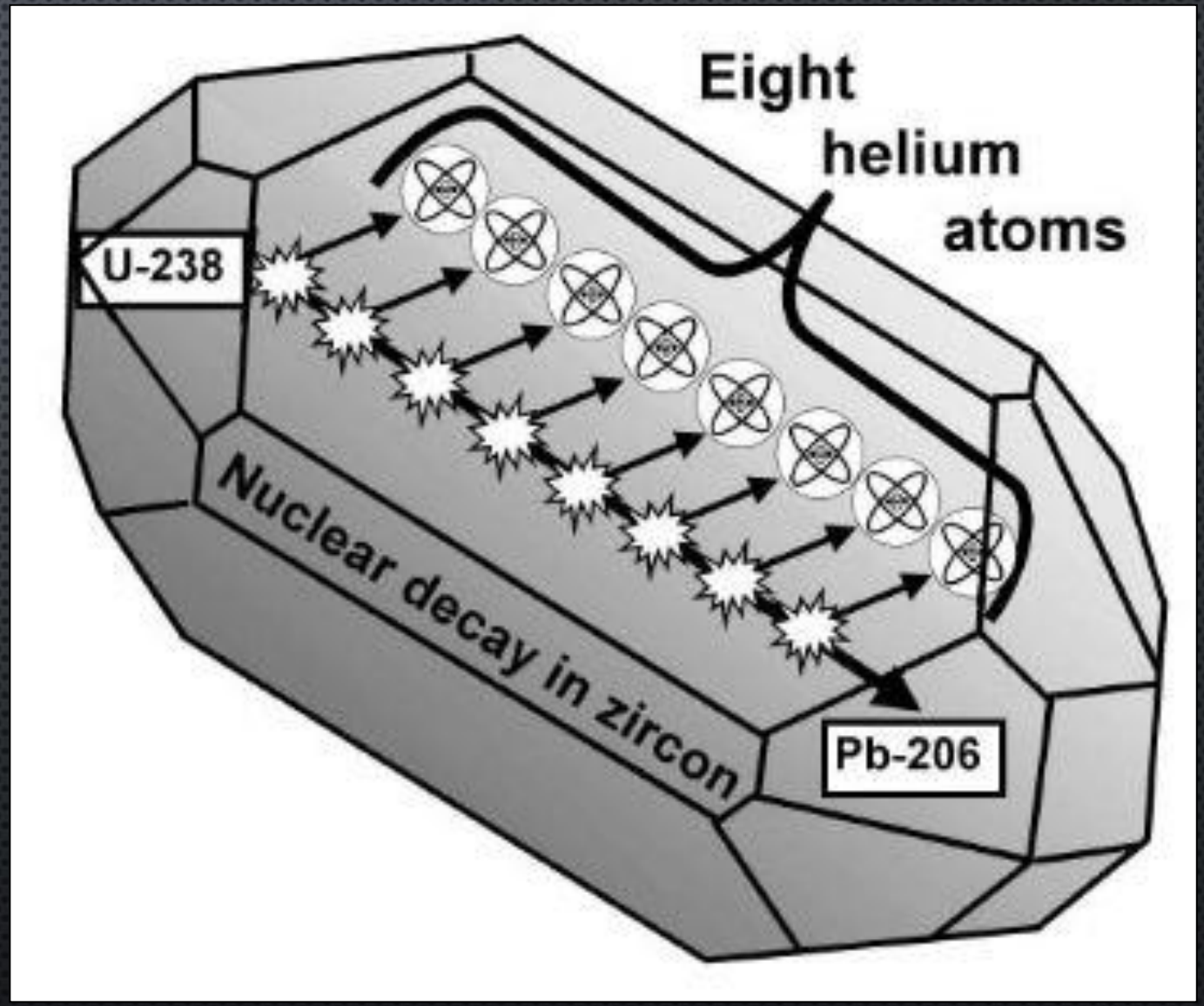
At present rates, the ocean basins could be filled with sediments in just 14 million years.



