



Carbon 14 Dating

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Some explanations

- **Isotope:** an atom with the same no of protons but different no of neutrons e.g. C 12 & C 14
- **Half life:** Time in years for half the amount of parent isotope to decay to daughter isotope.



Some explanations

- **Radiometric dating:** The calculation of age from the analysis of isotope levels remaining.
- **Isochron age:** A more accurate method involving measurement of several parent/daughter ratios.



Assumptions cont.

- Rate of decay has not changed in the past!

However there is accumulating evidence that the rate of decay is not constant. See:

<http://news.stanford.edu/news/2010/august/sun-082310.html>

<http://arxiv.org/abs/0808.3156>

- Research Article challenging calibration of C14 dating

<http://arxiv.org/abs/1204.5953>

- Research papers related to variations in the rate of decay

<http://web.mit.edu/redingtn/www/netadv/XperDecRat.html>

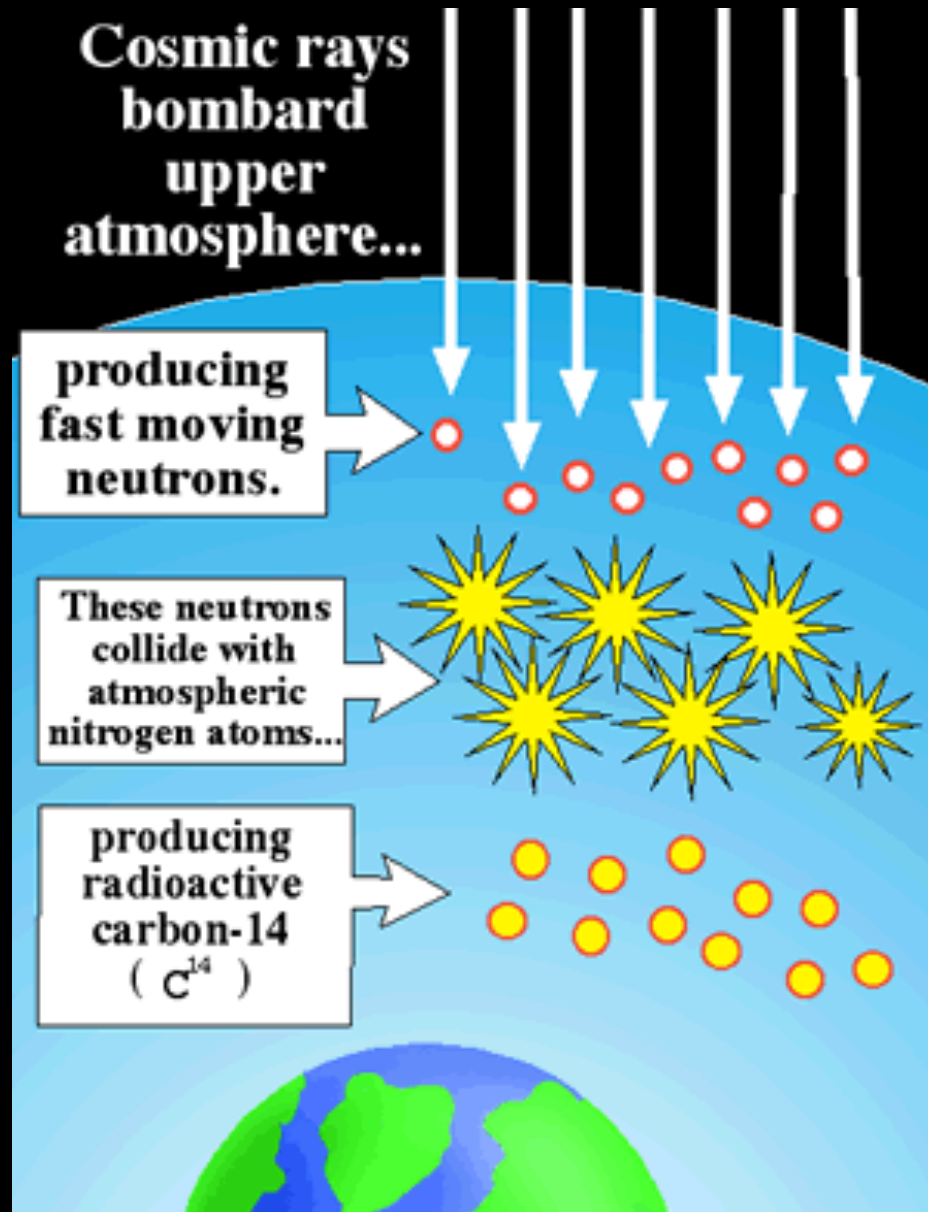


**Cosmic rays
bombard
upper
atmosphere...**

**producing
fast moving
neutrons.**

**These neutrons
collide with
atmospheric
nitrogen atoms...**

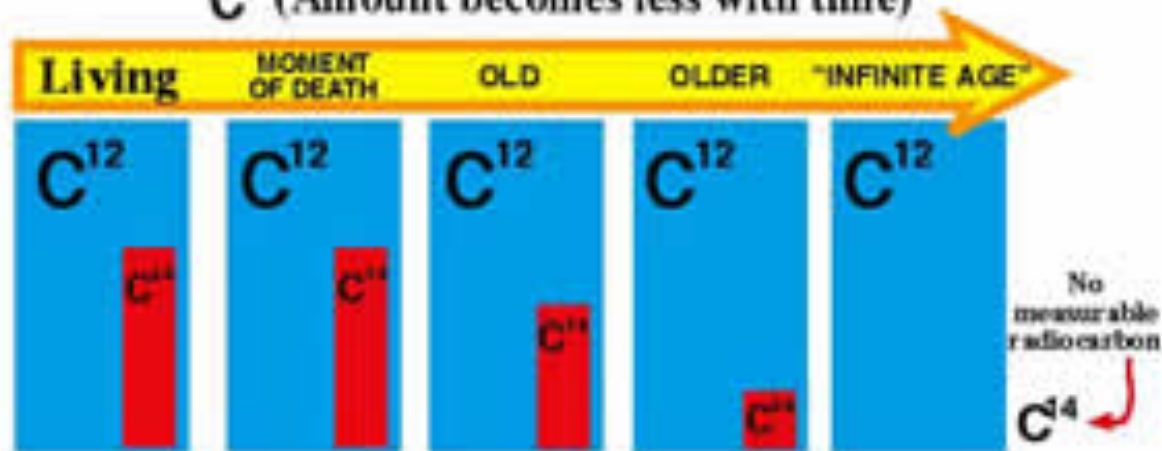
**producing
radioactive
carbon-14
(C^{14})**



Total carbon in a specimen



C^{14} (Amount becomes less with time)



Note

- Fossil bearing strata (sedimentary) are usually dated by dating igneous (volcanic) rocks above and below the strata.
- Fossils containing carbon can be dated by C14
- But C14 levels vary with cosmic ray flux which varies with earth's magnetic field which is decaying at about 5% per 100 years . i.e. C14 levels in the past would be lower giving older calculated ages than actual ages.





- Volcanoes emit CO_2 with depleted $\text{C}14$ which further dilutes the atmospheric $\text{C}14$ levels and there is ample evidence that volcanic activity was much higher in the past.
- Also deep ocean $\text{C}14$ levels are lower than surface terrestrial $\text{C}14$ levels and ocean current mixing results in marine organisms dating older than contemporaneous terrestrial organisms by hundreds to several thousand years.

C14 dating calibration curve

- Because of the complicating factors C14 calculated dates do not correspond to chronological dates and as a result C14 measurement have to be calibrated against known chronological dates
- Counting tree rings (dendrochronology) is the most common method up to around 10,000 years.
- After that lake varves have been counted and leaf matter trapped in the varves analysed for C14.





- In practice, tree-ring calibration is not as straightforward due to many factors, including overlapping pattern matching errors and individual measurements made on the tree rings and the sample have limited precision so a range of possible calendar years is obtained.
- Recent research on seasonal effects on tree rings, has revealed that up to five rings per year can be produced and extra rings are often indistinguishable, even under the microscope, from annual rings.

