

Subject: Anthropology
class notes for - DSE-1B(CC-2)
Topic: Earlier hominids
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AUSTRALOPITHECUS AFARENSIS

Fossil remains of considerable importance were, first of all, noted by the French archaeologist, Maurice Taieb, in the year 1967, at the Afar region on N.E. Ethiopia. The Afar, a fractured depression in the earth's crust, is considered as a tremendous importance to the geologists because of the fact that it links the African Rift valley to the rift system of the Red Sea and the Gulf of Aden. As a geological hotspot it is the source of considerable importance on plate tectonics and the continental development. In 1971, Taieb and Johanson conducted a joint French-American Expedition in the region mentioned and by means of which they explored a few significant fossil remains in the deposits traversed by the Omo River

in South Ethiopia. The First International Afar Research Expedition (IARE) was started in 1973 under the leadership of Yves Coppens, Donald Johanson and Maurice Taieb. In course of its work for four years a large number of fossils were unearthed and all jointly opened a new horizon in the line of thinking of human evolution. These are regarded as the unparalleled breakthrough in the age-long search for the evolution of mankind.

The Afar collections altogether comprised 197 hominid fossils—jaws, teeth, long bones, hand and foot bones, vertebrae, ribs, fragments of skulls. It was a disproportionate collection and the scholars are of opinion that these belonged to 13 individuals, young and old of both sexes. These appeared to have been buried together at a particular site and generally referred to as *The Family*. Taieb opined that they had died together owing to the sudden influence of flood at the time of their sleeping in a river bed. But Leakey gave a different view. According to him, the band of hominid was succumbed to a virulent disease. All the Afar fossils are of three million years old.

The most famous of Afar remains is the partial skeleton popularly known as *Lucy*. While working at a geological site Johanson and his colleague, Tom Gray, found the first fragments

of a skeleton. Ultimately they unearthed 40 per cent of the total skeletal fragments of a single hominid skeleton. It was named Lucy following the Beatle's song "Lucy in the Sky with Diamonds" which was playing on a tape in the camp during that famous discovery.

The close study of the skeletal fragments thus found indicates that Lucy was a small female *Australopithecine* who lived three million years ago by the side of a lake in Ethiopia. It was the most complete skeleton belonging to an early hominid ever discovered. Lucy's sexual status was confirmed after examining the

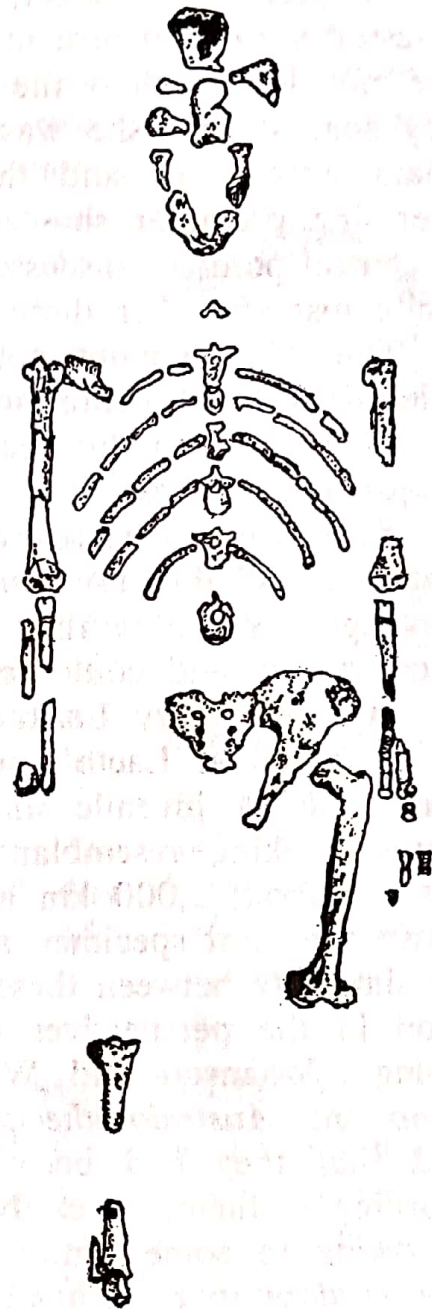


Fig. 12.9 : "Lucy"—Most Complete *Australopithecus* Specimen Discovered

pelvis. The post-cranial skeleton of Lucy suggests that Lucy was well adapted to an erect, bipedal mode of locomotion. But she possessed very long arm in proportion to the total body size. These were not longer than the legs but nearly similar. The teeth of Lucy suggest that she was 20 years of age when she died. The molars were large and the canines showed no projection. The lower first premolar showed a front-to-back elongation. Lucy was the central point of discussion in the press conference held at Addis Ababa just after her discovery in 1974.