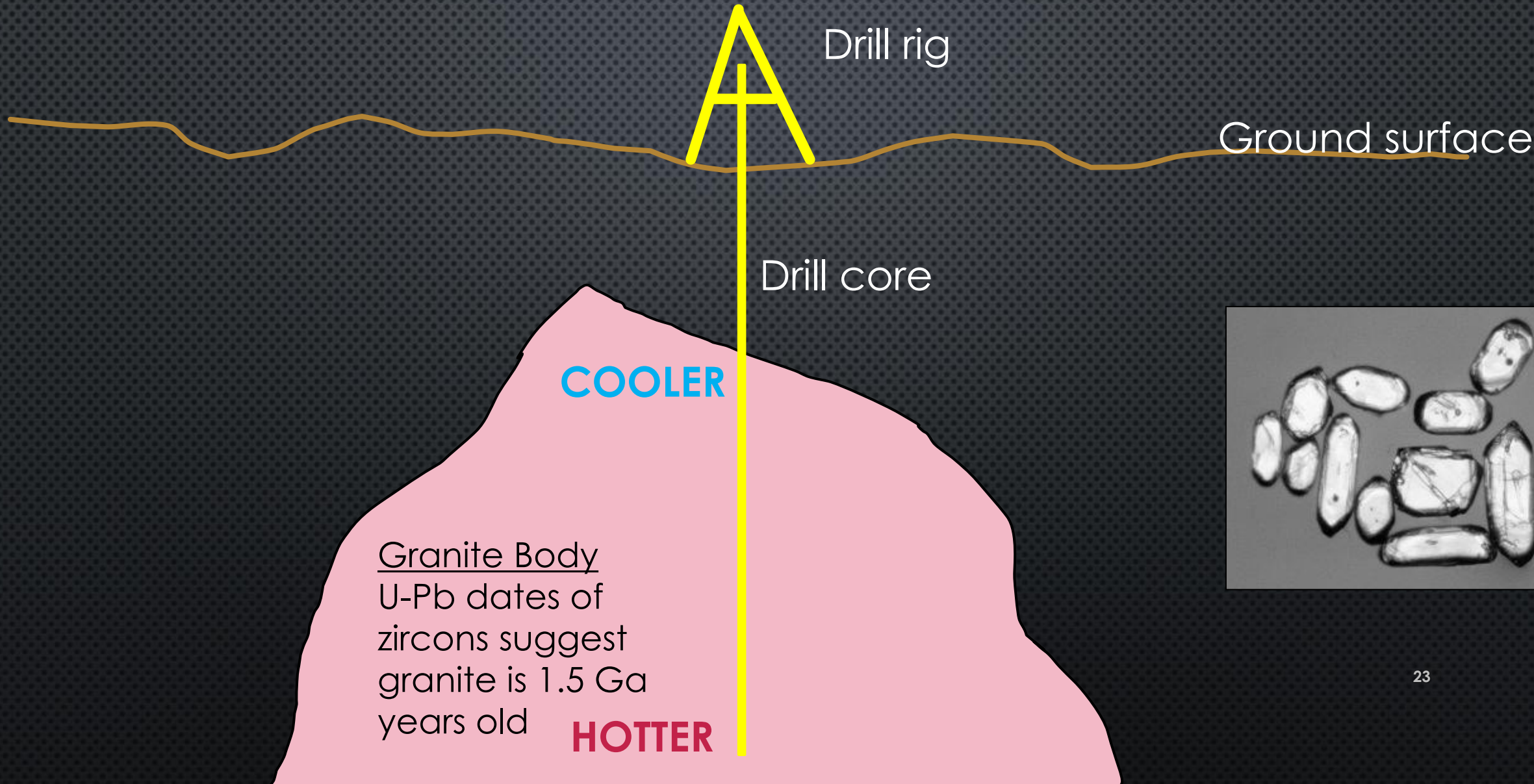
HELIUM IN ZIRCONS

HELIUM TRAPPED IN ZIRCONS

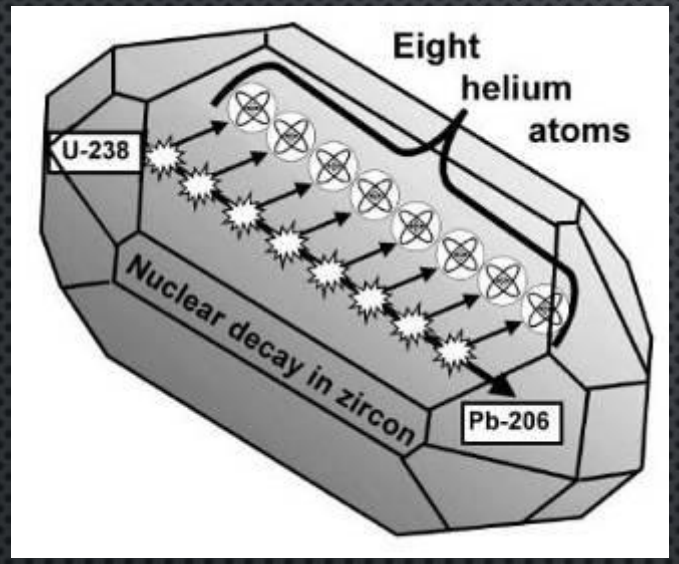


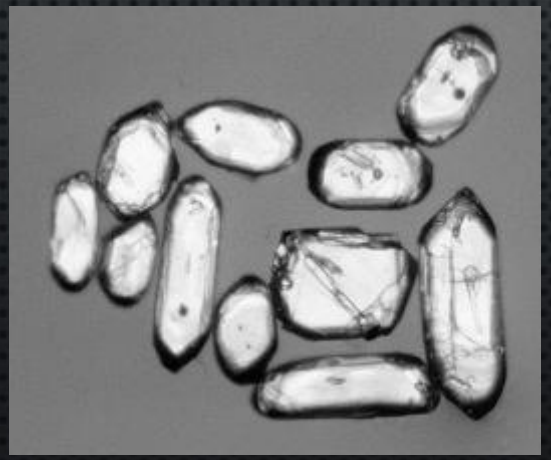