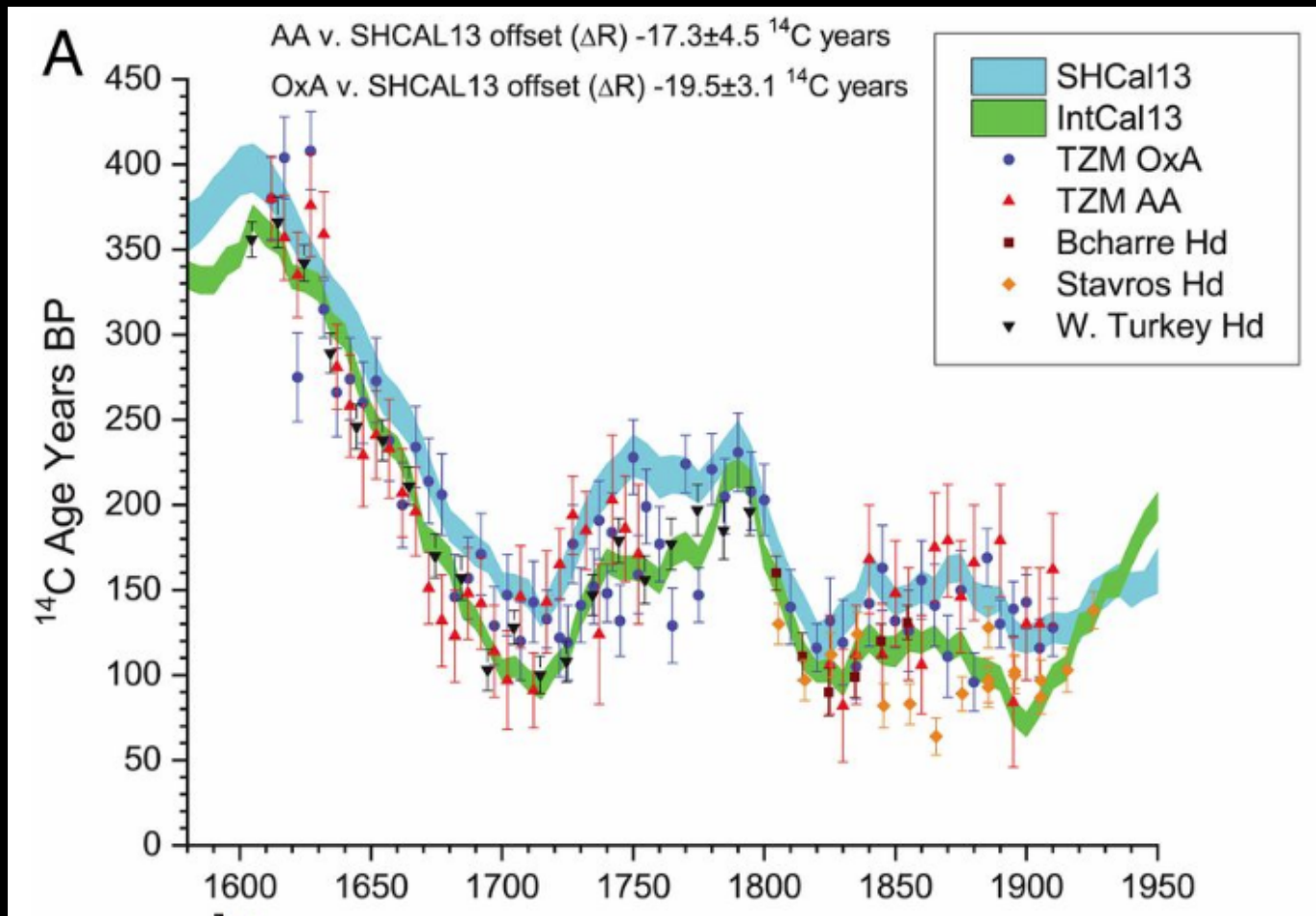


- Nowadays, the internationally agreed upon calendar calibration curves reach as far back as about 48000 BC (Reimer et. al., INTCAL13) and Marine13 radiocarbon age calibration curves 0 – 50000 yrs cal BP, (Radiocarbon 55(4), 2013).
- These curves are still being debated due to the need to match the “wiggles” from the different overlapping time periods.

