The Dentition of Australopithecus Africanus.

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With 6 plates (VI-X).

I. Introduction

1. The contrasted features of human and ape dentitions.

The dentition of living apes is specialised for the eating of fruit and for fighting; the dentition of man is specialised for the eating of flesh, he fights with his hands. Apes are omnivorous—frugivorous, men are omnivorous—carnivorous. The marks of these specialisations in dental structure are very patent.

The incisors of apes are long, broad and procumbent, being adapted for piercing the rinds of luscious, tropical forest fruits; the canines of apes are long and pointed like a dart, they have an arrow-blade form, they project laterally and are fashioned as fighting structures to be used in offence and defence. The molars of apes are long and narrow, their cusps are sharp and high and collectively the molars form a sort of saw-like arrangement. The teeth of this saw-like structure interlock by means of up and down crunching movements to cut up their fruit diet before swallowing it.

The incisors of men are short, relatively narrow and vertically set and even recurved, being adapted for gnawing at bones and tearing tough gristle and muscle away from bones while they are held in the hands. The canines of men are short, stocky and obtusely blunted. They are only slightly longer than the incisors and are fashioned for assisting the incisors in their gnawing and tearing operations, they also have a tendency to be recurved and are useless for fighting. The molars of men are short and broad, they are virtually square, their cusps are blunted and
tuberculated. They are constructed not for cutting objects by up and down movements, but for grinding them by rolling them between these crushing surfaces by side-to-side or rotary movements.

These differences in the dentitions and their mode of operation lead to or are associated with differences in the jaws themselves. Thus the jaws of apes are rotated upwards over the front of the brain and project forwards in front of and beyond the skull. The jaws of man are rotated downwards under the frontal region of the brain and come to lie, as it were, between the forehead and the cervical part of the vertebral column. On account of these growth movements the mouths of apes can be gaped widely and permit the effective use of the long canines in fighting; the mouths of men cannot gape very widely owing to its cramped position and the limitations placed on the downward and backward movement of the mandible by the soft tissues in front of the upright vertebral column.

These differences in gapping movements are assisted by the form of the condyles of the mandibles. They are semicylindrical surfaces in the apes; in them the jaws roll open. In men the condyles are globoid because the movements performed are chiefly rotary; huge up and down excursions of the mandible are unnatural and are only seen abnormally as in yawning. Man does not seize his food with wide-opened, gaping mouth, but opens his mouth merely sufficiently to introduce the small morsels of food which he has previously prepared to suit the small size of his mouth.

Further, in order to allow of the maximum amount of backward movement of the mandible in man during mouth-opening the angles of the mandible are everted. In apes they are rather inverted. Hence the back of the mandible in men is vertical, in apes it slopes inwards towards the angle.

In apes owing to the size and prominence of the incisors and canines and the increased length of the molars, the form of the maxilla as seen from below, is rectangular; in men it is parabolic owing to the recession in size and prominence of the incisors and canines and owing to the great relative breadth of the molars. For the same reasons the anterior part of the maxilla and mandible in apes is massive, long and voluminous in order to accommodate the anterior teeth. In men, on the contrary the anterior parts of these bones are reduced in size and the protuberant muzzle of these bones is reduced in size and the protuberant muzzle of apes is replaced by a shapely rounded face.

Owing to the entirely different character of the work they are called upon to perform, there are pronounced differences between the two in
respect of other general features. Thus men present a helicoidal (or twisted spiral) occlusal plane of wear owing to the predominantly rotary character of their masticatory movements. Apes may develop such a pattern especially in old age, when the teeth become greatly worn, but with men it is customary.

Secondly owing to the large size of the canines, the lower canines, in apes, do not fall within the periphery of the upper dental arcade; whereas, in men, they do fall within that periphery. That feature may be regarded as absolutely essential in a truly-rotating primate jaw.

Thirdly the alveolar margin and the disposition of the teeth in norma lateralis (especially in the upper jaw) is markedly curvilinear in men; the lower jaw not only rolls from side to side, but rolls from front to back during mastication. Thus the incisors of the upper jaw come to be at a somewhat higher level than the molars behind. The apes on the other hand present an alveolar margin which is straight and the teeth rows snap together like two plates rather than sliding over one another from behind forwards.

Owing to the masticatory function also we find that in men there is customarily a condition of general reduction in length and width of the dental apparatus in the lower as compared with the upper jaw.

