

## 10. Více o lebce KNM-ER 1470 (v angličtině)

### The Dating Game

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(**Pozor:** Neplést *Bones of Contention* Marvina Lubenowa s knihou Sylvie Bakerové *Bone of contention*)

**Web Editor's note:** This article appeared as an appendix in the first edition of Dr. Lubenow's book, *Bones of Contention*. Because this appendix was not included in the revised second edition of the book, we wanted to make this revealing research available here.

A very popular myth is that the radioactive dating methods are an independent confirmation of the geologic time scale and the concept of human evolution. This myth includes the idea that the various dating methods are independent of one another and hence act as controls. The methods appear so impressive that many creationists have accepted them as evidence that the earth is very old. Perhaps the best way to expose this myth for what it is—science fiction—is to present a case study of the dating of the East African KBS Tuff strata and the famous fossil KNM-ER 1470, as recorded in the scientific journals, especially the British journal *Nature*.

Richard Leakey, son of famed paleoanthropologists Louis and Mary Leakey, was just twenty-three when he borrowed a helicopter and first visited the rich fossil deposits east of Lake Rudolf (now Lake Turkana) in northern Kenya. The year was 1967. He was so stunned by what he saw that he immediately organized an expedition to that area to search for hominid fossils. The result is the permanent base known as Koobi Fora, which has produced some of the most striking hominid fossil discoveries in the entire history of paleontology.

The most important fossil discovered there is one that for all its fame has never been given a respectable name. It is KNM-ER 1470 (Kenya National Museum—where it is housed; East Rudolf—where it was found; and 1470—the museum acquisition number). Skull 1470 is very modern in appearance but was originally believed to be about 2.9 million years old. This conflict between its modern appearance and its ancient age presented a serious challenge to all currently held theories of human evolution. It precipitated a conflict over the dating of the fossil which lasted ten years.

One of the early geologists to work with Richard Leakey at East Rudolf was a young woman from Yale University, Kay Behrensmeyer. In seeking to unravel the geology of the area, she discovered a layer of volcanic ash or tuff that turned out to be crucial in the dating of the fossils and the artifacts found in association with it. The spot where she first located this tuff became known as the Kay Behrensmeyer Site. This volcanic tuff has become known ever since as the KBS Tuff. Richard Leakey, in a Denver lecture, laughingly remarked that Kay Behrensmeyer is the only woman in the world who has had a volcanic ash named after her.

If the KBS Tuff were located anywhere else, no one would give it a second thought. However, at East Rudolf it is of utmost importance. First, although human fossils and artifacts cannot be directly dated radiometrically, the KBS Tuff can be. It contains radioactive potassium 40, which decays to argon 40. Second, artifacts (tools) have been found in close association with the KBS Tuff. The assumption is that the date of the tuff gives an estimate of the age of the stone tools. Third, hundreds of *Homo* and australopithecine fossils have been found either above or below the KBS Tuff. The date of the KBS Tuff thus becomes a maximum age for fossils found above it and a minimum age for fossils found below it. Of all the fossils found in association with the KBS Tuff, skull 1470 is the most important.

The KBS Tuff is part of the Koobi Fora Formation, a sequence of sediments about three hundred feet thick that crop out on the eastern shore of Lake Rudolf. These sediments cover an area about fifty miles north and south along the shore and extend about twenty miles east of the lake. The KBS Tuff itself is only about three feet thick. Two other thin layers of volcanic tuff lie above the KBS (the Karari and the Okote Tuff) and another lies below it (the Tulu Bor Tuff). The bulk of the sediments in which the fossils are found are not volcanic tuffs. The four tuffs are like the floors of a four-story building, with the fossil-bearing sediments lying between them where the rooms of the building would be.

Although the KBS Tuff is volcanic in origin, it is not a primary air-fall tuff. That is, it was not deposited directly on the land when it was ejected from the volcano. Lake Rudolf was much larger at that time. Some ash fell into the lake and then made its way to the lake bottom. Some was carried by rivers into the lake. Thus, the KBS Tuff has been transported by and deposited from water. For this reason it has a great deal of foreign material in it, making it very difficult to get pure samples for dating.

The first attempt to date the volcanic rock layer known as the KBS Tuff was a feasibility study done in 1969, well before the discovery of skull 1470. Richard Leakey supplied rock samples to F. J. Fitch (Birkbeck College, University of London) and J. A. Miller (Cambridge University) who were recognized authorities in potassium-argon (K-Ar) dating. Many species of mammals had been found below the KBS Tuff, as well as australopithecine fossils and human artifacts. It was imperative that these discoveries be placed in their proper chronological setting.

In their report in *Nature*,<sup>1</sup> Fitch and Miller first commented on the many possible sources of error in dating. "One of the most intractable of these," they said, "is the possible presence of extraneous argon derived from inclusions of pre-existing rocks."<sup>2</sup> To check for this extraneous argon, they first dated the raw rocks as they were originally submitted by Leakey. Their analysis gave dates from 212 to 230 million years of age. "From these results it was clear that an extraneous argon age discrepancy was present ... ."<sup>3</sup>

The first question an outside observer would ask is, How did they know? The answer is that the associated fossils told them so. In spite of our being assured that the dating methods constitute an independent confirmation of evolution, the associated fossils had already determined the outside limits for dates that would be "acceptable." Based on their alleged evolution, the australopithecine and other mammalian fossils found beneath the KBS Tuff had determined that the rocks should be somewhere between two and five million years old. Anything beyond that was obviously the result of extraneous argon.

