eous diffusion rates, that any ‘aged’ carbon dioxide would intermix with the conventional ‘zero age’ carbon dioxide so rapidly and completely that no significant ^{14}C anomaly could occur at any appreciable downwind distance from the source of the anomaly. As evidence, they cite the rapidity with which ^{14}C concentrations, emanating from nuclear power stations, become homogenized with the much-lower ^{14}C concentrations of the surrounding atmosphere. However, such reasoning is not applicable to geographically large sources of ‘aged’ ^{14}C, if only for the following reason:

> ‘Note that nuclear power stations are essentially continuous point sources. In contrast, a large sea area is essentially a continuous line source, for an adjacent land mass. Simple geometry implies that gas concentration downwind from line sources declines much more slowly than gas concentration from point sources. Degassing seas would thus be expected to induce large gas concentrations at substantial distance.’[7]

To further substantiate his hypothesis, Keenan[8] provides several recent examples of ‘aged’ deep-sea carbon dioxide being brought to the ocean surface, and inducing notable ^{14}C anomalies over downwind land areas. These include a surface atmosphere built-in ‘age’ of 350 years, measured 250 km inland in Equator, probably caused by the upwelling of deep Pacific water and its ^{14}C-deficient carbon dioxide. Other examples include C-14 dates centuries older than tree ring dates in California and in Thailand, the latter believed caused by exceptionally-intense monsoonal upwelling of deep, ‘aged’ water. Still other examples are cited from various locations on Earth.

Conclusions

Questions about the historicity of the Mosaic accounts turn out to be much more fundamental than such issues as the veracity or otherwise of the standard Egyptian chronology. The systematic distortion of past Middle Eastern C-14 dates, caused by the hypothesized degassing of ‘old’ carbon dioxide from the Mediterranean sea floor (regardless of its exact cause), is an astonishing development that has, in effect, ‘thrown a monkey wrench’ into the archaeological sciences:

> ‘In conclusion, the hypothesis is plausible, and further research is required to verify or refute it. It would be ironic if the “cradle of civilization” turned out to be in just the right place and time to make its ^{14}C dates erroneous, but that might be the case.’[9]

It is not just a question of how inaccurate most currently-accepted C-14 dates are, but also how many perfectly valid C-14 dates have never seen the light of publication because they were incorrectly deemed erroneous. A top-to-bottom re-examination of *all* the raw C-14 dates is necessary before we are in a position to even begin to entertain questions related to Middle Eastern chronologies of the second millennium BC. For the Bible believer, as well as the honest skeptic, it is necessary to withhold judgment about the correlations of Biblical and secular history, from the indicated time period, at least until the top-to-bottom re-examination actually takes place.

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Revised datings for ‘Little Foot’ and other Sterkfontein fossil hominoid remains

Greg Beasley

In September of this year *Reuters*[1] reported that the famed South African fossil site at Sterkfontein may be a million years younger than previously thought.

The Sterkfontein caves are rich in fossiliferous material. Over many decades the site has become synonymous with many famous fossil hominine finds, including *Australopithecus africanus* (e.g. Sts 5) and *Homo habilis* (Stw-53).

The discovery of ‘Little Foot’

In 1995, palaeoanthropologists Ronald Clarke and Philip Tobias, of the University of Witwatersrand, announced the discovery of four fossilised hominid foot bones from material extracted from Dump 20 at Sterkfontein Cave in 1980.[2] The material derived from Member 2 of the six-member Sterkfontein formation. The fossils became affectionately known as ‘Little Foot’ (Stw 573a-d), because of their small size. They also revealed that their owner—a gracile australopithecine (*Australopithecus* aff. *africanus*)—was adept at climbing trees. The bones revealed a curious mix of human and ape traits.[3] The four bones comprised:

