What is our Real Knowledge about the Human Being
Pontifical Academy of Sciences, *Scripta Varia* 109, Vatican City 2007
www.pas.va/content/dam/accademia/pdf/sv109/sv109-asfaw.pdf

THE ORIGIN OF HUMANS: THE RECORD FROM THE AFAR OF ETHIOPIA

BERHANE ASFAW

I would like to start with just one simple statement. Our own species is anatomically and behaviourally very recent, and cannot be understood or appreciated without taking into account where it came from and the form it evolved from. That is the reason why we need to understand our biological history. I just want to review the road we had to pass through in our 6 million year biological history. Just to reiterate, evolution is a fact. The reason why we say that we are evolved is because of evidence from comparative anatomy, molecular biology and fossil evidence. My work is mostly on the fossil evidence.

Just to give you a summary, we can classify our six million year biological history into three chapters (Fig. 1, see page 163). The first chapter, starting from the bottom, from the third one, is the chapter of *Ardipithecus*. That is a very remote group of ancestors that lived from about 6 million years ago to about 4.4 million years ago, according to our knowledge in the fossil record. The second chapter, the *Australopithecus* era, is the second phase of our biological history. It emerged, from the fossil record as we know it, around 4.1 million years ago and then continued later, the specialised forms continued up to around 1.3 million years ago, overlapping with the third chapter of our history. The third chapter is the *Homo* phase. I am classifying humans in the Linnean sense, by pure comparative biological information, comparative anatomy, by just grouping different creatures based on what they share and how they look alike. Based on that classification, the early groups that we identify, as palaeontologists, to be our closest ancestors look something like this (Fig. 2, see page 163). This fossil is 6 million years old, from Chad. This is the same 6 million year old fossil from Kenya and this is from Ethiopia around 5.8 million years old, which is almost six million years old, and all of them belong to the first chapter of human evolution, or the biological history of ourselves, the base of everything.

The second chapter started around 4.1 million years ago and the first record comes from Kenya and Ethiopia and is known as *Australopithecus anamensis*. These are the species that formed the base of the second chapter, which spread out all the way to South Africa. You do not find them outside Africa. On the basis of recent work, some researchers have been able to identify the same species, members of the same group of the second chapter, the *Australopithecus* chapter, as far as Chad, but nothing out of Africa. Then, after 4.1 million years, for the first time we see footprints. Our human ancestors had been walking on this planet for at least 2 million years before *Au. afarensis*, or Lucy's group, but we have very good records, good footprints from Tanzania and we have a collection of skeletal remains from Ethiopia. This is Lucy (*Au. afarensis*) (Fig. 3, see page 164). So the second phase of our evolution is very well documented. It is not such a scanty record as we see it in the first chapter. As we get closer and closer to the present the record gets better and better, which is natural.

In the second phase of our biological history, which is the era of *Australopithecus*, after 3 million years, after Lucy's time, after *Au. afarensis*, you see lots of species, a big variety (Fig. 4, see page 164). The species *Au. africanus* is from South Africa, younger than 3 million years, and *Au. garhi* is from Ethiopia, around 2.6 million years, and with this for the first time, at least in the same time period, we start to find stone tools, but the brain size is still the same as the others, very small. *Au. aeithiopicus* is also another species from Ethiopia and Kenya, and *Au. boisei* is a species found in Kenya, Tanzania and Ethiopia. *Au. robustus* is another species and a very close relative of *Au. boisei*, and is found exclusively in South Africa, but this is the same era as *Australopithecus*, which shows the maximum diversity of the species and takes us to the third phase. However, some of the specialised forms, the relatives of *aeithiopicus*, which are *boisei* and *robustus*, continued to live side by side with the second phase until about 1.2 million years ago.

