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TASC

TASC's mission is to rebuild and strengthen the foundation of the Christian faith by increasing awareness of the scientific evidence supporting the literal Biblical account of creation and refuting evolution.

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Carbon 14 Dating of Fossils

By David Plaisted

Organic matter in the fossil record generally dates by carbon 14 (C14) dating to about 20,000 to 40,000 years. Other radioactive dating methods such as potassium/argon (K/Ar), rubidium/strontium (Rb/Sr), uranium/lead (U/Pb), thorium/lead (Th/Pb) and others that are based on decay of longer-lived isotopes often give ages in the millions or hundreds of millions of years for these fossils. Why is this? Why are the dates so different?

Many creationists believe that radioactive decay was faster in the past. However, in this talk I want to concentrate on reasons to believe the C14 dates are more accurate and that they give evidence that all life on earth is very young. If decay rates were faster in the past, then even the C14 dates could be too old.

How Carbon 14 Is Produced and Decays

Carbon 14 is an isotope of carbon with two extra neutrons in the nucleus. It is produced in the upper atmosphere. The rate at which this happens varies to some extent. Perhaps there was less C14 produced in the past, which would imply that even the relatively young C14 dates are too old.

Ordinary carbon is carbon 12 (C12). The C14/C12 ratio of living things and organic matter on the surface of the earth is about the same as in the atmosphere because carbon is constantly exchanged between living things and the atmosphere. After an organism dies, if it is buried and left undisturbed, the C14 in it gradually decays into nitrogen 14. The amount of C12 in the organism stays the same. Thus the ratio of C 14 to C12 in the remains of the organism gradually decreases with time. By measuring the C14/C12 ratio, one can get an estimate of the age for the date of a once living object or a fossil, assuming that the production of C14 and its decay rate have been constant in the past. These estimates are roughly correct for historic time, that is, the past several thousand years.[1]

The half-life of C14 is 5730 years, although there are subtleties about how C14 ages are actually computed. That means that in 5730 years, half of the C14 will decay to nitrogen 14. In three half-lives the C14 concentration decreases by a factor of 8. Twenty thousand years is 3.49 half-lives of C14 because 3.49 times 5730 is 20,000. In 20,000 years the concentration of C14 decreases by a factor of 0.089 (to less than a tenth) because $(1/2)^{3.49} = 0.089$. Thus in 40,000 years it decreases by a factor of about 0.0079 because $(0.089)^2 = 0.0079$.

Currently in the atmosphere there are about 1.5 C14 atoms in 10^{12} C12 atoms. In 40,000 years there would be less than one percent as much, in fact 0.079 as much. So there would be about $0.0079 \times 1.5 \times 10^{-12}$ or $1.2 *\times 10^{-14}$ C14 atoms for each C12 atom after 40,000 years. There are about 6 times 10^{23} C12 atoms in a mole (12 grams) of C12. This means that currently in a mole there are $1.5 \times 10^{-12} \times 6 \times 10^{23}$ C14 atoms, which is 9×10^{11} C14 atoms. After 40,000 years, there would be $0.0079 \times 9 \times 10^{11}$ which is 7.1×10^9 or about 7 billion C14 atoms in a mole of C12. Thus a sample that dates to 40,000 years by C14 dating still has about 7 billion C14 atoms per mole of carbon. This is still a large number of C14 atoms, and they had to come from somewhere!

Young Carbon 14 Dates

In general, organic matter in the fossil record dates by C14 dating to 20,000 to 40,000 years. Here are some specific results along this line; many more could be cited. These were taken from a conference in 2012[2] and were mentioned in an article on the TASC web site.[3]

- An allosaurus from the Morrison formation, late Jurassic, found in 1989 was dated by the University of Georgia by accelerator mass spectrometry. The age was found to be 31,360 ± 100 years old.