Thus the upper dental series overrides or overlaps the lower dental series in normal occlusion. The overlapping of the upper incisors beyond the lower incisors is known as ‘overbite’, the overlapping of the upper molars over the lower molars I have termed ‘lateral overlap’. In the apes overbite and lateral overlap are very rare, occasional features. They are not characteristic features in the tuberculo-sectorial dentition of apes.

2. The significance of the contrast between human and ape dentitions.

The living apes can and do use their hands for turning over rocks and sticks to find insects, for picking up their food, for peeling the stems from soft fruits, for freeing their bodies from pests and irritants and for many similar exploratory, serviceable and intelligent purposes. By means of their hands they are enabled to employ sticks and stones as weapons and tools; but in such exercises, their performances are apt to be chaotic and erratic, because they are occasional and not habitual. They depend in the long run, like dogs, on their teeth. Sectorial teeth and elongated canines are indispensable as weapons of offence and defense in living anthropoids. This degradation of facial function in creatures so intelligent as apes, is due to their bodily posture. Their hands are so
regularly employed with the feet in supporting the body weight, that
they cannot be liberated to perfect the higher offices of which they are
capable. They are entangled with the feet in a neural slavery whereby
the hands are bound by postural reflex nervous chains to the feet. Hence
the teeth are enforced to undertake those offensive and defensive duties
and responsibilities, which might so easily have devolved upon the hands,
if their handlimbs had been relied upon alone and completely for sup-
porting and transporting the weight of the body.

In other words brutal ferocious teeth and habituatedly adept and
skilful hands are the outward and visible expression of two entirely
opposed evolutionary tendencies based on two antagonistic body postures.
In men the primitive erect posture, which is found best developed amongst
apes in the gibbon, has become stereotyped. The naked erect body of
man has no natural defences whatsoever and renders him physically one
of the weakest and most vulnerable creatures in the world. An anthropoid,
which does not happen to possess enlarged canines and sectorial
teeth, is thereby rendered even more helpless than man himself; he is
not blest with man's supreme intelligence at the same time as he lacks
the oral armamentarium of the ape. Absence of such teeth in a man-
like ape, living in Southern Africa—admittedly the most dangerous, and
precarious environment on the earth—implies on first principles erectness
of posture, liberated hands and a compensatory increment in intelligence—
habitual instinctive and intellectual control over the movements of the
hands, especially in offence and defence, and an increased capacity for
suitably selecting and accurately employing natural objects as tools and
weapons.

Eight years ago, I described Australopithecus africanus as a
man-like ape living in Southern Africa in what was probably Pliocene
times, see Plate I. Various writers have attempted to dispute its geological
age, but gradually the evidence both palaeontological and geological is
accumulating to show that my original opinion is correct. I do not
intend to discuss that question here, nor will I bring forward any of the
evidence that justifies my statements, that he was an erect, cursorial,
terrestrial man-ape.

3. The Taungs Breccia.

It is necessary at the outset to recall to mind certain features of the
Taungs breccia which I discussed in an article on “Taungs and its
significance”, which was published in “Natural History” in 1926. At
that time the teeth could not be seen from the occlusal surface. The mandible was not separated completely from the upper jaw until 10th July 1929. But I pointed out (loc. cit) that it was a "midden-heap" and that its composition consisting of "the comminuted bones of turtles, birds, small insectivores, rodents, baboons, and perhaps small bok as well as bird's egg-shells, indicates by its nature, its sparsity, and its searched over and exhausted character, the careful and thorough picking of an animal, which did not live to kill large animals but killed small animals to live".

Since that time there have been found in addition to those animals already mentioned a number of others such as crabs, rock-rabbits (or coney) and a large rodent. The coney and large rodent are different species from those now living, and Dr. Robert Broom attributes them to the Lower Pliocene. In addition to the Primates he reports the presence of a primitive Hyrax (Procavia antiqua), of a Bathyergid (Gypsorhynchus), and of Antelopes (Palaeotragiscus and Cephalophus). "The fauna is", as Broom remarks, "equally far removed from the Miocene and from the recent fauna, between which it establishes a most valuable connecting link".

It is important to recognise that the fauna of the region is identical in type with that of today—it is an open-country, cliff-side fauna like that of the modern Taungs. The only difference is that it is a pre-historic and extinct fauna. It is a Pliocene type of fauna.