The third phase of our biological history is the phase of the time of the genus *Homo*. That is the group that we can really closely identify with, because they have a bigger brain. We evolved directly from these groups and the oldest record that we have, for the third phase, is about 2.3 million years ago, and that is from Ethiopia. After that we have a good collection from Kenya, Tanzania and also South Africa (Fig. 5, see page 165). Up to this time, all the records that we have, the fossil records, the biological history that we have, are exclusively African. It is after this time period, after this group of hominids, human ancestors, that we start to pick up the fossil record, a record of our biological history in Europe and Asia. That is the

time of the *Homo*. By this time they have evolved, this is the time of *Homo erectus*. *Homo erectus* is the species that you find almost in all parts of the old world. The earliest ones were found in Kenya, Ethiopia and South Africa, but you can find them at least in the Eastern part of Africa all the way down to the south. This (Fig. 6, see page 165) is the Georgian one. It is the smallest, it is very small brained, but structurally it is very similar and the age is almost the same as the one we found in Kenya. And the next one is from Indonesia. This is just to show how widespread these species are: once they appeared, once they evolved and started to use stone tools they developed big brains and were able to expand in the old world very widely.

Then these species of *Homo erectus* were later followed by a bigger brained kind of people. This is the time, according to our work in Ethiopia, when we were able to see what can possibly be interpreted as ritual activities, because we were able to observe some cut marks on the skull. However, without going into that part, but dealing only with biological history, they have a very expanded brain, this is almost about 600 to 500 thousand years ago and you find them in Europe, Asia and Africa (Fig. 7, see page 166).

Then the last ones are us, we are the latecomers. But our steps through time are fully recorded. As we can see it, through time the brain has expanded and the cultural material that is associated with these fossils has changed. The tools have changed and our biology has changed. The most significant part that we can observe is a very expanded brain and a reduced face, at least from the biological prints we can see that these groups are *Homo sapiens*, the last groups that are us. Again the oldest record that we have is from Ethiopia (Fig. 8, see page 166). These two (Ethiopia, *Afar* – Ethiopia, *Omo*) are almost contemporaries, if not a little bit less, but still the time difference is about 165 thousand years (Ethiopia, *Afar*), and this is still over 100 thousand (Ethiopia, *Omo*) and this is from Israel, about 100 thousand, and similar kinds of fossils, 100 thousand years old, can be found all the way down to South Africa.

This is our fossil record that I tried to walk you through, without counting the huge fossils that we have in Europe, the *Neanderthals*, who were living side by side with *Homo sapiens*, but this is just to show you that humans evolved. The data I presented may be enough, but I can take you to one single place in the world, on this planet, where the whole record of human history, not the whole but at least a whole chapter, is represented, and that is the Middle Awash of Ethiopia. A single place on earth were the six million years of biological history is found in time-successive sediments is the Middle Awash in Ethiopia. I can take you there and I can show you where it is and

the time-successive sediments and what type of record we have in that place.

This is Addis Ababa, the capital city of Ethiopia, and this is the Awash River. The Middle Awash is just right at the triangle of the rift. This is the Red Sea, so the Awash is right here. That is where I work. If you travel from Addis Ababa towards the Ethiopian Rift Valley, which is the very northern part of the East African Rift, once you have finished the highlands and are descending into the lowlands, you will have to go down this sharp cliff but Fig. 9 (see page 167) shows you a window at very high altitude, about 2,900 to about 3,000 metres above sea level, so when you go down you drop into the place where we have a big cache of fossils, a record of our biological history, and the altitude that you are going to reach is about 600 metres above sea level, so you are dropping about 2,300 metres from this highland.

