The Earliest Hominines Essay, Research Paper

The Earliest Hominines

The first undoubted hominine discovered thus far is Ardipithecus ramidus,

which was found in 1994 and is known from 17 fragments of teeth and bone. It

dates to approximately 4.4 million years ago.

Thought to be the descendent genus of Ardipithecus is the genus

Australopithecus; individuals of this genus were bipeds while on the ground and

had ape-like brains and dexterous hands. There are at least six species of

Australopithecus: A. anamensis, A. afarensis, A. aethiopicus, A. africanus, A.

boisei, and A. robustus.

In 1924 an unusual fossil was brought to Raymond Dart, an anatomist at the

University of Witwatersrand in Johannesburg. This fossil had a curious mix of

ape-like and human-like traits. Dart named the fossil Australopithecus africanus

and claimed that, based on the forward position of the foramen magnum, the

creature was a biped.

At least four species are recognized: A. afarensis and A. africanus being

smaller and lacking the massive jaws of the two larger species, A. boisei and A.

robustus. A. afarensis and A. boisei are from East Africa, while A. africanus and A.

robustus are from South Africa. An earlier species, A. anamensis comes from

Kenya, while a single representative of a sixth species, A. aethiopicus comes from

West Turkana and is known as the “black skull” for its distinctive black staining.

Australopithecus africanus has been discovered at three South African sites:

Taung, Makapansgat, and Sterkfontein. All of these sites range in date from 3 to

2.3 mya; however, a partial foot may be as old as 3.5 million years.

Australopithecus afarensis dates to between 3.9 and 2.9 mya, and was

discovered in the 1970s and 1990s in the Afar region of northern Ethiopia.

Included in this species are the two famous finds of Don Johanson: the remarkably

complete female skeleton AL 288-1, known as “Lucy”, and the collection of 13

individuals at Afar Locality 333 which has come to be known as the “First Family”.

Material nearly 4 million years old from Laetoli in Tanzania has also been

ascribed to A. afarensis, despite suggestions that the wide variation in size of

individuals may mean the presence of 2 species. It is likely, however, that A.

afarensis size differences represent sexual dimorphism similar to Miocene apes and

intermediate between the greatly dimorphic modern gorillas and the less dimorphic

chimpanzees.

Other East African sites have yielded fossils similar to A. afarensis or A.

africanus. These sites are all 2 million or more years old. The individuals ranged

between 3.5 and 5 feet, with weights of between 29 and 45 kg.

Australopithecus afarensis and A. africanus are considered to be “gracile” or

smaller australopithecines. These two species possessed small incisors, short

canines in line with the other teeth, and a rounded dental arch. No gap between the

canines and incisors in the upper jaw (diastema), as seen in apes, was present. The

molars and premolars were larger than those of modern humans, but were similar

in form. Tooth wear indicates that these species chewed as humans do, but with 2

to 4 times the force. The diet was largely tough, fibrous vegetation. A. afarensis

individuals tend to show more sivapithecine features, such as a less-rounded dental

arch, less shearing tooth wear, slight diastema, and some canine projection, than

the later A. africanus individuals. These sivapithecine features suggest a Miocene

sivapithecine-like ancestor.

Some sex differences have been noticed in these two australopithecines: males

seem to develop a bicuspid first lower premolar while females do not; and females

seem to possess skeletal features better suited to tree-climbing than males. These

differences suggest that males and females may have had slightly different foraging

strategies, with males spending more time on the ground and females exploiting

trees.

Cranial capacity of A. afarensis was 310 to 500 cc and that of A. africanus was

428 to 510 cc (roughly the size of a chimpanzee and 1/3 that of a human);

intelligence, however, is more a factor of the ratio of brain to body size.

Unfortunately, the vast rang of body sizes in these forms makes this ratio difficult

to assess. It is believed that these two australopithcines had mental capabilities

equivalent to those of the great apes of today.

What is significant is the fact that at 4 million years ago, there existed a bipedal

hominine. Evidence supporting this fact includes: forward placement of the

foramen magnum indicating a head balanced atop the spinal column; human-like

curvature of the spine; forearms shorter than those of an ape indications of a lower

centre of gravity than apes; the Laetoli footprints; and hip and knee anatomy. On

the other hand, these australopithecines still retained a slightly divergent great toe

and shoulder girdle well suited for climbing.

Bipedal locomotion preceded any increase in brain size; in fact,

australopithecines lacked the prolonged maturation of modern humans and likely

matured as apes do. Upright walking set the stage for larger brain sizes but was

not the sole cause of these later increases.