Dates of 212 to 230 m.y.a. were notoriously far off. These dates would place the KBS Tuff in the Triassic period of the Mesozoic era, which is early dinosaur times. Hence it was obvious that these dates were wrong. Without the associated fossils, however, there would be no way for a geologist to know if these were "good" dates or "bad" dates. Under other circumstances and without the fossils to guide them, geologists could well have accepted these dates as "good" dates. When fitting rock layers into their proper sequences over large geographic areas, it is evolution and the fossils that guide the geologists.

To compensate for this obvious error in dating the KBS Tuff, Fitch and Miller stated: "... it would only be possible to date this tuff by careful extraction of undoubtedly juvenile components for analysis."<sup>4</sup> In other words, Fitch and Miller then proceeded to remove from the whole-rock samples those components of the rock which they believed were "undoubtedly" juvenile or young, that showed no sign of weathering or alteration. The observer can be forgiven if he asks another question, How do they know for sure which components of the rock are undoubtedly young?

Thus began the long process, based upon evolutionary and other philosophical assumptions, by which the geochronologist manipulates or "massages" the data to guarantee that he gets a "good" date. I want to stress that the geochronologist does this in absolute sincerity. He is so committed to evolution and its attendant age demands that he believes implicitly that he removes error from his data to arrive at truth. The obvious subjectivity in it escapes him. It is a perfect illustration of circular reasoning in an experimental frame of reference. The experimenter manipulates the data to guarantee that he gets the result that is "needed." In computer language, it's "garbage in, garbage out."

Fitch and Miller requested new samples from Leakey containing "fresher" pumice lumps and feldspar crystals. Experiments were conducted on the pumice and the feldspar crystals separately, using three different processes: K-Ar age determination, <sup>40</sup>Ar-<sup>39</sup>Ar total degassing, and <sup>40</sup>Ar-<sup>39</sup>Ar age spectrum. Fitch and Miller concluded that the KBS Tuff was "very close to 2.6 m.y. (2.61 ± less than .26 m.y.)."<sup>5</sup> This figure of 2.61 m.y.a. was widely published in both the scientific and popular press. Richard Leakey stated that 1470 was found below rock that was "accurately dated"<sup>6</sup> and "securely dated"<sup>7</sup> at 2.6 m.y.a.

In 1972, before skull 1470 was discovered (or at least before it was announced), Vincent Maglio (Princeton University) published in *Nature*<sup>8</sup> a chronology of the hominid-bearing sediments east of Lake Rudolf which included the KBS Tuff. His work was based upon the vertebrate faunas. Several animal species seemed to show a significant degree of change through the stratigraphic sequence. This was interpreted as a rapid rate of evolution. Obviously, rapidly changing lineages make for more precise correlations than those that change slowly or not at all. The lineages were of two species of pig (suid) and one species of elephant. Although there were some problems, Maglio's dates for the sediments were somewhat compatible with the radiometric date arrived at by Fitch and Miller, and were considered at the time to confirm their date.

In 1974, a third chronology of the area was published in *Nature*<sup>9</sup> by Brock (University of Nairobi, Kenya) and Isaac (University of California, Berkeley). The study was based on the paleomagnetism of the deposits below the KBS Tuff utilizing 247 samples. They stated their conclusions for the group of fossils including skull 1470 as follows: "An age of 2.7 to 3.0 Myr for this group is strongly indicated."<sup>10</sup> Since this date referred to the sediments that skull 1470 was actually found in, and the KBS Tuff dated at 2.61 Myr lies above the fossil, it seemed to represent a "bull's-eye" for the

correlation of the various dating methods. The heading of the article stated that their measurements “provide a valuable check on other dating methods.”<sup>11</sup> Later they said that because the isotopic and paleomagnetic ages were consistent, “... this independent evidence greatly strengthens our proposed chronology.”<sup>12</sup>

However, Brock and Isaac also made the following comment:

The correlations shown in Figure 4 are not fully independent, and rely partly upon K.Ar and faunal evidence as well as upon the basic polarity data.

The starting point for the correlation is the age of  $2.61 \pm 0.26$  Myr obtained by Fitch and Miller from selected sanidine crystals from pumice specimens from the KBS Tuff.<sup>13</sup>

This comment indicates that the correlation by Brock and Isaac was not as independent of the other dating methods as they claimed it to be.

Also in 1974, Anthony Hurford (Birkbeck College, University of London) attempted to date the East Rudolf sediments using still another method: fission-track dating involving uranium. His purpose was to check out an unpublished study by Fitch and Miller that suggested that vast portions of the East Rudolf sediments had been changed or altered by volcanic heat or hot ground water around 1.75 m.y.a., causing partial or complete overprinting of the apparent ages obtained from them. Overprinting erases or obscures previous events.

Hurford’s conclusion regarding his fission track specimen:

The specimen has either suffered no thermal annealing or that it has been totally annealed at 1.8 Myr.