- A left talus (ankle bone) (Stw 573a), which was described as resembling the human condition;
- A left navicular (a concave wrist or foot bone) (Stw 573b), which was said to comprise a curious mix of human and ape traits;
- A left medial cuneiform (wedge shaped bone in the ankle) (Stw 573c), which featured a substantially ape-like morphology, and
- A left first metatarsal (instep bone)(Stw 573d), which, when locked into position against the

	Clarke & Tobias (1995)	Partridge *et al*. (2000)	Berger *et al*. (2002)
Member 4		2.6–2.8 Ma	1.5–2.5 Ma*
Member 2	3.0–3.5 Ma	3.22–3.58 Ma	2.15–3.0 Ma*

** The preferred dates by Berger* et al. *are based on a consideration of both the magnetostratigraphic dating of the rocks and comparisons of the faunal assemblages at other South African sites.*

medial cuneiform, was angled medialward—suggesting that the great toe (hallux) diverged away from the other toes, as in modern apes.

Many ape-like characteristics were present in the foot. As noted above, the hallux was appreciably medially diverged (varus) and strongly mobile, as in apes. A strong muscle peroneus longus adducted (turned it inward) the hallux, rendering it capable of powerful grasping movements. A wide range of movements was also possible at the first tarsometatarsal joint, whilst a locking mechanism was also present between the metatarsal and the medial cuneiform. Indeed, it was stated that:

> ' ... the medial cuneiform and first metatarsal retain primitive, Pan-like [chimp] features, whereas the navicular shows compromise morphology'.[4]

Yet even the navicular exhibited a large number of pongid [ape] traits—with the ' ... angle between the navicular facet and the upright limb of the L-shaped facet on the lateral surface is c. 90°, as in *Pan* ... '.[5] Other pongid characteristics included strong lateral recurvation, a narrow distance between the talar and lateral cuneiform facets and a marked angle between the facets of the intermediate and lateral cuneiform bones.

Of course, an arboreal (tree-living) lifestyle raised serious questions concerning the creature's hominid status. However, given a rather early dating (in excess of 3 Ma (millions of years)), its hominine status was assured.

Subsequent to the discovery of 'Little Foot' (1997), Clarke discovered some fossilized lower leg bone fragments, which had been stored away in the University vaults. Convinced that these bones and the bones of 'Little Foot' were associated, he reasoned that the site from which they derived might yet reveal other elements of the same individual's skeleton.

Thus, in 1998, a nearly complete skeleton—including a virtually complete skull—was unearthed at the site.[6] The composite picture assembled from the fossilised remains, yielded an individual approximately 120 cm tall, with an overall skeletal morphology similar to that of gracile australopithecines (*A. africanus*). However, when describing the individual, Clarke noted that the massive cheekbones and evidence of large jaw muscles were very different to those of other gracile australopithecines; so much so that he concluded that the remains could have belonged to an early [i.e. more primitive] form of *A. africanus* or a southern form of *A. afarensis*.[6]

Now, the oldest deposits at Sterkfontein derive from Member 1—the youngest deposits from Member 6. Of these members, Member 1 through 3 are exposed in the so-called Silberberg Grotto. Member 2 deposits are separated from underlying Member 1 and overlying Member 3 deposits by two thin layers of flowstone. An erosional unconformity exists between overlying Members 4 and 5.

To date, only Members 2, 4 and 5 have yielded fossilized remains of hominids. Not without significance, Member 4 has yielded an abundance of specimens (645 in all had been identified up to 1995) attributable to *A. africanus*. The remains of Stw 573 were the first to be recovered from Member 2, whilst Member 5 had yielded only 25 hominid specimens up to 1995.[7]

Contentious dates

Dating the Member 2 hominid remains has proven extremely difficult and, indeed, somewhat controversial. In contrast to East Africa, where a long, continuous history of volcanic activity has allowed palaeontologists to date the fossilised remains of hominids by measuring the relative abundances of radioactive isotopes in over and underlying layers of volcanic rock, the South African site has no way of radiometrically dating the deposits from which the bones derived.