The Afar remains collectively focus new light in the sphere of hominid fossil evolution. Thus IARE statement indicates that the knowledge on the genus *Homo* has been so developed in consequence of these discoveries that all previous theories on hominid origin need to be revised. The genus *Homo* used to walk, ate meat and probably used tools to kill animals three to four million years ago. Probably they had developed some kind of communication system and could form a trend of social cooperation.

In 1974, Mary Leakey and her son Philip unearthed a number of fossils at Laetoli near Olduvai. These included some isolated teeth, a juvenile mandible and one adult mandible which showed striking resemblance to the Afar specimens. These two sites are about 2,000 km apart from each other and in time perspective the Afar specimen are at least half a million years younger. The similarity between these two types in spite of conspicuous separation in the perspectives of time and space is very much astonishing. Johanson and White pointed out that the blending of *Homo* and *Australopithecus* features within the single species implied that they had been ancestral to both. These fossils can, according to them, be easily included in the genus *Australopithecus* but owing to some significant differences with the known species of *Australopithecus*, it has been necessary to create a new species—*afarensis*.

Johanson and White have put forward the evolutionary significance in a single, straight and slender stem of development. In this system *Australopithecus afarensis* remains at the bottom and *Homo sapiens* stands at the top. From the main stem a truncated branch is developed along which *Australopithecus africanus* evolved into *Australopithecus robustus* and subsequent extinction. Johanson and White are of opinion that *Australopithecus afarensis* was the only hominid-line for a long span of time and from this the *africanus* line got diversification about 2.5 million years ago. The genus *Homo* developed more recently with the appearance of *Homo habilis* about 1.9 million years ago.

Johanson was struck by the combination of ancient and modern

features in these fossil remains. They had upright posture and bipedal locomotion. But the jaws and teeth were very similar to those of *Ramapithecus*. They had very small brain with a capacity of 400 c.c. It is very surprising to see such a primitive feature in this stage of development. *Australopithecus afarensis* is thus regarded as the ancestor of every hominid fossil ever discovered because it is basically primitive but is provided with some modern characters emerging. Philip Tobias did not approve it. According to him, *Australopithecus afarensis* was an invalid issue. In a meeting of the Royal Society, in 1980, he pointed out that a number of features which Johanson, *et al.*, mentioned as diagnostic of the new species were also found in *Australopithecus africanus*. Philip Tobias was in favour of suppression of the species *Australopithecus afarensis*. He suggested renaming of these specimens with an inclination of sub-specific distinction conditioned by geographical distribution.

He presented two specific names like *Australopithecus africanus ethiopicus* and *Australopithecus africanus tanzanensis* for Afar and Laetoli specimens respectively.



Fig. 12.10 : Philip Tobias Who was in favour of Renaming Afar and Laetoli Specimens

line.

AUSTRALOPITHECINES

A large number and diverse fossil remains belonging to South Africa constitute a hominid perspective with the help of their distinguished bodily features. It is known by the name *Australopithecines*. This group of animals flourished in the soil of Africa during the late Pliocene to early Pleistocene, and the animals belonging to this group are remarkable by their tremendous contributions to the sphere of our understanding of hominid evolution. The name *Australopithecine* has no connection with Australia : *Australo* means southern. The first of the Australopithecine group was brought to light by an Australian born anatomist Prof. Raymond A. Dart, in the year 1924, the details of which are being discussed in the following lines.

Australopithecus africanus

THE TAUNGS APE

In the year 1924, when Prof. Raymond Dart of Witwatersrand University, Johannesburg, brought to light a wholly unexpected candidate for the role of remote human ancestor in a limestone quarry in South Africa, it did not receive any conspicuous welcome. After taking full charge of the Dept. of Anatomy at the

University of Witwatersrand Dart felt the necessity of organising an anatomy museum, and readily he took a promise to do the same. He initiated some of his students to collect fossilized bones from the different places of Africa. In due course, Dart's attention was drawn to the richness of fossilized bones and skulls at Taungs. He made a regular arrangement with the workers of a mine there as well as with its manager to supply him some stone blocks containing fossilized bone remains. While he was working with a huge block of stone he saw, to his utter surprise, that the skull of a human-like child with characteristic milk teeth and emerging permanent molars came out of it. Dart became overwhelmed with joy on getting that unexpected material. He was fully absorbed in extracting the whole thing minutely which revealed many humanoid features, like refinement of forehead, jaws, teeth and brain. On examination of the skull Dart noted that it was globular in form indicating its more erect position on the vertebral column in comparison to that of the living apes.