As this tuff is within the Kubi Algi Formation and is stratigraphically below the 2.6 Myr KBS Tuff, the second alternative is accepted as the correct interpretation.<sup>14</sup>

He agreed with Fitch and Miller that the sediments had been altered at about 1.75 to 1.8 m.y.a. One could be excused for asking why the annealing of the lower sediments at 1.8 m.y.a. did not call into question the KBS Tuff date of 2.6 m.y.a.

A study of Hurford’s methodology illustrates how dogma finds its way into science. He started by referring to the date of the KBS Tuff as a “firm date.” Apparently the date became firm because he felt that it was supported by the fossil and paleomagnetic evidence. He did not mention that the fossil correlation was only of the most general sort and that the paleomagnetic date was based on the radiometric date. In spite of an obvious need for caution, Hurford’s acceptance of the KBS Tuff date became the benchmark on which he based his fission-track conclusions.

It seems, however, that Hurford set up a strange scenario. In the absence of clear physical evidence to the contrary, the Kubi Algi Formation, which is below the KBS Tuff, would be older than the KBS Tuff, because it was laid down first. It is hard to understand how the Kubi Algi Formation could have experienced an overprinting at 1.8 m.y.a., and then later on have the KBS Tuff laid down on top of it with a date of 2.61 m.y.a. If, however, they were laid down in their present sequence and then some sort of thermal event overprinted the Kubi Algi at 1.8 m.y.a., how do we know that the KBS Tuff wasn’t affected as well? It would certainly seem to compromise the “firm date” of the KBS Tuff. At any rate, it is clear that the various dating methods are related, and the dates obtained are not independent of one another.

Late in 1974, Fitch, Miller, and associates published the results of their revised study confirming their original dating of the KBS Tuff at  $2.61 \pm .26$  m.y.a. They also reported a broad scatter of apparent ages from ten different samplings ranging from 0.52 to 2.64 m.y.a. Referring to the other studies, they stated: “The compatibility of independent evidence is a very strong argument for accepting the chronology now proposed for East Rudolf.”<sup>15</sup> However, we have seen from the other studies that they are not independent but were linked to the original radiometric date by Fitch and Miller.

By late 1974, two years after skull 1470 had been presented to the world, the KBS Tuff had been dated five different times by four different dating methods. The alleged compatibility of the four different methods would seem to make all of this a geologist’s dream. What better proof could one want for the reliability of the various dating methods to furnish independent confirmation of the dates for the fossil material? Because 1470 was found below rock dated at 2.61 m.y.a. and above rock dated at 3.18 m.y.a., skull 1470 was estimated to be an incredible 2.9 million years old. Richard Leakey had found the world’s oldest fossil belonging to the genus *Homo*. On the surface all seemed serene.

However, under the surface paleoanthropology was seething in ferment. Skull 1470 with its estimated date of 2.9 m.y.a. presented the evolutionary world with an intolerable situation. Richard Leakey did not exaggerate when he declared: “Either we toss out this skull or we toss out our theories of early man.”<sup>16</sup> The problem was quite simple. The theory of human evolution did not allow for a skull so modern in morphology to be that old. It was absolutely predictable to those of us who watched these matters unfold that something would have to give. Only three things could happen to relieve the stress that the theory of human evolution was experiencing: (1) the date for 1470 could be revised; (2) 1470 could be assigned to the most distant and primitive form of *Homo*; or (3) 1470 could be reevaluated and designated an australopithecine. Actually, all three of these solutions happened in one way or another. The date was eventually revised, the fossil was assigned to the category *Homo habilis*, and some—including one of Richard Leakey’s close associates, Alan Walker—said that 1470 was actually an australopithecine. As these revisions took place, paleoanthropologists heaved almost audible sighs of relief.

Richard Leakey, however, continued to fight for the original date. Although he was committed to evolution and was aware of the problem the date for skull 1470 presented for evolution, his situation was somewhat different. He was considered the discoverer of skull 1470. (Actually, it was discovered by Bernard Ngeneo, a member of his team.) No one will care if you discover the oldest fossil broccoli, but if you are fortunate enough to discover the oldest fossil human, the world will beat a path to your door. The acclaim and prestige such a person receives is beyond belief. Human fossils work a very special kind of magic. Richard Leakey needed this magic. He was only twenty-eight when skull 1470 was discovered, and he had had no formal college training. He learned paleoanthropology at the feet of his parents, Louis and Mary Leakey. Some paleoanthropologists have never forgiven him for entering the field by a different door. If skull 1470 was 2.9 million years old, he had discovered the oldest member of the genus *Homo*. If 1470 was not that old, he would lose that distinction. The problems that 1470’s age would pose for evolution were not as vital to him as the status 1470 would give him in establishing him in the field of paleoanthropology. Hence, he resisted any lowering of the date for 1470.

While Fitch and Miller were busy confirming their original results, still another study was already under way by G. H. Curtis and his associates (University of California, Berkeley). They used conventional K-Ar dates on pumice from three separate areas of the KBS Tuff. They claimed to distinguish two tuff units. One from areas 10 and 105 gave an age of 1.6 m.y.a. and the other from area 131, where skull 1470 was found, gave an age of 1.82 m.y.a. These dates were considerably younger than the dates the five previous studies had reported.

