The Antiquity of Man:

Artifactual, Fossil and Gene Records Explored

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Michael Brass
March 2002

"The Antiquity of Man" <http://www.antiquityofman.com>

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INTRODUCTION

Evolution. The mere mention of the word conjures up images either of the workings of the natural world or of propagandist materialism in people's minds. To put it into perspective, the contrast is between changes in allele frequency over time and observed speciation, and science force-fitted into personal belief systems. Alleles are alternate characters in genetic material and are integral to the process of speciation. Microevolution is the changes in allele frequency within a species, whereas speciation is macroevolution and alleles are not exchanged between populations under natural settings. The difference in allele frequency grows the further back in time the search for a common ancestor extends. The molecular clock, with its neutral proteins, is related to this process and the timing of the chimpanzee, gorilla and human split has been estimated through analysing the amino acid sequence differences of the protein albumin. The creative process of evolution is complex and installs a sense of wonder.

The common denominator of all creationist movements is the deep-rooted conviction that only their religion is true and that their interpretation of a particular religious tract is the most accurate. This has the effect of creationism being a highly fragmented religious stream of thought seeking support for their views in the geological and fossil records (natural science), as they want the benefit of scientific authority without the responsibility of its method. In order to accomplish their goal of preaching and brainwashing, creationists seek to refute the ruling paradigm of evolution by whatever means possible: from claiming evolution is merely a "faith" to actively promoting variant forms of creation "science" in public arenas outside the realms of academic journals. Readers are encouraged to visit the http://www.talkorigins.org website where various creationist arguments are listed, explained and rebutted in great detail; printed materials which cover this arena include Godfrey (1983), Scott (1997) and Strahler (1999).

Mainstream evolutionary science does not pass judgement on personal religious beliefs which are outside the realm of science, despite the protests of some prominent atheists. All mainstream churches, including the Roman Catholic Church and Pope John Paul II, regard creationism as unscientific and do not view a conflict between the findings of scientists and the Christian Bible. Saint Augustine, who lived before evolution became the dominant theory, also disagreed with a literal interpretation of the Bible.

Before delving into the realm of biological evolution as it pertains to the hominin fossil record, it is worthwhile to stand back and take further stock of the broad spectrum of the creationism versus evolution debate. By doing so we will gain a broader insight into its fundamentals which reveals specific trends and common flaws in creationist arguments.

How evolution is defined and recognised in the fossil and gene records is not fully understood by the general public beyond generalities. Schools, particularly in North America where the vast majority of creationist organisations are based, need to improve the quality and quantity of their evolutionary science teachings. The public know changes occur in nature, yet this is normally where their understanding peters out. Evolution is essentially the change in gene (allele) frequency over time, which began to operate after life first began. The origin of life is the realm of the separate scientific discipline of abiogenesis. Creationism attempts to link abiogenesis, cosmology and evolution under the broad banner of "evolution" but, as can be seen from the basic definition of evolution, that is nothing more than a misinformed stab in the dark which reveals a distinct lack of knowledge about the theory against which they are arguing. Evolutionary theories propose mechanisms to interpret these changes. In this regard confusion arises between scientists and the general public. As expressed eloquently by Dr. Eugenie Scott, head of the National Center for Science Education in America, "*the problem is that 'theory' and 'fact' are used differently in science and among the public. In science, a theory is a logical construct of facts, hypotheses, and laws that explains a natural phenomenon. To the general public, however, a theory is not an explanation, but a hunch or guess. To teach evolution as a theory in this sense is to teach it as something students don't have to take seriously*" (Scott 1997: 278).

In "Abusing Science: The Case Against Creationism," Kitcher (1982: 37) puts forward a wonderful definition of the scientific method:

> "*Theories are collections of statements. The observational consequences of a theory are statements that have to be true if the statements belonging to the theory are all true. These observational consequences also have to be statements whose truth or falsity can be*

> *ascertained by direct observation. Any theory that has a false observational consequence must contain some false statement (or statements). For if all the statements in the theory were true, then, according to the standard definitions of deductive validity and observational consequence, any observational consequence would also have to be true. Hence, if a theory is found to have a false observational consequence, we must conclude that one or more statements of the theory is false.*"

In other words, good scientific theories have observational predictions that would falsify all or components of a theory should they prove to be incorrect.

Research papers dealing with various evolutionary theories are the result of field research by genuine scientists who possess a solid grounding in biological and social sciences. Before being published, these papers undergo peer-review. Peer-review means that a scientist's paper, submitted to a journal, is referred to their panel of anonymous reviewers. They recommend any changes to be made to the content and comment on whether the writing contained within the paper is of acceptable scientific standard. The reviewers cannot veto publication based on whether they agree or disagree with the content of the argument(s) presented, although they can submit such recommendations in their report to the journal. However, the procedural aspects of higher scholarship, unfortunately, are not in themselves evidence that higher scholarship is free of bias. Even when opinion does not intrude outright on the reviewing process, reviewers often decide that the weight of evidence makes untenable a view that later research shows to be true, and tenure decisions and funding often flow from such judgments. What is really significant about peer review is not that it is free of bias, but that it is self-correcting over time. This is contrary to the creationist claims of "censorship."

Scientists utilising an evolutionary framework can date when mutations occurred, track them in time, determine their selective value, study their effects on the rest of the system, understand how these changes in particular organisms stimulated changes in other organisms in the ecosystem, and conduct experiments to understand the processes and outcomes of other ecosystems. In other words, evolutionary science observes the existence of genetic mutations and natural selection in operation.

It is no coincidence that the vast majority of people trained in biological- and geological-related sciences reject creationism. Creationism, in all its tenets, attempts to paint a picture of human beings being different from all the other animals, including is nearest relations, the apes. In other words, in the eyes of all creationists, humans are special in form, having been created through divine ordinance. I have yet to see any creationist explain satisfactorily why all primates, a group which includes humans, posses a functionless L-gulono-gamma-lactone oxidase gene for the synthesis of Vitamin C, the same as all other mammals with the exception of the hamster. This is a result of primates being descended from a common ancestral group in which such a mutation first arose, and then persisted, because of the rich vitamin C environments in which primates reside.

The genetic split between chimpanzees, gorillas and humans is comparatively minor on the evolutionary scale. There are many species of snakes that would be quite difficult to distinguish if their habitats and their skin colourings were unknown. How many modern species would biologists lump together if they simply had their skeletal remains with which to reconstruct their lives is uncertain. Ironically, Christian creationists have no trouble believing that guppies, barracuda and batfish evolved from a common ancestor, which they incorrectly term “changes within a kind” (“kind” coming from a Biblical translation in Genesis), without being able to scientifically define what a “kind” is. Also, creationism cannot give any scientific explanation as to why a barrier should be erected against primate speciation. This is because creationists have trouble with the terms micro- and macroevolution, and with the concept of separation between the scientific and theological worlds. No competent scientific hypothesis or theory has arisen since Darwin to challenge the basis of the theory of evolution. Mendelian genetics, molecular studies, radiometric dating and anatomical analyses have all served to reinforce the foundations of evolution. The standard creationist response to this is to claim there is a lack of transitional forms both in the present world and in the fossil record. This criticism has been comprehensively refuted as transitional forms of horses, elephants and whales, amongst many other animals, have both been excavated and described in the scientific literature (Strahler 1999; see also the Reports of the National Center for Science Education 2000).

Additional evidence for common descent and speciation include the fact that all mammals, with the exception of hoofed animals, have five digits; that flowering plants are found at the top of the fossil record; that all living creatures have shared genes; that features in foetus states are later absorbed; and that certain animals and plants are limited to various parts of the world as part and parcel of speciation.

One of the predominant creationist arguments is that as a result of the eye being perfectly designed, it cannot be broken down into separate functional parts and consequently evolution is false. Michael Suttkus (2001) has convincingly refuted such a claim in direct online debates:

> "*The best evidence that it did evolve is just how badly put together the human eye is. As someone who had to have surgery to correct the problems caused by the pathetically stupid design of the human eye, let me explain. Your retina is on backwards. For some stupid reason, it's behind both the nerve and blood vessels that make the system work. They suck up light, reducing the acuity of your vision. Even more stupid, you've got a blind spot in the middle where the nerve and blood vessel emerge from the back of the eye. Your brain is hardwired to ignore the spot, but it's still there, reducing your visual abilities. The worst part of the whole system, though, is that if there's any damage to the 'glue' attaching the retina to the back of the eye, the nerves and blood vessels pull the retina away causing detached retina, which was one of the most common causes of blindness before we learned how to surgically correct them. And all of this nonsense is utterly unnecessary. The squid eye has the blood vessels and nerves round behind the eye where they don't interfere. Now, tell me, what intelligent designer would design such an obviously flawed system when a better one was not only obvious, but known? Is your God in the habit of handing out stupid eye designs to his favored creations? That's some strange deity you've got there. Or maybe squid are God's chosen people and that's why they got the better eyes? Natural selection is stupid. It always works from the current design towards current improvement, not toward some foreseen future perfection. It's easy to understand how sub-optimal designs like the human eye are achieved by natural selection*."

Further details regarding the evolution of the eye are given by Lenny Flank (2001):

> "*How would an eye evolve? Well, we start with a small light sensitive spot, as in some of the modern flatworms. Then we go to an indented cup lined with light sensitive cells, like some other modern flatworms. Next, the cup closes to form a hollow ball with a pinhole opening at the front, like the modern nautilus. Then, we get a clear lens immovable at the front, as in many invertebrates. Finally, we get muscles which move the lens for focusing, as in vertebrates*.

Another cry of foul play from creationists is that evolutionary scientists present false and misleading evidence when claiming that the fossil record reveals distinct layers of super-positioning. It was geology creation scientists more than 100 years before the advent of the theory of evolution who noted the occurrence of distinct fossil layers.

Speciation has been observed both in the laboratory and in the wild. The following is a report by Perlman (2001) on two such cases involving the latter:

> "*Now three California scientists, led by David Irwin of the University of California at Bushmen Diego…say they have discovered the most compelling evidence yet to buttress the theory Darwin elaborated in his epochal volume* The Origin of Species*, which ignited a revolution in human thought. And another biologist, David B. Wake of UC Berkeley, has added to that evidence from his own years studying evolution in a group of colourful California salamanders. Wake's little amphibians and Irwin's Eurasian songbirds are known as 'ring species' because their forms have gradually altered as their populations have settled around a geographic ring of varied habitats and adapted over time to the demands of their different environments.*
>
> *"…Irwin and his colleagues tracked a single species of the drab songbirds called greenish warblers that settled to nest and breed in forest habitats encircling Asia's treeless Tibetan Plateau. The researchers have found an evolutionary surprise: The warbling songs of the birds differ slightly in each habitat, their body sizes vary, their wing markings change, and even their genes have diverged further and further apart. Populations of warblers, like other birds, easily mate and interbreed with neighboring groups around the ring. But when Irwin studied two separate populations of the birds that coexist in Siberia far from their original range, he found that they do not mate at all, and they differ strikingly in other characteristics. What had clearly been a single songbird species now bore all the signs of having evolved into two distinct species. To meet such extremely different environments, the birds, it seems, had indeed been 'modified for different ends,' as Darwin put it more than 150 years ago. Irwin's remarkable evidence of evolution in the birds called Phylloscopus trochiloides was published in a recent issue of the journal Nature."*

Irwin took measurements, DNA samples and measured their songs. In India the female recognise the males' songs, but in Siberia females in the two populations no longer respond to the other's mating calls. They are reproductively isolated. A gradual divergence in the choice of mates has led to an original single population diverging into two separate species, with differences occurring in wing colouration. The ancestral group, it is estimated, arrived in the Himalayas around 8 000 BC, from where they expanded into Siberia.

As I mentioned at the start of the introduction, there are various brands of creationism. I have attempted to broadly outline speaking the common ground shared between all creationist beliefs. Yet this book's focus is more specific as it is primarily concerned with a certain Hindu sect of creationism. The creationist tract "Forbidden Archeology," or as it is better known in its shorter form "The Hidden History of the Human Race," by Michael Cremo and Richard Thompson, falls into the latter category.

A good summary the basic Hindu belief that Cremo & Thompson subscribe to and how it interacts with and reinforces their view of humankind's past is given in an unrelated book by Diana Eck (1993 114-116):

> "*In the Hindu view, the soul's pilgrimage is a long one, and we are born time and again. Krishna tells Arjuna in the Bhagavad Gita, 'Death is certain for anyone born, and birth is certain for the dead; since the cycle is inevitable, you have no cause to grieve' (II.27). The incarnation and reincarnation of the atman, the spirit or breath, is presupposed in the Hindu view... The task of imparting illuminating wisdom to the dying and dead is undertaken, so they say, by Lord Shiva himself.*"

This quote emphasises nicely the cyclical nature of the Hindu concept of time and the notion of very long periods (kalpas) within each cycle. Hindu creationism applies this concept to the human fossil record.

Creationism is distinctly revealing because of the stark lack of scientific evidence and its general disdain for scientific procedures, through wanting the legitimacy of scientific findings without the responsibility of the scientific method. In applying this observation to Hindu creationism, it should be noted that Michael Cremo and Richard Thompson did not submit any of their original findings for publication to any peer-reviewed journal before publishing their book proposing a radical reinterpretation of the past. Cremo & Thompson by-passed the accepted method of advancing the general understanding of science, whereby theories are advanced and evaluated. This is something that should raise immediate suspicion in the minds of the general public. If the theory of natural selection were falsified tomorrow it would not be reasonable to conclude that Hindu creationism or, indeed, creationism in any form wins by default. The prevailing theory must be supported by weight of current scientific evidence: evolution could be disproved by a number of factors, but the theory which subsequently gains supremacy must take into account those new findings and be based on the scientific method. Nowhere in their books to date has Cremo & Thompson presented any falsifiable theory of Hindu creationism and explained how it can be tested using the scientific method. Indeed, nowhere as yet have they discussed and critiqued biological evolution taking into account the rest of the natural world and man's position as an animal within it.

At this point some readers may be saying that I am reading too much into the evidence laid before us and that my objections are speculative. So lets take a minute to review what Michael Cremo says about himself on his website:

> "*The soul that I am entered its present body at the moment I was conceived in the fall of 1947. I appeared from my mother's womb on July 15, 1948, in Schenectady, New York. That birth was probably one of millions I have experienced since I left my real home in the spiritual world. My mother tells me that when I was an infant, she would give me alphabet soup, and sometimes I would not eat it, but would just spell out words in the bowl. From that, I take it that I must have practiced writing in many previous existences. In this life, I recall always having wanted to be a writer…After carefully studying the Bhagavad-Gita, a gift of some Hare Krishna people at a Grateful Dead concert, I decided that I should absorb myself in the yoga of devotion to the mysterious Lord Krishna. Later I moved to Los Angeles to join the staff of the International Society for Krishna Consciousness, and to write for the Bhaktivedanta Book Trust (BBT). By 1980 I was regarded as an accomplished writer. To date, the books written and edited by myself and other BBT staff have sold more than ten million copies and have been translated into many languages. With Dr. Richard L. Thompson, a founding member of the Bhaktivedanta Institute, I began a series of books aimed at both scholarly and popular audiences. The first to be published was Forbidden Archeology: The Hidden History of the Human Race. This book shows that archaeologists and anthropologists, over the past one hundred and fifty years, have accumulated vast amounts of evidence showing that humans like ourselves have existed on this planet for tens of millions of years. We show how this evidence has been suppressed, ignored, and forgotten because it contradicts generally-held ideas about human evolution.*

In lecture presentations on Forbidden Archeology to scientific and lay audiences around the world I see a new consciousness emerging that integrates science and religion into a cohesive paradigm of reality."

Michael Cremo and Richard Thompson are prominent members of the "*Bhaktivedanta Institute, a branch of the International Society for Krishna Consciousness that studies the relationship between modern science and the world view expressed in the Vedic literature of India. From the Vedic literature, we derive the idea that the human race is of great antiquity. For the purpose of conducting systematic research into the existing scientific literature on human antiquity, we expressed the Vedic idea in the form of a theory that various humanlike and apelike beings have co-existed for long periods of time*" (Cremo & Thompson 1999: xix).

Of great significance in the introduction of Cremo & Thompson's "The Hidden History of the Human Race" is the admittance that their views are based on religion. It poses the question whether this book is a religious tract wrapped up in a pseudo-scientific covering. I will argue the answer is an unequivocal yes. Their statement shows a misapplication of the term "theory." Theories are derived in order to explain the existing data from observable and testable events. Cremo & Thompson take as the starting point a religious idea that humans have existed in anatomically modern form for hundreds of millions of years. From this is derived an attempt to fit the fossil record to their preconceived views, which runs counter to the scientific method. The result is the inevitable accusations of "Conspiracy!" and "Scientific cover-up!"

Of lesser interest, but of no less value, is ringing endorsement given to their book by one of the most prominent Christian creationists, Philip Johnson, on the back cover of "The Hidden History of the Human Race" (1999): "*A stunning description of some of the evidence that was once known to science, but which has disappeared from view due to the "knowledge filter" that protects the ruling paradigm*." Philip Johnson is a leading proponent of the Christian creationist Intelligent Design religious movement. Johnson has no biological-related background; he is a retired lawyer from the University of California. It is curious to see a Christian creationist praising the work of a Hindu creationist when their creeds are in dramatic opposition to each other. What strange bedfellows creationists make.

I hesitated for a long while before deciding to take the plunge to write this book. On the one hand it seemed reasonable to write a full-length reply to a particular creationist book, whilst on the other hand it may call Cremo & Thompson's work to the attention of people who might otherwise not have heard of it. Both paths of action have their considerable pros and cons. Furthermore, by writing this book I run the risk of giving further publicity to their work by taking it seriously enough to refute it in public. Would I have bothered to write a refutation of a Flat Earth book, and would the mere act of writing suggest to certain sections of the public that Cremo & Thompson's creationism starts on equal terms with modern day science?

What convinced me to take up this task was two-fold: firstly, Cremo & Thompson's books have been a phenomenal success in sales terms around the world. They have a simplistic yet expressive writing style, which is highly effective. Their Hindu creationist views are presented in such a way as to appear scientific when they are scientistic (scientistic works utilise scientific terminology in order to appear scientific). Secondly, when taking the above factors into account, it was clear that their book has reached many readers who possess neither the background knowledge nor training, nor have easy access to university facilities and the technical journals in order to do their own critique. Also, many more people simply do not have the time to conduct further research. The literature of human evolution is extremely vast and complex, and I felt it needed to be synthesised and brought to bear in evaluating Cremo & Thompson's work, within a framework accessible to all.

CHAPTER ONE:

EVOLUTION AND ITS PSEUDOSCIENCE HINDU CREATIONIST COUNTERPART

In the early 1990s a black woman in northeast South Africa was in the midst of a family tragedy, when her local community was stuck in destitution. She was without work and money, and she despaired for her son who was entering teenagehood. The schools in the area were poor and she wanted her son to have a better chance in life. She possessed great intuition and foresight, and slaved like a Trojan to scrap together enough money to send her son to Cape Town. Yet that was only the beginning of the story. The son arrived with hardly a rand to his name. He had to depend upon his skills to survive in the unfamiliar world he encountered. He refused to be bewildered and daunted by the task facing him, and quickly established himself.

He enrolled in a good, formerly white-dominated school (the early 1990s saw the end of legalised segregation was coming to an end). By doing so, not only had he overcome the destitution that the majority of the black South African population find themselves in, but he had also forced himself into the so-called "white man's" community. Although he initially struggled at school, he quickly found his niche and prospered. After he had completed high school, he enrolled at a top South African university. The son had overcome almost over disadvantage imaginable to achieve his goals. He and his brave mother had recognised the need for education if he was to make somebody of himself.

He flourished at university and quickly became a popular student member of his department. From a rural, poverty-stricken African background, he rose to become one of the most recognisable *student figures in the archaeology department of the University of Cape Town. He doesn't forget his mother and what he owes to her. He has continuously returned to his birthplace to help her both physically and financially in whatever way currently possible. His energy and unquenchable thirst for knowledge was and remains incredible. The last I heard of him was shortly before he left to participate on an Upper Palaeolithic excavation in southern France for the second time. I am honoured to have known Moses. His example and memory will stay with me forever; as I hope it will with you.*

Moses is not alone. His story has been repeated countless times throughout South Africa, and it was only the fall of fundamentalism which made it possible.

Before progressing further, I would like to take a minute to provide a quote from a creationist which contrasts sharply with the real-world determinism of Moses to learn more about the world around him and our collective past:

"The theory of evolution is the philosophical foundation of all secular thought today, from education to biology and from psychology through the social sciences. It is the platform from which socialism, communism, humanism, determinism, and one-worldism have been launched… Accepting man as animal, it advocates endorse animalistic behaviour such as free love, situational ethics, drugs, divorce, abortion, and a host of other ideas that contribute to man's present futility and despair… It has wrought havoc in the home, devastated morals, destroyed man's hope for a better world, and contributed to the political enslavement of a billion of more people" (LaHaye 1975: 5).

The concept of speciation was briefly covered in the Introduction, but it is worth pausing to examine its specifics in greater detail. The concept of the biological entity of "species" is fundamental to biology. If animals are unable to interbreed or if they will not, as per the example of the Siberian warblers, they are given separate species designations. Species are further divided into Mendelian populations, which are breeding populations (gene pool) from which males and females find their mate in the particular region where they reside. Isolation amongst breeding or Mendelian populations results in adaptive radiation and the emergence over time of new species. Different species are all related to one another, with varying depths of time since separation from a common ancestor. Homeobox genes play a central role in speciation.

Homeobox's role in evolution

Homeobox is a term for a collective group of genes which regulates the anatomical development of every animal. Variations in the frequency of these genes determines
which characteristics a particular animal will have. A foetus developed into a human instead of a fruit fly because the different homeobox genes were activated at different periods during development. It is a concept which many have trouble grasping, but the discovery of these genes and their workings is yet another demonstration of how we humans are an integral part of the animal kingdom.

The palaeontologist Jeffrey Schwartz (1999: 13, 372) summarises the current state of research with great clarify and insight when he states that:

> "*Life is less connected by a trail of transformation from one state to another than by a commonality of homeobox genes. Differences between organisms derive less from the addition of new regulatory genes than from the novel combination of existing homeobox genes. In short, genes do not evolve specifically for the creation of a particular organism, whether it be a human being or a worm. There are no such things as genes for a worm or genes for a human being. Rather, particular combinations of the genes that are already present in all organisms lead to the development of organisms that have specific morphologies...*
>
> "*[As a result of knowing] that a small molecular change can produce an effect as profound as having or not having an eye, we also know that such a micromutation can produce…macromutation leading to macroevolution. Since mutations in homeobox genes are inherited in the same way that earlier fruit-fly population geneticists understood the inheritance of the alleles for wing length or bristle number, we can appreciate that evolutionary significant novelty – which, in turn, could result in the emergence of a new species – can be passed on from parent to child as easily and simply as eye colour. Although there is a real and important distinction between the concepts of microevolution and macroevolution – the former involving natural*

selection and the refinement of adaptation, and the latter the origin of species – they can both be understood within a framework of micromutation. The major difference between the concepts of microevolution and macroevolution is the effect on the individual of the genes that mutated."

The human body

Hindu creationism follows the standard creationist tact, with the exception of Christian creationist Intelligent Design proponents like Michael Behe but including the Intelligent Design followers of Philip Johnson, of emphasising the perceived lack of transitional fossils. This form of creationism is well expressed by Cremo & Thompson, its most prominent proponents, who focus solely on hominin evolution in "Forbidden Archeology" and "The Hidden History of the Human Race."

By accenting the worn-out theme of "no transitional fossils" and by emphasising the concept of humans having existed on earth in anatomically modern form for hundreds of millions of years, Cremo & Thompson unwittingly introduce an indirect angle upon which to approach the question at hand. If their proposition was to hold true, then our bodies would:

- Show no signs of quadruped ancestry;
- Have little or no anatomical characteristics in common with chimpanzees; and
- Be perfectly designed for bipedalism.

These points are not addressed in "The Hidden History of Humankind" (1999). The human body is badly designed. When dissected, it resembles a rag-tag, make-shift assemblage of components. A brief summary of the major points is presented in Table 1 (page 22).

"*Bulging disks, fragile bones, fractured hips, torn ligaments, varicose veins, cataracts, hearing loss, hernias and haemorrhoids: the list of bodily malfunctions that plague us all as we age is long and all too familiar. Why do we fall apart just as we reach what should be the prime of our lives? ... In evolutionary terms, we harbour flaws because natural selection, the force that moulds our genetically controlled traits, does not aim for perfection or endless good health. If a body plan allows individuals to survive long enough to reproduce* *(and, in humans and various other organisms, to raise their young), then that plan will be selected… Had we been crafted for extended operation, we would have fewer flaws capable of making us miserable in our later days. Evolution does not work, however. Instead it cobbles together new features by tinkering with existing ones in a way that would have made Rube Goldberg proud. The upright posture of humans is a case in point. It was adapted from a body plan that had mammals walking on all fours… Our backbone has since adapted somewhat to the awkward change: the lower vertebrae have grown bigger to cope with the increased vertical pressure, and our spine has curved a bit to keep us from toppling over. Yet these fixes do not ward off an array of problems that arise from our bipedal stance*" (Olshansky et al. 2001).

UPPER BODY	MIDDLE BODY	**LOWER BODY**
Susceptible to ear damage through exposure to high-pitched sounds	Rib cage does not extend all the way around to fully encase our internal organs, leaving them exposed to potential damage	Loss of blood circulation in the legs, causing swelling and even blood clots.
One passage way splits in two, one to the stomach and the other to the lungs. Cannot breathe and swallow at the same time. Potential for food and drink to go down the wrong passageway causing choking and even death.	After the age of 30, bones begin to lose minerals and progressively become weaker. Old people are especially susceptible to osteoporosis.	Joints continuously rub against each other which, when a threshold is reached Causes numerous problems.
Weak eye retina attachment.	Slipped discs through wear and tear damage.	Enlarged prostrate in males, incontinence in women.

(Table 1 adapted from information in Olshansky et al. 2001: 44-47)

Nobody can fail to recognise the conditions, and yet many of us do not stop to think about their implications. We assume that they are part and parcel of normal everyday life and indeed in a sense they are. How many of us have admired dogs and cats for their exceptional eyesight and hearing? In my childhood my friends and I pondered, as children do, whether one day our eyesight and hearing would improve to their level. The realisation is that humans have anatomical defects. Anyone who has a relative who's experienced a slipped disc in their back, or had the unfortunate luck of experiencing it firsthand, knows all too well the frailties and limitations of our bodies. We are all aware of the benefits of swimming for our bodies and how relaxing the experience of floating in the garden or gym pool on a hot summer's day, yet how many of us have stopped to consider why this is so? Water effectively lifts us off our feet; our back and legs no longer have to bear our body weight. The proposition we have lived in this anatomically modern form with these defects over hundreds of millions of years pushes the boundaries of credulous, for that is what Cremo & Thompson's book boils down to.

Poor opposition to the scientific method

The following quotes are provided from "The Hidden History of the Human Race" (1999) in order for the readers to see first-hand what Cremo & Thompson (1999: 9-10) have to say in their synthesis of the state of research into human evolution, and in order that I am not accused of misrepresenting their arguments:

> "*Then there is the problem of cheating. This can occur on the level of systematic fraud, as in the Piltdown case… Unfortunately, there are always strong motives for deliberate or unconscious fraud, since fame and glory await the person who succeeds in finding a human ancestor. Cheating can also occur on the level of simply omitting to report observations that do not agree with one's desired conclusions… The drawbacks of paleoanthropological facts are not limited to excavations of objects. Similar drawbacks are also found in modern chemical or radiometric dating studies. For example, a carbon 14 date might seem to involve a straightforward procedure that reliably yields a number – the age of an object. But actual dating studies often turn out to involve complex considerations regarding the identity of*

samples, and their history and possible contamination. They may involve the rejection of some preliminary calculated dates and the acceptance of others on the basis of complex arguments that are seldom explicitly published. Here also the facts can be complex, incomplete, and largely inaccessible… Since the information conveyed by paleoanthropological reports tends to be incomplete, and since even the simplest paleoanthropological facts tend to involve complex, unresolvable issues, it is difficult to arrive at solid conclusions about reality in this field. What then can we say? We suggest that one important thing we can do is compare the quality of different reports. Although we do not have access to the real facts, we can directly study different reports and objectively compare them. A collection of reports dealing with certain discoveries can be evaluated on the basis of the thoroughness of the reported investigation and the logic and consistency of the arguments presented. One can consider whether or not various sceptical counterarguments to a given theory have been raised and answered. Since reported observations must always be taken on faith in some respect, one can also inquire into the qualifications of the observers. We propose that if two collections of reports appear to be equally reliable on the basis of these criteria, then they should be treated equally. Both sets might be accepted, both might be rejected, or both might be regarded as having an uncertain status. It would be wrong, however, to accept one set of reports while rejecting the other, and it would be especially wrong to accept one set as proof of a given theory while suppressing the other set, and thus rendering it inaccessible to future students. We apply this approach to two particular sets of reports. The first set consists of reports of anomalously old artifacts and human skeletal remains, most of which discovered in the late nineteenth and early twentieth centuries… The second set consists of reports of artifacts and skeletal remains that are accepted as evidence in support of current theories of human evolution. These reports range in date from the late nineteenth century to the 1980s… Due to the natural interconnections between different discoveries, some anomalous discoveries are also discussed… Our thesis is that in spite of the various advances in paleoanthropological science in the twentieth century there is an essential equivalence in quality between these two sets of reports. We therefore suggest that it is not appropriate to accept one set and reject the other. This has *serious implications for the modern theory of human evolution. If we reject the first set of reports (the anomalies) and, to be consistent, also reject the second set (evidence currently accepted), then the theory of human evolution is deprived of a good part of its observational foundation. But if we accept the first set of reports, then we must accept the existence of intelligent, toolmaking beings in geological periods as remote as the Miocene, or even the Eocene. If we accept the skeletal evidence presented in these reports, we must go further and accept the existence of anatomically modern human beings in these remote periods. This not only contradicts the modern theory of human evolution, but it also casts grave doubt on our whole picture of the evolution of mammalian life in the Cenozoic era*."

Piltdown Man has been covered extensively in the published literature (Chippindale 1990; Spencer 1990), and on the internet at the www.talkorigins.org website. In brief, it was unearthed by Charles Dawson in 1912, England. At that time, the expectation of British scientists was that the human brain was the first to develop, with the rest of the skull and body following. Piltdown delivered. However, not all European and American scientists accepted it as genuine. In 1953 Weiner, Oakley and Le Gros Clark published an article which discussed the results of fluoride tests and showed the skull was from a recent modern human. The rest of the remains were from an orangutan. Hardly a creationist article or book goes by without Piltdown being dragged up as an example of "scientific fraud and disfunctionality." However, during the entire time the debate raged over the authenticity of the skull, not a peep was heard from the creationists; they did not examine the skull. Piltdown is the perfect example of science in action. An artifact was found, examined, preliminary conclusions drawn, re-examined and re-examined again as new techniques became available to investigators, and it was eventually proved to be false. Evolutionary scientists alone examined, interpreted and disproved the skull. This same basic procedure continues to operate today in every sphere of evolutionary science.

Cremo & Thompson are incorrect to take the discovery of the Piltdown skull as a fake to paint the disciplines of palaeoanthropology and archaeology as fraudulent in fossil discoveries and in the interpretations given. As an archaeologist, I strongly object to this characterisation. Palaeoanthropologists like the Leakeys have a tendency to attach new species names to skeletal remains found, but they do so in accordance with the rules of science, nomenclature, and their evidence is subjected to immense scrutiny. The other accusation, that fraud is also being committed subconsciously, is incredible and without foundation.

Stone tool patterning

The artifacts referred to by Cremo & Thompson in the quote above are skeletal and stone tool remains. The former will be dealt with in detail in a following chapter. For now it is worthwhile outlining current theories regarding the stone tool usage amongst the early hominins. The term landscape is frequently used by archaeologists to categorise an activity, whether mental or physical, that is engaged in by hominins with their surrounding environment. Therefore landscape, as defined here, refers to the integration of natural and human settings, and the impact thereof. This definition in itself is very broad and it leaves open a large scope for varying degrees of application to and interpretation of the fossil and geological records. Hominin actions occur over both time and space, and therefore the end result examined by archaeologists (and also by other disciplines such as art historians and cultural geographers) is complex.

According to the laws of preservation, the further back in the past scientists investigate, the scantier the fossil, artifactual and habitation evidence they will have to deal with. The challenge faced is how to go about reconstructing the hominins' interrelationship with their environment. It is a debatable point whether early *Homo* possessed a capacity for symbolism at c. 1.5 million years ago (mya). Taken together, these factors impose strict limits on various research and interpretative tracks which can be applied to a given problem, thus leaving the door open for novel and innovative methods. Rather than searching for symbolic explanations of the placement of archaeological features in the landscape, archaeologists and palaeoanthropologists instead concentrate on functional, socio-economic probabilities through a combination of recorded studies of our nearest surviving relatives the chimpanzee, through typological analyses of the stone artifacts, through microscopic examinations of the damage exhibited on animal bone remains, and through the range, distribution and clustering density patterns of both the stone tools and animal bones.

The loose definition of landscape archaeology permits contrasting interpretations of the inter-relations between the artifactual remains and the land on which they were imposed. It is impossible to determine with a degree of certainty what kind of hierarchies existed within early *Homo* habitation and foraging groups, and how these different levels of society used and viewed their place in the landscape by comparison both with their group peers and other groups inhabiting the same landscape, i.e. the relations of production and the dynamics of interaction; and also what obvious or subtle differences, if any, existed between different *Homo* groups at opposite geographical spectrums of the Rift Valley and their interaction with varying environmental conditions and pressures.

The examination of early hominin land-use patterns is accomplished through varying research programs on the regional distribution of sites, how these sites are inter-related and their ecological contexts. The four models examined here begin from differing premises, yet they all have the same structural theme.

Schick (1987) endeavours to sample specific horizontal archaeological layers at "frozen" moments in time. These frozen moments consist of periods lasting for 100 000 years or longer. Isaac (1978) and Rose & Marshall (1996) produce general models to account for artifact distributions through space and time in the early hominin tool-production period. Peters & Blumenschine (1998) reconstruct paleoenvironments and use it as a basis for predicting the distribution and function of early hominin "sites."

These exercises have been collectively termed "landscape archaeology." The aim, with regard to hominin paleoenvironments, is to map the density distribution of artifacts and their compositional degree of spatial variability, and thereby explain their socio-economic function within an interpretative framework of the surrounding ecological context.

Three of the best known occurrences of artifact assemblages, in distinct horizon layers, are the FxJj 20 site complex of Koobi Fora, and the FLK Zinj and the FC West Floor of Olduvai Gorge. They were originally termed "living floors" by the Leakeys, which carried the implications of artifactual debris deposited on a ground surface within either one or more temporally fixed occupations areas (Isaac 1978). A modern analogue would be a hunter-gatherer camp where a particular social group of people would carry out their diverse day-to-day domestic activities of survival, for a limited period.

The model failed to explain adequately how the site formation processes of the "living floor" occurred. This was a challenge taken up subsequently by Isaac (1978) in the development of his "home base" hypothesis. The foundation of the home base hypothesis rests on the assumption that hominin social groups existed who foraged and hunted independently over the surrounding terrain. These groups would have come together at a particular focal point in the landscape for the purpose of various activities. It is this focal point that Isaac classifies as a "home base" (Isaac 1978).

Isaac focused on Koobi Fora and Olduvai Gorge. A locality at Koobi Fora, termed the hippopotamus/artifact site (HAS) dated to 1.6 mya, has yielded the faunal remains of hippopotami in association with stone tools. Isaac turned to a second site, the Kay Behrensmeyer site (KBS), at Koobi Fora to answer the questions posed about the hominin behavioural patterns in the HAS assemblage. KBS was situated in the same volcanic layer as HAS and thereby provided good stratigraphic analogies between assemblages of comparatively the same age. The nearest suitable material, both in the form of rocky outcrops and naturally occurring stones, for the manufacture of stone tools occurs three kilometres away. The hominins would have needed some form of carrying aid to transport the stone tool materials. In addition, Isaac believed it was unlikely that all the faunal remains were the results of killings that took place within a short time interval at these sites. This led him to tentatively conclude that both the meaty bones and the stone tools were transported to the chosen localities.

Isaac proposed that these behaviours could also account for the dense concentrations of broken-up bones and stone artifacts found by Mary Leakey at the Zinjanthropus site of Olduvai Bed I (1.8 mya). Other stone concentrations at Olduvai Gorge, Koobi Fora and sites like Omo have very few faunal remains. These could either have been stone tool manufacturing sites with other economic and social activities occurring which are not archaeologically visible. Isaac hypothesised that the hominins undertook foraging rounds, during which period they would split up and later regroup at a predetermined locality on the landscape. He took this hypothesis one step further by analogies with modern hunter-gatherer societies in proposing that during the foraging rounds the social group fissured further into males and females. The males hunted and the females collected plant foods. These foods would then be redistributed at the home base for consumption.

Isaac's home base model, therefore, draws on analogies between the Plio-Pleistocene sites and present-day hunter-gatherer camps. The archaeological material is a combination of primary refuse and materials that had been deposited there for intended future purposes. Criticism has been levelled at this hypothesis as the result of its ahistorical assumption that the land-use patterns and social organisation of modern hunter-gatherer communities remain largely unchanged from early hominin behavioural activities. Also the question of how and why these faunal remains and manuports were created in such dense concentrations is essentially unanswered.

Schick (1987), who approaches the question from a novel angle, took up this challenge. A tool site is where the dumping of stone tools is greater than their removal and this definition is subsequently utilised in building a model explaining the formation of archaeological deposits in concentrated space in any given stratigraphic horizon, the occurrence of vertically diffuse artifactual deposits, and the hominin behavioural patterns which resulted in contrasting spatially large and small concentrations of artifacts in the landscape.

The site of FxJj 50 (Koobi Fora), dated to 1.6 mya, contains 1405 flaked stone artifacts, 76 unshaped cobbles and cobble fragments, in association with 2100 faunal remains. The intensive studies carried out on this site have revealed that the manufacturing activities occurred elsewhere. This raises questions regarding hominid transport patterns.

General experimental replications, and the resultant predictive models, show that the cores present are in the late stage of reduction, and thus were imported from other localities.

The question arises about how and why these artifacts were taken out of the broader equation of the stone transport system. Although some portions can be regarded as “de facto” waste, this would only be applicable to debris with a maximum dimension of less than 2cm that resulted from the on-site flaking processes. It leaves the problem of the cores and core tools unaccounted for. Explanations such as deliberate disposal of tools are unsatisfactory. They are unable to account for the volume of incomplete and complete cores, and large, sharp flakes so visibly in abundance at a great number of sites. Plausible reasons include:

- The necessity to transport other materials, either gathered or processed (such as plant and animal foods, bedding and perhaps wood), as they moved on to their next locality in their hunting-foraging rounds;
- The sudden abandonment, of smaller sites, due to predator threat; and
- The next anticipated hunting-foraging locality having known stone resources which the hominins would have been able to easily exploit.

The localities that were rich in exploitable faunal resources were likely to have been the sites continuously visited periodically for planned hunting-foraging activities. The high rates of stone tool transport demanded by Schick’s model are proposed to have occurred due to the uncertainty over suitable raw material availability during the course of the hunting-foraging rounds. When moving onto a locality with known or anticipated high sources of raw materials (see point 3 above) it is hypothesised that the artifacts would have been required as surplus and left at the previous locality. Provided that these sites were visited regularly enough on the hunting-foraging rounds, stone deposition density would occur through a circular feedback mechanism.

Medium density sites would have arisen through more sporadic occupation by the hunter-foragers due to their less attractive surrounding environments. Hominins moving to other hunting-foraging localities within this environment would have had an incentive to carry away with them some of their stone tools, thus increasing the exportation rate and maintaining the artifact density at a moderate level (Schick 1987).

By contrast, low-density depositions are those most frequently recorded in surface surveys. These localities may represent places of infrequent habitation or simply areas where large stone resources were both imported and exported by their hominins inhabitants due to the general scarceness of new stone resources in that particular environment.

Some localities contain vertically diffuse deposits. This may have been caused by frequently visited sites that had rapid rates of sedimentary deposition in comparison with the rate of cultural deposition (Schick 1987). Factors like vertically mixed deposits also have to be taken into consideration. Rock source sites provide an interesting way to test this hypothesis, although most of them are to be found in erosional or non-depositional environments, as well as within stream gravels, which severely hinder preservation.

Schick's hypothesis accounts for several predictions concerning the formation of stone tool assemblages in differing circumstances: inter-site variability in assemblage size, raw material and technological diversity, and the frequency of visits by the early hominins to the localities.

Prime foraging areas are expected, in this model, to have attracted the making of the larger archaeological sites through frequent visitations by the early hominins and, by extension, are more likely to possess variably complex sets of technological systems (Schick 1987). These artifact systems would be comprised of imported artifacts and manuports, on-site manufactured artifacts, and artifacts that were exported from the locality. The frequency of the visits in favourable areas increases the possibility of there being deposited stone tools and unfinished stone tools made from distant source raw materials, sometimes as far as 10km away.

Smaller-scale assemblages would, according to the predictions made by

Schick's hypothesis, develop at sites less frequently visited, and where much debitage might occur with little conjoinable material. At these sites this would be a result of a higher export than import ratio, examples of them being FxJj 1, 10, 11 and 17 at Koobi Fora.

The diverse stone resources available in the vicinity of Olduvai Gorge resulted in the localities' stone transport patterns exhibiting more complexity by comparison to their Koobi Fora counterparts. The hominins of Olduvai Gorge lived in rich lake margin environments with diverse stone resources. At the Koobi Fora basin the stone tool materials came from cobbles found in and nearby the streams that drained from the east and from the volcanoes to the northeast. These streams decreased in gradient and, with it, the size range of available cobbles to such an extent that the early hominins utilising the localities of FxJj 1, 3 and 10 (which are part of the Lower Member within the channels of the delta distributary adjacent to the lake) would have had to travel an estimated 4km for appropriate raw materials to manufacture their stone tools.

Rose & Marshall (1996) present a revised version of Isaac's home base hypothesis, which they term the "resource-defence model." They take a novel approach in examining what the effects of early hominid meat-eating have on their relations with the Plio-Pleistocene carnivore compatriots. One of the central arguments against the home base hypothesis has been the stressing of the potential danger posed to the hominins by the carnivores attracted to the carcasses. Rose & Marshall believe the underlying assumption of this argument is the early hominins possessed a behaviourally limited capacity for hunting and that scavenging was an easy way out (Rose & Marshall 1996). An inference of the critiques of the "home base" hypothesis is these hominins were incapable of defending either their kill or the carcasses to which they first had access. In this way the scavenging and "home base" models have been seen as mutually exclusive behavioural strategies. Rose & Marshall produce a refined version of the "home base" hypothesis in which they envisage carnivore predation and the competition resulting instead in increased co-operative social behaviour.

Due to our incomplete knowledge of habit use by both Plio-Pleistocene carnivores and the hominins, it is difficult to assess their degree of interaction. However, it is unlikely that the hominins would have been exposed to higher risks of predation than some extant primates. Studies of primate behaviour in the face of predation danger are taken as the basis for their model. Living group primates have a wide range of alarm calls and co-operative defensive systems. Rose & Marshall theorise that the early hominins had a similar response mechanism, which developed a step further into intensive co-operation in confrontational behaviour with other animals for food resources.

Rose & Marshall avoid drawing a straight parallel between primate and early hominin behaviour, pointing out that meat comprises only a small portion of primate sustenance. As meat consumption increased with early *Homo*, so did the risk of increased carnivore competition. Under this threat, without the tree-climbing ability protection enjoyed by their predecessors and some of their contemporaries, Rose & Marshall hypothesise early *Homo* developed the primate trend towards co-operative defence to a greater degree in order to actively defend both themselves and their resources.

The view of hominins participating in passive scavenging holds that there would have been little meat and bones to take back to a particular locality for processing. However if early *Homo* were instead engaging in active, also termed "confrontational," scavenging, they possessed the ability to appropriate carcasses from carnivores. This implies significant amounts of meat could have been obtained for carcass transport, processing and group sharing at a chosen site. The competitive ability would have been sufficient not only in obtaining the carcass or carcasses, but further defending both their food resources and themselves at the focal localities in the landscape.

Furthermore, Rose & Marshall envisage a series of high quality patches which would have been rigorously defended. This selective pressure would have resulted in improvements in nutrition and survival rates. The social structures, in terms of mating, would also have undergone alteration. This is a major revision to Isaac's model of seeing the origins of modern hunter-gatherer social divisions in the Plio-Pleistocene.

Fruit trees are spatially fixed resource patches for primates. Rose & Marshall hypothesises that this concept can be extended to early *Homo* by regarding hunted and scavenged carcasses as movable high quality resource patches requiring defence from both carnivores and other hominid groups. This way of life would also have had to take into account stone tool raw material availability, water, trees for shade and potential sleeping places. Rose & Marshall propose that effective mechanisms would have been in place for the transportation of food and other objects to the safe-havens, where they would be either consumed or worked upon.

The basic principle on which Peters & Blumenschine's (1998) predictive model, for the lowermost Bed II Olduvai Basin, is built revolves around the variability early Homo would have faced. These different chances would be reflected in the faunal and stone tool assemblages scattered across the landscape.

With the possibility of artifact assemblages created by wood cutting and nut pounding being negligible (although visible at Large Spring on the Eastern Lacustrine Plain), most of the stone tools are predicted to be remnants of early hominid scavenging of larger mammal carcasses, and early hominid hunting of larger mammals. The composition of these assemblages are said to be the result of facet-specific constraints: competition with carnivores as well as other hominins for larger mammal carcasses; and the degree of carnivore predation risk involved in scavenging. These constraints are, in turn, ultimately determined by the geographically ecological variability of cover abundance.

