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STERK FONTEIN CAVES. LATEST FINDS - 1990S

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Archaeological Resource Development Project (ARDP)
The ARDP is committed to making the archaeological past available to all South Africans. It began with the help of Kathy Schuyssen, who began to offer lectures at the site and other sites.

CHAPTER 5

A MOMENT IN TIME: FROM A "LITTLE FOOT" TO A COMPLETE SKELETON

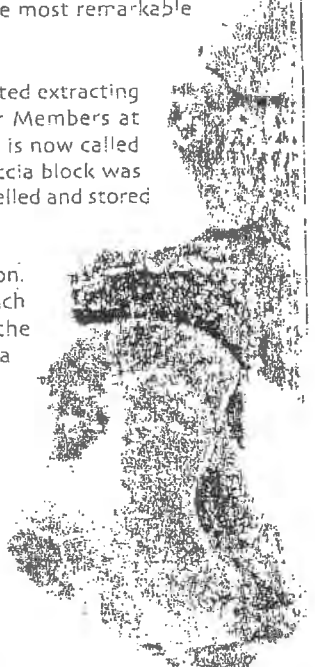
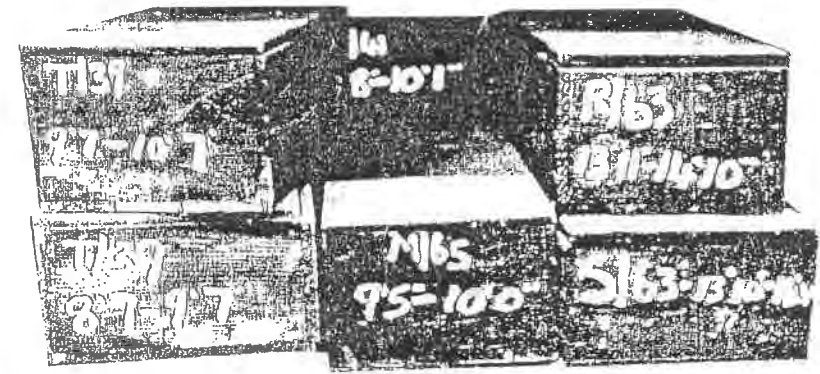
In 1994 Dr Ron Clarke's discovery of four foot bones led to one of the most remarkable scientific discoveries of all time.

In 1978 Alun Hughes, then director of excavations at Sterkfontein, started extracting breccia blocks discarded by lime miners from the deeper and older Members at Sterkfontein. These Members (1, 2, and 3) are all to be found in what is now called the Silberberg Grotto (named after H. K. Silberberg). After each breccia block was laboriously lifted from the subterranean cave, bones were removed, labelled and stored in boxes.

In 1992 Prof Phillip Tobias felt that Member 2 warranted further excavation. He, together with Dr Ron Clarke, organised for some of the breccia, which was particularly hard, to be blasted out from untouched areas in the grotto. By 1994 it was apparent that most of the fossils from this breccia were from carnivores and monkeys. This puzzled Dr Clarke. He wondered why there were no bones from other animals, like buck. So he returned to the collection of bones previously stored away by Alun Hughes. Among foot bones of buck, monkeys and carnivores, he found the first of a series of clues that would enable him to make the discovery of the century. He found four bones that belonged to the left ankle and big toe of an early hominid.

This find was extremely exciting for two reasons.

1. At the time it represented the oldest hominid find in South Africa; and
2. The fact that these small foot bones had been found together indicated that the creature may have died and decomposed in the caves. If the creature had been killed, then eaten by scavengers and its bones washed into the caves, the chances of the small bones staying together would be slim.



WHO'S WHO?

Prof Raymond Dart identified the Taung child in 1925 as being an ape intermediate between apes and men, or what today we would call a 'missing link'.

Dr Robert Broom, a Scottish physician, took to full-time palaeontology after his retirement. He excavated at Sterkfontein on and off from 1936 until his death in 1951.

Prof J.T. Robinson worked for many years along side Broom.

Alun Hughes directed excavations at Sterkfontein for just over 20 years.

Prof Phillip Tobias's unflagging passion for palaeoanthropology has kept the discipline alive in South Africa.