Dart's revolutionary findings were, first of all, made their first appearance in the *STAR*, published from Johannesburg, on the 3rd February, 1925. In the same year, Dart published a broad-based paper entitled "Australopithecus africanus—the Man-Ape of South Africa" in *NATURE*—a renowned British Scientific Weekly.



Fig. 12.4 : Robert Broom : the Discoverer of Robust Australopithecus

In these discussions Dart assigned a very progressive position to the *Australopithecus* specimen. His claims were not well received by the anthropological establishments who refused the presence of any significant human trait in the Taungs baby. Sir Arthur Keith, the towering personality in the study of human evolution of those days, vehemently opposed the views of Dart. He went to the extent of saying that the specimen was nothing remarkable, and any attempt to highlight it as a human ancestor would end in utter absurdity.

But Dart was not disheartened. He continued the work very seriously with his new findings. In 1936, the search was continued by Robert Broom—a 69 year old Professor of Geology.

In 1938, he could discover the remains of a related creature with heavy body built. Broom published all the *Australopithecus* remains with analytical assessment. With this Dart's discovery of the *Australopithecus* remains received full acceptance by the then scientists. In a letter published in the *Nature* (1947), Sir Arthur Keith duly acknowledged his fault in not assigning specific importance to Dart's discovery.

DETAILED STUDY ON AUSTRALOPITHECUS AFRICANUS

Now let us discuss the Taungs skull in detail to have an overall idea on it. This fossil find includes the entire facial region of the base of the skull, together with a natural endocranial cast of limestone. The skull possessed twenty milk teeth and four permanent first molars. The possessor of the skull was probably five years old at the time of death.

The geological age of this fossil ape is very uncertain. But now it has been established that the geological age of the Taungs ape should be the Lower and Middle Pleistocene.

The Taungs skull was carefully studied by Prof. Dart who considered this to be in the direct line of descent of man. But this view has not been received by many scientists. The skull resembles closely that of the chimpanzee in size and facial portion. *Australopithecus* is dolichocephalic. The supra-orbital ridges are absent. The orbits are circular like those of the orang and lemroids. The premaxilla is well-marked as is found among the apes. The nasal aperture is small and almost as high as it is wide. In man, it is higher than its width, and in ape, it is wider than its height. The face is slightly prognathous. The teeth are arranged on the jaw in human fashion. The canines are small and not tusk-like as in apes. The grinding teeth resemble human in every detail. The *Australopithecus* chewed their food just as we do and the motion was not up and down as we find in the case of the apes. The diastema is found in the upper jaw between the incisor and canine. The palate is parabolic in shape which is a human feature.

The lower jaw is massive and thick. It resembles that of the chimpanzee and organs. The chin is absent; The foramen magnum is situated further forward than in apes. This indicates that the head of *Australopithecus* is more well-balanced than in apes. The cranial capacity, according to Prof. Dart, is 520 c.c. The range of cranial cavity of the adult species has been estimated at 518-733 c.c. *Australopithecus* had larger brain than that of the chimpanzees and in many characters the brain showed humanoid features.

From Taungs Dart's area of investigation was extended to

many sites abound in rich fossilized bones and skulls. He made special investigation at Makapansgat site. By means of his close field study at different Australopithecus sites Dart opined that Australopithecus population had a definite culture of their own and they were flesh-eating hunters. They were in the regular habit of using a kind of antelope-bone club, and also they used a variety of bone, horn and tooth tools and weapons. Thus Dart claimed a pre-stone age of culture which he named *Osteodontokeratic*. But it got a very cold reception by the archaeologists and prehistorians. Dart all along used to employ his unprecedented power of perception in recognizing the specific characteristics of the discovered fossilized materials when his scientific colleagues went against him.

From the above study it has been cleared that Australopithecus exhibits the mixture of simian and human characters. It is true that Australopithecus is more man-like in character than any known anthropoid ape.