The Rift Valley, especially the Afar Rift, is a big area but my area of interest, where I am working now with my group, is this place (Fig. 10, see page 167) and this is the place where we get six million years of human history. At present this place is desolate and dry, it is a desert. But if we were able to go back in time, this is one of the 2.5 million year old sites, and then if you go back to 4 million and 6 million this place was lush and green, a very beautiful place, because the fossil evidence of the animals and of the plants tells us that our ancestors were living in a very beautiful environment, not a desert like this one. This (Fig. 11, see page 168) is just to show you the thickness of the sediments. It is one kilometre thick. And we compiled these one kilometre thick sediments in different ages and each exposure gives you a snapshot of the past. We have twelve horizons, from the bottom 6 million years till the top, about 80 thousand, and in this one kilometre section we have 12 snapshots. These 12 snapshots give us an idea of our past in time-successive sediments. The earliest one comes from the bottom. This is the species we call *Ardipithecus kadabba*, from the western part of the Middle Awash. The Awash divides the area in two, we call this side the eastern side and this side the western side and this is the earliest evidence of our ancestors. When we go up to about 4.4 million years ago we find another species. That species of the first chapter is called *Ardipithecus ramidus* (Fig. 12, see page 168). As I have told you earlier, when you try to reconstruct the past and draw the picture of what it was like 4.4 million years ago, the picture that we get of this place is something like this, because the kind of animals that were associated with these human ancestors, the fossil ancestors, are Colobine monkeys, which are forest-loving monkeys, and different kinds of antelopes, which are forest-dependent. So the area was lush and green and foresty.

When you go higher in the section you find a different form, a more evolved form. As we are walking through time, up in the section these species change and become closer and closer to us by adding more and more of the features that we have now. They add them through time and they evolve. This is the level of the 4.1 million year old *Australopithecus anamensis* (Fig. 13, see page 169). This species is only from Kenya and Ethiopia. The evidence, these are fossils from that time, and recently we have also found additional specimens from that horizon. When you go up, from 4.1 million years I am taking you to 3.4 million year old horizons, that is the area of Lucy's ancestors and relatives, and that is what we call the *Australopithecus afarensis* time (Fig. 14, see page 169). And we have the record of it in the Middle Awash. What I am showing you is only in one area, in one place, that is the record we have as a good evidence of human evolution. And we have the species *Australopithecus afarensis*. It is a different species, even though we find them in one place in time in successive sediments. It was also living in Kenya, Ethiopia and Tanzania. And then higher, at around 2.6 million years ago, we find a new species and that new species was found also with stone tools (Fig. 15, see page 170). When we published the finding of human ancestors from 2.6 million years ago, the first time it was published we did not have any record of stone tools in this horizon. The only thing we had at that time was evidence of cut marks on the bones. But last year, when we were doing our fieldwork, we found stone tools from the 2.6 million year horizon, which means the same horizon where this human ancestor came from. When we first discovered this in 1997, we had indirect evidence and were not really sure whether this human ancestor was really responsible for it or not. But now we have found more bones from the same time period and more stone tools, so now I can say conclusively that this species may be the one who is the first stone tool maker. And then we go higher, to around 1 million years ago, in the same place, the same Middle Awash. Here we find a bigger brained human, a member of the third chapter of our biological history (Fig. 16, see page 170). That is *Homo erectus*, with stone tools (Fig. 17, see page 171) And when we go higher we find another one. From 1 million years I am taking you to 500 thousand. This one has a bigger brain and still has stone tools. And then we go higher, to 165 thousand years ago and there we find this, a much bigger brained human and this is basically what we call 'us', *Homo sapiens*, the first species (Fig. 18, see page 171). And we can go higher and I will stop there and, at around 100 thousand years ago, we find sophisticated tool types, a different kind of tool which we call the Middle Stone Age, well-shaped, some of them look like arrow points, and we also find lots of bones (Fig. 19, see page 172). And those bones, basically we did not

only find skulls like the ones that I showed you, skulls of different types, but in this horizon we found skeletons from head to toe. This may be the time that if we find skeletons in the open air sites, not in the cave sites, then we may be able to talk about something more sophisticated, about our cultural beginnings, our consciousness of these people. We have to do a serious investigation and see what is coming. It does not stop there. That is about 100 thousand years ago. Where I am taking you is a place where Alison Brooks has been working for four years, and in that place we also find a human ancestor. It is about 80 thousand years old. And then you can see the tool types (Fig. 20, see page 172). As the biology changed, as the biology evolved, there was also a cultural evolution taking place side by side, but the speed of the cultural evolution was really picking up after the emergence of *Homo sapiens*, the one that I showed you from 165 thousand years ago.