[1] Brown RH (1973 Apr) Answering questions concerning radiocarbon dating. (<https://www.ministrymagazine.org/archive/1973/04/answering-questions-concerning-radiocarbon-dating> Accessed 23 May 2017

[2] Miller H, Owen H, Bennett R, de Pontcharra J, Giretych M, Taylor J, van Oosterwych M, Kline O, et al. (2012 Aug 15) A comparison of δ13C & pMC values for ten Cretaceous-Jurassic dinosaur bones from Texas to Alaska USA, China and Europe, Asia Oceania Geosciences Society (AOGS) - American Geophysical Union (AGU) Joint Assembly, Resorts World Convention Center, Singapore, 15 August, 2012

[3] Spears J (2013 Nov) Radiocarbon dating of dinosaur fossils, <http://tasc-creationscience.org/sites/default/files/newsletter_pdf/nov2013.pdf>

- Another Hell Creek formation dinosaur, found in 2004, a triceratops, was dated by the University of Georgia by accelerator mass spectrometry in 2009 as 24,340 ± 70 years old.
- An apatosaurus was found in late Jurassic strata of the Morrison formation, and excavation was done in 2007 and 2009. In 2011 the University of Georgia dated the fossil to 38,250 ± 160 years old.

Special care was taken to prevent contamination.[4]

There are many more such results:[5]

> Fossils, coal, oil, natural gas, limestone, marble, and graphite from every Flood-related rock layer—and even some pre-Flood deposits—have all contained measurable quantities of radiocarbon. All these results have been reported in the conventional scientific literature. …
>
> Pieces of fossilized wood in Oligocene, Eocene, Cretaceous, Jurassic, Triassic, and Permian rock layers supposedly 32–250 million years old all contain measurable radiocarbon, equivalent to "ages" of 20,700 to 44,700 years. …
>
> Similarly, carefully sampled pieces of coal from ten U.S. coal beds, ranging from Eocene to Pennsylvanian and supposedly 40–320 million years old, all contained similar radiocarbon levels equivalent to "ages" of 48,000 to 50,000 years. Even fossilized ammonite shells found alongside fossilized wood in a Cretaceous layer, supposedly 112–120 million years old, contained measurable radiocarbon equivalent to "ages" of 36,400 to 48,710 years.

Mary Schweitzer Results on Dinosaur Bones

Recent finds of Mary Schweitzer are also relevant for the dating of ancient bones. Mary Schweitzer, a professor at North Carolina State University (North Carolina), has found soft tissue and protein in dinosaur bones. Even more, proteins in this tissue retain their structure. Extraordinary efforts were made to eliminate all contamination from the measuring apparatus. These results were discussed in a recent *Science* article.[6]

Mary Schweitzer's results shows that essentially all the remaining material in the dinosaur bone is original because she had no trouble finding these young appearing proteins. If there had been contamination, then it would have introduced other substances into the soft tissue.

Here is a discussion of this and related finds by Brian Thomas, a creation oriented author:[7]

> One find reported in *Nature Communications* included signatures of Type I collagen in a *Lufengosaurus* sauropod fossil supposedly 190-197 million years old. …
>
> Another find recently published in the *Journal of Proteome Research* verified and extended protein identification in a duck-bill dinosaur that Mary Schweitzer's team had described in 2009.
>
> These two new finds join dozens of others published over the last half-century, but evolutionary scientists still have a hard time accepting that these fossils retain original biochemicals. Robert Service wrote in *Science*:[6]
>
> > The [soft tissue fossil] claims were met with howls of skepticism from biochemists and paleontologists who saw no way that fragile organic molecules could survive for tens of millions of years, and wondered whether her samples were contaminated with modern proteins.
>
> Ancient protein specialist Michael Collins noted, "Proteins decay in an orderly fashion. We can slow it down, but not by a lot." …

This shows that there are many such finds of protein in fossil specimens, and also that experts in the field have trouble seeing how proteins could survive in bone for millions of years.

Here are more quotations from the Science article referenced above:[6]

> Last week in the *Journal of Proteome Research*, Schweitzer, her postdoc Elena Schroeter, and colleagues report that they did a complete makeover of their 2009 experiment to rule out any possible contamination. …Schroeter even went so far as to break down the mass spectrometer piece by piece, soak the whole thing in methanol to remove any possible contaminants, and reassemble the machine. …Just how those collagen sequences survived for tens of millions of years is not clear. "About the only thing that is the same [as the 2009 experiments] is the dinosaur," Schweitzer says. …
>
> Meanwhile, Schweitzer's team is going beyond collagen. In a 2015 paper in *Analytical Chemistry*, her group reported isolating fragments of eight other proteins from fossils of dinosaurs and extinct birds, including hemoglobin in blood, the cytoskeletal protein actin, and histones that help package DNA.