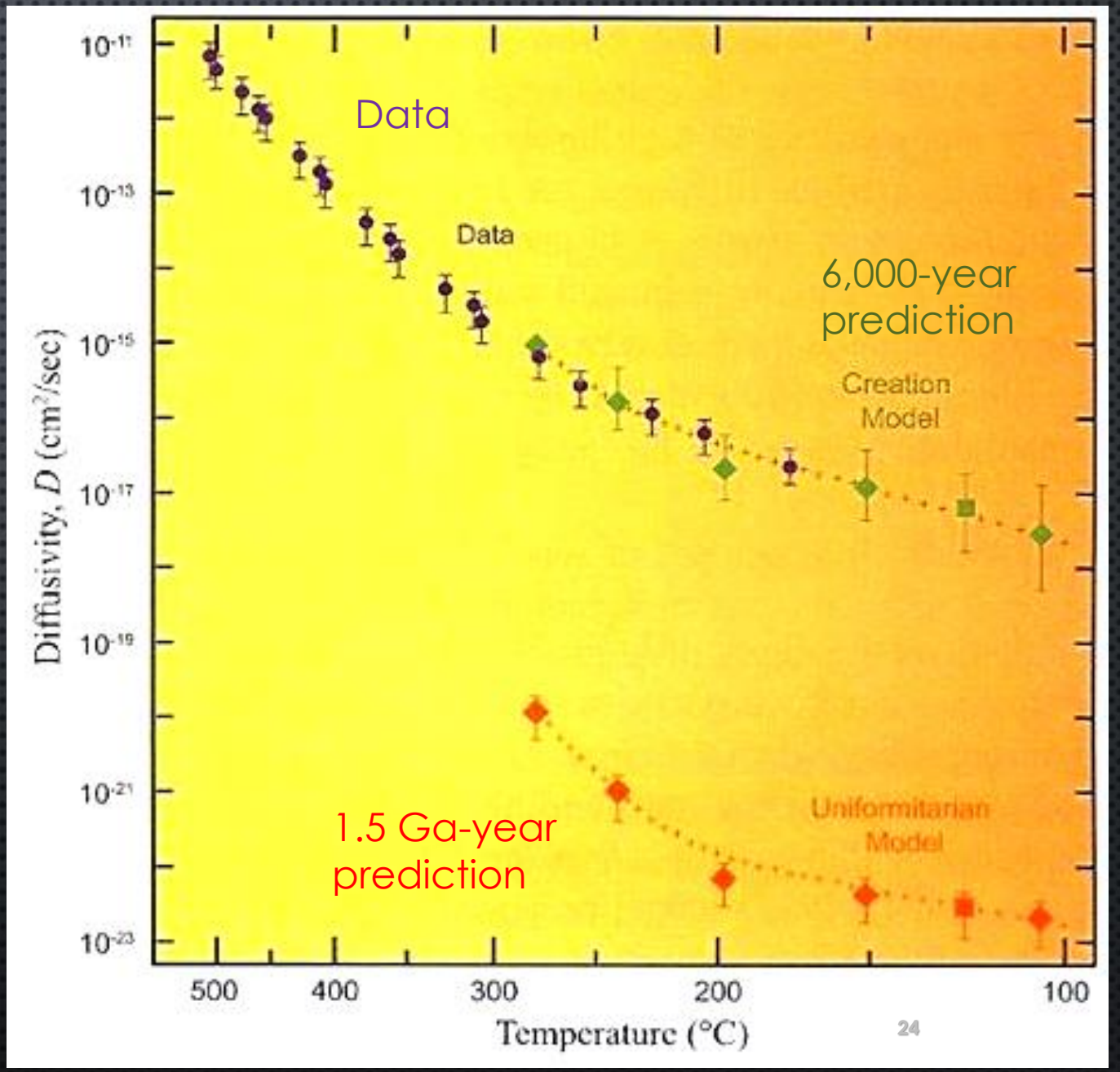
Jemez Mountains of northern New Mexico



Dr. Russ Humphreys







Radioisotopes and the Age of the Earth, Vol. 2, p. 741, 2005.