Just to summarise, what we have found is only the last 1 million year biological history of us in the Middle Awash (Fig. 21, see page 173). You can see the *Daka* man at 1 million, and then this one, the *Bodo* man, at half a million, and then *Herto* at 165 thousand years ago, and *Aduma* at about 80 thousand years ago. This is evidence, the undeniable and irrefutable evidence of our biological history and of the fact that humans have evolved. It is impossible to understand modern *Homo sapiens* without understanding the road that we went through the course of our evolution. If we do not understand that, it is totally impossible to understand ourselves as a species, as human beings.

In conclusion, we have a good fossil record showing that humans have evolved. The fossil record is getting denser and denser as our work continues. Human evolution is a fact based on evidence. The evidence comes from three parts: comparative anatomy, molecular biology and fossil record. However, although we have this much fossil collection and know much more than those people who started the fieldwork 100 years ago, in Darwin's time, still there are lots of things that we do not know. We do not know who the last common ancestor was. We do not know the origin of *Homo*. I have shown you five species of *Australopithecus* and which one gave rise to the genus that we all belong to, the genus *Homo*, which one really is the basis, we do not know yet. I have my own views, my other colleagues have different views but we are not yet clear on that. And we do not know the place of the *Flores hominid*. Our own species is anatomically and behaviourally very recent and cannot be understood or appreciated without taking into account where it originated and the species it evolved from. I would like to repeat it again. As I told you earlier, the place is the Middle Awash of Ethiopia, where we have the irrefutable evidence of human evolution (Fig. 22, see page 173).

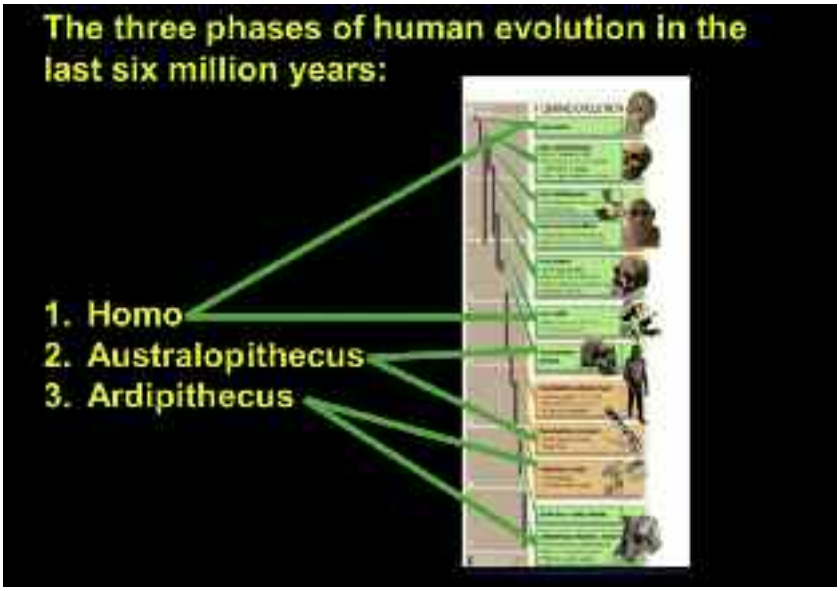

Figure 1.

Figure 2.

Figure 3.

Figure 4.

Figure 5.

Figure 6.