According to Clarke and Tobias, Stw 573 could not be less than 3.0 million years old, and more likely, was dated to about 3.5Ma.[8] These estimates were later confirmed by the work of Partridge *et al*.[9]

More recently, however, Berger, Lacroz and de Ruiter have suggested that there are other possible dating schemes for the deposits at Sterkfontein—several of which raise the possibility that the Member 2 remains may be decidedly younger than the dates previously advocated by Partridge.[10]

According to Berger and his colleagues, the deposits from Member 2 could be as recent as 1.07–1.95 Ma. This alternative dating range assumes that there is a continuous magnetostrategraphic sequence present at Sterkfontein.[11]

In either case, the significance of these redatings is immediately apparent. If the more recent dates for Member 2 have any validity, then *A. africanus* may have been broadly contemporaneous with *A. garhi*, *A. aethiopicus*, *A. boisei* and early members of the genus, *Homo*.[12] Under such circumstances, it would no longer qualify as hominine.[13] Of course, if the creationist view of history were to be accepted as correct, then the dates at Sterkfontein would have no relevance in an absolute sense at all. However, the layering of the deposits—being intrusive in nature—would have some relevance in determining relative dates.

What are the Sterkfontein fossil assemblages saying?

One thing that is immediately evident in the fossil assemblages at Sterkfontein is that there is a proliferation of genera and species types with the passage of time.[14] Early deposits—such as those from which the remains of 'Little Foot' derived (Member 2)—contain but a handful of carnivore and primate species. Later deposits, such as those from Member 4, however, contain vastly greater diversity in genera of carnivores, primates, equids, herbivores, subungulates and even rodents.

Secondly, it is abundantly clear that there is a remarkable degree of persistence in species type. Indeed, it is this persistence that makes the Sterkfontein deposits difficult to date. (A feature of the mammalian assemblages at Sterkfontein is the absence of any sensitive chronological indicators). Several species from the primate family, Cercopithecidae (i.e. Old World monkeys), for instance, are present in both Members 2 and 4—including *Papio izodi* and *Parapapio jonesi*. Likewise, in the Order Carnivora, the leopard (*Panthera pardus*) and cheetah (*Acinonyx jubatus*) are present in both Members 2 (earlier) and 4 (later) as are the remains of several other carnivores, including the large Machairodontinae felids [cats], *Dinofelis barwoli* and *Meganteron cultridens*, and specimens of hyaenidae [hyenas] (*Chasmaporthetes silberbergi* and *nitidula*).

Thirdly, there is a curious, but conspicuous, absence of domesticated animals from the Member 2 assemblage. Even equines are delayed until Member 4 and only become commonplace in the fossil assemblages of Member 5.[15] The relatively small sample of equine remains in Member 4 could be reflecting the arrival of the first domesticated animals about the time that the Member 4 deposits were accumulating. (Some have argued that the rarity of *Equus* in Member 4 is grounds for assuming that all *Equus* material should be consigned to Member 5).

Towards an alternative interpretation of the fossil assemblages

As noted above, an apparent abundance of *A. africanus* remains have been recovered from Member 4, whereas only a handful of remains have been recovered from Member 2. Yet seemingly, by the time the Member 5 deposits were laid down (remember the presence of an erosional unconformity separating Members 4 and 5), *A. africanus* remains are becoming scarce once again. Could Member 2 be reflecting an initial migration into the Transvaal by these so-called southern apes? If so, then Member 4 could represent a period of consolidation and rapid population increase. But what of Member 5? My suspicion is that with the drying out of the Transvaal (possibly during a brief, but intense, post-Flood Ice Age) food sources became scarce—driving the apes back into rainforest areas further to the north.

So what of man? Could it be that the late arrival of domesticated animals at Sterkfontein can be explained in terms of the late arrival of the master domesticator—mankind (*Homo sapiens*). After all, according to the Biblical view of history, post-Flood man only began to repopulate the earth after the dispersion from Babel.[16] It's food for thought.

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