Furthermore, factors of refuge and transport of carcass parts have to be considered. The prediction made is that the transport of stone and the carcass bones would have been minimised by the hominins endeavouring to seek the nearest natural or artificial source of stone raw materials or stone tools, and the transport of some of the tools and the carcass to the nearest facet which would offer relative safety. This is something which Peters & Blumenschine have termed the "least-effort principle."

The minimising of distance ensured that lost and discarded stones and stone tool could have been reused, but only to the degree that its locality was predictable. The clusters of stone tools that can be reused for butchery and predator defence are not found generally in unwooded localities, but are common in closed areas with a fresh supply of water nearby. It is unclear in the Peters & Blumenschine model whether stone carrying devices were used which would have permitted greater mobility. Moreover it cannot be determined with a degree of certainty whether the visual assemblages are due to the settings having been appropriate safe-havens or whether food was being carried back to various dependents.

For the early hominins transport of artifacts and raw materials for artifact manufacture was an integral part of a well-developed behavioural pattern. Isaac's model was very influential in its time, being a novel attempt to explain the site formation processes of contextually related artifact and bone assemblages. However, Isaac's primary weakness was a crucial argument employed within his hypothesis: uncritically using modern hunter-gatherer ethnography as analogy for hominin behaviour 2 mya. Allied with this oversight hindrance is that while Isaac's home base hypothesis strives to explain the occurrences of the assemblages, it fails to address the question of the interconnectedness of these assemblages in the landscape; i.e. whether their distribution is random or whether there is a detectable patterned use of the landscape by the early hominins in a given archaeological stratigraphic horizon.

The main difference between Isaac's and Rose & Marshall's versions of the home base hypothesis, and the cause for Rose & Marshall renaming their version the resource-defence model, lies in the greater body of knowledge currently available on meat consumption and processing patterns of modern carnivores in East Africa from primate perspectives. Rose & Marshall have put forward hypothetical answers to the questions posed over Isaac's home base model of why and how it happened. They also provide the social perspective glaringly lacking in Schick's model. Their model essentially irons out the problems highlighted above with Isaac's model, but in doing so the authors produced another critical problem of their own: it is not time-restricted. What is presented is a general model based mainly on analogies with primate behaviour and sociality. They fail to test their hypothesis on any early hominid time-period environment and the assemblages accrued. Admittedly this could be due to the lack of good excavated horizons yielding the paleo-environment detail necessary, but it does not explain why at least no qualified attempt was made mention of.

Schick contrasts different landscape features and the flow of stone raw materials and artifacts through them, but fails to demonstrate whether there is a relationship between the different assemblages in a particular environment or not. She also does not take into account why an assemblage was sited where it was within the different landscape; i.e. within a wooded environment would the site be in the shade and protection of the trees or would it be where the cover was less dense and more likely closer to good killing and scavenging sites.

Peters & Blumenschine's predictive model is designed to provide an ecological interpretative framework for future landscape archaeological work at Olduvai Gorge. It examines the differential transport of carcass parts and stone from open, dangerous areas to relatively safe localities. Up to this point their model is in general agreement with the three models outlined above. However, their model differs in that it posits a central locality would only have been useful for hominins where small patches of trees or other covering providing reasonable protection occurred in the landscape. If there was extensive cover available, this would have had the effect of dispersing the hominins and the traces of their activities would thus have been dissipated, resulting in a loose land-usage pattering being archaeologically visible through route foraging. Peters & Blumenschine's predictive model attempts to reconstruct the differing paleo-environments and which animals would have inhabited them. Based on these results, they go on to make predictions about which animal skeletal parts will be most commonly found at hominin sites and which animals would be represented, in conjunction with predictions made about the variability and placement of these sites in the landscape. These predictions are based on their hypothesised model of hominin behaviour, that the early hominins were primarily non-confrontational scavengers.

The differing hypotheses of Peters & Blumenschine and Marshall are essentially irreconcilable because they start from different premises: non-confrontational vs. confrontational scavenging and the resulting patterns of hominin behaviour that arise from these competing behavioural and land-use strategies. Schick's model can potentially combine well with Rose & Marshall's by not only subjecting Rose & Marshall's model to a specific time-period test, but by explaining the movement of raw materials utilised by the hominins between the various resource-defence bases. Schick can not be reconciled with Peters & Blumenschine for the simple reason that Peters & Blumenschine view the assemblage occurrences as randomly chosen, utilised and then discarded; in other words, Peters & Blumenschine's model predicts that early Homo had no concept of central territoriality.

Projecting the concept of landscape archaeology back into the distant past is therefore problematic in some respects: a whole model can be based on a premise as equally valid as a competing premise. The task is made even more frustrating by the last of written records to tell us in greater detail about the movement of these early hominins across the landscape: could all the early *Homo* groups have been behaving in the same manner 1.8 million years ago? Did they practice seasonal exploitation and, if so, to what extent and how exactly did this affect their movements across the landscape? What kind of hierarchical system did these early hominins have? What kind of territoriality did they practice?

Material data and interpretation

Material appears as blank objects. All of us at some point in our lives have walked across an open plain or on a mountain slope, bent down to pick a fascinating-shaped object and wondered what its significance is in the greater scheme of things. It may have been as insignificant as a pine-cone with its nuts being food for squirrels or a stone which looks like it has had flakes knocked off. Questions need to be asked like did the stone fall off a cliff face with naturally fractures occurring, does it have a bulb of percussion indicating man-inflicted pressure to produce flakes and are there other modified stones in the vicinity?

A general rule of thumb is if three stone tools are found in close vicinity, the area is designated a site. One or two stone tools may have been dropped by accident, but the chance of three or more tools being left accidentally is rare. The site could be a place where a group of hunter-gatherers stopped to enjoy a quick meal, a settlement or a butchery site.

In 1996 I participated in the 13th (and last) session of the Tel Miqne-Ekron excavation in Israel. The dig was headed by Professor Sy Gitin (WF Albright Institute, Jerusalem) and Associate-Professor Trude Dothan (Hebrew University, Jerusalem). The head of Field IV, where I worked, was Steve Ortiz. I asked Steve and Dr Garth Gilmour (a South African archaeologist who was working on a different Field) how Tel Miqne was originally discovered. The process started with an examination of the ancient Biblical texts and through examining the typology of the area. Pottery had been found on the ground surface and test trenches were dug which convinced Professor Gitin and Professor Dothan that it was worthwhile conducting further excavations to determine whether this site was Tel Miqne or another undiscovered settlement. This is one way in which sites are located. When searching for older sites you do not have textual evidence to guide you, and for these time periods you learn to locate sites through combined experience of geological settings and old-fashioned walking for kilometres scanning the ground for artifacts and/or skeletal remains.

All that sounds quite straightforward. But stop and think for a minute. How do excavators distinguish between different categories of site activities? How do these sites compare with each other chronologically and culturally? And, most importantly, how do excavators set about planning the excavation to maximise the return of information to analyse?

Human actions, both past and present, are meaningfully constituted, i.e. they promote messages to different people in different ways across space and time. One of the most fundamental questions facing the palaeoanthropological and archaeological disciplines is how closely do the different paradigms correspond to the reality of the site when it was first formed. Modern theoretical frameworks of incorporating and explaining data, as well as the dating techniques that help to further organise and integrate the various sequences, are examined below.

Structuralism

This method of data interpretation was very popular in the 1960s. In some cases it is, such as by Professor Thomas Huffman at Great Zimbabwe, still in use today. It is an organising scheme with specific social and economic contexts utilising binary oppositions. The oppositions are, in the main, left/right, male/female, life/death. These symbolic principles aid in analyses of symmetry and they are also generalities providing insights into the ways beliefs and concepts are integrated into social and ecological strategies used in everyday life. However, this theoretical framework raises a barrier between materialism and idealism: it ignores the fluidity of societal structure that changes over time and varies according to context. To this end, structuralism is not held in the same regard as it once was.

Processualism

Processional archaeology attempts to separate the systems of a society and their behavioural implications, and to integrate them with the surrounding ecology. As Ian Hodder states (1995: 26-27):

> "*The initial need to define subsystems in analytical research has provided a framework for the specialisation of methods, theories and generalisations relevant to each sub-system. There are those who work on settlement studies or spatial analysis, while others write books or conduct cross-cultural research on burial, exchange, subsistence economies, arts and so on. Despite attempts to break down these barriers, each subsystem realm is developing its own vocabulary which is fast becoming incomprehensible to specialists in other fields. Much of the literature, teaching and research in archaeology is divided along these lines. There is a need for integration, which would be the logical result for a symbolic and 'contextual' archaeology*."

This is where post-processualism makes its mark.

Post-processualism

The move from processual to post-processual archaeology began in the early 1980s as archaeology opened itself to broader social theories from the historical and philosophical disciplines, which had adopted and critiqued those years earlier.

The aim of this theoretical framework is:

> *"...to break down six oppositions which had been set up by processual archaeology. The first was the opposition between norm and adaptation or situational expediency. Rather than seeing culture as normative, static and invariant, hindering adaptation, post-processual approaches see culture as being the medium through which adaptation occurs and as being transformed in the process. Culture, norm and meaning are processes, not things, integral to all practical action. The second processual dichotomy which needed to be broken down was between materialism and idealism. While post-processual archaeologists do not reject the importance of material constraints on societies and may even emphasise them, they accept the need to incorporate meaning, values, symbolism. They seek the dialectical processes which link the ideal and the material. Third, post-processual archaeologists reject the separation of system and structure. Through the influences of Marxism and structuralism, they search for structures behind systems which incorporate conflict, tension and contradiction. Fourth, many post-processualist archaeologists reject any absolute dichotomy between societies and individuals. While they do not expect that archaeologists can see individuals or that the intentions of individuals shaped the course of history, they often seek the relationships between agency and structure. They are concerned with material culture as active, being used meaningfully to further social interests. Fifth, post-processual archaeologists reject the separation of the general and the particular, anthropology versus history. While many would emphasise the specificity into the contemporary world through generalisation. Finally, post-processual archaeologists debate the relationship between subject and object rather than seeing any possibility of a radical separation of the two"* (Hodder 1995: 84-85).

Relative dating

This is one of the most utilised methods for placing objects and stratigraphy in their respective, relative geologic timeframes, whereby one object is said to be older than another without knowing the exact dates. Imagine the mess on your desk. The papers at the bottom are generally older than those at the top. In other words, the papers are ordered according to relative dates in a stratigraphic sequence. This is, in effect, stratigraphic superimposition.

However, this neat scenario requires near perfect geological conditions. Crustal displacements, landslides and other geomorphic events can reverse sequences, placing older layers on top of the younger. This is a frequent occurrence at the East African sites. Correlations can be made between layers with the same type of fossil and geological composition.

Two prominent radiometric (absolute) dating techniques for early hominins

Radiopotassium (Potassium/Argon)

Roughly 0.01% of all the natural potassium (K) is radiopotassium, or 40K. 40K decays into 40Ar (argon-40). With the decay ratio having been calculated, this dating method has been applied with enormous success to volcanic rock. In human evolutionary terms, it has its greatest application in East Africa, which saw a great deal of volcanic activity in its geological past.

The 40K/40Ar method is less common today with the development of a more sophisticated method, 40Ar/39Ar. Deino et al. (1998) deal with this in greater detail.

Electron Spin Resonance

This is a luminescence method of dating: naturally occurring uranium, thorium and radiopotassium causes electrons to accumulate in defects within crystalline substances; when the rocks are heated; the electrons escape, causing a glowing effect. There is an amusing story of a scientist from around two centuries ago going to bed with a diamond (no one has ever explained why he felt the urge to), which began to glow as his body heat caused electrons to escape.

The intermediaries

Aegyptopithecus, from the Oligocene era, resembles monkeys in its post-cranial anatomy, but the dental plan is ape-like and hominin-like. It is a likely candidate for the ancestral condition from which the modern anthropoid apes (which includes the hominins) evolved. The anatomical evidence demonstrates that the australopiths and chimpanzees share a common ancestor, and that *Homo sapiens* are descendants of the australopiths. Nowhere in "The Hidden History of the Human Race" are these anatomical characteristics discussed in detail.

- The anatomical characteristics which link the African apes to the australopiths include:
- The canines of the australopiths differ from the African apes in not projecting much further in relation to the other teeth;
- Australopith canines also show a decrease in sexual dimorphic size over time, from the ape condition;
- The australopith molar root pattern is intermediatary between chimpanzees and Homo;
- The third premolar in *Australopithecus afarensis* is intermediary in size;
- Tooth enamel progresses from an ape-like thinness in the earliest hominin known, *Ardipithecus ramidus*, to a more *Homo*-like thickness in the preceding australopithecines;
- The australopith thorax widens towards the bottom, as in the apes;
- The australopith upper limbs are quite robust because arboreal activity may have played some part in their daily lives, although not to the same extent as the apes. The australopiths would have spent a great part of their time walking bipedal on the ground. In this, they are perfect intermediaries;
- The australopith and ape elbow structures do not differ in any substantial form;
- Australopiths and apes probably shared a divergent big toe, although there is debate on this matter and it is not yet settled;

- The cranial capacity of the australopith increases from the ape cranial capacity range to that approaching *Homo*;
- Baby apes and baby *Homo* bear very close similarities, which strongly indicate that the australopiths did the same;
- Ape-like sexual dimorphism is evident in the australopiths; and
- The australopith forearm:upper arm length ratio is greater than in *Homo* and resembles the chimpanzee condition.

The anatomical characteristics which link the australopiths to *Homo*, include:

- The canines of the australopiths do not project much further in relation to the other teeth than they do in *Homo*;
- Australopith canines also show a decrease in sexual dimorphic size over time, in the direction of the *Homo* condition;
- Tooth enamel progresses to a more *Homo*-like thickness over time;
- Wear patterns on australopith teeth suggest a "crushing" motion, similar to that of *Homo*;
- The cranial capacity of the australopiths increases to a capacity range approaching that of *Homo*;
- The foramen magnum was intermediary between the apes and *Homo*, except for the robust australopiths (also known as *Paranthropus*) where it was just as in *Homo*; and
- The shared tibiae conditions of australopiths and *Homo* reflect the demands placed on the bodies by bipedalism.

Goodman (1999) has reviewed the amount of difference between human and chimpanzee genomes, with typical non-coding DNA giving >98.3% in common and the active coding sequences of functional nuclear genes, c. 99.5%. Both genetic and anatomical evidence give a timeframe of 5-8 million years for the divergence of chimpanzees and humans from a shared common ancestor.

The anatomical similarities between chimpanzees and anatomically modern humans (*Homo sapiens*) can be summarised as follows:

- The foramen magnum is more centrally orientated at the skull base in modern humans than in apes, with it being in a strikingly similar positions in babies of both species;

- A shared transversely broad thoracic cage, a vertebral column inside the rib cage, a dorsally-placed scapula and laterally-facing shoulder joints;
- *Homo sapiens* posses a mobile shoulder joint – a hangover from our arboreal ancestry;
- The positioning and angle of the humeral shaft and humeral head is the same;
- There are few differences between the elbow structures; and
- The wrist structures are strikingly similar between *Homo sapiens* and other hominoids.

Wood & Richmond (2000: 23) state it clearly when they say that:

"...the presumption is that the common ancestor and the members of the Pan lineage would have had a locomotor system that is adapted for orthograde arboreality and climbing, and probably knuckle-walking... [These features] would have been combined with projecting faces accommodating elongated jaws bearing relatively small chewing teeth, and large, sexually-dimorphic, canine teeth with a honing system. Early hominins, on the other hand, would have been distinguished by at least some skeletal and other adaptations for a locomotor strategy and other adaptations for a locomotor strategy that includes substantial bouts of bipedalism, linked with a masticatory apparatus that combines relatively larger chewing teeth, and more modest-sized canines that do not project as far above the occlusal plane."

Yet the question remains of how these differences and similarities arose to begin with, and what impact did they have generally on human evolution. Schwartz (1999: 378) explains:

"The similarities that humans share, to varying degrees, with extinct hominid species reflects merely the recency or antiquity of past common ancestors. For instance, the presence in all hominins, including the earliest species, of various, almost fully modern, skeletal features that are associated with bipedalism – such as the curve of the lower spine and knee joints that angle in under the body – would reflect the regulatory changes that had occurred in the ancestor of the entire group… Armed with this expectation, we are faced with the specimen from the South African site Sterkfontein, which Ronald Clarke and Philip Tobias nicknamed Little Foot. Surprisingly, this hominid

had a divergent big toe. And when Clarke and Tobias compared these foot bones with the foot bones attributed to Homo habilis, they found that this supposed biped had also had a divergent big toe. I predict that we will never find a hominid with a halfway divergent big toe. And the reason lies in the way in which feet, and hands, for that matter, develop. The human hand and foot emerge as paddle-shaped ends on the limbs. Within these paddles, cartilage cells concentrate in specific locations to form the precursors of the bones of the hands and feet as they will be in the adult. Later, cell death in the regions between the developing fingers and toes frees them up and they become separate digits. The same developmental picture characterizes all tetrapods that have been studied. The divergent big toe of most primates and the more aligned big toe of Homo sapiens develop in the same positions they have in the adult foot. The Australian physical anthropologist Arthur Abbie was very much mistaken when he surmised that the differences between a divergent big toe and one that is aligned with the other toes was due to differential degrees of clefting between the digits. Because of what we know about development, we should not expect to find a series of intermediate fossil forms with decreasingly divergent big toes and, at the same time, a decreasing number of apelike features and an increasing number of modern human features. If Little Foot and Homo habilis had some features possessed by apes and others possessed by humans, this means that they retained the apelike features from a much earlier ancestor than the one from which those fossil forms retained the features also seen (and retained) in Homo sapiens. After hominins and apes diverged from their common ancestor, some hominins were affected by regulatory changes that influenced the architecture of their feet. The discovery of modern humanlike elbow and knee joints among the 4-million-year-old fossils from the Kenyan sites of Allia Bay and Kanapoi suggests that the same genes that produce these characteristic morphologies in Homo sapiens were also then available, and that they were expressed and they interacted in a similar way. If this similarity indicates a close evolutionary relationship between these ancient fossils and other hominins who had these features, then the underlying regulatory event would have occurred in an ancestor that these fossils and H. sapiens shared."

This correlates well with both the phyletic gradualist and punctuated equilibrium interpretations of the fossil record which are, despite protests to the contrary, two sides of the same coin. The measured rate of morphological change today is estimated to be between 10-100 times faster than that observed in the fossil record (Miller 1999: 91). Punctuated equilibrium does not posit that new species appeared in an instant, rather that new species will evolve over tens of thousands of years which appear as a geological instant in time. In other words, punctuated equilibrium is an artifact of geological layering. The difference between phyletic gradualism and punctuated equilibrium is the timescale chosen over which to represent the data in an investigation, which is why the latest studies have failed to distinguish between phyletic gradualism and punctuated equilibrium (McKee 2000, 2001; Miller 1999).

Creationists always ask "where is the missing link?" As shown above, the African apes, australopiths and *Homo* are all related and share a common ancestor. In this discussion, the question is most relevant in a slightly different sphere. Cremo & Thompson regard the australopiths as walking apes and curiously relegate African *Homo erectus* (or *Homo ergaster*) to a side branch also. It is appropriate to end off the chapter with this quote from Walker & Shipman (1996: 237) regarding the Turkana Boy (dated to 1.6 million years ago):

> *"He was in many ways an animal in a human body. Over and over again, when we examined his remains we found humanlike attributes: an anatomy of legs, pelvis, and torso that was nearly modern in its adaptations to upright posture and gait; a vestibular apparatus similarly adapted to balancing on two legs; the human proportions of the body; and the unexpectedly large size and massive strength of that body. Even the boy's growth patterns were hauntingly human, from the sequence of eruption of his teeth, to the fusion of his bones, to the way his face would grow to assume adult dimensions. Our analyses even revealed that Homo erectus experienced the typically human prolongation of childhood, a pattern that must be closely tied to an extended period of intensive learning. Physiologically, the boy showed human adaptations too. He had a thoroughly human mode of adapting to his tropical climate in terms of body build and heat dissipation. He, unlike so many tropical animals and like humans, remained active during the heat of the day. Even more remarkably, our studies of his pelvis and brain size demonstrated that the missing link had already mastered the human evolutionary trick of bearing big-brained babies and growing their brains to impressive size. It was astonishing that these seemingly complex adaptations, attributes that seem so*

sophisticated and uniquely human, were well in place by 1.5 million years ago. Of course, there were signs of human behaviour...The diseased skeleton, 1808, gave heartrending evidence of the development of strong social ties."

CHAPTER TWO:

THE EMERGENCE OF THE FIRST HOMININS

I arrived at Ben Gurion, the airport of Israel's capital Tel Aviv, on 30 June 1996. This completed a journey that had taken me from the southernmost tip of Africa into the heart of the Near East. Dr Garth Gilmour, a South African Biblical archaeologist then employed at the Jewish Studies Centre at the University of Cape Town, was kind enough to take me through to the camp. It was a typical Israel mid-summer's day, with not a cloud in sight and the temperature in the early thirty degree centigrade. We travelled along the roads in a 45-minute drive whilst he filled me in on the progress made on the excavation. I was assigned to work on Field IV, at the Biblical Canaanite city of Tel Miqne-Ekron. The next day the supervisor of the square I was excavating in spotted something glinting half hidden in the soil. We stepped down into the square, to the spot where the previous night I had finished sweeping the floor clear of dust and where she had taken a final look as we had packed up. There, covered by dust, which probably explained why we had missed it in the fading dusk light, was the tip of an ivory fragment. As it was slowly uncovered, we saw it part of the body of a beautiful ivory statuette. As luck would have it, not only was it the find of the season until that point, it was also the day before my birthday. Two days later, the famous Ekron stone slab inscription was found two squares away by a friend, having originally had its non-inscribed side uncovered the day before. The context of the finds? Field IV was a palace temple and courtyard, which is dated to c. 600 BC by its Assyrian pottery.

Context is the most important principle in archaeological and palaeoanthropological research. Excavators out in the field have to determine the exact provenance of a find, whether it was found in situ or whether it was derived from another stratigraphic layer. Findings are subjected to further scrutiny in the laboratory, like radiometric dating and isotopic examination, to name but two techniques. These guiding principles have been the mainstay of archaeological investigations since the late 19th century, although it is really only in the last fifty years that the benefits have been realised, due to improved stratigraphic controls imposed and stricter methods of analysis. Bear this in mind as we explore the early palaeoanthropological record and the controversies, both valid and pseudoscientific, surrounding competing theories.

The late 19th century was a time of great excitement as the discipline of archaeology began to take shape. Disciplines in their infancy are bound to make mistakes, which are subsequently investigated and corrected, and the documentary record from that time period reveals the same trend. Inadequate excavation controls and deliberate hoaxes resulted in fantastic claims. Cremo & Thompson cite old and discredited reports in an effort to drag the name of archaeology through the mud, in the interests of "exposing" the "evolutionist propaganda machine". Apart from failing to take into account these factors, the authors of "The Hidden History of the Human Race" also fail to analyse the social anthropological environment of the time and this blinds them to the inherent defects in the literature. It is noticeable that they attempt to strongly critique archaeological and palaeoanthropological findings from the last fifty years to close scrutiny, but do not extend the same standard to earlier periods. The contextual relationship of the findings, and particularly its social terms, from the late 19th century is discarded. A few examples are given below with references where the reader can examine the evidence in greater detail. Cremo & Thompson's arguments on the pre-late Miocene periods are so poor I feel it is pointless to waste space refuting them further in micro-detail, for I would like to focus on other more important matters to hand.

There are some interesting problems with the copper coin from Illinois and the figurine from Nampa, Idaho. The former is stated by Cremo & Thompson (1999: 109) to be between 200 000 - 400 000 years old and the latter 2 mya. Water wells at the time were drilled using a cable tool. The cable tool worked by pounding away at the bottom of the hole reducing the rock or soil to a mess of pulverized rock or mud. After a while, the repeated pounding would have caused the bottom of the hole to be completely clogged with rock chips. The bit would then be raised and a bailer used to clean the mud or rock chips produced by the drilling out of the hole. Afterwards, the bit would be lowered back down and the process continued. However, whether the drilling was undertaken with a cable tool or a rotary rig, the problem is the same in that the rock at the bottom of it was pounded into fine dust or rock chips. The result of this process, is that had the metal coin come from the bottom of the hole, as assumed by the people who discovered it, it would be pounded during the drilling operation into a mangled piece of metal. Had the figurine come from the bottom of the hole, it would have been pounded into dust. Both the coin and figurine had to have fallen into the bailer from somewhere above including the surface or surface soil. If the holes had been cased, as such wells in loose soils usually are, they could have fallen in only from the surface. Thus, at best, the location in the well from which these objects came from is unknown and, at worst, they were either dropped in the hole or fell from loose soil surrounding the ledge of the well.

Perhaps the most prominent claim, in the public's eyes, was made over artifacts found in Table Mountain, California, which included spear points and pestles. As Paul Heinrich (1996a) notes, contradictory evidence, which eliminates Cremo & Thompson's contention, is largely ignored. Heinrich's conclusion is particularly revealing:

> *"Contrary to the claims of the Mysterious Origins of Man [the television program which included an overview of the arguments presented in "The Hidden History of the Human Race"], the evidence for the presence of artifacts within the Tertiary gravel is highly suspect and unreliable. For example, the characteristics of the artifacts and later testimony by Mr. Neale contradict his claims that the artifacts were found in place. Furthermore, given the lack of any notes or drawings documenting his claims, his affidavit is useless as evidence for the presence of artifacts within the Tertiary gravels beneath Table Mountain in Tuolumne County, California."*

Another example is the grooved sphere remains from South Africa, which Cremo & Thompson (1999: 122) contend were found in situ, could not have been produced by nature and conclude that "*the evidence is somewhat mysterious, leaving open the possibility that the South African grooved sphere – found in a mineral deposit 2.8 billion years old – was made by an intelligent being.*" The arguments are spurious as the spheres are natural (Heinrich 1996b).

Cremo & Thompson's statements surrounding the so-called Utah "shoe print" demonstrate better than most other examples the inherent faults of their investigative approach. Despite competent geologists having investigated the Meister print and found it to be natural in formation, Thompson, a mathematician with no geological training, either formal or informal with field work exposure, whatsoever, examined the print and concluded that trained scientists are incorrect:

> "*The Meister print, as evidence for a human presence in the distant past, is ambiguous. Some scientists have dismissed the print after only a cursory examination. Others have rejected it sight unseen, simply because its Cambrian age puts it outside the realm of what might be expected according to evolutionary theory. We suggest, however, that the resources of empirical investigation [it is amazing how all creationists, without fail, use that phrase without adhering to the scientific method] have not yet been exhausted and that the Meister print is worthy of further research*" (Cremo & Thompson 1999: 120).

Also see Heinrich (1996c) and the references therein for a review of Cremo & Thompson's arguments concerning the Calaveras skull. Now to turn to the true crux of the matter, the excavated Pliocene and post-Pliocene remains.

The original usage of the term "Hominidae" encompassed those fossils regarded as being more closely aligned to *Homo sapiens* than to our nearest relative the chimpanzee, with whom we have 98.3% of our genes in common (Goodman 1999). In the last few years genetic evidence, combined with new anatomical studies, has put forward a compelling case for revision in order for the morphological similarities to be classified in a clearer manner. Tables 2 and 3 outline the contrasting positions in further detail. This study follows the latter convention and therefore the term "hominin" is used throughout in place of the more commonly known "hominid."

Table 2

Superfamily Hominoidae ("hominoids")			
	Family Hylobatidae		Genus Hylobates
	Family Pongidae ("pongids")		Genus Pongo
			Genus Gorilla
			Genus Pan
	Family Hominidae ("hominids")		
		Subfamily *Australopithecinae* ("australopithecines")	Genus Ardipithecus
			Genus Australopithecus
		Subfamily Homininae ("hominines")	Genus Homo

Table 3

Superfamily Hominoidae ("hominoids")					
	Family Hylobatidae				Genus Hylobates
	Family Hominidae				
		Subfamily Ponginae			Genus Pongo ("pongines")
		Subfamily Gorillinae			Genus Gorilla ("gorillines")
		Subfamily Homininae ("hominines")			
			Tribe Panini		Genus Pan ("panins")
			Tribe Hominini ("hominins")		
				Subtribe *Australopithecina* ("australopiths")	Genus Ardipithecus
					Genus Australopithecus
				Subtribe Hominina ("hominans")	Genus Homo

The origins of the Hominidae are to be found in the pre-Pliocene epoch termed the Miocene (23-5 million years ago). Hominidae ancestral groupings such as *Kenyapithecus*, *Ramapithecus*, *Ouranopithecus*, *Dryopithecus*, *Sivapithecus* and *Gigantopithecus* are well described in the current literature (Klein 1999, Strahler 1999) and are not elaborated upon here. The identification of the Lothagam mandible, which dates to 5.5 million years, cannot be ascertained with certainty due to its isolationist position in time, although Kramer (1986) believes it shares certain key characteristics in common with *Australopithecus afarensis* and the earliest dates for *Ardipithecus ramidus*, see below, now encompass this timeframe.

At present twelve hominins are known from the Pliocene era: *Ardipithecus ramidus*, *Australopithecus anamensis*, *Australopithecus afarensis*, *Kenyanthropus platyops*, *Australopithecus bahrelghazali*, *Australopithecus africanus*, *Australopithecus garhi*, *Australopithecus aethiopicus*, *Australopithecus robustus*, *Australopithecus*, and the contentious *Homo rudolfensis* and *Homo habilis*. A possible thirteenth, *Orrorin tugenensis*, is highly controversial. Lengthy details of how the australopiths and hominans were first excavated, described and recognised are not provided here; for this readers are advised to consult Richard Klein (1999), and Pat Shipman and Eric Trinkaus (1993).

Snakes alive, it walks!

The period of 5-8 million years ago, when intense radiation preceding the first hominin group occurred, saw the earth's climate cool. The great tropical forests, which had cut a great swath across central Africa, shrunk to their present day dimensions. Near the great African Rift in East Africa, the environment thinned out to open woodland. Chad was also covered in part by woodland. Nor did the climatic changes end there, for East Africa continued to become progressively drier until 2.5 mya (Cane & Molnar 2001). These changes would have selected for new social and biological adaptations within the existing hominoids.

The closer one approaches the transition from the Late Miocene to the Pliocene, c. 5 mya, from the present, the more primitive one would expect the hominin specimens to be if (a) evolution is correct and (b) we are descended from a common ancestor with chimpanzees.

The earliest known hominin is *Ardipithecus ramidus*, although *Orrorin tuggensis* is a contender. The subspecies *Ardipithecus ramidus kadabba* is ascribed to finds made from the Middle Awash in Ethiopia dating to 5.2-5.8 mya. It is described by WoldeGabriel et al. (2001). "Ram" means "earth," i.e. root species. The type specimen of *Ardipithecus ramidus* was described by White et al. (1994 and 1995) from the site of Aramis (Ethiopia), after first being assigned to the genus "*Australopithecus*." However, the second report in 1995 considered the differences between the *Australopithecina* and the new skeletal material to be sufficient to warrant the creation of a new genus, *Ardipithecus*. The material includes foot and pelvis bones as well as a skull. The type specimen has a date of 4.4 mya, which is c. 200 000 years older than the next hominin, *Australopithecus anamensis*.

As had been predicted for an early hominin around this period, it possesses many characteristics in common with the apes such as molar and canine sizes falling within chimpanzee ranges. Its tooth enamel is also thinner than that seen in the australopiths. To term *A. ramidus* an extinct ape, however, would be to ignore the contrasting features of its dental work. The canines project forward more than they do in *A. afarensis* but less than in the chimpanzee, and are diamond-shaped rather than the chimpanzee v-shape. The canine wear pattern is also different to the ape condition. Incisors are also smaller in size and, furthermore, the endocranial opening for the spinal cord, called the foramen magnum, is situated closer to the base of the skull as in later hominins and, by contrast, to the apes comparatively more horizontal opening. These mosaics of features demonstrate beyond a reasonable doubt the hominin nature of *A. ramidus* and place it squarely in the earliest known phase of our ancestry.

The positioning of the foramen magnum of *A. ramidus* is indicative of a likely bipedal tendency. It is reasonable to theorise, therefore, that the environment in which the hominin lived would not have been a tropical forest but rather woodland, as shown by the fossilized *Canthium* seeds at Aramis (WoldeGabriel et al. 1994). Although mammal remains were found in association with *A. ramidus*, no spatial distributional relationship is evident and they bear carnivore teeth markings are evident. This rules out any suggestion of a hominin-based kill site, but it does leave open the possibility that most of the animal (including hominin) remains are the result of random killings by predators. The teeth suggest a diet of soft fruit and leaves. *A. ramidus* weighed around 40 kg and had a height of about 4'0" feet. The full report on Aramis and its skeletal, fauna and flora remains is eagerly awaited.

Interestingly enough, although the report on *A. ramidus* was first published five years before the updated "The Hidden History of the Human Race," nowhere is it mentioned by Cremo & Thompson. Cremo & Thompson also neglect to discuss *Australopithecus anamensis*, which was described in Nature in 1995. Apart from showing poor research, this also exposes the richness in their contention that palaeoanthropologists and archaeologists are "selective" in their evidence.

Orrorin tugenensis was found at Aramis, Lukeino Formation, Kenya, by Martin Pickford and Brigitte Senut in October 2000. Subsequent excavations have yielded additional remains and the total stands at 22 fossils from a minimum of 6 individuals (Gibbons 2002). Dated to 5.7-5.8 mya, *O. tugenensis* possesses a more *Homo*-like dental morphology with their small molars and thicker enamel, and a more *Homo*-like femur. It had the same diet and lived in the same type of environment as *Ardipithecus ramidus*. Pickford and Senut regard it as the ancestor of *Homo* whilst they assign *A. ramidus* as the ancestor of the chimpanzees. They propose the creation of a new genus *Praeanthropus* which would include various *Australopithecus anamensis* and *A. afarensis* fossils. Professor Owen Lovejoy posits that the differences observed between *O. tugenensis* and *A. ramidus* may be variation in a single species, although this is disputed by Pickford and Senut. *O. tugenensis* has v-shaped canines like chimpanzees, whilst *A. ramidus*' canines share the same characteristics as the later australopiths. This was a time of species radiation and it comes as no surprise to find more than one bipedal animal. One must also be careful about mistaking parallel evolution for an ancestor-descendant relationship. A fuller explanation of the controversy is given by Kreger (2002).

Australopithecus anamensis was discovered at Kanapoi and Allia Bay (Kenya) in 1995n and its date is calculated as 4.2-3.9 mya (Leakey, M. et al. 1995, 1998). Although the observation was made that more than one hominin may be represented in the sample (Andrews 1995), this has been rejected by the original describers (Leakey et al. 1998). *A. anamensis* is distinguished from *A. ramidus* by thicker tooth enamel, with the teeth themselves showing both affinities and differences in relation to *A. afarensis* (Leakey et al. 1995). Demonstrating its primitive nature are the canines, with their long and robust nature. This hominin also has indisputable post-cranial evidence of bipedalism, as described in explicit detail by Leakey et al. (1995: 566):

> "*Rectangular proximal surface with anterior/posterior lengthening of the articular surfaces, condyles both concave and of roughly equal area, expanded metaphyseal bone, probably small*

fibular articulation, very straight shaft in those parts preserved, and a distal articular surface that faces directly inferior. Although the proximal fibular facet is broken away, the small size of the missing area shows that the articulation must also have been small, as in humans."

The scarcity of identifiable male and female skeletons means that sexual dimorphism is currently indeterminable for this species. The provisional mean body weight is estimated at c.50kg, with the body itself possessing longer arms in arm:leg ratio lengths by comparison to *Homo sapiens*. It had curved fingers which may have either been interpreted as demonstrating an arboreal component in its lifestyle or an evolutionary hangover. The species lived in open woodland and feasted on nuts and fruit, which accounts for the thicker enamel.

In 1965, Bryan Patterson and Howells (1967) discovered a humerus bone at Kanapoi that has now been attributed to *A. anamensis*. Although Cremo & Thompson do not mention *A. anamensis*, they discuss this and another humerus from Gombore in Ethiopia. They attribute them *to Homo sapiens* (Cremo & Thompson 1999: 251-252):

"Patterson and Howells found that the Kanapoi humerus was different from the humeri of gorillas, chimpanzees, and australopiths but similar to those of humans. They noted that "there are individuals in our sample of man on whom measurements…of Kanapoi Hominoid I can be duplicated almost exactly.

"Patterson and Howells would not have dreamed of suggesting that the Kanapoi humerus belonged to an anatomically modern human. Nevertheless, if an anatomically modern human had died at Kanapoi 4.0-4.5 million years ago, he or she might have left a humerus exactly like the one they found.

"Further confirmation of the humanlike morphology of the Kanapoi humerus came from anthropologists Henry M. McHenry and Robert S. Corruccini [1975] *of the University of California. They concluded that 'the Kanapoi humerus is barely distinguishable from modern Homo' and 'shows the early emergence of a Homo-like elbow in every subtle detail.*'

"In a 1975 study, physical anthropologist C.E. Oxnard agreed with this analysis. He stated: 'we can confirm clearly that the fossil from Kanapoi is very humanlike.' This led Oxnard to suggest, as did Louis Leakey, that the australopithecines were not in the main line of

human evolution. Keeping Australopithecus as a human ancestor would result in a very unlikely progression from the humanlike Kanapoi humerus, to the markedly less humanlike humerus of Australopithecus, and then to one more humanlike again.

"*The Gombore humerus, given an age of about 1.5 million years, was found along with crude stone tools. In 1981, Brigitte Senut said that the Gombore humerus 'cannot be differentiated from a typical modern human.' So now we seem to have two very ancient and humanlike humeri to add to our list of evidence challenging the currently accepted scenario of human evolution. These are the Kanapoi humerus at 4.0-4.5 million years in Kenya and the Gombore humerus at more than 1.5 million years in Ethiopia. They support the view that human beings of modern type have co-existed with other humanlike and apelike creatures for a very long time*."

It should be made clear that Patterson never claimed a *Homo sapiens* designation for the Kanapoi humerus, merely a *Homo* origin. If the reader returns to the discussion in Chapter One on homeobox genes, it will be recognised that the genes have a big role to play in resolving this supposed discrepancy pointed out by Cremo & Thompson. In essence, the masking and emphasising of contrasting genes happens quickly in geological timeframes. The important aspect is not whether the humerus proves *Homo sapiens* were present 4.2 million years ago, for the humerus could represent an extent *Homo*, but whether the humeri of other australopiths really are distinct from that of Kanapoi. If they are not, what does this have to say about our evolutionary relationships?

To begin to answer this question, we should look to see if more recent examinations have been undertaken on the Kanapoi humerus than McHenry's 1975 study. When the humerus was first uncovered, its date could not be established with any degree of certainty. This led to it being put in a suspense account until more accurate information could be ascertained. Shortly after the discovery of *Australopithecus anamensis* and the application of advanced dating techniques to the area, the attention of some investigators shifted to solving the uncertainty surrounding the humerus. By the early 1980s, many more *Australopithecina* samples were available for the purposes of comparative studies than Oxnard and McHenry possessed. This occurred mainly with the discovery of *Australopithecus afarensis* at Hadar, Ethiopia. Consequently, when taken together with new quantitative techniques, one would naturally place greater emphasis on the findings of these new investigations.

Studies which show great similarities between the Kanapoi humerus and those of *A. afarensis* are reported in Johanson et al. (1982) and Lovejoy et al. (1982). Other palaeoanthropologists who have found the Kanapoi humerus to be different from *Homo* include Feldesman (1982) and Lague & Jungers (1996). Considering the likely evolutionary descendant relationship between *A. anamensis* and *A. afarensis*, it is therefore not surprising to see the *A. anamensis* and *A. afarensis* humeri showing a close relationship; this is also in line with what one would expect from the workings of homeobox genes. The Gombore humerus is from *Homo ergaster*; so too is the KNM-ER 813 talus, based on size and morphology (Woods 2001: pers. comm.).

In a great display of one-upmanship against Richard Leakey, Don Johanson set off to Hadar, Tanzania, vowing to beat the Leakeys at their own game and establish his reputation as a great fossil finder (Morell 1995). The tabloids had a field day, playing up a supposed rivalry between the two men, which both at first denied. Johanson struck pay dirt, first with Lucy (A.L.-288) in 1974 and then with the discovery of the "First Family" in 1975 (Johanson & Edey 1981, Johanson et al. 1982); these date to between 3-3.4 million years ago. Remains from Fejej (Ethiopia) bear close similarities to both *A. anamensis* and *A. afarensis* and cannot be assigned to a specific species currently with any degree of certainty. Although questions were raised over whether more than one species was represented in the Hadar sample, an early australopith and an early *Homo* (Olson 1981, 1985; Senut & Tardieu 1985), sexual dimorphism adequately accounts for the observed differences (Kimbel et al. 1985, Kimbel & White 1988).

While *A. afarensis* shares many cranial and dental characteristics with chimpanzees, their canines are smaller and their postcanines are bigger in size. Their face was also less pronounced, although they have heavy brow ridges. The shape of the mouth is intermediate between the modern parabolic and the chimpanzee rectangular states, with the dentition displaying the same intermediary pattern. Lucy's post-cranial remains provide evidence that *A. afarensis* (and most likely its predecessors as well) retained the barrel chest shape characteristics of apes, while evolving a short and wide ilium more like modern humans.

There is marked sexual dimorphism, with females weighing around 25 kg and males about 50 kg; their height was 1-1.5 m; and their cranial capacity range was 375-540 cm^3. When the cranial capacity is taken relative to body mass, there is not much comparative difference with chimpanzees. *A.*

afarensis, as indicated by the thick dental enamel, probably followed relatively the same diet as *A. anamensis*. The fauna and faunal remains suggest that *A. afarensis* existed in a mosaic environment: floodplains, woodland and riverine forests. Its fingers are longer than in modern humans but shorter than in chimpanzees; they are also curved, thus resembling those of *A. anamensis* (Latimer 1991).

The pelvic shape indicates that this hominin was bipedal and this interpretation is strongly supported by the Laetoli footprints; both indicate that they had a bent-knee, bent-hip bipedal gait (Stern 1999). There is currently a big debate as to the extent to which these anatomical features featured in their everyday life, i.e. were the long arms and fingers an evolutionary hangover (Latimer 1991) or did they serve as an aid for tree-climbing (Stern & Susman 1983, Berger & Hilton-Barber 2000). The answer has an important impact of the implications for the origins of bipedalism. Cremo & Thompson (1999: 261) have picked up on the theme of this strongly debated topic (hotly contested matters are a sign of a healthy and vibrant science) and wrote this statement, the content of which speaks for itself:

> "*One can just imagine the effects of a painting or model of Lucy engaged in suspensory or other arboreal behaviour. This would surely detract from her image as a creature well on the way to human status. Even if one believes Lucy could have evolved into a human being, one still has to admit that her anatomical features appear to have been misrepresented for propaganda purposes*."

Running with this logic, one is left to conclude that the correlation between *A. afarensis*' gait and weight, and the Laetoli footprints is nothing more than a palaeoanthropological conspiracy perpetuated down through the ages to hide the dreadful truth from their fellow, more open-minded human beings.

What wonders the mind creates when thinking of the distant past. Were our ancestors deformed with four toes, were modern humans secretly walking the earth 4 million years ago hidden in a shroud of contemporary mystery, or could reality be more simplistic yet infinitely more fascinating? Humans, by nature, enjoy inventing mysteries and have been doing so since time immemorial. Religions have been built up around factual events, cultural perspectives of the world and gross elaborations over time until they come to be regarded as indisputable fact. It was natural, therefore, when hominin footprints came to light that they received special scrutiny from both academics and creationists. Footprints have the potential to inform us about a person's height, weight and their form of bipedalism. So when Mary

Leakey's expedition, at the site of Laetoli in Tanzania, uncovered footprints dating to 3.5 mya (Tuttle 1996: 97), which are generally interpreted as having been made by the contemporary *Australopithecus afarensis*, creationists objected.

Laetoli was first brought to the attention of palaeoanthropologists in 1935, with expeditions following in the same year (Louis Leakey), in 1938-39 (Kohl-Larsen) and in 1959 (Louis Leakey). However, the breakthrough came when Mary Leakey began a series of excavations in 1974 for, in 1976, Andrew Hill (a palaeontologist from the Kenyan Museum) discovered a series of Pliocene mammal footprint impressions in Tuff 7 (Berger & Hilton-Barber 2000). These prints, as closer inspection revealed in 1977, were from a variety of animals, none of them human (for a fuller description of these and other non-hominin trails at Laetoli, see White & Suwa 1987).

From the perspective of this book the most significant event occurred in 1978, with the discovery by Paul Abell of an ancient set of hominid tracks at Locality 8, Tuff 7. What Abell had observed was the impression left by a heel of a foot. Upon preliminary analysis, Louise Robbins (who was the footprint expert accompanying the expedition) tentatively concluded that they were two bovid prints super-imposed upon each other (White & Suwa 1987). This provides a contrast with the following statement of Cremo & Thompson (1999: 261): "*National Geographic magazine featured an article by Mary Leakey titled "Footprints in the Ashes of Time." In her analysis of the footprints, Leakey cited Louise Robbins, a footprint expert from the University of North Carolina, who said "they looked so human, so modern, to be found in tuffs so old*." Admittedly, Robbins made that comment after the footprints had been exposed fully but it does raise concerns about the validity of Cremo & Thompson's contention that the prints are those of anatomically modern humans: if the footprints were that obviously made by anatomically modern humans, Robbins would not at first attributed them to a very different animal.