Dr Ron Clarke, famous for his ability to reconstruct hominid fossils, has made one of the most significant hominid discoveries in the world.

Stephen Motsumi, an expert fossil preparator, and excavator Nkwane Molefe have worked for a number of years extracting fragile fossils from the breccia.

Dr K. Kuman conducts research on the stone tools found at Sterkfontein

Dr H.K. Silberberg collected a number of key fossils from the chamber now named after him, Silberberg Grotto.

Raymond Dart



Stephen Motsumi



Nkwane Molefe



Prof Phillip Tobias



Dr Ron Clarke



Dr Kathy Kuman

CHAPTER 6

6 MILLION YEARS AGO: COMMON ANCESTORS AND FAMILY TREES

When scientists began to order and group the animals in the Animal Kingdom, they immediately placed humans in the same category as monkeys, apes and prosimians. This decision was based on the fact that they have the following things in common:

- Well developed eyes that face forward, providing binocular vision;
- Flexible fingers and hands that can grasp;
- Fingers with nails and not claws;
- Giving birth to one baby at a time, which requires a fair amount of nurturing; and
- Advanced social organisation.

This large group or order was given the heading Primates, meaning 'first'. As science advanced it became evident that we were more closely related to some of our fellow Primates than previously imagined.

Microbiology has shown that we share approximately 98.4% of our genetic material with the chimpanzees and 97.7% with gorillas. In fact DNA studies tell us that we are most closely related to the African apes, with only about 2% of our DNA different from theirs. All these similarities have led scientists to believe that at one time we must have shared a common ancestor with the African apes.

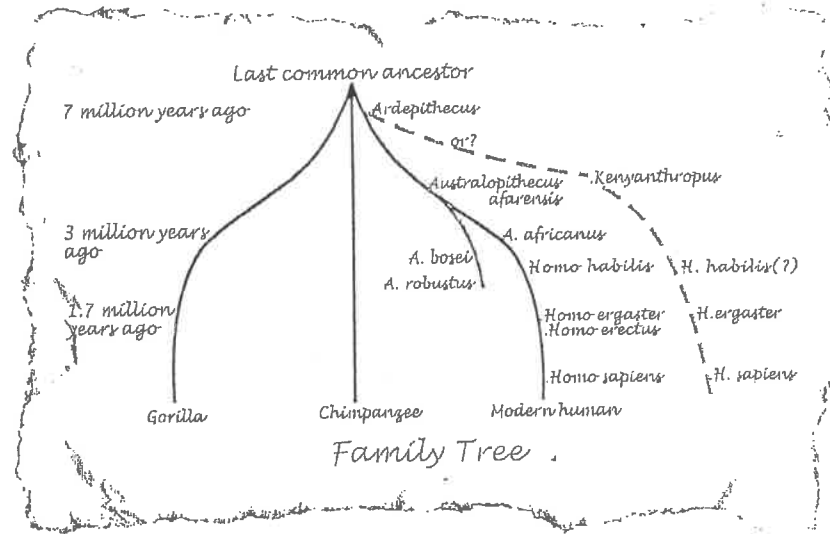
Sometime after 10 million years ago a split between the apes and hominids occurred. The apes evolved in one direction and the hominids in another.



About 6 million years ago, there was a radiation of hominid species and one of these offshoots gave rise to the family of hominids from which we emerged.

OUR FAMILY

Initially, it was thought that we developed or evolved along a straight line – from ape-like to more human-like, to fully human. We now know, thanks to the many fossil hominid discoveries, that our family tree has many branches and offshoots. In fact we have so many early relatives that it is becoming increasingly difficult to trace our direct ancestry. But, as more and more fossils are found, we are slowly but surely beginning to understand what set our earliest ancestors aside from the apes. For example, evidence from the growing number of hominid fossils in Africa show that: by 6 million years ago our ancestors walked upright (bipedal), even though they still spent time in the trees; their hands were less specialized than the other apes and therefore more like our own; and analysis of 2.6 million-year-old fossils indicates that some of their diets were more like ours than the diet of chimpanzees. Indeed, it is only a matter of time before we understand fully how we evolved.