Robert Broom and John Robinson first discovered Australopithecus robustus,

a larger, more robust australopithecine, in 1948 at the sites of Swartkrans and

Kromdraai (South Africa). While no accurate dates are available, it is believed that

the deposits are 1.8 to 1 million years old.

A. robustus is similar to A. africanus, except for thicker bones relative to size,

with large muscle-markings that included an ape-like sagittal crest on the large

skull.

Cranial capacity of A. robustus was around 530 cc and the crest served to

anchor the massive chewing muscles of powerful jaws. Such chewing apparatus is

also seen in the modern gorilla and is an example of convergent evolution in these

two species.

In East Africa, a robust australopithecine species also exists: Australopithecus

boisei.

First found at Ngorongoro Crater of Olduvai Gorge in 1959 by Mary Leakey,

the original specimen was named Zinjanthropus by Louis Leakey. Further study

revealed it was another australopithecine and it was renamed A. boisei.

Potassium-argon dating places the find at 1.75 million years old; however, another

specimen thought to be an earlier A. boisei is dated to 2.5 mya. The most recent A.

boisei fossils are only 1.3 million years old.

A. boisei is similar to A. robustus in form; however, the East African robust

australopithecine is even more robust than its South African relative. A. boisei s

cranial capacity was 500 to 530 cc and its weight was 34 to 49 kg, compared with

the 32 to 40 kg range of A. robustus.

The Black Skull from Kenya shares some primitive features with

Australopithecus afarensis and, being far earlier than the other A. boisei finds, has

been suggested as being descended from A. afarensis. While your text considers

this specimen to be an early A. boisei, other researchers prefer to place the Black

Skull in a separate species, Australopithecus aethiopicus.

It is uncertain whether A. robustus represents a southern offshoot of the A.

boisei lineage or an example of convergent evolution that evolved from A.

africanus.

A. boisei and A. robustus were both highly efficient “chewing machines” which

had a diet of tough, uncooked vegetation.

The law of competitive exclusion states that when two closely related species

compete for the same niche, one will outcompete the other, bringing about the

“loser s” extinction. The specialized vegetarian robust australopithecines avoided

such competition with early Homo and these two genera were thereby able to

coexist for some 1.5 million years.

Older than Australopithecus afarensis is Australopithecus anamensis. This

species is a recent find, dated to 4.2 to 3.9 mya, and is represented by an arm bone

found in 1965 and two jaws and a tibia found in 1995. The jaws were ape-like with

a shallow palate and large canines, but the tibia was similar to that of A. afarensis

and is the oldest direct evidence of bipedalism yet found.

Older still than Australopithecus anamensis is Ardipithecus ramidus, a species

known from pieces of 17 individuals from Ethiopia dated to 4.4 mya. No pelvic,

foot, or leg bones are among the fossils; however, the shapes of the canines and

vertebral elements are hominine in appearance.

It is believed that the Australopithecus evolved, by way of Ardipithecus, from

some Miocene sivapithecine ancestor. Evolution of the hominines was not steady;

it was far more likely periods of stasis punctuated by short episodes of rapid

changes, as evidenced by long periods of little change between the diversification

of the various Australopithecus species.

At the close of the Miocene, the climates changed, with the Mediterranean Sea

drying up temporarily and the vast forests undergoing a reduction in size. More

open country was available, requiring the ancestors of the hominines, as well as the

early hominines themselves, to spend more time on the ground. New foods were

made available as older arboreal ones disappeared; dentition therefore was altered.

With the reduction of canines came, it is believed, a reliance on hands for defense,

using clubs or rocks. This use of objects for defense may have set the stage for

tool-use/tool-manufacture. There is no evidence of tool use or manufacture among

australopithecines, but modern chimps and orangs can and do make tools; in fact,

under experimental conditions, chimps have been able to make crude chipped stone

tools. Based on the abilities of modern chimps and orangs, it is believed that the

australopithecines used natural objects as tools.

There is a 2 million-year gap between the last sivapithecine and the first

australopithecine; the individuals in this gap likely were undergoing the transition

to bipedalism.

Bipedalism has drawbacks: exposure of soft belly to attack; slower running and

poorer ability to change direction instantly; back problems, hernias, circulatory

problems associated with the upright posture; and the consequences of serious leg

injury.

So why bipedalism? Perhaps for: carrying foraged foods from place to place

carrying infants so that fatal falls from mother were minimized; faster food

gathering and longer treks with less fatigue; spotting food sources or predators

from a distance with the increased height and visual perspective of standing on the

hind limbs; or freeing hands to fend off predators by using natural objects as

weapons. In any case, the bipedal adaptation was likely the result of several

factors.