But the most important discovery that has been established in the meantime is that the skulls of the baboons belong to animals that were killed by force. The skulls are not only broken, but they show radiating fractures due to the impact of sharp objects, probably stones, in the right parieto-temporal region of the skull and on the opposite side there are fractures of "contrecoup" nature, such as all surgeons are familiar with in human skulls that have been struck violently. These skulls also exhibit rounded openings in the vertex or base showing that their contents were forcibly removed for food. See Plate II.

It is the midden-heap of an intelligent carnivorous creature, who was a skilled wielder of weapons. That intelligent being was either a man or the man-like ape, Australopithecus. I suggested the latter hypothesis in 1926, and today I feel positive that no reasonable alternative can be put forward to the contrary.

Darwin said in "The Descent of Man". "It has often been said that no animal uses any tool; but the Chimpanzee in a state of nature cracks a native fruit, somewhat like a walnut, with a stone. Rengger
easily taught an American monkey how to break open hard palmnuts; and afterwards of its own accord, it used stones to open other kinds of nuts, as well as bones. It thus also removed the soft rind of fruit that had a disagreeable flavour. Another monkey was taught to open the lid of a large box with a stick, and afterwards it used the stick as a lever to move heavy bodies, and I have myself seen a young Orang put a stick into a crevice, slip his hand to the other end, and use it in the proper manner as a lever—The Chimpanzee will throw any object at hand at a person who offends him—In the Zoological Gardens, a monkey, which had weak teeth, used to break open nuts with a stone, and I was assured by the keepers that after using the stone, he hid it in the straw, and would not let any other monkey touch it. Here, then we have the idea of property”.

Since Darwin’s time we have had the remarkable and interesting psychological investigations of Koehler, Yerkes and others to demonstrate to us more precisely the amazing intellectual achievements of untrained apes. Their capacity in the use of implements is well-known; that of Australopithecus was manlike.

II. The Character of the Teeth in Australopithecus

A. External Features.

1. Milk Incisors: These teeth are as vertical as those of man, they are even recurved especially the medial incisors. In actual size they are as small as, or even smaller than those of a human European child; they are absolutely smaller in every respect than those of the chimpanzee. “Their true incisive wedge-like form, their near equality of size, their vertical or nearly-vertical position, and small relative size to the other teeth, and to the entire skull” which Owen stated to be the distinguishing characteristics of human incisors are the characteristics of the incisors of Australopithecus. In occlusion the incisors of the jaws are in the human condition of “overbite”.

2. Milk Canines: (a) Inferior: These teeth are as shortened, obtusely-blunted and as convex laterally as the canines of man. Their tips do not project above the general occlusal plane of the molars at all. Their tips are not exposed laterally in occlusion as are those of apes. They fall within the periphery of the upper dental arcade. They are completely worn over their blunted extremities. They have the typical obtuse globular human appearance; they are a millimetre longer and
broader than the human European canines, but they are not as high as the latter. They have a definite medial or lingual ridge with a basal tubercle and valleculae in front and behind the broad ridge. See Plate III.

(b) **Superior:** These teeth are similar globular teeth. Owen said that in man "the true character" of this particular tooth "is indicated by the conical form of the crown, which terminates in an obtuse point, is convex outward, and flat or sub-concave within, at the base of which surface there is a feeble prominence".

To Owen the small size of this tooth and the absence of a diastema between it and the upper lateral incisor was "the most marked distinction between the bimanal (or human) dentition and that of the highest Quadrumanals". Every feature which he regards as specifically human is repeated in the canines of Australopithecus. They are typically human in form and only slightly larger than those of the European child. Their form is almost ultra-human. See Plates I and III.

3. **Milk Molars:** See Plates III and IV.

(a) **Anterior Lower.**—This tooth is in some respects the most critical of the whole dentition. In the apes owing to the elongated upper canines, this tooth forms a shearing, cutting surface with the canine. It therefore becomes a tooth which is caniniform, and really has only one cusp.

In Australopithecus, it is a definite molar tooth with fully-developed protoconid, hypoconid, metaconid and entoconid. The particular value of this tooth lies not only in the fact that it is non-sectorial but also in that it is a full-fledged molar. In modern man the molar pattern of this tooth is so obscure that there has been considerable debate as to the exact morphology of its cusps. The nature of this tooth in Australopithecus shows that the milk molar of man is the degenerate offspring of a molariform and not a caniniform first milk molar. It rules out of consideration as human ancestors any apes that have caniniform molars.