Let us now discuss the other members of this group and see the position of the Australopithecinae in the evolutionary tree.

Table No. 12 : 2

THE SITES OF DISCOVERIES OF THE DIFFERENT AUSTRALOPITHECUS SPECIMENS IN AFRICA

Area	Particular site	Name of the specimen
South Africa	Taungs	Australopithecus africanus
	Kromdraai	Paranthropus robustus
	Makapansgat	Australopithecus prometheus
	Sterkfontein	Paranthropus transvaalensis
	Swartkrans	Paranthropus crassidens
East Africa	Swartkrans	Telanthropus capensis
	Olduvai	Zinjanthropus boisei
	Olduvai	Homo habilis
	Kanam	Homo kanamensis
West Africa	Garusi	Australopithecus
	Tchad	Australopithecus
Palestine	Tell Ubeidiya	Australopithecus
Java	Djetis	Meganthropus palaeojavanicus
China	Drugstore	Australopithecus

Plesianthropus transvaalensis

In the year 1936, Dr. Broom discovered at Sterkfontein, in Transvaal, an almost complete skull, some teeth and skull fragments, which showed the characteristics allied to the Taungs specimen. The site where the skull was found was situated at a distance of more than 200 miles south-west of Taungs. At this time the fossil finds were also found in limestone deposits belonging to the Middle Pleistocene age. Dr. Broom first named it as *Australopithecus transvaalensis* and then *Plesianthropus transvaalensis*. Again, in the year 1947, Dr. Broom discovered several fragments of long bones, pelvis, etc., of the same species at a place situated not far from the earlier site.

The top of the skull of *Plesianthropus* lacked the bony crest as is found in the gorillas and orangs. The frontal sinuses are large. The face is concave in profile. The nasal bones are long with narrow nasal apertures. There is a slight alveolar prognathism. The molars are larger than those of chimpanzee or of man. The canines are slender and short. The upper premolars of *Plesianthropus* resemble those of *Sinanthropus* in size. The two cusps of the upper premolars are equal in height—a human feature. In the case of the apes, it is seen that the outer cusp is much higher than the inner cusp. A diastema is noticed between the lateral incisors and canine. The palate is almost parabolic in shape as in man. The cranial capacity of *Plesianthropus* is estimated at 600 c.c.

Australopithecus prometheus

In a deserted limeworks dump on the farm Makapansgat, about 13 miles north-east of Potieterarust, South Africa, a calvarial fragment of a man-ape belonging to *Australopithecinae* was discovered in the year 1947. The remains that were found there included the major portion of the occipital bone in which most of the right margin of the foramen magnum and portions of the parietal bones were well preserved. The bones are very thick in nature. The base of the occiput presents a very broad surface, the occipital torus is moderately developed. The external occipital protuberance is found to be situated inferiorly in relation to the opisthocranium point. A transverse occipital suture is seen. The cranial capacity has been estimated at 650 c.c. Prof. Dart considers the features presented by this fossil find as human.

Paranthropus robustus

In 1938, a bone remain of the fossil ape was discovered by a school boy who suddenly came across the piece of bone. The boy

gave it to Dr. Broom who realised the importance of the bone and went to the site named Kromdraai, two miles east of Sterkfontein, and discovered from the Middle Miocene deposits several other bone remains. It includes a part of the skull, part of humerus and ulna, some carpal and tarsal bones.

