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CONTRIBUTION

TO THE

VERTEBRATE FAUNA OF THE MIOCENE
OF OREGON.

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FOR SALE BY

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On some of the Characters of the Miocene Fauna of Oregon.

(Read before the American Philosophical Society, November 15, 1878.)

By E. D. COPE.

We have been for some time in possession of information as to the ungu late forms which inhabited Oregon during the Miocene period. Through the labors of Profs. Leidy, Marsh and Bettany, we have learned of the existence there of *Oreodontidæ* in considerable variety; of *Anchitheridæ*; of peccary-like species; of *Elotherium*, and of *Rhinocerus*. But of the unguiculate types, of *Rodentia*, and of the inferior orders of Mammalia, almost nothing is yet known. Having recently received a number of specimens from the deposits in question, I am in a position to offer a number of new identifications. The following species already known from the Miocene of Colorado, I find contained in the collection, viz.: *Palæolagus haydeni*; *Canis gregarius*; *Canis lippincottianus*; *Hyperagulus calcaratus*; *Leptomeryx evansi*.

RODENTIA.

STENEOFIBER GRADATUS, sp. nov.

This species is represented in my collection by a cranium which is nearly perfect, the principal deficiency being the absence of the mandibular rami. It is of smaller size than the *S. nebrascensis* and *S. pansus*, and differs from both these species in the relative sizes of the superior molar teeth. The first of these is the largest, and the others diminish regularly in size to the last, whose grinding face does not present more than one-third the extent of that of the first. The triturating surfaces of the second and third have their long axes transverse. In all the crowns, besides the internal and external enamel inflections, there is but one fossette, which is anterior to the external inflection. The latter has become isolated from the superficial enamel on the last three molars, by attrition. The superior incisors are flat anteriorly with the external angle rounded, and its dentine presents the transverse undulations seen in *S. pansus*.

<i>Measurements.</i>	<i>M.</i>
Length of skull from incisive alveolus.....	.0500
Width between summits of first molars.....	.0060
" " fourth " .....	.0095
Length of molar series.....	.0115
Diameter of the first molar { antero-posterior.....	.0040
{ transverse.....	.0045
Diameter of third molar { antero-posterior.....	.0028
{ transverse.....	.0032
Diameter of fourth molar { antero-posterior.....	.0020
{ transverse.....	.0024

From the above measurements it is apparent that the molar series in this species is equal in length to the anterior three molars of the *S. nebrascensis*

and *S. pansus*. The posterior fossettes of the crowns seen in those species are wanting in the *S. gradatus*.

ENTOPTYCHUS CAVIFRONS, gen. et sp. nov.

Char. gen. Probably of the family *Saccomyidae*.* The cranium is elongate, and presents inflated periotic bones, and slender zygoria. The foramen infraorbitale is small and anterior in position, entering the maxillary bone near its suture with the premaxillary.

Generic characters. Molars $\frac{4}{4}$ - $\frac{4}{4}$, rootless, and identical in structure. The crowns are prismatic, and in the young stage present a deep inflection of enamel from one side, the external in the superior teeth, the internal in the inferior. After a little attrition, the connection with the external enamel layer disappears, and there remains a median transverse fossette, entirely enclosed by enamel. The tooth then consists of two dental columns in one cylinder of enamel, separated by a transverse enamel-bordered tube. Incisors not sulcate.

The teeth of this genus differ from those of *Perognathus* in being without distinct roots, and in having the enamel loop cut off and enclosed. In *Dipodomys*, the molars are undivided simple prisms.

Specif. Char. This species is represented by some entire crania, and numerous separated jaws. The postorbital part of the skull is subquadrate in outline, and depressed in form. The interorbital region is narrowed, but the superciliary margins do not meet nor converge to form a sagittal crest. They are thickened, forming two subparallel ridges which are separated by a shallow concavity of the frontal bone. The nasal bones are very narrow, and their posterior apices just attain the line of the supero-anterior angle of the orbit. The base of the malar bone is much elevated and very oblique. The molar teeth are directed obliquely backwards, the alveolus of the first issuing below the anterior part of the orbit. The first superior molar is the largest, and the proportions of the others diminish regularly posteriorly. The first inferior molar is a little smaller than the second and third, and is about equal to the fourth. Its anterior column is contracted, while the last molar is like the second and third. The face of the inferior incisor is flat, and its enamel is smooth. The external face of the jaw is bounded below by a strong angle, as far anteriorly as below the first molar.