Footprint Site G was slowly exposed during the remainder of 1978 and the course of 1979. The two parallel tracks run from north to south, with the southern prints being better persevered due to their deeper burial and, consequently, the greater protection offered by the tuff. A smaller individual made the western track. It has been suggested the eastern track was made by two hominins walking in quick succession in each other's prints (White & Suwa 1987), although this view has been strongly disputed (Clarke 1999). The most prominent investigators of the prints have been Stern & Susman

(1983), Tuttle (1981, 1985, 1987, 1988, 1990, 1992, 1994, 1996, 1997), White & Suwa (1987), Deloison (1991) and Clarke (1999).

Cremo & Thompson (1999: 264) would like the public to believe that the footprints cannot be distinguished from those made by anatomically modern humans. They have access to White & Suwa's article so it is surprising Figure 13 is ignored here, where it is made clear in pictorial form that a reconstructed female *Australopithecus afarensis* foot fits the print impression better than those of a modern human. This oversight appears to be a consequence of their over-reliance on Russell Tuttle's work. Tuttle (1985, 1987), hypothesising that another hominin was responsible, noted that the prints bear a resemblance to anatomically modern footprints and suggested the phalanges of the australopiths causes their feet to be larger and therefore incompatible with Laetoli. Tuttle, to his dismay, has had the dubious distinction of creationists pouncing upon with his work with glee and holding it up as the definitive proof that modern humans made the prints. Unfortunately for Cremo & Thompson, Tuttle makes no such claim. Tuttle does not argue the Laetoli prints were made by modern humans, but rather by an unknown hominin species.

Tuttle (1987: 517):

> "*The feet that produced the G trails are in no discernible features transitional between the feet of apes (as we might envisage from extant species and Proconsul) and those of Homo sapiens. They are like small barefoot Homo sapiens. Therefore, the time of the initial transformation from a prehominid condition to the hominid foot and habitual bipedalism must be sought prior to 4 Ma. The advanced state of the hominid prints at Site G suggests that the change probably occurred earlier than some of the quite recent dates that have been suggested by chimpophilic molecular anthropologists. On the other hand, if selection pressures were intense and the precedent adaptive complex was amenable to change, there is no reason to preclude a rapid transition shortly before 4 Ma.*"

Tuttle (1998: 404):

> "*I did not describe or classify the makers of the Laetoli prints or discuss how they are linked to the 'Homo lineage.' Indeed, we need many more specimens before such an exercise might be fruitful. However, in view of the marked paleoecological differences between the Hadar (wooded and moist) and Laetoli (open and seasonally arid)*

sites and the fact that many other animals diversified during the late Miocene and Pliocene epochs, it is imperative that we be ever vigilant for more than one Pliocene hominid."

Tuttle (1990: 356-57):

"*Overall, the 3.5 My footprint trails at Laetoli Site G, bear telling resemblances to those of habitually unshod Homo sapiens. Accordingly, we conclude that a species of Pliocene Hominidae possessed humanoid soles and replicated many features of modern human gaits >- 1My before stone tools appear in the fossil record. It is also likely that their locomotor achievement was accomplished before ballooning of the brain, which characterizes Homo. The major difference that emerged in our comparisons between the Laetoli hominid trails and those of modern people, is the greater stride width of Laetoli G-3 as compared with those of* [a] *Machiguenga* [woman]."

Tuttle (1996: 100):

"*In order to place them in hominid phylogeny, we must know who made them. Regrettably, available evidence is insufficient to determine the species that left the prints. In an earlier era, one might assign them descriptively to a unique species – Ichnanthropus bipes – and breathe freely until additional fossils indicated that they should be sunk into another species. Today, however, prudence dictates that they be classified as Hominidae genus et species indeterminate. If the Laetoli hominid G prints were undated or were dated 1 Ma younger, they probably would be acceptable as Homo sp. Because of their striking humanness. Because genus Homo is based primarily on craniodental traits, I recommend against this. It is reasonable to expect that open-country ancestral species of Homo sapiens would have evolved feet like ours before they achieved craniodental traits that define our species or even our genus*."

The foot morphology of OH 8 (Olduvai Gorge, Bed 1), *Homo habilis*, closely matches the pattern displayed by the footprints; but *H. habilis* lived a million years later. White & Suwa (1987) use the foot of OH 8 in their reconstruction of the AL 288-1 foot, arguing that it displays phylogenetic similarities to *A. afarensis*. It should also be noted that the morphology of OH 8 is in all likelihood closer to *A. afarensis* than *H. sapiens*.

Seemingly on the face of it there is a standoff between the contrasting viewpoints of White & Suwa and Tuttle, a debate that follows ample freedom to Cremo & Thompson to pick and chose the evidence they believe fits their paradigm the best. But, as so often happens in palaeoanthropology, another piece of evidence has popped up which sheds new light on an old controversy. The groundbreaking new discovery comes not from East Africa but from down south, from the site of Sterkfontein in South Africa. This is "Little Foot," or StW 573. "Little Foot" is the foot bone remains of an *Australopithecus africanus*, which is dated at 3-3.5 million years ago (Clarke & Tobias 1995; Berger & Hilton-Barber 2000). The skeletal remains are claimed to show that *A. africanus* (if that is indeed who the foot belongs to) possessed a divergent big toe (hallux). This, if confirmed, might place a shadow of doubt over the accuracy of the reconstructed OH 8 foot, the claims made by Tuttle and the reconstruction made by White & Suwa of *A. afarensis*' foot morphology based partly on OH 8. It could show that *A. afarensis* and *H. habilis* had a big toe that was more divergent than previously expected.

Ron Clarke, the discoverer of "Little Foot," undertook an experiment in 1985. He got two chimpanzees to walk over wet sand. The result was revealing: the footprints left behind by the chimpanzees bore a strong correlation with Clarke's own observations of the Laetoli footprints. The female walked with her big toe spread out, while the male drew it closer to his other toes. The difference between the two is likely to have been a consequence of confidence in walking over the surface. With regard to Laetoli, Clarke (1999: 480) states:

> "*In the footprints of the larger individual there was, at a regular distance behind the tip of each big toe, another toe-like impression that I interpreted as left by the metatarso-phalangeal joint. Subsequent study by Yvette Deloison (of the Natural History Museum, Paris) of detailed casts that I had made of the prints led her not only to agree with my conclusions concerning divergence of the big toe but also to make observations of her own that indicated a foot with ape-like characteristics. These included weight-bearing on the lateral side of the foot, a prominent medial expansion of the abductor hallucis muscle, pointed heel, and absence of individual toe impressions apart from the hallux*."

When taken in combination, the chimpanzees and "Little Foot" show that the Laetoli hominins in all probability possessed the ability to diverge its big toes. Further supporting Clarke's findings is the distinct lack of toe impressions in the Laetoli prints, aside from the hallux. Clarke, backed by

Deloison, regards this as a consequence of their toes having being curled underneath the feet.

Skeletal remains of *A. afarensis* have also been excavated at Laetoli:

> *"Based on their find spots, the individual Laetoli australopithecine fossils can be at least broadly related to eight wide-spread marker tuffs, numbered 1-8 from bottom to bottom. Most of the specimens came from between Tuff 3 and Tuff 8, and in age they are bracketed between radiopotassium estimates of 3.76 my ago from below Tuff 1 and 3.46 my ago for Tuff 8. One specimen (a mandible designated Laetoli Hominid 4) is the holotype, to which the remaining fossils have also been assigned. A. afarensis was probably responsible for some spectacular human footprints preserved on a paleosurface within Tuff 7 (the 'footprint tuff')"* (Klein 1999: 169).

A. afarensis is thus the only hominin whose skeletal remains have been found in the relevant strata at Laetoli.

Cremo & Thompson (1999: 266) state, in response to the criticism by White & Suwa (1987) of Tuttle that only *Australopithecus afarensis* is to be found at Laetoli, that "*as we have seen in our review of African hominid fossils, there are in fact a few "shreds" of evidence for the presence of sapiens-like creatures in the Pliocene, some not far from Laetoli*". What is this evidence? As it turns out, the findings cited by them have already been shown in the palaeoanthropological literature to conclusively either be the result of intrusive burials or belonging to a hominin other than *Homo*. Some of these have already been discussed while others will be illuminated on in the forthcoming sections and chapters.

Macchiarelli et al. (1999) undertook a study of South African australopith locomotor abilities and arrived at the following conclusion:

> "*As reconstructed here, in the form of a mosaic electronically elaborated radiographic images, the australopithecine hip bone architecture suggests that the strength and direction of the daily gait-related peak strains borne by its pelvis differed from those of extant primates, including Homo. This supports the view that Australopithecus probably had more versatile locomotor abilities and repertoires than modern humans and reinforces the statement that, perhaps alternating with other less frequent locomotor solutions, Australopithecus was not an obligate terrestrial biped but rather combined arboreal climbing with a bipedal gait*."

The same has been proposed for *Australopithecus afarensis* (Stern & Susman

1983; Hunt 1996), although there are palaeoanthropologists who disagree (Lovejoy 1988; Latimer 1991), and the majority view is *that A. afarensis* possessed a "bent-knee bent-hip" walking style (see Stern 1999 and the references therein). The reconstructed height, weight and stride length of *A. afarensis* also matches the Laetoli footprints and differs from that of an adult human.

In sum, there are *Australopithecus afarensis* skeletal remains which are contemporary with the Laetoli footprints, and *A. afarensis* possessed a gait determined from the remains which bears striking similarity to that seen in the trails and a foot morphology which matches. There are no grounds for the conclusions reached by Cremo & Thompson regarding this site.

Australopithecus bahrelghazali was first brought to the world's attention by Brunet et al. (1995). Dated to 3.5 million years, this addition to the australopiths was excavated at Bahr el Ghazal, Chad. This was a significant discovery for it extended the known boundaries of the earliest hominid dispersals quite significantly. These finds consisted of a maxilla premolar and a mandible, possessing thicker enamel than *A. ramidus*, more symmetrical third premolar crowns than *A. anamensis* (but see White et al. 2000 for a counter-argument) and more complex mandibular premolar roots than *A. africanus*. The habitat was riparian woodland, similar to the habitats of eastern and southern Africa, with *A. bahrelghazali* consisting primarily of fruits, nuts and seeds. Despite this find being published four year prior to the second edition of "The Hidden History of the Human Race," it bears no mention.

Meave Leakey (the wife of Richard Leakey) recently proposed a new genus be erected for a group of new fossils excavated to the west of Lake Turkana in Kenya (Leakey et al. 2001). These finds, dating to 3.5 million years, are reported to be distinguishable enough from the australopiths to warrant its designation of *Kenyanthropus platyops* (Lieberman 2001). It has been linked in an ancestral relationship with *Homo rudolfensis*. However, the fossils are very fragmentary and questions have been raised in palaeoanthropological circles about the reliability of the reconstructions. Until such matters are resolved, most palaeoanthropologists regard it as premature to erect a new genus name and prefer instead to place the fossils in the *Australopithecina*, under a suspense account. This is the position adopted here.

Australopithecus africanus is most famously personified as the "Taung child," a skull blasted from the Buxton Limeworks deposit at Taung in the former Transvaal (now Gauteng province), South Africa. It was examined by Raymond Dart of the University of the Witwatersrand, who gave it its name which translated means "southern ape from Africa" emphasizing the common ancestry between humans and chimpanzees (Dart 1925). However, his conclusion that it was a member of the tribe *Hominini* was hotly disputed, especially in the United Kingdom (remember this was also the period of the Piltdown Hoax). Although no further hominin discoveries have been made at Taung, three additional southern African sites have subsequently yielded remains: Sterkfontein (1936-present), Makapansgat (1947-present) and Gladysvale (1991-present). *A. africanus* is estimated to have originated c. 3.3 mya (Kuman & Clarke 2000, Partridge et al. 1999; contra McKee 1996, who posits a later maximum age for the Member 2 formation at Sterkfontein).

A. africanus has bigger post-canine teeth than *A. afarensis* and smaller anterior teeth, together with the first deciduous molar possessing a more complex crown. As mentioned earlier, the discovery of "Little Foot" brought about a rethinking of the australopiths' foot morphology. The associated skeleton from Sterkfontein has had no less an impact (Clarke 1999). Although *A. africanus* is similar to *A. afarensis* in some aspects of their post-cranial remains, there are significant differences: it had long arms and short legs (as opposed to the comparative shorter arms and longer legs of *A. afarensis*) (Berger & Tobias 1996, Clarke & Tobias 1995, Berger & Hilton-Barber 2000). In this respect it bears a striking resemblance to *Homo habilis*, which McHenry & Berger (1998) theorise is a direct descendant.

Its bipedal gait was probably similar to that of *A. afarensis*, with the same curved phalanges suggesting that *A. africanus* was also partly arboreal. Where it differed with *A. afarensis* and other earlier australopiths, however, was that its hand was suited to precision griping, i.e. morphologically it was as capable of making stone tools as its *Homo* predecessors and likely engaged in some form of tool manipulation. The ability for and results of tool manipulation are discussed later in this chapter.

Sexual dimorphism, to the same degree as in *A. afarensis*, is evident amongst the members of the *A. africanus* species. It exhibits the same non-human style of walking: bent knee, bent gait. Its habitat was woodland with grassland and a river nearby. The evidence from Swartkrans and Taung points towards the southern (and most probably also the east) African australopiths being prey for leopards and other predators. Indeed, Bob Brain (1993) has hypothesised the former influence is how much of the skeletal remains at Swartkrans accumulated.

For an australopith that features so strongly in the fossil record, and which has a great bearing on hominin evolutionary interpretations, it is puzzling to find only one mention of it in "The Hidden History of the Human Race." What Cremo & Thompson (1999: 251) say is quite bizarre and out of touch with palaeoanthropological reality:

> "*Male gorillas and some male chimpanzees also have saggital crests, whereas the females of these species do not. Mary Leakey therefore said in 1971: 'The possibility that A. robustus and A. africanus represent the male and female of a single species deserves serious consideration.' If the possibility raised by Mary Leakey were found to be correct, this would mean that generations of experts have been wildly mistaken about the australopithecines*."

However, Cremo & Thompson fail to place Leakey's statement in its palaeoanthropological context. The late 1960s and the early 1970s were characterised by the single and multiple species theories. The single species theory stated that there has only been one species of hominin inhabiting the planet at any point during the past 5 million years. Based as it was on the then current palaeoanthropological record, it was a respectable scientific theory. The discovery of KNM-ER 3733 in 1975, by Richard Leakey's team in the Turkana beds, laid this theory to rest. This *Homo ergaster* fossil dated to 1.9 mya, which is the same time period as *Australopithecus boisei* in East Africa. Viewed in this context, Leakey's is out-dated and the usage to which Cremo & Thompson put it is invalid. Cremo & Thompson also ignore all the subsequent cladistic analyses that have taken place demonstrating the distinctiveness of *Australopithecus robustus* from *A. africanus* (e.g. Lieberman et al. 1996; Strait et al. 1997). Sexual dimorphism, as evidenced in crania, is also distinctive between *A. africanus and A. robustus* (Lockwood 1999). Finally, *A. robustus* only exhibits certain characters in the overall *A. africanus* morphology (Lockwood & Tobias 1999).

Published by Asfaw et al. (1999), *Australopithecus garhi* has been found at Aramis, Maka and Bouri (Ethiopia), and it is dated at 2.5 million years. *A. garhi* possesses larger canines than its *A. afarensis* "cousin," with the post-canine teeth matching the size of the robust *australopiths*. However, it lacks the a*ustralopiths*' thick post-canine enamel and it also does not have the a*ustralopiths*' derived facial structure, with the cranial morphology possessing more primitive traits than *A. africanus* and *Homo*. Despite suggestions from Tim White (one of the original authors) that this may be the intermediary species between *A. afarensis* and *Homo*, it has longer forearms than either of the other two respective candidates, *A. afarensis* (from whom it is believed to be derived) and *A. africanus* (Strait & Grine 1999). *A. garhi* is a regional stem on the evolutionary bush.

The retention of long arms close on 2 million years after *A. ramidus* existed is unlikely to be an evolutionary hangover and arboreality played an important role in the lifestyle of *A. garhi*. The elongated femur that has been discovered proves that this species was also bipedal. Groupings of animal bones have also been found bearing cut-marks, but it is as yet unclear whether these particular carcasses were obtained by hunting, or by active or passive scavenging. *A. garhi* lived in open woodland.

It has been proposed that *A. aethiopicus*, *A. boisei* and *A. robustus* be given the separate genus designation *Paranthropus*. However, their robust cranial similarities are more likely to be a function of their heavy diet with the resulting parallel morphology.

The type specimen for *Australopithecus aethiopicus* is a mandible from the Omo Shungura Formation, although its best known specimen is the so-called "Black Skull," from West Turkana, dating back 2.6 mya. *A. aethiopicus* has larger incisors than *Australopithecus boisei*, as well as a less-flexed cranial base. The size of the incisors suggests that it played a greater role in the dietary habits than the other robust *Australopithecina* taxa. Indications from associated fauna suggest that *A. aethiopicus* also lived in a more "closed" habitat. Taking the current fossil record into account, it is a likely descendant of *A. afarensis*, although future discoveries may reveal a more suitable candidate.

The Russian Valery Alexeev, who is now deceased, in 1986, first proposed the new species of *Homo rudolfensis*. The fossil from East Rudolf, KNM-ER 1470, shows significant differences in comparison with the type *H. habilis* fossil from Olduvai as well as the other *H. habilis* fossils from Olduvai. It has also been found in the Chemeron Formation, Lake Baringo, Kenya, which dates to c. 2.45 mya. According to Alexeev, the variability is too great and it is a view that is corroborated by other studies (e.g. Wood 1991, Kramer et al. 1995).

In addition to the proposals outlined below under *Homo habilis*, an additional proposal has been made which is now receiving the greatest support. It involves splitting *Homo habilis* into *Homo habilis sensu stricto*, with reference to the material that has emerged from Olduvai Gorge and part of the Koobi Fora remains, and *Homo rudolfensis*.

Homo habilis' face is widest superiorly, while *H. rudolfensis*' face is greater in the middle. *H. rudolfensis* also possesses a great cranial capacity of c. 750

to 800 cm^3; however its brain to body ratio is on average the same as the australopiths, due to its greater body height. It has the same big post-canine teeth in the manner of the australopiths, a robust mandible and more complex premolar root systems than *H. habilis*. No post-cranial remains have yet been excavated; despite this, the males are tentatively estimated to have weighed c. 45 kg. The large post-canines hint that its dietary niche resembled that of the australopiths, at least in terms of its eating demands.

Stone the crows

The biggest problem that modern archaeologists have is that right from the start of our assignment we are distanced in time from our subject. Archaeologists are unable to go back in time to see first-hand what our extinct hominin ancestors were doing, how they survived, how they created artifacts and how they responded to challenges.

However, the sites that our ancestors have left behind provide us with the opportunity to examine some of the mysteries of the past. What makes a site? What events and/or activities by man made tools? And how does that help in our understanding of the past? The direction to take at first in attempting to understand the formation of Stone Age sites is to have a close look at the system of artifact manufacture – a purpose that will become clear.

A large section of the first half of "The Hidden History of the Human Race" is dedicated to examining eoliths in search of a few claimed anomalous pieces that they could then proclaim to be anatomically modern man-made stone tools. So why isn't an equivalent amount of space set aside in this book to examine those claims individually? There are a variety of reasons. By focusing on their skeletal claims for the Pliocene and Pleistocene periods, we have effectively been investigating the underlying bedrock of their idea. If there is no evidence for anatomically modern humans between the periods of the last common ancestor between hominins and chimpanzees, and 200 000 BP, then honestly what are the chances of finding remnants of *Homo sapiens* back 20 or 200 million years? Effectively the scenario would be no *Homo sapiens* remains for 5 million years, with plenty of anatomical and genetic evidence in favour of the mainstream theory of evolution, but yet an artifact 50 million years is claimed as proof-positive that they have existed all this time. Unlikely. Aside from these objections, there are other problems with taking Cremo & Thompson's pre-Pliocene stone tool proposals seriously.

The mechanics of stone tool manufacture was poorly understood in the 19th century. No proper replication attempts were undertaken and experimental archaeology was a virtual unknown. Furthermore, the supposed stone tools are in fact rare examples within the broader eolith deposits encountered at pre-Pliocene sites and have no clear association with any faunal remains; this is something "The Hidden History of the Human Race" neglects to bring to their readers' attention regarding these eoliths. By contrast, Pliocene and Pleistocene stone tool occurrences are plentiful and usually in clear association with animal bones; this pattern re-occurs repeatedly over the 2.5 million year time frame tools have been manufactured by hominins. Moreover, the "anomalous" cited by Cremo & Thompson are spread widely over time and space, now appearing sophisticated, now crude, without any explanation is to why this is the case and without constructing a workable theoretical framework to account for these changes.

Finally, the past four decades has seen the documentation of primate tool use. Parallels and extrapolative theories can be drawn between these usages and australopith survival practices. Practical replication experiments have been undertaken into Oldowan stone tools and the resulting knowledge have been weaved into framework of broader social understanding of the australopiths' lifestyles. Two such studies are by van Schaik et al. (1999) and Kibunjia (1994).

The question which goes to heart of this framework is, what are the conditions that create an ideal climate for primate tool use to become more sophisticated and for stone tool manufacturing to have become integrated into the social life of the australopiths. To understand this is to recognise that various ecological, social and cognitive factors were at play. Suitable niches would have had to be available for active and continuous exploitation over a sustained period of time, and the australopiths using those tools would have had to possess social tolerance which is vital with regard to how tool use is required and utilised. Chimpanzees occasionally use unaltered "stone tools" in display for attraction, yet this usage is arbitrary. Other aspects of tool usage are more common; for example, termite fishing.

Greater social tolerance in species results in tendencies for closer bonding and therefore behavioural co-ordination. This closer interaction would, in turn, have a positive impact on the range and success of their food-gathering and scavenging forays as it would minimise loses to predators.

Taking these factors into account, it is probably no great train smash to learn that the first tools appear in the archaeological record around 2.4 million years ago (Semaw et al. 1997). Some archaeologists have observed that the Oldowan industry appears to be a stone tool industry appearing without prior developmental stages in stone tool manipulation. The general counter to this argument has been pointing to the primitive chimpanzee use of stone on an arbitrary basis, but this was never really satisfactory for why weren't intermediary steps evidenced in the archaeological record. Mzalendo Kibunjia (1994: 159) set out to investigate this crucial question and reached some telling conclusions:

> "*Archaeological evidence from the Lake Turkana basin, as well as from several other localities in eastern and central Africa, shows that stone tool manufacture and use occurred at least by the later part of the Pliocene, about 2.4 million years ago (Ma). However, little is known from the archaeological record about the technological characteristics of Pliocene material culture, and related aspects of hominid behaviour, such as habitat use and preference, and subsistence of the tool makers. Expanded excavations at the West Turkana site of Lokalei, dated to 2.35 Ma indicate that hominids making artifacts at this site had little success in striking off whole flakes from the parent core forms. The large number of scars left on these forms consists of step, hinge, and small flakes (>2 cm) which may not have been very successful in cutting or slicing, despite the fact that the raw material utilised was a medium-grained volcanic lava with observable conchoidal fracture mechanics. The fauna is characterised by mainly size 1 or 2 bovids, suggesting early access if scavenged or hunted. This lithic technology patterning, which is shared by other assemblages in the basin, suggests that the Oldowan is not the earliest stone tool technology industry. Rather, the Oldowan represents a point in a continuum from simpler Pliocene technology characterized by little understanding of stone fracture mechanics to greater technological complexity and appreciation of fracture mechanics in the Pleistocene*."

When an Oldowan core is flaked, what stone debris is produced? How many fragments are there? Although this will obviously depend on how much the artifact has been worked, a simple rule has been found to apply (Schick & Toth 1993: 192): "*The average ratio is approximately one core to thirty or forty flakes and fragments*." Although different flaked cores will produce other figures, at least this does give us an average figure to work with when examining sites.

Now that we have established roughly how many flakes would have been produced, the question arises: what are their sizes? The size distribution is most likely as follows (Schick & Toth 1993: 193):

>8 cm: 1%
4 – 8 cm: 8%
2 – 4 cm: 23%
1 – 2 cm: 41%
<1 cm: 27%

Although flaking a few cores would thus produce much stone debris, there will have been many that were too small to have been of any use to our early ancestors. To us, however, this stone debris is invaluable. The debris assemblage enables the archaeologist to assess how significantly, if at all, a site has been subjected to water erosion. This analysis, combined with a geological assessment of the site, yields evidence of how much erosion a site has undergone and thereby helps the archaeologist establish in which sites hominid remains and/or remains of hominid activity would be best preserved.

Through the creation of Oldowan cores and examining the spatial flaking and fragmental debris, it has been determined that the chips usually fell within a five-foot radius of the toolmaker, with the larger chips landing closest. This is a useful tool to use when examining patterns of stone pieces from other sites. Experiments have also been conducted under laboratory conditions simulating water erosion, observing which artifacts were washed away and which remained *in situ*; the results of which contribute towards understanding the extent of the erosion out in natural settings and what might have occurred.

It is from the results of these types of experiments, together with observations about the workings of the local natural environments, that archaeologists are able to form opinions about the formation of sites as well as determine what a certain site can reveal about the nature of its occupants. There are different lines of evidence – geological evidence, geographical evidence, etc. – which reveal different patterns to look out for that inform the archaeologist that the site under question is pretty much undisturbed or that it has been drastically altered since it was occupied. The most important evidence to look for is as follows:

Artifact disposition: Large numbers of flakes to a low number of cores, as well as there being more fragments than whole flakes, is a very good indication that the site is relatively undisturbed compared with a disturbed site of a high core to flake ratio and a high flake to fragment ratio; and

Stone and bone alignment: In a site that has had significant disturbances, most of the elongated pieces will have similar alignments, either in one direction (the direction of the flowing water) or at right angles. An undisturbed site will not show this alignment.

The survival rate of bones has to be established at sites. In other words, the presence or absence of certain sections of skeletons may be related to both their delicacy and inability to preserve in the face of the elements. Observation of skeletal remains at Sterkfontein suggests that some skeletal parts were hardier than others (Brain 1981: 22). An interesting observation is that "*in his book Early Man in Europe, Rau described the contents of Stone Age refuse dumps or kitchen middens, in Denmark, pointing out that the bones were the discarded food remains of the people and their domestic dogs. To verify this assumption, Rau described how Professor Steenstrup locked up some dogs, restricting them to a diet of bones and thereby ascertained that all the bones rejected by the dogs were the same that are present in the kitchen middens, while the bones or portions of bones devoured by them are correspondingly missing there*" (Brain 1981:22).

Then there is the fact that some animals' skeletons are simply more resistant to carnivore damage than others: for example, a primate's vertebral column is more prone to extensive damage than that, say, of an antelope (Brain 1981: 26). Thus, the representation of different animal skeletons in the archaeological record should take into account the different degrees of resistance to carnivore action.

A collection of bone fragments was made from the area near a Hottentot village; the strange thing was that many pieces showed wear and polish as if from human use. However, the Hottentots denied using bone tools. Now, these "tools" were found to be abundant near water holes. What actually happened was that in protected areas, the bones would develop chalky surfaces and then the sand, disturbed by the animals coming down to drink, would wear the bone so that the bone would eventually be worn and polished. That should serve as a cautionary message not to judge bones as tools that were used by humans simply because those show signs of wear and polish.

There is also the question: what level of technique went into making stone tools? It must be remembered that stone tools first appear in the archaeological record roughly two and a half million years ago. This is the same time that *Homo ergaster* appears up on archaeological sites. Since the australopiths were also around at that time, it is possible that either both species were toolmakers or that *H. ergaster* was the lone maker. The earliest stone tools have so far been found at Olduvai Gorge, first by Louis and Mary Leakey, and are primarily large cobbles with flakes knocked off. Nick Toth

conducted research on these tools and arrived at some insightful conclusions:
1. The hominins were after the flakes and not the cores;
2. Tools were sometimes manufactured a distance away from the raw material sources; and
3. The survival of the hominins did not depend upon the tools and consequently it is doubtful whether the technology required to make them accurately reflects their cognitive abilities.

In essence, therefore, Toth is suggesting that heavy stone bashing tools were a small part of the technology used by our ancestors and that our ancestors probably possessed more skills than what are reflected in the stone tool remains.

Brain has provided more definite evidence for a stone artifact enterprise in Member 1, Swartkrans. The tools are quite thin and with polish and faceting stretching 30mm from one tip that, in most cases, are blunt. One possible use for these tools, Brain suggests, is for digging bulbs out from rocky soils together with stone hammers and a digging stick. After half an hour of digging, the experimental tools used showed wear that was very similar to those Brain found at Swartkrans. More recently, Backwell & D'Errico (2000) have theorised, on the basis of microwear analysis, the patterning on the bone tools is the result of wear induced from termite hunting. Most of the stone artifacts found could have simply been debris left over from the manufacturing of tools. While for the remainder, their presence indicates that at least part of the manufactured tools were kept as a reserve for future foraging or were conserved after they had already been used rather than being left on the forage site.

Robert Blumenschine of the University of Rutgers has studied reasonable healthy animal bodies together with carcasses that still had to undergo scavenging all year round on the Serengeti Plain in East Africa. He concluded that the best times for scavenging were during the dry season along river banks where edible animal parts, especially fatty marrow contained in the lower limb bones, would have been readily available and accessible (Schick & Toth 1993: 207).

The Wisconsin University pairing of Bunn and Kroll (1986) came to a different conclusion after a close examination of animal bone remains at Olduvai Gorge where antelope, ancient hartebeest, springbok, waterbuck, pigs and other carnivores were present at FLK Zinj. Most of the remains were therefore of large animals, weighing more than one hominid could carry as a whole by himself. The lower jaws, upper and lower hind legs and forelimbs constituted the majority of the bone remains. Bunn and Kroll arrived at the conclusion that stone tools were used to extract the most nutritious animal parts and that therefore early man was either a very competent hunter or brilliant scavenger with the ability to get to a carcass before other scavengers or before other scavengers could get very far in demolishing the carcass.

Animals adapted for savannah life normally live in packs or groups that consist of relatives. This is due to the need for protection against the ever-present threat of other predators, of other carnivores. There was also the need of defending their resources against enemy hominid groups as well as other predators or scavengers. The result of interaction in groups means that individuals have a better survival rate, as well as relatives. This "primitive" social grouping is termed as "kin selection."

It is on this basis that one may draw the conclusion that it is very likely that our early hominid ancestors lived in communal groups that were kin related. The necessity of controlling social interaction and relationships, movements (with reference to scavenging or hunting large animals) would most likely have resulted in communication skills receiving a huge evolutionary boost. The improved interaction would help with respect to gaining control of large dead animals and the cutting up or processing of a carcass would be much more efficient with the group putting in a concerted effort. Therefore it can be seen that in order for a group to function, co-operation was essential; and for the hominin species to survive and evolve, it was of paramount importance to form groups to protect themselves from other hominins and carnivores.

An important advantage in the struggle for survival is mastering the control of fire. Fire provides warmth. It also provides security against other predators that are afraid of fire. So, the question is: when did our ancestors first master the art of fire control? Bones have been found at Member 3 of Swartkrans, South Africa, dating to 1-1.5 mya which have been deliberately burnt. On close investigation, the temperature they had been heated to was found to be in the range of that expected in campfires:

> "*In a series of 10 specimens, darkened Swartkrans fossils always contained over 2% carbon, whereas normal fossils always contained less than 1.5% carbon. A background level of approximately 1% carbon is associated with the inorganic phase; organic char is recoverable from only darkened fossils. We found that, in experimental studies, such char develops mainly between 300 and 400 degrees centigrade.*

> *The carbon-to-nitrogen ratio (C:N) of fresh collagen ranges from 2.9 to 3.6; for char in the experimental series it is 4.2 to 6. Swartkrans fossil chars are even more depleted in nitrogen; this is constant with elevated C:N ratios reported for organic residues from other burnt archaeological bones*" (Brain 1988: 828).

As *Australopithecus robustus* was not yet extinct, it is not possible to be certain whether it was he or his neighbour, *Homo habilis*, who mastered the art, or even if it was both species.

CHAPTER THREE:

THE PLEISTOCENE FLORESCENCE

The four sessions of excavation, between 1992 and 1999, at Blombos Cave went smoothly. The students who participated at first did not understand why they were not permitted to take part in the actual excavating, particularly the experienced students. It soon became abundantly clear the site held previously unsuspected potential. The stratigraphy was extremely complex and the finds which came out of the Middle Stone Age levels held the prospect of revolutionising our understanding of this period in southern African prehistory. The combination of this importance, as explained in Chapter Four, and the general complexity rightly meant that only the experienced, qualified archaeologists set to work exposing the site. Context had to be established, samples for dating extracted and the site situated within the broader context of the known African Middle Stone Age framework.

The Pliocene ended c. 2 mya. This period saw not only further climatic change but also the appearance of new hominin species.

Australopithecus robustus has smaller canine and incisor teeth than its predecessor, *A. africanus*, although its face, brain and molars are bigger with the postcanine teeth possessing thick enamel. It possessed a cranial capacity of 475 cm^3. The best-preserved examples come from the site of Drimolen, South Africa. Described by its excavator Andre Keyser, the cranium and mandible discovered in 1994 reveal that the species' sexual dimorphism is greater than what had previously been theorised and reinforces what was previously known, namely that *A. robustus* and early *Homo* were contemporaries in southern Africa.

Males weighed around 40 kg and females, 32 kg. Dental analyses have concluded that the foods eaten by *A. robustus* were harder and required less use of the incisors than its cousin, *A. africanus*. The examinations of its enamel, via stable carbon isotopes, have added further to the reconstruction of this hominin's dietary behaviour: grasses, tubers as well the meat of animals whose diet comprised primarily of C4 plants; thus, contrary to previous hypotheses, *A. robustus* was a generalised eater (Lee-Thorp et al 1994). Interestingly though, the C^3 and C^4 proportions of the *A. robustus* and the early *Homo* diet appear to be similar, although this should not be taken to mean that their diets were the same especially considering the massive dentition of *A. robustus* (Lee-Thorp et al. 2000).

This new scenario is consistent with tool finds at Swartkrans. *Australopithecus robustus* comprises the majority of the skeletal remains from Swartkrans, where many stone tools have been found, and the hominin also posses a hand morphology that is virtually the same as modern humans; this means it had a precision grip). Thus it is very possible both *A. robustus* and *Homo erectus* utilised stone tools at the site of Swartkrans, especially with bone tools found in the same breccia member as *A. robustus* bearing wear marks.

Australopithecus boisei was the first hominin discovered in East Africa, by Louis Leakey at Olduvai Gorge in 1955. Although this first specimen is designated OH3 (teeth), it is OH5 (cranium with dentition), excavated in 1959, which is regarded as the type specimen. At first Leakey included *A. boisei* in a separate genus (*Zinjanthropus boisei*), but this was later abandoned. Both *A. robustus* and *A. boisei* lived between 2-1 million years ago.

Apart from Olduvai Gorge, remains of *Australopithecus bosei* have also been excavated at Omo, Konso (Ethiopia), Malawi and Koobi Fora, amongst others. Its cranial capacity was c. 450 cm^3, with a wider and larger face than its southern African counterpart. Its premolars and molars have thick enamel, are broad-based and have large crowns. Unfortunately, as yet no post-cranial remains can be attributed to this hominin with any degree of certainty, although Walker attempts to link this taxon with a partial skeleton from Koobi Fora (Walker et al. 1989). The limb proportions of this skeleton bear closer resemblance to *A. afarensis* than *A. africanus*, and their lives would have included an arboreal component. The estimated weight of males is around 50kg and females, c. 34 kg. The environments in which they lived would have been open woodland and scrub woodland, with a water source nearby.

The first *Homo habilis* specimen was discovered in 1960, one year after *Australopithecus bosei*, at Olduvai Gorge in Bed 1: OH 7 and 8. Of crucial importance were the hand bones for these indicated that the hominin possessed a precision grip; this was then regarded as a prerequisite for a fossil to be included within the genus *Homo*. OH 7 turned out to be a juvenile who had no bony crests like *A. bosei* and whose molar and premolar teeth were smaller in size. These factors led to the proclamation of a new species, *Homo habilis* (Leakey et al. 1964).

Further *Homo habilis* specimens were discovered shortly after 1960: OH 4, 6, 14 and 16 (Bed 1), and OH 13 (Bed II). Unfortunately for Louis Leakey, Philip Tobias and John Napier, classifying these specimens into the genus *Homo* necessitated lowering the accepted cranial capacity threshold for *Homo* from c. 800 cm^3 down to c. 600 cm^3, with the specimens displaying capacities ranging from 600 to 700 cm^3. This caused controversy that still rages to this day. Leakey, Tobias and Napier defended their classification by pointing out that *Homo habilis* possessed an upright posture and a bipedal gait.

Critics of the new species claimed it is a combination of more "advanced" *Australopithecus africanus* and more "primitive" *Homo erectus* fossils. However, *H. habilis* displays a range of characteristic morphological features and one of "advanced" *H. habilis* specimens (OH 24, from Olduvai Gorge) is also the oldest at 1.8 mya. The alternative proposal that *Homo habilis* is returned to *Australopithecus* as *A. habilis*, on the grounds of morphological and adaptive critiques was proposed by Wood & Collard (1999: 66):

> "*Cladistics is the method of choice for identifying monophyletic groups, but there is no equivalent system for identifying adaptive strategies. Nevertheless, for a species to emerge and persist, the individuals belonging to it have to flourish in the face of the challenges posed by their environment and produce sufficient fertile offspring to repeat the process. The ways in which a hominin species meets these fundamental requirements are clearly important components of its adaptive strategy. Thus, if H. neanderthalensis, H. erectus, H. heidelbergensis, H. habilis, H. ergaster, and H. rudolfensis have been allocated to the correct genus, two conditions must be met. First, cladistic should confirm that these species are more closely related to H. sapiens that they are to any of the australopith genera – Australopithecus, Paranthropus, Praeanthropus, and Ardipithecus. Second, assessments of function should indicate that the adaptive strategies used by fossil Homo species to maintain homeostasis, acquire food, and produce offspring are more similar to the strategies used by the H. sapiens than they are to the strategies employed by the australopiths*."

This reassessment has been controversial and is not widely accepted.

More recent finds attributed to *Homo habilis* include OH 62 (the oldest *H. habilis* specimen from Olduvai Gorge) and OH 62. OH 62 presents an intriguing puzzle for its limb proportions are more primitive than *Australopithecus afarensis*, with its longer arms and shorter legs. Lee Berger and Henry McHenry (1998) hypothesis that the proportions are chimpanzee-like and this indicates that they spent a large portion of their lives in the trees and that they were likely to have displayed more sexual dimorphism than other contemporary hominins. The hand bones indicate its grip was more powerful than that of modern humans, which is claimed to be further evidence for arboreal activities. Tobias (1987) proposed that *H. habilis* was capable of spoken language, a claim that is now regarded as invalid. Estimates for their weight range from 25 to 37 kg and its diet was similar to its australopith contemporaries.

Two craniums from Sterkfontein (Members 5 and 1) are said to represent a transitional form from *Australopithecus africanus* to *Homo habilis*, as is a maxilla from Hadar. Aside from Olduvai Gorge and Sterkfontein, *Homo habilis* has also been recovered from Omo, Hadar and Koobi Fora.

Cremo & Thompson (1999) actively campaign against the mainstream view that early *Homo* were the ancestors of *Homo sapiens*. Again, allegations of cover-ups, suppressions and deliberate false interpretation of the evidence surface:

> "*The OH 62 find supports our suggestion that the ER 1481 and ER 1472 femurs from Koobi Fora, described as very much like those of modern Homo sapiens, might have belonged to anatomically modern humans living in Africa during the Late Pleistocene. Some scientists attributed them to Homo habilis. But the new view of Homo habilis rules this out. Could the femurs perhaps belong to Homo erectus? G.E. Kennedy, for example, assigned the ER 1481 femur to Homo erectus. But E. Trinkaus noted that key measurements of this bone, with one exception, are within the range of anatomically modern human femurs…a fairly complete foot skeleton, designated OH 8, was found in Bed 1 at Olduvai Gorge. Dated at 1.7 million years ago, the OH 8 foot was attributed to Homo habilis. In 1964, M.H. Day and J.R. Napier said the OH 8 foot very much resembled that of Homo sapiens, thus contributing to the overall humanlike picture of Homo habilis. But O.J. Lewis, anatomist at St. Bartholomew's Hospital Medical College in London, demonstrated that the OH 8 foot was more like that of*

chimpanzees and gorillas. He considered the foot to be arboreal, adapted to life in trees. This poses a problem. It certainly does not serve the propaganda purposes of evolutionists to have the public visualizing a supposed human ancestor like Homo habilis climbing trees with an arboreally adapted foot rather than walking tall and brave across the African savannahs. So in the end, we find that Homo habilis is about as substantial as a desert mirage, appearing now humanlike, now apelike, now real, now unreal, according to the tendency of the viewer. Taking the many conflicting views into consideration, we find it most likely that the Homo habilis material belongs to more than one species, including a small, apelike, arboreal australopithecine (OH 62 and some of the Olduvai specimens), a primitive species of Homo (ER 1470 skull), and anatomically modern humans (ER 1481 and ER 1472 femurs)" (Cremo & Thompson 1999: 254, 256).

To start, Cremo & Thompson do not explain why they call one group primitive *Homo* and yet exclude it from our line of ancestry. They are correct in drawing attention to the discrepancy between the known *Homo habilis* post-cranial remains and the two femurs; however, they make a fatal judgmental error in their analysis. As they themselves note (1999: 252), the femurs were discovered in the same strata level as the *Homo rudolfensis* skull designated KNM-ER 1470. This relationship should have provisionally suggested to the authors that the finds might belong to the same species. The idea presented that they might be the remains of anatomically modern humans is unlikely because shortly afterwards, *Homo ergaster* appeared on the scene with modern human bodily proportions. Occam's Razor dictates that *H. rudolfensis* probably possessed more human-like proportions in line with *H. ergaster* than *did H. habilis*. This raises a far more interesting question which can only be resolved by more detailed remains being uncovered: is *H. rudolfensis*, and not *H. habilis*, the direct ancestor of *H. ergaster* or are the exhibited characteristics an example of evolutionary parallelism.

It is widely regarded today that the original reconstruction of the OH8 foot was faulty. Although more recent reconstruction has tended to emphasise the more arboreal aspects of its morphology, in no way is the valid and detailed scientific reports examples of "propaganda." Indeed, if palaeoanthropologists were so dedicated to preserving at all costs a fully "human-like" picture of *H. habilis*, these reports would never have been published in peer-reviewed journals and subjected to the same standard analytical reviews that all reports are. More likely, this is another example of homeobox genes at work in all their splendour.

The dissenters: stubbornness or earth-shattering revelations

No creationist story would be complete without dismissing the australopiths as being part of our ancestral lineage. It is an essentially part of their myth, in which they try to impress ordinary people by citing two palaeoanthropologists in particular: Solly Zuckerman and Charles Oxnard. Standard creationist procedure also dictates those direct rebuttals to Zuckerman and Oxnard's articles are dismissed through non-mention. "The Hidden History of the Human Race" follows the dictate to the letter, but with a few added extras: "*Louis Leakey held that Australopithecus was an early and very apelike offshoot from the main line of human evolution. Later, his son Richard Leakey took much the same stance*" (Cremo & Thompson 1999: 257).

What Cremo & Thompson do not mention is that Richard Leakey has subsequently abandoned this track of thinking. As he states in the updated version of his widely available book, "Origins Reconsidered" (the previous version, "Origins," is referenced but the second edition is not):

> "*It is already clear that with Homo we are looking at a putatively very different kind of animal from Australopithecus… Bipedal apes had been in existence for a long time when Homo arrived. The human family emerged about 7.5 million years ago; Homo evolved sometime before two million years ago… It is true that modern humans are bipedal apes in a sense, but the earliest hominids were bipedal apes, and no more. Only with Homo did the evolutionary equation change, and in a dramatic direction*" (Leakey & Lewin 1993: 141).

After having given the impression that Richard Leakey still supports his father's idea, thereby lending an additional "air of authority" to their claims, Cremo & Thompson head back with the normal creationist tract, insisting Zuckerman and Oxnard have disproven any ancestral relationship between *Homo* and the australopiths. This approach is mandatory, for if one of the australopith species were ancestral to *Homo* it would effectively destroy any factual basis to their religious paradigm.

Venturing into the lion's den, Cremo & Thompson (1999: 257-58) state:

> "*In the early 1950s, Sir Solly Zuckerman published extensive biometric studies showing Australopithecus was not as humanlike as imagined by those who favoured putting this creature in the lineage of Homo sapiens. From the late 1960s through the 1990s, Charles E. Oxnard, employing multivariate statistical analysis, renewed and amplified the line of attack begun by Zuckerman. According to Oxnard, "it is rather unlikely that any of the Australopithecines…can have any direct phylogenetic link with the genus Homo*."

The best, readily available response to these claims is by Jim Foley on the mainstream Talkorigins website:

> "*In 1950, Wilfred Le Gros Clark published a paper which definitively settled the question of whether the australopithecines were apes or not. He performed a morphological study (based on the shape and function) of teeth and jaws, since these formed most of the fossil evidence. By studying human and modern ape fossils, Le Gros Clark came up with a list of eleven consistent differences between humans and apes. Looking at A. africanus and robustus (the only australopithecine species then known), he found that they were humanlike rather than apelike in every characteristic. Judged by the same criteria, A. afarensis falls somewhere between humans and apes, and possibly closer to the apes (Johanson and Edey 1981). White et al. (1994) did not judge A. ramidus by these criteria, but it is clear that ramidus is even more chimpanzee-like than afarensis. The ramidus arm bones also display a mixture of hominid and ape characteristics. Solly Zuckerman attempted to prove with biometrical studies (based on measurements) that the australopithecines were apes. Zuckerman lost this debate in the 1950's, and his position was abandoned by everyone else (Johanson and Edey 1981). Creationists like to quote his opinions as if they were still a scientifically acceptable viewpoint. Charles Oxnard (1975), in a paper that is widely cited by creationists, claimed, based on his multivariate analyses, that australopithecines are no more closely related, or more similar, to humans than modern apes are. Howell et al. (1978) criticized this conclusion on a number of grounds. Oxnard's results were based on measurements of a few skeletal bones which were usually fragmentary and often poorly preserved. The measurements did not describe the complex shape of some bones, and did not distinguish between aspects which are important for understanding locomotion from those which were not.*

Finally, there is "an overwhelming body of evidence", based on the work of nearly 30 scientists, which contradicts Oxnard's work. These studies used a variety of techniques, including those used by Oxnard, and were based on many different body parts and joint complexes. They overwhelmingly indicate that australopithecines resemble humans more closely than the living apes."