This tooth shows an attritional wear of the rotary type for which its squarish crown was adapted. It is also displaced medially and rotated slightly so as to bring the incisor, canine and molar series into a more curved alignment than has ever been found previously in anthropoids.

(b) **Anterior upper.** See Plate III.

Here, as in the lower anterior molars, there is no suggestion of caniniform specialisation. It is a broad flat triangular type of tooth, as
seen from the occlusal aspect. It is a bicuspid tooth, the lateral cusp being subdivided in the human fashion into three minor cuspules. The lingual cusp has been worn down by attrition to such an extent that the dentine is exposed over the whole length of the tooth. It is a broad triturating type of tooth, and is definitely displaced medially and well-rotated so as to bring the incisor canine and molar series into the human type of parabolic alignment.

(c) Posterior Upper.

These teeth, as in man, possess an expanded protocone, and a relatively small paracone and metacone. The protocone has borne the brunt of the attrition, the hypocone is reduced and is also partially affected by the wear. In all respects this square type of tooth approximates the human and not the anthropoidal type of tooth.

Posterior lower.

These teeth are broad squarish teeth of the human type having five cusps and even a sixth or accessory cuspule. The protoconid, hypoconulid and sixth cuspule are so worn down by attrition as to be recognisable only by the rounded islets of wear exposing the dentine in the centre. The metaconid and entoconid are only slightly worn and are of equal height, thus demonstrating that, as in man, the trigonid was on the same general plane with the talonid. The hypoconulid is large and exceedingly well-defined, thus distinguishing it from that of the chimpanzee; while the metaconid is completely shifted to the lingual border of the crown, and the size of the four main cusps is sub-equal.

The morphology of these teeth is human, and proves that the molar of Dryopithecus rhenanus, the only fossil milk molar of an ape that we possess, is not as primitive as that of the modern chimpanzee; because it is more tuberculosectorial than that of the chimpanzee.

4. Permanent Molars. See Plates III and VI.

(a) Upper first. These teeth, 12.75 × 14.0 mm. are larger teeth than occur in any of the apes with the exception of the gorilla. Their size approximates most closely that in the orang. They are not, however, nearly so large as the unworn molar teeth of Pithecanthropus, which, according to Tomes’ “Dental Anatomy” have an antero-posterior length of 12.0 mm. and a transverse diameter of 16.0 mm. These teeth in Australopithecus are not antero-posteriorly contracted but rather the reverse in form. Their cusps are obtuse but stout and well-developed.
The Dentition of Australopithecus Africanus.

There is no evidence of crenulation, but the cusps show some secondary furrows. The paracone is not larger and more protuberant than the metacone; the hypocone is not on a lower level than the protocone. All four cusps are of sub-equal height. There is a low bridge (transversely indented by a furrow) connecting the diagonally adjacent protocone and metacone, but there is not a true ridge between these two cusps. They are large but humanoid molars.

(b) Lower first. Once again these teeth are of humanoid rather than pithecoid form. In actual measurements $14.0 \times 13.5$ mm. they are closer to the maximum $14.7 \times 13.5$ mm., given by Gregory and Hellman for the orang than to the smaller teeth of the chimpanzee or to the larger teeth of the gorilla. Every feature characteristic of the first permanent molar in man, especially primitive man, is found in that of Australopithecus. The molar crown is not elongated, its posterior moiety is wider than its anterior moiety; it has five cusps, and the faintest trace only of an incipient sixth cusp; and finally the entoconid is greatly enlarged.

This enlargement of the entoconid (better expressed perhaps as a reduction of the metaconid) is so great; that the groove, separating the two, is brought into transverse alignment with the groove separating the protoconid and hypoconid; and so, produces the more or less cruciform pattern of the sagittal and transverse grooves in the teeth, which characterises the human teeth. But the hypoconid is nevertheless in contact slightly with the metaconid; and an arrangement of the furrows and cusps exists, which is identical with that in the first right molar of Heidelberg Man and with that in the first and second left molars of the Mousterian youth, and in the first and second molars of Eoanthropus.