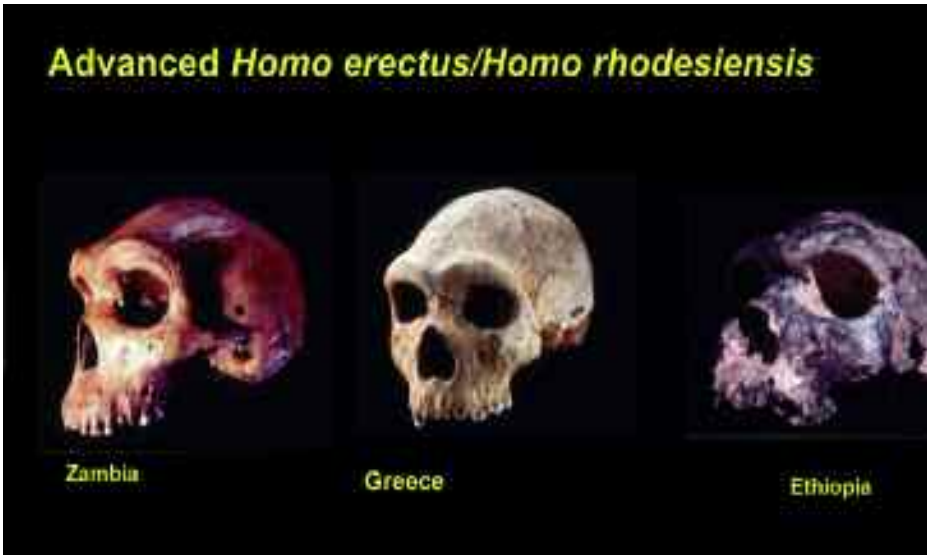

Figure 7.

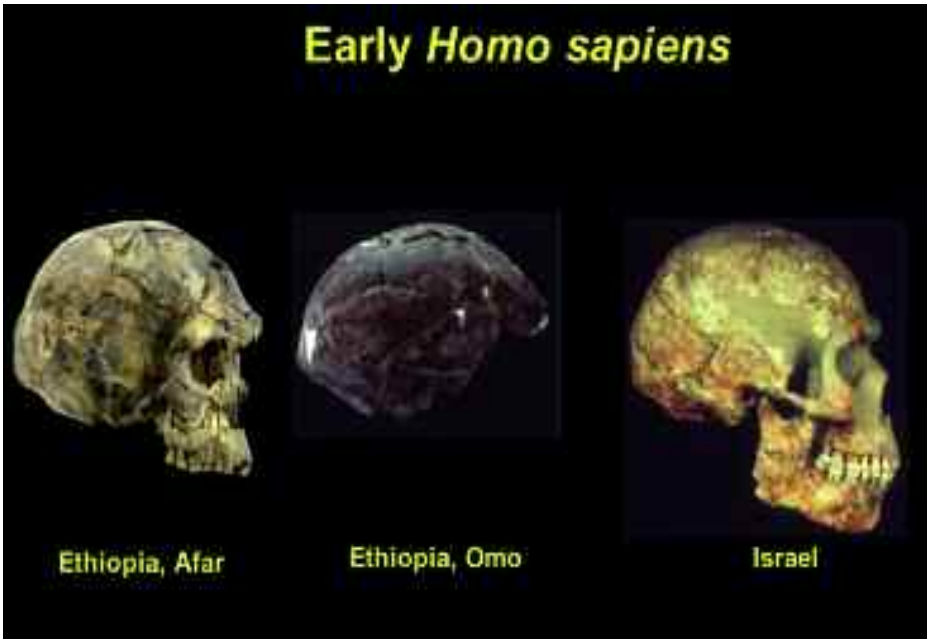

Figure 8.

Figure 9.

Figure 10.

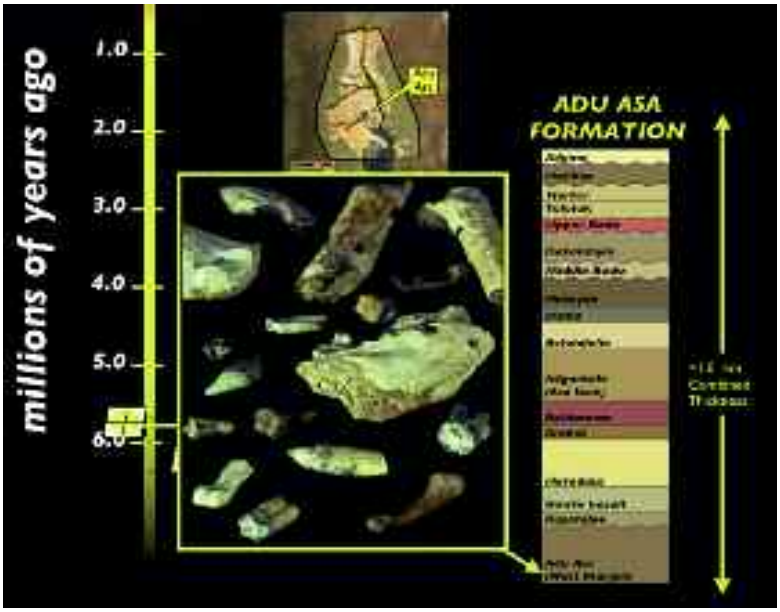

Figure 11.

