Paul Artale   12.8.13

Review: Answers in Genesis, *Radioactive Dating-Turning Foe into Friend* (ft . Dr. Andrew Snelling), 2009

Runtime (min): 62

Basic elementary physics is explained:

*P=e for every atom.

*The number of *neutrons* in an atom's nucleus determines the isotope.

*In radioactive atoms a *parent* isotope decays into a *daughter* isotope as its nucleus is unstable.

Radioactive atoms (parent and daughter) are found in minerals contained in rocks and fossils, opening up the possibility of radioactive dating. Rocks can be *chemically* analysed for radioactive isotopes, then extracted and measured.

Key dating assumptions (must be memorised):

I) Initial conditions are known, e.g. there are zero daughter isotopes.

II) The rock is impervious to its surroundings for the complete duration of the assumed age. E.g. no hot aqueous solutions can flow into it impacting parent and daughter isotopes.

III) The rate of change from parent to daughter isotopes is constant. Historically, decay rates have only been measured for the past 100 years.

IV) 'Biased' results can be discarded. Biased means any result outside of the evolutionary paradigm!

Radioisotope examples:

Parent	Daughter
^{14}C	^{14}N
^{238}U	^{206}Pb

^{235}U	^{207}Pb
^{40}K	^{40}Ar
^{87}Ru	^{87}Sr
^{147}Sa	^{143}Nd

It is good to note the measurement accuracy and operational scientific component is not in doubt – the [expensive] technology (which can measure a single ^{14}C atom) is incredible.

Compelling uniformitarianism evidence is the concordance of radioactive dates and order of rock strata, but this can be explained under a creationist model. The Precambrian age is 545Ma – why should decay rates have been constant over such a time?

To test assumption III, the Radioisotopes[and the]Age[of]The Earth group of scientists was formed from 1997-2005. Using five lines of investigation it was falsified:

I) <u>Helium Leakage Rate out of Zircon Silicate (ZrSiO$_4$) Crystals</u>

Each of the eight steps in the ^{238}U decay chain emits an alpha particle which, after capturing two electrons become He, a very slippery molecule [3D cube diagram shown is helpful]. He escapes out of the zircon and being *independent* of the radioactive decay rate, the measurable He leakage rate out of the zircon is an excellent independent check on the veracity of radioisotope dating.

The status quo is an age of 1.5Ga from the U-->Pb methods. This was experimentally tested by drilling a 4km borehole, extracting rock samples and measuring the He % remaining (of what original quantity?)

Tabulated results and graph:

Depth(m)	T(^{0}C) in situ	He% left from 1.5Ga	Leakage Rate (cm^2/s)	Age (yrs)
750	95	80		
960	105	58		
1035	124	42		
2170	151	27	$1.09*10^{-17}$	7270
2960	197	17	$5.49*10^{-17}$	2400
3502	239	1.2	$1.87*10^{-16}$	5730
3930	277	0.1	$7.97*10^{-15}$	7330
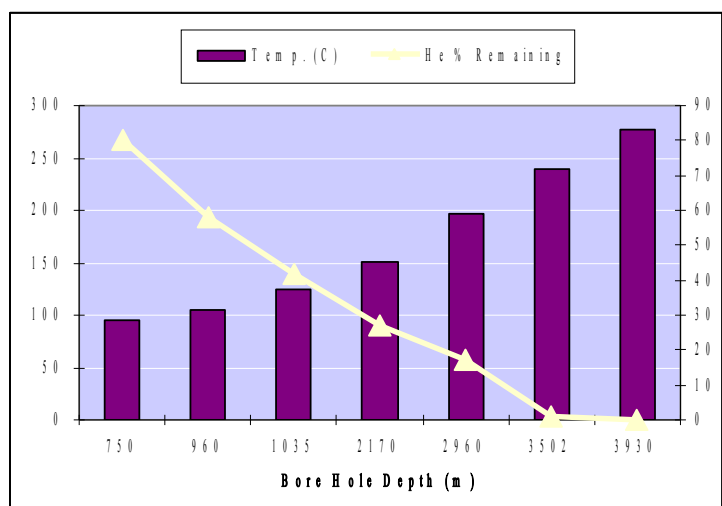
Helium retention and depth are inversely related due to higher temperatures exciting atoms, making them even more slippery.

The leakage rate is simply: [He lost]/[Elapsed time]

Given these three variables we must have two knowns to calculate the other. He lost ('diffusivity') is known from the samples taken, but the elapsed time is unknowable. Two alternatives were assumed, ~6k years as per the Bible, and 1.5Ga under an evolutionary paradigm.

A plot of inverse Temperature (T) Vs Diffusivity (D) for both series, with actual data observations:
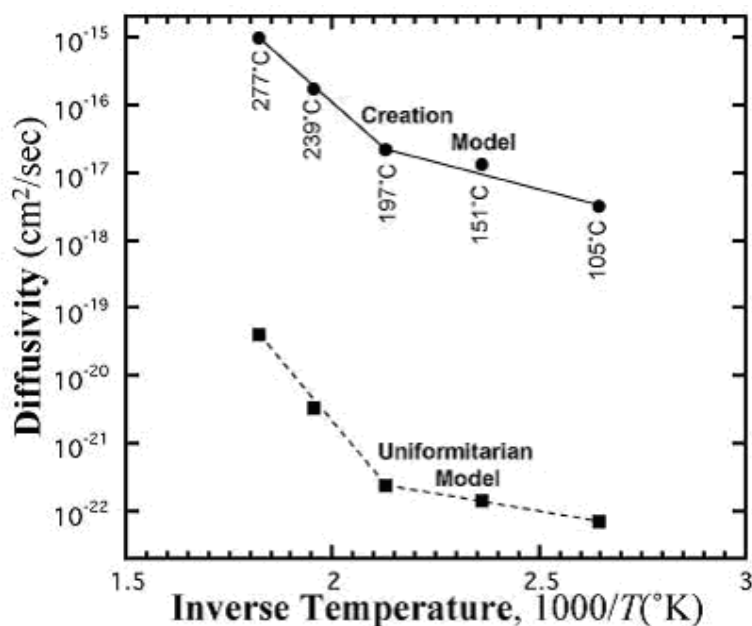

Figure 4. Predicted (Humphreys, 2000, p. 348, Figure 7) helium diffusion rates necessary to retain the observed amounts of helium (Table I) for (a) 6,000 years (Creation model), or (b) 1.5 billion years (Uniformitarian model).