Commenting on the broad scatter of results Fitch and Miller had obtained earlier, they gave this explanation:

Contamination by ancient bed rock material during the reworking of the tuffs was suggested to account for the anomalously old dates, whereas subsequent alteration, ‘overprinting,’ of the pumice fragments used for dating, by alkaline-rich and possibly heated ground water may explain the anomalously young dates by partial loss of radiogenic argon.<sup>17</sup>

Since the whole point of their exercise was to establish the age of the KBS Tuff, the question again must be asked, How did they know that the older dates or the younger dates were anomalous? Anomalous with reference to what? It was obvious that it had already been determined what the “proper” age should be. How was this determined? By the concept of evolution. The age of the KBS Tuff and of skull 1470 must be lowered.

The Curtis article challenged the validity of the <sup>40</sup>Ar-<sup>39</sup>Ar technique for this particular dating situation and criticized the methodology of Fitch and Miller. It further stated that “... older pumices may also be present in the KBS Tuff horizon which could account for the 2.61 Myr date reported by Fitch and Miller.”<sup>18</sup> Criticizing the samples used by Fitch and Miller, the dating method employed by Fitch and Miller, and the laboratory technique of Fitch and Miller left little more to be said.

All of the above-cited articles spoke of the great difficulty in getting rock or crystal samples that were not altered, weathered, or derived from older rock. Curtis *et al.* explained at length their efforts to extract from the whole-rock samples the portions that were suitable for dating. However, Fitch and Miller also went to great lengths to extract suitable samples. The question arises, How does one know when one has good samples for dating? The only answer to that question is that “good” samples give dates that are in accord with evolutionary presuppositions. “Bad” samples are the ones that give dates not in conformity with evolution—a classic illustration of circular reasoning.

Curtis *et al.* also mentioned the factor that would ultimately determine the date of skull 1470: the evolution of the pigs.

[When some palaeontologists compared fauna associated with] the KBS Tuff in East Rudolf with those of other, supposedly well calibrated localities, the reliability of the date of 2.61 Myr for the KBS was questioned. Although Maglio found that the morphology of elephant fossils fit with a 2.5 Myr date, Cooke and Maglio, in 1972, pointed out that fossil pigs from below the KBS Tuff horizon at East Rudolf seemed to correlate best with those from beds dating close to 2 Myr in the Omo River area to the north in Ethiopia.<sup>19</sup>

Notice that elephant evolution fit the older date, but pig evolution fit the younger date. The pigs would ultimately win. This does not support the idea of concordant results that evolutionists talk about. Perhaps that was why Maglio left geology to study medicine.

It is fascinating to see that Curtis *et al.* claimed authority for their dating results because of the high degree of correlation within their study. But that same claim was made for the older date. Also, five different dating projects involving four different dating techniques all supposedly agreed on the older date within reasonable margins of error. The 28 October 1976 issue of *Nature* contained not one but two dating projects for the KBS Tuff by two different methods. These two methods seemed to agree on an older date for the tuff and hence for skull 1470.

The first of these studies was by Fitch, Miller, and P. J. Hooker (Cambridge University). They first recalculated the results of their 1969 work and told why:

Developments in the analytical techniques of  $^{40}\text{Ar}$ - $^{39}\text{Ar}$  dating since then enable recomputation of the results obtained, using, in addition, a more accurate value for the constant of proportionality (J) used in the 1969 experiments.<sup>20</sup>

Recalculating with 1969 rock samples and utilizing both the K-Ar and the  $^{40}\text{Ar}$ - $^{39}\text{Ar}$  methods gave them a revised estimate for the age of the KBS Tuff of 2.42 m.y.a. Calculating with rock samples obtained in 1971–73 and using only the  $^{40}\text{Ar}$ - $^{39}\text{Ar}$  technique gave a minimum age for the KBS Tuff of 2.4 m.y.a. The close correlation of these two dating efforts by different radiometric techniques gave them confidence in the accuracy of their results. Because of the inherent difficulties of obtaining proper samples for dating, they also looked to other methods for support. This support came in an accompanying article in the same issue of *Nature* involving fission-track dating of zircon crystals. We will consider that article later.

Fitch, Miller, and Hooker acknowledged the controversy that was raging around the dating of the KBS Tuff. That controversy was largely because of stone tools found in it and one very human-looking fossil found below it.

Over the past five years, opposition to the acceptance of a 2.5-Myr age for the KBS Tuff has come from three sources: first, archaeologists and palaeoanthropologists disturbed by the consequent antiquity of hominid fossils and stone tools found close to or associated with the KBS Tuff; second, palaeontologists reporting apparent misfits between the faunal sequences at East Rudolf and elsewhere; and third, from a small programme of conventional total fusion K-Ar age determinations on East Rudolf pumice samples undertaken at Berkeley.<sup>21</sup>

I will deal with these matters in reverse order. The “small programme” at Berkeley is a reference to the work of Curtis *et al.* who dated the KBS Tuff at 1.6 and 1.82 Myr. The flaw in that date is quite obvious to Fitch, Hooker, and Miller:

... K-Ar apparent ages in the range 1.6–1.8 Myr obtained from the KBS Tuff by other workers are regarded as discrepant, and may have been obtained from samples affected by argon loss.<sup>22</sup>

This exercise can appropriately be named the dating game. Since yours is obviously the correct date, those who arrive at a younger date had samples that obviously had experienced argon loss. A date older than yours can be explained if you declare that those samples had obviously inherited excess argon from older rock. How does one refute that kind of logic?