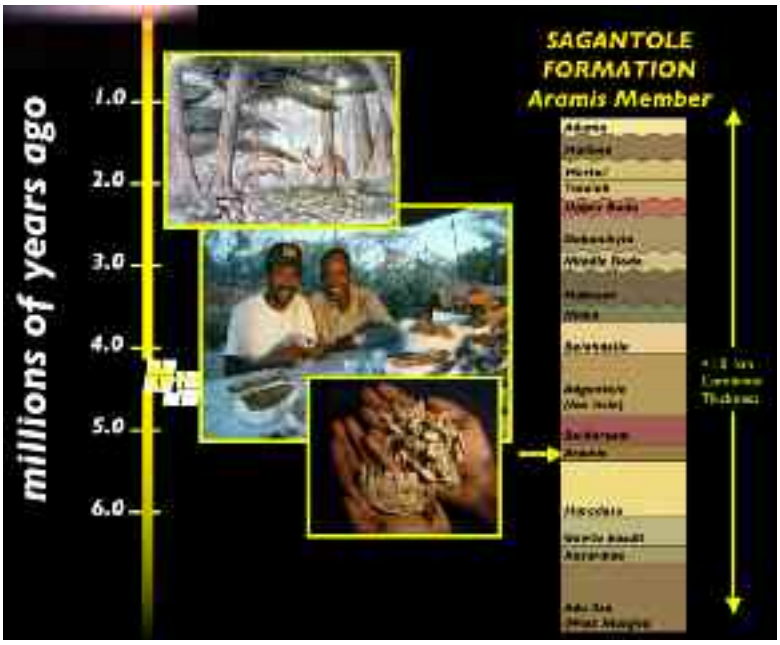

Figure 12.

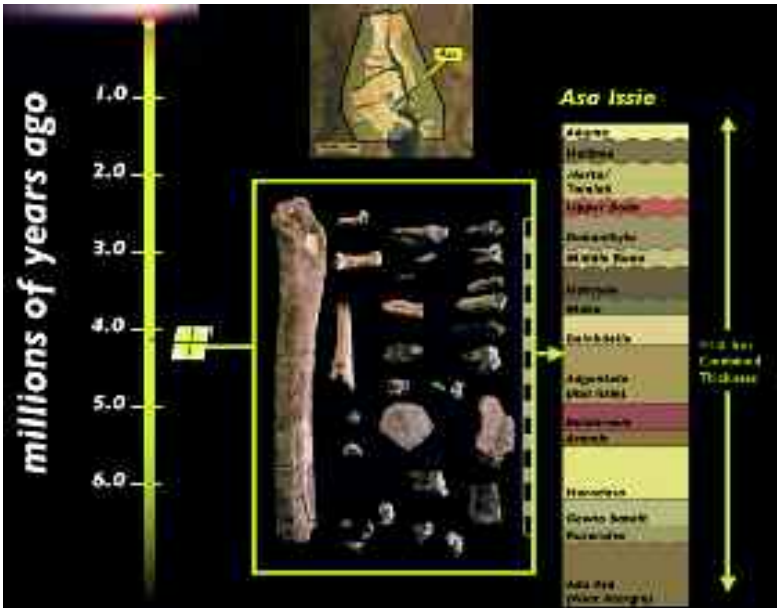

Figure 13.