In South Africa, the earliest line of hominids that we have are the australopithecines, and Sterkfontein in particular has produced a most outstanding record of these early hominids and the environment that they lived in.

DID YOU KNOW?
All living things have genetic material (DNA). DNA contains a set of instructions that determine what an organism looks like and how it develops. Our DNA is also like a huge database in that it keeps a record of information that is billions of years old. By studying this information we can work out how much of our DNA we share with other plants and animals, and how much we have in common with all other living things.

WORD BOX
Hypothesis – a proposition.
Radiation – spreading out or multiplying from a single point.
Prosimians – ancient monkeys like lemurs and bush babies.
Organism – a living thing.

STER 7

3.3 MILLION YEARS AGO: THE IMPORTANCE OF A COMPLETE SKELETON

Around 4 million years ago at Sterkfontein, a long, narrow, vertical shaft opened up between the surface of the earth and the caves below. Animals like sabre-toothed cats, hunting hyaena, leopard, monkey and hominids fell down the shaft, died, decomposed and became fossilised as partial or complete skeletons deep below the surface of the earth.

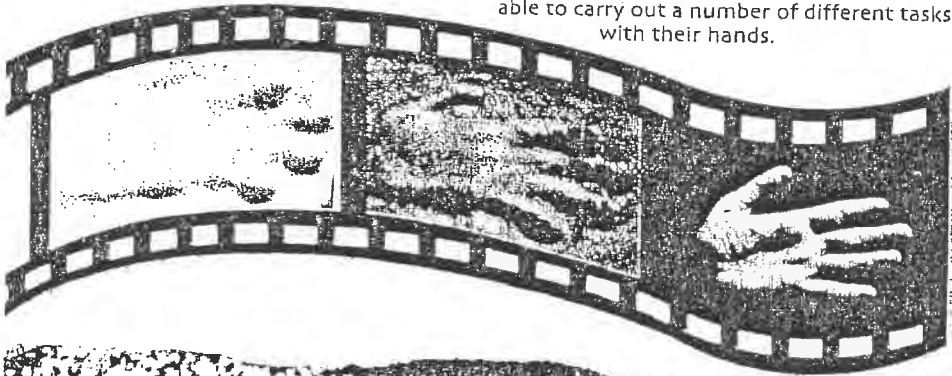


Fossilised complete skeletons are rare but important finds. They allow the scientists to begin to reconstruct, amongst other things, the length of the animal's limbs, the size of the head in relation to the body, and how powerful the body would have been. For example, the long forelimbs of the hyaena *Chasmaportheles* tells scientists it ran its prey down in the way that a cheetah does.

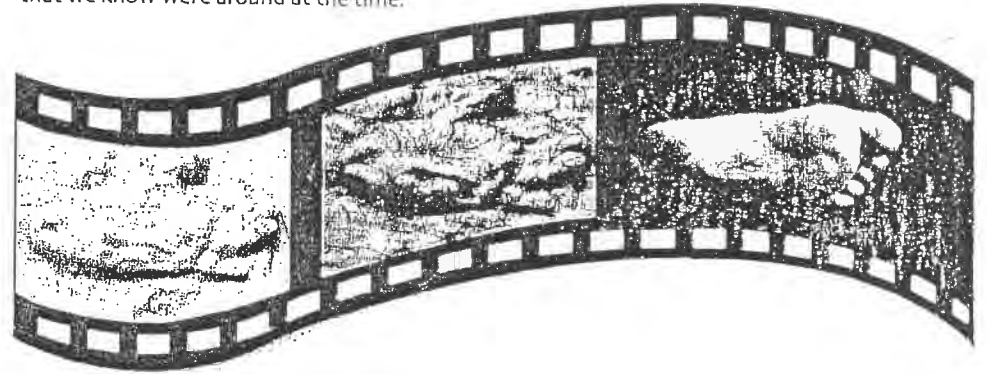
As you can imagine, the discovery of an almost complete fossilised skeleton of a 3.3 million-year-old early hominid is even more phenomenal. Scientists from around world agree that this is the most spectacular find ever. For the first time a scientist, in this case Dr Clarke, will be able to rebuild this early hominid, piece by piece, from its feet to its head.