Moreover Campbell in his monograph on "The Dentition of the Australian Aboriginal" has shown that the molars of Pithecanthropus, despite their enormous size "come within the range of measurements of corresponding Australian teeth". They are also of similar type being considerably broader (labio-lingually) than they are long (mesio-distally). The molar teeth in Eoanthropus are different; they are narrower than they are long; they are also considerably smaller than of some Australians, though they are definitely larger than those of most modern races of Men.

The lower first molars of Australopithecus are not as broad $13.5$ mm. as those of Pithecanthropus $16.0$ mm., and some Australians $16.0$ mm; but they are longer $14.0$ mm. than those of Pithecanthropus
12.0 mm. and most Australians; still they fall below the maximum 14.25 for length measurements found by Campbell in a lower molar of an Australian Aboriginal. The molar teeth of Australopithecus being more or less square, form an intermediate type; from which, variation in the direction of lengthening or widening on the one hand, or of increment or shrinkage on the other hand, may well have proceeded. They can be described as truly human teeth, in the light of what we know about the tremendous size to which some Australian teeth can attain.

The gap separating Australopithecus from Eoanthropus (13 x 11 mm. according to Hrdlička) in molar size is comparable with that separating Eoanthropus from the Modern European. The molar of Australopithecus may well have given rise to that of Eoanthropus or to any of those other human types such as Heidelberg and Neanderthal Man. The degenerate and specialised molar of Pithecanthropus could not have been ancestral to these latter human types, but the excessively broad and retrograde pithecanthropic teeth are derivable from the generalised humanoid type, which Australopithecus possessed.

We may now summarise briefly our investigation of the external characters of the teeth. In every instance; milk incisors, milk canines, milk molars or permanent molars, the teeth are human and not simian in type.

B. Results of radiographic study. See Plates V and VI.

I will not give here the details of the radiographic study of the jaws. It may however be stated that owing to the heavy infiltration of the jaws with carbonate of lime, it has been extremely difficult to secure radiographs. The most important facts elicited from the radiographic study which will be discussed in my complete memoir are:

1. That the permanent canines like the milk canines are humanoid.
2. That the fangs of the molars are not divergent.
3. That the pulp cavities are of the cynodont type.
4. That the permanent incisors remained small like those of man rather than broad like those of the chimpanzee.
5. That the permanent premolars are broad crushing teeth.

These features may be detected in the radiographic plates furnished herewith.
III. General Features of the Face and Dentition.

Hence the fact cannot be questioned that Australopithecus retained in the adult the innocuous and human visage of his youth. The human facial alterations symbolised by the almost complete closure of the premaxillomaxillary suture, by the downward and backward rotation of the face and the protrusion of the frontal lobes of the brain over the facial skeleton were not haphazard freaks. They are diagnostic, like the teeth, of the prehuman attributes of Australopithecus. See Plate I.

The position of the jaws were such in Australopithecus that they could not gape widely and accommodate elongated canines; the condyles of his mandible were globoid and the excursions of the mandible were chiefly rotary, as the form of the condyles, the nature of the dental attrition and the enhanced size of the lateral pterygoid carina (which gives attachment to the enlarged pterygoid muscles) prove. He did not seize his food with wide-opened, gaping mouth, but he opened his mouth sufficiently and merely to introduce therein the small morsels of food which he had previously prepared to suit the small size of his mouth.

The angles of his mandible were everted to allow of the maximal amount of backward movement of the mandible; the back of the mandible was vertical as in man, and not inverted as in apes. The anterior parts of the maxilla and mandible were reduced in size and the protuberant muzzle of apes was replaced in him by a shapely rounded face.

His dentition as a whole presents a pronounced helicoidal (or twisted spiral) occlusal plane of wear owing to the predominantly rotary character of the masticatory movements carried out by the jaws. Owing to the small, blunted character and medially-displaced situation of the canines the inferior canines fell entirely within the periphery of the upper dental arcade. The alveolar margin and the disposition of the teeth in the maxilla is markedly curvilinear; the dentition displays overbite and marked lateral overlap.

IV. Summary.

In brief there is no feature external or internal in the dentition of Australopithecus, that can be termed simian. We are led, by our detailed study of the dentition to an unqualified support of the deductions that are to be drawn from the study of the bone breccia at Taungs.
If any single tooth in this dentition had been found separately, it would unquestionably have been called a human tooth. We stand in the presence of an ape with a human dentition, of an ape that lived on a carnivorous diet—a diet indistinguishable from that of primitive man, a diet consisting of animals that live in an open-country region. The teeth more than any other single feature removes Australopithecus from apes and assembles him with men. As in the jaws of primitive men we find here the dentition of a man in the jaws of an ape.

