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The Canine Teeth— Normal Functional Relation of the Natural Teeth of Man (continued)

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THE EDGE-TO-EDGE BITE: RESOLUTION OF ITS DEVELOPMENT

The very changes that Hector Jones has seen in his study of the primitive Australian aboriginal and present living descendants, I likewise have seen in my study of the pre-white and present California Indian. He has seen the change in the functional relation of their teeth, i.e., the extensive attrition and edge-to-edge bite of the "primitive" to the overbite of upper incisors and overlapping and interlocking upper canines as seen in those living today in an environment of Western European culture.

Practically all writers agree that the attrition of the dentition of primitives is due to mastication of a coarse, abrasive omnivorous diet. Most seem to agree that the canines in man appear to be casualties of evolution. I believe that the attrition and edge-to-edge bite of incisors and canines are the result or effect of extraordinary or excessive usage of the teeth. It is the result of function in the attempt made by primitives to adapt themselves to an extremely coarse, abrasive diet. The canines in the primitive have been casualties of function rather than casualties of evolution.

To increase the leverage of the mandible in order to cut and crush hard foods more readily, the primitive instinctively learned to exercise the internal pterygoid so as to move the mandible medially while the temporal and masseter muscles moved it vertically. This produces a glancing shearing action of the buccal cusps, increasing their efficiency in function. However, as the lingual cusps of the upper teeth glide laterally on the transverse ridges of the buccal cusps of the lowers, the abrasive nature of the food hastens the wear of those cusps. This action rapidly eliminates cuspal interference thus permitting wider horizontal latitude in mandibular movements.

Attrition of the occlusal surfaces progresses quite rapidly. Actually, it starts at the time of weaning in infancy in the deciduous dentition. Due to the fact that man's teeth do not possess the compensating factors as seen in the teeth of the herbivores, wear of the occlusal surfaces of the opposing dentitions results in the reduction of the vertical dimension of mandible to maxilla. Figure 23 A illustrates the progressive reduction of the vertical dimension as attrition of the opposing natural teeth progresses. The upper central incisors, line E K, overlap the lower central incisors, line I N. They slope downward and forward. The lower central incisors slope forward and upward. Point F represents the axis or the center of rotation in the vertical movement of the mandible. Point N represents the anterior-inferior point of the mandible (symphysis). The upper central incisors are fixed to the maxilla so that the distance of line E K to the axis is constant and fixed. However, the lower central incisors, line I N, are fixed to the mandible and move in a constant arc described by the vertical rotation of the mandible at its axis.

It will be noted in the diagram that the radius F N is much greater than the radius F E as shown by the arc D as compared to point E. If we reduce the length of the

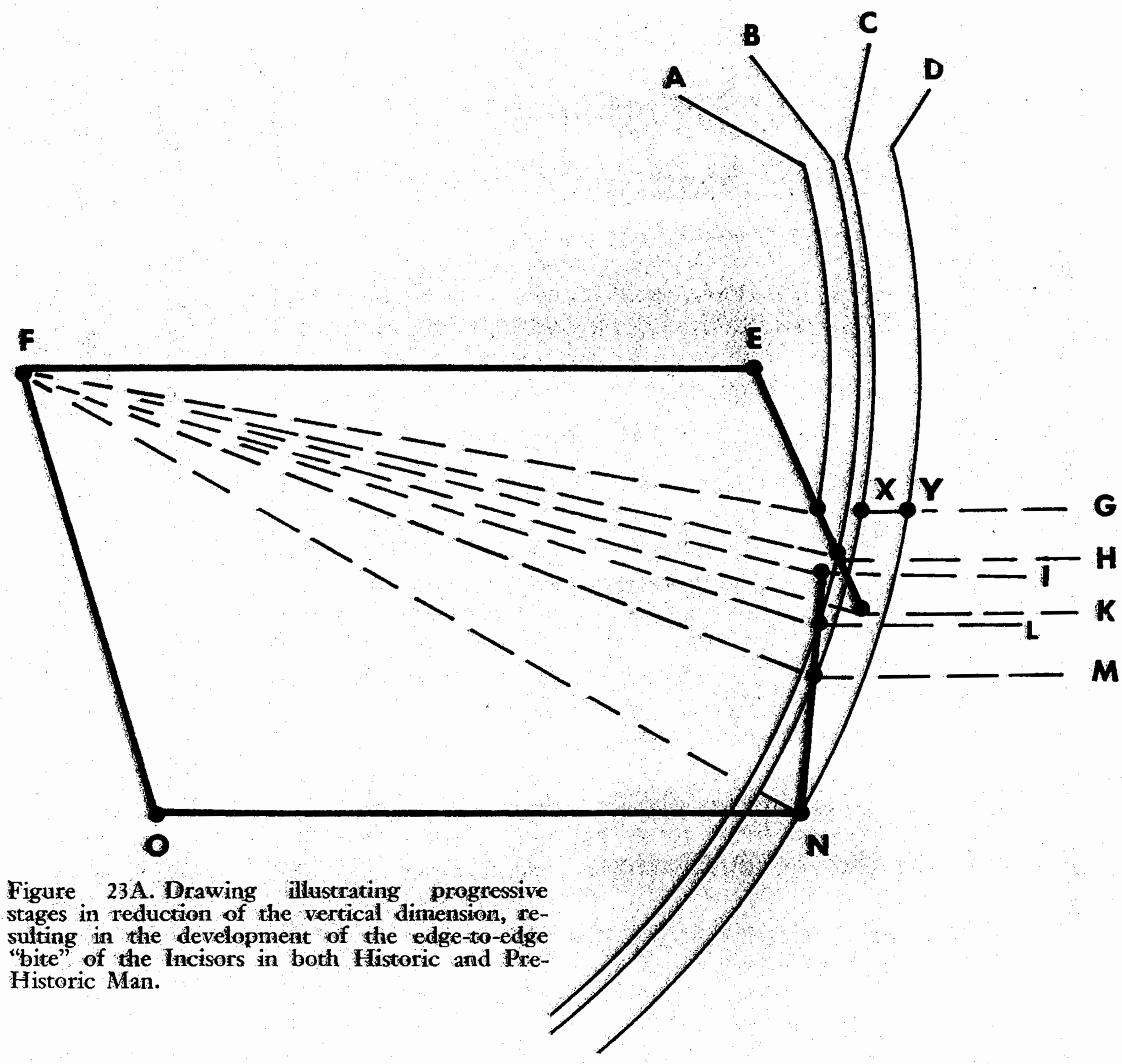

Figure 23A. Drawing illustrating progressive stages in reduction of the vertical dimension, resulting in the development of the edge-to-edge "bite" of the Incisors in both Historic and Pre-Historic Man.

upper incisor from point K to point H, and the length of the lower incisor from point I to point L, upon closure of the mandible, point L will describe the arc B and will contact line EK at point H thus producing the edge-to-edge bite of the incisors.

Further reduction of the distance E K to point G and I N to point M would show the lower incisor as being anterior to the upper incisor. As the mandible rotates upward, point M will follow the arc C and intersect point G at point X. Thus the difference in the length of the radius F G to that of F M would be equal to the distance G X, as point G would describe the arc A while point M would describe arc C. Arc D would be the path of the symphysis if it could continue its upward rotational movement at its axis F.

In the premolar and molar areas we have an entirely different relation. Here we see the opposing teeth in a vertical relation to each other, and closer to the center of rotation or axis. Although the radii of the lower molars and premolars would be slightly greater than that of their opponents, the difference is so slight that as the vertical dimension is reduced the inter-cuspal relation would appear to be unaltered. The cusps of the lower premolars and molars would certainly be slightly anterior of the original inter-cuspal relation before attrition sets in, but hardly enough to be noted by the naked eye.

The foregoing clearly demonstrates the writer's contention that there is no shifting or change of position of the condyle in the glenoid fossa as the vertical dimension is opened or closed. The center of rotation is constant. Likewise, there is no forward shift of the anterior teeth during the development of the edge-to-edge bite either in primitive man or man as we know him today.

The design of the diagram depicts the relation of the incisors as seen in the paleolithic type. Both upper and lower incisors slope forward and showing a lack of development of the chin as seen in Neanderthal, Tabün and other specimens in that category. In the neolithic type, (modern man) we see a well developed chin with the lower incisors either in a more vertical position or sloping slightly lingualy. The difference in the dimension of the radii from the center of rotation to the upper incisors as compared to that of the lower incisors would be far greater than that seen in the paleolithic type.