The near complete skeleton falls within the genus *Australopithecus* but it has yet to be given a species name. This will only be done once more of the creature has been removed from the matrix and its distinguishing features have been studied. It may be that it is more like the east African hominid *Australopithecus afarensis* (Lucy) or more like our younger species *Australopithecus africanus* or something completely different that warrants a new species name.

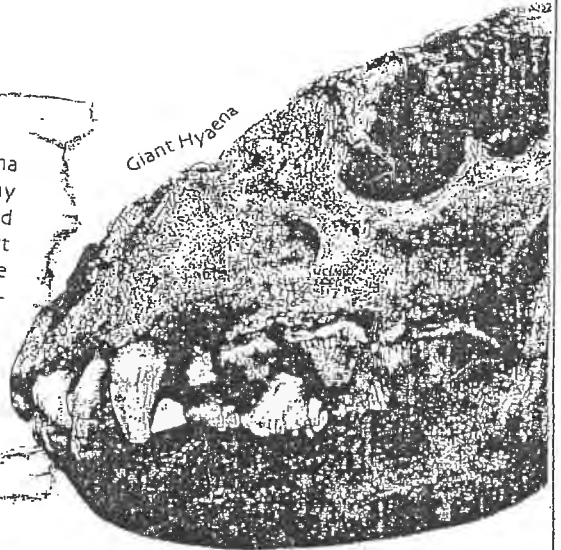
Already this specimen is starting to throw light on what until now have been fairly murky areas. The arm, hand and legs of the skeleton support arguments that these early hominids were bipedal (they walked upright on two feet), and never knuckle walked like the apes and monkeys. Dr Clarke explains, "If you're sitting in the trees you sit upright. When you come down to the ground you have a choice: you can either walk on two legs or run on two legs or you can get down on all fours the way the apes and monkeys do and run on all fours. This hominid walked on two legs. It did not use its hands at all. We can now say this for certain because we know it had short arms and short fingers". In fact one of the things that has surprised the scientific world is that the hand is not like the ape's or monkey's but is about the same as humans. Hands of monkeys and apes tend to be quite specialised. They have long fingers and short thumbs and are suited to specific activities. For example, the orang-utan's long fingers enable it to hang from branches. In contrast, humans have a short palm and fingers and a long thumb and are able to carry out a number of different tasks with their hands.



However, the now famous foot bones also tell us that this hominid still spent time in the trees. The big toe was separate from the other toes, a little like our thumb, and enabled it to grasp branches to climb trees. This tree climbing ability would have helped it escape from the many predators, like hunting hyaena and sabre-toothed cats, that we know were around at the time.



DID YOU KNOW?
While there are only four species of hyaena alive today, in the past there were many more. Fossilised bones from sites in and around Sterkfontein indicate that amongst the many different kinds of hyaena there was a giant hyaena called *Pachycrocuta* - about the size of a modern lion - and a hunting hyaena called *Chasmaportheles* - with long legs for running and teeth better suited to tearing flesh than to crunching scavenged bones.



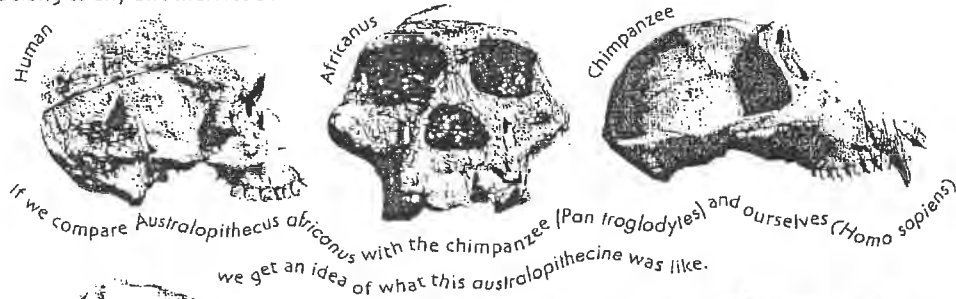
WORD BOX

- | | |
|-----------------------------------|---|
| Predator | - an animal that preys on others. |
| Vertical | - from top to bottom. |
| Distinguishing | - special. |
| Bipedal | - walking upright on two feet. |
| <i>Australopithecus afarensis</i> | - an early australopithecine found in East Africa. |
| <i>Australopithecus africanus</i> | - an early australopithecine found in South Africa. |

CHAPTER 8

2.6 MILLION YEARS AGO: AUSTRALOPITHECUS AFRICANUS

Australopithecus africanus is by far the most common hominid found at Sterkfontein. There are more than 400 specimens of this species, most of which come from Member 4. This does not, however, represent 400 individuals as several fossil specimens, like a mandible, vertebra, or finger bone could belong to any one individual.