Cremo & Thompson discuss australopith anatomy and imply that arboreal characteristic precludes it from being related to *Homo*:

"*Oxnard found the brain, teeth, and skull of Australopithecus to be quite like those of apes. The shoulder bone appeared to be adapted for suspending the body from the limbs of trees. The hand bones were curved like those of the orangutan. The pelvis appeared to be adapted for quadrupedal walking and acrobatic behaviour. The same was true of the femur and ankle structure. 'Pending further evidence,' wrote Oxnard in 1975, 'we are left with the vision of intermediary sized animals, at home in the trees, capable of climbing, performing degrees of acrobatics and perhaps arm suspension.'*"

At this point, flip back to Chapter One and the list given of the anatomical similarities given between the australopiths and *Homo*. After reading this, the question arises as to what Cremo & Thompson expect intermediary ancestors, from the time of the chimpanzee-hominin split to the advent of *Homo sapiens*, to look like. The further back in time you go surely the greater anatomical similarities between chimpanzees and hominins become. Those very characteristics, cited as supposed proof *Australopithecina* are different to us and therefore do not belong in our lineage, are indeed proof positive (Deacon & Deacon 1999; Klein 1999; Kuman & Clarke 2000; Lee-Thorp et al. 2000; Lockwood 1999; Lockwood & Tobias 1999; McHenry & Berger 1998; Susman 1998; Walker & Shipman 1997; Wood & Collard 1999; Wood & Richmond 2000).

Cremo & Thompson go on to claim, citing Zuckerman and Oxnard's 1973 cry of "authoritarian" overrule, that "*The voices of authority in palaeoanthropology and the scientific community in general have managed to keep the humanlike view of Australopithecus intact. The extensive and well-documented evidence contradicting this favored view remains confined to the pages of professional journals, where it has little or no influence on the public in general, even the educated public*" (Cremo & Thompson 1999: 258).

As can clearly be seen from the evidence presented so far, Oxnard and

Zuckerman's arguments were investigated, found wanting and appropriately discarded. That is the way of the scientific method. To dig up papers two to three decades old, portray them as fact, ignore the counter-arguments and claim "cover-up" is unscientific. It should also be noted that while Oxnard removed the australopiths from our line of ancestry, he believed that *Homo* and the australopiths shared a common ancestor. It is patently clear to anyone who takes the time to research present and past journals and books, that no evidence has been buried and there is no conspiracy to hide the truth and "protect" the public. All the lines of anatomical evidence, from straightforward measurements to cladistic analyses, are convincing in their documented measurements that the genus *Homo* is a descendant of one of the australopiths.

The long walk

I ascribe to the hypothesis advocated by, in particular, Bernard Wood (1984, 1994) and Groves & Mazak (1975) that the genus *Homo erectus* be split in two. The type specimen for *Homo ergaster* is KNM-ER 992, but some authorities regard it as belonging to *Homo erectus*. Wood controversially proposes that the Turkana Boy (KNM-WT 15000), dated at 1.6 million years ago, be reallocated from *Homo erectus* to *H. ergaster* on the basis of similarities with the type specimen. Wood theorises that *H. ergaster* arose in and migrated out of Africa into Asia, where it evolved in situ into *H. erectus*. Other palaeoanthropologists have conducted analytical tests on the remains under question and found that although there are morphological differences these are not enough to warrant the designation of a new species (Rightmire 1998 and references therein); in other words, the variability is sufficient to be accommodated within the existing designation.

Homo ergaster is the first indisputable hominin to possess modern-like body proportions, although tentative, controversial evidence is also available *for Homo rudolfensis* as reviewed earlier. The specimen provides invaluable detail both about the anatomy and the lifestyle of his genus. *H. ergaster*, in adulthood, would have averaged around 6 foot in the hot East African sun, which is the equal of the modern Masai. This suggests that their body attained its proportions because their lifestyle now involved full exposure to the sun. Tall body proportions are the most energy efficient way for bipedals to limit exposure to the sun over the entire body surface area and for sweating. It may be at this time that the last remnants of thick body covering hair were lost.

The subject of the origins of our speech has also been a much debated topic within palaeoanthropology and Turkana Boy goes a long way towards providing a solution. The spinal cord in the Turkana Boy narrowed in the area of his thorax, which indicates a lessening of vital spinal tissue and, consequently, nerves. These nerves are essential in *Homo sapiens*' control of breathing which is, in turn, linked to the ability to control our speech. Lacking control over their lungs, *H. ergaster* was incapable of modern speech although the extent of his vocal communication abilities in terms of pronunciation is debatable. The Broca area was once thought to be the most vital part of the brain controlling speech, and it is in evidence in the cranium of the Turkana Boy. However, newer research has revealed other sections of the brain also play a vital role and it is unclear to what extent these were present in *H. ergaster* (Walker & Shipman 1996).

In years gone by, emphasis of been placed on a linkage between the appearance of *H. ergaster* and the beginnings of big game hunting, the nuclear family, a more modern weaning period for children and labour division (Walker & Shipman 1996). While it is clear, through comparisons between the pelvic shape of *H. ergaster* and the cranial capacity of the Turkana Boy and adults, that youngsters remained dependant upon their elders for periods of time approaching the modern mean, closer scrutiny has dispelled the myth of "man-the-hunter." As is widely documented in the ethnography from contemporary and near-contemporary hunter-gatherer societies world-wide, hunting alone does not come close to meeting the nutritional requirements over a sustained period of time (see Smith et al. 2000 and the references therein).

The ability of *H. ergaster* to expand out of Africa into the Middle East and Asia must have been due to a more adaptive ability to deal with new environments and environmental variation. Although the evidence over central home bases and, by extension, nuclear families, is questionable (see Chapter 1), this was a species that cared for its members. KNM-ER 1808 died from hypervitaminosis A, which caused her severe discomfort and would have impeded her lifestyle. That she lived for weeks or even months after contracting this dreadful disease tells us a lot about her society, for there must have been a strong social bonding. This tighter social structure may have been another differential characteristic distinguishing this species from its australopith predecessors and contemporaries. Recently the "grandmothering" hypothesis has been resurrected by some investigators in a new form theorising about *H. ergaster's* social structure and their diet (O'Connell et al. 1999). This hypothesis proposes that *H. ergaster* had an intermediate life-span between chimpanzees and *Homo sapiens*, and that the elder members of the society actively participated in raising the young and in gathering plant foods (in particular, tubers). In this theory, meat hunting and scavenging plays a relative minor, but important symbolic, role. It emphasises that while the lifestyle followed by *H. ergaster* was intermediate between that of the australopiths and modern hunter-gatherers, it was highly successful in its own right. So successful was it, in fact, that *H. ergaster* was the first hominin to migrate out of Africa and colonise new regions of the world.

The date of the first Out-of-Africa migration has been fixed at 1.5-1.8 million years ago. The site of U'beidiya (Israel) dates to c. 1.2 million years (Tchernov 1987), while the Georgian site of Dmanisi has deposits comprising of Developed Oldowan tools and four *H. ergaster* skulls dating from c. 1.5-1.8 million years ago (Gabunia & Vekia 1995). Dates in the same time-frame have also been forthcoming from China and Java. Tooth remains from Longgupo, China, were put at 1.9 million but the identification of them as hominin has been disproven (Schwartz et al. 1996, Etler & Guoxing 1998). The Java sites of Bushmengiran and Mojokerto have been dated to 1.6 million and 1.8 million years respectively (Swisher et al. 1994, 2000). Although the provenance and relationship of the samples dated to the hominin fossils has been questioned (Semah et al. 1997, Langbroek & Roebroeks 2000), the accuracy of the dates have been rigorously defended (Swisher 1994, Curtis et al. 2000).

The currently available data therefore suggests two contrasting scenarios: (a) a migration out of Africa into the Middle East between 1.8-1.5 million years, and a subsequent expansion into Asia at around 1 million; or (b) an expansion into both the Middle East and Asia at around 1.8 million years.

Zhoukoudian and *Homo erectus*

The site of Zhoukoudian Locality 1 was first excavated in 1921 by J. Andersson, with the first hominin fossil (a molar) found by Otto Zdansky in 1923 (Klein 1999). Over the following decades preceding the Second World War, excavations were headed by first Davidson Black and, after his death, by Franz Weidenreich. Many more hominin fossils were uncovered, including skullcaps and other cranial fragments. In total, the remains found comprised a total of over 40 *Homo erectus* people. However, World War II interrupted and the fossils were lost en route to America; but not before Von Koenigswald had made first-rate casts which survive to this day. A more comprehensive overview of this period can be found in Trinkaus & Shipman (1993), and Walker & Shipman (1996).

Zhoukoudian is currently dated to between 500 000 - 240 000 BP (Klein 1999). This contrary to a 1983 report by Wu & Lin cited in "The Hidden History of the Human Race" (1999: 202-203). No mention is made of the subsequent tests which produced the revised stratigraphical dates, on oxygen-isotope correlations (Liu 1985, Wu 1985), faunal (Aigner 1986), and radiometric grounds (Chen & Yuan 1988, Grun et al. 1997). Whilst the incorrect impression given by Cremo & Thompson regarding the age of Zhoukoudian is irritating, their use of the data within Wu & Lin's report is disturbing.

Wu & Lin (1983), according to the data given on page 203 of "The Hidden History of the Human Race" (1999), suggested that the cranial capacity of the *Homo erectus* craniums in levels 8 and 9 averaged 1075cc. Cremo & Thompson (1999: 202) make a most serious accusation in accusing Wu & Lin of leaving out important information:

> "*Wu and Lin also neglected to mention that one of the skulls discovered in layers 8 and 9 (skull X) had a cranial capacity of 1,225 cc, which is 85 cc larger than the most recent skull (V), found in layer 3. When all the data is presented (Table 10.1, column B) it is clear that there is no steady increase in cranial capacity from 460,000 to 230,000 years ago… The report of Wu and Lin, especially their claim of increased cranial capacity in Sinanthropus [Homo erectus] during the Zhoukoudian cave occupation, shows that one should not uncritically accept all one reads about human evolution in scientific journals. It appears the scientific community is so committed to its evolutionary doctrine that any article purporting to demonstrate it can pass without much scrutiny*."

Cremo & Thompson give the cranial capacity for the four layer 8 & 9 skulls as: 1225, 1015, 1030 and 1025cc respectively. It is only when "skull X" is included in the calculations is Wu & Lin's average cranial capacity of 1075 cc reached. As is clear from the very chart Cremo & Thompson present, Wu & Lin were tracking the average increase in cranial capacity of *Homo erectus* over a substantial period of time. The average cranial capacity at

Zhoukoudian Locality 1 420 kya was 1075cc and 230 kya, 1140cc. Whilst it is natural to for overlapping to occur, the overall trend can be defined.

Radiometric, faunal and isotope dates are judged on the quality and reliability of the work undertaken. This leads to the rejection of unsustainable results. All dates, therefore, at the end of the day do not have equal parity, especially as extraction and dating techniques are constantly improving. Fossils are also judged on their stratigraphic context and by comparative analyses with fossils in other, more securely dated, sites. All these factors interact to produce the time frames given in scientific reports and are not arbitrarily decided upon in a vacuum on the basis of a doctrine.

To state "*if we find an apelike hominid in connection with a certain Middle Pleistocene fauna at one site and a more humanlike hominid in connection with the same Middle Pleistocene fauna at another site, then we must…conclude that the site with the more humanlike hominid is of a later Middle Pleistocene date than the other… With this manoeuvre completed, the two fossil hominids, now set apart from each other temporally, are then cited in textbooks as evidence of an evolutionary progression in the Middle Pleistocene! This is an intellectually dishonest procedure*" (Cremo & Thompson 1999: 205) is inaccurate and a gross distortion of basic scientific procedures.

Cremo & Thompson attempt to use the site of Tongzi to boost their case for scientific dating procedures to be faulty, on the grounds that a "*Homo sapiens*" fossil found in the context of a Middle-Upper Pleistocene range must date to the Middle Pleistocene. From this they move on to conclude that anatomically modern humans existed during the Middle Pleistocene in China. They also seek to back up their belief by stating the Maba skull, dating from the Middle Pleistocene, is that of *a "Homo sapiens with some Neanderthaloid features*" (Cremo & Thompson 1999: 208); but again their classification is inaccurate. Unfortunately for them, both Tongzi and Maba are classified as either late *Homo erectus* or *Homo heidelbergensis*, also known as "*archaic Homo sapiens*."

By-passing the archaics from the Far East

Apart from excluding the australopiths from our ancestry, in order to maintain their belief system that *Homo sapiens* have always existed Cremo & Thompson must also explain away *Homo ergaster*, *Homo habilis*, *Homo* *erectus* and *Homo heidelbergensis*. Giving Cremo & Thompson the benefit of the doubt assuming they regard *H. erectus* as subsuming *H. ergaster*, there is one real problem left: despite their dismissals of the australopiths and *Homo erectus*, nowhere in "The Hidden History of Mankind" are the examples of *Homo heidelbergensis* discussed with regard to their relationship with anatomically modern humans.

In 1999, Cremo presented a paper at the Fourth World Archaeological Congress entitled "Forbidden Archaeology of the Early and Middle Pleistocene: Evidence for Physiologically and Culturally Advanced Humans." This paper is available on the World Wide Web and it complements "The Hidden History of the Human Race" (pp. 155-159, which discusses Dubois and the Trinil femur). In it Cremo attempts to bypass *H. erectus* by claiming a co-existence with anatomically modern humans:

> "*During the early Pleistocene, the island of Java was sometimes connected with the Southeast Asian mainland (the Sunda continental shelf), but between Java and Flores there are three deepwater straits. The narrowest of these was at least 19 kilometers wide, even during periods of lowered ocean levels. Morwood et al. (1998: 176) noted, 'The impoverished nature of the fauna on Flores…seems to negate a connection with Sunda at any time. The presence of endemic pygmy elephants, giant reptiles and giant rats in the Early Pleistocene also suggests a continued insular context.' The implication of an 'insular context' is that Homo erectus, or whatever hominid was responsible for the tools, had to have arrived by boat. This would require a revolutionary upward adjustment of the cultural level of Homo erectus to include ocean crossing with vessels. Morwood et al. (1998: 176): noted: 'Previously…this capacity was thought to be the prerogative of modern humans and to have appeared in the Late Pleistocene, with the earliest widely accepted evidence for watercraft being the colonization of Australia by modern humans…between 40,000 and 60,000 years ago. Outside this region, the technology to undertake even limited water crossings is not clearly evident until much later, at the end of the Pleistocene.' But perhaps instead of elevating Homo erectus to a level of culture previously associated with anatomically modern humans, we should consider the possibility that the Flores hominid may have in fact been fully human. Some reason for this can be found in nearby Java. In 1891, Eugene Dubois discovered at Trinil a Homo erectus skullcap. The following year, he found a femur in the*

same deposits, at a distance of about 15 meters from the place where the skullcap was found. He nevertheless associated the femur with the skullcap, an association that eventually came to be accepted by most physical anthropologists… But subsequently Day & Molleson (1973) concluded that 'the gross anatomy, radiological [X-ray] anatomy, and microscopical anatomy of the Trinil femora does not distinguish them significantly from modern human femora.' They also said that Homo erectus femurs from China and Africa were anatomically similar, and distinct from those of Trinil. The layers in which the skullcap and femurs were found have a potassium-argon date of about 800ka years, roughly contemporary with the Flores finds… In summary, modern researchers say the Trinil femurs are not like those of Homo erectus but are instead like those of modern Homo sapiens. What is to be made of these revelations? The Java thighbones have traditionally been taken as evidence of Homo erectus existing around 800ka years ago in the Middle Pleistocene. Accepting their traditional provenance, it now appears we can accept them as evidence for anatomically modern humans existing 800ka years ago."

Would this adjustment of *Homo erectus*' cultural level be as radical as Cremo & Thompson imply? For some researchers, such as Alan Walker (1997) and J. D. Clarke (1995), it would be: they regard the "sameness" of the Acheulian stone tool industry as implying a static, low-level culture. What Cremo & Thompson do not mention is that this viewpoint has been challenged by other archaeologists, for example Sillen & Hoering (1993), and Kohn & Marek (1999). As new evidence comes to light, old hypotheses are re-examined and revised conclusions reached. It has longed seemed unlikely to archaeologists that *Homo erectus* would have reached Java without some form of watercraft. The investigation by Morwood et al. (1998) goes someway towards confirming this theory. Cremo's statement regarding the Trinil femur is factually incorrect. The femur is regarded as modern and does not date to the time of *Homo erectus* (Leakey & Lewin 1993).

The intermediary archaics

Homo ergaster vanishes from the African fossil at an earlier date than the last known representative of *Homo erectus* in the Far East: c. 600 000 BP in Africa (Klein 1999) as opposed to 27 000 BP at Ngandong, Java (Curtis et al. 2000). In Africa, *H. ergaster* was replaced by a daughter lineage termed *Homo heidelbergensis* (Rightmire 1998). Some archaeologists and palaeoanthropologists (e.g. McBrearty & Brooks 2000) advocate that *H. heidelbergensis* was confined to Europe, and the African archaics should be termed *H. rhodesisensis* and *H. helmei*. This was the time of the Middle Pleistocene and the Middle Palaeolithic Acheulian stone tool industry, which had originated with *H. ergaster* 900 000 years previously. One such early skull is from Bodo in Ethiopia and it clearly demonstrates the intermediary nature of *H. heidelbergensis* between *H. ergaster* and *H. sapiens* within the African continent.

The most prominent African *H. heidelbergensis* and early *Homo sapiens* remains are found at Elandsfontein (South Africa; Klein & Cruz-Uribe 1991), Laetoli 18 (Tanzania; Klein 1999), Ileret (Kenya; Klein 1999), Jebel Irhoud (Morocco; Grun & Stringer 1991), Bodo (Ethiopia; Klein 1999), Broken Hill (Zambia; Stringer 1986), Florisbad (South Africa; Brink 1987), Omo (Ethiopia; Klein 1999), Klasies River (South Africa; Grine et al. 1998) and Border Cave (South Africa; Sillen & Morris 1996). The *Homo heidelbergensis* fossils display close morphological affinities to anatomically modern humans (*Homo sapiens*). Ironically, some of the strongest support for *Homo sapiens* having originated c. 100 000 - 150 000 BP comes from one of the strongest debates raging in palaeoanthropology today: the Out-of-Africa versus the Multiregional theories of evolution. In this example we focus on three Klasies River cranial remains, KRM 21776 (mandible), KRM 16425 (frontal) and a maxilla. Rightmire & Deacon (1991) argue for the early Klasies River fossils to be included in *Homo sapiens*, while Wolpoff (1989: 65) regards them as retaining too many archaic features for inclusion:

> "*These three specimens are morphologically archaic. The frontal has a vertically thick although non-projecting superciliary arch that is not unlike that of Florisbad in its central portion, lack of nasal root depression, and low nasal profile. The mandible is extraordinarily robust for a 'modern' find from any geographic region, let alone from Africa where gnathic reduction is early*."

Europe received its first dose of immigrants in roughly 800 000 BP. *Homo erectus*, or a form of *Homo ergaster*, is present at the Italian site of Ceprano about 700 000 BP (Ascenzi et al. 1996). An early archaic Homo has been found at Trinchera Dolina, Atapuerca (Spain), which was given the new species designation of *Homo antecessor* (Bermudez de Castro et al. 1997). The date of this latter site has been estimated at 800 000 years, due to the fossils' position beneath a boundary of the earth's last magnetic reversal. The associated faunal remains, however, point towards a date closer to 500 000. This uncertainty needs to be resolved. Also, it is debatable whether the new species designation is warranted, due to the fragmentary nature of the hominin fossils. Further detailed investigations are required before any definitive conclusion can be reached regarding this site.

In fact, it is only from 500 000 BP onwards that there is any kind of consistent patterning of archaeological sites. There appears to have been an influx of immigrants from Africa or the Near East at this point in time, who are best *termed H. heidelbergensis*. The patterning before this time appears to have been sporadic occupation, at best, which likely did not contribute much to the gene pool of the incoming people. It is these new comers and their descendants who are represented at sites like Boxgrove, Heidelberg and Petralona. Once established in Europe, this population of *H. heidelbergensis* slowly evolved first into incipient and then into "classic" *Homo neandertalensis* (Rightmire 1998).

The one-million-year-old Masai

In 1913 the German geologist Hans Reck was searching at Olduvai Gorge when his helpers came across an anatomically modern skeleton in Bed II (out of a sequence of five beds, with Bed I being the oldest). Bed II is dated at 1.2 mya. Louis Leakey paid the site a visit in 1931 with Reck and came to the same conclusion, namely that the skeleton was not an intrusive burial due to the layer above the skeleton being intact. Later however, after soil samples were tested from Bed II and the skeleton, they published their revised conclusions, in the prestigious journal Nature: a grave filling from Bed V. Leakey also stated, in "Stone Age Races of Kenya" (1935), that although at first Oldoway Man appeared to be of great antiquity, subsequent closer scientific investigations revealed his age to match his recent modern morphology.

Cremo & Thompson (1999: 236) reject the revised conclusion on the invalid basis that "*perhaps Reck was simply tired of fighting an old battle against odds that seemed more and more overwhelming.*" Further details are given by Morell (1995: 66) that unmentioned go by Cremo & Thompson (1999):

"*Meanwhile, in England the death knell was sounding for Olduvai Man. Several independent geological tests had been run on the skeleton and soil samples. These showed that the body had been buried in Bed II in comparatively recent times, when a fault exposed that horizon. Sometime after the burial, Beds III and IV eroded away; then Bed II had been covered over by the deposits of Bed V. Reck had mistaken the soil of Bed V for that of Bed III – an easy enough error to make as both are a deep red in color*."

Cremo & Thompson (1999: 237) point out that Bed V has an age of 400 000 BP, so the skeletal remains "*still gives a potentially anomalous age for the fully human skeleton.*" However, Bed V is divided up further: Masek Beds, Ndutu Beds and the Naisiusiu Beds. The Lower Ndutu Bed began accumulating around 400 00 BP, and ended c. 75 000 BP. The Naisiusiu Beds are dated between 22 000 - 15 000 BP.

Reiner Protsch published the results of radiocarbon tests in 1974, which dated the skeleton to 16 920 years ago. These are challenged as untrustworthy by Cremo & Thompson (1999) on the grounds of:

- Uncertainty over whether the sample tested came from the original skeleton;
- The sample (224 grams) being a third smaller than the normal test size;
- Possible contamination, if the sample was from the skeleton, by more recent carbon through exposure to bacteria and preservation with Sapon, an organic preservative, which may not have been taken into account during the testing process; and
- The amino acids were not dated individually (for the technique called "Accelerator Mass Spectrometry," AMS, had not yet been developed) and therefore doubt can be placed on the reliability of the resulting age.

In the 1970s the sample requirement of many laboratories was 1 gram of carbon. Some laboratories had smaller counters. Fresh bone contains 20% collagen. The carbon content of collagen is 40%, which means that 224 grams of bone could potentially give 18 grams of carbon. Even if the bone was poorly preserved and had only 1% of carbon in it, the tests could still have been carried out reliably.

The procedure of extracting collagen with weak acid and getting pseodomorphs takes care of bacterial contaminants. If one follows the Gelatine extraction method, it is possible to incorporate some bacteria. NaOH takes care of humic acids. The laboratory would have dissolved the Sapon out.

The requirement for dating each individual amino acid is an artifact of AMS dating, not some command from on high. In part, it has to do using extremely small samples, which can be contaminated with very small amounts of contaminant. In the case of the Hans Reck skeleton this is irrelevant and the procedures followed by the laboratory, with the results obtained, stand.

Cremo & Thompson make an additional elementary mistake. In the extremely unlikely event that there were errors with the dating, they would be in exactly the opposite direction from what Cremo & Thompson predict: an intrusive burial may have contamination from material much older than the skeleton, which would make the dates falsely old.

When the broad spectrum of the radiocarbon date and the fluorine studies are taken together, Cremo & Thompson's conclusion (1999: 238-39) "*the available evidence suggests that Reck's skeleton should be assigned a probable date range extending from the Late Pleistocene (10, 000) to the late Early Pleistocene (1.15 million years)*" is untenable.

A classic misdiagnosis

The famous Louis Leakey. The same Louis Leakey who discovered "Zinjanthropus" at Olduvai Gorge also held preconceived notions that the history of anatomically modern humans stretched far back into the distant past. That in itself is not a bad thing, but Leakey took it to an extreme that permitted him to dismiss mounting contradictory evidence. Back in the 1930s all that was really known about human prehistory was at some point in time *Homo neanderthalensis* had existed in Europe and *Homo erectus* in the Far East. Africa was an unknown entity in palaeoanthropological terms. This opened a gap for Leakey to try and prove his theory of a very ancient antiquity for *Homo sapiens*, thereby relegating *Homo neanderthalensis* and *Homo erectus* to the role of interesting "cousins" who were not in our direct line of ancestry. It must also be born in mind that the excavation techniques of the 1930s lacked the tight chronological, stratigraphical and contextual controls imposed by those working in the field today.

It is this intellectual atmosphere which Cremo & Thompson (1999) delve into. By failing to take into account the above discriminatory factors, they are guilty of poor scientific analysis. They also fail to account for the provenance of the finds, new skeletal discoveries made subsequent to the 1930s, as well as new research undertaken into Leakey's original remains. Plummer & Potts' (1995) report appeared in the American Journal of Physical Anthropology, which is four years prior to the publication of the second edition of "The Hidden History of the Human Race." Equally important, a 1994 study by Plummer et al., in which the results of florescence analyses are given, also does not bear a mention. This oversight has enormous significance and implications in terms of Cremo & Thompson's conclusions.

Leakey led the Third African Archaeological Expedition in the 1932-33 season and the Fourth African Archaeological Expedition in the 1935 season, at the East African site of Kanjera near Lake Victoria. Hominin specimens 1, 2, 3, 4 and 5 were recovered in 1932. It is likely that hominin 3 is not a hominin, but the fragmentary nature of the remains attributed to it makes a final conclusion impossible. Further remains belonging to hominin 3 were recovered in 1935. The National Museums of Kenya uncovered remains said to belong to hominins 1,3 and 4, as well as new discoveries in the form of hominins 6 and 7 in 1981. The Smithsonian undertook work at Kanjera from 1987-88 and further remains attributed to hominins 1, 4, 6 and 7 were found.

The geology at Kanjera is complex. The currently recognised beds were determined by the Smithsonian Expedition, who divided the site into the following beds, in order from youngest to oldest: BCS (Black Cotton Soil), Apoko formation, Kanjera Formation (KN) 5, KN-4, KN-3, KN-2a and 2b, KN-1. Geological faults, exposing units of differing ages, also need to be considered. BCS is dated to the Holocene, the Apoko Formation to the middle-late Pleistocene, and KN to the early-middle Pleistocene (Plummer & Potts 1995).

Leakey's Kanjera skeletal discoveries were made in the area of KN-2a (Pickford 1984: 216). Hominins 1 and 4 were found on the surface, hominin 2 just below the surface, and all three were nearly adjacent. Hominin 3, on which Cremo & Thompson focus their main attention, was found in a south-easterly direction 60 yards away. The provenance of the Kanam jaw is explained in detail by Virginia Morell (1996).

The fluorine, nitrogen and uranium tests conducted by Kenneth Oakley on the Kanam and Kanjera remains were fairly inconclusive, yielding contradictory results. These are taken by Cremo & Thompson (1999: 244) to imply that:

"*...all in all, the results of chemical and radiometric tests do not eliminate the possibility that the Kanam and Kanjera human fossils are contemporary with their accompanying faunas. The Kanjera skulls, said to be anatomically modern, would thus be equivalent in age to Olduvai Bed IV, which is 400,000 to 700,000 years old. The taxonomic status of the Kanam jaw is uncertain. Recent workers hesitate to call it anatomically modern, although this designation cannot be ruled out completely. If it is as old as the Kanam fauna, which is older than Olduvai Gorge Bed I, then the Kanam mandible would be over 1.9 million years old*."

In the above statement, Cremo & Thompson have ignored Plummer & Potts (1995: 14) who dispute the old age attributed to the Kanjera remains by Leakey: "*While assigning the Kanjera remains to H. sapiens, Leakey felt that their long, parallel-sided braincases wide frontals, and thick vaults were primitive features consistent with their presumed antiquity. The crania are undoubtedly long, but their extreme parallel-sidedness is probably a reconstruction artifact*."

However, the thicknesses of various parts of the cranium differ in important aspects from those of Neanderthals, *Homo erectus* and *archaic Homo sapiens*. Plummer & Potts (1995: 19-20) explain further:

"*In acquired anaemia (e.g. iron-deficiency anaemia), inadequate availability of dietary iron results in abnormal haemoglobin. In both types, red blood cells are defective and have shortened life spans, leading to greater turnover and increased demand for haematopoietic tissue. During infancy and early childhood all marrow is already fully occupied with red haematopoietic tissue; in anaemic individuals long bone red marrow volume is increased at the expense of cortical bone, while diploe may increase at the expense of the tabular bone in the skull. In adults, red marrow space can increase at the expense of fatty marrow, and anaemia may not lead to bone remodelling. Modern Lake Victoria is host to a variety of parasites, including malarial plasmodia and schistosomes, providing the potential for both forms of anaemia among the circumlake populations. Maintenance of a balanced polymorphism for sickle-celled anaemia is an adaptation against malaria, with heterozygotes of the sickle-cell haemoglobin gene having increased resistance. A high parasite load and/or iron-poor diet can lead to iron deficiency anaemia. Cranial thickening in the Kanjera sample may indicate that individuals in past populations were also* *exposed to heavy parasite loads, and thus subject to hereditary and/ or acquired anaemia*."

The Kanjera remains found by Louis Leakey were likely shallow Holocene burials into older deposits (Plummer & Potts 1995: 20):

"*The provenancing of the hominid sample has always been problematic, because six of the seven stratigraphic units at the locality are bone-bearing, and most of the hominids have been surface-collected. The National Museums of Kenya's hominid sample, as well as several fragments from Hominids 1 and 3 in the Natural History Museum, London, were included in an energy dispersive x-ray fluorescence analysis provenancing study. The low elemental concentrations of the entire hominid sample indicates they postdate Kanjera Formation deposition"* (Plummer et al. 1994).

While the finds are therefore younger than the Kanjera Formation, exactly how old are they? The modern morphology puts it within the past 150 000 years and deliberate burials are most frequent from the Holocene period. Holocene burials with similar morphology were made by the 1974 Yale Expedition at Kanam which strengthen the argument that the skeletal remains of Louis Leakey at Kanjera were intrusive Holocene burials.

To further back up their claims regarding the Kanam jaw, Cremo & Thompson (1999: 241-242) state:

"*In 1960, Louis Leakey, retreating from his earlier view that the Kanam jaw was sapiens-like, said it represented a female Zinjanthropus. Leakey had found Zinjanthropus in 1959, at Olduvai Gorge. He briefly promoted this apelike creature as the first toolmaker, and thus the first truly humanlike being. Shortly thereafter, fossils of Homo habilis were found at Olduvai. Leakey quickly demoted Zinjanthropus from his stature as toolmaker, placing him among the robust australopithecines (A. boisei). In the early 1970s, Leakey's son Richard, working at Lake Turkana, Kenya, discovered fossil jaws of Homo habilis that resembled the Kanam jaw. Since the Lake Turkana Homo habilis jaws were discovered with a fauna similar to that at Kanam, the elder Leakey changed his mind once more, suggesting that the Kanam jaw could be assigned to Homo habilis. That over the year's scientists have attributed the Kanam jaw to almost known hominid (Australopithecus, Australopithecus boisei, Homo habilis, Neanderthal man, early Homo sapiens, and anatomically modern Homo sapiens) shows the difficulties involved in properly classifying* *hominid fossil remains. Tobias's suggestion that the Kanam jaw came from a variety of early Homo sapiens, with neandethaloid features, has won wide acceptance. Yet as can be seen in Figure 12.3, which shows outlines of the Kanam mandible and other hominid mandibles, the contour of the Kanam mandible's chin region (h) is similar to that of the Border Cave specimen (f), recognised as Homo sapiens sapiens, and to that of a modern South African native (g). All three share two key features of the modern chin, namely, an incurvation toward the top and a swelling outward at the base. But even if one were to accept Tobias's view that the Kanam jaw was neanderthaloid, one would still not expect to discover Neanderthals in the Early Pleistocene, over 1.9 million years. Neanderthaloid hominids came into existence at most 400,000 years ago and persisted until about 30,000 or 40,000 years ago, according to most accounts*."

Cremo & Thompson have inaccurately interpreted the fossil record with this statement: no Neanderthal remains have been found in Africa. Tobias is referring to the morphological characteristics shared by Neanderthals and late African *Homo heidelbergensis*, which are evidence of a shared common ancestor.

The Border Cave specimens, which include the one drawn in their book, are of anatomically modern humans. So it is no surprise when, compared to their drawing of an African jawline, the two chins closely resemble each other. When the BC and native South African jaws are taken in conjunction and compared with the Kanam jaw, the differences are stark. The extension of the Kanam "chin" is a deformative growth. It is also revealing, given the reference to *Homo habilis* as stated by the Leakeys, that Cremo & Thompson do not include a reconstructed *H. habilis* lower face for comparison. The prevailing view in palaeoanthropology today is well summed up by Virginia Morell (1996: 92):

"*Today, paleoanthropologists generally accept the authority of Louis's Kanam mandible. The Kanam beds are now known to range in age from about 200,000 to 6 million years ago. 'There is no reason to believe that the mandible did not come from where Louis said it did,' noted Harvard anthropologist David Pilbeam in 1987, 'and no reason that it may not be two or more million years old.' Pilbeam and others believe the fossil may represent Homo habilis, a species dating to two million years, which the Leakeys discovered in 1960 at Olduvai Gorge*."

Cremo & Thompson attempt to make a conspiracy "deliberately concealed" theory regarding the Kanam jaw out of something that does not exist in contemporary science. They also failed to take into account in "The Hidden History of the Human Race" (1999) the latest research results from Kanjera, which were well published in the scientific literature.

The rooting of *Homo sapiens*

All of the known *Homo sapiens* sites, and the implications of the excavated remains thereof, are discarded without a mention in "The Hidden History of the Human Race." These sites are well known and well documented. Equally devastating is the non-mention of the DNA sequencing results, which have been forthcoming for the best part of the last two decades, proving that anatomically modern humans do not have the deep ancestry which Cremo & Thompson would like to attribute to them (Takahata 1994; Penny et al. 1995; Hammer et al. 1998).

Objections have been raised by members of the general public to the usage of the molecular clock as a whole on various grounds. Different animals have different metabolisms and, subsequently, mutation rates vary. Hominoids produce antioxidants in their body which seems to have an effect on the mutation rates as they are slower. Contrasting body sizes come into play too and, as has been seen, there was significant sexual dimorphism in our past.

Rebuttals to these points have been issued by Dr Mark Stoneking (geneticist) and Professor Colin Groves (palaeontologist). Stoneking (2001: pers. comm.) replies:

> "*The answer to this and other theoretical objections to molecular clocks is that in practice molecular clocks do work. That is, statistical tests of empirical data demonstrate that rates of evolution are (with some exceptions) constant over time. So, even though we may not know why they work, and even though we can think of reasons why they should not work, the fact is that they do work. Presumably those factors mentioned…, such as metabolic rates, have at most a small influence on rates of evolution*."

Groves (2001: pers. comm.) provided a different variant:

> "*This relates to the 'global vs. local' molecular clock debate. Very few people now, to my knowledge, would support the idea of a global clock, but local clocks are widely supported, and can be tested*

(in part) by use of the Relative Rates Test: if species A and B form a clade with respect to C, then if a molecular clock holds, A and B should have approximately equal molecular distances from C. For example, Homo (human) and Pan (chimpanzee) have a common ancestor separate from Pongo (orangutan); if for any given DNA sequence a local clock exists, the Homo-Pongo genetic distance should be about equal to the Pan-Pongo distance. (The implication being that, since they separated from each other, the Pan and Homo lineages have continued to change at the same rates) There has been much discussion about this metabolic rate business, but I know of no evidence that there has been a slowdown of rates between Homo and other hominoids. In fact, relative tests suggest not.

"*[Is there] any evidence that mutation rates differ between men and women? I know of none! The old assumption was that the coalescent of mtDNA ('Eve') was the point of origin of Homo sapiens, but this is not necessarily the case at all. Ditto for 'Y-chromosome Adam'. Gene trees are not species trees; except in the case of selective sweeps, DNA lineages will separate before (often well before) population lineages. If there have been selective sweeps in the human mt- and Y-chromosome DNA cases, then 'all bets are off', except that one can expect that the human population was still living in a restricted geographic area at the time.*"

In palaeoanthropology and archaeology today, there are two competing theories seeking to account for the origins of *Homo sapiens*. Each has its own variants. The first is the Out-of-Africa whereby *Homo sapiens* originated in Africa and spread throughout the world displacing the local archaic inhabitants. Its proponents either advocate a strict replacement without admixture (Stringer 1989; Klein 1999), or some admixture between the incoming migrants and local populations on the peripheries with remnants seen in the skeletal remains of this early period (Brauer 1989). In opposition is the Multiregional theory which either sees all archaic populations evolving into *Homo sapiens* through continuous gene flow from the tip of Africa to the furthest regions of the Far East (Wolpoff 1989), or through *Homo sapiens* arising in Africa and spreading into the Near East with the subsequent gene flow along the peripheries accelerating the other archaic populations towards becoming anatomically modern (Smith 1993). Wolpoff would go as far as subsuming *H. ergaster, H. erectus* and *H. heidelbergensis* within *Homo sapiens* on this basis (Wolpoff et al. 1994).

Central to this debate are the early fossils from Klasies River, Border Cave, Omo, and others, and from Zhoukoudian, Europe, Middle East (e.g. Qafzeh and Skhul), Australia (e.g. Coobol Creek) and Java (Ngandong). The Multiregional theory concentrates on the Near Eastern, European and Far Eastern fossils, and sees continuous morphological traits over 1-1.8 million years. Wolpoff argues that an ancestry can be traced through the Ngandong skull to the early Australasian fossils. This has been contested by analytical test results suggesting the resemblance is superficial (see Anton & Weinstein 1999 and the references therein). These tests reveal close similarities between the early Australasian skulls and those of more recent times which were artificially deformed.

Stringer (1992) undertook a comparative analysis between late Middle Pleistocene archaic and recent modern crania. The aim was to test the underlying basis of the universal Multiregional and Out-of-Africa theories, by means of determining the relationship of modern humans to their archaic ancestors. The method decided upon was the Penrose Size and Shape Statistic, which has the crania's shape as its primary focus.

The late Middle Pleistocene hominids were drawn from the Neanderthal samples of Europe and the Near East, Africa and China. The results obtained confirmed the obvious close relationship between the two Neanderthal populations and indicated that the African and Chinese crania were not as closely related. Comparisons were also made between the Chinese and the two Neanderthal groups, and the African and the Neanderthals; the distances were big. The statistical shape analysis raises doubt over the multiregional claim for shape similarities between the Neanderthals and the Upper Palaeolithic inhabitants of Europe.

As the sharp differences between the Chinese and the African crania were smaller than between them and the Neanderthals, Stringer narrowed his focus. A reasonable deduction to be made if multiregionalism is correct would be a close affiliation between the archaic Chinese and modern Japanese (for Asia), and between archaic Africans and modern Zulus (for Africa). However, the shape distance derived from those calculations is greater than the distance between archaic Chinese and modern crania, and archaic African and modern crania. The same pattern is observed between the early modern and modern crania, i.e. inter-regional differences are of a greater magnitude than regional distances.

The results of this study of Stringer's are backed by a comprehensive survey done by Marta Lahr (1996), and an overview of the current Neanderthal debate (Hoffecker 1999). Although there are inherent problems with DNA sequence analysis in tracing the origins of *Homo sapiens* (Templeton 1992, Fu & Li 1997), the majority of studies support an African origin (Takahata 1994, Penny et al. 1995, Hammer et al. 1998). Other geneticists prefer to remain more neutral (e.g. Relethford 2001). The genetic evidence argues against Wolpoff's version of Multiregionalism, but while it supports an African origin of *Homo sapiens* between 100 000-200 000 BP it is not unequivocal in distinguishing between Stringer, Brauer and Smith's contrasting hypotheses. In recent years DNA samples have been extracted from Neanderthals in Europe and Mungo 3 in Australia.

Anne Gilbert (2001), an amateur scholar who heads the Palanthsci mailing list at Yahoogroups, has raised a few questions regarding the Neanderthal and "Mungo Man" DNA samples which have been recently extracted:

> "*There have now been three Neandertal specimens whose mtDNA has been analysed. In each case it was claimed that the results were very divergent from that of modern Europeans. However, what was not taken into consideration is the possibility (raised by Mungo Man) that ancient 'moderns' were also very divergent from modern 'modern' populations. It was just assumed that Neandertals were so divergent that they were somehow 'not us'*."

Stoneking (2001: pers. comm..) replies:

> "*Again, it was not 'assumed' that Neandertals were so divergent, the observation is that Neandertal mtDNA sequences fall outside the range of modern human variation. Whether or not ancient modern populations had mtDNA sequences similar to the Neandertals can only be answered by analysing ancient DNA from early modern fossils, which so far has not been done*."

Groves (2001: pers. comm..):

> "*This is a good point, of course, and we need to have data on more Late Pleistocene H. sapiens. What is clear so far is that (1) the three Neandertal sequences form a clade, which is about as heterogeneous as is the Homo sapiens sapiens clade (meaning, not very! Human mtDNA is famously homogeneous compared to that of any other hominoid species]; (2) the divergence of the two clades, sapiens and neandertalensis, is much older than the divergence of Mungo 3's mtDNA from other moderns'; (3) at every stage, DNA sequences in a species are varied, and it is obvious, given the (apparently) non-recombining nature of mtDNA, that, when an ancient*

specimen is sequenced, the older the specimen the more likely it is that a sequence will be picked up that is outside the modern range. There is no evidence that the divergent Mungo 3 sequence is anything but a polymorphic variant, but every evidence that the Neandertal sequences are not."

The Australian skeleton termed Lake Mungo 3 has recently become another central piece of the debate. Thorne et al. (1999) argue, on the basis of unreliable Electron Spin Resonance, Uranium-Series and Optically Stimulated Luminescence samples, that Mungo 3 dates from c. 60 000 BP. This has been disputed by Gillespie & Roberts (2000) and by Bowler & Magee (2000). Given that Mungo 3 was a burial, the most likely date is 43 000 BP. Gregory Adcock et al. (2001a, 2001b) extracted mtDNA from the skeleton and compared it with mtDNA from modern Aborigines. It fell outside the range. Here, they claimed, was the oldest *Homo sapiens* mtDNA. On the surface this is compelling support for the Multiregional theory. A good overview of the debate can be found online at the palaeoanthropologist Peter Brown's (2002) website. In 2001 I asked Professors Stoneking and Groves for their views on how the Mungo 3 data impacts on their viewpoints of the Out-of-Africa theory.

Stoneking:

"*I have real reservations about the authenticity of those results. Sensible criteria for authenticating ancient DNA have been published many times (most recently by Cooper and Poinar in a letter to Science, 289(5482): 1139, 2000) and these were not followed by the authors of the Mungo Man study – in particular, the results should be replicated in an independent lab. But if one assumes that the sequence is in fact real, then what it indicates is that 60,000 years ago (or 20,000 years ago, depending on what date you believe for Mungo Man) there were mtDNA lineages that are not found in modern humans today. This is not surprising, as we know that mtDNA lineages go extinct over time (and, if we believe the Recent African Origins hypothesis, only one of the many mtDNA lineages that were present about 150,000 years ago is now represented today). I can see two possible explanations: (1) the Mungo mtDNA type was one of the mtDNA types that was present in an ancestral African population whose descendants spread across the world, but subsequently this lineage went extinct, which is consistent with the Recent African Origin (with complete replacement) hypothesis; or (2) this lineage was present in archaic Australasians* *who interbred with modern humans coming from Africa, which is consistent with what Wolpoff calls the newest version of multiregional evolution, or what I and others call assimilation hypotheses, or a Recent African Origin with some interbreeding/admixture with some non-African archaic populations. I don't see any reason to favour one explanation over the other, so my viewpoint on the genetic evidence for modern origins hasn't changed. Namely, the genetic evidence strongly suggests a Recent African Origin of modern humans, perhaps with complete replacement, perhaps with some interbreeding (although the latter has not yet been demonstrated.*"

Groves:

"*There are many interesting findings. First, perhaps most remarkable, is the discovery of mtDNA in LM3 that is represented only by a nuclear insert in other modern humans. (I understand that some attempts to sequence mtDNA do in fact inadvertently sequence a corresponding insert, and I am sure that the authors have taken precautions against doing this). So the mtDNA of LM3 belongs to a lineage that diverged before the MRCA of living humans (coalescent point, or 'Eve'), a lineage that is now either extinct or very rare. Second is that, even with the discovery of this extremely divergent lineage, the Neandertal sequences are still some way outside the variation of Homo sapiens lineages. It may be, as they mention, that there was occasional interbreeding between Homo sapiens and Neandertals, but there is no evidence that it was anything but a very rare event, and there is certainly no evidence for the survival of Neandertal genes, mitochondrial or nuclear, in modern or Pleistocene European H. sapiens. Third is the failure to discriminate between 'gracile' and 'robust' fossil Australians. This is not at all surprising; there is no evidence that they are in any way different peoples, indeed the differences between them are very largely an artefact of artificial cranial deformation in the 'robust' population, a cultural activity that was widespread worldwide until the 20th century – the Australian occurrences (Kow Swamp and Coobool) being the earliest known evidence for it. As in Europe, Africa, Asia and (arguably) the Americas, late Pleistocene/early Holocene people in Australia were more 'robust' than their present-day ancestors. I agree that, when discussing modern human origins, the genetic evidence (at least the mitochondrial evidence) is equivocal; the African-origin model stands or falls by the* *fossil evidence (in my opinion, it stands). The authors' hypothesis of a selective sweep seems a good explanation for the global predominance of a single mtDNA lineage of limited time depth*."