The presence or absence of a diastema in man has been as fascinating to the writer as has been the development of the edge-to-edge bite in the primitive. It is the personal opinion of the writer that the prescence of the diastema in the ape is due to the articulation of the cusp of the lower canine tooth in the embrasure between the upper lateral incisor and canine tooth. The cusp of the lower canine is pronounced and serves as a wedge thus causing a separation between the upper lateral incisor and canine. In primitive man attrition and the edge-to-edge bite of the anteriors has eliminated this wedge-like relation of the lower canine tooth. It is quite likely also that the development of the Musculature of the upper lip was sufficient to develop enough tension to force the upper incisors lingually, thus bringing the upper lateral incisors in contact with the canines.

This is strictly a personal opinion of the writer. However it can not be too far from the truth if we observe and study the dentition seen in the "man apes" of the Pliocene-Pleistocene era, Plesianthropus-Transvaalensis.* The morphology of the teeth is that of an ape and the canines closely resemble those of the chimpanzee. The extent of attrition in the upper and lower dentition, showing a reversed plane of occlusion definitely indicates an edge-to-edge bite of the anterior teeth. The wedging and leverage of the lower canine teeth had been eliminated, thus permitting the upper lateral incisors to make contact with their adjacent canine teeth.

To the writer, the edge-to-edge bite and lack of diastema seen in Australopithecinae indicates only the result of function. It would not necessarily indicate human relationship. The following is Hooton's opinion: "There is, in point of fact, a rather serious disagreement as to the human or infra-human status of the erect presumably featherless, biped Australopithecinae of South Africa, who almost certainly had feet modified away from the prehensile type for support in two-legged locomation, who probably used sticks and stones with their emancipated fore-limbs, who satisfied the minimal and some further dental requirements for human status and yet seem to have had such small brains that their hats would have slipped down over the ears of a chimpanzee. If these Australopithecinae were men, we shall have to enlarge the zoological scope of anthropology." (16)

The presence of a diastema in man today is not uncommon. Some times it appears unilaterally, however in the majority of cases it is present bilaterally. In each instance, a study of the articulation of the lower canine teeth will give us the answer of why it is present. One of the many cases the writer has in mind is illustrated in figures 64 and 65.

The rapid loss of tooth structure by abrasive action, the resulting loss of the vertical relation and development of the edge-to-edge bite of the incisors were the prime factors which simplified the mechanics of mastication for the primitive. The elimination of cuspal interference of the premolars and molars, and the elimination of cuspid and incisor guidance reduced the lever action of the opposing teeth to a minimum when they came into functional contact or articulation. We could look upon this change of functional relation as being a desirable re-action to action, because the resulting direction of the opposing applied forces would be almost parallel to one another and in line with the long axis of the teeth. This favorable condition existed only during the period that the flat incisal and occlusal surfaces remained horizontal and at right angle to the long axis of the teeth.

However, the loss of tooth structure

not see how the biological factors controlling the growth, development and function of the teeth of the three mammals cited by Sicher are related to those of man. The teeth of the sloth functioned in the manner of those of the herbivor, attrition of the softer dentine allowed the harder layer of dentine to remain sharp for shearing while constant eruption of the tooth compensated for the attrition and loss of tooth structure. Constant eruption of the incisors of the rat also is a compensating factor to offset the rapid attrition of the enamel of the incisal edges.

As to the human teeth, Sicher states that "even in such teeth as the human teeth, growth, though limited in rate, never stops. The continuous growth of the cementum, and its accentuated increment around the root ends, is a well known fact. And as in the case of the rat incisor, dental growth is indivisibly linked with eruption, the latter being the visible effect of the former. Furthermore, one must not overlook the fact that attrition in man is at the same time occlusal and proximal wear. As a matter of fact the latter is much more regular than the former. And it is again by minute movements, the well known mesial drift, that proximal wear is compensated, that, in other words, the teeth keep their ranks tightly closed despite the shortening of their mesiodistal diameter. This movement also is the effect of differential growth, thus also dependent on the continuous apposition of cementum. Continuous vertical eruption and mesial drift entail, however, also growth changes of the alveolar bone."

The growth changes of the alveolar bone seen by Sicher are the presence of osteoblasts on the distal wall and the presence of osteoclasts on the mesial wall. He also notes a constant build-up of cementum around the root. The presence of the osteoblasts would indicate an acceleration in the regeneration or replacement of overaged (fatigued) bone cells. Osteoclasts seen in the mesial wall of the alveolar process would indicate an arrest in growth of the bone tissue, thus permitting the mesial drift of the tooth. Sicher also states that the vertical eruption of the tooth toward the wider cervical parts of its socket permits the build up of cementum around the root thus avoiding encroachment upon the periodontal membrane and alveolar wall. According to Sicher, the foregoing biological changes are the factors which compensate for the loss of tooth structure both occlusal and proximal.

The loss of tooth structure whether lost as a result of attrition or caries is permanent. Enamel and dentine are tissues which do not possess regenerative powers. Compensation from this biologic standpoint is completely negative. Compensation for the loss of tooth structure by continuous eruption of the teeth as seen in the ruminants and rodents, is also absent in man. If such a biologic phenomenon did exist in man, the edge-to-edge bite relation of the incisor teeth of primitive man could have never been developed. For instance, looking at illustration 23 A, if the upper incisor erupted continuously to compensate for the loss of tooth structure in the incisal area, then the incisal edge would remain constant at point K and the line E K representing the length of the incisor would also remain constant. This also would hold true for point I representing the incisal edge of the lower incisor. The distance or radius from the incisal edge of the upper incisor from point K to the axis or vertical rotation center at point F would likewise remain constant. This would also apply to the radius of the lower incisor from point I to the axis at point F.

The published article by Sicher was not accompanied by illustrations of either the maxillary or mandibular segments. However, the text would indicate to the writer that he was describing the changes which he saw in the mandibular teeth and their associated parts. If this assumption is true, then the anatomy of the body and alveolar process of mandible of modern man would be identical to that of the Heidelberg "jaw." Constant bone growth of the alveolar process, plus constant growth of the cementum plus constant eruption of the teeth, plus the mesial drift would certainly have prevented the development of the chin as seen in modern man. The development of the chin in man has been at the expense of the alveolar process. The body of the mandible and the distance from the posterior angle of the ramus to the symphisis have remained more or less constant while at the same time the growth and development of the alveolar process has progressively been reduced. Function (mechanics) is a very important factor in the growth and development of the organism and it cannot be ignored.

The California Indian:

A. FUNCTIONAL RELATION OF THE CANINE TEETH AS SEEN IN THE PRE-WHITE CALIFORNIA INDIAN.

B. COMPARISON WITH PRE-HISTORIC SPECIMENS.

A study of the pre-white California Indian dentition at various stages of life vividly portrays not only the progressive steps of attrition and the resulting edge-to-edge bite of the incissors, but also the eccentric temporo-mandibular movements.

The University of California Anthropology Museum is noted for its Indian collection, and with the permission and co-operation of Professor McCown and Professor Gifford and their assistants I was able to examine a number of skulls of not only the California specimens but also a few of the Peruvian and Egyptian. Adult and senile specimens all presented the same progressive changes of attrition. They all exhibited an accomplished fact. However, specimens of children and youth definitely revealed information which explained the progressive changes in attrition and vertical relation of mandible to maxilla.

The first specimen (figures 24, 25, 26) is that of an Indian child of approximately 5½ to 6 years of age. Although this is a specimen of a Nevada Indian, it conforms to the cycle shown by older Maidu Indian specimens of Central California (U. C. Catalogue 12-3494—Indian burial five miles downstream from Nixon Post Office, Nevada.) The occlusal surfaces of the deciduous molars have been worn flat. The first permanent molars are not quite in occlusion. The extent of attrition of the deciduous teeth indicates that it started as soon as the child was weaned and nourished on solids. This is the first step in reduction of the vertical dimension and closure of the

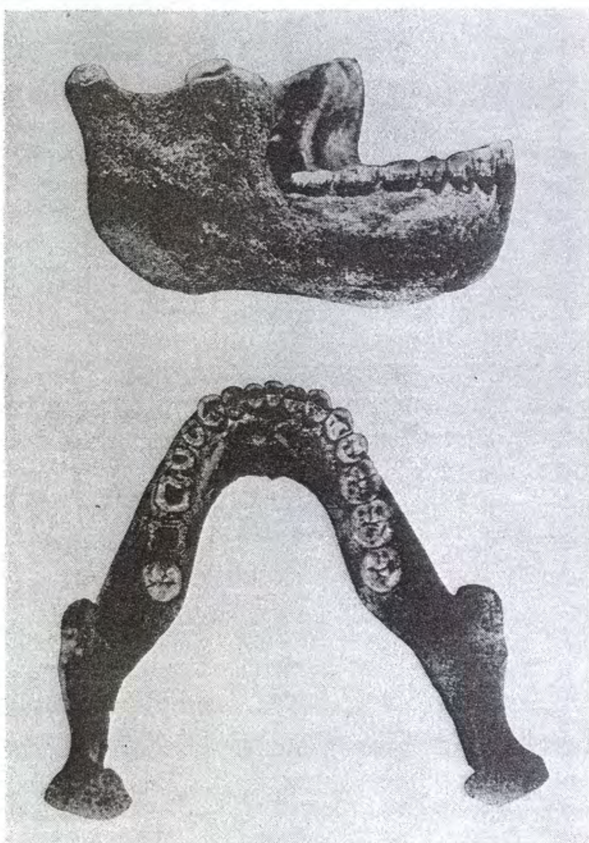

Figure 23. Mandible of Homo-Heidelbergensis. After Schoetensack. From Wm. K. Gregory, "Origin and Evolution of the Human Dentition," 1922, Williams and Wilkins.