The second problem, “apparent misfits between the faunal sequences,” will eventually be settled rather arbitrarily by a victory of the pigs over the elephants. Where else but in the world of science fiction could such a confrontation of pigs and elephants have such unlikely results?

It is the third problem that is most revealing. It involves archeologists who are “disturbed by the consequent antiquity of hominid fossils and stone tools found close to or associated with the KBS Tuff.” “Disturbed” seems a strange word to describe scientists who are supposed to let the facts speak for themselves. I would think that words like interested, amazed, or intrigued would be far more appropriate. Disturbed sounds like they felt threatened. They were. The whole

concept of human evolution was on the line. This was the real issue behind a controversy that raged for ten years over some ash out of a volcano in East Africa.

One more item needs to be mentioned. Fitch *et al.* commented that the Berkeley group reported “scatter” in their dates ranging from 1.5 Myr and 6.9 Myr. Fitch *et al.* reported their own scatter in apparent ages ranging from .5 Myr to 2.4 Myr. In some cases the scatter was interpreted as overprinting events. In other cases, “naughty” crystals were removed to give results more appropriate to the overriding principle behind it all—human evolution.

The other article in that 28 October 1976 issue of *Nature* was written by Hurford, Gleadow (University of Melbourne, Australia), and Naeser (U. S. Geological Survey, Denver). It was about fission-track dating of zircon crystals found in the KBS Tuff. They began with a rather remarkable statement regarding the K-Ar and  $^{40}\text{Ar}$ - $^{39}\text{Ar}$  dating methods:

K-Ar and  $^{40}\text{Ar}$ - $^{39}\text{Ar}$  dating techniques have been applied to >100 rock and mineral samples from East Rudolf, but interpretation of the dates determined by these methods has not been straightforward. Geological and analytical factors have been postulated to explain the scatter of K-Ar and  $^{40}\text{Ar}$ - $^{39}\text{Ar}$  apparent ages obtained from volcanic sanidine-anorthoclase crystals separated from pumice cobbles in the tuffs.<sup>23</sup>

The authors did not imply that the radiometric dating workers were being dishonest. They did say that the interpretation of the dates involves hypothetical and philosophical assumptions that have a bearing on the results. (This, by the way, is exactly what creationists have been saying about all radiometric dating methods.) They also stated that their study was conducted because of the apparent conflict between the K-Ar and  $^{40}\text{Ar}$ - $^{39}\text{Ar}$  dating methods—something that was played down in previous studies.

Their conclusion was that the KBS Tuff has a date of 2.44 Myr. This was very close to the estimate of Fitch *et al.* published in the same issue of *Nature*. After describing their methodology they said:

Using these techniques and a value for the  $^{238}\text{U}$  spontaneous fission decay constant,  $\lambda$  of  $6.85 \times 10^{-17} \text{ yr}^{-1}$  we have obtained ages on standard zircons which agree very closely with their independently known ages.<sup>24</sup>

This remarkable correlation of dates involving two independent dating techniques seemed to confirm all that the general public has been led to believe—that the dating methods can be trusted because independent methods give the same results.

However, in the 16 June 1977 issue of *Nature* appeared a letter from G. A. Wagner of the Max Planck Institute in West Germany. Wagner maintained that there is uncertainty as to the spontaneous fission constant of uranium 238, and that Hurford *et al.* should have used a different constant:

... many fission-track specialists no longer use the  $6.85 \times 10^{-17} \text{ yr}^{-1}$  value, but now use as the decay constant  $8.46 \times 10^{-17} \text{ yr}^{-1}$ ; there are good reasons for this preference. If this higher value for the decay constant is used, the fission-track age of the pumice in the KBS tuff recalculates to 1.98 Myr, which would lend support to the K-Ar age measured by Curtis *et al.*<sup>25</sup>

Hurford *et al.* defended their use of the uranium 238 constant by saying:

When it is used in conjunction with the fission track glass standards of the U.S. National Bureau of Standards, we get the best agreement with the K-Ar ages of co-existing minerals and we use it for this reason.<sup>26</sup>

In other words, the true value of the spontaneous fission constant of uranium 238 is unknown. At least two values are currently in use. In matters of fission-track dating, one is thus free to use the value that gives him the answer he is looking for. One can make the age of the KBS Tuff agree with either Fitch or with Curtis, whatever one’s pleasure might be. The difference in the two dates is almost half a million years in dealing with a date of only about two to two-and-a-half million. That hardly seems like precision dating.

Because they tended to confirm the older date for skull 1470, these two studies dating the KBS Tuff at 2.4 Myr obviously put more strain on the evolutionary establishment. Hurford *et al.* wrote: “Curtis has described the original  $2.61 \pm 0.26$  Myr date for the KBS Tuff as being much questioned in private anthropological and paleontological circles.”<sup>27</sup> Since anthropologists and paleontologists do not normally have technical expertise in the radiometric dating methods, they were not challenging the methodology or the assumptions of the dating methods. They were rejecting the

older date solely because of its philosophical implications. The problem was the modern morphology of KNM-ER 1470 versus the demands of evolutionary theory.

A new study on the paleomagnetism of the Koobi Fora Formation was published in early 1977. It acknowledged that the previous paleomagnetic study had used "... the previously published age of  $2.6 \pm 0.26$  Myr for the KBS Tuff as a fixed point ... ." <sup>28</sup> The study cited additional paleomagnetic results as warranting a reevaluation of the magnetic stratigraphy.