Cremo & Thompson (1999: 251) hold a very strange view concerning the Neanderthals:

"*But what about the Neanderthals? These, say some authorities, show clearly an evolutionary transition between Homo erectus and Homo sapiens. But Leakey had another explanation: 'Is it not possible that they are all variants of the result of crossbreeding between Homo sapiens and Homo erectus?' One might object that such crossbreeding would have yielded hybrids that were unable to reproduce. But Leakey pointed out that American bison cross fertilely with ordinary cattle*."

This is an extraordinary statement which ignores the clear evolutionary development , as stated in both the Multiregional and Out-of-Africa models, of Neanderthals in Europe and the Near East, and the early ancestral links the fossils indicate from *Homo erectus* and *Homo heidelbergensis*. *Homo erectus* only continued to exist in parts of Asia, far away from Europe. Also, if *Homo sapiens* were so unique after surviving for hundreds of millions of years, they would have been genetically incompatible with *Homo erectus* and thus unable to successfully interbreed. Furthermore, what alternative genus and species designation do Cremo & Thompson want to give to the other species of the genus *Homo*, as they would not be related to *Homo sapiens* in their scenario. No alternative is given in "The Hidden History of the Human Race" (1999), which is a fatal methodological flaw. Effectively, Cremo & Thompson's statements fails to take note of all the contradictory evidence outlined in this chapter and instead relies on an appeal to authority.

Another factor in favour of the conventional views of human evolution and the rise of *Homo sapiens* is the spread of stone tools (Foley & Lahr 1997) and the rise of modern behaviour (Kaufman 1999, McBrearty & Brooks 2000). "The Hidden History of the Human Race" postulates that some eoliths resemble Upper Pleistocene and Holocene (Late Stone Age) tools; despite the fact that none of the "tools" cited exist today for modern analyses with more powerful tools and extreme uncertainty even over the reliability of the accuracy of the drawings. According to Cremo & Thompson's view, we would have Oldowan and Holocene-type tools existing side-by-side tens of millions of years ago, until the Oldowan died out 1.5 million years ago with the Holocene tools existing until the present. In that case it is very revealing that *H. heidelbergensis*, who has clear anatomical ancestry to *Homo sapiens*, is found with the Acheulian and Middle Stone Age industries; and the first clear *Homo sapiens* fossils are in context with Middle Stone Age industries. The first sign of a Late Stone Age-like industry is to be found in the Howiesons Poort industry of southern Africa, dated to 75 000 - 65 000 and discussed in greater depth in the next chapter. The Howiesons Poort is clearly a Middle Stone Age industry but it foreshadows the Later Stone Age in important details.

The mistaken child of the Howiesons Poort

Mr. Peers and his son had long been interested in the study of reptilia and zoology in general. They discovered Peers' Cave in Fish Hoek, Cape Town, South Africa, and commenced excavation work in May 1927.

Peers' Cave is a low shelter looking east, wholly protected from the north-east winds. The shelter is under the buttresses of a small group of hills isolated from the main Kalk Bay range and looks out immediately above and opposite to the entrance of the Kalk Bay Pier. The front of the shelter is shielded by rock talus and bush growth making excavation difficult.

The frontal span is 110 feet and it is 38 feet deep. It is sheltered by a projecting roof at a height of about 20 feet from the floor and projecting from the front about 30 feet. The fact that the cave is practically mid-way between the Indian and Atlantic Oceans means that the nearest relatives to the sea-shells now found in the shelter are about 3 and a half miles away. This suggests that the sea must have receded since the cave's occupation, hence the great age of everything consequently found there.

The excavation work began at the northern end of the shelter. Two crude pounders were found embedded in shell deposit at 2 feet. Below this point work was rendered difficult by a large rump in the cave wall. Further into the cave greater depth was obtainable.

The cave floor was subsequently marked out in 6 foot squares and work began on these. It was soon realised that the cave had been previously rifled by bad excavators, but the shell was carefully sieved. A few punched or bored shells, and further on a number of human toe and finger bones were discovered, and other fragments of an infant skeleton disturbed by the previous excavators. Many other fascinating relics of the past were found – a few stone implements, some no larger than a fingernail, fragments of woven reed, mother-of-pearl ornaments, piece of rope, bone awls and arrow-points, stone shoppers of a crude, shell-opening type, bored stones, beads of ostrich eggshell and other objects.

The whole floor was excavated to a depth of 5 feet and at this level all signs of occupation ceased and the cave rear curved in, reducing the floor space to a quarter and this consisted of a thick deposit of mountain sand.

Further interesting discoveries were made as Peers and his son continued their excavation and found, tucked away under the little shelters to the rear of the cave, three adult skeletons. One showed the decayed remnants of medicine bags strung as a curative belt about her, for she evidently suffered from lameness. Under another of these skeletons a fragment of rusted European iron was found, proving that this last burial was actually made after the early Portuguese voyagers has passed this way. Almost all the bodies had been buried in the same position – face downwards, with the legs folded under the stomach, and the arms tucked under the chest, the head being pressed slightly more deeply into the earth than the greater bulk of the body behind. A flat stone had been laid on the shoulders and some had ostrich egg beads strung on stripes of hide around their necks. All the skeletons seemed to have excellent teeth. The remaining overburden of shell was now sieved and removed leaving a sandy sterile floor overlying the lower deposit. High up in the north-eastern corner of the cave there are still faint races of ochre-painted fingers and hands on the rock wall.

After the shells were successfully removed, further excavations were started. Implements in considerable numbers appeared consisting of crescents (or lunates), burins, a few lance-heads and points, scalloped scrapers, with small fabricators, residual cores and core scrapers. These lay at a total depth of 7 ft 6 inches and form a single layer of about 18 inches thick, apparently undifferentiated. There were few signs of shell deposits at this depth (6-7 feet), thus bearing out the belief that the common fare of these people was quite different from the later inhabitants, consisting more of meat and vegetable matter than shell-fish. The layer in which the artifacts lay buried was of semi-crystalline hardness and contained no signs of decomposed matter, only dark sandstone granules tightly bound together, apparently by the 6 feet of accumulated midden material above.

The material is now known as the Howiesons Poort (which appears in southern Africa between 75 000 - 65 000 BP). The appearance of the Howiesons Poort industry caused a great deal of controversy, since, when it was first seen at Peers' Cave, it was assumed to be an early version of the Later Stone Age. Later it was recognised both at Peers' Cave and at Klasies that the Howiesons Poort was overlain by another flake MSA unit. In essence, this blade industry was an innovation within the Middle Stone Age.

The most dramatic find of all, however, was that of the little skull that was to make scientific history and bring these two amateur archaeologists world fame in 1929. Even they, inexperienced as they were, realised there was something totally different about this skull that lay at a greater depth than any – almost blackened with age – and with a notably difference in bone structure. They themselves could only guess at its antiquity and Mrs Peers decided that this small, blackened relic of a prehistoric past could not possibly be transported home in anything as homely as a rucksack. She removed her own hat and laid the skull gently inside. At first it was thought to date from the Howiesons Poort but is now believed to have been an intrusive burial from the Later Stone age deposits. When it was found, it was the largest brained type of humanity then discovered.

In January 1941 Peers' Cave was declared a National Monument.

The first American pioneers

Taking into account the fierce debate raging within North and South American palaeoanthropology regarding the first population of the Americas, the date can be fixed in a broad range from c. 14 000 - 40 000 BP. Cremo & Thompson (1999) seek to extend the time-frame back to around 250 000.

For Bushmendia Cave (America), they rely on the second hand testimony of Virginia-Steen McIntyre (Cremo & Thompson 1999: 93-94):

> "*In 1975, Virginia Steen-McIntyre learned of the existence of another site with an impossibly early date for stone tools on North America – Bushmendia Cave, New Mexico, U.S.A., where the implements, of advanced type (Folsom points), were discovered beneath a layer of stalagmite considered to be 250,000 years old… One such tool is shown in Figure 5.9. In a letter to Henry P. Schwartz, the Canadian geologist who had dated the stalagmite, Virginia Steen-McIntyre wrote (July 10, 1976): 'I can't remember if it was you or one of your colleagues I talked to at the 1975 Penrose conference (Mammoth Lakes, California). The fellow I spoke to as we waited in line for lunch mentioned a uranium series date on the stalagmite layer above artifacts at Bushmendia Cave that was very interesting to him – it disagreed violently with the commonly held hypothesis for the date of entry of man into the New World. When he mentioned a date of a*

quarter of a million years or thereabouts, I nearly dropped my tray. Not so much in shock at the date, but that this date agreed so well with dates we have on a controversial Early Man site in Central Mexico… Needless to say, I'd be interested to learn more about your date and your feelings about it!' According to Steen-McIntyre, she did not receive an answer to this letter. After writing to the chief archaeological investigator at the Bushmendia site for information about the dating, Steen-McIntyre received this reply (July 2, 1976): 'I hope you don't use this "can of worms" to prove anything until after we have had a chance to evaluate it.' Steen-McIntyre sent us some reports and photos of the Bushmendia artifacts and said in an accompanying note: 'The geochemists are sure of their date, but archaeologists have convinced them the artifacts and charcoal lenses beneath the travertine are the result of rodent activity… But what about the artifacts cemented in [original italics] the crust?*'"*

However, Cremo & Thompson use the data uncritically. They fail to take into account one of the primary site reports by Haynes & Agogino, summarised by Keith Littleton (1998), despite it having been published 13 years prior to the second edition of "The Hidden History of the Human Race." The stratigraphy of the site is complex and is given below, in descending stratigraphic order:

Unit J
Unit I
Unit H
Unit G
Unit F
Unit D
Unit C
Unit B
Unit A

According to the scenario advocated by Cremo & Thompson, the uranium-series date comes from the stalagmite layer Unit D and the artifacts from a layer beneath it. However, the stone tool pictured in their book comes from the layer *above* Unit D, Unit F, and is thus of a younger date.

Furthermore, Cremo & Thompson confuse stratigraphic layers. Unit D is not continuous throughout the site and is actually absent where the Folsom artifacts were excavated. Instead, Unit C is beneath the artifact bearing Unit F.

Unit G is also a stalagmite layer and it appears that Cremo & Thompson have confused it with Unit D. The "cemented" artifacts that Steen-McIntyre refers to come from Unit G. Also, the uranium-series dates are unreliable, on account of the Palaeozoic limestone which contaminated the samples' carbonate levels. Uncontaminated radiocarbon results obtained from the same samples paint a different picture, with dates of c. 13 000 BP. In conjunction to this date from Unit D, Unit H has a radiocarbon date of c. 9 000 BP. Those results are consistent with radiocarbon dates from other Folsum-bearing sites.

The vast extent of the discrepancy between the uranium-series and radiocarbon dates calls into question the uranium-series dates at Hueyatlaco, Valsequillo. Here the radiocarbon results again tell a different story. Steen-McIntyre participated as a graduate student on the USGS team which dated Hueyatlaco. The obtained uranium-series date of 250 000 BP was published in the site report by Dr Irwin-William, who was the head archaeologist directing the excavation. This is not mentioned by Cremo & Thompson (1999). They attempt to make out that archaeologists attempted to suppress the date without explaining why, then, McIntyre eventually got her own report published in 1981. They contend that the anomalous date ruined Steen-McIntyre's career. Yet, if it were true that anomalous dates ruin careers, it is miraculous that Irwin-Williams was by-passed. On excavations, ultimate responsibility for everything rests on the shoulders of the chief archaeologist and not a graduate student; therefore the brunt of anger would have been directed primarily to Irwin-Williams. In actual fact, those who disagreed with the uranium-series date did so on the basis of perceived deficiencies in the procedures used. Frank Steiger (1996) elaborates:

> "*Conditions at the site [were] complex... To obtain samples, trenches were cut into the formation, which consisted of different layers of sand, silt, and clay interspersed with layers of volcanic ash. The site was near a lake and had been subjected to flooding. In some cases the strata had been tilted considerably. Sampling location was a critical factor and there was considerable disagreement among Steen-McIntyre, Irwin-Williams and Jose Lorenzo concerning sampling location and interpretation*."

Taking all these factors into account, it is a safe bet that the uranium-series date of 250 000 BP is in error.

Calico (America) is dated to 200 000 BP by uranium-series and is a prime example of a setting for eoliths. It is in an alluvial fan. The site has clearly, therefore, been disturbed with the rocks and boulders having been reworked and redeposited. Cobble stones were broken. These factors make any stone tool deduction a haphazard guess, at best. The geological processes which created the Calico eoliths are detailed by Haynes (1973). Taylor (1994) has also done a review of the site and found it lacking. There is no context or anything approaching a context for this eolithic site. The details of Louis Leakey's involvement with Calico can be found in Morell (1995). Interestingly, "The Hidden History of the Human Race" (1999) does not cite these latter two works, and while the Haynes article is included in the references it is neither cited nor discussed within the text. This is a glaring omission for a book which claims to condense the arguments presented by "Forbidden Archeology" into an informative format for the general public.

While the sites of Sheguiandah (Canada) and Timlin (New York) are also cited as examples of anomalies, they have been investigated and found lacking (Julig et al. 1991, Cole & Godfrey 1977).

To end off this section on the populating of the Americas, it is worthwhile noting that the first *Homo sapiens* sites found in southern Siberia are from 45 000 - 35 000 BP and northern Siberia (inside the Arctic Circle), c. 25 000 BP (Goebel 1999). This correlates well with mtDNA studies done on Native Americans which estimates that the Americas were first colonised by immigrants from northern Asia between 21 000 - 14 000 years ago (Horai et al. 1993) and with the most recent anatomical study giving an age of 17 000 BP (Brace et al. 2001).

The power of the mind

One facet of recent *Homo sapiens* in Later Stone Age and Upper Palaeolithic times has been rock art paintings, a product of the modern mind. Here we examine different theories regarding southern African rock art and their significance. It is at this point, in my opinion, that *H. sapiens* truly flourish artistically in a form never before utilised.

With the empiricism approach having reached its limit of enhancing our understanding of the meaning of southern African rock art, David Lewis-Williams developed an alternative model which interprets the rock art as fundamentally shamanistic exhibiting the depictions of the trance performance in the ritual curing dance and aspects of community rituals by medicine men in order to enhance their power (Lewis-Williams 1983, Van der Merwe 1990).

Lewis-Williams makes metaphorical links between the art and Bushmen myth and ritual by drawing on the Bleak and Lloyd ethnographies, backed up with supporting evidence from Orpen and recent Kalahari ethnographic studies undertaken by Marshall, Lee, et al.

Aside from the easily disposed of criticism levelled at the so-called "shamanistic hypothesis" by the chief proponent of empiricism, A. Willcox (Willcox 1983), more serious challenges to differing aspects of Lewis-Williams' theory have emerged in recent years from Jolly (1995) and Solomon (1992, 1997, 1999).

Jolly investigates the question of the extent of Nguni and southern Sotho influence on the religious and ritual expressions in the rock art of south-eastern Africa, suggesting that their cosmology can be found depicted not only in some of the rock art but also in various accounts given by past informants (Jolly 1995).

Solomon, on the other hand, investigates the importance of application of Bushmen mythology to the rock art, suggesting the figures exhibiting animal and human characteristics are best understood not as trance-dancers but in relation to Bushmen myths and their belief system involving the spirits of the dead (Solomon 1997). Solomon also raises the question of the representation of gender in rock art (Solomon 1992).

By the early 1970s the realisation had dawned that, despite all the information gathered by means of data collections, a hypothesis explaining the meaning of rock art had still to be put forward. As the last artists had passed away a century before, first Vinnicombe and later Lewis-Williams turned to the ethnographic record – from the analysis of the modern Kalahari Bushmen by anthropologists, to the Bleek and Lloyd records and to the accounts left by Orpen. In fact this promising line of investigation had begun in the late 19th century, until brought to a temporary halt by Bleek's death in 1875 and Orpen's developing interest in other matters. Lloyd, continuing Bleek's work, did not hold the same fascination for rock art (Lewis-Williams 1983).

The empiricist approach that reigned supreme for much of the twentieth century is exemplified by the following statement of Willcox in criticism of Lewis-Williams' approach:

> "*In my opinion, the minimum hypotheses as the raisons d'être of the representational rock art of southern Africa are the following: (1) to record important or pleasant events in the life of the community or in the experience of the artist; (2) to instruct the young or illustrate folktales; (3) to give pleasure to the artist through his work and his*

recreation on the rock, to be seen again, of what pleased him at first view, coupled with the aesthetic experience and receiving admiration for his skill. This motive I take to account for the great bulk of the art, and it does not conflict with, but would accompany, Reasons 1 and 2... The importance of the pleasure principle can hardly be overstated" (Willcox 1983: 540).

In essence, the most simplistic explanation is the right one.

However, 'simple' explanations assume a range of interests and values on the part of the artist that are, in most cases, clearly a Western cultural construction. In reality it ranks the lowest in terms of the scientific evaluation of data by virtue of the fact it is ill-defined by nature and consequently its application is problematic (Lewis-Williams 1984). In summary, Willcox's interpretations of the rock art subtly implies a constructional understanding of the artists' system of values and the way that symbols expressed those values. Therefore an understanding of Bushmen values and beliefs is essential to a scientifically-applicable approach to interpreting the Bushmen rock paintings.

Lewis-Williams' trance hypothesis is based upon the many similarities between that observed among modern 20th century Kalahari Bushmen, that expressed in the Bleek and Lloyd records and that which is evident in the rock art paintings. Modern Bushmen shamans, when asking for supernatural potency, have their arms behind their back. This occurs when the intensity of the trance dance increases and the shaman feels the energy or potency beginning to 'boil' inside him (Lewis-Williams 1990, Van der Merwe 1990). Sticks were an integral part of the trance dance. Women rarely participated in the dance, instead clapping and singing medicine songs which helped activate the potency. This potency is believed to originate in the stomach, travelling up the spine and exploding in the head, the result of which is the dancer entering trance (Van der Merwe 1990). This dance can also be observed in the painting at Orange Springs, eastern Orange Free State (Dowson 1994). Nasal haemorrhaging also occurs in the curing ritual whereby the blood was wiped on the body of the patient in the belief that its smell would keep evil spirits at bay (Lewis-Williams 1982).

Yet caution has to be exercised in proposing that all depictions of rock art figures supporting themselves with sticks are representations of shamans in trance dancing. The possibility exists that some of these depictions are the expression of outside influences on Bushmen society, a form of symbiotic relationship (Campbell 1986). One such opinion has been voiced by Jolly in his examination of the paintings from the cave at Melikane, Lesotho (Jolly 1995). In this region the Bushmen were in contact with Nguni and Sotho groupings. Jolly believes they were influenced by their ritual practices, and points out that the bending posture of the Melikane figures, who support themselves with sticks, are reminiscent of the identical posture adopted by Nguni diviners who also support themselves with two sticks (Jolly 1995).

It is not only straight forward trance dance icons that are represented in the rock art, but also its symbols. The trance hypothesis proposes that a relationship was seen between a trance dancer symbolically ‘dying’ and a dying antelope by the southern Bushmen. Such an analogy was drawn upon because both staggered, sweated and suffered nasal bleeds (Lewis-Williams 1982). Trance also resulted in the sensation of the shaman’s hair growing, paralleled by a dying eland’s hair standing on end. Moreover, a dying eland was seen to be charged with the power a shaman drew upon as he symbolically ‘died’ (Lewis-Williams 1982). This led to the depiction of a relationship between a trance dancer and a dying eland, which is recognised by its front legs collapsing, blood pouring from its nose, and almost always its head is down. The eland is thus a primary symbol of trance potency (Van der Merwe 1990).

However the Bushmen concept of animal potency is not limited to the eland. The !Kung have ritual dances at the time of the year when bees are swarming, believing that bees possess the potency which is harnessed by the shamans (Lewis-Williams 1983). This symbolism of potency can be seen in the painting from Cullen’s Wood, Barkly East, South Africa, where bees are depicted over the heads of dancing men.

The sensation experienced by the medicine on entering into trance was often expressed in terms of water (Lewis-Williams 1990). This is the consequence of the roaring sound heard during particular altered states of consciousness, and symbolised in Bushmen mythology as a great body of water through which the shaman had to pass to enter the spirit world of the dead (Lewis-Williams 1990).

However, a hypothesis that emphasises the primacy of mythology results in an interesting variant. The /Xam myths, as recorded by Bleek and Lloyd, describe the waterhole as the realm of the spirits of the dead, as the realm of sickness. Solomon (1997) believes that these testimonies refer not primarily to trance but rather to the set of beliefs held regarding mortality, and that these are notions of ‘factual’ death rather than any hallucinations.

Thus ‘falling’ into and through water is visualised in terms of ‘death.’ In spatial terms a journey to the netherworld of the spirits of the dead and their mythical ancestors of 'The First Creation.' These mythical ancestors were regarded as being primitive, and to descend to their world was thought of as a reverse in time and culture (Solomon 1997). Thus the Bushmen concept of time was not linear, allowing spirits or trance dancers to travel regularly between the past and the present.

Both these explanations draw on Orpen's statement that the figures at Melikane represented those who had "*died and now lived in rivers*" (Orpen 1874: 2 cited in Solomon 1997: 3). On the other hand, as Qing kept in close contact with the Sotho, Jolly regards his remarks as probably expressing Phuthi notions associated with visits by diviners in trance to underwater realms. Jolly concludes that the reference to the 'dead' is likely to be a metaphor for trance experience, as the trance hypothesis proposed, but with the moderating influence of Phuthi religious ideology (Jolly 1995).

Lewis-Williams interprets depictions of so-called "flying buck" as "trance buck" – shamans in trance. The painting from Glenavon, Barkly East depicts some of the "trance buck" in a kneeling posture (the position a trance dancer often falls in to). Two of these dancers have antelope heads and all have their arms in the characteristic backward posture adopted when receiving potency (Lewis-Williams 1982: 435). Thus these figures are "dying" in trance and the transformation of the dancer into the buck is taking place (Lewis-Williams 1982, 1987).

The linking of the shamans and animals with which they fused, however, is sometimes almost virtually or fully complete, thus rendering detection very difficult. However, nasal blood is one of the evidences for painted shamans in trance (Lewis-Williams 1987). In fact the bleeding from the nose is one of the most important arguments against the interpretation of therianthropes as hunters dressed in animal masks, others being that often therianthropes bear flywhisks – an important trance dance symbol – and, instead of feet, have hoofs (Lewis-Williams 1987).

However Jolly puts forward a case for the Melikane therianthropes being instead representations of ritual functionaries – his likely candidate being either Sotho or Nguni, and not Bushmen, adopting ceremonial dress embodying an antelope's head and skin. He backs up this hypothesis by citing Walton (1957: 279 in Jolly 1995: 72) who "*remarked that Sotho ritual functionaries wear animal-head masks*." There is also the striking resemblance between the Melikane paintings and those of a Sotho-Tswana "buck-jumper" photographed in 1934 who clasps onto two sticks and is covered by an antelope's skin and head (Jolly 1995: 72). The argument that these ceremonial dresses were probably too impractical is countered by the photograph and records of similar skin dresses in other parts of the world (Jolly 1995: 72 citing Saunders 1989, 1994: fig. 3). Jolly also believe that the Melikane painting techniques differ from those depicting a fusion of man and animal, as the animals' heads seem to be attached to, and the arms and legs distinctly separate from, what appears to be a kaross (Jolly 1995). Jolly believes that further research could likely prove this to be the case with certain other therianthropic depictions.

This issue of ritual raises the question of whether there is any relationship between therianthropes and the Bushmen mythology, a line of inquiry which Solomon (1997, 1999) addresses. According to this hypothesis, therianthropes are most likely the spirits either of the ancestral Bushmen (in their 'First Creation' or therianthropic form) or of dead people considered powerful magicians while alive. When this perspective is taken into account then the references to water and death, together with the spoiling of the eland, become clear. The therianthropes can indeed be "*men who have died and now live in rivers, and were spoilt at the same time as the eland, rather than products of hallucinatory experience*" (Solomon 1997: 9).

Lewis-Williams has hypothesised that the elongated figures in the rock art are the representations of shamans' trance sensations of becoming taller (Solomon 1992, Van der Merwe 1990). However, in developing the hypothesis of the trance dancers' experiences being culturally determined, Solomon notes that gender conventions in recorded Bushmen records express femininity in terms of being "round/low/broad/short" and masculinity as "tall/narrow/slender" (Solomon 1992). Solomon consequently hypothesises that these assertions of masculine form determined the form feelings of bodily distortion in trance (Solomon 1992).

However, there are features of people in the rock art that can only be satisfactorily explained at present by the trance hypothesis – such as lines rising out of a shaman's head, which are said to be the shaman's spirit leaving his body and could only be seen by other shamans in trance (Lewis-Williams 1983: 9). For the /Xam informants of Bleek, out-of-body travel was important and some referred to these journeys as taking place in the form of an animal, the favourite being a lion (Lewis-Williams 1982, 1992). The aim of this transformation was to frighten away any lurking evil spirits which could also have assumed the shape of an animal.

The practice of rain-making is reflected in the Bushmen art in differing ways. According to Lewis-Williams, some of the rain-animals are probably narrations of the capture of a real rain-animal while others represent symbols of trance hallucinations (Van der Merwe 1990). A favourite rain-animal was the eland; and unnaturally-tusked figures have also been suggested to relate with rainmaking. The Bleek and Lloyd records speak of "*ritual practitioners...riding a 'rain-animal' to the top of a mountain and killing it so that its blood would fall as rain*" (Lewis-Williams 1992). It was believed that rain would fall where the blood of the rain-animal had run.

However Solomon believes that rain can be construed in gender terms as well, by pointing out that the Kung believe fat rain-bringing clouds are feminine and wispy rainless clouds are male. There is a similar belief about the 'footprints' of the rain – marks left by the rain on the ground that are broad and shallow are those of the female rain, while smaller and deeper marks are those caused by the male rain (Solomon 1992).

Solomon also points out that the importance of the eland as a rain animal, together with being a sexual and generalised fertility symbol, has a lot to do with its feminine characteristics of fat, docility, herbivorous and its link to water (Solomon 1992). There are many instances in the rock art paintings of human figures being connected to each other and to animals by means of a red line fringed with white dots (Lewis-Williams 1982). The trance hypothesis links the white dots to the shaman's footprints and the whole thing to the fundamental issue of potency with which the hypothesis deals with.

Solomon (1992) approaches the question from a gender perspective in which blood is viewed as feminine and representative of life, and water as masculine and death. One of Bleek's informants described the red lines with white dots as representing the "rain's navel," and therefore Solomon follows the thread that these lines might be a way of representing the contrast between blood and water. Where the blood of the rainmaking animal soaked the ground, rain was believed to fall. Thus the white dots probably represent rain drops, or the rain's footprints, rather than the footsteps of a shaman (Solomon 1992). There are paintings of shamans in trance in which dots portray the sweat from a shaman's armpits. The red line is interpreted as depicting blood.

Some of these lines will stretch for some metres through a rock shelter and link "*widely separated paintings and apparently weaving in and out of the rock face.... It enters a tiny inequality on the rock or simply ends, only to reappear a few centimetres away"* (Dowson & Lewis-Williams 1990: 5). Frequently figures seem to appear from or disappear into cracks and steps in the rock face. *"Others are 'folded' into concave right angles; still others* *come off the edges of convex right angles. Some are fitted neatly into facets or hollows in the rock and a few incorporate nodules of rock"* (Dowson & Lewis-Williams 1990: 5).

To explain these occurrences, Lewis-Williams has turned to the inner workings of the body's nervous system as there is one feature of trance that is neurologically determined (rather than the mind culturally valuing certain hallucinations above others) – the image of a tunnel, the sensation of travelling through one often being compared – on account of the rushing roaring heard – to that of the sound of rushing water. The tunnel was equated by the Bushmen with a hole in the ground through which the spirit world could be.

Lewis-Williams believes that often shamans entered trance in the presence of the rock shelter. Depth perception changes in trance and so their hypothesis proposes that "*the walls of shelters and especially holes and inequalities in the rock surface may, under such conditions, have appeared to be entrances to tunnels leading to the spirit world. Shamans were drawn into these tunnels as they headed for the other realm.*"

The shamanistic model developed by Lewis-Williams is currently the most widely prevailing explanation of the Bushmen rock art paintings, and has as its central role the Bushmen trance dance. In the Kalahari today, women sit around a fire while singing medicine songs containing supernatural potency and clapping to its rhythm. The men, of who normally roughly half are shamans, dance (Lewis-Williams 1987). They tremble and stagger before entering trance, after which they lay their hands on various people to draw real or imagined sickness out of their bodies. Shamans enter a deeper level of trance, collapse and endure various hallucinations – for example out-of-body experiences. In this hypothesis trance is primary and mythology secondary – the trance experience resulted in the Bushmen mythology.

What Lewis-Williams' hypothesis does not incorporate is the question of the symbolism of gender – how gender is portrayed in the rock art. With the social and economic gender divisions in Bushmen society, this aspect was sadly neglected until Solomon's' article (1992) and even now its relationship to the art requires further investigation. Solomon extended her investigations to include the possibility of the primacy of Bushmen mythology to trance (1997). In essence, Solomon puts forward the possibility that it was Bushmen mythology which culturally influenced which visions the shamans experienced in their altered state of trance and, consequently, the paintings are best viewed in association with the religious beliefs of the Bushmen.

Although the possibility of cross-cultural religious influences can never be ruled out (Jolly 1995), Lewis-Williams, Solomon and Jolly all emphasise, albeit in different ways, the role of the trance dance. And one of the major underlying reasons for performing the trance dance among the modern Kalahari Bushmen is to emphasise the group's social and spiritual cohesion.

CHAPTER FOUR:

THE ORIGINS OF MODERN HUMAN BEHAVIOUR: A SOUTHERN AFRICAN PERSPECTIVE

In March 1999 I led members of the Archaeological Field Club of the University of Cape Town, South Africa, on a field trip to the Acheulian and Middle Stone Age site of Cape Hangklip. Cape Hangklip is an hour and a half's drive east of Cape Town along the coast. It is an open-air site which spreads for kilometres in mountainous countryside. Once off the little-used small road, except in the tourist season, we were literally walking over hundreds of thousands of years of our ancestry. Myself, Matt and Nirdev demonstrated to the undergraduates what distinguishes a stone tool from a natural rock, the mechanics of stone tool manufacture and, where their sources of raw materials were. We located boulders which had been used as quarries, showed how the stone was quarried, and which discards were subsequently utilised in various manufacturing processes insitu and elsewhere in the landscape. We also discussed which hominins undertook the manufacturing processes, what the processes and settlement patterns reveal of their cognitive behaviour and their mental construct of the landscape, and how these cognitive and material patterns altered over time. Confronting the physical evidence for the continuity of anatomically modern humans from our Homo heidelbergensis ancestors through analysing the continuities in the stone tool record was very revealing. It drove home to everyone an appreciation of the constructive beauty and power of evolution, and left us with a deeper appreciation of the abilities of our direct ancestors.

What constitutes modern human behaviour and how can it be recognised in the archaeological record? According to the premise proposed by Cremo

& Thompson, there should be archaeological remains of this behaviour stretching back hundreds of millions of years. If their idea is to be valued, they should have also set forth criteria determining how such behaviour is recognised and evaluated against the fossil record. An examination of their work reveals that no such criteria has been proposed.

A principal component behind Cremo & Thompson's premise is summarised in Chapter 6 of "The Hidden History of the Human Race (1999: 103), under the heading "Evidence for Advanced Culture In Distant Ages":

> *"Up to this point, most of the evidence we have considered gives the impression that even if hominins did exist in the distant past, they remained at a somewhat primitive level of cultural and technological achievement. One might well ask the following question. If hominins had a long time to perfect their skills, then why do we not find ancient artifacts indicative of an advanced civilization?*
>
> *"In 1863, Charles Lyell expressed this doubt in his book Antiquity of Man: 'instead of the rudest pottery or flint tools…we should now be finding sculptured forms, surpassing in beauty the masterpieces of Phidias or Praxiteles; lines of buried railways or electric telegraphs, from which the best engineers of our day might gain invaluable hints; astronomical instruments and microscopes of more advanced construction than any known in Europe, and other indications of perfection in the arts and sciences.' The following reports do not quite match up to this standard, but some of the objects described do give hints of unexpected accomplishments.*
>
> *"Not only are some of the objects decidedly more advanced than stone tools, but many also occur in geological contexts far older than we have thus far considered.*
>
> *"The reports of this extraordinary evidence emanate, with some exceptions, from nonscientific sources. And often the artifacts themselves, not having been preserved in standard natural history museums, are impossible to locate.*
>
> *"We ourselves are not sure how much importance should be given to this highly anomalous evidence. But we include it for the sake of completeness and to encourage further study.*
>
> *"In this chapter, we have included only a sample of the published material available to us. And given the spotty reporting and infrequent preservation of these highly anomalous discoveries, it is likely that the entire body of reports now existing represents only a small fraction*

of the total number of such discoveries made over the past few centuries."

These artifacts have already been examined here and elsewhere. Contrary to their assertion, Cremo & Thompson have placed quite a big emphasis on their significance and the "revelations" they contain. By their own admission, this "evidence" does not come from any scientific sources which immediately places a question mark over their validity. These "anomalous artifacts" are bits and pieces scattered over vast spans of time. When considered in geological terms, they are mere spots on a page and their individualistic occurrence has no demonstrable basis or linkage. To get around this problem, Cremo & Thompson advance the absurd proposition that more such artifacts have been found but deliberately hidden away because they do not fit the evolutionary paradigm. One only has to visit a museum and view its storage collection to see the absurdity. Also, the eoliths, the very naturally occurring stone artifacts that Cremo & Thompson compare to the Oldowan and Palaeolithic industries, stand in direct contrast to the claims made regarding advanced technology: would the people who had the capability to cut the grooved spheres have been using extremely advanced technology on the one hand and stone tools resembling the Oldowan industry on the other. As there is no foundation to the claims, what is the real evidence in the archaeological record? Many overviews have been published in genuine scientific literature. Here I examine the evidence from a different angle, asking how does the evidence from southern Africa contribute to our understanding of the overall picture of the emergence of cognitively modern behaviour.

Background

The remains examined here include the type of artifacts manufactured and utilised, the composition of the faunal remains, and the occurrences of worked organic remains. The question of the behavioural capacity of the southern African MSA hominins has been much debated in the literature, predominantly through two principal figures over the last two decades with Richard Klein advocating primitive behaviour and Hilary Deacon, cognitively modern behaviour. The model offered by Klein for early modern behaviour is derived from a set of characteristics associated with Upper Palaeolithic hominins (Klein 1994, 1995, 2000). The focus in Europe has centred on Western Europe, and in particular the supposed boundary markers between the Middle and the Upper Palaeolithic at ca. 40 000 BP. These are the time periods in which Neanderthals and *Homo sapiens*, respectively, occupied Europe. According to this model, the hominins inhabiting Africa between 130 000 and 60 000 BP were physically modern or near-modern, but behaviourally they were very similar to their Neanderthal contemporaries.

The Neanderthals are believed to have manufactured a small range of recognisable stone artifact types, with their assemblages varying remarkably little over time and space despite environmental differentiation. It is also suggested that they obtained the raw materials for their stone tools from local sources rather than from afar. This, the model hypothesises, is indicative of small home ranges and/or simple social networks (Klein 1995). Also, resources such as bone, ivory and shell were rarely intentionally modified with the intention of producing formal artifacts. Although campsites of Neanderthals have been successfully identified, excavations have yielded little or no evidence for either the erection of structures or for any other formal modification of these sites (Klein 1995). It is suggested that the population figures of the Neanderthals were low and they were ineffectual hunter-gatherers who lacked, for example, the ability to fish. Klein (1995) also argues that the Neanderthals left no indisputable evidence for either art or decoration. Whereas the Mousterian Neanderthals produced only small quantities of symbolic artifacts, there are rich bodies of Aurignacian and Gravettian symbolic evidence. These take the form of body ornaments, three dimensional ivory figurines, beads, decorated or engraved or painted slabs, blade and burin technology, bone and ivory and antler tools and projectiles, as well as evidence on these objects for abundant intentional polishing (White 1990). These same Neanderthal-Upper Palaeolithic attributes are applied by Klein (1995) to the African MSA-LSA transition. In this scenario, therefore, the MSA of Africa is equated with the Middle Palaeolithic of Europe in terms of the range of artifacts produced, behavioural patterns and symbolic capacity.

An alternative argument has been put forward by Hilary Deacon (1989, 1995; Deacon & Deacon 1999) that, unlike in Africa, Europe was already occupied and in the grips of a glaciation when the first *Homo sapiens* arrived on the continent during a period of rapid climatic fluctuation with minor interstadials (Palmer 2000). Faced with these challenges, modern hominins would have had to both carve out a niche for themselves as well as find a way of expressing their self-identity. The beginning of the Upper Palaeolithic marks an explosion of archaeological sites, which has been correlated with a significant increase in population numbers; this has usually been the sequence of events upon modern hominins entering vast new territories (Diamond 1998). This would have resulted in the need for innovative ways of hunting and catching more food, and Deacon has suggested that this need manifested itself in specialised fishing and hunting equipment (Deacon & Deacon 1999). Groups would have been in competition with each other both for living space and hunting grounds, and means of identification would have needed to be expressed. Deacon hypothesises this was done via the explosion of art seen in this period, bone and shell ornaments, as well as the innovative stone tool technologies. In other words the Upper Palaeolithic was a regionally distinct phenomenon utilising stylistic symbolic signalling as identity.

The summaries of the behavioural implications of the southern African MSA have primarily focused on Klasies River. This is because Klasies River is the most excavated of the southern African MSA sites, with the best understood sequence. Die Kelders hasn't been far behind in Klein's summary of his faunal analysis work and the behavioural implications thereof. As these two sites are, consequently, the most important in the published literature they are included in-depth in this discussions. Southern African sites are amongst the most and best excavated in Africa and it is from here that potentially the best information derives. Other sites apart from Klasies River and Die Kelders have the potential to fill out and broaden our understanding of MSA behaviour when they are considered together as a whole. The literature is a mine of information, but it is also a mix of conflicting ideas. In essence though, unsuitable as it is because of the inherent influence from the European Upper Palaeolithic record, the following are the generally recognised attributes of cognitively modern behaviour (McBrearty & Brooks 2000: 491):

"Increasing artifact diversity
"Standardization of artifact types
"Blade technology
"Worked bone and other organic materials
"Personal ornaments and 'art' or images
"Structured living spaces
"Ritualistic
"Economic intensification, reflected in the exploitation of aquatic or other resources that require specialized technology
"Enlarged geographic range
"Expanded exchange networks."

An overview of the southern African sites

The mouth to Klasies River is located on the South African Tsitsikama coast between Plettenberg Bay and Cape St Francis. The Main Site cave depositories are situated a further half a kilometre to the south in a re-entrant cliff face, 40 - 60m above sea level.

Die Kelders is a site along the Cape South Coast with a sequence that stretches from the Middle to the Later Stone Age. It consists of two sea-level caves formed at the base of a 12m high cliff-face by the action of the sea and freshwater seeping through the irregularities between the Palaeozoic quartzite of the Table Mountain Bushmendstone series and the covering Neogene limestones that comprise part of the Bredasdorp Formation (Grine et al. 1991). At DK I, the continental shelf ends abruptly with the result that throughout the Middle Stone Age the site was never more than 1-5km distance from the coastline.

Border Cave is on the South African side of the border with Swaziland, in the southern Lebombo Mountains. It is semi-circular with a maximum width and depth of c. 40m and 30m respectively. The roof currently varies in height between 2m and 7m. The site is composed of deposits that are older towards the back by comparison with the front. The deposits are 4.5m thick, with the strata composed mainly of black or white ash (Beaumont 1973).

Bushman Rock Shelter is located in north-east South Africa, in the province of Mpumalanga. It is on average 56m wide and 25m deep, and was formed out of the Malmani dolomites of the Transvaal system. BRS has a cultural sequence stretching from the Middle Stone Age into the Later Stone Age. The first excavation was undertaken in Louw in 1969 but it was only with Inna Plug's excavations that the site has been properly analysed (the first 18 layers).

The Cave of Hearths is located in the former Transvaal province of South Africa. It contains ESA (Early Stone Age) as well as MSA and LSA layers.

The Middle Stone Age site of Florisbad is located slightly north-west of Bloemfontein, South Africa. It is a unique site in that spring vents formed its deposits. Archaeological investigations of Florisbad started around the turn of the century, in the 1910s and 1920s, but it was only in 1932 that the first large-scale scientific investigation occurred under Dreyer. In 1952, A.C. Hoffman and A.J.D. Meiring undertook a new research program, but it wasn't until the National museum took over control of the site in 1980 that further scientific investigations were allowed to continue.

Blombos Cave is situated on the southern Cape coast of South Africa and stands at a height of 35 metres above sea level, 100m inland. Preliminary excavations were undertaken in 1993 which have subsequently yielded both Later Stone Age (dating to within the last 2000 years) and Middle Stone Age layers, including the Still Bay Industry.

Kathu Pan, in the Kalahari region, is one of the rare sites, along with the Cave of Hearths and Wonderwerk Cave, which spans the ESA-MSA-LSA sequence. It is comprised of two Acheulian, two Middle Stone Age and two Later Stone Age assemblages.

Wonderwerk is believed by Beaumont (unpublished) to date back c. 400 000 BP, i.e. the Middle Pleistocene. It comprises of 2 Acheulian, 1 MSA and 2 LSA industries.

Sibebe Hill is a series of granite domes in the Mbulizi River Valley, in the Hhohho District of north-west Swaziland. Located 1 400m above sea level, the shelter is situated in the boulder field on the peak (Price-Williams 1981). The present day floor of the shelter is horizontal with the roof 6m at its maximum height, and the width 20m. Geologically, the surrounding region contains feldspar, granite, micro-granite and quartz (Price-Williams 1981).

It was at the farm Elandsfontein, north of Cape Town, that Ronald Wymer and Keith Jolly discovered the 60-odd fragments of the Saldanha skull. Lying in association with the skull were many artifacts and thousands of bones that date to the Acheulian. The site of Elandsfontein consists of a mobile area of sand, 3km long by 1.5km wide, and rests on a watertable, down to which level the sandy substrates have deflated. Thus the living conditions of the local Acheulian hominins were effectively that of a wetland (Deacon 1998).

Typology and social organisations

It is the deposits from caves 1, 1A, 1B, 1C (6 meters above sea level) and 2 (18m above sea level) which comprise the Klasies River Main Site. These caves, with the notable exception of 1B and its Howiesons Poort levels, contain the same sequences: MSA I, II, Howiesons Poort, MSA III, IV and late Holocene (the last 2000 years). These are chronological divisions, devised by Wymer, based on stratigraphic and typological characteristics (Singer & Wymer 1982). The strata, which are compressed through diagenesis of the shell carbonates, are composed of numerous brown sands separating ash and carbonised layers (Wurz 1999). The Howiesons Poort deposits range in thickness from a maximum of roughly 5m in Cave 2 to the minimum of about 1.5m measured in Cave 1A.

Oxygen isotopic analyses and uranium disequilibrium dating place the basal layer in correlation with MIS (Marine Isotope Stage) 5e (Deacon & Geleijnse 1988). It has been proposed that the SAS member (MSA I and II) is in the region of 90 000 years and the Upper Member (MSA III and IV) no less than 50 000, thus out of the range of radiocarbon techniques (Grine et al. 1990, Deacon et al. 1986). The Howiesons Poort is generally correlated with MIS 5a and 4, the boundary of which is estimated at around 74 000 kya (Deacon & Geleijnse 1988).

Local quartzite was used during MSA I to produce thin flake-blades. Some, but not all, of the flake-blades were retouched into points and denticulates. The edge of the striking platform on the core was carefully worked back and "bruised" until the critical angle was obtained. The long, thin flake blade was then detached from the core via an "intermediate punching technique" executed close to the edge; thus it also removed most of the platform (Singer & Wymer 1982). The succeeding MSA II saw a drop in the quality of the flake-blades, and higher frequencies of pointed flake-blades paralleled by a decrease in the quantity of worked points. The Howiesons Poort assemblages exhibit backed and/or truncated forms such as trapezoids and relatively large segments. These artifacts range in length from about 25 to 60mm and are manufactured from finer-grained raw materials. Silcrete, for example, was transported from sources up to 20km away. Typical Middle Stone Age flake-blades are also present, although they tend to be of smaller size than those of the other Middle Stone Age divisions. The MSA III, subsequent to the Howiesons Poort, bears similarities with the MSA II in that unifacial points and flake-blades with lateral retouch ('knives') are among common retouched forms. The MSA IV has yielded small convergent flake-blades (Singer & Wymer 1982).

Lindly & Clark (1990) theorise that the continuous lithic industries reveal no evidence of stylistic patterning over time, they concede that the Howiesons Poort layers (Layers 10-21 of Shelter 1A) demonstrate a shift in the Middle Stone Age industry to retouched stone tools. However, they make no reference to a recent technological and typological analysis of the MSA II stage at Klasies River Mouth, conducted by Thackeray and Kelly (1988), that concludes the finished product does not necessarily represent they way things are in practice, but rather the way things should be ideally.