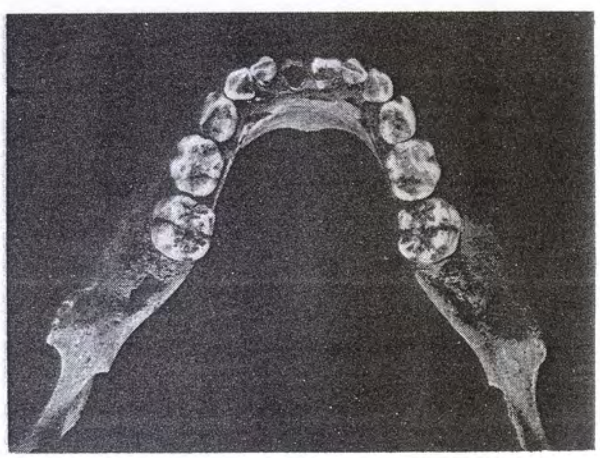

Figure 24. Occlusal view of mandibular teeth of pre-white Nevada Indian child. Courtesy of Anthropology Museum, University of California, Catalogue No. 12-3494.

mandible on its hinge axis. The first permanent molars are erupting in the same relation as that seen in man today, that is, in conformity with the curve of Spee with the occlusal surfaces inclined lingually.

The second specimen (figures 27, 28, 29) is that of a Maidu Indian, age estimated 11 to 12 years. (U. C. Catalogue 12-5496. Burial #42 from the Miller mound near Colusa, California.) Figure 29. Note extreme attrition of the buccal cusps of the lower first permanent molars. Bicuspids are not quite in full occlusion. The second permanent molar, not fully erupted or in occlusion, possessed normal anatomy and erupted to conform with the curve of Spee. The upper shows extreme attrition of the lingual cusps of the first permanent molars. (Figure 27). The second permanent molars erupted in the same normal position as we see them today, following also the curve of Spee.

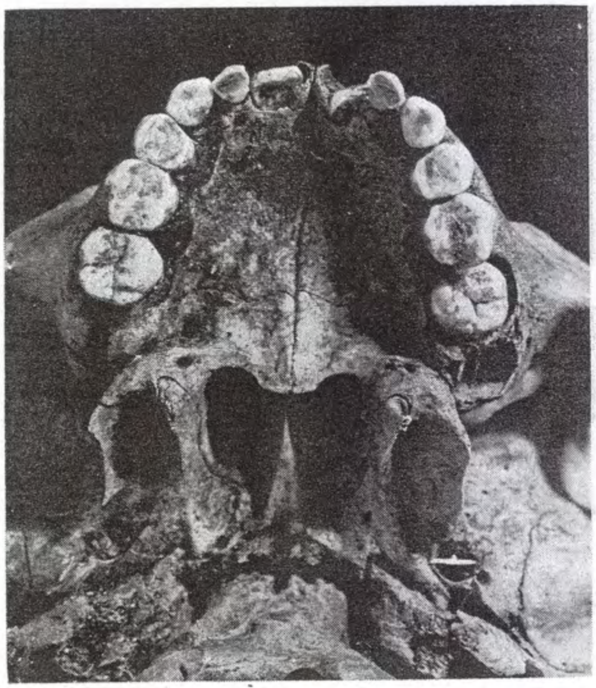

Figure 25. Occlusal view of Maxillary teeth of pre-white Nevada Indian child. Courtesy of Anthropology Museum, University of California, Catalogue No. 12-3494.

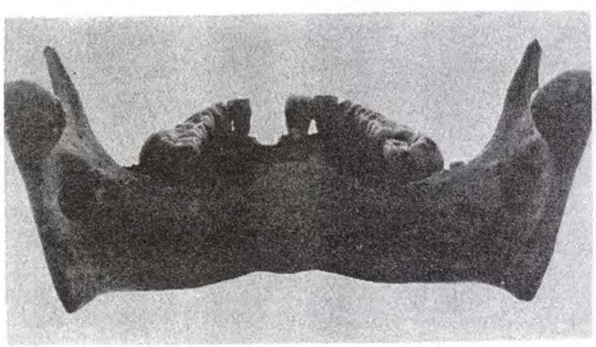

Figure 26. Posterior Anterior Lingual view of mandibular teeth of pre-white Nevada Indian child. Courtesy Anthropology Museum, University of California, Catalogue No. 12-3494.

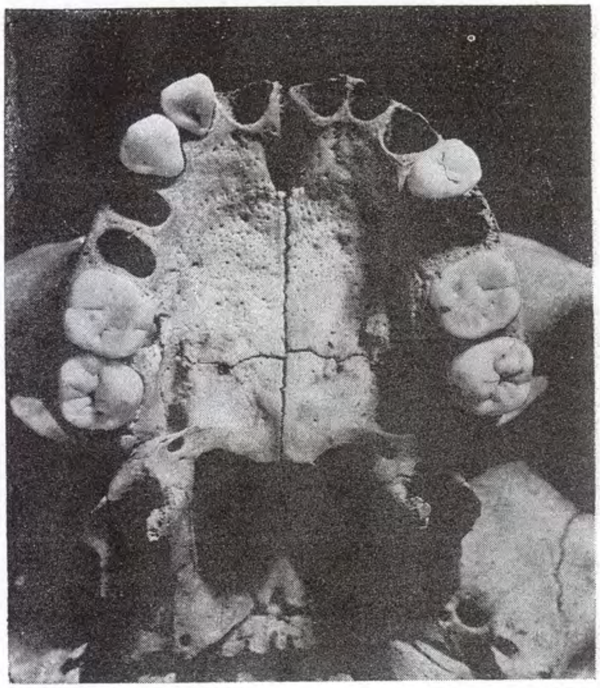

Figure 27. Occlusal view of maxillary teeth. Prewhite California Indian youth. (Maidu) Approximate age 11 to 12 years. Courtesy Anthropology Museum, University of California, Catalogue No. 12-5496.

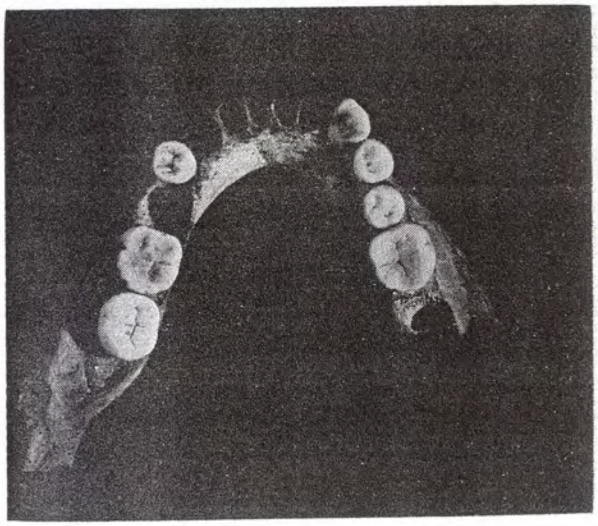

Figure 28. Occlusal view mandibular teeth: Prewhite California Indian (Maidu) approximate age 11 to 12 years. Courtesy Anthropology Museum, University of California. Catalogue No. 12-5496.