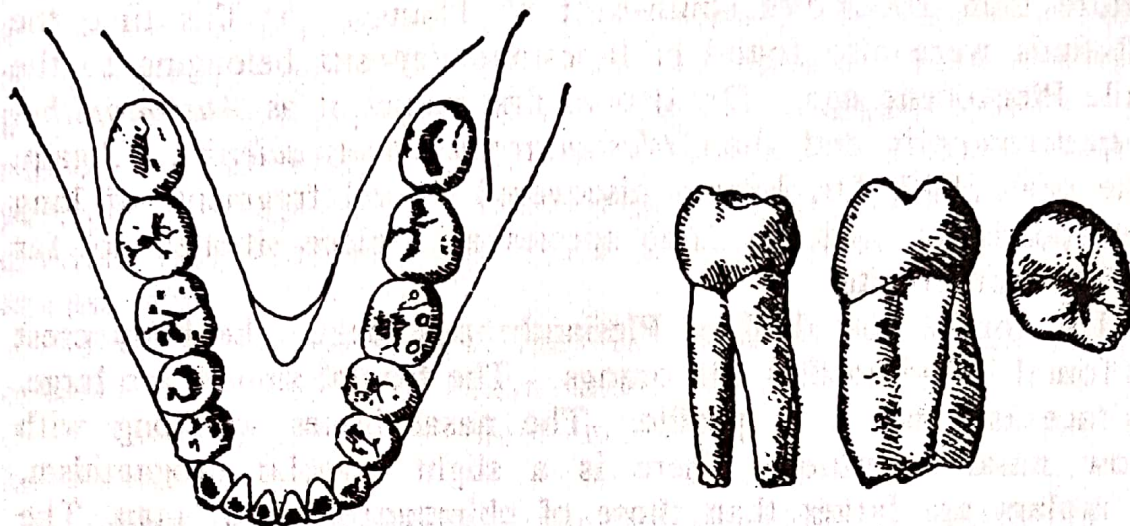


Fig. 12.5 : Jaw and Molars of Paranthropus

Broom estimates the cranial capacity of Paranthropus at 600 c.c. The face is marked by the forward projection of the cheek bones. The lower region of the upper jaw is flat. According to Gregory and Hellman, the lower facial region of Paranthropus resembles very much that of orang utan. The lower jaw is massive. The prognathism is noticed. The canines of Paranthropus are not well-preserved; the sockets for the canines prove that they were small in size. The molars have more humanoid tendencies. The palate is parabolic and not U-shaped as in apes.

Robinson (1954) called this specimen as *Paranthropus robustus robustus*. Oakley (1954) preferred to call it *Australopithecus robustus*. It is excepted by all concerned that this Kromdraai specimen is an Australopithecus of robust variety having very stout and heavy body with massive jaws and molars. The grinding teeth were huge in proportion to the size of the incisors. The canines were very small. The skull was provided with a bony crest, the *sagittal crest*, for anchoring jaw muscles. This development of the muscles meant for chewing up large quantities of tough vegetable food.

Paranthropus crassidens

A massive man-like mandible was discovered by Broom, in 1948, in the deposits on the Swartkrans farm—about a mile away from the proper Sterkfontein quarry. With this fossil find two

perfectly preserved upper incisors and upper canines were also discovered at some distance and, according to Broom, those teeth belonged to the different individuals of the same species. The other remains of *Paranthropus crassidens* were found out by Broom and Robinson at Swartkrans during 1949 and 1950. Uptil now a number of remains belonging to *Paranthropus crassidens* have been unearthed which include many intact skulls of adult individuals, two juvenile crushed skulls and various fragmentary remains of other skulls of the same species.

So far as the characteristics of the teeth are concerned it is seen that these are typically human though the premolar and molar teeth are somewhat larger than in modern man. The skull is provided with a well-developed sagittal crest. The orbits are overhung by the supra-orbital torus. The upper jaw is prognathous. In some of the female specimens, it is seen, that the lower jaw possesses a distinct chin. Broom estimates the cranial capacity of *Paranthropus crassidens* to be as high as 1,050 c.c. in the male specimens. But, according to some, this estimate seems to be a bit excessive.

On studying the pelvis it is seen that the pelvis is man-like excepting the form of the ischium which gives an ape-like feature. In most of its characters the pelvis supports the fact that *Paranthropus crassidens* could stand and walk erect to a considerable extent.

Telanthropus capensis

In the year 1949, Robinson discovered some jaw fragments at Swartkrans which are somewhat finer and man-like than the *Paranthropus* remains found out from the same site. On these jaw bones a good deal of argument is still going on amongst the physical anthropologists. After considering all the situations this fossil individual has been named *Telanthropus capensis*. The jaw is more or less perfect. The right condyle is missing and some parts of the left side are not found. Robinson and Broom consider that the general appearance of the jaw reminds that of the Heidelberg specimen. The ramus is broad and short. The height of the jaw is 550 mm. and it is devoid of simian shelf. The mylohyoid groove is seen running upto the distance of mandibular foramen as is seen in the human skulls. The teeth, in general, are somewhat larger than those of man. The incisors and the canines are strikingly human so far as their sockets are concerned. The third molar is large and it does not tally with the characteristic feature of human teeth. Considering all the above characters Broom and Robinson believe that *Telanthropus* falls in the intermediate stage between ape-man and true man.