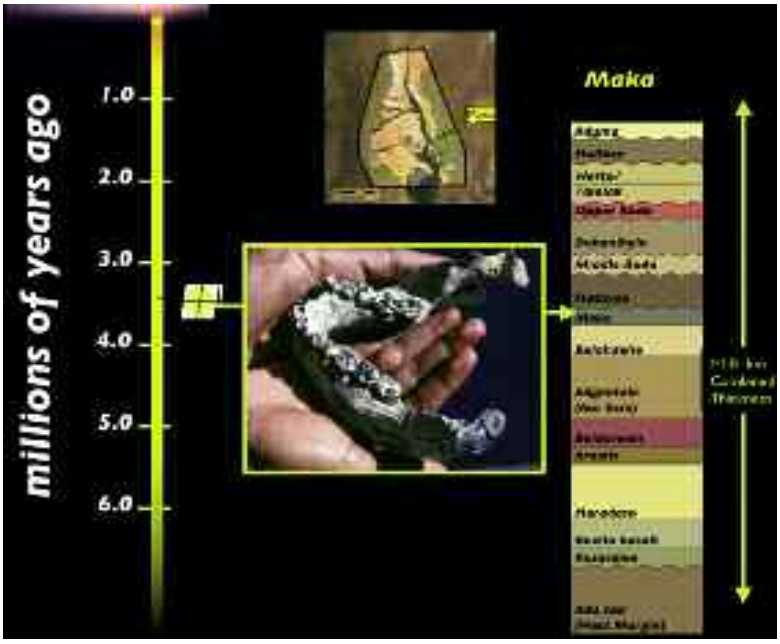

Figure 14.

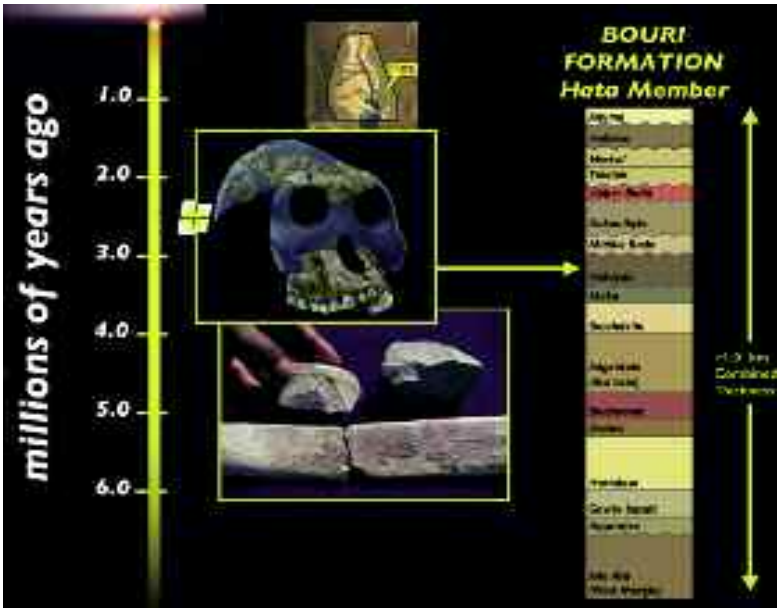

Figure 15.