The third specimen (figures 30, 31, 32) is that of a Maidu also. (U. C. Catalogue 12-5483.) The estimated age is 15 to 16 years. Note the unerupted upper third molars. The occlusal surfaces of the lower and upper first molars are worn flat; there is progressive attrition of the buccal cusps of the lower first molars and lingual cusps of the upper first molars. Closure of the vertical relation has established the edge-to-edge bite as can be seen by the extent of attrition of the upper and lower incisors. Cusps of the canines have come into functional occlusion, as can be noted by the attrition on the cusps. Attrition of the buccal cusps of the lower second molars and lingual cusps of the upper second molars indicates that these teeth also have

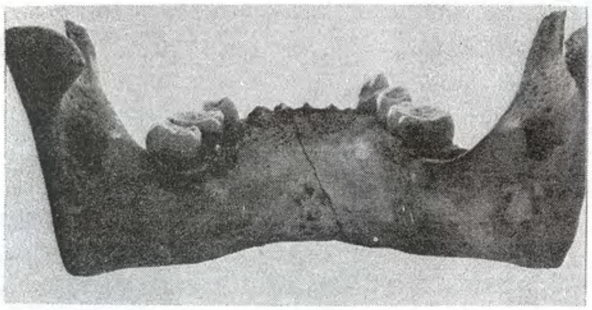

Figure 29. Posterior-Anterior view of Figure 28. Courtesy Anthropology Museum, University of California. Catalogue No. 12-5496.

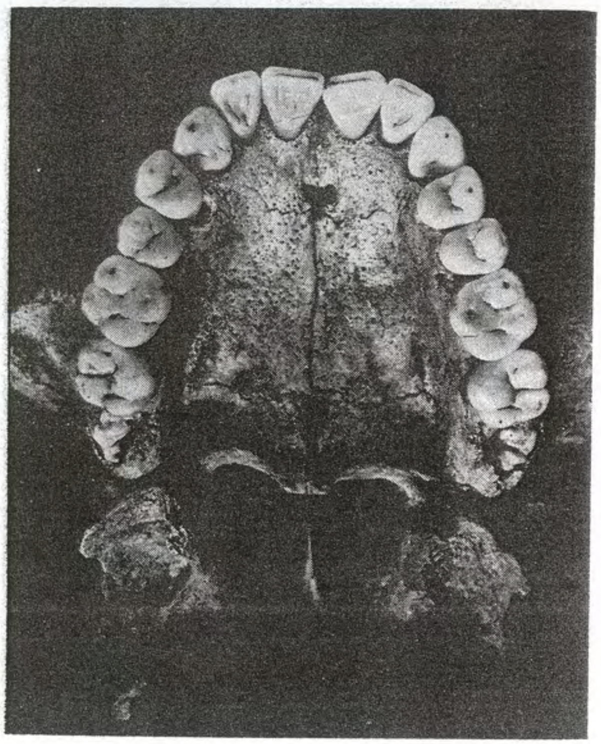

Figure 30. Occlusal view maxillary teeth of pre-white California Indian (Maidu) Approximate age 15 to 16 years. Courtesy of Anthropology Museum, University of California, Catalogue No. 12-5483.

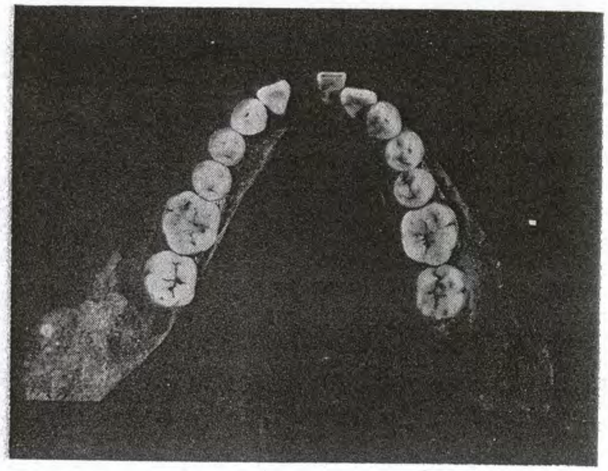

Figure 31. Occlusal view of mandibular teeth of pre-white California Indian. (Maiden). Approximate age 15 to 16 years. Courtesy Anthropology Museum, University of California, Catalogue No. 12-5483.

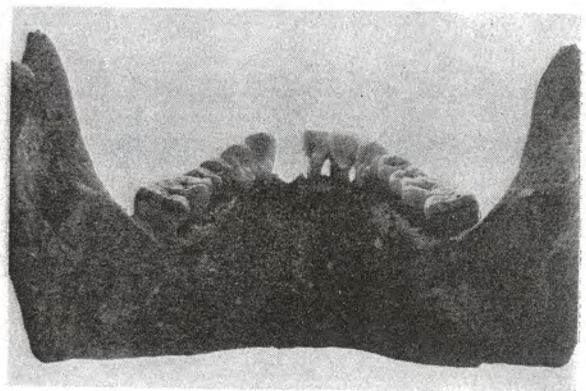

Figure 32. Posterior to Anterior View of Figure 31. Courtesy Anthropology Museum, University of California. Catalogue No. 12-5483.

Figure 33. Posterior to Anterior view of Maxillary teeth of pre-white California Indian. (Maidu). Approximate age 20 to 22 years. Courtesy Anthropology Museum, University of California. Catalogue No. 12-5507.

been in functional occlusion for a short time. The posterior-anterior view of the mandible is a better illustration of the second molars, showing the lingual inclination of the occlusal surface and the slight attrition of the buccal cusps.

The fourth specimen of an early California Maidu Indian is that of one at an estimated age of 20 to 22 years. (U. C. Catalogue 12-5507. Figures, 33, 34.) Both views were from posterior to anterior to better illustrate the alignment of the third molars. The lower left third molar is missing, however, the lower right and upper third molars are definitely erupting as we see them in man today. In this specimen we note further attrition of the anteriors, the premolars and molars, with the occlusal plane of the lowers changing from the horizontal to a buccal inclination due to advanced attrition of the buccal cusps. Other adult and senile specimens all showed

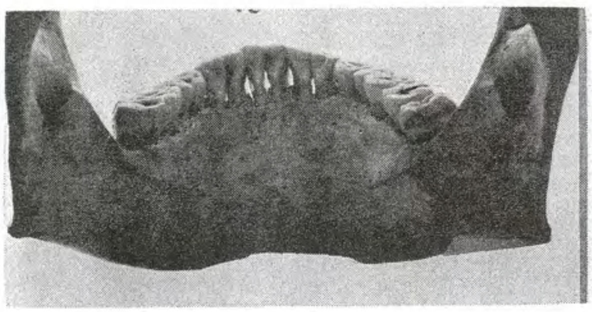

Figure 34. Posterior to Anterior view of mandibular teeth of pre-white California Indian (Maidu). Approximate age 20 to 22 years. Courtesy of Anthropology Museum, University of California. Catalogue No. 12-5507.

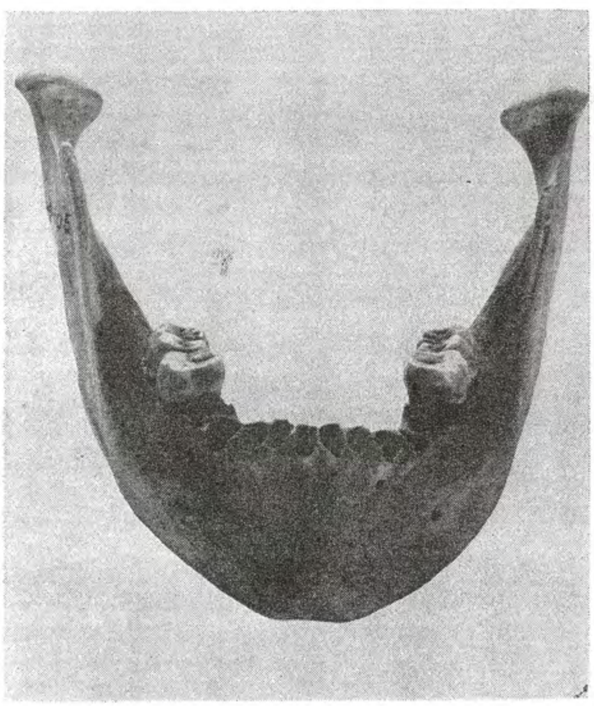

Figure 35. Mandibular first and second molars of Egyptian specimen. Approximate age 14 to 15 years. Courtesy of Anthropology Museum, University of California. Catalogue No. 12-4805.