The correlation of the Howiesons Poort layers with a period of changing environmental conditions has lead Hilary Deacon to propose an inter-relationship whereby the environmental stress caused by the ecological changes resulted in attempts by the MSA hominins to maintain previously existing social structures and populations levels. Instead of adapting to nature, they modified their behaviour. Remnants of their adaptation can be found through examination of their stone artifacts in functional terms. Deacon (1995) concludes, through analogies with Wilton backed artifacts which were most likely used as arrowheads, that the backed segments and trapezes are best regarded as hafted projectile points used in hunting. The MSA backed pieces are larger and were more likely to have been spear points and barbs. Bushmen ethnographic writings record that projectile points carry both stylistic and social meaning, marking social and linguist groups, and are used as exchange gifts. The appearance of backed artifacts in the Howiesons Poort is, therefore, viewed as an attempt by the tool-makers to mark out social boundaries and the intensification of social networks under a period of environmental duress. As the climatic conditions improved towards the onset of the MSA III, the factors that influenced this cultural selection for a high level of symbolic behaviour therefore gradually fell away and the people reverted to their standard MSA technology (Deacon 1989).

A Howiesons Poort sample (KR2-95) was randomly surface scraped in 1995 from Klasies River Cave 2 by Sarah Wurz for her Masters thesis. The waste materials were included within the sample, although the primary aim was to collect more backed pieces for analysis (Wurz 1997). Comparisons were made with the 1968 Cave 1A top cutting (119 336 artifacts) sample (KR1A-68) of Singer & Wymer by utilising the use of the same major typological categories: waste, utilised pieces or edge-damaged pieces and formal artifacts (Wurz 1999).

Waste counted for 97.35% of the 14 246 KR2-1995 artifacts. In-depth analysis revealed that while stone working took place within the cave, with chipping debris and irregular unretouched flakes making up 45.79% and 25.96% of the assemblage respectively, cortex flakes were uncommon. These findings, backed up by the KR1A-68 assemblage, indicate that the primary preparations of the cores were undertaken elsewhere, possibly at the quarry sites (Wurz 1997). Similar findings were derived from the Howiesons Poort levels at Nelson Bay Cave (Volman 1981).

Howiesons Poort blades occur in greater frequency than their typical MSA predecessors and descendants, 17.44% versus 0.98% (Wurz 1999). There is also a lack of retouched and utilised artifacts. Blades are more common in this period than flakes for use as blanks, 207 blades versus 42 flake-blades in the KR2-1995 assemblage (Wurz 1997). These blades were produced using a punch technique, which is the only identified instance of the technique's occurrence in the MSA. The backed artifacts have previously been suggested by Thackeray (1992) to be less standardised than their Later Stone Age counterparts, a conclusion countered by Wurz (1997). The variation coefficient obtained falls within that recorded for the LSA, demonstrating the backed artifacts from the Howiesons Poort and the Later Stone Age were designed with a comparable mental construct in mind of their shape parameters (Wurz 1999). Backed artifacts from the MSA Howiesons Poort and the Later Stone Age Wilton are design types of the same kind, although the Howiesons Poort backed artifacts range from two to three times their size (Wurz 1999). Wurz draws parallel between demonstrable archaeological and ethnographic usage of backed artifacts as projectiles (Deacon, J. 1992). Amongst the Bushmen these projectiles are imbued with symbolism (Wiessner 1983). Wurz points out that there are many possible forms that projectiles can take and therefore the form chosen during the Howiesons Poort was a material action of choice governed by social rules and by extension was a form of modern behaviour (Wurz 1999).

Although 148 pieces of ochre (4 of which are ochre rubbers) were found in the KR2-1995 assemblage, the inference is that the hominins readily utilised it, although the exact purpose, bearing in mind its fragile nature, is unknown (Wurz 1997). It is noteworthy that both red ochre and ostrich eggshell show parallel increases in frequencies throughout the Howiesons Poort layers (Wurz 1997).

By comparing the raw material samples of KR2-1995 and KR1A-68 in terms of quartzite and non-local rock occurrences, Wurz (1997) determined that a marked difference is evident in the raw material composition. Singer & Wymer's KR1A-68 was biased as a result of the majority of the waste products being discarded. Around 27% of its Howiesons Poort artifacts were manufactured from non-quartzite (and consequently non-local) raw materials (Wurz 1999). By contrast the unbiased KR2-95 is comprised of 4% non-quartzite artifacts, with a high percentage (39%) of the retouched artifacts made from these materials (Wurz 1999). A high degree of selection is therefore in the choice of raw materials.

Wurz used the analytical *chaine operatoire* approach in analysing particularly the choice of raw materials by the Klasies River people for their stone tools. Non-quartzite materials increase in numbers only in the middle stages of the Howiesons Poort, before again falling to low levels (Wurz 1997). It is doubtful whether the sources for the raw materials changed significantly over time, if at all, and therefore Wurz (1997) attributes these raw material changes to conscious choices.

Wurz (1997) analysed the backed artifacts in terms of segments (crescents), intermediates and trapezes to determine whether a relationship could be established between the form and extent of backing, and the resulting artifact. Subsequently, scrapers were analysed for they obligate a different operational manufacturing strategy (Wurz 1999). The waste materials are also regarded as by-products from the main design of shaping cores for the removal of blanks. Consequently, the production and subsequent utilisation of backed artifacts were likely to have been the result of decisive decision making and deliberate steps taken. Wurz (1999: 42) states that "*the decision steps that are part of this operational sequence are the acquisition of raw material, the techniques used to produce the distinctive blade blanks, blank selection and the production and use of the backed artifacts*."

F. R. Schweitzer conducted excavations at Die Kelders I (the larger of the two caves) between 1969 and 1973. The LSA layers, radiocarbon-dated to between 2 000 and 1 500 BP, are separated from the occupational levels of the Middle Stone Age by sterile strata (Schweitzer 1979). The Middle Stone Age layers at Die Kelders I have been dated, by electron-spin resonance and correlation of the sedimentary sequence to the global climate stratigraphy, to the early part of the Last Glaciation, or Isotope Stage 4 which dates between 74 000 and 59 000 BP (Klein & Cruz-Uribe 1996).

The MSA layers have yielded no deliberately altered bone pieces. The 200 000 pieces comprising the stone tool collection were manufactured from debris fragments of poor quality quartzite rock wall, some of them smaller than 30mm (Grine et al. 1991). From level 6 down, wall rock becomes increasingly abundant and some parts of it were occasionally used as a source of raw material. Level 6 yielded roughly half of the site's excavated MSA artifacts. The dominant raw material is quartzite, although there are instances of quartz and silcrete being used for stone tools also (Grine et al. 1991).

The quartz flakes differ from those found at other southern Cape Coast MSA sites, where the raw material (together with silcrete) was often only available in the form of small beach cobbles. These cobbles contain structural fractures and which hindered any efforts at producing large, regular flakes out of these raw materials. The quartz flakes at Die Kelders measure up to between 50-60mm in length and silcrete flakes (predominantly from Levels

5 and 6) between 50-70mm, reaching up to 80 mm and 90 mm long in some instances (Grine et al. 1991). Quartzite was manipulated in the same fashion as the other raw materials both in a technological and a typological sense. However, other MSA sites displayed the sharp differentiation between quartzite used for long, regular flakes and the quartz and silcrete cobbles selected for the manufacture of small, sharp-edged flakes; this occurred most likely because quartz and silcrete have properties more conducive to finer trimming than those contained in the quartzite raw material (Grine et al. 1991). Quartz and quartzite are available in the immediate surrounds of the site. The sources of silcrete were probably not too far away, with the most likely candidate being the flooded continental shelf.

Throughout the MSA layers the following attributes are common to the elongated flakes: parallel, sub-parallel and, on occasion, convergent dorsal scars (Grine et al. 1991). Levels 10-15 reveal long and proportionately narrow quartzite flakes. The quartzite flake size, by comparison, in levels 6-9 is shorter with increased width; while levels 4-5 quartzite flakes revert to relatively greater length with a decreased width. The samples drawn from all the MSA layers at Die Kelders I were mostly small. This led Grine et al. (1991) to suggest that therefore the most reliable contrasts that can be drawn between different layers are from the top (level 4) and bottom (14-15), against the middle layers 6 and 8.

Radial cores are abundant through the MSA sequence sometimes, reduced substantially below their original size. This conclusion was arrived at by the fact that none of the large, elongated flakes fit the cores sampled. It has been suggested that they may have been altered from single and double platform types to radial and change-of-orientation types in the process (Grine et al. 1991).

Less than 1% of all pieces >30mm from all MSA layers display any kind of systematic retouch (Grine et al. 1991). From most other sites from southern Africa, which also lack stone tools made from the crypto-crystalline raw material, this same pattern can be observed (Volman 1984). The stone tool retouch in the DK1 sequence, although it may have resulted sometimes in fairly regular denticulation, is primarily comprised of varied and irregular damage to most of one or more flake edges resulting from disproportionate notching and lighter removals. In some instances these modifications are difficult to distinguish from utilisation and/or post-depositional damage that may occur (Grine et al. 1991). No evidence exists for discontinuity in the kinds of retouched pieces that were produced throughout the sequence.

Level 6 yielded many of the several dozen pieces that exhibit edges displaying concentrated, continuous and regular enough removals that classify them as scraper retouch. *“Only one piece even minimally qualifies as a retouched point; this is a silcrete flake from level 12 that has convergent dorsal scars and some trimming near one edge”* (Grine et al. 1991). The southern African Howiesons Poort is characterised by the increased exploitation of the crypto-crystalline raw materials and by backed pieces. The lack of these artifacts have led Grine, Klein and Cruz-Uribe to conclude that the Howiesons Poort may be absent at Die Kelders I.

Prior to Peter Beaumont’s excavations for his 1978 MA thesis on Border Cave, BC had been excavated previously on the three separate occasions by affiliates from the University of the Witwatersrand. This started with Raymond Dart (July 1934) in conjunction with the Department of Anatomy. No report appeared, as Dart’s excavation was regarded merely as a prelude to forthcoming expeditions. Through the activities of farmer W.E. Horton in 1940, digging up sediments to sell as “agricultural fertiliser,” hominin remains, comprising a nearly complete frontal fragment of a skull as well as limb-bones, were discovered. Dart stepped in to launch another excavation in the winter of 1941, with the co-operation of the departments of Anatomy and Geology.

However, it is from Beaumont’s excavations that the currently accepted lithostratigraphy is derived. Border Cave thus provides the ideal conditions for a study of its long and exceptionally complete cultural sequence throughout the MSA and the LSA until roughly 30 000 BP (Beaumont 1978). The deposits were laid down at extremely slow sedimentation rates.

The sequences of Border Cave are as follows, in relative order from youngest to oldest (Beaumont 1978):

- 1BS.UP (First Brown Bushmend. Upper)
- 1BS.UP (Sterile layer)
- 1BS.LR (First Brown Bushmend. Lower)
- 1WA (First White Ash)
- 1BES.UP and LR (First Beige Bushmend. Upper and Lower)
- 2BS.UP (Second Brown Bushmend. Upper)
- 2BS.LR (Second Brown Bushmend. Lower), 2WA (Second White Ash), 3BS.Up and LR (Third Brown Bushmend. Upper and Lower), 3WA (Third White Ash)

- 1RGBS.A and B (First Rubbly Grey-Brown Bushmend. A and B)
- 1GBS.UP and LR (First Grey-Brown Bushmend. Upper and Lower)

The “Early” Later Stone Age is characterised by ground bone and other objects (e.g. bone and shell beads); differing scrapers (primarily straight- and convex-edged) dominating the formal tool assemblages; backed artifacts, including two geometric microliths; microbladelets and the exclusive occurrence of flakes with plain platforms (Beaumont 1978). Beaumont believes that the 1WA/1BES (charcoal radiocarbon dated to c. 39 000 BP) and 1BS.LR (c. 30 000-39 000 BP) layers are to be classified as belonging to an “Early Later Stone” tool technology. He arrives at this conclusion because of the presence of potential bone arrow points and ostrich eggshell beads, items that appear throughout the subsequent LSA stratigraphic sequence, as well as through an examination of the faceted flakes and the few radial prepared cores of these layers.

Backed pieces are evident in the stratigraphic sequences 1RGBS, 3BS (Middle Stone Age), 2WA and 2BS.UP (MSA3), all of whom are outside the limits of radiocarbon dating (i.e. they have infinite dates and therefore are older than 45 000 BP). The backed pieces are conspicuous by their absence during MSA1 (Middle Stone Age 1, which is bracketed between the older layers BACO.D and 1GBS.UP).

There is a noticeable increase in the use of cypto-crystalline for raw materials between the 3WA and BACO.D layers (which excludes the 1RGBS and 3BS, as well as the 1GBS.UP sequences). Also, backed points partially replace trimmed points between 1RGBS.B and 3BS. Border Cave has a relatively low percentage of points made from chalcedony and this, due to it being less readily available than crypto-crystalline, could suggest that perhaps an uncertain value was attached to them (Beaumont 1978).

The typological changes recorded through the different stages of the Middle Stone Age are correlated with the appearance of, in Beaumont’s (1978) opinion, advanced economic, ethical and aesthetic systems. These systems are believed by Beaumont to be physically manifested in one form by the presence of pigment throughout the entire MSA sequence at Border Cave (Beaumont 1978). The regularity of its occurrence suggests systematic accumulation of the pigment, rather than fortuitous sporadic collection or association. These pigments occur in two different forms: in “plain” shapes with damage fractures resulting from its extraction or from pounding parts off for powder; and ground pencils, most of which exhibit multiple facets from it being rubbed against various abrasive surfaces (Beaumont 1978).

The upper 18 levels at the Bushman Rock Shelter, dating to the Late Pleistocene and early Holocene, are easily distinguishable by soil colour and texture, as well as their contents (Plug 1981). The first 16 levels contain heavy ash concentrations, as does Level 17 which also yields chips from the roof and wall. These chips average out smaller and less weathered than in Level 18. A continuous, thick and blank deposit forms a neat separation barrier between levels 14 and 15/16 (Plug 1981).

Levels 1-14 have been attributed to the Later Stone Age, with some broken artifacts occurring in levels 13 and 14 that exhibit characteristics of the Middle Stone Age (Plug 1982). Levels 15 and below are ascribed to be Middle Stone Age. Vast discrepancies have emerged between radiocarbon dating of charcoal samples (Plug 1981) and the dates given by UCLA that were derived from the faunal assemblage.

The raw material utilised most frequently in the Middle Stone Age at BRS was hornfels, compared with quartz in the Later Stone Age. The period during which layer 18 formed was one of wetter conditions than either those preceding or following it. Unlike at Pomongwe, BRS remained occupied at this time as evidence by the vast amount of artifacts and bones that have been excavated, as well as the concentrations of ash from hearths. However, level 18 is separated into two deposits by a roof spall, with a clear break in between. The upper spall exhibits more signs of weathering than those immediately following it, suggesting a greater exposure time. Plug (1981) suggests that the level was deposited between 26 000 and 14 000 BP, during the cold phase. It is unclear, though, how the dates derived from the faunal assemblage of level 18 (c. 30 100-33 700 BP) fit in with this suggested scenario. The picture is completed further by the fact that the level 17 faunal sample does not provide a clear and accurate overview of climatic change with regard to the upper sections. A larger and more representative sample is required.

The typological assemblages from levels 15-18 are well-manufactured tools displaying a variety of bifacial and unifacial retouch. Points are included, but without a definition of the usage of the uncommon term. There are predominantly facetted platforms. The artifacts, particularly those made from hornfels, are larger than those unearthed from levels 1-14. Levels 15-18 have yielded no backed tools, with the possible exception of two flakes from levels 17 and 18 that display very steep retouch (Plug 1981). End scrapers are present in small quantities. Side scrapers, together with side- and end-scrapers, are present in quantities. Retouch is more common than pieces displaying solely utilisation, a reversal from the occurrences of levels 6-14 (Plug 1981).

The Cave of Hearths contains a substantial Early Stone Age deposit, together with MSA and LSA layers; this makes it one of only a handful of sites in southern Africa that does so. The first occupational evidence of the cave of Middle Stone hominins is the narrow trench-like camp place found at the back of the cave, also known as Bed 4 (Mason 1988). It is unclear whether Bed 4 was a continuous occupation or whether there were breaks between the yearly occupational rounds of the MSA hunters and foragers, in the view of Mason. However, it is unknown whether the MSA rounds, if they had rounds, were annual or longer-term which were perhaps dependant on varying cycles of rainfall and grazing for wild animals.

What is known, however, is that roof scaling and soil blown or washed in over the shelving roof of the cave covered all the MSA debris layers through time. A vertical east wall was created half way through the MSA by an enormous slab that had separated from the roof. This new wall was the focal point that upheld the 'Late' Middle Stone Age.

Revil Mason (1988) divided the MSA sequence of the Cave of Hearths, dating roughly from 100 to 50 kya, into Beds 4-9. Each bed contains deposits between roughly 25cm and 150cm in depth (Mason 1988). Bed 4 is the 'Early' Middle Stone Age, Bed 5 is the 'Middle' Middle Stone Age, and Beds 6-9 are the 'Late' Middle Stone Age levels.

These dates for the Middle Stone Age at the Cave of Hearths were derived from a comparison with the Kalkbank Middle Stone Age faunal assemblage, in conjunction with the radiocarbon dates from Bed 2 ('Later' Middle Stone Age) at Olieboompoort (Mason 1988). Olieboompoort is situated 200 km west of the Cave of Hearths and the results came from an excavation by Mason in 1955: date, >33 000 BP (Mason 1962). No relationship has been established between the Cave of Hearths beds and the oxygen isotope sequences, and the only direct method of dating each bed currently open is tooth enamel dating, by techniques such as ESR (electron spin resonance). Consequently, the period of occupation represented by each bed is currently undetermined. Further work is currently in progress at the Cave of Hearths, with a team from the University of Liverpool, but nothing so far has been readily published.

Mason's work at the Cave of Hearths provided the very first quantitative analysis of the Middle Stone Age in South Africa. An additional advantage was that a substantial MSA sequence was in evidence from which to derive a detailed framework of the composition of Middle Stone Age assemblages (Mason 1988). Each of the Cave of Hearths MSA beds represents a long period of stable artifact assemblage composition, from a variety of different social and economic activities carried out during intermittent visits, with long-term composite attributes. There is little or no technological or stylistically change within each bed. However, multivariate analysis conducted by K. Turton confirmed that substantial artifact changes occurred between Beds 4 & 5, and Beds 5-6 to 9.

Garth Sampson (1974), in the mid-1960s, undertook a systematic analysis of the artifactual assemblages derived from Beds 4-9. This was done on the basis of a complex "functional" artifact classification, which had as its underpinning an elaborate trimmed tool typology. Bed 4 was assigned to the Pietersburg industrial complex.

Beds 4-9 were separated from each other on the basis of a basal ash accumulation. Deposits of boulders, rubble and soil ranging between 25cm and 50cm in thickness overlay these ash layers (Mason 1988). Although the assemblages between beds 4 and 5, and 6-9 are different, the same basic classes of parallel, convergent and irregular flakes and cores occur in all beds.

The assemblages from Beds 6-9 are overlain by Late Stone Age material. Due to the lack of any readily distinct relationship between Beds 9 and 10, Mason proposes that there was a hiatus of between 30 000 - 50 000 years which went unrecorded without deposition occurring (Mason 1988).

Four segments were excavated from the Cave of Hearths Bed 9 (the uppermost Middle Stone Age bed). Mason believes that these link Beds 6-9 to the Howiesons Poort layers at Rose Cottage Cave, with an age of over 50 000 years (Mason 1988). The backed artifact assemblage from Beds 6-9 contains only segments, with a few light parallel flakes (or blades). Therefore, strictly speaking, the 'Late' Middle Stone Age at the Cave of Hearths does not conform precisely to most Howiesons Poort assemblages which contain segments and small backed blades (Mason 1988).

As reported by these early investigators, the Florisbad lithostratigraphy was composed of 10 layers or "peats" (Brink 1987):

1. Brown "peat" (Peat IV)
2. Hard yellow sand
3. Brownish-black "peat" (Peat III)
4. Grey sand

5. Blackish sandy “peat” (Peat II)
6. Greenish sand
7. Black waxy “peat” (Peat I)
8. Brown sand
9. Brownish-green basal “peat”
10. Dolerite or shale bedrock

The sand deposits were proposed to have resulted from an increased flow of water from the main eye of the spring in the centre of the mound (Dreyer 1938). The peat layers were considered to be the result of opposite geological events: the overflow of sand and water from the main eye lessened to a large extent, thus encouraging luxuriant plant growth. Dreyer implies from this description that the layers were continuous, except for the edge of the mound where they lensed out (Dreyer 1938). On the southern edge of the mound are smaller eyes that cut through the different horizontal layers in columns, although these columns did not penetrate the surface of the ground. The majority of the fossil bones and artifacts have come from the spring debris formed by these eyes, with the horizontal layers themselves containing little. The columns of spring debris, covered at each stage by the different horizontal depositional layers, were composed of a basal concentration of artifacts, bones and coarse sand capped by pure quartz sand (Dreyer 1938).

Two typological artifact assemblages are evident at Florisbad. The oldest, said to be associated with the Old Collection (discussed below) and which includes the well-known Florisbad skull fragment, was recovered from the brownish-green basal “peat”; while an MSA assemblage is evident above Peat II (Brink 1987). The skull fragment is the best known artifact from Florisbad and has been subject to varying degrees of interpretative studies down through the years. The first analysis was done by Dreyer (1936, 1947), and two of the most recent by Rightmire (1978) and Clarke (1985). Dreyer, in his 1947 report, compared the skull fragment with Bushmen skulls and the MRI skull (Matjes River), and reached the conclusion that the Florisbad skull fragment represented a transitional stage between archaic and modern Homo sapiens; with a line of descent being drawn with the MRI skull (Brink 1987).

Drennan (1935, 1937) arrived at a different conclusion: the Florisbad skull fragment was that of an “African Neanderthal.” Wells (1972), by contrast, lumped the Florisbad skull fragment together with the Border Cave cranium under the classification of an undifferentiated proto Negro-proto

Bushman group. The difference between the two skulls was attributed to growth deformity. However, modern studies by Rightmire (1978) and Clarke (1985) are essentially in agreement with Dreyer: the Florisbad skull is that of an archaic Homo sapiens.

Still Bay sites are found along the east Cape south coast. The diagnostic feature of the Still Bay industry is the leaf-shaped bifacial point, suggested to have been used as a spearhead. This was generally manufactured out of the raw material silcrete. Its length can vary from two to three centimetres to the very large "Blombos point" collected by Heese. The "mother" site of the Still Bay industry is Nordkapperspunt, where Heese found Acheulian, MSA and later assemblages. The site, though, is currently overgrown and no further investigation of it has been undertaken.

Generally Still Bay sites are situated close to the coast, but some lie a few kilometres inland on top of tertiary deposits of limestone. Heese noted that the outcrops of Table Mountain sandstone on the coast near Still Bay provide an impermeable base below the porous tertiary deposits. This causes fresh water springs to form near the sea. It may be that this abundant supply of fresh water was one of the primary reasons for the abundance of open sites in the Still Bay area.

The dating of the Still Bay has long been an unanswered question in southern African archaeology. The results of radiocarbon dating on charcoal and shell from the Still Bay levels at Blombos Cave should be considered as infinite dates. Recent luminescence dates suggest an age of c. 100 000 BP for the earliest MSA layer, BBC M3. the Still Bay points come from BBC M1 and BBC M2. Thermoluminescence and optically stimulated luminescence, both multi- and single-grain measurements, tests yielded dates of 77 +/- 6 kya, 69 +/- 5 kya and 70 +/- 5 kya respectively. See Henshilwood et al. (2002) and references therein for further details. This corresponds to an early part of oxygen isotope stage 4, or a late part of OI 5a.

Kathu Pan, in the Kalahari region, is one of the rare sites, along with the Cave of Hearths and Wonderwerk Cave, which spans the ESA-MSA-LSA sequence. Four LSA, two MSA and two Acheulian MSA assemblages are present. The two MSA industries are the Still Bay and the Howiesons Poort. The two Acheulian industries are associated with a fauna dominated by terminal *Elephas* recki and is faunally and typologically comparable to the Namib IV assemblage, dated by thermoluminescence to greater than 350 000 BP. The "Early" Later Stone Age at Kathu Pan has been dated by Beaumont, the excavator, to be older than 32 100 +/- 780 BP (Beaumont, unpublished). Kathu Pan is a wetland area, as is evidence by signs of substantial watertable fluctuations, with some of the assemblages permanently below the present watertable. It is unclear whether the Howiesons Poort and Still Bay levels have been dated, but Beaumont (unpublished) suggests that thermoluminescence would be the ideal dating method in the thick beds of the lightly calcified Kalahari sands.

Wonderwerk is believed by Beaumont (unpublished) to date back c. 400 000 BP, i.e. the Middle Pleistocene. It contains 2 Acheulian, 1 MSA and 2 LSA industries. Beaumont excavated the site during 1985 and 1986, and ended his investigations at Stratum 6r at a depth of roughly 1m. A layer of ash underlies the Acheulian sequences in Stratum 3 of area W-X 49-54, and Beaumont therefore ascribes it to the ESA and estimates it originally covered ca. 300 square metres horizontally (Beaumont unpublished). This black ash has yielded a radiocarbon date of 38 600 +/- 1 080 BP, which should be regarded as infinite, thus lending conditional support to Beaumont's assertion.

Beaumont was the first archaeologist to examine Sibebe Shelter, in the mid-1960s. A charcoal sample was obtained from the upper levels of a MSA deposit 1.2m thick. It was dated to 22 850 +/- 160 BP. The strata also yielded well-flaked bifacial points that have been interpreted as being for use in spears. Sampson (1974) has assigned this sample to the Bambata complex.

D. Price-Williams and Masson undertook an observational trip to the site in 1978. They observed the scatter of Middle and Later Stone Age artifacts over the open hills in close proximity to the shelter. The trenches made by the previous excavations had been backfilled by the local farmers. The presence of Later Stone Age artifacts on the surface of the shelter was most likely the result of failed endeavours by reckless amateurs (Price-Williams 1981).

An area of 300 square meters was excavated. He chose to excavate several squares in two locations: Area A near the drip-line (squares I 11, 13 and 12); and Area B in the rear of the shelter (N 10, O 10, 11 and 9) (Price-Williams 1981). The previous excavations had been undertaken to the south of Area B, also at the back of the cave.

Area A consisted of stratum 1, provisionally assigned to the Iron Age, and strata 2 and 3 from the Later Stone Age. Strata 1 and 3 of Area A are also represented in Area B, but stratum 2 is not. Area B also contains strata 4 and 5 (Price-Williams 1981). Stratum 4 is also tentatively assigned to the Later Stone Age, with Stratum 5 dating to the Middle Stone Age on the basis of its stone tool industries. Bedrock was reached beneath Stratum 5 (Price-Williams

1981). The Middle Stone Age at Sibebe Shelter was previously dated to 22 850 +/- 160 BP, which correlates well with the transition observed in other Swaziland sites (Price-Williams et al. 1981).

Stratum 5 consists of a coarse sandy clay, reaching a thickness of 0.7m. In places charcoal is evident, sometimes in dense concentrations, within the upper 0.4m (Price-Williams 1981). However, Price-Williams does not indicate whether these pieces of charcoal were from man-made fires or hearths, or whether natural veld fires or other occurrences caused them. Apart from the charcoal, there are few other distinguishing features present in this stratum. There is little typological change through the lithic industry, with unifacial and bifacial points predominating. Hammerstones and cores are rare, although there are a few discoids, points and scrapers, and fragments of iron ore.

The lack of cores suggests that the tools were made elsewhere, possibly at the source, or that blanks were brought to the shelter. The blanks that were utilised produced broken pieces that were then discarded (Price-Williams 1981). The raw materials were predominantly non-local. The cherts and the quartz originated in the Fig Tree, Moodie and Onverwacht series of the Swaziland system, to the north-west and west of the shelter. The nearest Fig Tree quartzite occurs at Ngwenya, a distance of 20km. Some chert origins are over 25km away.

The importance of the watertable fluctuations is self-evident and, together with deflation, played a major role in the site formation process at Elandsfontein. The brown sand plains encountered throughout the sections excavated at Elandsfontein by Deacon in 1964 were probably the end result of fluctuating mobilisation and stabilisation (by vegetation) of the dunes (Deacon 1998). In this site formation model, water holes would have occurred where deflation interceded with the watertable and it was at these places where both Middle Pleistocene animals and Acheulian hominins would have gathered. The result was the accumulation of fauna and artifactual remains dating from this period (Deacon 1998). With the watertable being the limit of deflation, it is logical that the horizon in which the artifacts and fauna are excavated from represents the average level of the then watertable level. The watertable level is only marginally less today. This deflation model opens up the possibility that a number of separate episodes of deflation occurred over time. However, the tight clustering of carnivore molar lengths suggest that the Middle Pleistocene accumulations possibly occurred during an interglacial period when the temperatures were similar to those of the present day. The model also proposes that the higher watertable and the intermediate stabilisation of the sands led to the dune cover's decalcification, the ecological consequences of which are evident in the present acid sands. These sands are capable of supporting only a low carrying capacity fynbos.

Cutting 10 has been the most rewarding in terms of archaeological material. Here numerous small well-finished bifaces, cores and flakes were excavated from beneath a brown sand layer (Deacon 1998). The faunal remains found in the same cutting may not be directly associated with the artifacts. The artifact sample recovered has bifacials of such similarity collected from a localised area that its integrity, stratigraphic and temporal contemporaneity is not in doubt. By contrast the bone surfaces are poorly preserved (Deacon 1998). A taphonomic study by Milo of these skeletal parts revealed that animal and not hominin agencies were the cause of the deposit accumulation (Milo 1994).

Despite the unequivocal non-association of artifacts and faunal remains, the raw material of the bifacials (comprising 25% of the sample) originated kilometres away. Thus the stones, both in their finished or raw material chunk forms, were obtained from the nearest available sources and transported back to the sandveld. Deacon suggests that this fact points very strongly towards these artifacts comprising a butchery toolkit (Deacon 1998). The niche occupied by Acheulian foragers may be the result of preservation bias and taphonomic problems. Yet Deacon (1998) suggests rather that it was a result of the distinct lack of the social mechanisms geared towards aggregation and dispersal of groups over the entire countryside and in all environmental conditions.

Environmental exploitation and social spacing

The relative abundance of the MSA faunal remains raises the question of whether aspects of hominin behaviour can be deduced through statistical, analytical, microscopic and comparative analyses. For this kind of analysis to be effective, the assemblages should ideally have accumulated under identifiable environmental conditions. Klasies River is one site on the Cape south coast that meets this and the necessary faunal sample-size criteria to a greater extent than most sub-Saharan African sites.

Until 1998, the analysis of the faunal assemblage had been undertaken primarily by Klein. Klein (1989) concluded that the abundance of marine food remains indicates that the MSA people were exploiting the sea on a regular and constant basis, although there is a contrast between the fish and sea bird faunal counts when compared to LSA sites like Nelson Bay Cave, Byneskranskop and Elands Bay Cave. Occurrences of bird bone at Klasies River are rare, while they are abundant in the coastal LSA Holocene sites that contain comparable quantities of shells, seal and penguin bones. It is theorised that less effectual MSA exploitation of marine resources accounts for their apparent inability to actively fish and fowl (Klein 1979): stone line sinkers and bone "gorges" (carefully crafted, small and double-pointed bone splinters able to be used for attachment to a line and baiting), also known from LSA sites, are glaringly lacking at Klasies River.

In further support for his theory Klein cites the lack of bow and arrows for hunting, differences between the age profiles of fur seals in the Klasies River MSA and Nelson Bay Cave Holocene levels, as well as the comparatively different sizes of MSA and LSA limpets. The bow and arrow enabled the LSA inhabitants of southern Africa to prey on dangerous species, such as buffalo and bushpig, from safe distances, and to kill them effectively. This raised the odds of the hunter's survival considerably and resulted in increased numbers of these ungulate remains in the faunal debris.

The Cape fur seal is indigenous to the south-western African coast, from Port Elizabeth to Angola. When the MNIs of fur seals from the LSA Holocene levels of Elands Bay, Nelson Bay Cave and Die Kelders Cave are set against the figures obtained from the MSA layers at Klasies River, it reveals the people in the LSA were actively targeting young fur seals. This is shown by the number of fused shaft epiphyses: 2 out of 42 shafts at Elands Bay Cave have fused epiphyses, Nelson Bay Cave 11 out of 82, and Die Kelders Cave 15 out of 114, in comparison with 28 out of 71 shafts at Klasies River (Klein 1989). What is particularly significant, in Klein's view, is that the LSA assemblages show a very high percentage of distal humeri of fur seals aged roughly 9 months old, far greater than that evidenced in the preceding MSA. These figures are attributed to a lack of awareness or observation by MSA inhabitants regarding the seasonal increase in numbers of young seals. The yearly round of Cape coastal LSA people intentionally coincided with the fur seals' weaning time, to reap maximum benefit from this easily available food source. Klein (1989) thus postulates that visits by MSA people to Klasies River were less seasonally patterned and they indiscriminately killed and scavenged fur seals as they came across them. The LSA hominins utilised their modern cognitive abilities to take advantage of the weaning season when young fur seals quickly lose strength swimming and come ashore in a weakened state where humans could easily have killed them and scavenged upon those who had already succumbed to death.

A similar pattern can be observed in the remains of ungulate species. The Klasies River Minimum Number of Individuals (MNI) count is 80 eland, 29 Cape buffaloes and 3 minuscule bushpigs. By comparison, the faunal assemblage at Nelson Bay Cave Holocene levels reveals the remains of at least 6 eland, 39 buffaloes and 38 bushpig (Klein 1989). The numbers of the deciduous molars, dP4s (lower fourth) and M3s (lower third), reveal that in the MSA layers of Klasies River eland outnumber buffalo remains to a large degree, with the reverse in operation at the LSA sites of Byneskranskop and Nelson Bay Cave.

In analysing these figures Klein (1989) noted that the MSA ungulate remains are in relative proportion to the docility of the animal; thus the bushpig, being one of the fiercest fighters, has one of the lowest frequencies of occurrence. The LSA Holocene levels from Nelson Bay Cave, however, provide evidence that the greater abundance of the dangerous buffalo and bushpig, compared with eland, in the historical environment is matched by their frequencies in the late prehistoric record. The question arises whether the ancient Klasies River environment naturally supported a greater abundance of eland. However, there is nothing in the sediments or the fauna that currently supports such a hypothesis for, apart from this occurrence, the numbers of ungulate faunal remains are broadly reminiscent of the historical fauna (Klein & Cruz-Uribe 1996). The predominance of eland is evident in both the "interglacial" and "glacial" time layers. Although research on the faunal remains yields the result of the glacial layers being relatively richer in grazing species, which in turn suggests a grasser environment more like the historical interior of the country, the interior shows no signs of having a greater abundance of eland (Klein & Cruz-Uribe 1996).

Klein proposes that these figures are explainable in terms of human behavioural patterns (Klein 1989, Klein & Cruz-Uribe 1996). Eland and buffalo respond to predation in different ways, with the eland fleeing from and the buffalo aggressively mobbing the attacker or attackers, in defence. Eland can be run down for their energy levels become depleted after a short distance. In terms of this hypothesis, the lesser numbers of eland at the LSA Nelson Bay Cave and Byneskranskop are attributed not to a drop in the hunting of eland but rather the increase in hunting and hunting efficiency of the more dangerous animals (Klein & Cruz-Uribe 1996).

The age profiles of the dead eland have been determined. The results show the eland M3s have a tendency to be less heavily worn than the buffalo m3s from MSA Klasies River, and that of eland at LSA sites (Klein & Cruz-Uribe 1996). Through a process of mathematical conversions of the crown heights into ages, results have been obtained which support the proposal that the eland from the MSA layers of Klasies River display a greater proportion of prime- versus old-age adults. Although more old eland and prime age buffalos could have been successfully hunted, the question would then switch as to why these remains were not transported back to the site on a regular basis. Old buffalo skulls are also no more nutritious than old eland, and the same applies to prime age skulls (Klein & Cruz-Uribe 1996). Therefore it is most probable that the number of faunal remains indeed reflect actual encounter rates, with Klein (1989) proposing that buffalo reflects attrition rates while the eland is catastrophic.

Eland remains in LSA sites, such as Nelson Bay Cave, Kasteelberg and Elands Bay Cave, may simply reflect the lack of appropriate sheer cliffs in the hunting range vicinity. In order to protect their hypothesis from the contention that this shows the same hunting methods were utilised to the same extent in both the MSA and LSA time periods, they contend that this evidence is consistent with the hypothesis that the MSA hominins were relatively ineffectual hunters when compared to their LSA counterparts. Killing off prime-age eland often would have led to a decline in their birthrate and thereafter a rapid decrease in population numbers (Klein & Cruz-Uribe 1996).

Klein (1994) has attributed the mortality rates to hunting buffalo by stalking and by driving eland over nearby cliffs. Stalkings, according to Klein's interpretation of MSA mental and technological abilities, result in the killing of the young and old, whereas cliff killings produce an attritional rate of all ages resembling their abundance in the natural environment (Klein & Cruz-Uribe 1996). Scavenging is unlikely at Klasies River to have produced the attritional mortality pattern that characterises the buffalo faunal remains.

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Klein also believes that the MSA population densities across the landscape were relatively sparse and that it was a side effect of their lesser capabilities by comparison with their LSA counterparts. He concludes that, because the MSA inhabitants at Klasies River lacked the ability to hunt dangerous animals and didn't undertake LSA activities like fishing and fowling, they were not behaviourally modern as they did not have the same mental capacities as their LSA counterparts.

There are analytical and theoretical problems with the data. Klein (1989) himself acknowledges that his figures and the conclusions he draws from them are the result of inter-site analyses, rather than comparative studies between the MSA and LSA layers of a particular site, in this case Klasies River. Klasies River possesses limited LSA occupational layers that accumulated only during the last 2000 years. However, Klein never undertook a detailed analysis of butchery patterns of the Klasies River assemblage to determine probable further insights into the patterns of behaviour of the people who produced it. Klein's examination only identified the faunal remains to the species level.

Richard Milo (1998) has filled this void, reaching conclusions which differ largely from Klein's. He examined in detail the surface morphology of the MSA faunal assemblage of Klasies River Mouth. The resulting MNI list of carnivore-damaged elements of the axial skeleton, forelimb, hindlimb and phalanges, is particularly revealing in that some of the carnivore tooth marks could only have been made after the bones had already been disarticulated by the hominins, i.e. carnivores scavenged animals killed by the hominins and not vice-versa as postulated by Binford (1984).

J. Thackeray (1990) suggested that leopards and brown hyenas might have accounted for a large percentage of the faunal collection, particularly Class I bovids, such as grysbok. This hypothesis is unsubstantiated as 1-2% of damage on Class I bovid bones can be attributed with certainty to the action of carnivores killing the animal rather than scavenging its remains (Milo 1998). Instead, the baboon bones exhibit evidence of predation by carnivores. The regular collection of bovids at Klasies River belonged exclusively to the domain of the hominins living in the area.

The cut marks alone on these faunal remains thus support the position held by Deacon that the MSA hominins were efficient hunters in their own right and not backward opportunistic scavengers. Discoveries during the course of the microscopic analysis of the bovine bones, of 18 occurrences of stone tools planted in the bone (Milo 1998). These were fragments of butchering tools made from the quartz and quartzite found along the coast which have a tendency, due to natural faults in the rock, to crack. It is this very act of fissuring which makes these tools highly effective when dismembering carcasses, for it consistently re-shapes the cutting edge of the tool (Milo 1998).

A small, quartzite stone point (part of what was originally a larger stone piece) was discovered in the neck of a mature giant buffalo (Pelorovis) (Milo 1998). Other assemblage vertebrae bear no signs of butchering cuts, suggesting that artifact was part of a stone tool used in hunting. The positioning of the tool is, however, the most significant. It is the first direct evidence available from MSA times confirming the existence of weapon-assisted hunting. The weapon penetrated the neck of the giant buffalo at a low angle from the front, thereby inflicting the fatal wound. This region of the neck is a particularly vulnerable location due to the presence of the carotid arteries and jugular veins, resulting in heavy blood loss and death (Milo 1998).

The logical inference to make is that these MSA inhabitants were effective fighters with hand-held weapons, but that view does not stand up to closer scrutiny. The point would have had to be delivered with super-human force; even allowing for the real possibility that our MSA ancestors were physically more powerful than us. The probability exists this may have been a freak occurrence with the buffalo charging the hominin, who planted the hafted weapon into the ground before turning tail and running. How long the hunter would have survived though, if this were a regular MSA hunting strategy, is open to question. A widespread method of this nature of hunting would have placed the continuing biological survival of his social group at serious risk. Those risks, which would undoubtedly have far outweighed any prestige attached to making the kill of such a large and dangerous animal. It is more likely that another method was utilized.

An alternative scenario, proposed by Milo (1998), involves the use of ground traps. These may have had wooden shafts with stone tips driven into the ground at a determined angle in intervals. When the buffalo fell into the trap it would have been impaled, using the force of its own weight, in the manner suggested by the alignment of the stone tool embedded in the vertebra. The pits would have served another purpose: if the animal did not die immediately, in the confined space, it would have been unable to defend itself effectively and thus could be finished off by hand-held weapons. Milo backs up this hypothesis by citing an unidentified cranial fragment that exhibits six indentations from heavy objects, possibly cobbles.

The use of pit traps is recorded in a historical account (Coon 1971) of the Cape Bushmen, although this point is not an integral part of Milo's argument. What is significant is that the attrition age profiles of dangerous animals like the Cape buffalo and bushpig, observed by Klein, can be accounted for by the use of the trap method. The young animals would have been too inexperienced to avoid potential dangers, as opposed to the mature members of the herd. Old animals would have had impaired eyesight and hearing and tended to be separated from the rest of the herd.

Milo notes Klein's interpretation of the age profiles of the eland remains, as well as their abundance, and concurs that these were the result of catastrophic killings by the animals being driven over a nearby cliff (Milo 1998). His analysis of marks on eland bones reinforce this theory. There are marks on some of the vertebrae that are consistent with butchering by stabbing weapons. Some of the animals which survived the fall, but would have been badly injured and unable to defended themselves by running, were killed by hand, perhaps in a similar way to that of the mass killing drives by native Americans.

Similar marks are founded on some Cape buffalo vertebrae. With these two lines of evidence, Milo (1998) takes the interpretation of the Klasies River Class IV bovid assemblage to the next stage and theorises that eland drives required coordination, with the consequence that the MSA hominins were part of "socially mediated task groups." The butchering and dismemberment of animals and carcasses would have been carried out more quickly and efficiently through subdivision of different tasks. As these mass drives and killings are historically and archaeologically evidenced amongst Native American cultures, the implication is that these remains of eland and Cape buffalo are the by-products of modern human cognitive behaviour.

An active social formulation of the concept of danger, planning methods to overcome it, and negotiating the killing process and distribution of tasks requires extensive formulation: strategic positioning and digging of the pits, the time to collect the raw materials for the spears and the manufacturing therefore, placing the weapons in correct positions in the pits and finally camouflaging the pits effectively to confuse the animals. The planners and executors would have had to have possessed a cognitive picture and knowledge of the size required for trapping the animal successfully. In other words, the procedural planning of the hominins was such that they made use of hunting tactics within a modern-like social context of land usage (Milo 1998).

Before Milo, Hilary Deacon was hypothesising that the hominins at Klasies River were behaviourally modern, but he was doing so on different grounds. Following the 1967/68 excavations of Singer & Wymer (1982), Deacon undertook subsequent excavations at Klasies River to tighten up control over the stratigraphy and to see what new information the site could provide. His excavations confirmed what Singer & Wymer had already found. The layers of debris are interspersed with sandy matrices, indicating that this was not a continuous occupation but one which took place sporadically over a number of weeks before the hominins moved on to another locality after utilising the local resources to the maximum sustainable limit. This is regarded by Deacon (Deacon & Deacon 1999) as support for the MSA hominins following a modern hunter-gatherer type lifestyle. Nevertheless, it is unclear whether this movement was seasonal like during the LSA, as evidenced by the fur seal remains at Nelson Bay Cave discussed earlier.

Deacon argues that a shift is visible during the first occupational sequence, IA, towards an economy based on terrestrial-styled subsistence economy rather than one based primarily on coastal resources. The origin of modern behaviour at Klasies River is directly connected to this shift in economies, to the change in perception of the value and potential of their environment (Deacon 1989). One of the features of these changes, Deacon believes, is the presence of carbonised materials in lenses during the Howiesons Poort. By analogy with the Holocene levels of Melkhoutboom Cave, which displays the similar patterns, these are hypothesised to be the inedible residues of geophyte corms which were an important source of food for LSA people (Deacon 1989).

Hearths are a consistent recurring feature throughout the MSA levels and are surrounded by carbonised flora remains. The local modern flora consists of corms, bulbs and rhizomes. These are collectively known as geophytes. Black areas are identifiable in the space surrounding the hearths and these may have been the burnt remains of bulbar leaves and corm tunics. Deacon (1995) hypothesises that the presence of abundant hearths is indicative of the ability of these inhabitants to control fire, unlike their Acheulian predecessors.

In contrast to the Acheulians, who followed a valley-tied subsistence lifestyle, the distribution of Middle Stone Age sites differed markedly. There is no discernible difference in the siting of Middle Stone Age and Later Stone

Age locations. Deacon (1989) hypothesises that the wide range of MSA and LSA sites is the result of these hominins following the same basic subsistence ecology, part of which was the same exploitation of the naturally occurring abundance of geophytes (Deacon 1989). In order to exploit to the maximum the potential of geophytes in a controlled fasion, it is necessary that the location of targeted geophytes be periodically burned to encourage new growth as they are, like all fynbos, a slow renewing resource (Deacon & Deacon 1999). By drawing a comparison between the numerous MSA hearths at Klasies River and the MSA hearths at Boomplaas, whose features are identical to the hearths found in the LSA deposits, Deacon proposes this is further evidence for the controlled use of fire and for the artificial control of the surrounding geophyte resources in a similar subsistence behavioural strategy to that of LSA hominins. Deacon, backed by Henderson (1990), reaches this conclusion through assuming that the consistent patterning of the hearths demonstrates an ability to make fire at will and correlates this with the carbonised plant remains surrounding the hearths and the growth response of the geophytes in the surrounding environment to fire burning (Deacon 1995).