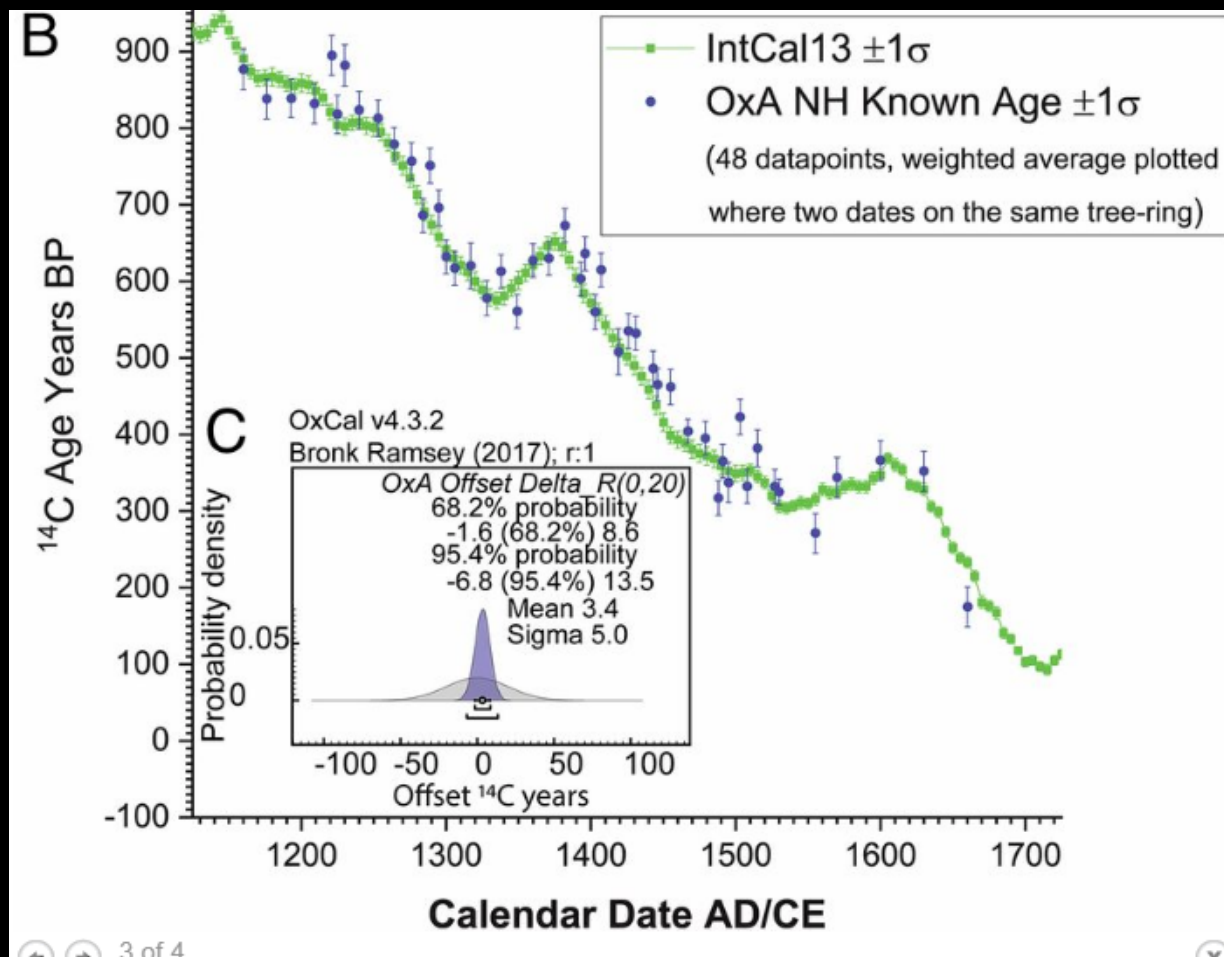


- Note:
- These calibration curves are therefore based on estimated dates assuming annual cycles.
- They are not based on known proven dates!!!

Stuart Manning, professor of archaeology at Cornell University and director of the Cornell Tree-Ring Laboratory, 2018.