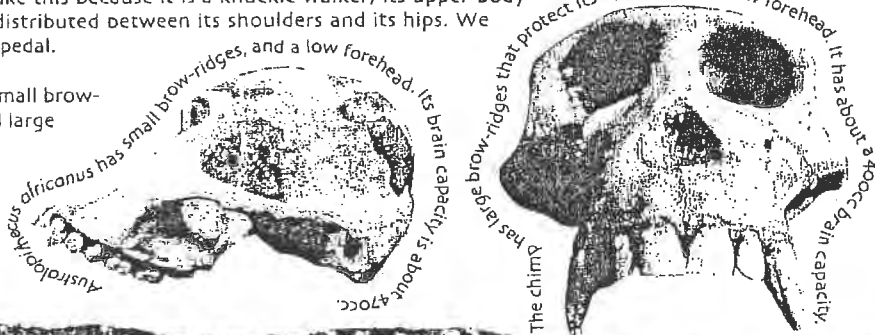


Our face is fairly flat. We have a u-shaped palate and relatively small canines. *Australopithecus africanus* has a protruding face. The shape of its mouth and teeth are more like ours than the chimps. The chimpanzee has a muzzle you can place your hand around, like a dog's. It has a very long palate with large canines.



Our hipbones are compact and slightly s-shaped, designed to carry upper body weight, and in the female to give birth to large-brained infants. *Australopithecus africanus*'s hips are very similar to ours, demonstrating that by 2.6 million their hips were fully adapted to carrying upper body weight. The chimp's hipbone is long and wing shaped. Its hipbone is shaped like this because it is a knuckle walker; its upper-body weight is distributed between its shoulders and its hips. We are fully bipedal.

We have small brow-ridges, and large vertical foreheads. Our brain capacity is between 1200 and 1300ccs.



INNER EAR AND BALANCE

Deep inside the inner ear we find the organ of balance. The organ of balance helps sy our vision with our head and body movements. When the organ of balance malfun feel dizzy and sea sick. Scientist Dr Fred Spoor has discovered that there is a link betw size of the semicircular canals and locomotor behaviour, and, more importantly, that the semi-circular canals fossilise. Studies of the organ of balance in *Australopithecus* show that it is like the great apes', indicating that it combined climbing behaviour with bipedality.

SIZE

Australopithecus africanus as an adult was not much bigger than a 9-year-old human approximately 1m in height.

DID YOU KNOW?

Dr Francis Thackeray has argued that the famous *Australopithecus africanus* specimen called 'Mrs Ples' may not be 'Mrs' at all, but rather a young male. Dr Robert Broom designated Ples female because she appeared to have small canine sockets, and therefore small canines. Dr Thackeray argues that the tooth sockets have been worn down, probably during the process that lead to its being deposited in the cave. He thus believes that if the sockets were 'rebuilt' it would show that Ples had larger canines. He furthers his argument by showing that Ples has fairly prominent eyebrow ridges.

In opposition, Dr Clarke argues that one cannot say with any certainty whether Ples was male or female because there simply isn't enough material to compare it to. In other words, you can only determine whether something is male or female if you know what the males and females of that species look like. That aside, Dr Clarke feels that Ples is not robust enough to be male. He points out that erosion of the tooth sockets does not change the fact that the roots of the canines indicate the canines were relatively small.