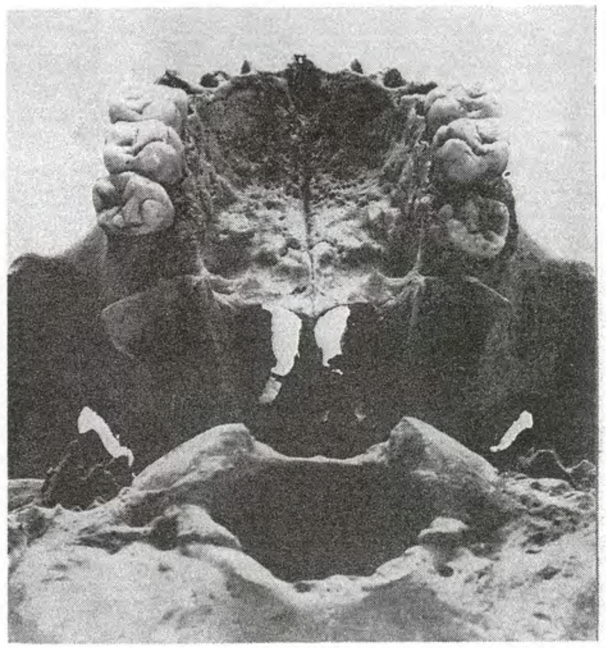

Figure 36. Occlusal view of first, second and third maxillary molars of Egyptian specimen. Approximate age 20 years. Courtesy of Anthropology Museum, University of California, Catalogue No. 12-4822.

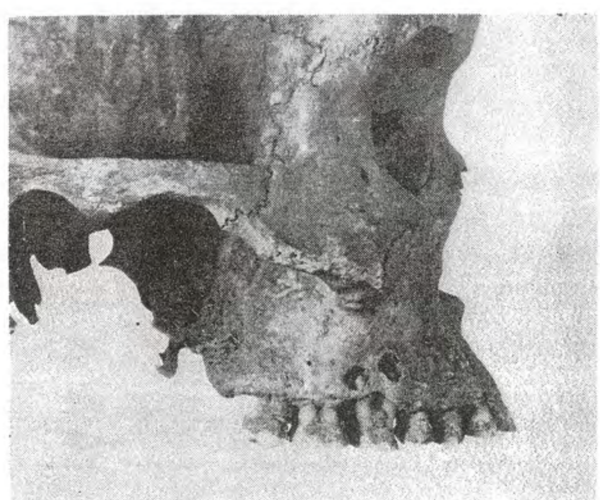

Figure 36A. Right lateral view of canine, premolar and molar areas of pre-white adult (senile). California Indian. Courtesy of Anthropology Museum, University of California. Catalogue No. 7077.

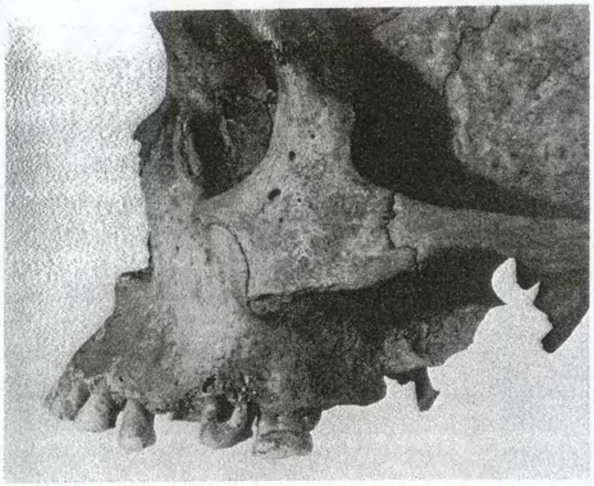

Figure 36B. Left lateral view of same specimen illustrated in Figure 36A. Courtesy of Anthropology Museum, University of California. Catalogue No. 7077.

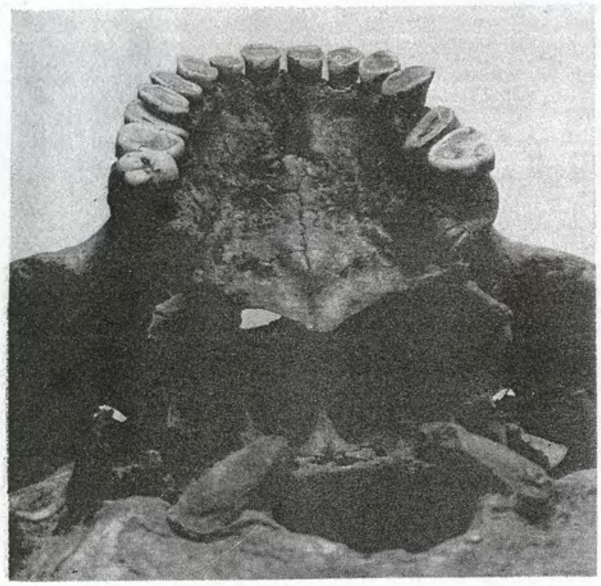

Figure 36C. Posterior to anterior view of occlusial and incisal surfaces of specimen illustrated in Figures 36A and 36B. Courtesy Anthropology Museum, University of California. Catalogue No. 7077.

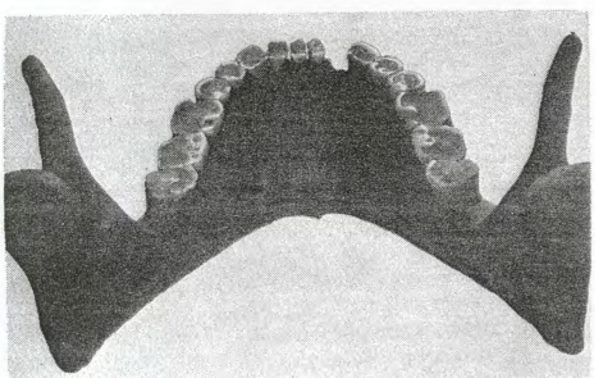

Figure 36D. Posterior to Anterior view of mandibular teeth of pre-white adult (senile) California Indian. Courtesy of Anthropology Museum, University of California. Catalogue No. 6791.

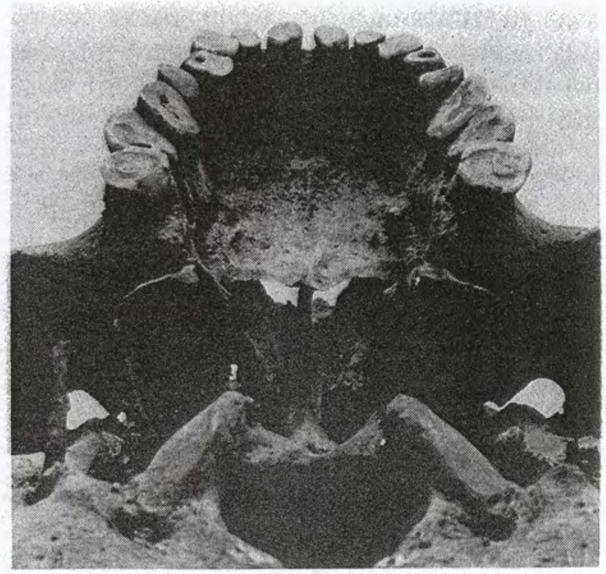

Figure 36E. Posterior to Anterior view of occlusal and incisal surfaces of maxillary teeth of companion specimen illustrated in Figure 36D. Courtesy of Anthropology Museum, University of California. Catalogue No. 6791.

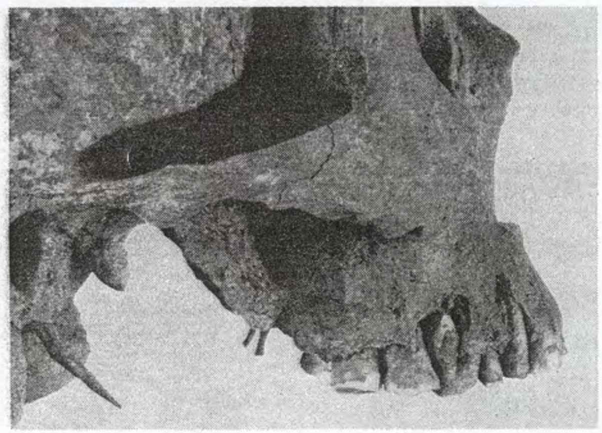

Figure 36F. Right lateral view of specimen illustrated in Figure 36E. Courtesy Anthropology Museum, University of California. Catalogue No. 6791.

Figure 36G. Left lateral view of specimen illustrated in Figures 36E and 36F. Courtesy of Anthropology Museum, University of California. Catalogue No. 6791.

the same progressive change. In some senile cases attrition had reached the point where the pulp chambers were completely exposed, the pulps having putrified, resulting in the formation of cysts and causing absorption of the alveolar process at the apices of roots.

Figures 36-A to 36-G inclusive demonstrate the advanced stages of attrition. Figures 36-A-B-&-C (U. C. Catalogue 7077. Alameda 329-Alameda County south) are views of upper right and left lateral sides and the horizontal occlusal plane. The occlusal plane is reversed, the occlusal surfaces being at an angle to the long exis. Lateral views reveal extensive fatigue and resorption of the supporting bone structure. (The cause for this will be found in the chapter resolving the applied forces.) Figure 36-C reveals the result of the medial, vertical gliding movement of the mandible.