[4] Carbon-14 dated dinosaur bones - under 40,000 years old. AOGS Conference, Singapore, 2012 presentation. <http://www.youtube.com/watch?v=QbdH3l1UjPQ> Accessed 2017 May 20

[5] Snelling AA (2011) Carbon-14 in fossils and diamonds: An evolution dilemma. *Answers Magazine*, <https://answersingenesis.org/geology/carbon-14/carbon-14-in-fossils-and-diamonds/> Accessed 2017 May 20

[6] Service RF, (2017) Researchers close in on ancient dinosaur proteins, *Science* 355(6324): 441-2

[7] Thomas B (Stunning protein fossils confirm the flood. *Acts & Facts*. 46(4) <http://www.icr.org/article/9940> Accessed 2017 May 20

Amino Acid Dating

There is another dating method based on the orientation of amino acids, whether they spiral to the right (D) or to the left (L):[8]

> All biological tissues contain amino acids. All amino acids except glycine (the simplest one) are optically active, having a stereocenter at their α-C atom. This means that the amino acid can have two different configurations, "D" or "L" which are mirror images of each other. With a few important exceptions, living organisms keep all their amino acids in the "L" configuration. When an organism dies, control over the configuration of the amino acids ceases, and the ratio of D to L moves from a value near 0 towards an equilibrium value near 1, a process called racemization. Thus, measuring the ratio of D to L in a sample enables one to estimate how long ago the specimen died.

This dating method is considered to be accurate for ages up to several hundred thousand years. It is calibrated by C14 dating, and the ages given by the two methods are in close agreement after such calibration.[9] In millions of years, there would certainly be roughly equal numbers of D and L forms, so that the ratio of D to L would be one. A chart of the ratio of D to L for samples of various radiocarbon ages shows that even for samples dated to 30,000 or 40,000 years, the ratio of D to L is significantly less than one.[10] Thus one can expect that in the dinosaur bones this ratio is also significantly less than one because amino acid and C14 dates generally agree. However, in millions of years, there would certainly be roughly equal numbers of D and L forms, so that the ratio of D to L would be one. This is additional evidence that these bones are not millions of years old. At any rate, it would be interesting to determine the D to L ratio for the proteins found in dinosaur bones.

Another interesting fact about amino acid dating is that the transformation of L to D forms seems to occur more and more slowly the older the sample is:[11]

> Interestingly enough, the racemization constant or "k" values for the amino acid dating of various specimens decreases dramatically with the assumed age of the specimens (see figures). This means that the rate of racemization was thousands of times (up to 2,000 times) different in the past than it is today. Note that these rate differences include shell specimens, which are supposed to be more reliable than other more "open system" specimens, such as wood and bone.

Many fossils have been dated both by racemization and by C14 dating. The conventional time scale assumes that racemization occurs slower and slower as we go back in time. If we assume that racemization occurs at a constant rate, which is a reasonable assumption, then we get a time scale that is more compressed even than the C14 time scale. This would imply that any date within 50,000 years by C14 dating is really at most 18,000 years, and even any date within a million years by conventional dating is really at most 18,000 years. This would imply that the dinosaur bones are also at most 18,000 years old![11]

Are Young Carbon 14 Dates Due to Contamination?

One response of evolutionary scientists to the relatively young C14 dates is to say that they are due to contamination of the bones by modern carbon, having a higher proportion of C14. But other times they accept C14 ages in the range of 20,000 to 40,000 years as valid. Also, as mentioned earlier, extraordinary methods were used to eliminate all possible contamination when measuring the C14 in these supposedly ancient bones.

In addition, the preservation of soft tissue together with bone has implications for the possible contamination of the dinosaur bones.