The study gave two different interpretations of the data based upon the two different suggested ages of the KBS Tuff. It clearly revealed that dates arrived at by paleomagnetism are not independent confirmations of other dating results but are closely tied to the radiometric results they use as a starting point. Since the KBS Tuff is the top unit of the lower member of the Koobi Fora Formation, the following quotation reveals how different the results can be when different starting points are used in this dating game:

In both interpretations the age of the upper member, which lies above the KBS Tuff, is between 1.2 and 1.8 Myr; however, the age of the top boundary of the lower members differs by 1 Myr. <sup>29</sup>

Around 1976, the name of the large lake on which Richard Leakey has his base of operations was changed by the Kenyan government from Lake Rudolf to Lake Turkana. This change has been a fruitful source of confusion, since fossils recovered east of the lake continue to carry the designation East Rudolf, whereas fossils recovered from west of the lake, representing more recent work, carry the designation West Turkana. Up to now we have consistently used the name Lake Rudolf. From now on, we will use the newer name Lake Turkana.

On 20 March 1980, two more dating studies on the KBS Tuff appeared in the pages of *Nature*. Remember that two earlier studies—one on fission-track dating of zircons and one on  $^{40}\text{Ar}$ - $^{39}\text{Ar}$  dating of orthoclase crystals—agreed closely that the age of the KBS Tuff was 2.4 Myr. They cited the close correlation of two independent dating methods as validating their accuracy. Now, two studies—one on fission-track dating of zircons and one on K-Ar dating of orthoclase crystals—agreed closely that the age of the KBS Tuff is 1.87 or 1.89 Myrs. They also cited the close correlation of two independent dating methods as validating their accuracy for the revised date. The new fission-track study was by A. J. W. Gleadow. The K-Ar study was by Ian McDougall, Robyn Maier, and P. Sutherland-Hawkes (all of the Australian National University, Canberra) and A. J. W. Gleadow. Then in late 1981, Ian McDougall published in *Nature* his  $^{40}\text{Ar}$ - $^{39}\text{Ar}$  study of the KBS Tuff, giving a date of 1.88 Myr. At that point, the ten-year controversy over the date of the KBS Tuff came to a close. Concordance on the more recent date had been achieved.

At first glance, it would seem to be a tremendous victory for evolution and the uniformitarian dating methods. We know that science often proceeds by trial and error and by controversy. The fact that an amazing correlation between the pig evidence and three different dating methods—fission track dating, K-Ar, and  $^{40}\text{Ar}$ - $^{39}\text{Ar}$ —had been achieved should be something to celebrate. The dating of the KBS Tuff was now a nonissue. Yet, there were factors that demand a closer look at the situation.

### **The Power of the Pigs**

The dating of the KBS Tuff was not settled in 1980 and 1981 by the conformity of three different dating methods. The controversy was actually settled in 1975 by the pigs. Donald Johanson tells of attending the Bishop Conference on anthropology and geology in London. The dating of the KBS Tuff and its implications were major topics of conversation. Glynn Isaac, who accepted the older date, arrived with a "pig-proof helmet" to protect him against the pig men.

A major paper was presented by Basil Cooke (Dalhousie University, Halifax), who had studied the pig sequences at Omo (a fossil area in Southern Ethiopia on the Omo River, which flows into Lake Turkana from the north), at Hadar (the Ethiopian site where Johanson had worked), and at Olduvai Gorge (where Louis and Mary Leakey worked for many years). According to Cooke, the dating at Lake Turkana, based on the dating methods, was off by about 800,000 years. The pigs at Turkana told him so. He even wore a tie with the letters MCP woven into it. They stood for "male chauvinist pig," but Cooke claimed that they really stood for "Mesochoerus correlates properly." *Mesochoerus* was the species of fossil pig that was central to his argument. Johanson wrote of the 1975 conference: "Nearly everyone but the Lake Turkana team [Richard Leakey and his associates] went away convinced that the KBS tuff and the skull 1470 dates would have to be corrected." <sup>30</sup>

Astounding about the whole affair was that the anthropologists were rejecting the same objective, scientific data that they universally appeal to. At that time the radiometric evidence for the older date was very strong. There was

internal consistency within the studies, and a high degree of conformity by five different dating techniques. The main thing the dates did not conform to was the concept of the evolution of pigs and of humans.

The evolution of the pigs is said to be the clear-cut answer to the dating problems at Koobi Fora as well as elsewhere in East Africa, but the evidence is less than impressive. In his phylogeny of the pigs (bushpig, forest hog, warthog, etc.) Basil Cooke presented family trees for three taxonomic groups.<sup>31</sup> Two of the groups have at their bases the phrase hypothetical Sus-like ancestor. The twenty species that make up these three groups are all shown in parallel lines connected only by dotted lines, indicating that there is no known relationship between any of the species. The parallel-line chart could just as well have been drawn by a creationist.