Figures 36-D to 36-G (U. C. Catalogue 6791. Sacramento 60. Sacramento County) are views of the dentition of another senile pre-white California Indian. Note the reversed occlusal plane of both lower and upper dentition in figures 36-D and 36-E. The extensive attrition seen in the lingual incisal area of the lower incisors would indicate that the vertical relation had been reduced to the extent that the lower incisors were occluding in anterior relation to the incisal edges of the upper incisors. The right and left lateral views reveal the same fatigue of the supporting bone structure. (Figures 36-F, 36-G.)

Other specimens available included a few Peruvian and Egyptian skulls and mandibles. These were not available in any great numbers; however, those examined portrayed the same progressive changes as described in the California Indian. The Peruvian were in the adult and senile stages, but all were practically identical to the Californian.

In the Egyptian collection there were only two specimens of the age group close to the ages of the young California Maidu Indians. One specimen was a mandible with right and left first and second permanent molars. (Figure 35) (U. C. Catalogue 12-4805.) The estimated age of this specimen is approximately 14 years. Note the attrition of the buccal cusps and the flat horizontal occlusal plane indicating the same primitive translatory movement of the mandible; also, note the occlusal plane of the second molars following the curve of Spee. The position and sequence of eruption is not any different from what we see in man today.

The second Egyptian specimen was that of a maxilla with the six molars in position. (Figure 36) (U. C. Catalogue 12-4822.) The estimated age is approximately 20 years. Note the attrition of lingual cusps of the first molars and the horizontal occlusal plane. The second and third molars follow the curve of Spee. Here again we note that the sequence of eruption and progressive attrition is the same as we noted in the California Indian and the other Egyptian specimen.

The features that are common and noteworthy in all the previous specimens are the position of eruption and sequence and the attrition of the buccal cusps of the lower premolars and molars, especially the first molars and the attrition of the lingual cusps of the upper premolars and molars. Significant also, is the early attrition of the deciduous teeth at which stage closure of the vertical dimension starts. The deciduous canines were never a factor in guiding mandibular movements because being the last to erupt, the cusps were abraded as they came into functional occlusion and were never able to interlock and overlap the lowers. The same sequence and manifestation was repeated during the eruption period of the permanent canines. Because of this, and lack of cuspal interference, horizontal movement of the mandible as in the herbivor was the natural result. This, however, cannot be accepted as normal, since the causes were extraneous and cultural.

In his article, Hector Jones describes at great length the edge-to-edge bite of the incisors and canines of the Australian aboriginal. From his description it is evident to the writer that his observations were from anterior to posterior and merely saw in adult specimens an accomplished fact due to extraordinary use and wear over a period of years. He failed to see the natural position and eruption from the posterior to anterior which I have endeavored to illustrate and which convinces me that all primitive species living in a similar state and eating an omnivorous-type diet prepared in a similar primitive manner, would all develop the edge-to-edge bite due to the reduction of the vertical dimension brought about by extremely early attrition of the cusps, first in the deciduous dentition and later in the first permanent molars and premolars.

The progressive stages of attrition as seen in the recent "primitives" such as the Australian aboriginals as described by Hector Jones, (15) and the California Indian as I have described and illustrated are also seen in the man apes of the Transvaal and early specimens of hominidae and Homosapiens. In figure 37 the upper illustration shows the buccal view of lower dentition of the specimen designated as Plesianthropus Transvaalensis.* Note the occlusal surfaces sloping buccally. The lower illustration is the occlusal view of the same specimen. Note the extent of attrition of the first molar, decreasing in the second molar and still less in the third molar. Constant reduction in the vertical dimension progressed as the second and third molars erupted and came into functional contact. The same procedure is seen in another specimen designated as Paranthropus crassdens, Figure 38.

Specimens of hominidae and Homosapiens living in later ages such as Pithecanthropus erectus, Sinanthropus, Neanderthal, and Heidelberg man (figure. 23) all show similar progress of attrition. Specimens of these species are few. Of greater interest than the preceding specimens as far as the study of the natural dentition of primitives is concerned are the specimens found at Mt. Carmel in Palestine by McCown and Keith. (17). These are designated as Tabun and Skhul. McCown dates these back some 35,000 years or more.

It is the belief of McCown and Keith that the variability of these specimens would indicate that these primitives were in the throes of evolutionary change and divergence, and that they represent a series

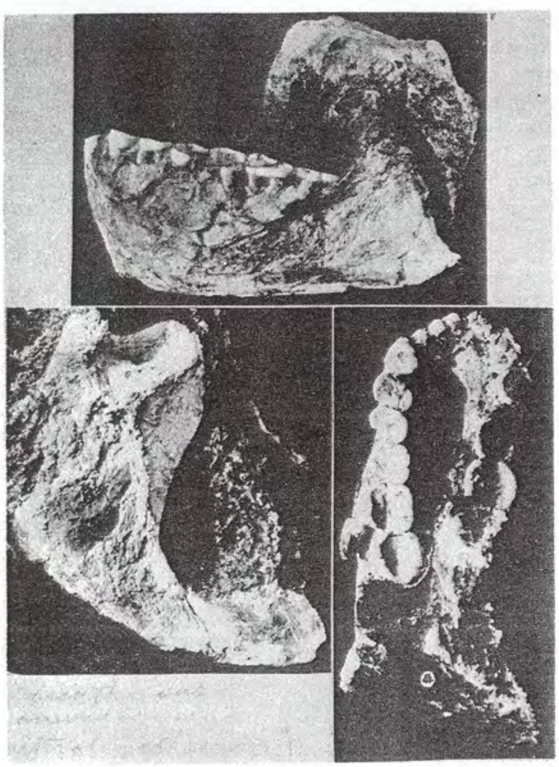

Figure 37. Upper: Lateral view of mandibular teeth of Plesianthropus Transvaal-ensis. Lower Right: Occlusal view of upper right maxillary teeth of same specimen. Broom and Robinson. Courtesy of Transvaal Museum, Pretoria, Union of South Africa.* See note page 142.

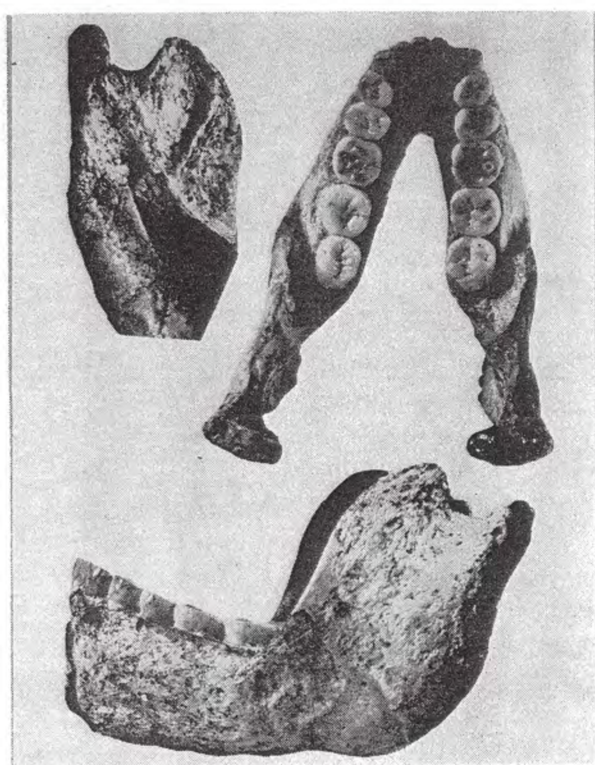

Figure 38. Upper Right: Occlusal view of mandible and mandibular teeth of Paranthropus crassidens. (Australopethicanae). Lower: Left lateral view of same. By Broom and Robinson, "Swarthrans Ape-Man." Courtesy of Transvaal Museum, Pretoria, Union of South Africa.

which can be arranged between a Neanderthal form at one end and a Cromagnon form at the other. The dentition of these specimens offers an interesting study, in that the progress of attrition likewise is similar to that seen in all other primitive specimens. Skhul I for instance, presents some features of attrition quite similar to the Nevada Indian child. It is believed to be a female of an estimated age of 4 to 4½ years. Seventeen teeth were found in this specimen, ten deciduous and seven permanent. Describing the canine they noted that "the cutting edge is divided into two parts by a median projection or point; one part of the edge is transverse – *for articulation with the lower canine by which it has been worn*, and the other part of the edge (distal) – for articulation with the lower first milk molar is oblique." (17). This would indicate translatory movement of the mandible as attrition of the canines has set in.