Yet, a geophyte subsistence base in isolation is untenable for human survival due to its richness in carbohydrates and deficiencies in protein. The fish remains that have been found are of such limited numbers that they may be accounted for by gulls from nearby cliffs (Deacon 1995). These fish remains in the occupational horizons are not situated in a context or with artifacts that suggest those hominins possessed the technology to fish. If this is correct, it is most likely attributable to a lack of the technological equipment for line fishing rather than the absence of the necessary mental ability. Washed-up dead fish were not scavenged because they did not rank high on the protein chain list (Deacon 1995). The result was the likely non-investment of time and energy in fishing, which should not be correlated with an inability to catch them (Deacon 1989). The absence of the remains of flying birds is attributed to a lower perceived value of bird bone as a raw material than in the LSA.

Klasies River is situated in an environment where the groundwater is deficient in minerals and Deacon proposes the shellfish accumulations to result from mineral need rather than a principal commodity in the hominin diet. Shellfish classically accumulate rapidly in the archaeological record and Klasies River is no exception. This fact in itself calls into question Deacon's conclusion: if they were a mineral need at this site, then why are they present in equal quantities at sites whose ground water possessed the necessary minerals? Moreover, the extent to which shellfish are able to compensate for groundwater minerals is unknown.

Singer & Wymer (1982) recorded that the accumulation of shell at Klasies River differed from those of known LSA sites. Deacon proposes this is due to the tendency of Perna *perna* (the brown mussel) to collapse under the sheer weight of the overburden, when in mass deposits and through diagenesis (Deacon 1995). On this basis he hypotheses that shell fish were collected and disposed of systematically, in much the same way as in the LSA. Deacon backs his view up by pointing to the midden in front of Cave 1C, SAS SM5, which is spread over a horizontal length of 5 meters. This distance falls within the ranges observed for LSA shell middens (Deacon 1995).

There are a number of fragmentary morphologically modern human remains at Klasies River, dating from >90 000 ka. These fragments have distinctive cut and impact marks, and others are burnt. Many of the jaws only have the back cheek teeth; the presence of the masseter (chewing muscle) confirms this is not an accident of selective preservation (Deacon & Deacon 1999). There are no signs of these fragments being the remains of either a burial or re-burial and associated with them are discarded remnants of food products. Deacon follows Tim White (1987) in attributing these features to ritual cannibalism (Deacon 1995).

White based his deductions on analogies with on the native Anasazi North American culture, which existed 1 000 years ago. The breakage patterns and marks that exist on cannibalised remains from Anasazi sites bear close similarity to those of the Klasies River fragments (Deacon & Deacon 1999). Deacon elaborates this hypothetical scenario (Deacon 1995). He states it is not sufficient to dismiss this as an example of dietary cannibalism, for all modern and ethnographically recorded events of cannibalism demonstrate there is consistently a ritual component which plays an integral part in the events. Rituals are a form of symbolic behaviour, which is a cognitively modern phenomenon.

The preservation of bones at Die Kelders I, like at Klasies River, has been excellent. Although the deposits have suffered heavy decalcification, they have also been protected from the various destructive forces of dissolution (Klein & Cruz-Uribe 1996). This occurred through the protection offered by shell together with calcitic sandstone roof fragments.

Prior to 1991, only limited information could be derived from the small faunal sample then available. Excavations between 1991 and 1995 have largely corrected that imbalance. Klein and Cruz-Uribe's subsequent count and analysis of the faunal numbers revealed striking similarities to the Klasies River MSA faunal remains: numerous shells and bones of seals and penguins, but few coastal birds and virtually no fish remains.

Eland remains outnumber the buffalo by a large margin, like at Klasies River. The historical record reveals the predominance of buffalo in the Cape South Coast, with the eland reputedly more scattered and harder to detect. As a result the buffaloes were more conspicuous in the landscape both in sight and numbers. The possibility exists that the environment in the MSA suited the eland more than the historical and LSA environments, but the sediments extracted with the faunal assemblage preclude such a conclusion. The MSA layers contain greater numbers of grazing species, suggesting that DK I possessed a grasser environment similar to the interior. Closer inspection, however, revealed that the interior possessed relatively similar same numbers of eland in historical times as the coast (Klein & Cruz-Uribe 1996).

Klein and Cruz-Uribe (1996) hypothesise that the predominance of eland in the MSA layers were primarily the result of differential hominin behaviour by comparison with the LSA sites, in line with Klein's theory regarding Klasies River. At DK I eland are proposed to have been fairly scarce in the landscape, but the lack of the bow and arrow available to the LSA counterparts forced the MSA hominins to concentrate their hunting efforts on this species (Klein & Cruz-Uribe 1996).

Klein and Cruz-Uribe (1996) examined the teeth of the large ungulates found at DK I and other Middle Stone Age sites, and compared them with those from LSA faunal assemblages; they examine especially the lower fourth deciduous premolars (dP4s) and the lower third molars (M3s). They place more emphasis on the age results obtained through analysis of the third molars, because these erupt at roughly the time when female buffalo and eland reach sexual maturity. The DK I M3s of buffaloes show more wear than those of eland do. This suggests that the faunal assemblage contains more old buffalo adults compared with prime-age eland (Klein & Cruz-Uribe 1996). While the possibility exists that older eland and prime-aged buffalo could have been hunted and killed, this leaves open the question of why they were then preferentially abandoned and not brought back to the camp site for consumption. In addition, the skulls of old- and prime-age buffaloes and eland versus old buffaloes and eland possess similar bulk, with no actualistic evidence to demonstrate that one age group possesses greater nutritional value than the other does. Taking these age profiles into account, Klein and Cruz-Uribe (1996) theorise that the most plausible interpretation is that the MSA eland at DK I also demonstrate a catastrophic mortality profile, while those of the buffalo also tend towards being attritional.

DK I also yielded a sizeable fur seal assemblage. In the few weeks between late November and early December fur seals breed, and nine months later the adults force the young off the off-shore rocks. This results in many young seals washing up either dead on the shore or so exhausted that they are easy targets for human scavengers and hunters (Klein & Cruz-Uribe 1996). It is notable that the age profiles of fur seals in LSA samples are in this 9- 11-month-old age bracket. This meant that the LSA hunter-gatherers timed their yearly round to coincide with the beachings of juveniles. When the DK I assemblage is counted, it emerges that more adult fur seals were also killed in conjunction with the young. This wide size-age difference has led to suggestions, like those of Klein at Klasies River, that the visits by MSA hominins to DK I were untimed and therefore not part of a planned seasonal round, with individuals or groups of fur seals being picked off at random (Klein & Cruz-Uribe 1996). The lack of water containers in the DK I MSA sequence, as compared to that of the LSA sequence in other sites, is cited as conclusive evidence in support of this hypothesis.

Circumstantial evidence in support of this is said to come from the 1994 excavations at Boegoeberg I. BOG I is a shallow rock-shelter positioned in the side of a schist-walled gully near Alexandra Bay, in the Northern Cape excavated by Halkett, Hart and Parkington (Klein & Cruz-Uribe 1996). Three radiocarbon dates yielded a minimum age of 37 000 years for ostrich eggshell fragments found in association with the faunal assemblage. Out of the 4 000 identifiable bones, over 3 000 was from Cape fur seals (Klein & Cruz-Uribe 1996). It is highly likely that this assemblage accumulated during the Last Interglacial in local near modern climatic and environmental conditions. The brown hyenas which patrol that stretch of the western coastline are the most likely candidates to have accumulated those faunal remains due to the distinct lack of artifacts and cut marks on the bones.

The limb bones of the Cape fur seal are rare at BOG I, because of the activities of these hyenas. Klein & Cruz-Uribe (1996) used the better-represented (possibly because of preservation factors) posterior portion of the mandible in order to derive age profiles for comparison with other archaeological samples. The statistics at BOG I and DK I are similar. These figures re-affirm, in their view, that the LSA fur seal bones are predominantly those of juveniles aged between 9 - 11 months, and that the sample from DK I is composed of greater numbers of adult or near-adult fur seals (Klein &

Cruz-Uribe 1996). On this basis alone it could be that the presence of older seals at BOG1 and at MSA sites in general might be the result of hyena activity; therefore, according to this view, there was no seasonal difference between the coastal rounds of MSA and LSA humans. However, unlike BOG1, DK1 has yielded numerous artifacts and bones that have been deliberately cut, in comparison with few coprolites or partially digested and undigested bones or tooth-marked bones. Also, DK1 has the same limb-bone-rich, vertebrae poor pattern of skeletal part representation that marks the LSA sites, not BOG1 (Klein & Cruz-Uribe 1996). Circumstantially, BOG1 thereby lends its weight to the hypothesis that the LSA coastal rounds were more seasonally focused.

Klein and Cruz-Uribe believe that the faunal remains from Die Kelders I, and the conclusions drawn, complement those they arrived at for Klasies River. In essence, the faunal sample is held up by Klein and Cruz-Uribe as evidence that Middle Stone Age humans foraged and hunted with less efficiency than in the Later Stone Age, demonstrating less sophisticated cognitive abilities (Klein & Cruz-Uribe 1996).

The Border Cave post-cranial remains of the suids and bovids were fragmentary, and therefore Klein (Appendix 33, Beaumont 1978) relied upon the teeth for species identification. Except for possibly the Bond's springbok, the giant Cape horse and the small bastard hartebeest, the species are also known historically from the eastern lowveld. Generally speaking, therefore, the fauna over the timespan of Border Cave was broadly similar to historical times: dense thickets mainly next to rivers, with vast open grasslands and savannas.

With no direct evidence forthcoming from Border Cave, Beaumont relied on circumstantial indications as to the seasonality of occupation. The lack of seeds from the Upper MSA levels in soil which would have permitted good preservation led Beaumont to conclude either that the hominins exploited meat as a food source, or occupied the site at times during the year when seeds were not available, i.e. mid-late winter; or, thirdly, the floral environment in which they undertook their foraging activities lacked seeds (Beaumont 1978).

The species most represented by teeth is the highly dangerous buffalo. Klein concludes that the buffalo was opportunistically hunted, based on the majority of the kills being either of very young or old animals (Klein Appendix 33, in Beaumont 1978). These data figures are hypothesised by Beaumont (1978) to be representative of contrasting scenarios where either females were targeted for predation at birth or soon afterwards, while in a weakened state; buffalo in historical times at BC calved year round, a cycled that peaked in early summer. Or females and their young were preferentially targeted during the dry season, which is the time of the highest environmental stress resulting in weakness and also a higher youth mortality rate due to less water sources being available and those that were available suffered from nutritional deficiencies.

When Beaumont (1978) compared these two hypotheses with the fossil tooth record of the buffaloes, a yet undetermined combination of the two alternatives was revealed. Beaumont tentatively proposed that the high incidence of calf teeth favoured the latter option stated above.

Klein interprets the very low frequencies of bovids such as hartebeest and wildebeest in line with their migratory nature (Klein Appendix 33, in Beaumont 1978). The Lowveld around Border Cave would have produced palatable and mature grasses during the dry winter, while the Highveld possessed the best spring grasses. Those young would likely have been born away from Border Cave and only returned after they had undergone considerable growth. This would, therefore, have rendered them a less attractive target for prospective hunters living at Border Cave and provides a scenario that explains the low incidence of their remains in the excavated fossil record (Beaumont 1978).

Beaumont proposes that the evidence listed above is tentative support for Border Cave being occupied during the last half of winter. This would mean, if correct, that this routine was adhered to over long stretches of time. Also out of line with the general hunter-gatherer pattern, the reason may ultimately have been an environmental constant, like BC's proximity to the Ingwavuma River. The river is a big Lowveld waterway and it dries up during the winter months. When temperatures and rainfall fell, these discrepancies would have become more marked. These inferred conditions appear to have been present during the time of the "Early" LSA and MSA2 (Beaumont 1978). The river, reduced to discontinuous pools, would have attracted and acted as focal points for large game congregations.

Klein puts a different perspective on the subsistence implications posed by the Border Cave fauna. He points out there is a lack of independent evidence to complement the hypothesis for climatic and/or vegetation change as the cause of the faunal fluctuations (Klein Appendix 33, Beaumont 1978). These fluctuations may primarily have been the result of changes in the hunting strategies of the BC people, but that does not explain certain factors adequately. Klein questions why the BC inhabitants would have shifted their focus in hunting from a set of species preferring more closed vegetation conditions to a set favouring more open ones and then returning to the first set. This makes more sense if the species themselves were fluctuating in frequency. An additional factor that must be considered is the long periods over which the faunal fluctuations seem to have taken place. Klein believes environmental change must remain the fundamental explanation (Klein Appendix 33, Beaumont 1978).

In 1979 Klein hypothesised that more eland and significantly fewer suids were hunted by Middle Stone Age peoples than their Later Stone Age counterparts under identical environmental conditions at sites in the Southern Cape. This was previously mentioned concerning Klasies River, where this difference was attributed to Middle Stone Age hominins actively avoiding hunting dangerous species, while targeting the more docile ones. Klein notes, however, that this is not evident in the faunal lists from Border Cave: elands occur in more or less the same frequency throughout both the MSA and LSA periods (Klein Appendix 33, Beaumont 1975). Eland are rare throughout both the MSA and LSA sequences, most likely because it was an usually uncommon species in the lowland faunas. What is more significant therefore is the fact that not only is there no demonstrable increase in suids during the LSA, but that the number of suids remains is greater during the MSA (Klein Appendix 33, Beaumont 1978). In order to save his hypothesis, Klein argues that the evidence for an increase would only be evident if the faunal samples were larger, particularly as suids are and were presumably present in greater numbers at BC than in the southern Cape. He alternatively proposes that the high suid/bovid ratio only characterise LSA cultures that are substantially later than the “Early” LSA of Border Cave does. The southern Cape MSA fauna is 15 000 years younger than the “Early” LSA of BC (Klein Appendix 33, Beaumont 1978).

Klein approached the question of the interaction of the Border Cave hominins with their prey species through the age profiles of their dental features. In this exercise, only the teeth of bovids provided a large enough sample for analysis. Klein revealed that young buffalo occur frequently amongst the fauna, in comparison to the nearly non-existent young of other bovids such as hartebeest, wildebeest, tsessebe, roan/sable and kudu (Klein Appendix 33, Beaumont 1978). This profile of the buffalo is in accordance with those from Klein’s southern Cape samples, Klasies River and Nelson Bay Cave. Klein proposes that these similarities between the different sites in time and space points towards buffalo behavioural characteristics and herd structure being the primary determinant factor in stone age hunting practices, rather than the particular attributes of the predator (Klein Appendix 33, Beaumont 1978).

Beaumont (1978) raised the question of the home range of the Border Cave MSA hominins. Zebra bones indicate that the hominins were familiar, to an unknown degree, with the lowland plains to the west and the animals that roamed upon them. Quartzite is consistently found throughout the layers, sometimes in great abundance. The nearest sources are roughly 2km away to the south at Ingwavuma Poort (Beaumont 1978). Below Ingwavuma, situated about 8km to the south of Border Cave, is a sharp face possessing thin lenses of obsidian. Obsidian occurs in low frequencies at Border Cave, attesting thus to only occasional usage of this raw material (Beaumont 1978). The consistent, and sometimes prevalent, use of the crypto-crystalline raw materials had its origins in the Lebombo hills, where it occurred in relatively large frequencies roughly 15km east and south-east of Border cave (Beaumont 1978).

Two excavated assemblages have been recovered from Florisbad: the spring sand columns reported by Dreyer (1938) and Meiring (1956), termed the Old Collection; and the more recently excavated MSA assemblage (Brink 1987). Although the methods used during the excavations of the Old Collection were not up of today's standard, this assemblage contains over 5000 specimens and therefore useful as a measure of inference. The MSA assemblage is a representative sample from an excavation, from 1982 - 1984, of a MSA horizon peripheral to the principal assemblage of spring vents (Brink 1987).

The Old Collection was not generated by human activities but rather the result of carnivore predation (Brink 1987). This gives it added importance when subjected to comparisons with the MSA assemblage. The spring water is slightly alkaline, which helped in the good preservation of the Old Collection. In contrast, faunal remains from the MSA assemblage are friable and badly preserved from the humic acid leaking into the water from dying plant remains (Brink 1987). This is the type assemblage of the southern African Florisian Land Mammal Age. It is questionable whether the Old Collection and the MSA assemblage are contemporary, but they are considered to date to broadly the same period: the last part of the Middle Pleistocene - early Late Pleistocene (Brink 1987).

The Florisbad grassland environment differed during the Middle - Late

Pleistocene transition from that of the present day in a significant component: the presence of a more diverse range of large ungulates in addition to the medium sized alcelaphines and equads that are present. This was likely due to either higher or more effective rainfall creating feeding niches in the environment which no longer exist (Brink 1987). The Old Collection, apart from supplying reliable information about the large mammal composition of the southern African interior Late Pleistocene grassland palaeo-environment (both locally and regionally), provides an invaluable counterpart to the human agency MSA assemblage in providing palaeontological remains displaying carnivore damage (Brink 1987).

In his analysis of the Old Collection, Brink (1987) determined that a higher probability of representation existed in the original death collection for the animals that frequented the spring most often. These animals presented more of a target. This sample was further modified through the destructive attentions of hyenas, amongst other possible scavengers, weathering, mineralisation and the bones themselves being absorbed into the spring sediments. Thus, the excavated collection was the result of numerous ongoing processes rather than of once-off events (Brink 1987).

These destructive agencies raise the question of whether the in situ assemblage is an accurate reflection of the original death collection. However, an important point to appreciate and consider is that carnivore (bone-breaking) and porcupine (bone-removal) activities would not have affected the overall taxonomic composition and frequencies of taxa as only the body part survival pattern would have been affected, which is largely irrelevant in terms of Brink's investigation. It is important to note that the faunal remains of the Old Collection would be representative of the animals coming to the spring that were killed by subsequent carnivore predation, and therefore may not be representative of the surrounding environment as a whole. In this regard, comparisons cannot be made lightly between the Old Collection and other kinds of carnivore-accumulated fossil assemblages (Brink 1987).

As noted above, the MSA assemblage was excavated from an undisturbed sedimentary context to the north of the modern spring activity by Ron Clarke between 1981 and 1984. The remains were recovered from a grey-white sand layer occurring above Peat II. The depositional agency is believed to be water. This conclusion was reached by consideration of the load structures present at the base of the grey white sand as well as flame structures in the surface of the underlying organic sedimentary unit and the fossiliferous sedimentary unit displaying relatively small changes in its lateral facies (Brink 1987).

This has resulted in the assemblage in effect being a three-dimensional scatter, which Brink terms a "diffuse accumulation." There is no evidence for any substantial post-deposition disturbance.

The occurrence of stone artifacts with bone occurrences does not constitute ground for hypothesising that those skeletal parts are present though human actions. The most that can be said without microscopic examination of the bone damage is that humans were present in the area during the time of the fossil formation process.

Support for this is strengthened by the presence also of charcoal (Brink 1987). A concentration of charcoal pieces, stone artifacts and skeletal fragments were discovered during the course of the 1981-1984 excavations. Termed a "hearth" by the excavators, the possibility remains that it is the leftovers of a washed-out MSA hearth, despite differing from the Klasies River sequence of MSA - LSA hearths (Brink 1987). LSA hearths were localised oval depressions that contained concentrations of ash situated around charcoal cores (Deacon 1976). The absence of ash at the proposed Florisbad MSA "hearth" has been attributed to the leaching effect of a subsequent rise in the water table (Brink 1987).

During the period of accumulation of the MSA assemblage, it would be expected that there would have been a carnivore presence in the area. However, these creatures have apparently had little impact upon the skeletal remains. Aside from the acid etching evident on two small bovid astragali, neither carnivore coprolites nor chewing marks on bones have been revealed. This suggests a negligible carnivore contribution to the process of the MSA assemblage accumulation. It is impossible, though, to determine the extent of carnivores removing skeletal parts out of the assemblage. Brink concludes that the surface weathering of the bones, together with their sedimentary context, is a strong indicator of quick covering deposition of the grey-white sand unit. This, when considered in conjunction with the relatively poor traces of carnivore activities, strongly points towards this assemblage dating exclusively from the Middle Stone Age and representing various forms of early hominin subsistence activities (Brink 1987). Brink's hypothesis is supported by evidence for bone modification by artificial means: the highly fragmented bones, the stone tool marks and the breakage patterns point towards artificial bone breaking.

By contrast with the scarcity of carnivore damage there is solid evidence of numerous wide indentation marks made by hammerstones, termed both "lunate fracture scars" and "broad internal flake scars." The flake scars that are evident are crescent shaped bone flakes, longitudinal flake scars, ragged edge breaks and shear faces.

The crescent shaped bone flakes are a frequent occurrence in the MSA assemblage. Brink (1987) hypothesises that the blows were for the purpose of extracting bone marrow, as the detached flakes are from the long axes of the skeletal remains. Abruptly broken bones caused the ragged edged breaks. Although the occurrence of scapulae articulations is a fairly common occurrence in MSA faunal assemblages, they are conspicuous by their absence at Florisbad. Brink (1987) hypothesises that the process utilised in the dismemberment processes wiped out any traces of articulation, with the forelimb being separated from the body by cutting actions through the shoulder. The ragged breaks may have been caused by the dismemberment of the carcasses. This is a conclusion that can be tested further through replication studies. The shear faces are bones that exhibit breakage marks at either one or both ends, although which stone tools caused these marks is yet unclear (Brink 1987).

There is a further category of damage evident, reflecting not aspects of carcass processing but modification after a kind of deposition already occurred. Two longbone shaft fragments and an articulated digit were crushed in such a fashion that they did not splinter into small pieces. This suggests that they were embedded in the sands and then struck (Brink 1987). Post-depositional influences are unlikely to have produced this damage behaviour, since it is very much a localised occurrence.

The skeletal remains of the large-medium and small-medium class bovids are commonly almost complete. This raises the possibility that whole carcasses of these classes of bovids were carried back from the kill site to the spring for processing (Brink 1987). By contrast the skeletal remains of hippopotami are selective, with only the front limbs and front axial skeleton being excavated.

The pattern displayed by the Florisbad MSA assemblage was one of random nature that displayed no correlation between bone density and bone survival. The density of the MSA assemblage faunal remains mapped over the excavation squares reveals that the highest densities of skeletal parts were recovered from a limited area, with the rest of the excavated site yielding relatively low by comparison (Brink 1987). These core areas are situated along a north-south and east-west axis, this being the palaeoslope and thus the orientation of the skeletal remains was most likely determined primarily by slightly shifting material in line with the gradient. This is also the area in which the “hearth” was excavated, thus suggesting that the hominins concentrated the majority, if not all, of their activity in this region of the spring surrounds.

Examinations of the inter-square survival patterns of representative skeletal parts yields further support for this interpretation. Bones with low survival characteristics have generally a lower survival rate in the palaeontological record through consequences of hominin activity rather than by natural means (Brink 1987). The number of specimens within the proposed activity region is less than in the surrounding squares, 15 compared with 4 (21.3%). By comparison, 58.82% of the marrow-rich bones, like longbones, were found within the proposed activity area. In essence, bones containing little marrow would have most likely been discarded outside the activity focal point: pelves, compact bones, scapulae and vertebrae. These would not have been subjected to the same treatment of extraction as marrow-rich bones and therefore their discard is the result of conscious decision making. The marrow-rich bones would then have been processed within the locus. These activities, Brink (1987) hypothesises, were the mechanisms responsible for the skeletal part survival pattern evident.

The MSA assemblage is notable for its complete lack of large grazers, which is what would have been expected if the hominins hunted according to the faunal natural abundance. Medium-sized grazing bovids such as *Damaliscus spp*., *Antidorcas bondi* and *Kobus lechwe* make up the majority of the fauna. It resembles the Old Collection in that a regional versus a local component can be identified (Brink 1987). Although the local component is composed primarily of hippopotami, it is the only large animal present in the MSA assemblage and as such is anomalous.

The southern African coastal MSA sites are notable for their lack of fish remains. The small fish bones at Klasies are believed to have been brought in by sea gulls and not through human agency (Deacon & Geleijnse 1988), with the accompanying competing behavioural interpretations discussed earlier. The species of fish evident at Blombos in the MSA encompass *Aries feliceps*, *Cymatoceps nasutus* and *Chrysoblephus* (Henshilwood & Sealy 1997). *Cymatoceps nasutus*, the black musselcracker, is also the most common species of fish in the LSA at Blombos.

A combination of slumping and flushing of ephemeral occupational debris was the cause of the undifferentiated nature of the MSA in Area B, Sibebe Shelter. The large number of points (the term points is not defined) may have been utilised in hunting, highlighting its likely importance for the Sibebe

MSA communities. Price-Williams (1981) hypothesises that Sibebe was a seasonally occupied camp that was integrally connected with the annual migration route of animals. In this view, Sibebe is a hunting base with the hunters exploiting the animals utilising the naturally rich resources of abundant water and new grasses, resulting from the early Middleveld Valley rains (Price-Williams 1981).

Throughout southern Africa, Acheulian sites are located within wetland habitats in the immediate vicinity of river valleys, pans and springs. Elandsfontein is no exception. During the Middle Pleistocene a non-fynbos environment predominated, founded on the calcareous substrates of that time (Crowling & Holmes 1992). The Middle Pleistocene also had a higher annual summer rainfall which in turn enabled the environment to support the large numbers of grazers, which dominate the bovid fauna of the Middle Pleistocene (Klein & Cruz-Uribe 1991). Deacon proposes the more economical hypothesis that the Middle Pleistocene vegetation alliances offered sufficient graze, together with possibly minerals and trace elements, to attract grazers (Deacon 1998). Both hypotheses recognise that the last major ecological change at Elandsfontein was the establishment of restioid fynbos at the onset of the Late Pleistocene. The two models thus also concur that Elandsfontein was a wetland site centred on water holes.

Organic remains and symbolic behavioural

Klasies River has yielded four specimens of worked bone: one bone point from the Howiesons Poort layers, a bone marked with thin, regular parallel grooves and two notched rib fragments from an antecedent MSA II layer (Singer & Wymer 1982). Bone tools demonstrate the ability of hominins to recognise a range of raw materials as suitable for artifact manufacture.

Throughout the Die Kelders I MSA sequences are remains of ochre. However, these small quantities are mostly the remains of disintegrated pieces, their fragments in turn having also broken. The largest pieces are up to 100 mm in length, with ground surfaces and numerous striations. Grine, Klein and Cruz-Uribe (1991) hypothesise that the ochre pieces were ground up into powder form, but recognise that there is currently no evidence regarding its usage. There are no Howiesons Poort levels, but the presence of ochre leaves open the question of whether is usage was functional or symbolic.

Beaumont (1978), at Border Cave, undertook a spatial analysis of the distribution of ostrich eggshell (OES) on a square by square basis through the levels in Exc. 3A Rear. The post-2BS occurrences are localised and are the remnants of abandoned raw material utilised in the production of beads. Many pre-1WA OES distributions are also localised but are believed to be the result of post-depositional breakage of larger fragments, the purpose for the collection of which remains unknown. However, no pre-1WA square produced enough fragments that could constitute a whole ostrich eggshell (Beaumont 1978). This evidence currently militates against the possibility that whole ostrich eggshells were valued as water containers by the Border Cave MSA hominins and therefore their exact purpose remains unclear.

Yet ostrich eggshell wasn't the only worked find by Beaumont with implications for the behaviour exhibited by the BC humans. Equally significant was the distinct presence of pigments. Beaumont and Dart located the source of these pigments at the Lion Cavern locality at Ngwenya in western Swaziland (Dart and Beaumont 1971, cited in Beaumont 1978). The Lion Cavern thus registers the onset of actual early mining. A MSA1 deposit, including stone tools utilised for mining overlies the artificial bedrock. Infinite dates provided by charcoal suggest an age of 43 200 + 1 350/ / -1 200 BP. Beaumont (1978), however, estimates the true age to be in the region of 110 000 BP.

While both these finds have great bearing on the implications for human behaviour, undoubtedly the most important discovery is the presence of notched artifacts at Border Cave. Marshack (Appendix 8, Beaumont 1978) analysed unprovenanced engraved objects that were recovered from Horton's Pit (Squares J-O, 15-17; Q-r, 13-15; T9, slumped), including a charred warthog tusk fragment, as well as engraved artifacts from the LSA and MSA stratigraphic layers 1BS.LR (Squares T18, 46cm – 1WA; Q21, 61cm – 1WA) and 2WA (Square T19).

All the objects had suffered from breakage of various kind and severity, and therefore appear to be incomplete. It was only on the objects from Squares J-O 15-17 slumped, Q21 61cm – 1WA and T18 46cm – 1WA that markings were extensive enough to permit microscopic examination.

The best-preserved markings are that on J-O 15 – 17 slumped; a rib fragment that exhibits 32 notches. Marshack proposed that this artifact has been used on many occasions, due to the heavy and equally worn nature of the notches along their upper surfaces. He concluded, furthermore, that one person had made these notches together, due to the regular manner in which they appeared and by indications that the same tool, grip and pressure had been applied to its manufacture. This, according to Marshack (Appendix 8, Beaumont 1978), indicates that these notches are the products of a single marking intended as decoration by its maker.

At the opposite end of the spectrum is the analysis potential of the four uncharred wood fragments, excavated from Square Q21 61cm – 1WA, with most of the surfaces displaying shallow engraved lines over much of their surfaces. Despite these incisions having the appearance of being placed in sets, Marshack (Appendix 8, Beaumont 1978) concluded that the spacing between them were irregular and that these artifacts made been manufactured over a period of time. It is premature to state with any degree of certainty whether these markings were intended for a decorational or notational purpose, particularly as analysis of the wearing patterns is hindered substantially by their surfaces being slightly humified.

Square T18 46cm – 1WA yielded one charred, 7.7 cm long baboon fibular fragment displaying notches along an edge made by scraping and striking motions of differing intensity and angles with various tools (Marshack Appendix 8, Beaumont 1978). Thus, no single rhythm or grip can be detected in the manufacture of this artifact. It also appears that this artifact was infrequently used, if at all, because of the distinct lack of roundness and smoothness that is characteristic of the majority of the other engraved objects.

These analytical and interpretative problems surrounding the 1BS.LR artifacts are compounded by the fact that the markings, if they are indeed decorative, are clumsily made. However, if they served a notational purpose, then they are correctly laid out according to Marshack (Appendix 8, Beaumont 1978), who states "sequential accretions of visually discrete sets capable of being differentiated and read back as such as by the marker."

In an attempt to clarify this discrepancy, Marshack investigated the third remaining interpretative possibility, that of ritual markings. Examples of these usages are known in the ethnographic record, e.g. bones, sticks and stones either ceremoniously or ritually marked for differing purposes of participation or invocation (Marshack Appendix 8, Beaumont 1978).

Although Marshack believes that the engraved objects from Border Cave have the closest affinities to those of ritual markings, he concedes that it is currently impractical to come to a solid and testable hypothesis surrounding the intent and purpose of the markers towards their creations (Marshack Appendix 8, Beaumont 1978). Although the symbolic content of these artifacts can not yet be determined, they are amongst the earliest objects found anywhere in the world. This is even more so if Marshack's hypothesis that they represent the intentional accumulation of engraved marking, for either decorational or notational or ritual aims – is correct, as these would be strong indicators of the capacity for modern symbolism amongst the inhabitants of Border Cave 45 000 - 50 000 years ago and, more controversially, of a modern or near-modern capability for spoken language before the onset of the Upper Palaeolithic in Europe c. 40 000 years ago (Marshack Appendix 8, Beaumont 1978).

The existence during a period as early as the "Early" LSA at BC of these variable markings possesses a wider significance for southern Africa as a whole. The finds demonstrate, in Marshack's view, that these early people possessed a complex cultural tradition, utilising various kinds of materials and objects in differing symbolic fashions. Consequently, the examination of Marshack tentatively concludes that the artifacts were produced by cognitively modern humans.

Bushman Rock Shelter is significant because of the presence of worked bone from both the LSA and MSA layers, demonstrating that bone working was an integral part of MSA tool manufacturing that possessed its own rather elaborate technology (Plug 1982). Louw's excavations only yielded a handful of bone artifacts from both the LSA and MSA. Nevertheless, Plug's excavations, carried out by the University of Pretoria, have collected a total of 88 additional bone artifacts and ornaments (Plug 1982). Plug fails to provide an explanation of the categories used, e.g. the "end-flaked" is not described as being relative to what fixed point. The categories she states in her reports are not part of a widely used typological schema for stone tools.

The point-flaked tool in the MSA layers 15-18 is significant. Plug classified these artifacts on the basis of possessing "pointed bone flakes where the points are mainly the result of natural breakage or splitting of the bones, but where these points have been subsequently modified through use or percussion flaking, often resulting in a very sharp, narrow point resembling a drill" (Plug 1982). This suggests the possibility that point-flaked tools like these were used in the BRS MSA sequence, of which one example was found by Plug, for the perforation of ostrich eggshells.

Two bone tools were also found in the MSA layers. Plug (1982) regarded these tools as displaying close similarities in appearance to the scaled pieces (outils ecailles) from the stone tool assemblage, although the outils ecailles are now thought to be bipolar cores. Scaling has modified the edges, which also have scars resulting from intensive utilisation.

The polish displayed on all LSA and MSA bone artifacts and points are attributed by Plug to utilization rather than to intentional means. Some of the broken bones show traces of red colouring, possibly ochre. However, these are only on pieces dating from the LSA (Plug 1982). No perforated needle-like tools were found in any MSA layer.

BRS also yielded vast quantities of beads, in different conditions and at all the various stages of manufacture, from levels 1-17. Level 18 proved to be bare and the levels below have yet to be analysed, although small numbers of beads and ostrich eggshell fragments are reported to be amongst the artifactual assemblages of levels 21 and 28 (Plug 1982). The majority of the beads in both the LSA and MSA assemblages were manufactured from ostrich eggshell. Although some Achatina shell beads and bone beads are present, they are few and far between: for example, in the MSA there is only one bead crafted out of Achatina shell, and there are only three bone beads in the whole cultural sequence of BRS (Plug 1982).

BRS has excellent bone preservation. This has enabled the survival, in the upper 18 levels, of evidence for a well-developed bone industry. There are a large variety of artifacts, indicating they served numerous purposes. The bone tools that exhibit percussion flakes were most likely used on soft materials, meat, skin and vegetables (Plug 1981), perhaps as a means for cutting, scraping and digging. Bone tools cannot be resharpened and would be discarded (Standford et al. 1981). This accounts for the frequency of percussion flaked bone tools evident in the assemblage. No scoring or tooth marks, indicative of animal behaviour, are evident on the bones, leaving human action as the logical alternative.

Most of the flaked bone surfaces are smooth. This is the result obtained when bones are artificially fractured when fresh; rough and uneven surfaces are the end product with dry bones (Plug 1981).

The ‘Late’ Middle Stone Age at the Cave of Hearths contains lower and upper grindstones, but no occurrences have yet been noted below Beds 6-9. Many of the upper grindstones have indentations in their centre. Only from Olduvai Gorge have earlier occurrences of these indentations been excavated (Clark 1975). Sampson (1974) described the existence of upper and lower grindstones in his Bambata Complex which he compares with the middle or Upper Pietersburg. He also recorded the occurrence of grindstones, presumably in Late Middle Stone Age assemblages ranging from the Lupemban of Angola and related sites in Zimbabwe down to Howiesons Poort near Grahamstown (Sampson 1974: 223, 238). Grindstones are present at 7 out of 15 recorded ‘late’ Middle Stone Age assemblages, comparable with Cave of Hearths Late Middle Stone Age Beds 6-9 and Kalkbank. Grindstones are present at one Cape Late Middle Stone Age site, Howiesons Poort, but absent from Klasies River Mouth and the Cape Peninsula sites (Mason 1988). These grindstones are taken by Mason as representing a major technological advance, and suggest that they were utilised in the manufacture of paste making as a foodstuff as well as in cosmetics (Mason 1988).

The Cave of Hearths Beds 6-9 have also yielded the earliest dated ostrich eggshell pendant or drilled disc on the African continent, and an abraded horn core pendant (Mason 1988). Mason hypothesises that the pendant was part of early experiments undertaken in the manufacturing of drilled disc beads that were a common feature on LSA sites.

The ostrich eggshell pendant has a circular external diameter, probably originally measuring 30mm. The central hole has a 3mm-drilled diameter. Both the exterior and the interior have been smoothed by the use of abrasives. The horn pendant is 40mm long, with a waist-like rough groove abraded on the opposite end of the point to a depth of about 2mm. Mason (1988) hypothesises this may have been for the purpose of adding suspension. It may be the earliest known existence of "rotary abrasion" that was later used effectively in the production of LSA bone artifacts in northern South Africa.

The Blombos Cave Still Bay layers have thus far yielded the remains of over 20 worked bone pieces (Henshilwood & Sealy 1997, Henshilwood et al. 2001b). These include an incised bone, two bone points, awls and an item that has been suggested to be a peg. The majority of artifacts have been partly shaped through utilisation, e.g. drilling, gouging and/or piercing. The two bone points bear close resemblances to those found at LSA sites, and were ground and polished through intentional means rather than as a result of utilisation. This is important because it means that people were making bone tools to a standardised, pre-conceived pattern, in the same way as stone tools. These two bone points are formal, rather than ad hoc tools. There are bones at Swartkrans, in the Early Stone Age, modified by utilisation, but the Blombos bone points are the earliest formal bone tools in southern Africa to date.

The bone point, manufactured from a seal fibula, from unit TOB possesses a length of 61mm and a maximum diameter of 7mm (Henshilwood & Sealy 1997). The opposing end to the point has been broken. However, whether this breakage was the result of utilisation or intentional is as yet unclear. The tip was created through a process of grinding, as evidenced by the striations present in this region. The use of fire as a means of hardening is suggested through the tip possessing a darker colour than the rest of the point (Henshilwood & Sealy 1997). Indentations are evident towards the broken end of the point. The suggestion has been the point was hafted when soft, thus permitting the binding materials to leave their marks.

The second point, A1 (uncharred with a diameter of 7mm and a length of 55mm), displays signs of ochre in its polish and it has a groove from its tip to the opposite end. There are surface scratchings that may be the result of intentional usage (Henshilwood & Sealy 1997).

Unit SAN, square E3 yielded a bone that was cut with a succession of subparallel channels. These markings may have resulted at one time from the same stone tool. There are no blade-like marks, instead it appears like the grooves are drag markings.

However, as bone artifacts are more common in the LSA than in the MSA, it remained to be proven that they indeed were not intrusive. This was done through carbon and nitrogen analyses. Both the bone points and the incised bone show lower carbon and nitrogen contents than their LSA counterparts, similar to the results obtained from the MSA faunal remains.

Two incised pieces of red ochre, with a further 7 being subjected to tests for confirmation of their markings, have been discovered amongst over 8000 pieces found to date. They are evidence of symbolic behaviour and are detailed in Henshilwood et al. (2001a, 2001b).

Red ochre has also been found at Kathu Pan I dating back to the Acheulian Fauresmith period around 200-250 000 BP. This find is significant, as the earliest occurrences of ochre in Europe appear about 50 000 BP. Beaumont (unpublished) suggests it was probably used as body paint, although this remains unproven for that period of time.

Stapleton and Hewitt (1928) excavated a single engraved hematite fragment from the Howiesons Poort sequence at the type-site Howiesons Poort. Beaumont therefore focused his excavation on the MSA deposits at Wonderwerk, which yielded 3 engraved hematite fragments. However, two of these were derived from a disturbed context and therefore the association is dubious. The unit they were excavated from is considered by Beaumont to postdate the Howiesons Poort, through an analogy of its lithics (some refined blades and one convergent point with a ventrally reduced butt). The time frame given for these engraved hematite fragments, termed “works of art” by Beaumont (unpublished), is ca. 100 000 BP. However, if they are indeed post-Howiesons Poort, they are more likely dated to somewhere between 70 000 and 40 000 BP.

The site of Strathalan Cave A, where the terminal MSA is dated to 22 000 BP, is located in the north-eastern Cape. Its MSA levels have yielded geophyte remains (Watsonia corm scales and a Tritonia-Freezia corm tunic) in the late MSA deposits (Opperman & Heydenrych 1990). Hearths are present in these deposits also, surrounded by beddings of grass. Further outwards from the hearths are the geophyte remains. This spatial arrangement suggests that the inhabitants were organised in a way that distinctly resembles that of LSA people. This lends conditional support to Deacon and Henderson's claim of a similar spatial arrangement in the Klasies River MSA hearths. The deposits at Strathalan are very well protected from rain, so the remains have been dry probably since they were deposited, making for excellent preservation. This influence of preservation raises the question that perhaps geophytes are not found more often at other MSA sites because of a lack of the right environmental conditions for preservation.

The late date is comparable to the late MSA date of Sibebe Shelter and illustrates that the MSA ended at different times at various sites in southern Africa, i.e. the transition to the LSA wasn't a uniform occurrence. This has implications for the behavioural aspects of the MSA humans, as it is suggestive of a MSA-LSA continuity. These are aspects that are discussed in more detail later.

Apollo 11, in Namibia, has yielded painted slabs which may date to the period between 27 500 and 25 500 BP (Wendt 1976). The seven fragments, unique in Africa, are separate representations on loose slabs ("mobile art") and are therefore not exfoliated parts of a larger wall painting (Vogelsang 1996). Three notched rib fragments of unknown function are present. Ostrich eggshell water container mouths have also been found in the MSA layers at Apollo 11, but the majority of the ostrich eggshell samples are unmodified fragments. Only single finds imply the intentional decoration of ostrich eggshell during the Middle Stone Age (Vogelsang 1996).

Incised ostrich eggshell has been found in the Howiesons Poort layers from Diepkloof (Sealy 1999: pers. com.). Fish bones have also been excavated from the MSA layers at Olieboompoort, and this site has been described as a "factory site" for the production, shaping and use of ochre pieces during the MSA2b ca. 110 000 - 80 000 BP (Knight et al. 1995). Hollow Rock Shelter in the south-western Cape has been found to contain notched red ochre in its Still Bay Industry (Evans 1993).

Hominin remains at Border Cave and their impact

Border Cave has yielded some of the earliest remains of anatomically modern humans. The remains of two further individuals, this time unprovenanced, came to light during the sieving of Horton's Pit material: BC1 and BC2. BC1 is an incomplete cranial fault from an adult roughly 30 year old at the time of death and it was found in the north-west region of Horton's Pit. It was said to have originated from a "chocolate" layer above the 4WA correlating to 1GBS.LR. This skull has different attributes from the later Khoisan people, e.g. greater breadth (Beaumont 1978). The contrast of the relatively complete fragments contrast with the mean macrofaunal fragment mass values (<1.0g). Beaumont (1978) hypothesises that the better preservation could have been due to the preservation offered by a burial. According to this hypothesis, BC1 is greater in age than BC3, and 1GBS has a minimum date from radiocarbon of >49 000 BP.

The partial BC2 adult mandible bears similarities to the Khoisan, according to Beaumont (1978). However, the Khoisan are a physically unusual group in the context of modern humans generally and therefore are not the most appropriate group for use in comparative purposes. Beaumont (1978) proposes that the larger size of the fragment in comparison with the mass of the reputedly associated macrofaunal leaves open the possibility of a burial, proposes Beaumont (1978). Nitrogen and aspartic readings obtained by Beaumont (1978) were similar to those from BC1. This suggests to Beaumont that it was also originally derived from 1GBS with its ascribed date.

BC3 is the skeletal remains of an infant burial. The individual was aged between four and six months. Its various metrical and morphological characteristics suggest to Beaumont a relationship with the Khoisan (Beaumont 1978). The application of hematite powder has been proposed to account for the reddish-brown marks evident on some of the bones. This may have occurred either before or after skin decomposed. Found in context with the BC3 skeleton was a perforated Conus shell that came from the coastline, around 80km eastwards. The grave is roughly 24cm deep and was about 5cm below the base of the reportedly intact 1RGBS. No grave shaft was found. The conclusion reached by Beaumont (1978), on the basis of its association with 1GBS.UP, was that the infant dates from the end of MSA1 with a minimum age obtained by radiocarbon of >49 000 BP.

Jonsson (Appendix 64, Beaumont 1978) follows Beaumont in attributing the Conus seashell is the material manifestation of a tradition which was to combinate in the rich and varied funerary remains seen in the southern African Holocene period (Jonsson Appendix 64, Beaumont 1978). He rules out the possibility of the supposed religious sensibility amongst the Border Cave hominins taking the form of an endocannibalism cult. This is where the relatives of the deceased, to ensure that he/she remains close to his family, eat the cranial remains. Jonsson does, however, make the important connection that it is impossible to know whether the decomposition of the infant's body occurred before or after the burial occurred (Jonsson Appendix 64, Beaumont 1978). This problem is compounded by the question of fact whether colouring matter on skin would disappear as the skin rotted, or whether it would subsequently adhere to the skeletal remains. Few stark ethnographic recordings have been made on the application of ochre to dead bodies and, even if this were not the case, it is unclear whether the answer could be established for the Border Cave infant with any degree of certainty given the vast intervening expanse of time. No discoloured animal bones were in the same layer as the infant. Jonsson and Beaumont conclude that the use of ochre was inter-linked with burial rites as a symbolic substitute for life-giving blood (Jonsson Appendix 64, Beaumont 1978). This has the further implication of the MSA hominins displaying self-consciousness, self-awareness, and a modern symbolic cognitive belief system and structure describing our place in the world.