II) <u>Differing Radioisotope Dating Method 'Ages'</u>

Given every rock has only one age, each of the different methods if accurate should give this age, any discrepancies falsifying the accuracy. Geologists follow this principle by only using one or two methods themselves.

RATE used all four methods on all samples, incorporating the isochron technique which fits an 'isochron' line through five or more samples in each case (in some cases 20 samples were taken).

*Grand Canyon Bass Rapids diabase sill[1]

Method	Age(Ma)
K-Ar	841.5
Rb-Sr	1,060
Pb-Pb	1,250
Sa-Nd	1,379

range = 537.5, σ = 234.2, av.= 1132.6

*Cardenas Basalt[2]

Method	Age(Ma)
K-Ar	516
Rb-Sr	1,111
Sa-Nd	1,586

range = 1,070

*Brahma Amphibolites[3]

Method	Age(Ma)
Rb-Sr	1,240
Pb-Pb	1,883
Sa-Ne	1,655

range = 415

*Elves Chasm Granodiorite[4]

Method	Age(Ma)
Rb-Sr	1,512
Pb-Pb	1,933
Sa-Nd	1,684

range = 415

Each of these samples represents a one-time geologic event at a unique location so the different ages means a different rate must have existed.

Surprisingly there is an age pattern that can help give meaning to the data: K always less than Rb.

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[1]This is rock formed from material 'squeezed' up into existing strata under huge forces.
[2]A metamorphic rock from lava flow.
[3]Formed from volcanic lava eruptions (metamorphosed basalt).
[4]Granodiorite is granite rock that has crystallised.
(both undergo beta decay) (e.g. Cardenas and Granodiorite) which means α-decay process rates were accelerated more than β-decay process rates. Also heavier atoms and longer decay rates have a greater age than lighter ones. Strong nuclear forces are the reason behind these patterns.

III) Abundant Fission Tracks

In rare natural instances ^{238}U will undergo nuclear fission (i.e. the nucleus will split in half causing explosive damage track in the surrounding crystals). This was observed in zircons within a volcanic ash bed section of the Maui Limestone in the Grand Canyon.

Track-counting is a method used to calculate ages, and track existence most certainly is evidence of nuclear decay having occurred.

In the Peach Springs Tuff, Arizona, 21Ma-equivalent of fission tracks are evident at the top of the sequence. At the Morrison Formation Tuff in Utah 136Ma was measured.

At the Tapeats sandstone which also has a volcanic ash bed 75-500+Ma of tracks exist.

The interesting pattern here is dates get older the further down in the strata layers (i.e. Peach, Morrison, Tapeats).

IV) U/Po Radiohalos

Dealt with in a separate DVD presentation, the material here is detailed

and significant.

The La Posta Granite in California contains black biotite flakes and ^{238}U in the zircon lattice. With each α-decay in the U-decay chain a 3D radiohalo of damage is produced, emitted from the radio**centre**. N.b., this is only visible in tiny (1μm) zircons as in large ones (60μm) the α-particles do not have enough energy to escape into the surrounding biotite.

It is estimated each halo requires 500 million-1 billion α-particles, or 100Ma worth of radioactive decay at today's rates.

Every sample across the globe contains these radiohalos suggesting a global process. The mystery is where zircons contain up to three additional halos (from Po at the end of the U decay chain). Where did the Po in the biotite come from as it only exists from the nuclear decay rate? It must have formed *quickly* at the same time as U.

V) Radiocarbon Dating

One of the most important methods to study for apologetic's purposes. The current technological limit to 'dating' using this method is 95Ka (0.001% of modern carbon). It stressed the technology is never questioned, rather the *assumptions*.

A popular example, if the whole world were a ball of ^{14}C it would all decay to (^{14}N) within only 1Ma.

A rock containing unfossilised wood was found in the Jurassic Marlstone, Hornton, Oxfordshire, England. The rock was dated 189Ma but the radiocarbon date of the wood came back at only 24ka.

The Newcastle Permian coal seam has an accepted age of 250Ma but the carbon date is 33.7Ka.

Another sample is fossil ammonite and wood found in a 112-120Ma Cretaceous mudstone bed in Redding, California. The wood was dated 42,390 years, the ammonite 48,710.

Coal was then worked for dates (ten samples across geological ages) from the U.S. Department of Energy bank held at Pennsylvania State University.

The average was 0.247Ma and σ=0.109. The coal source is all pre-Flood.

Six African diamond samples have been dated and all had detectable ^{14}C in them. The speaker notes diamonds are impervious to contamination, they also form 200 miles in the mantle erupting via volcanoes to the surface in two or so hours. They are 1.5-3Ga ago in the evolutionary world.

Further research is looking at dating a meteorite sample, as well as the Po radiohalos.

The method is not totally disparaged. Although magnetic field decay changes (i.e. twice as strong 1400 years ago), nuclear activity and exposed carboniferous material (100 times less than pre-Flood) are all unknown factors, reasonable calculation adjustments have been attempted with the results giving coal sample dates of <5000 years.