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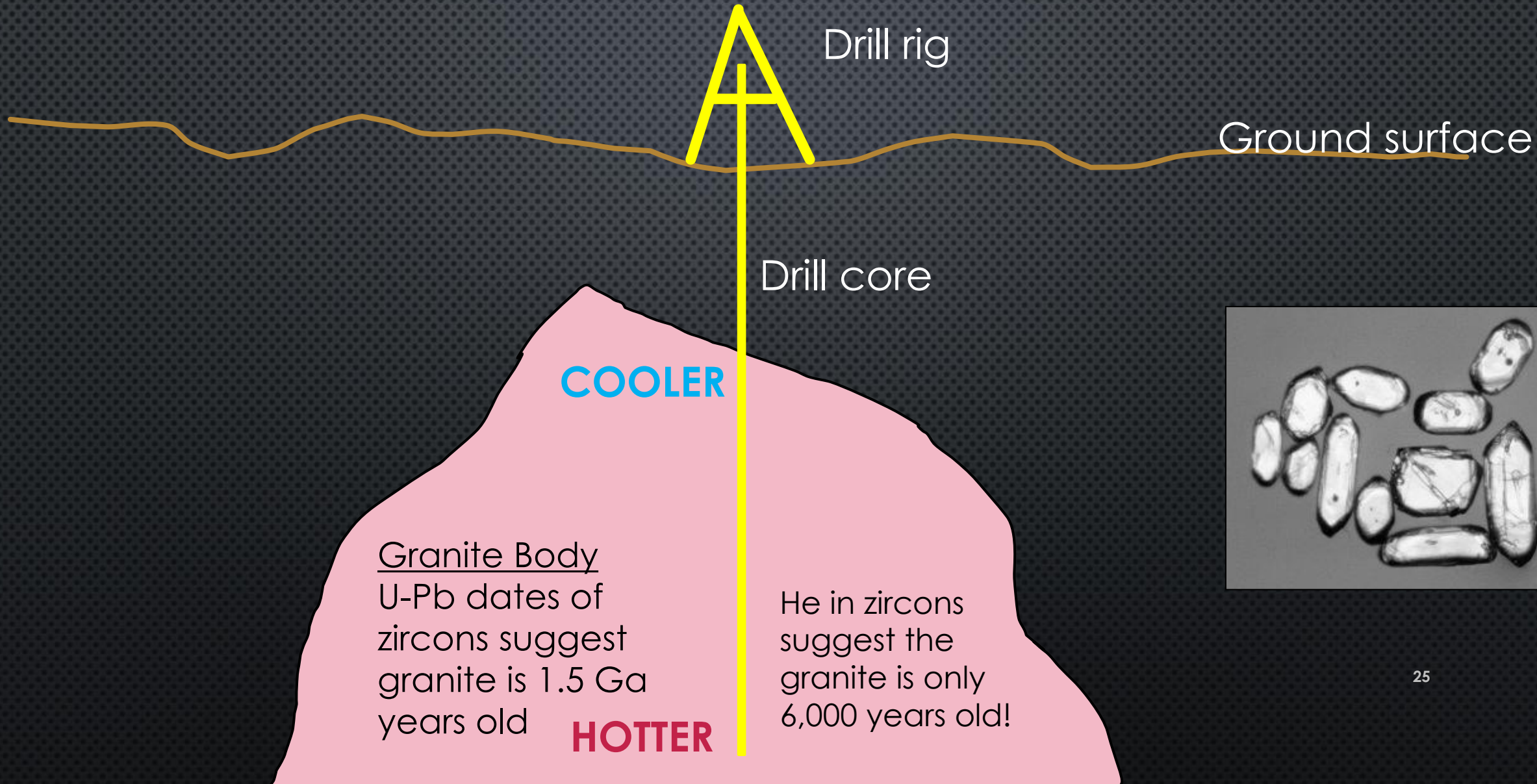

FOLDS

Tapeats Sandstone in Carbon Canyon

- Deposition of Tapeats: 520 million years ago
- Age of folding: 60 million years ago
- Time difference: 460 million years!