Preservation of Bone and Soft Tissue

If dinosaur bones with soft tissue, which require a dry environment for preservation, are typically found in similar environments as dinosaur bones with young C14 dates, then this would suggest that the young C14 dates are not caused by contamination. Based on current tests, it appears that many and perhaps all fossils with organic matter have young carbon 14 dates, and also that a significant number of dinosaur fossils have soft tissue, so this is a reasonable assumption.

If such dinosaur bones with soft tissue had been wet for a significant length of time, bacteria would have consumed the remaining proteins and there would be no soft tissue left. That's how bacteria get their energy, by breaking down proteins and other organic substances into simple substances that are water soluble, and burning the carbon in them. This is how nutrients are made available to plants. But Mary Schweitzer has shown that the proteins are still there in the dinosaur bones. Thus these bones must have been dry since their burial. If this is so, then how could they be contaminated? Contamination would have to come through water flowing through the bones.

Soft tissue and even bones do not survive long in damp conditions, except under highly unusual conditions such

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[8] Amino acid dating. <https://en.wikipedia.org/wiki/Amino_acid_dating> Accessed 2017 May 20

[9] Bada JL, Helfman PM (1975) Amino acid racemization dating of fossil bones. *World Archaeology* 7(2):160-73 <https://www.jstor.org/stable/124036?seq=1#page_scan_tab_contents> Accessed 2017 May 20

[10] Bada JL, Schroeder RA, Protsch R, Berger R (1974) Concordance of collagen-based radiocarbon and aspartic-acid racemization ages. *Proc. Natl. Acad. Sci. USA* 71(3):914-17 <http://www.pnas.org/content/71/3/914.full.pdf> Accessed 2017 May 20

[11] Pitman SD (2010 Jan) Amino acid racemization dating. <http://www.detectingdesign.org/?page_id=575> Accessed 2017 May 20

as in peat bogs[12] where soft tissue can survive in highly acidic anaerobic conditions and low temperatures. However, under such acidic conditions, bone is rapidly dissolved. Because the soft tissues and bones are still intact, they must have been kept very dry since their burial. A considerable amount is known[13,14] about the preservation of bones in soil and the need for a basic environment for bones to survive.

Perhaps a highly basic environment would inhibit bacterial growth and permit soft tissue to be preserved. But a basic environment breaks down organic matter and soft tissue:[15]

> Common corrosives are either strong acids, strong bases, or concentrated solutions of certain weak acids or weak bases.
>
> A **corrosive substance** is one that will destroy and damage other substances with which it comes into contact. It may attack a great variety of materials, including metals and various organic compounds, but people are mostly concerned with its effects on living tissue: it causes chemical burns on contact.
>
> Concentrated or strong bases are caustic on organic matter and react violently with acidic substances.

The definition of caustic is: capable of burning, corroding, or destroying living tissue.[16] So a mildly alkaline environment would still permit bacteria to grow. A strongly alkaline environment would destroy tissue because it is caustic.

So if there is some wet environment permitting both bone and soft tissue to be preserved for millions of years, it must be highly unusual. It seems that it could not be highly acidic, highly basic, or neutral. So such an environment could not explain how fossil remains from all through the fossil record could contain significant amounts of C14, dating to about 40,000 years or less because most of them would not be in such an unusual environment, if it could even exist. But if the environment were dry, then the bones could not be contaminated.

Now, could air bring contamination to these bones? Air would bring moisture, which again would enable the growth of bacteria. Dry air would contain carbon dioxide, but this is a highly stable molecule and would not transfer carbon to the bone without an input of energy from somewhere. In any event, such contamination would be on the surface and would be omitted by thorough cleaning methods.

Necessary Quantity of Contamination

Now, how much contamination would there have to be if the dinosaur bones were really of infinite C14 age as the scientists claim?

Suppose X parts of carbon were original and Y parts were contamination. Suppose a1X of the original were C14 and a2Y of the contamination were C14. Suppose the ratio C14/C12 in the whole is a3. Then $(a1X + a2Y)/(X + Y) = a3$. So $Y/X = (a1 - a3)/(a3 - a2)$.