Describing the upper right and left second deciduous molars, they note that "these are almost identical in crown pattern but differ slightly in dimension, the right one being slightly the smaller. The body and part of the roots are still attached to the left tooth; only the crown of the right is present. The enamel has a crystalline appearance; *only the apices of the cusps are worn*." This too, then would be an early stage of attrition. However, I would venture to say that they anticipated a more advanced stage of attrition at this age, as in the last paragraph describing these two teeth they state that "the slight degree of wear of the milk teeth, notwithstanding the complete development of the crown of the unerupted first permanent molar, may be due to a grit-free, easily masticated diet. Or was it a milk and flesh diet?" Regardless of the cause for the arrest in wear, it is significant that at the same age of the

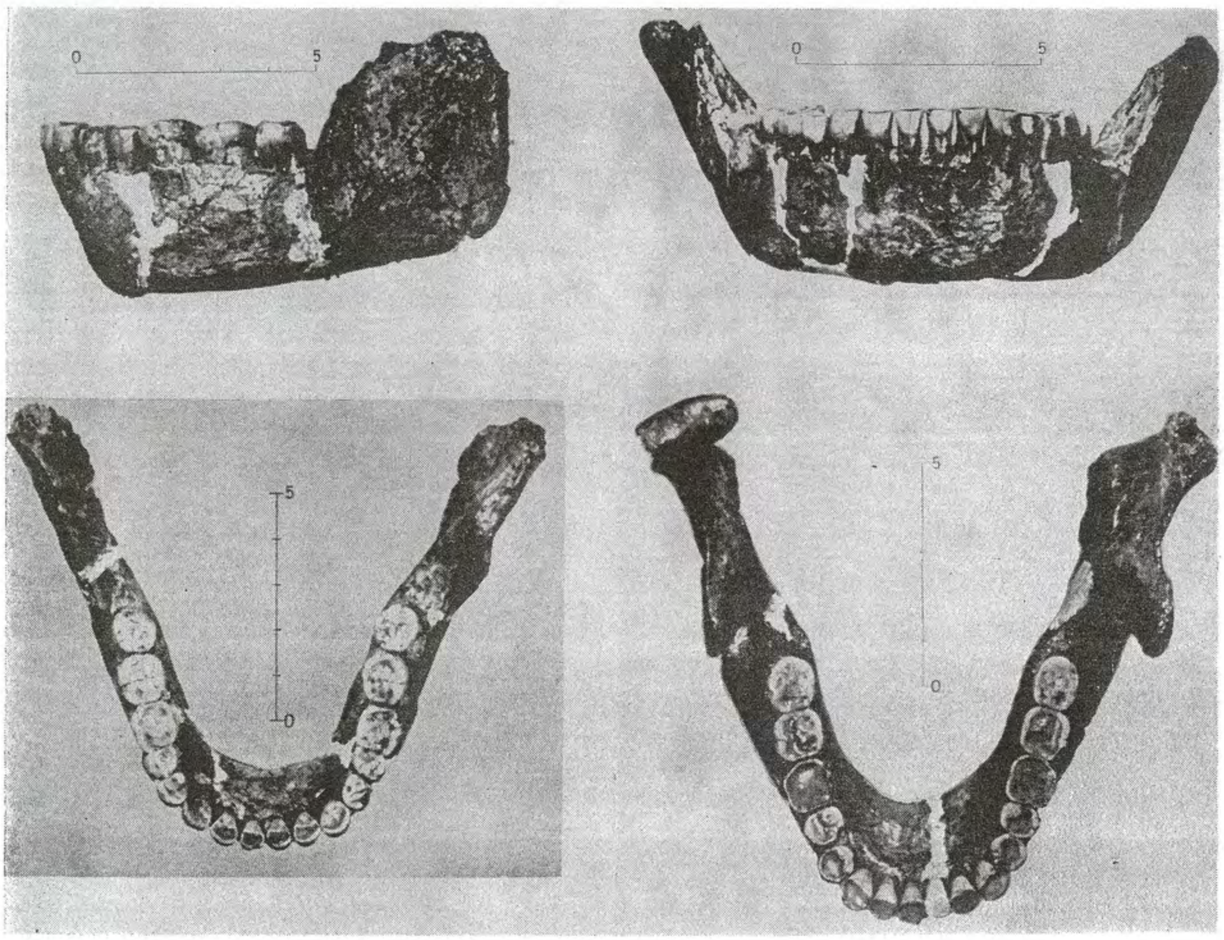

Figure 39. Mount Carmel Specimens. (Mandibles). Upper Left: Left lateral aspect of Tabun I. Upper Right: Anterior aspect of Tabun I. Lower Left: Occlusal aspect, Tabun I. Lower Right: Occlusal aspect, Tabun II. From "The Stone Age of Mount Carmel," by T. D. McCown and Arthur Keith. Reprinted by permission of Oxford University Press.

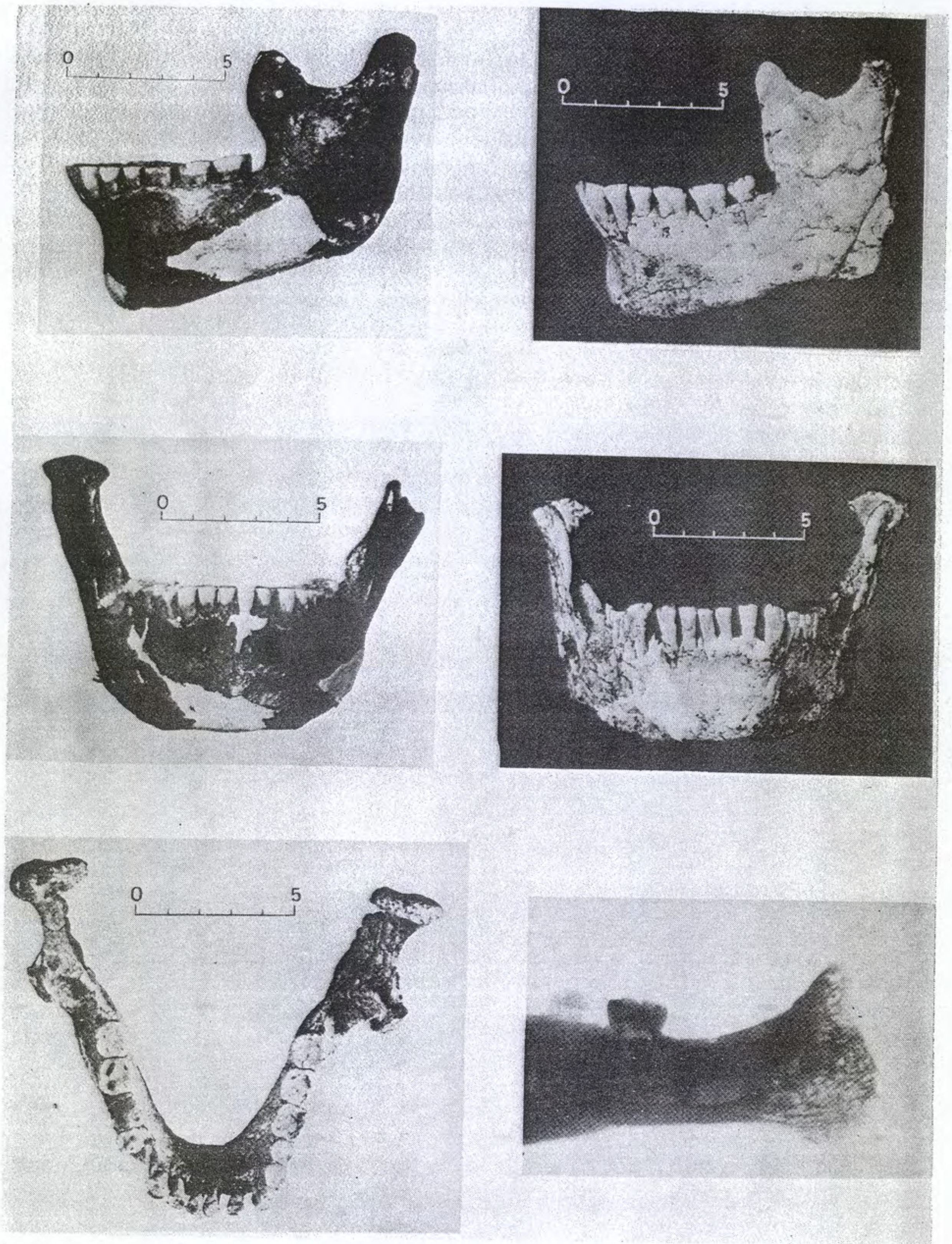

Figure 40. Mount Carmel specimens. Mandibles. (Continued). Upper Left: Left lateral aspect Tabun II. Center Left: Anterior aspect, Tabun II. Lower Left: Occlusal aspect, Skhul V. Upper Right: Left lateral aspect, Skhul V. Center Right: Anterior aspect, Skhul V. Lower Right: Radiograph of left half of mandible, Skhul I. From "The Stone Age of Mount Carmel," by T. D. McCown and Arthur Keith. Reprinted by permission of Oxford University Press.