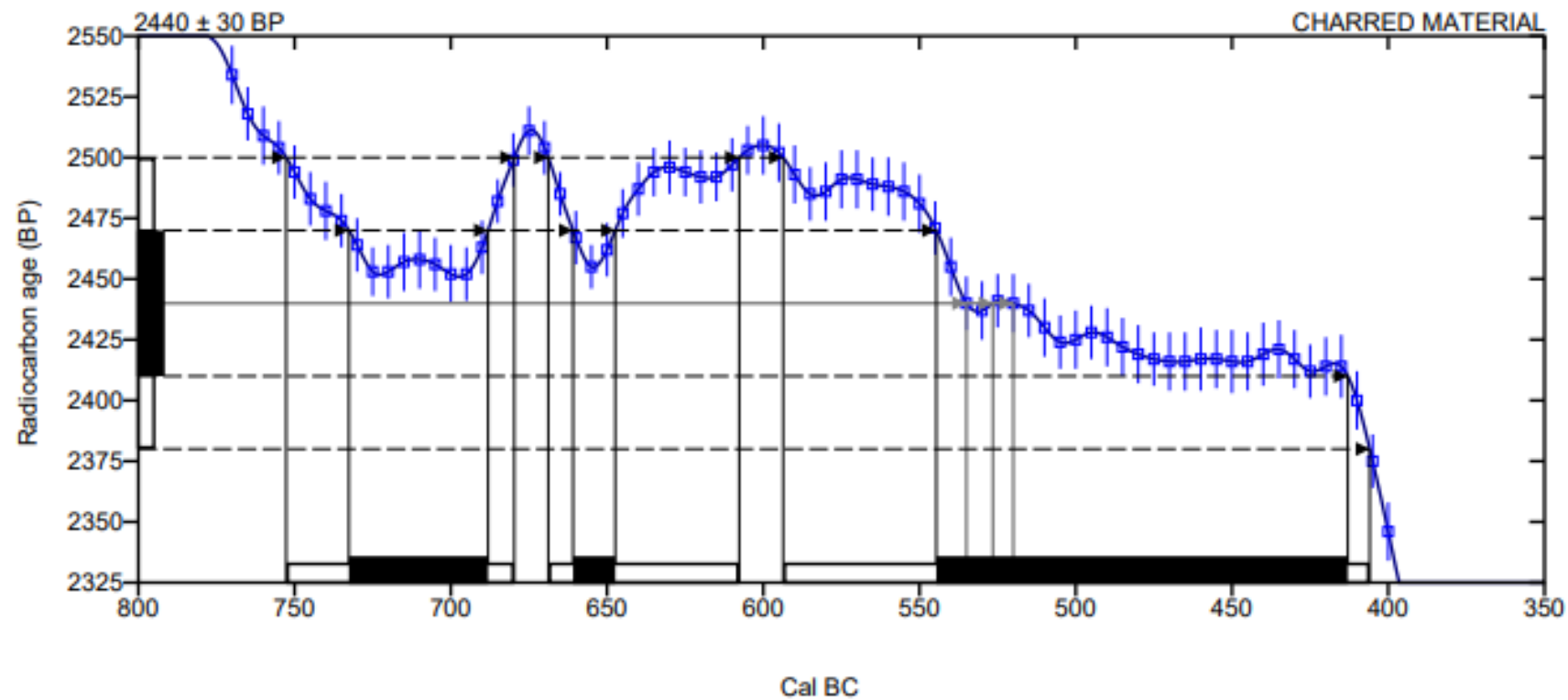


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2018 <https://doi.org/10.1073/pnas.1719420115ps>





- More examples of calibration curves can be found at
- <https://journals.plos.org/plosone/article/file?type=supplementary&id=info:doi/10.1371/journal.pone.0194838.s003>



- However reports of carbon 14 being measured in dinosaur soft tissue remains, in coal and in diamonds – all supposedly millions of years old -raises serious questions for C14 dating calibration since no C14 should be detected in such old samples..



- For example in 2007 fossil ammonites and terrestrial wood found together in Cretaceous Strata near Redding California (conventionally dated between 112-120 million years) were Carbon 14 dated by the Iso Trace Radiocarbon Lab at the University of Toronto, Ontario.
- Careful procedures were followed to remove any contamination and laboratory background errors.
- The Ammonite samples dated 36,400 to 48,700 years
- The Wood samples dated 32,700 to 42,390 years
- These dates convert to around 4,000 – 4,500 years when corrected for ancient biosphere conditions!