Most of the fossil-pig evidence consists of teeth. Several species are based on the skimpiest of evidence (“imperfectly known,” “rare,” “scarce”) and the various relationships are largely judgment calls. Terms such as these appear:

is probably ancestral  
seems to represent  
suggest that ... evolved independently  
must at this stage also be giving rise to  
probably ancestral to  
suggests a derivation from  
may have branched off  
almost certainly branched off from  
demand descent from a common ancestor

Cooke’s article was written in response to one by White and Harris.<sup>32</sup> Cooke had three taxonomic groups while White and Harris had four. There are differences in the two taxonomies, but Cooke maintained that they were of no great moment. He then went on to explain why species that White and Harris had grouped together should be separate, and vice versa. This creation and annihilation of species by the whim of the taxonomist “due to our having different basic philosophies on the nature of species in paleontology”<sup>33</sup> reveals how plastic and subjective this science is. I am not minimizing the difficulty of the species concept in paleontology, nor am I debasing the attempt to sort things out. I am merely stating that the authority with which paleontologists make dogmatic statements about the evolution of the pigs is not warranted by the facts. As in every other area of paleontology, a great deal more humility would be appropriate.

The 1980 and 1981 studies on the date of the KBS Tuff contained so many criticisms of all of the earlier studies that they called into question the objectivity and validity of the dating methods themselves. Gleadow began the process:

K-Ar evidence of Curtis *et al.* suggesting that tuffs mapped as the KBS in Areas 105 and 131 were of slightly different age, has now been eliminated with the discovery of a systematic error in the lower (1.6 Myr) ages.<sup>34</sup>

After demonstrating the presence of contamination in all of his own samples, and the extreme difficulties in dating zircons in the 1–3 Myr time span, he continued:

It therefore seems highly likely that feldspars separated for K-Ar dating could also contain traces of much older basement feldspar. This supports the contention that older K-Ar and <sup>40</sup>Ar-<sup>39</sup>Ar ages are the result of contamination. As discussed above, the fission track ages of Hurford *et al.* are thought to be too old for purely analytical reasons, in particular the mis-identification of a finite number of acicular inclusions or dislocations as tracks and possibly a biased choice of grains for counting.<sup>35</sup>

In the same issue of *Nature* was the report of a study by Ian McDougall *et al.* on the K-Ar dating of the KBS Tuff. They began by confessing that “Conventional K-Ar, <sup>40</sup>Ar/<sup>39</sup>Ar and fission track dating of pumice clasts within this tuff have yielded a distressingly large range of ages.”<sup>36</sup>

After explaining that Fitch and Miller actually reported results ranging from 0.52 to 2.64 Myr in one set of concentrates and ages from 8.43 to 17.5 Myr on another clast before settling on a 2.61 Myr date which they later revised to 2.42 Myr, they also explained how Curtis *et al.* arrived at their “concordant” ages:

Disregarding four conventional K-Ar ages on feldspar from pumice clasts in the KBS Tuff in the range 2.01–6.9 Myr, thought to be caused by detrital contamination, Curtis *et al.* obtained concordant K-Ar ages on feldspar and glass

from pumice clasts found in this horizon with mean value of  $1.82 \pm 0.04$  Myr and  $1.60 \pm 0.05$  Myr in two different areas, respectively. Subsequently, Drake *et al.* reported an error in potassium determinations on the samples previously dated by them that yielded the 1.6 Myr ages.<sup>37</sup>

McDougall *et al.* then stated how “remarkably concordant” their own dates were at 1.9 Myr after removing from consideration samples that gave ages of 4.11 and 7.46 Myr. They explained these anomalous ages as follows:

We attribute these poorly reproducible ages to the presence of variable but small amounts of old detrital K-feldspar in the aliquants used in the argon extractions. Careful petrographic examination of the mineral concentrate, however, did not lead to positive identification of detrital K-feldspar. Nevertheless, there is no doubt that old detrital material was being brought into the East Turkana Basin during deposition of the sediments.<sup>38</sup>

With this clear victory of philosophy over observation, they then used the concordance of their results and agreement with the results of the study by Gleadow to give validity to their date for the KBS Tuff.

Since the fission-track dates and the K-Ar dates of the KBS Tuff had now been reconciled with the date demanded by the evolution of the pigs, the only remaining problem was the high  $^{40}\text{Ar}$ - $^{39}\text{Ar}$  dates that Fitch *et al.* had reported. McDougall solved this problem in 1981. He reported that in some of his work there was a greater scatter of data points than could be explained by experimental error, and that in the step-heating experiment it was necessary to exclude some data.

Plateau and regression ages are derived using all data from each step heating experiment, as well as by excluding results from steps that give discordant ages. The criterion for exclusion of a datum was that the calculated age differed by more than twice its error (2s) from that of the plateau.<sup>39</sup>

However, he maintained that the differences these matters made were small, and he expressed complete satisfaction in his date of 1.88 Myr for the KBS Tuff. He did not neglect to mention that this date was in excellent accord with the other recent dating studies of the KBS Tuff.

McDougall then issued one of the most stinging rebukes of a fellow scientist that I can remember seeing in the scientific literature. He referred to Fitch *et al.* and their older date for the KBS Tuff when he said:

On the basis of the large scatter in the ages and the small proportion of  $^{40}\text{Ar}^*$  in the gas extracted from the anorthoclase concentrates, I suggest that the results are analytically less precise than given by these authors.

I suggest that unrecognized analytical difficulties and larger than quoted errors must be invoked to explain these earlier  $^{40}\text{Ar}/^{39}\text{Ar}$  results.<sup>40</sup>

McDougall was accusing Fitch *et al.* of invoking what is affectionately known in scientific circles as “the fudge factor” (deliberate falsification of data to achieve a desired result).