Australopithecus boisei (Zinjanthropus)

THE EAST AFRICAN TOOL MAKER

Mrs. and Dr. L. S. B. Leakey discovered the skull, shin-bone of this earliest hominid from a Lower Pleistocene deposit in Olduvai Gorge, Tanganyika Territory, East Africa, in the year 1959. The word *zinj* means East Africa, in the Classical Arabic. The specific name *boisei* has been given after an English benefactor. The skull was excavated from a living floor which contained primitive stone tools, viz., choppers, hammer stones and numerous flakes. These were the typical artifacts belonging to Oldowan industry. Along with the Zinjanthropus skeletal remains there were traces of his food which consisted of antelopes, pigs, rats, frogs, snakes, birds etc. The Zinjanthropus was found at Olduvai Bed I which belonged to the Lower Pleistocene. The age of Zinjanthropus, estimated by Dr. Leakey, is about 600,000 years or possibly more. According to some scientists it was too much. But the two renowned geologists, Evernden and Curtis of the University of California, have attempted to find out the exact date of Zinjanthropus by the potassium-argon dating method. They have estimated the age of Zinjanthropus at about 1,750,000 years.

The skull fragments discovered belonged to a youth between the ages of 16 and 18 years. In the skull the exuberant growth of bony struts is a most striking feature. The sagittal crest is well-developed and the supra-orbital torus is massive. The inter-orbital



Fig. 12.6 : The Skull of *Australopithecus boisei*

width is enormous and the face is enormously long. The face of Zinjanthropus is, no doubt, larger and ape-like in proportion in comparison to those of other Australopithecines. But it resembles man in some of its features—(a) the eye-sockets are wide and these are set apart, (b) the skeleton of the nose can be viewed from the side along the entire length, and (c) the nasal spine is set forward. The nasal bones, in general, are long and narrow. The palate is very high. The canines and incisors are small

and in these Zinjanthropus resembles modern man. In the upper jaw there is no trace of premaxillary diastema. The premolars and the molars are very large in size. The third molar is smaller than the second one as in man. The condition of the premolars and the molars indicates that in the evolution of hominid dentition the incisor-canine series experienced reduction prior to the premolar-

molar series. In Zinjanthropus the nuchal crest is strongly developed, but in its form and low situation it resembles man. The foramen magnum, situated at the base of the skull, is found even more towards the frontal plane than the same is seen in the case of Homo sapiens. The possession of large mastoid process is another hominid feature. The size of the brain in Zinjanthropus is like that of an ape and the cranial capacity has been estimated at 530 c.c. which in adult individuals may be 700 c.c.

The long bones include tibia and fibula that have been discovered from the 22-foot level of Bed I in Olduvai Gorge along with the remains of the skull. These are long, slender and almost straight apparently. The lower ends of these bones are broken. The long bones appear to be essentially human in character but the fibula is somewhat heavier than the tibia. Some say that these bones must belong to two different individuals.

The Zinjanthropus, no doubt, belongs to the Australopithecinae but in some respects the Zinjanthropus show more man-like features in comparison to the Australopithecus individuals of South Africa. Dr. Leakey has taken the measurements on the different parts of the skulls of Australopithecus africanus and Zinjanthropus boisei which help in arriving at a comparative statement in relation to these individuals.

Table No. 12 : 3

DIFFERENT MEASUREMENTS ON THE SKULLS OF AUSTRALOPITHECUS AFRICANUS AND AUSTRALOPITHECUS BOISEI

Measurements	<i>Australopithecus africanus</i>	<i>Australopithecus boisei</i>
1. Maximum Length	147 mm.	174 mm.
2. Maximum Breadth (Supra-mastoidal)	120 mm.	138 mm.
3. Maximum Breadth (Inter-temporal)	99 mm.	118 mm.
4. Basion-Bregma Height	105 mm.	99 mm.
5. Bi-orbital Diameter	88 mm.	122 mm.
6. Inter-orbital Diameter	24 mm.	42 mm.
7. Bi-zygomatic Breadth	131 mm.	188 mm.
8. Upper Face Height	74 mm.	114 mm.
9. Nasal Length	49 mm.	73 mm.
10. Nasal Breadth	27 mm.	42 mm.
11. Palatal Length	64.6 mm.	84 mm.
12. Palatal Breadth	64.6 mm.	82 mm.

References: R. M. Sankar