The partial mandible of BC5 is most likely that of a male aged between 25 and 35 years at the time of his death. Severe attrition is attested by the surface wear patterns of the intact pulp cavities being exposed. The fragment was matched by Beaumont, through soil analysis, to 3WA's base (Beaumont 1978). Adjacent was a part depression that may or may not have been the remains of a grave. The associated artifacts are from a middle phase of MSA2, with a minimum date from radiocarbon of >49 000 years ago (Beaumont 1978).

Beaumont excavated both the faunal and the hominin remains in the early 1970s (Sillen & Morris 1996). In 1987 Beaumont discovered "the BC humerus" and "the BC ulna," during the sieving of sediments which had slumped over time into the upslope eastern section of Horton's Pit. These hominin remains are thus unprovenanced as well as fragmentary (Sillen & Morris 1996). The eastern section of Horton's Pit is relatively close in space to the faunal series previously excavated. BC1, BC2, and BC3 (from Dart and Cooke's 1940-41 excavations) were also obtained from the cave's interior, but are further away from faunal series: 15m to the northwest. It proved impossible to reconcile the faunal series with the Iron Age skeleton BC4, due to it having been excavated from the far south-western portion (where the drip line features) of the cave's interior (Sillen & Morris 1996). These factors, coupled with the question mark hanging over why the BC3 skeleton didn't have a grave shaft, if he indeed was buried, gave rise to doubts concerning the reliability with which these remains could be associated with the strata from which Beaumont believes they originated.

Sillen & Morris mapped diagenetic changes in both hominin and faunal skeletal remains at Border Cave using both mineral crystallinity and nitrogen concentration. The aim was to try and establish with a greater degree of certainty whether the hominin bones were contemporary with the sediments from which they were said to derive (Sillen & Morris 1996). The faunal remains utilised by Sillen & Morris were derived from the south-east interior of the cave and, as such, have the advantage of being directly comparable with BC5 (3WA, base level).

The faunal bones derived from the Iron Age levels of Border Cave have clear infrared splitting factor measurements (SF) of under 3.1, which distinguish them from the rest of the faunal series whose measurements are greater than 3.1 (Sillen & Morris 1996). 1BS.UP L1 samples exhibit elevated nitrogen in the region of 4%. The remainders of the faunal series have values less than 1%. Specimens from 1BS.UP L3-B6 have, on average, increased nitrogen by comparison with samples from lower levels (Sillen & Morris 1996). However, there is much overlap in individual values.

The results of the crystallinity tests on BC2 (with sample powders coming from the University of the Witwatersrand, fresh, and from the British Natural History Museum, old) yielded different results. Possible reasons why this discrepancy occurred include that a combination of the NHM samples having been exposed to atmospheric moisture during the last two decades and the heating exerted while powder was ground resulted in recent maturation in crystallinity (Sillen & Morris 1996). Therefore, the powder obtained for tests may have a limited usage time-span. Because of this vast discrepancy, the results from BC2 can not be interpreted with any degree of certainty. A similar conclusion was reached regarding the BC1 specimen. The NHM BC1's increased crystallinity appeared, to Sillen & Morris (1996), to be consistent with a MSA origin. However, when the possible "shelf-life" phenomenon seen in the BC2 samples is taken into account, there is a similar cause to doubt the signal emanating from the NHM BC1 powder. The question of the application of crystallinity measurements to the BC1 and BC2 remains can only be solved through the obtaining and testing of fresh samples.

The other five Border Cave hominin specimens, however, provided consistent enough results for them to be compared with the faunal series. The BC3 infant skeleton's "young" crystallinity signal contrasts sharply to the fauna from Beaumont's MSA layers. Both BC4 and the two unprovenanced postcranial remains show values consistent with their Iron Age and MSA faunal sequences, from which they had been said by Beaumont to derive (Sillen & Morris 1996). BC4 has a relatively elevated content of nitrogen, consistent with its Iron Age origin. The nitrogen levels obtained from BC3 and BC5 were consistent with the nitrogen results obtained from both the 1BS UP and the ELSA and MSA layers.

Sillen & Morris (1996) point out that their results should not be taken as suggesting that the hominin remains can be dated in any chronometrical or relative sense. Nevertheless, they believe a number of implications can be inferred from their work. The humeral and ulna fragments have the same macroscopic state of preservation, crystallinity and very low nitrogen values as the MSA fauna. The BC3 skeleton, however, has good macroscopic preservation and poor crystallinity, indicating intrusiveness. The BC3 skeleton is also realistically the sole evidence for burial during MSA times, and it is tentatively suggested it is better assigned to the Holocene, where it would also be consistent with the established archaeological remains. The same relative arguments apply to the well-preserved BC5 mandible.

The contributions of the different sites to our understanding of the southern African MSA behavioural record

Over the years many investigators have approached the remains at Klasies River from differing practical and theoretical positions. These have ranged from pure typological analyses to specific focus on the faunal remains. No hypothesis has been proposed that adequately encompasses both aspects at the opposing ends of the research spectrum. For the better part of the past two decades the predominant view has been that the MSA hominins at Klasies River were not fully cognitively modern.

It was in this intellectual background that Klein analysed the faunal remains of Klasies River and arrived at his conclusion, through comparative analysis primarily with the Nelson Bay LSA faunal count (in terms of MNIs) and with the varying degrees of docility of the different animals represented, that the modern physical form preceded the development of the modern mind. The main features of Klein's arguments were the low numbers of buffalo by comparison with eland, the lack of fish remains, and the greater number of young seals in the LSA.

The reason that eland faunal numbers are less in the LSA is considered by Klein and Cruz-Uribe to be the result of more effective weaponry in the LSA. This weaponry is said to have opened the opportunity for LSA hunters to exploit other species with greater intensity, thus obtaining greater animal numbers overall, contributing to an increase in population numbers in the LSA compared with the MSA (Klein & Cruz-Uribe 1996). The invention of this weaponry is said by them to be a result of cognitively modern minds, whereas Deacon believes it may have more to do with changing social factors.

Klein, however, neglected to examine the faunal skeletal remains for signs of weapon damage, which Milo did. Milo's findings of the partial quartzite stone tool lodged in a Pelorovis demonstrated that the MSA humans did indeed possess a great deal of hunting skill and mental ability, which he attributed to be near-modern. The differences between the MSA and the LSA assemblages Milo put down to the greater range of stone tools available during the LSA.

Deacon, upon his re-excavation of Klasies River, approached the question of behaviour from a different angle. He examined the placement of hearths through time and their features, claiming they are identical to those found in LSA sites. How similar the hearths are to those from Acheulian sites is, however, unclear and as such this particular area of argument hasn't been adequately dealt with. He points towards the MSA sites having a similar distribution as the LSA sites in the landscape and hypothesises this is because they exploited the same sets of resources, by comparison with the Acheulians. Deacon uses Bushmen ethnography to interpret the typological remains, believing the Klasies River humans invested them with symbolism, a modern attribute. The controlled use of geophytes is also proposed to have occurred.

There remains one area of Klein's arguments that both Milo and Deacon have neglected to counter. This is the issue of the fur seal age profiles and the implications of this for possible differential seasonal movement in the MSA and the LSA.

Wurz's primary analysis has been to do with the Howiesons Poort occurrences at Klasies River. The aim of the research has been to investigate whether or not there is a correlation between the type of artifacts manufactured and a behavioural level best described as a process of a cognitively modern symbolic mind. The process of creating an artifact is closely linked to the condition of the manufacturer's mind and their behavioural abilities, i.e. the dynamics of the intentional decisions made and undertaken in practice. A *chaine operatoire* approach is utilised. The subject of the investigation is the backed artifacts present in the Howiesons Poort layers, their raw material composition, their production and selection, and the ways in which their usage and the applied retouch have resulted in their modification. Wurz attributes these processes to the imposition of style in her conclusion that symbolic behaviour originated thousands of years before the European Upper Palaeolithic. Symbolic behaviour is equated as the ability for symbol manipulation and this is a modern cognitive ability.

The typological studies of the Klasies River stone tool assemblage are pointing strongly towards them having been the product of cognitively modern minds. The faunal remains require further investigating into the exploitation of the coastal resources before studies such as Milo can reach the same level of argument. Future investigations are likely to produce interesting results.

Whereas quartzite was used to manufacture different stone tools from those manufactured out of quartz and silcrete at other MSA sites, including Klasies River, the MSA humans at Die Kelders used the same raw materials for the same technological and typological purposes. This may indicate that the use was not only determined by their structural properties, but also by the cultural choices made by the people.

According to Klein and Cruz-Uribe's (1996) hypothesis, the greater abundance of sub-adult and adult fur seals in the MSA demonstrates a lengthier occupation of the coast year-round, contrasting to the LSA hominins targeting 9-11 month fur seals. The alternative explanation offered by the two investigators is that the seals were slaughtered during seasonally random visits throughout the year rather than visits targeted to maximise the annual peak in the availability of young seals.

Klein and Cruz-Uribe (1996) believe that the differences evident between the MSA and the LSA assemblages are the result of a transformation from an archaic way of living to one that, in material terms, is the same as the documented ethnohistoric patterns. It is a consequence of these beliefs that leads them to dismiss the possibility that the practice of driving elands over cliff faces during the MSA, as in the LSA, may be evidence of the same kind of hunting strategy. This is done on the grounds that there are only so many prime-age eland that can be killed before the eland population is decimated. However, to effectively drive eland over the nearby cliff faces would have required the same basic strategies during both the MSA and the LSA, namely the knowledge of the eland movement routes, good knowledge of the surrounding environment, and the ability to plan both the event and execute it. Not to mention the knowledge of how many eland can be killed so as not to depress the population figures too drastically. This could be termed a "wild herd management strategy" and it implies the same behavioural characteristics were practiced by the MSA humans together with the LSA people at the various southern African sites, including Klasies River.

The statement that the relative proportions of prime-age and old eland and buffaloes, as revealed by the M3s molars, are indicative of actual encounter rates does not add up: both eland and buffaloes travel in herds and therefore there is no reason why the old (who would likely be slightly separated from the main group in both species, due to losing strength and poor eyesight) of one group would be targeted and not the old of the other. This would imply a conscious mental and cultural decision over a broad stretch of time, an alternative which Klein and Cruz-Uribe (1996) do not consider.

Klein and Cruz-Uribe's interpretation of the typological and faunal remains is weighted heavily in favour of their interpretation of the MSA humans being ineffectual hunters by comparison with the LSA people as a result of not being as cognitively advanced. These conclusions may be challenged with regard to Die Kelders as a result of the different research strategies and results obtained by Deacon (1989), Wurz (1999) and Milo (1998) at Klasies River.

Border Cave is potentially one of the most informative southern African sites of the Middle Stone Age. However, excavations that were not properly conducted have cast serious problems on the relationships between the stratigraphy and the faunal and the hominin remains, as well as the association between the fauna and the hominin finds.

The ELSA at Border Cave may contain some of the earliest known bone arrow points and ostrich eggshell. At Klasies River backed artifacts, believed by Deacon and Wurz to have been attached for use as spear points, occur in the Howiesons Poort layers, whereas at Border Cave they are present too in the MSA2 and MSA3 deposits. Wurz (1999) suggests that they are indicative of cognitively modern activities, both subsistence and behavioural, and are also an expression of style. The backed points at Border Cave may also have a similar significance, due to some having been manufactured from rare chalcedony.

The human subsistence and behavioural activities occurred within the general vicinity of Border Cave. There are, however, occurrences of raw materials whose origins are further away, indicating the outer reaches of the annual rounds of the hominins or possibly some form of trading occurring with neighbouring groups in the vicinity. Beaumont (1978) has hypothesised the following are indicative of such long distance activities: red hematite fragments (possibly of Ngwenya ore origin, 120km north-west) which occur through the Border Cave MSA sequence; two talcose schist boned stone fragments (the 1WA and 1BS, LR. Although there are local occurrences in granite, 40km away, the major source is at Ngwenya); the possible echinoid spine and five shells of Nassa (above the 2BS. Its origins are a minimum of 80km away); and the single perforated Conus shell (found in association with BC3 and ascribed by Beaumont (1978) to the end of M.S.A.). There are MSA shell middens along the Maputo coastline at Revas Duarte and Kassimatis The circumstantial evidence points towards the existence of links with areas near Mbabane and thereby possible contact with the Indian Ocean. Beaumont (1978) draws a further inference: that possible seasonal movements could have been restricted to a radius of ~120 km from Border Cave.

A complication has arisen with part of Beaumont's hypothesis: recent tests conducted by Andrew Sillen and Alan Morris have revealed the BC3 skeleton, and its associated remains, to more likely date from the Later Stone Age (Sillen & Morris 1996). This is significant, for BC3 was potentially the only known burial from the MSA. If it does indeed belong to a LSA ascribed date, it would then fit in with the archaeological record from that time. It also leaves open the matter of why the MSA humans did not bury their dead, and the extent to which this impacts on the question of whether they were behaviourally modern.

The material engraved objects, the hominin remains, the hunting patterns, the artifacts and the evidence of mining all raise the question of the capacity of early man for religion, and how that capacity relates to the archaeological evidence. Religion is potentially a symbol for modern cognitive behaviour and mental capabilities.

Klein's conclusion that buffalo kills at Border Cave were opportunistic, which was the same conclusion he reached for them at Klasies River and Die Kelders, can now be questioned in light of Milo's recent research at Klasies River, and in particular his find of a stone point embedded in the neck of a giant buffalo. A tentative suggestion could be that the Border Cave buffalos were also hunted by means of traps that would have resulted in the same age profile in the faunal record, a scenario that was discussed in greater length in the section on Klasies River.

Equally important is that the eland faunal numbers occur in the same relatively low frequency in both the MSA and LSA sequences at BC. Klein's explanation for the contrast between this and southern Cape coast MSA faunal numbers is not convincing, for it contradicts his assertion that sites such as Klasies River and Die Kelders can be taken as representative of the behavioural strategies employed by all MSA humans.

Border Cave has traditionally been substantially left out of the discussion of MSA behaviour, or has had relatively little space devoted to it. Although it is a problematic site in terms of its stratigraphy and relating finds to specific deposits and layers, the information that has been gathered from it to date can no longer afford to be ignored in the larger scheme of things.

The Middle Stone Age lithic assemblages in levels 15-18 are from a period about which confusion reigns at BRS. This is because the radiocarbon dates are predominantly clustered around the 12 000 BP mark, which is very late. Amongst the lithic assemblages from these layers are small numbers of LSA remains from Louw's excavations (Plug 1981). The bone tools and beads are not different from those of levels 1-14. The possibility remains of inter-mixing, but this does not account for the discrepancy between the MSA industry and the late 12 000 BP date.

Levels 19/10 (Louw's excavation level 35), 22 and 28, deep into the MSA sequence, also yielded beads. Bone tools were excavated from Louw's 34 and 41 levels (Louw 1969). The finds point strongly towards the MSA inhabitants possessing the necessary cognitive and technological skills.

It could be argued that the MSA assemblage originated from later levels or from elsewhere in the shelter. This would have concealed an early and distinct LSA industry. These events are unlikely, though, as the deposit was reportedly undisturbed and Level 18 is nearly impenetrable with its tightly packed rock spalls and ash (Plug 1981). This would have prevented movement between it and the preceding levels.

Bushman Rock Shelter is potentially a very rich site in terms of bone tools and ostrich eggshell being present in its MSA levels. However, the extent of these numbers is not known. It is amazing that a site such as this has received so little attention. Radiocarbon dating at the beginning of the 1980s was not as sophisticated as it is today, and better samples and more accurate dates can surely be obtained.

The Cave of Hearths is an unique site, yet its sequence isn't securely dated. This makes comparisons with other sites difficult beyond a measure of generality in terms of its MSA composition. Like the other sites discussed so far, it exhibits technological and stylistical change between artifact beds. Whether there is a Howiesons Poort occurrence or not is a debatable point at the Cave of Hearths, with its lack of segments in Mason's nominated Beds 6-9.

Grindstones occur after Beds 6-9 occur, a significant find. It is unclear from Mason's report whether they were used in any way to grind ochre. Grindstones are a common occurrence in LSA sites, and this projects its origins back into the MSA. Whether the grindstones were used in the same fashion in the MSA at the Cave of Hearths as at the LSA sites is a debatable point, but the inference is not unreasonable and not without its merits. Grindstones do not occur in any MSA layers at the sites under discussion in this dissertation. Ostrich eggshell has to date also been an uncommon occurrence in MSA southern African sites, with the possible exception of Border Cave, and it has been hailed as a possible indicator of behaviourally modern humans.

These rare occurrences raise the question of whether the odd find is indeed a once-off occurrence, or if it is a result of not enough properly stratified MSA sites being found to excavate or if poor excavating in the past has simply destroyed much valuable evidence.

The evidence for site use at Florisbad suggested to Brink that distinctions between the spatial organisations of patterns between it and the LSA can not be readily drawn. This is reflected on a greater scale in the Florisbad people's subsistence practices. Brink (1987) regards the MSA horizon as being representative of a "home base." He defines a "home base" as being "the location where certain "quasi universal" sets of human behaviour as carried out [including] the tendency to carry food to the specific locality, to feed at such a locality, to sleep at the locality [and] the controlled use of fire in such localities which tend to organise activity areas." Brink regards the presence of these four categories as being representative of modern behaviour. The problem with this is that the "home base" hypotheses were developed to provide an explanation for artifactual and faunal occurrences in the early Pleistocene in East Africa, and they have subsequently been challenged (e.g. Blumenschine & Peters 1998). The controlled use of fire is also present in the early Pleistocene at Swartkrans. As such, the mere presence of these categories cannot be sufficient and conclusive evidence by itself to regard a site use pattern as being indicative of modern behaviour.

Brink (1987) used the environmental and faunal information derived from the Old Collection, despite its limitations, as a control menu on the resources available to the MSA inhabitants. From this a level of selection utilized by the people was proposed. Brink contends that, despite the relatively small comparative age differences, the same range of animals were present for the MSA hunters as is evident in the Old Collection. It is notable that carnivores and small animals are conspicuously absent in the MSA assemblage (Brink 1987).

The local aquatic animals are poorly represented in the MSA assemblage, as opposed to medium-sized bovids predominating. Brink (1987) hypothesises this is evidence of two different subsistence strategies used by the hunters: opportunistic scavenging and active hunting.

The MSA assemblage bovids are notable for possessing a body mass of less than 100kg. Body size and height is a major factor that hunters need to take into account (Bourliere 1963). The optimal prey is of the same size or slightly bigger than the predator. The MSA people lacked the technological advantage of the bow and arrow. The killing of prey larger than their own size may have been regarded as being both an unnecessary risk and an unnecessary expenditure of energy, especially in the unique Florisbad environment. The MSA assemblage bovids are either the size of humans or lesser and the remains are predominantly those of young prime adults, indicating that these were preferentially targeted. These selective patterns of faunal representation imply standardised hunting methods aimed at targeting prey animals. Their success contradicts the theory of MSA hominins being ineffectual hunters.

Therefore while the site use patterns are ambiguous, the faunal remains point towards the people of Florisbad possessing a behavioural system which bears considerable similarities to the LSA. Brink (1987) puts the site into perspective when he states that "the total environmental setting was different from later times, and it is to be expected that human subsistence behaviour in the earlier part of the Late Pleistocene was different in degree but not necessarily in kind from the subsistence behaviour of Later Stone Age Holocene populations in more impoverished habitats". Also if the Old Collection and MSA assemblage are recognised as penecontemporaneous, then there arises the situation of late *archaic Homo sapiens* possessing exhibiting essentially modern behavioural patterns.

A question mark hangs over the radiocarbon date of ca. 23 000 BP assigned to Sibebe Shelter by Vogel, as a result of the dating having been done two decades ago and without benefit of recent advances in the technique. However, as it accords well with other Swaziland sites not too much can be said about it at this stage. Should these late dates prove accurate they pose a serious problem for Klein's hypothesis of the MSA humans not being fully behaviourally modern.

The fact that the raw materials used in the manufacture of stone tools were non-local is significant, for it highlights that either the MSA humans at Sibebe Shelter engaged in rounds of considerable length and scope or that they were trading with other MSA people. Beaumont has observed a similar case for Border Cave, and it therefore appears that the subsistence and behavioural strategies employed at both these sites were similar.

Deacon contrasts the Acheulian hominins of Elandsfontein with his proposed model of MSA behaviour at Klasies River Mouth. Deacon hypothesises that the Acheulians were terrain specialists (stenotopic) who lived in valley bottom-wetland habitats, and points to Geelhoutboom and sites in the Vaal River valley to back up his contention (Deacon 1998). By contrast Klasies River can be stratigraphically and typologically correlated with both coastal and inland sites covering all terrains. Therefore the Klasies River MSA inhabitants were eutrophic, meaning they possessed the capacity for landscape dispersal (Deacon 1998). This enabled them, in Deacon's view, to occupy essentially a modern hunter-gatherer niche. As such, he proposes that while modern hunter-gatherer ethnographies have some kind of interpretative relevance which can be applied to the Middle Stone Age, the same luxury can not be extended to Acheulian sites such as Elandsfontein (Deacon 1998).

Kathu Pan (Fauresmith), Hollow Rock Shelter, Wonderwerk (the MSA deposits) and the Howiesons Poort type-site have yielded ochre remains, with the latter two sites possessing engraved hematite fragments. The use of the ochre at these sites and the purpose of the engravings are currently unknown, but are potentially significant as their makers may have had stylistic and symbolic intentions.

The Still Bay industry is limited to sub-Saharan Africa, but occurs in low frequencies in South Africa. Deacon (1999) has suggested that this assemblage is indicative of craft specialisation, because its function as a hunting spear point would have in all likelihood been better served had the points been smaller. This hypothesis therefore accords stylistic symbolism to the artifacts.

The discovery of bone tools in the Still Bay deposits at Blombos Cave is significant due to their rarity at other MSA sites. Such finds have yet to be discovered in other Still Bay deposits, although small quantities of fish bones have been discovered in the MSA deposits of Olieboompoort. The preserved geophytes from the MSA sequence at Strathalan Cave B are the first indisputable identifiable evidence of geophyte remains around hearths in the MSA. Deacon had, at Klasies River, burned remains near hearths which he inferred, through comparisons with LSA sites like Melkhoutboom, to be geophyte (Deacon 1989). The spatial arrangement at Strathalan Cave A suggests that the inhabitants organised their activities in a way that distinctly resembles that of LSA people. This lends conditional support to Deacon and Henderson's claim of a similar spatial arrangement in the Klasies River MSA sequence hearths.

The ostrich eggshell container mouths from Apollo 11 are evidence that the MSA humans at that site had realised the potential of this resource. It can be hypothesised that previous water containers were made out of perishable materials such as leather. But the use of ostrich eggshell is significant for it is potentially a long-lasting carrying resource for water, as used by the Bushmen in the ethnographic and historical records. Diepkloof has yielded incised ostrich eggshell from the Howiesons Poort and Olieboompoort, fish bones. These finds may be suggestive of a modern environmental exploitation strategy.

It appears, therefore, that the more MSA sites are excavated, the more evidence of advanced behaviour by the MSA humans slowly comes to light.

Conclusions on the origins of cognitively modern behaviour

Anatomically modern humans arose in Africa between 150 000 - 200 000 BP, and Klasies River displays one of the earliest recorded sub-Saharan occurrences at >100 000 BP (Deacon 1989). The two predominant hypotheses revolve around the question of whether these early humans were modern in body but archaic in mind (Klein 1989) or were they modern in both body and mental abilities (Deacon 1989).

The perceived lack of symbolic artifacts in the Middle Stone Age of Africa has led to some researchers equating the MSA with the Middle Palaeolithic of Europe, in this respect (Klein 1995). This comparison, however, is unwarranted upon closer investigation. *Homo sapiens*, although related to *Homo neanderthalensis*, did not evolve from them (Stringer & Andrews 1988) and therefore the surrounding circumstances are different.

Africa and Europe have different resource bases open for exploitation, and on that basis the cultures of the people living on these continents should be expected to differ. In sub-Saharan Africa:

> "*there were not the same conditions of predictable, seasonally abundant food resources needed to encourage particular technological innovations and permit population increase. Indeed, at the time when populations were expanding in Eurasia, they appear to have been contracting after an even earlier expansion in Africa. Thus the usual Upper Palaeolithic indicators for the appearance of modern cognition have no relevance for the archaeological record in Africa. Another important difference is that anatomically modern people were present in Africa in the Middle Stone Age, tens of thousands of years before their appearance in the Upper Palaeolithic in Europe*" (Deacon & Deacon 1998: 101).

The criteria for modern human cognition amongst MSA people are essentially those behavioural and subsistence strategies that would link them with the LSA. Klein sees the MSA hunters as being ineffectual by comparison with the LSA, and he points out what he perceives as the lack of symbolic artifacts in the southern African MSA sites. Deacon, on the other hand, views the distribution of MSA sites in the landscape as mirroring that of the LSA and he suggests as a result they occupied the same environmental niches and exploited the same range of foods through active hunting and gathering; this required mental planning and also the ability to manipulate fire to control the growth and collection of geophytes. Deacon (1999) also suggests that the Howiesons Poort artifacts were utilized partially as exchange goods, in a fashion similar to the reciprocal exchange mechanisms of modern Bushmen hunter-gatherer communities.

Anne Thackeray (1992: 421) hypotheses that there were fundamental differences in the worldviews of the Middle Stone Age and Later Stone Age inhabitants, which indicates that the MSA hominins were not behaviourally modern. There are significant problems with that statement, not the least of which is that the LSA began long before the advent of the Holocene ca. 12 000 BP. The youngest MSA sites are in Swaziland, like Sibebe Shelter where the MSA came to an end around 23 000 BP (Price-Williams 1981). That leaves, at a minimum, 11 000 years unaccounted for and ignored. Rock art also only appears during the Holocene in large quantities, underlining that the explosion of rock art in Upper Palaeolithic Western Europe was simply a regional phenomenon and unconnected with the LSA of sub-Saharan Africa.

There are two challenging arguments against the MSA people exhibiting symbolism in their artifacts, comparable with the LSA. Although all the MSA sites discussed do exhibit time-restricted patterning in their assemblages, Thackeray (1992) states that these are of a minimal state of retouch and subtle attributal drift over time periods of up to 20 000 years. The Howiesons Poort and the Still Bay are two MSA forays into much more formal, patterned tool-making. Lindly and Clark (1990) see the Howiesons Poort occurrence as an "adaptive response" to environmental pressures that resulted in mobility pattern changes and the procurement of higher-quality raw materials for their stone tools. This viewpoint therefore presupposes that the technological changes are not related to stylistic preferences and expressions.

The Howiesons Poort was an event during an interglacial period lasting from ca. 80 000-70 000 BP (but see Parkington 1990). The environmental changes would indeed have placed unique pressures upon the MSA inhabitants of southern Africa. To say that the environment determined their responses ignores the mental processes behind the conscious choices involved in making the changes they did. The Klasies inhabitants, for example, had perfectly good quartzite raw material available on the beaches, yet during the Howiesons Poort they imported silcrete from Langkloof 20 km away to manufacture the backed tools (Wurz 1997). Non-local raw materials were also utilised during the Howiesons Poort at the Cave of Hearths and Border Cave. Backed tools can be made out of quartzite also, but a conscious decision was made not to do so. This suggests that silcrete, and by extension MSA Howiesons Poort backed tools, were imbued with both style and symbolism. The manufacture of the Howiesons Poort artifacts was, therefore, governed by cognitively modern social rules. Deacon and Wurz's views eloquently back up those expressed by Vishnyatsky (1994): to change substantially and rapidly, a culture must already have a great potential in the form of a reserve of ideas and abilities which are known but not put into practice. Like the recessive genes in biology, these abilities and ideas came to the fore in a material sense (to move from the genotype of a culture into its phenotype) only when circumstances (environmental, demographic, social, etc.) changed and the necessity arose to use the recessive part of cultural potential. Just as recent hunter-gatherers have proved reluctant to employ their extensive botanical knowledge in going over to agriculture, the Middle Stone people used only that part of their potential of ideas and abilities which enabled them to lead a habitual way of life.

Deacon (1995) has used Bushmen ethnography to suggest that the backed artifacts from the Howiesons Poort reflect iconographical style. He suggests that the backed artifacts served as boundary markers as well as for gift exchange as social mechanisms adjusted to maintain population numbers and distribution and the stress thereof. The Kalahari Bushmen accomplish the later through the use of hafted metal projectile points (Wiessner 1983). However, as the Bushmen usage of stylistic projectile points is only at the level of differing linguistic and not cultural groupings, the Howiesons Poort may have had a similar arrangement; this reinforces Deacon and Wurz's views that these artifacts were imbued with some form of stylistic expression.

Deacon (1999) has proposed that the Still Bay, dating to ca. 90 000 BP, is an example of a MSA craft specialisation industry. The Still Bay occurs at a number of large MSA occupation sites and in a high frequency at Blombos Cave. These deposits at Blombos have yielded important items of ochre and bone tools. Some of these tools were engraved and polished. These are the earliest securely dated MSA bone tools, some of which may have been used for fishing. Blombos and Klasies River are not a large distance apart, which suggests that the Klasies River inhabitants did indeed have access to such knowledge but made a cultural choice not to utilise it, as suggested by Deacon (1989). Deacon suggests that craft specialisation resulted in reciprocal trading, but it still remains to be determined first whether the Still Bay industry is indeed a form of craft specialisation. What is clear is that the Still Bay industry points do not make for better spear points than other smaller bifacial tools, and this may have had something to do with a symbolic value being attached to them.

Most of the MSA human remains are fragmentary. Beaumont hypothesises that BC1 and BC2 could have been burials, but this remains far from proven. The Border Cave 3 burial is the only clear evidence of burial that has been attributed to the MSA (Beaumont 1978), but its association with the deposit has been seriously challenged by Sillen & Morris (1996) and its more probable origin is the LSA. This potentially causes a problem as it is widely regarded that a fundamental attribute of modern human behaviour is concern for the dead and some formalised system of disposing of dead bodies is normal, and this occurs during the LSA, thereby on the surface supporting Klein's interpretation of the archaeological evidence. However, it is significant that the majority of the archaeological burials date from the time of the Holocene and it can tentatively be suggested to be a cultural decision. On the other hand, many modern cultural groups like the Nuer expose bodies to be eaten by scavengers.

White and Deacon believe that ritualistic cannibalism may have been a part of the Klasies River MSA hominins. It is unclear how to argue against White's deductions. Klasies River has a rich environment, so if these remains are indeed the result of cannibalism, they could represent extreme events. Cannibalism has essentially a ritualistic essence. In this scenario the Main Site would have been a place for gathering where the ritual observances were undertaken. However, the archaeological record cannot reveal whether these events were indeed a common or uncommon ritual happening, or if they were inspired by hunger.

Bushman Rock Shelter is a potentially significant site with its bone tool industry. This site is not in isolation with polished bone tools having been found at Blombos Cave (one of which may have been hafted for hunting as the tip of a spear) and in small numbers at Klasies River. Border Cave possesses notched bone artifacts also, which have tended to be dismissed in the literature (e.g. Lindly & Clark 1990) as an occurrence of no significance due to their supposed non-existence at other MSA sites; the finds from Klasies River, Bushman Rock Shelter and Blombos Cave argue strongly against such a conclusion. The conclusions reached by the excavators of the different sites as to function and purposes of these artifacts but, particular once the finds from the lesser known archaeological sites are taken into consideration, a picture begins to emerge of MSA humans having the capacity to express symbolic thought as well as having the ability to produce a sophisticated technology to suit their needs and exploit their particular environments.

The grindstones present at the Cave of Hearths are significant for its rarity at MSA sites. Their purpose, though, is unclear although they may have been used to grind the ochre pigment present.

Knight et al. (1995) have done a statistical survey of the occurrence of ochre in southern African MSA sites. In the survey ochre first makes its appearance in the MSA record during MSA2b. Beaumont (1990a, b) has found that ochre makes an occasional appearance in earlier Acheulian Fauresmith sequences in southern Africa. This opens up the possibility that the absence of pigments in the MSA1 (ca. >130 000 BP) may be the result of small sample sizes. In the MSA2a assemblages ochre is either present in very low frequencies or absent. However, the MSA2b sequence sees an explosion of the use in ochre and Knight et al. (1995) conclude that ochre had now become a regular feature of use amongst at least some groups. This explosion is of great magnitude, with Olieboompoort in particular being one of the primary sites of pigment processing and use. This is also the time period when Beaumont (1973) believes that the mining of hematite began at Lion Cavern in Swaziland. The numerous pieces of ochre from Olieboompoort and the many fragments from Die Kelders, the piece from the Howiesons Poort type, site, the 3 pieces from Wonderwerk, the notched ochre from Hollow Rock Shelter and the Howiesons Poort drilled and ground ochre pieces from Klasies River strongly suggest continuous symbolic traditions indicative of cognitively modern human behaviour. The only parallel that can be drawn to this enormous increase in the appearance of ochre is at the start of the Upper Palaeolithic, occurring 70 000 - 60 000 years later. In modern hunter-gatherer societies ochre is a symbol of lifeblood and is used in rites of passage for youngsters as well as burial and ceremonial rites. There is, however, no clear indication of the use to which it was put during the MSA, although Deacon (1999) hypothesises that the presence of ochre is a sign of symbolic communication.

Bushman Rock Shelter displays examples of worked bone from its MSA layers, one of the few MSA sites apart from Blombos Cave to do so in any quantity. These sites together strongly support the idea that bone working was indeed an integral part of the MSA humans' tool manufacturing repertoire. Incised ostrich eggshell has clearly been identified from the Howiesons Poort layers at Diepkloof and the Cave of Hearths, and ostrich eggshell water containers from the MSA sequence at Apollo 11. The findings of worked bone and incised ostrich eggshell in southern African MSA contexts can, therefore, no longer be classified as an odd occurrence worthy of no mention in the discussion of the origins of symbolism and modern behaviour.

The argument that the frequency of worked organic remains that have been found in MSA deposits cannot compare with those from LSA sequences (Klein 1989) does not stand up well to closer scrutiny. In southern Africa the increase in the occurrence of worked organics occurs in the Holocene, 12 000 years after the MSA ended late at Sibebe Shelter and over 35 000 after Border Cave. These findings from the lesser known MSA sites are, therefore, of crucial importance in understanding MSA behaviour and the implications thereof. They suggest that the numbers found in pre-Holocene LSA layers mirrored the frequency of the worked organic remains in the MSA to a large extent. When this argument is considered in conjunction with the evidence yielded by Sibebe Shelter for a late MSA/LSA transition, it becomes clear that Klein's hypothesis possesses serious flaws.

The remains of geophytes are evident at Strathalan Cave B and are inferred at Klasies River. At both sites the geophytes were present in large quantities around hearths throughout the sequences. This would have required sustainability in approach to collection. For significant amounts to have been gathered over a lengthy period of time, it is proposed that controlled burning of the veld is necessary, which is a form of environmental management (Deacon 1989). This approach, together with protein from animals and shellfish, is approximately the same subsistence pattern as in the LSA. The placement of the geophytes around the hearths has led Deacon (1995) to suggest that the site formation processes in the MSA were identical to the LSA. However, it remains to be seen what the features of Acheulian hearths were and what comparative conclusions can be drawn from them.

An essential component to this argument is the composition of the MSA faunal remains. Binford (1984) claimed that the inhabitants of Klasies Rivers scavenged rather than hunted and did not share their food, based upon skeletal part representation. This view was countered by Klein (1989). Klein points out that the same faunal assemblage pattern characterises both LSA and Iron Age sites, the inhabitants of which clearly hunted. The alternative interpretation, therefore, is that the MSA skeletal pattern resulted from transportation factors.

A fundamental tenet of Klein's hypothesis is that humans passed a cognitive threshold at the period of the technological transition from the MSA to the LSA (Klein 1989). This neurological change resulted in the adoption of modern behavioural patterns and, consequently, to the ability of *Homo sapiens sapiens* to expand out of Africa and the Levant into the cold climate of Glacial Europe and thrive.

Klein (1989, 1995) uses the faunal evidence from Klasies River and from Die Kelders to hypothesise that the discrepancy in the numbers of dangerous game animals between the MSA and the LSA was due to the MSA humans being inferior hunters. Based on evidence from Klasies River and Die Kelders, Klein (1995) suggests that MSA eland were driven to their deaths over nearby cliff-faces and dangerous game were opportunistically hunted in proportion with their attritional profiles.

Klein suggests that the lack of fish, young seal and sea bird remains at the southern Cape coastal sites was due to the MSA humans being unable to recognise them as a potential source for effective targeting as food (Klein 1989, 1995).

However, modern humans first appear in the European archaeological record ca. 40 000 BP, at a time when Sibebe Shelter and other southern African sites may still have been utilising MSA technologies (Border Cave, Kathu Pan and Wonderwerk with their "Early" Later Stone Age assemblages may have been the exceptions). The dates do not match up in Klein's hypothesis. Also, his view would consequently leave a scenario of behaviourally archaic and modern humans living together in the same landscape. Questions must be raised about the realism of that prospect. Although it is known that modern humans and Neanderthals co-existed for some time in Europe, it was not for tens of thousands of years.

The finding of a broken stone tool in the neck of a giant Cape buffalo (Pelorovis) by Milo (1998) adds weight to the theory that the theory that the MSA people did not possess the bow and arrow, and instead hunted with spears. To have actively hunted dangerous game with hand-held spears would have been extremely dangerous and Milo suggests that they adopted a different strategy: camouflaged pits lined at the bottom with spears stuck into the ground at an angle. The prime-aged experienced animals would have avoided such traps relatively successfully, while the inexperienced youngsters and the old, more incapable game would not have. The same explanation could account for the attritional buffalo profile at Border Cave.

Klein (1999) regards the appearance of beads and bone points as one of the main signifiers of modern cognition. These bone points appear early at Blombos. Furthermore, the greatest numbers are to found only during the Holocene, which is 30 000 year later than the time the time-frame of c. 40 000 to which Klein would like to attribute the appearance of cognitively modern humans (Wadley 1993). The changes were likely caused by climatic, and population growth and pressure factors. This further undermines the methodology of those archaeologists who would like to apply Upper Palaeolithic markers to the rest of the world.

At Die Kelders the same numbers of eland are present in both the MSA and the LSA sequences. This suggests that the same kind of strategies were used in choosing the most suitable cliff-faces, guiding the eland away from their migration paths along the chosen pathways, and in the placement of people in the right positions to be able to chase the eland over that final barrier. All this required co-ordination and detailed planning, as well as a mental picture of the desired end result. The ability to anticipate and plan ahead in detail is a cognitively modern behavioural characteristic.

Deacon (1995) charges that cultural choices explain the lack of bird bones as a raw material for artifacts as in the LSA. However, this may simply have been the result of the MSA people lacking the necessary technological equipment to actively fish (such as fish gorges and sinkers), and hunt fur seals and birds (bows and arrows). This scenario has been challenged by recent discoveries at Blombos Cave, suggesting that MSA humans possessed the capacity and capability for active exploitation of the sea but deliberately chose whether or not to utilise this knowledge, i.e. differential exploitation patterns employed by the occupants of the different MSA sites. This selective ability is a cognitively modern human trait.

Deacon & Geleijnse (1988) point out that the sizes of the MSA shell middens at Klasies are identical to those in the LSA, and Deacon (1989, 1995) draws the conclusion that exploitation was occurring on the same scale. However, the average limpet size is smaller than in the LSA (Klein 1989), but MSA tortoises are generally bigger than LSA ones. Consequently this need not be taken as less effective exploitation of the natural resources, but may rather be the result of a less dense MSA population (Thackeray, A. 1992).

At Florisbad the MSA assemblage was undoubtedly the result of human actions, in particular those of late archaic Homo sapiens (Brink 1987). The composition of this faunal collection points towards the archaic people scavenging hippopotami, but selectively hunting small and medium-sized bovids; and the site formation processes arguably bearing the hall-marks of near-modern cognitive ability.

Deacon views the site of Elandsfontein as a typical Acheulian occurrence: life in and exploiting narrow environmental wetlands. As such he suggests that they were technologically and mentally archaic by comparison with the "modern" MSA humans (Deacon 1995). Florisbad displays evidence of selective patterned hunting and site formation processes, attributed by Brink (1987) to near-modern behaviour, which contradicts Deacon's over-simplification of Acheulian cognitive abilities. The answer may lie in that archaeologists are looking at two opposing sites. Kohn & Mithen (1999) have recently proposed the Acheulian handaxes, which dominate the assemblages, were an integral part of the process of Acheulian sexual selection. They propose that the relationship between males and females changed as *Homo* became bigger brained, resulting in modern brain sizes, and children consequently became more dependent on their parents for nurturing. The hypothesis is that females gradually turned their attention towards males that could provide the most reliable resources of food and protection (Kohn & Mithen 1999). These changes in sexual selection patterns may have resulted in males changing their stone tool components to hunting equipment possessing more functional efficiency. This was also the period of the emergence of the MSA. It is possible that these processes, if proved correct, were ongoing at different rates at Elandsfontein and Florisbad, particularly as they are temporarily apart.

The occurrence of fish bones at Olieboompoort is significant. It is the first time such organic remains have been found at an inland southern Africa site and it strongly suggests that targeted specific locations were targeted in the environment. This can be labelled a cultural choice on the part of the inhabitants and it is a characteristic of modern human behaviour.

Through the inclusion of the lesser known MSA sites a new window is opened on our understanding of the timing and development of modern behaviour during the MSA. The inhabitants of the different MSA sites under discussion exploited their environments in significantly slightly different ways and display their cognitive abilities in various contrasting symbolic artifacts. These differences are evident in the composition of the faunal and artifactual remains.

It can tentatively be proposed that the period of transition from the Acheulian to the MSA stone tool industries also saw the first substantial rise of signs of cognitively modern behaviour. It appears that a mental threshold was broken through. From the evidence presented, when the southern African MSA is looked at as a whole including the unpublished sources of information instead of selective focusing on the better known sites and analyses such as Klein's, then a picture emerges of the behavioural patterns of the MSA humans which is more conclusive than those from the well known published sources alone. Although the hypothesis has its problems, which are detailed above, the weight of evidence appears to be on the side of the MSA humans possessing fully modern human behaviour exhibited through subsistence strategies, distribution on the landscape, and stylistic symbolism in stone and organic artifacts.

CONCLUSION

The common rallying cry of creationists, as it pertains to human evolution, is that palaeoanthropologists and archaeologists are engaging in a conspiracy to deceive the general public and to convert people to the "evolutionary doctrine." It conjures up images of scientists from all four corners of the world contacting each other: "Psst, have you heard of the latest evidence to hush up?" Scientists vehemently disagree with each other. As seen through this book, Cremo & Thompson do not deviate from the standard script. But does this justify classifying "The Hidden History of the Human Race" (1999) as pseudoscientific? To answer this, let's examine 7 specific criteria:

1. **Little or no change in the tenets:** Cremo & Thompson take the Vedic Texts as the fundamental basis for their arguments and attempt to weave the hominin fossils and artifacts around it. Their religious document cannot be altered, for to do so would be admitting their personal faith is partly in error. Also, should it alter then it would be vulnerable to further, more fundamental revision. No evidence whatsoever can shake their religious basis. By contrast, mainstream palaeoanthropology and archaeology are constantly constructing new hypotheses based upon recordings and observations, all of which are testifiable and falsifiable.
2. **No research community:** Scientists conduct research and publish their results in peer-reviewed journals. They are therefore part and parcel of the research community. By contrast, Cremo & Thompson come from a religious institution that has no real anthropological research program. The work of Cremo & Thompson is intended to attack evolution and to support their religious doctrine. Cremo & Thompson do not participate in any mainstream science research, nor do they produce a comparable amount of results published in peer-reviewed journals. In other words, they do not operate within any recognised scientific parameters.
3. **The party or parties proclaiming the idea do so for other aims:** The host society in this regard is the Hindu religious sect Cremo & Thompson

belong to. It makes good business sense to attack the prevailing evolutionary theory for it focuses the spotlight upon their sect and on the perceived "evils" perpetuated amongst the general public.

4. The basis of the alternative idea cannot be falsified: Cremo & Thompson's work incorporates the supernatural realm. The supernatural is a matter of belief and cannot be proven correct or otherwise.

5. Circular logic: With regard to the present investigation, Strahler's statement (1999: 526-527) that *"logic is certainly not respected by the creation scientists in their arguments against mainstream evolutionary science. Time and again we have seen the non-sequitur chain used in the creationist argument that reads: 'Science is in disarray; therefore science is in error; therefore recent creation is the truth'"* can be amended slightly. If "Hindu creationism" is substituted for "recent creation," the statement stands up to close scrutiny of Cremo & Thompson's work.

6. Problems concerning the cognitive realm: The background to how and why life is the way it is, is based on unshakeable, untestable personal beliefs.

7. Isolated cognitive field: Because the points raised by Hindu creationism are based on a religious text, this very factor does not overlap with modern science. Modern science relies upon falsifiable theories. Instead, it is a belief system that is only overlapped by other belief systems, such as the different variants of creationism.

Cremo & Thompson's book "The Hidden History of the Human Race" holds true in all these respects. Anyone who still doubts the various matters discussed regarding their work being based upon a personal interpretation of one particular religious text, and their selective usage of quotes from scientists, are encouraged to read Tom Marrow's (1999) review of "Forbidden Archeology's Impact" and Wade Tarzia's (1999) "Cheering with the Enemy, or Boosting Your Mileage with the Best from Bad Reviews."

It has been repeatedly shown during the course of this book that the theory of evolution and the mechanism of natural selection best interpret the hominin artifactual and fossil remains. Hominins diverged from a common ancestor with chimpanzees between 5-8 million years ago, with us being the sole remaining member of the hominin branching tree alive. It is a fascinating story and one that will continue to attract talented researchers dedicated to furthering our understanding of the hominin record, many of whom I am honoured and humbled to know.

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