The study of the ten-year controversy in the dating of the KBS Tuff is tremendously revealing. Whereas the public is led to believe that these dating methods are highly objective and accurate, the scientific literature itself reveals that they are highly subjective. There is no question that rock samples are often manipulated to give the desired results. There is also no question that this manipulation is done in the utmost sincerity and with the noblest motives. But it is manipulation nonetheless. The “bad” material must be removed to allow the “good” material to be dated. But there is no way of knowing for sure which material is “good” and which is “bad.”

The history of the dating of the KBS Tuff reveals that no matter how careful a scientist is in selecting his rock samples and in performing his laboratory work, if he gets the wrong date for his rocks he is open to the charge of using contaminated material and a defective methodology. The charges need not be proved. The fact that he got the wrong date is proof enough. The literature suggests that even if radiometric dating were valid in concept (which it is not), the practical matter of selecting rock samples that can be proven pure and uncontaminated requires an omniscience that is beyond the ability of mortal humans. The radioactive dating methods are a classic example of self-deception and circular reasoning. It is another of the myths of human evolution. Naeser *et al.* have said it well:

The accuracy of any age can only be guessed at, in that we do not know the true age of any geologic sample. We can only strive for the best agreement with K-Ar and the other dating methods.<sup>41</sup>

I have no doubt that my evolutionist friends will protest that I have not been fair. “East Turkana,” they will say, “is a most unique situation. It just isn’t ‘cricket’ to take a unique situation with its many problems and imply that it is the norm.” In this response, my friends are both right and wrong. There is no question that the geology of the Koobi Fora Formation, with the KBS Tuff, is exceedingly complex. However, Koobi Fora is far from the only fossil site that has a very complex geology. What is unique about Koobi Fora is something that so far has not been mentioned by anyone.

The radiometric date of 2.61 m.y.a. for the KBS Tuff was established before skull 1470 was discovered. It was supported by faunal correlation, paleomagnetism, and fission-track dating. Up until that time, the fossils and the artifacts that had been found in association with the KBS Tuff were more or less compatible with that older date. It is entirely possible that if skull 1470 had never been found, the KBS Tuff would still be dated at 2.61 m.y.a. We would continue to be told that it was a “secure date” based on the precision of radiometric dating and the “independent” confirmation of other dating techniques that acted as controls. It was the shocking discovery of the morphologically modern skull 1470, located well below the KBS Tuff, that precipitated the ten-year controversy.

What normally happens in a fossil discovery is that the fossils are discovered first. Then attempts are made to date the rock strata in which they are found. Under these conditions, a paleoanthropologist has a degree of control over the results. He is free to reject dates that do not fit the evolution scenario of the fossils. He is not even required to publish those “obviously anomalous” dates. The result is a very sanguine and misleading picture of the conformity of the human fossil record with the concept of human evolution. If, in many of these fossil sites the dates had been determined before the fossils had been discovered, evolutionists could not guarantee that the turbulent history of the dating of the KBS Tuff would not have been repeated many times.

The pigs won. In the ten-year controversy over the dating of one of the most important human fossils ever discovered, the pigs won. The pigs won over the elephants. The pigs won over K-Ar dating. The pigs won over <sup>40</sup>Ar-<sup>39</sup>Ar dating. The pigs won over fission-track dating. They won over paleomagnetism. The pigs took it all. But in reality, it wasn’t the pigs that won. It was evolution that won. In the dating game, evolution always wins.<sup>42</sup>

## Notes

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24. Hurford, Gleadow, and Naeser, 739.
25. G. A. Wagner, letter, *Nature* **267** (16 June 1977): 649.
26. Naeser, Hurford, and Gleadow, letter, *Nature* **267** (16 June 1977): 649.
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29. Hillhouse *et al.*, 414.
30. Donald C. Johanson and Maitland A. Edey, *Lucy: The Beginnings of Humankind* (New York: Simon and Schuster, 1981), 240. Bracketed material added for clarity.
31. H. B. S. Cooke, "Suid Evolution and Correlation of African Hominid Localities: An Alternative Taxonomy," *Science* **201** (4 August 1978): 460–63.
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34. A. J. W. Gleadow, "Fission track age of the KBS Tuff and associated hominid remains in northern Kenya," *Nature* **284** (20 March 1980): 229.
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36. Ian McDougall, Robyn Maier, P. Sutherland-Hawkes, and A. J. W. Gleadow, "K-Ar age estimate for the KBS Tuff, East Turkana, Kenya," *Nature* **284** (20 March 1980): 230–31.
37. McDougall *et al.*, 231.
38. McDougall *et al.*, 232. Emphasis added.
39. Ian McDougall, "<sup>40</sup>Ar/<sup>39</sup>Ar age spectra from the KBS Tuff, Koobi Fora Formation," *Nature* **294** (12 November 1981): 123.
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42. Chapters 9 and 10 of Roger Lewin's *Bones of Contention* contain his account of the ten-year history of dating the KBS Tuff. Since my account was written independently of his, it would be an enlightening experience to read his account also. By omitting many of the details that I have included, he is able to make the affair a graphic victory for the dating methods. Accounts like his explain why many people continue to put almost unlimited faith in the dating.