We have seen from our introductory remarks that these demonstrated facts carry with them striking implications. An ape living in southern Africa and having only the dentition of a defenceless man must have been gifted with an almost human intelligence. This ape moreover was like primitive man, a hunter; he subsisted on the bloody fruits of the chase. He was enabled to do this because he was a practised and skilful wielder of lethal weapons of the chase.

Australopithecus was troglodytic and predaceous in his habits—a cave-dwelling, animal-hunting, stream-searching, bird-nest rifling and bone-cracking ape, who employed destructive implements in the chase and the preparation of his food. We can no longer regard such qualities as distinctive of Man.

V. The Relationships of Australopithecus.

Australopithecus satisfies every known criterion of generic and specific ancestral relationship to man. He is the most generalised of all known apes; he is the most specialised in the human direction of all known apes. There is every reason to believe that the Australopithecidae as a group were ancestral to the Hominidae.

The relationship of Australopithecus is closest amongst living apes to the chimpanzee. The close correspondence in characteristics between Australopithecus and the chimpanzee prove, to my mind, the far removal of the gorilla and his predecessors from the human stock. But despite his relationships with the chimpanzee there are numerous features of the anatomy of Australopithecus whose counterpart is found only in the orang and even in the gibbon. We have seen in the teeth for example, how similar in respect of size they are to those of the orang. The characters which Australopithecus shares with the gibbon—namely orbital aperture declination, reduced prognathism, erectness of posture, lack of orbital ridges, humanoid frontal arc and forehead, bodily agility,
and manual dexterity—are so many and so fundamental that I am led to believe that the human stock diverged from the stock leading to the living apes at a pre-gibbonoid stage.

I do not mean by this, that we are to join Osborn in representing the ape ancestry of man to be mythical. Even if the stocks diverged at an early stage they were and may be all described scientifically as anthropoidal. The proboscidean ancestry of moeritheria, mastodons, stegodons, mammoths and true elephants is not legendary—There are unquestionably greater gaps physically and mentally between some of these, than between man and the apes; but they are and may all be scientifically described as elephantine.

The human characters of the teeth in Australopithecus are the product of an ancient and obviously omnivorous-carnivorous specialisation. The nature of the dentition shows that the teeth of man did not arise from that of a tuberculo-sectorial frugivorous ape like Dryopithecus, but from that of an omnivorous-carnivorous ape like Australopithecus.

This carnivorous specialisation of Australopithecus cannot be regarded as having begun with Australopithecus himself. It had its origin in some earlier type, the nearest approach to which, that we have at present is Propliopithecus of the Fayum Oligocene.

In the earliest anthropoid dentition we possess namely that of Propliopithecus, we find molars of the subquadrate form. That is the molar form characteristic of modern man; that is also the form of tooth which is found in the primitive forms of mankind such as Neanderthal, Heidelberg, Eoanthropus and Pithecanthropus. It is essentially the same type of tooth that we encounter in Australopithecus. The evidence is overwhelming therefore that, in the direct line of human ancestry the general length-breadth relationships of the molars have fluctuated within narrow limits.

I am unable then to support Gregory's derivation of the human dentition from a dryopithecid dentition. The human and dryopithecid dentitions are both derived from some common type to which the broad molar is more closely related. The discovery therefore by Fourteau in the lower Miocene of Egypt of "a Dryopithecus with broad molars", which Pilgrim thinks should on this account be called a Sivapithecus, is of exceptional interest. It elevates our expectation that there will be forthcoming in the African Miocene, anthropoids with broad molars and reduced canines, bridging the gap, which is now shown to exist, between the African Australopithecus and the diminutive and very primitive African Anthropoid Propliopithecus.
We may be confident that this stock will also reveal small canines. The discovery of small canines was so surprising to me that I hesitated to look upon him at first as a human ancestor. It seemed so contrary to what one expected to find on the Darwinian hypothesis of enlarged canines in the human ancestor. But the indications are all in the other direction. The canines of Talgai, Eoanthropus, Sivanthropus and Pithecanthropus, however largely they vary in size, are human canines and not simian canines.