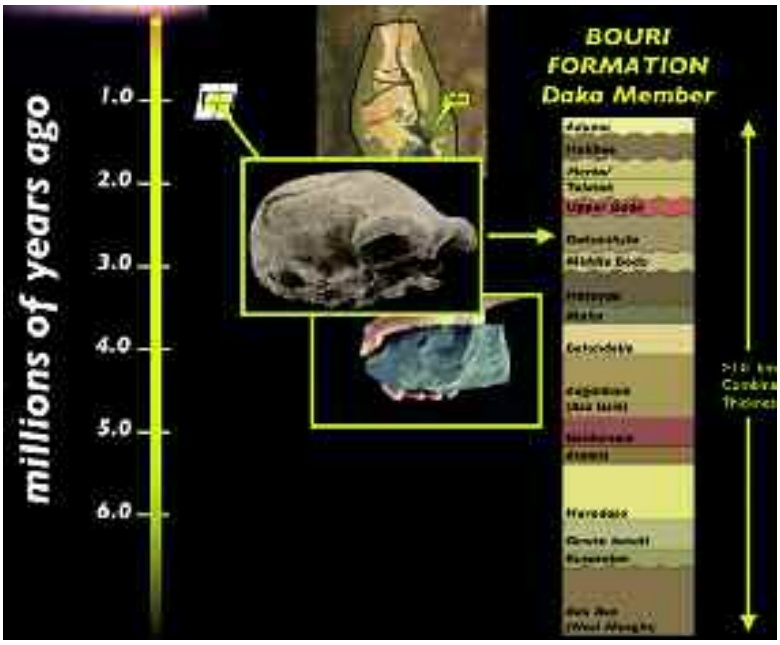

Figure 16.

Figure 17.

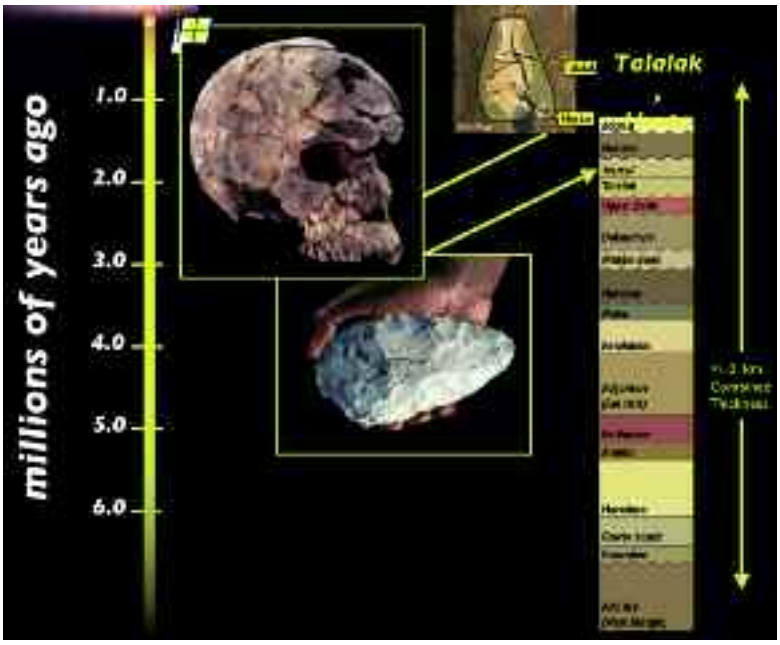

Figure 18.

Figure 19.

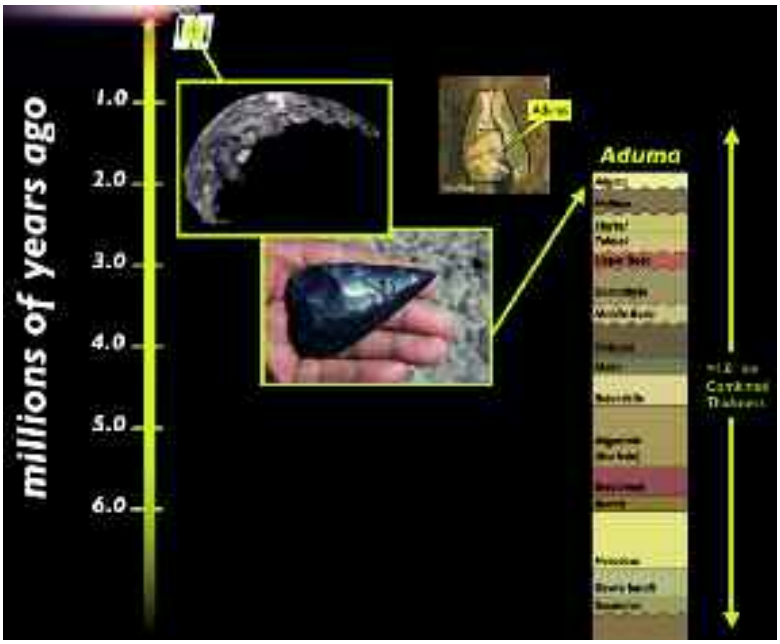

Figure 20.

Figure 21.

Figure 22.