Triceratops near Glendive, MT
Sawing Bone Femur





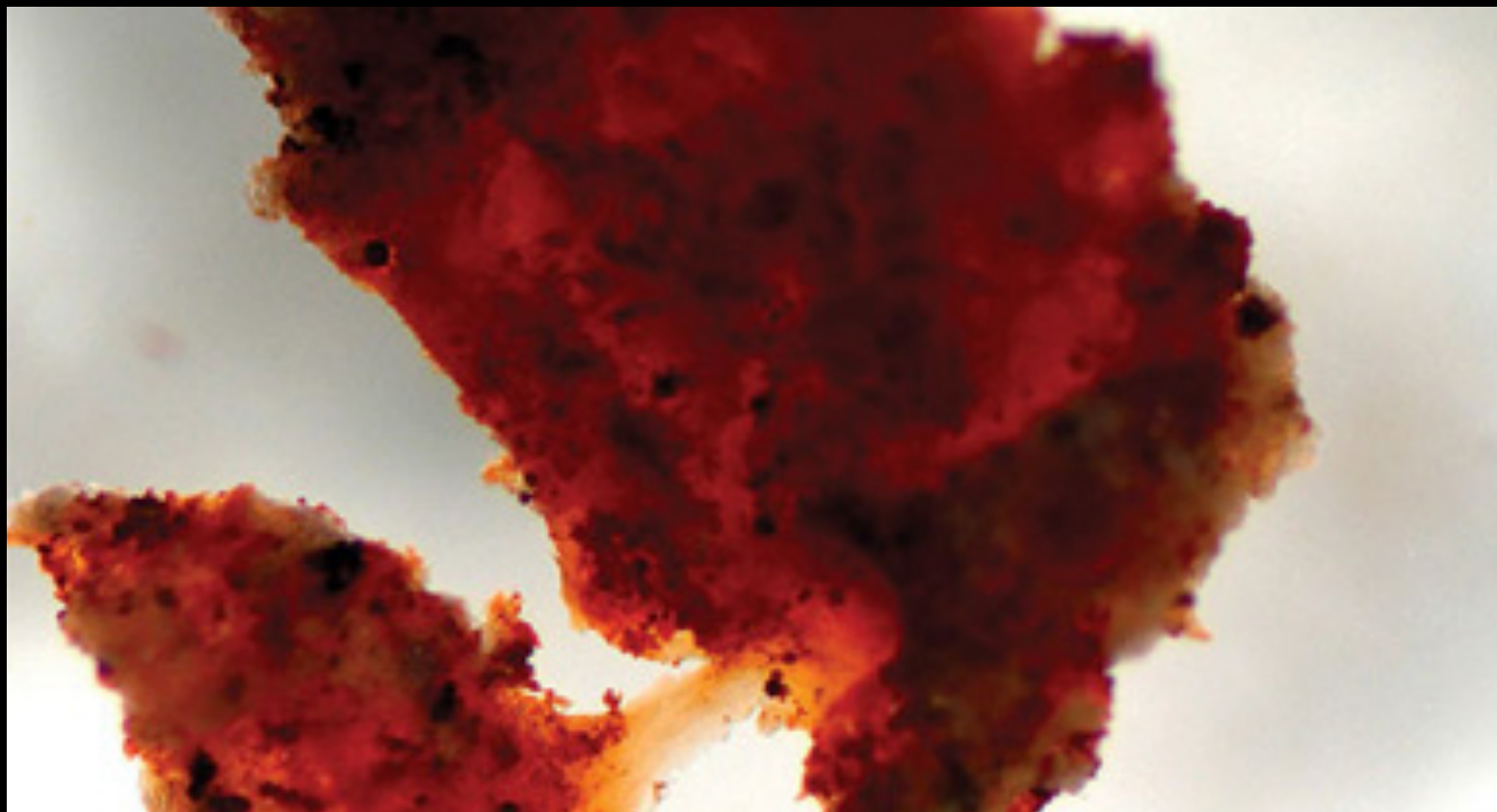
**Sample Extraction of
Triceratops femur July 2005
near Gendive, MT**

Soft tissue found in dinosaur remains!