The small canines and incisors in Australopithecus afford concrete evidence that the basic characters of the human incisors and canines were determined in the remote infancy of prehuman history. When we know from Gregory's writings that Propliopithecus probably had small canines, and we see that the form ancestral to Australopithecus probably exhibited small canines, the belief is heightened that Propliopithecus is ancestral to Australopithecus.

The point I am emphasising is that the dental conditions in Propliopithecus, Australopithecus and primitive men are such that the forms bridging these gaps need never have passed through nor have given rise to any dentitional stage comprising tusk-like canines, wide incisors and antero-posteriorly elongated premolars and molars, such as we associate with living apes and all the known fossil anthropoids of the dryopithecid genus save the specimen from Moghara. The Oligocene Propliopithecus may be regarded as ancestral to the Pliocene Australopithecus through unknown Miocene forms.

I beg to express in conclusion my great indebtedness in the study of this dentition to the classical monograph of Dr. W. K. Gregory whom I have been privileged to count as my personal friend for the last thirteen years.

3. 5. 1933.

Legends (Plate VI–X).

Plate VI. Photograph approximately natural size of Australopithecus africanus, from the right lateral aspect, oriented on the Frankfurt horizontal plane and with the dentition in normal occlusion. Note the "overbite" and "lateral overlap," the characters of the individual teeth, the curvilinear alveolar margin and occlusal plane.

Note also the overhanging relationship of the frontal lobes of the brain to the orbits and to the palate and dentition, the downward inclination of the plane of the orbital aperture, and the scalloped and recessed face. Observe the gyration, sulcal pattern and the marks of blood-vessels and sinuses on the endocranial cast.
Plate VII (a). Photograph of baboons from Taungs to illustrate their violent death and handling prior to fossilisation.

Upper row. Three baboon skulls deficient in the occipital and basal regions. The right and left hand specimens in particular show bone fragments in the region that should be occupied by this area of the skull. They show that when the skulls were emptied of their contents they were thrown into the general refuse heap.

Lower row. Three baboon skulls demonstrating radiating fractures in the posterior parieto-temporal region. The opposite sides of these skulls show fractures of “contrecoup” character. The regularity and precision of the fatal blow, which is generally on the right side, indicates a blow given by stealth after stalking or lying in wait for the prey.

Plate VII (b). Series of baboon skulls and an endocranial cast to exhibit violence prior to fossilisation, as seen from the vertical view. Reading from left to right and from above downwards:

Upper row: 1. Papio izodi. The first baboon brought to the Department of Anatomy, by Miss Josephine Salmons. Note aperture in right half of frontal bone.

2. Endocranial cast exhibiting a similar deficiency in the right half of the frontal lobe.

3. Battered and compressed skull (shown also in Plate II (a), upper left-hand corner).

Central: 4. A remnant of the vertex of a baboon skull, typical of many fragments found in the breccia.

Lower row: 5. A skull showing depressed fracture of the right frontal region (This skull is seen in lateral view in Plate II (a), lower right-hand corner).

6. Skull showing transverse fracture across the two parietal bones (lateral view in Plate II (a), lower left-hand corner.)

7. Skull with cast in situ, exhibiting a marked deficiency over the anterior half of the skull.

Plate VIII-a. Photographs to illustrate the character of the dentition in Australopithecus. For details, see text.

Plate VIII-b. Oblique photograph of mandibles of a human (European) child, Australopithecus and a chimpanzee of same age period, to illustrate the human characters of the dentition in Australopithecus.

Plate IX. Radiographs of the upper jaws of (1) a human (European) child, (2) Australopithecus and a chimpanzee of the same age period, to illustrate chiefly the human character of the permanent canine rudiments in Australopithecus. (4) The upper and lower dental arches in Australopithecus.

Plate X. Horizontal radiographs (enlarged) of lower molars in the European child (left upper), (b) and (d) Australopithecus (right upper and lower), and (c) chimpanzee (left lower) of the same age.

Note the cynodont character of the pulp cavities, vertical short fangs and wide crowns of these teeth in Australopithecus. See also the internal deposit of lime in the teeth and the rolled tuberculated character of the permanent pre-molar rudiment as compared with the sharp cusps of the same tooth in the chimpanzee.

The human specimen presents an abnormal third milk molar.
(a-1)

(a-2)

(b)

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