Nevada Indian child, we could expect to see the same progress in attrition.

Of the adult specimens, figures 39 and 40 tell a story similar to that of the California Indian as far as attrition is concerned. Both Tabun I (female – age 30) and Tabun II (male – age 30 to 35, fig. 39) show the same pattern of wear on the occlusal surfaces, the greater amount of the first molars, decreasing to a lesser extent in the second molars and lesser yet in the third molars. The body and ramus of Tabun I show a great resemblance to the Heidelberg jaw, however, Tabun II, figure 40, shows an advanced development of the chin. In figure 40-C note the buccal inclination of the occlusal surfaces of the premolar and molars. Figures 40-X and 40-Y illustrate the reversed occlusal planes of the mandibular and maxillary teeth of Skhul V. These are photographs of models made from the original specimens, and loaned to the writer for photography purposes by Prof. McCown. The pattern of attrition and massive proportions of this specimen are well illustrated in these photographs.

The Tabun and Skhul specimens found on the eastern shores of the Mediterranean should be of interest to us inasmuch that it is believed that succeeding inhabitants of that area became the first historic people of Western Europe. Changes in the way of living that have taken place in that area during the past ten thousand years have had an effect on the functional relation of the natural dentition. The edge-to-edge

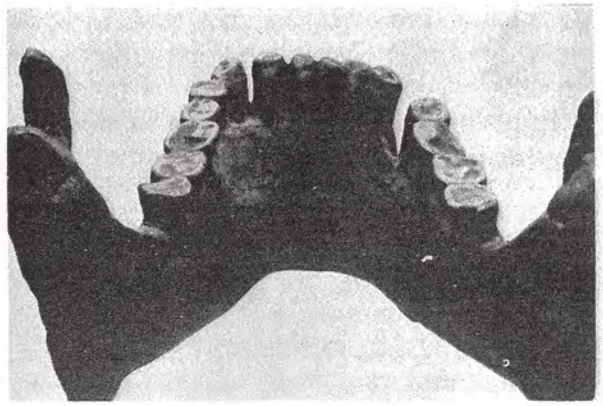

Figure 40X. Posterior to anterior aspect of mandibular teeth of Skhul V. (Photograph of model). Courtesy of T. D. McCown.

Figure 40Y. Posterior to Anterior aspect of maxillary teeth of Skhul V. (Photograph of model). Courtesy of T. D. McCown.

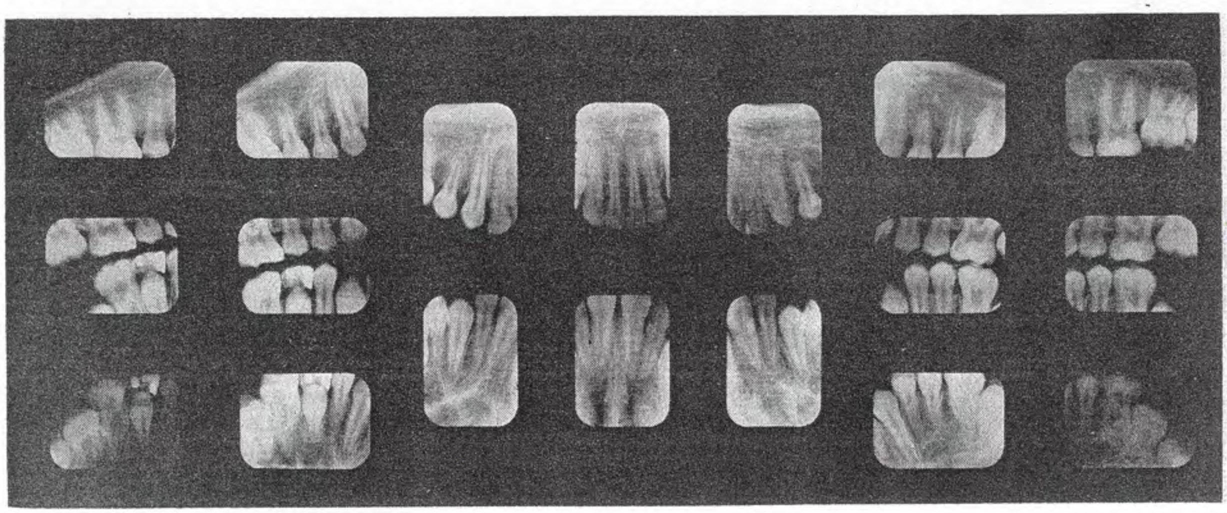

Figure 40Z. Radiographs of dentition of adolescent male, age 13 years, illustrating sequence of eruption of successional canine teeth.

bite of the incisors and canines of these people gradually disappeared and the overbite relation of these teeth became progressively pronounced. Some writers state that this phenomenon is an evolutionary change. The writer questions such a belief or opinion because evolutionary changes do not take place in such a short period.

It is the opinion of the writer that the gradual change from the edge-to-edge bite of incisors and canines to an overbite relation is due to the gradual changes in the way of living which took place in Western Europe during the past five thousand years or more. The introduction and use of metals played a great part in eliminating abrasive agents in our dietary during its preparation for cooking and consumption. Also, the use of clay, porcelain and glass, and improvements in construction of shelters to seal out the elements played an important part in eliminating the causes which brought about rapid attrition of the dentition.

The changes in culture from the primitive Stone Age to recent European was gradual. This gradual change resulted in a change in the texture and abrasive nature of our foods; the soft texture now being not unlike the soft texture of the natural dietary of the great apes; fruits and vegetation. Because of this, the writer believes that had primitive man specialized in a soft, non-abrasive dietary similar to that of the great apes, and for which the morphology of his dentition was intended, he would have exhibited the overbite and interlocking relation of the canines. To the writer, the dentition seen in Pithecanthropus robustus (figure 13) would be what he would expect to see in all prehistoric primitives if they had not subjected their teeth to function for mastication and comminution of a highly abrasive, omnivorous diet.

(*Continued in May Issue*)

REFERENCES:

15. Jones, Hector, Austrailian Aboriginal, Amercan Journal of Physical Anthropology, Sept. 1957. (Vol. 5, U.S. No. 3).
16. Gavan, James A., The Non-Human Primates and Human Evolution. Wayne University Press, 1955. Page 2.
17. McCown, Theodore D., and Keith. Sir Arthur, F.R.S., The Stone Age of Mount Carmel, Oxford at the Clarendon Press, 1939, Vol. 11.
21. Sicher, Harry; Biology of Attrition, Oral Surgery, Oral Medicine, & Oral Pathology, January—June Vol., 1953.

*Note: Since this manuscript went to press in December 1957, the writer received a letter from Dr. J. S. Robinson of the Transvaal museum. Dr. Robinson was the associate of the late Dr. Broom and is now Professional Officer in charge of Department of Vertebrate Paleontology and Physical Anthropology. In his letter, Dr. Robinson has informed the writer that "the name Plesianthropus is no longer valid, the only generic names now used for the Australopithecines proper are *Australopithecus* for the specimens from Taungs, Sterkfontein and Makapan and *Paranthropus* for those from Swartkrans and Kromdraai." The reader should keep this change in designation in mind as he reviews and studies these specimens.

* * * * *

Los Angeles County Dental Society

1958 NOMINATING COMMITTEE REPORT

The Nominating Committee, duly elected by the membershio, has met per By-Law requirement and presents the following nominations.

President-Elect .... Clarence D. Honig
Vice President .... William Armstrong
Secretary .... James E. Wilson
Treasurer .... Schuyler Strang

Councilors to the Southern California State Dental Association (to be seated following the Annual Meeting, 1959):

Carl W. Rasmussen — J. Harold Thomason
Edward Halvorson — William Armstrong
L. A. Wingfield

Directors to the Los Angeles County Dental Society Board of Directors

J. Harold Thomason — Clarence Honig
Harry Altaffer — Schuyler Strang
Paul Davidson

Member at Large to the First District Board of Directors

John B. Hopkins

Nominations by petition for any office may be presented to the Secretary any time prior to fifteen (15) days preceeding the March meeting providing said petition bears the signatures of twenty-five (25) or more members entitled to vote. Said nominations shall appear on the ballot, in order, following the names presented by the Nominating Committee. In the event of one or more petitions being received, the order of the names on the ballot shall be governed by the order which said petitions are filed with the Secretary.

LYNN OPENSHAW, D.D.S.
Secretary