<i>Measurements.</i>	M.
Length of skull to incisive alveoli.....	.041
Width of skull at mastoids.....	.020
“ “ between orbits.....	.005
“ “ at middle of muzzle.....	.010
Elevation of skull from second molar.....	.011
Length of molar series.....	.007
“ first molar.....	.002
Width of “ “.....	.002
Length of crown of last molar.....	.0015

*See Coues' Report U. S. Geol. Surv. Terrs. XI, p. 491.

<i>Measurements.</i>	M.
Width of crown of last molar.....	.0015
Length from M. 1 to infraorbital foramen.....	.007
Depth of mandibular ramus at M. 2.....	.006
Width of face of inferior incisor .....	.0016

ENTOPTYCHUS PLANIFRONS, sp. nov.

A larger species than the *E. cavifrons*, represented in my collection by parts of crania, and rami. The former show that besides the superior size, this species differs from the *E. cavifrons* in the absence of the superciliary ridges, and hence perfect flatness of the interorbital region. The latter is also wider, measuring five-sixths the width of the muzzle at its middle, while in the *E. cavifrons* it is only half as wide. The subjoined measurements give the characters in detail.

<i>Measurements.</i>	M.
Width of interorbital space.....	.007
“ muzzle at middle.....	.0086
Elevation of skull from second molar.....	.0130
Length of inferior molar series.....	.0072
Depth of ramus at M. 2. ....	.0072
Width of inferior face at M. 2.....	.0043
“ “ incisor .....	.0018
Distance between infraorbital foramen and M. 1.....	.0050

ENTOPTYCHUS CRASSIRAMIS, sp. nov.

This, the largest species of the genus, appears to have been less abundant than the two already described. I refer to it portions of two crania and three mandibular rami, found separately. The superior size of the parts is obvious, the posterior three superior molars having the same longitudinal extent as the entire series of the *E. cavifrons*. The gradation in the size of these teeth, is as in that species, the grinding surfaces diminishing rapidly in extent posteriorly. The superciliary ridges are not well preserved, but were probably thickened as in *E. cavifrons*, and the interorbital space was relatively as narrow, and not so wide as in *E. planifrons*. The measurements below exhibit the characters more exactly.

<i>Measurements.</i>	M.
Width of skull between orbits.....	.007
Elevation of skull from second molar.....	.015
Length of series of superior molars.....	.0115
Diameter of second molar { antero-posterior.....	.003
{ transverse.....	.004
Diameter of fourth molar { antero-posterior.....	.002
{ transverse.....	.002

In the mandibular rami the inferior masseteric ridge extends to below the anterior border of the first molar, and is very prominent and acute. It results that both the exterior and inferior aspects of the ramus are con-

cave to the anterior extremity of the crest, which slopes upwards. The incisive alveolus, though not prominent as in the *Hystriomorpha*, is on the inner side of the base of the ramus in front, and the enamel-face of the incisor tooth is directed more inwards than downwards. Above the alveolar prominence, the inner face of the ramus is gently concave. The anterior origin of the coronoid process is opposite the posterior border of the second molar.

<i>Measurements.</i>	M.
Length of inferior molar series.....	.0105
Width of anterior face of inferior incisor.....	.0028
Depth of ramus at M. 2.....	.0085
Width of ramus below at M. 2.....	.0070

PLEUROLICUS SULCIFRONS, gen. et sp. nov.

Char. gen. Fam. Saccomyidae. Superior molars rooted and short-crowned. The crowns with a lateral fissure bordered with an inflection of the enamel sheath, extending to their bases. In the superior molars this inflection is on the external side, and does not divide the crown. Superior incisors not grooved.

This genus is curiously near to the existing *Heteromys* and *Perognathus*, the two genera of *Saccomyidae* with rooted molars. The former differs in having the molars divided into two columns, each of which is sheathed in enamel, while *Perognathus* only differs so far as I am aware, in having the superior incisors grooved.

Specif. Char. This species resembles those of the allied genus *Entoptychus* in many respects. The superciliary borders are thickened upwards, forming two ridges, which enclose a groove between them which is more pronounced than in the *Entoptychus cavifrons*. The muzzle is plane above and considerably wider than the interorbital space. The base of the malar is thin and oblique, and the *foramen infraorbitale exterius* is well in advance of the molar teeth and at the anterior part of the maxillary bone. A groove passes backwards from its inferior border, terminating in a small foramen which marks a point nearly half way to the first molar. Within this, another shallow groove bounds the more prominent median line. The palatal surface exhibits two shallow lateral grooves, which commence opposite the posterior border of the first molar.

The grinding surfaces of the molars are transverse ovals, only interrupted by the exterior fissure. The first molar is slightly different in form, being larger, and its section, when not much worn, being nearly round. Its anterior portion extends towards the alveolus, giving an antero-posterior oval, on prolonged wear. Each tooth has three roots, one interior and two exterior; in the first they may be described as two posterior and one anterior. The last molar is the smallest, the series exhibiting a regular gradation in size.