MAKE SURE YOU SEE

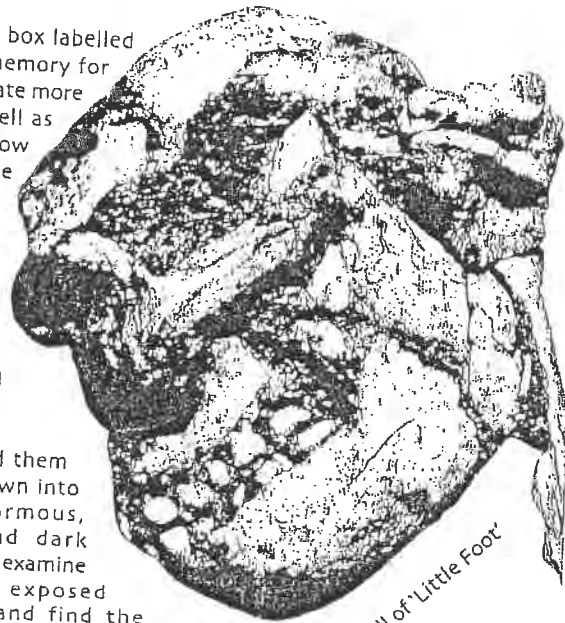
Member 4 - The *Australopithecus africanus* specimens and Ples in the museum.



WORD BOX

- Protruding - sticking out.
- Synchronize - occur at the same time.
- Designated - named.
- Prominent - jutting out.
- Robust - strongly built.
- Erosion - worn away.

Ron Clarke started going through another box labelled 'monkey fossils' and, relying on his keen memory for shapes and kinds of bones, he was able to locate more left and right foot- and ankle-bones, as well as fragments of the left and right shinbones. Now with twelve foot and leg bones of a single hominid Clarke felt sure there was a chance of finding the entire skeleton. When he examined the right shinbone closely, he realised the bone had been broken when the miners had blasted the breccia out. He made a cast of the end of the bone, and then set what seemed an impossible task for Stephen Motsumi and Nkwane Molefe, two of the fossil preparators at Sterkfontein.



Skull of 'Little Foot'

He asked them to go down into the enormous, deep and dark cavern to examine all the exposed breccia and find the other end of the shinbone. Mid-way through the second day they spotted a broken section of a bone protruding from the breccia into which their cast fitted perfectly.

In 1997 the three men began to excavate the leg bones in the hope of finding the rest of the skeleton, but beside the lower legs they found nothing more. Knowing that the whole skeleton had to be there, Dr Ron Clarke began to look more closely at the breccia. What he found was that a large block of breccia had collapsed sometime after the creature had died, causing the bottom part of the skeleton to be separated from the top part.

Limestone had then flowed in between the two halves. Once this flowstone was removed more bones started to appear - first the left upper arm bone, then the jaw and the skull, and later, the lower left arm and hand.

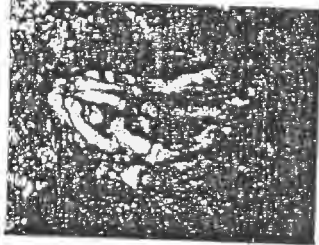
The creature lay face down with its left arm outstretched above its head. Dr Ron Clarke had made the find of the century, a near-complete skeleton of an early hominid.



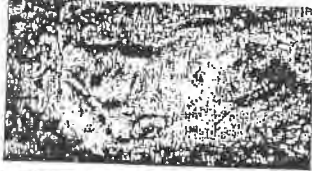
Leg bones



Arm bones



Hand bones



Laetoli Footprints

DID YOU KNOW?

Footprints, probably of the hominid *Australopithecus afarensis*, are preserved in volcanic ash at a place called Laetoli in Tanzania. About 3.6 million years ago a volcano called Sadiman produced a series of light ash eruptions. The ash contained a mixture of minerals which, when mixed with water or rain, formed a soft cement-like layer. While the layer was still soft, two hominids walked over it, leaving their footprints behind. When the layer dried it became rock hard and preserved the footprints. Interestingly, Dr Ron Clarke, as a young researcher, helped Dr Mary Leakey excavate the footprints at Laetoli. Little did he know that years later he would discover the foot bones of a creature with a very similar foot structure.

WORD BOX

- Carnivore - An animal that eats other animals.
- Decomposed - Broken down into constituent elements by bacteria or fungus
- Scavengers - An animal that feeds off animals that have been killed by other animals or that have died through other causes.
- Protruding - Sticking out.