Assuming contamination of infinite age carbon by zero age carbon, $a2 = 1.5 \times 10^{-12}$ and if the measured age is about 40,000 years, $a3 = 1.2 \times 10^{-14}$. Also suppose $a1 = 0$ (the original sample had no C14 before contamination). Then $Y/X = (-a3)/(a3 - a2)$ so $Y/(X+Y) = 1/(X+Y)/Y = 1/(1 + X/Y) = 1/(1 - (a3 - a2)/a3) = 1/(1 - (1 - a2/a3)) = 1/(a2/a3) = a3/a2 = 0.8 \times 10^{-2}$. This means that nearly one percent of the carbon would have to be contamination. To get a measured age of 20,000 years, $a3 = 0.089 \times a2$ so $Y/(X+Y) = a3/a2 = 0.089$. Thus nearly 10 percent of the carbon would have to be contamination! Similarly, to get a measured age of 40,000 years if the contaminating material had a C14 age of 20,000 years would mean that nearly 10 percent of the total carbon would have to be contamination! Surely this would be noticed.

If a bone really has an infinite C14 age and contamination reduces the age to 40,000 years, then about 8/10 of one percent of the carbon in the bone has to come from contamination. This is a large amount and should be detectable by some means. This figure is for contamination from recent organic matter. If the contamination is by older carbon, then the amount would even have to be larger. And in any case, in a dry environment, contamination would be impossible.

Recent bones have about one part in 10^{12} of C14 in their carbon. This is not considered as contamination. Then why should one part in 10^{12} C14 not be considered contamination but one part in 10^{14} is? This cutoff is purely arbitrary.

Could It Be Bacteria?

Could contamination of the bones come from bacteria? One would expect any bacterial contamination to happen soon after the bone was buried, so it wouldn't change the C14 date by much. Also any bacteria would have eaten up the remaining protein in the bones, contradicting Mary Schweitzer's results. And, of course, in a dry environment there would be essentially no bacteria. Dry environments preserve organic matter well.

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[12] Bog Body <https://en.wikipedia.org/wiki/Bog_body> Accessed 2017 May 20

[13] Preservation of human remains. <http://theexaminiationofhumanremains-lara.blogspot.com/p/preservation-of-human-remains.html> Accessed 2017 May 20

[14] Surabian D (2012 Dec) Preservation of buried human remains in soil. <https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb1167745.pdf> Accessed 2017 May 20

[15] Corrosive substance <https://en.wikipedia.org/wiki/Corrosive_substance> Accessed 2017 May 20

[16] Caustic <http://www.dictionary.com/browse/caustic> Accessed 2017 May 20

Could It Be Atmospheric Conditions?

Even if dinosaur bones were 100 percent C14 originally in their carbon content, a ridiculous assumption, after a million years there would be very few C14 atoms left, and this much C14 in the beginning might give off too much radiation for the animal to survive. Also, this would require a lot of radiation entering the earth to generate so much C14, and this radiation alone would drive many species extinct.

To get from 100 percent C14 to 10^{-14} parts C14 per unit of C12 takes a factor of about 46.5 half-lives of C14, or 266,445 years. This is an absolute upper bound on the ages of these fossils regardless of atmospheric conditions, assuming no contamination.

Neutron Capture Explanation

Some people attempt to explain away these young dates by saying that neutrons were generated in the earth and created the C14 in the dinosaur bones. These neutrons could have been generated by the decay of uranium and thorium in the soil. However, referring to this possibility for C14 found in diamonds, Dr. Paul Giem writes:[17]

> One can hypothesize that neutrons were once much more plentiful than they are now, and that is why there is so much carbon-14 in our experimental samples. But the number of neutrons required must be over a million times more than those found today, for at least 6,000 years…

Also, it was presented at the Singapore conference[2,4] that there were less than 20 parts per million of uranium and thorium in the dinosaur bones, which is not an exceptionally large amount. In addition, the Wikipedia article on C14 dating does not even mention uranium decay as a problem for C14 dating.[18] The normal concentration of uranium in soil 300 μg/kg to 11.7 mg/kg;[19] the latter figure is 11.7 parts per million. Thus the concentration of uranium and thorium in the dinosaur bones is near or in the normal range. If this amount could invalidate C14 dates, then it would be mentioned as a significant factor in C14 dating. Furthermore, historic C14 dates are relatively accurate. Uranium does not seem to be affecting them.