- Soft tissues and blood components and other proteins have been found in dinosaur fossils dated up to 120 million years old.
- In 2009 a freshly dug, from under 7 metres rock, dinosaur leg bone yielded collagen proteins, bone cells and parts of DNA independently verified by researchers from 3 universities including Harvard University.

See: *Science*, Vol 324, 2009, pp 626-631.







- In 2011 University of Lund (Sweden) scientists reorted soft tissue in a mosasaur (Cretaceous marine lizard) fossil conventionally dated at 70 million years.
- 5 mg of carbon was extracted , (3 mg was used in C14 analysis) and gave an age of 24,600 years
<http://www.plosone.org/article/info%3Adoi%2F10.1371%2Fjournal.pone.0019445> (2011).



- In 2012 Carbon-14 (C-14) dating of multiple samples of bone from 8 dinosaurs found in Texas, Alaska, Colorado, and Montana gave ages ranging from 22,000 to 39,000 years BP.
- The findings were presented at the 2012 Western Pacific Geophysics Meeting in Singapore, August 13-17, a conference of the American Geophysical Union (AGU) and the Asia Oceania Geosciences Society <http://newgeology.us/presentation48.html>



- Carbon 14 has a half-life of about 5,750 years. This means that after 100,000 years there is no measurable carbon 14 left.
- However when we analyse coal, diamonds and dinosaur bones supposedly millions years old and older we find measurable levels of Carbon-14.
- **See: Recent C-14 Dating of Fossils including Dinosaur Bone Collagen.**

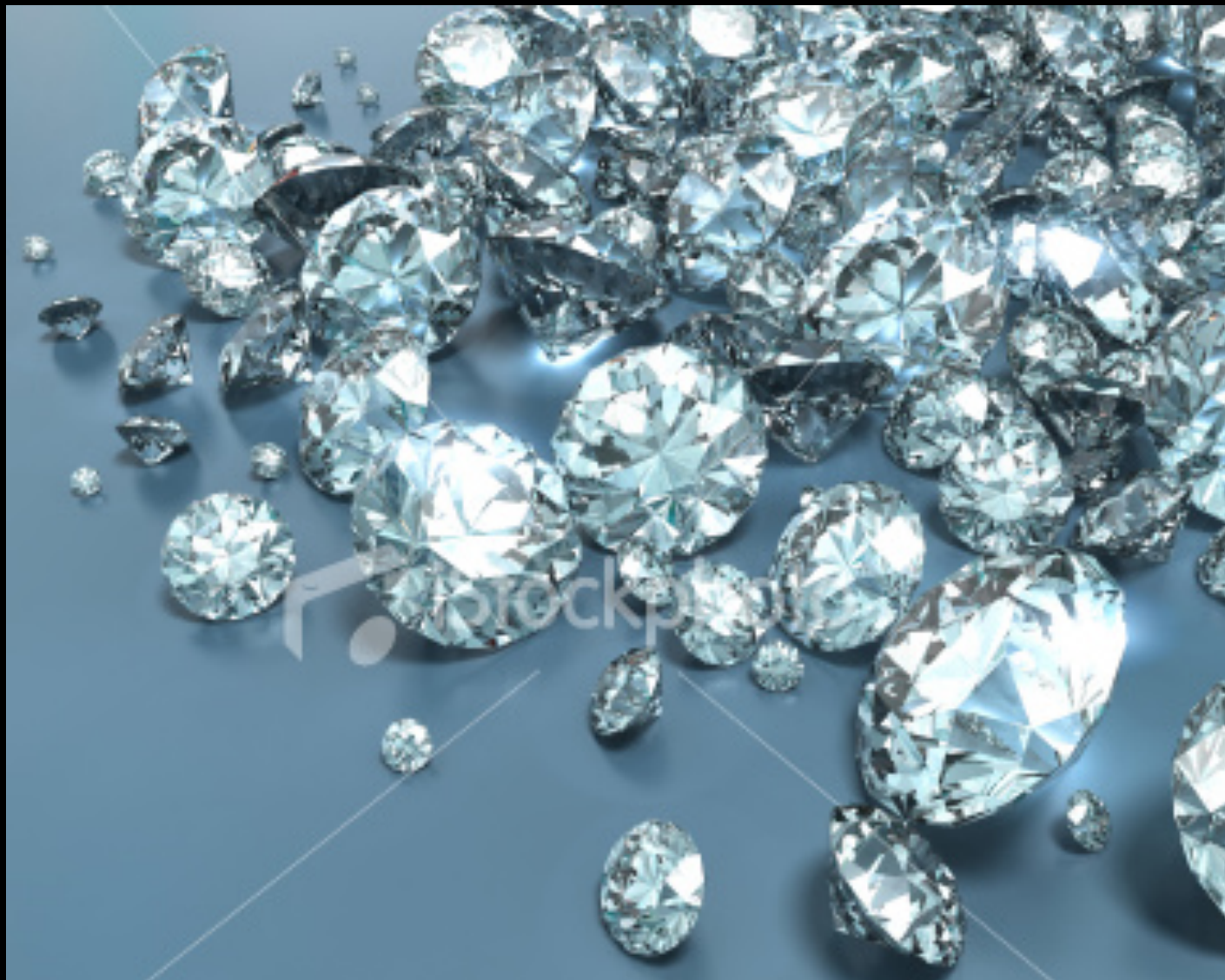
<http://www.sciencevsevolution.org/Holzschuh.htm>