Could It Be Radiation?

Another possible explanation for the young C14 dates is that some kind of radiation from space is causing them. If the problem is radiation from outer space, then why do some bones date to 20,000 years, others to 40,000 years? Radiation from space would strike everywhere the same. And such radiation might even cause the remaining C14 to decay faster.

If uranium is producing neutrons that make C14 from C12, then why are C14 dates of 20,000 years to 40,000 years ever accepted? They are accepted for example for the mastodons. The following quotation is from 1997.[20]

> Scientists now believe that the buried cypress grove unearthed last winter during excavations for the Ravens football stadium in downtown Baltimore flourished 34,000 years ago, at a time when mastodon foraged in Maryland's woods. …
>
> The date was established by radiocarbon tests, and reinforced by a careful study of pollen found in clay samples recovered by the Maryland Geological Survey. …
>
> By measuring the ratio of carbon 14 remaining in plant or animal material, scientists can determine approximately when it died—provided it falls within the last 40,000 years.

If radiation from space and uranium were significant factors in C14 dating then they should be used to correct historic C14 dates as well, but they are not. If there is enough radiation from space or from uranium to convert an infinite C14 date to 20,000 years (about 3 half lives, or 1/8 of current C14 concentration) then it would also change a 20,000 year date to about 14,000 years (1/8 of current concentration to 1/4 of current concentration) and a 5,000 year date to maybe 4,000 years or less (1/2 of current C14 concentration to 5/8 of current concentration), a significant correction.

It's amazing how uranium concentrates around dinosaur bones to invalidate their C14 dates but manages to avoid mastodon remains and everything else that is dated. Likewise radiation coming from millions of miles away in space has an uncanny ability to hit dinosaur bones only.

Conclusion: The Dinosaur Bones Are Young

So the young C14 dates can't be due to radiation. They can't be due to contamination. They also can't be the result of differing atmospheric conditions. It must be then that these bones are really young.

However, this conclusion is not likely to be accepted by the scientific community. There is tremendous inertia in science. Those who propose radical changes risk damage to their careers and ridicule. Evolution needs long ages, so

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[17] Sarfati J Diamonds: a creationist's best friend; Radiocarbon in diamonds: enemy of billions of years. <http://creation.com/diamonds-a-creationists-best-friend> Accessed 2017 May 20

[18] Radiocarbon dating <https://en.wikipedia.org/wiki/Radiocarbon_dating> Accessed 2017 May 20

[19] Uranium in the environment <https://en.wikipedia.org/wiki/Uranium_in_the_environment> Accessed 2017 May 20

[20] Royland FD (1997 Oct 04) Mastodons frolicked in Md. cypress groves History: Woods flourished here 34,000 years ago, when primitive elephants and ground sloths the size of grizzly bears lived along the Patapsco River valley. <http://articles.baltimoresun.com/1997-10-04/news/1997277098_1_carbon-dating-isotope-of-carbon-carbon-14> Accessed 2017 May 20

the scientists have to defend long ages or else give up evolution, which they do not want to do or are afraid to do. They say that organic matter in the fossils has to be old because evolution requires it and we know that evolution is true. This is an argument that is used to justify the old dates.

The Ages Could Even Be Younger Than 40,000 Years

Before the flood there could have been a lot more vegetation. Thus the C14 produced in the atmosphere would have been diluted by a lot more carbon in vegetation. This could have made the C14 ages too old, so life could actually be younger than 20,000 to 40,000 years. Of course, if there were less C14 in the past due perhaps to a stronger magnetic field around the earth, this would also have had a similar effect. A younger age would be in accordance with a short (literal) Bible chronology.

COMING EVENTS

Thursday, June 8, 7:00 pm, Providence Baptist Church, 6339 Glenwood Ave., Raleigh, Room 207

Dave Plaisted will discuss evidences that dinosaur bones are young, including carbon 14 dates, preservation of soft tissue, and amino acid racemization. These results challenge the conventional view that these dinosaurs existed millions of years ago.