C14 ages for coal.

- Ten coal samples conventionally dated from 40 million years to 300 millions years were analysed for C14 by precision accelerator mass spectrometry (AMS) all samples gave ages ranging between 44,000 years and 57,000 years.
- NB when earth's magnetic field effects etc. are accounted for, the estimated age would be much less e.g. possibly around 4,000 – 5,000 years!





- Diamonds are supposed to have formed when the continents formed. They are supposed to be around 2,500 million years old.

C14 ages for diamonds.

- Five kimberlite pipe diamonds and one alluvial diamond, were analysed by AMS in the early 2000s. All contained measurable C14 and gave an average age of 55,700 years.
- A subsequent University of California study using the high precision Keck Carbon Cycle AMS gave C14 ages ranging from $64,900 \pm 400$ years to $80,000 \pm 1,100$ years.
- The detection of C14 means the diamonds (and the continents) must be less than 100,000 years.



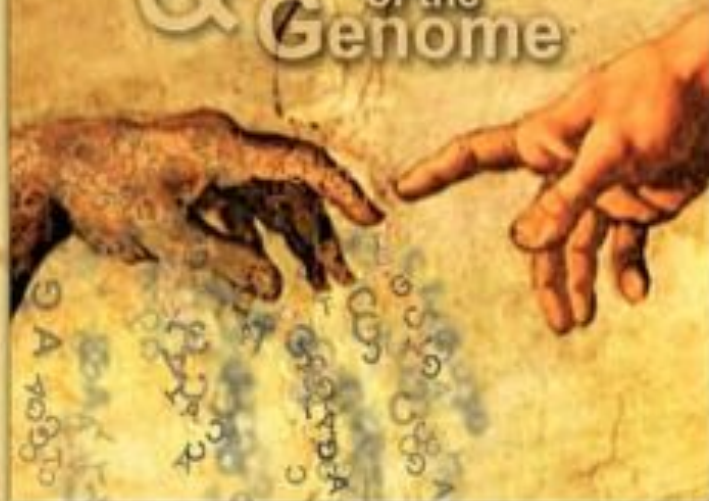


More comments about C14 dating can be found at:

- <http://creation.com/images/pdfs/cabook/chapter4.pdf>
- <http://www.answersingenesis.org/articles/nab/does-c14-disprove-the-bible>
- Another challenge to C14 dates comes from the area of genetic entropy.

Genetic Entropy

& The Mystery
of the
Genome



Dr. J.C. Sanford



- Because the DNA of living things is steadily accumulating errors we can estimate how long it would take before there would be so many errors in the DNA that the plant or animal or bacteria would no longer survive.
- That calculation gives an answer of less than 100,000 years down to around 10,000 years.
- This means life on earth must be less than 100,000 years old which does not fit with radiometric dating timescales.