<i>Measurements.</i>	M.
Interorbital width.....	.0050
Width of muzzle at middle.....	.0080

<i>Measurements.</i>	M.
Depth of cranium at M. 2. ....	.0138
Length of molar series along base.....	.0080
Diameter of second molar { antero-posterior.....	.0016
{ transverse.....	.0020
Width of face of superior incisor.....	.0020

MENISCOMYS HIPPODUS, gen. et sp. nov.

Gen. Char. The characters of this genus are derived from the dentition of both jaws, and from portions of the cranium which are preserved. The molars are rooted, and number $\frac{4}{4}$. Those of the superior series are without enamel inflexions, and the triturating surface exhibits two external and one internal crescentic sections of the investing enamel. On the second superior molar there are three external crescents in the typical species; and the first molar is simply conic. Between the inner and external crescents, there are the curved edges of enamel plates directed obliquely and transversely. The grinding surfaces of the inferior molars display in the unworn condition, two L-shaped transverse crests, connected longitudinally on the median line; on wearing, the lateral emarginations of the enamel become shallower, disappearing from the inner side, but remaining on the outer. Incisor teeth not grooved. *Foramen infraorbitale anterius*, if present, elevated in position and near orbit.

The characters of the dentition of this genus resemble those of the genus *Pteromys*, which is now confined to Asia and the Malaysian Archipelago. The superior molars differ from those of *Pteromys* in wanting all reentrant enamel inflection. Specimens in my collection indicate two species of *Meniscomys*.

Specif. Char. Superior molars with a vertical ridge from the points of junction of the crescents on the external side; there are thus two on the second molar, and one each on the third and fourth. Within each of the external crescents is another crescentic edge of a pair of vertical enamel plates, and the inner marginal crescent sends off a short transverse branch towards them. With attrition, all these crests unite by their extremities, enclosing four distinct lakes, which, after still further wear, disappear. Attrition produces a similar result in the inferior molars, viz.: two pairs of crescents enclosing four lakes, which ultimately wear out. The inferior incisor has a shallow concavity on its anterior face.

The maxillary bone, anterior to the molar teeth, is shorter than the premaxillary. The incisive foramina are entirely in the latter. The sides and superior aspect of the muzzle are regularly convex in transverse section. The inferior incisive alveolus is enclosed entirely in the plane of the ramus, and extends posteriorly to below the last molar tooth. The masseteric ridge is very oblique, and rises to a median point below the second molar. The coronoid process rises from the front of the last molar.

<i>Measurements.</i>	M.
Length of superior molar series.....	.008

<i>Measurements.</i>		M.
Diameter of second superior molar	{ antero-posterior... .004	
	{ transverse..... .0035	
“ third “ “	{ antero-posterior... .0020	
	{ transverse..... .0025	
Width of superior incisor.....		.0020
Length from base of first superior molar to base of incisor.....		.0065
Width between bases of first molars.....		.0020
Length of first inferior molar.....		.0033
Depth of ramus at second molar.....		.0050
Width “ below “.....		.0035

MENISCOMYS MULTIPLICATUS, sp. nov.

This species is considerably larger than the *M. hippodus*, and differs in the greater complication of the enamel plates of the inferior molars. The four crescentic areas are discernible on the worn surfaces of the crown, of which the posterior inner is reduced in size on the middle two molars. The two enclosed lakes have very plicate borders which form many small loops, and sometimes they are fused into a single irregular area. The last molar is extended a little posteriorly, and all present an entrant angle between the inner columns. The coronoid process originates opposite the third molar, and the masseteric ridge ceases below the middle of the jaw below the second molar.

<i>Measurements.</i>		M.
Probable length of inferior molar series.....		.0120
Length of posterior three molars.....		.0095
Diameter of second molar	{ antero-posterior..... .0030	
	{ transverse..... .0025	
Length of fourth molar.....		.0040
Depth of ramus below second molar.....		.0070
Width “ “ “.....		.0050

CARNIVORA.

TEMNOCYON ALTIGENIS, gen. et sp. nov.

Gen. Char. This genus is only known from a mandibular ramus which supports all the teeth excepting the incisors and probably the last molar. There are four premolars and probably three true molars, all having the general character of those of *Canis*. The only character by which I distinguished the new genus *Temnocyon* is seen in the form of the heel of the sectorial tooth. Instead of presenting a concave surface bounded by ridges or tubercles, it presents a more or less median cutting edge as in the posterior premolars of *Oxyena*. In the typical species, there is but one row of cusps on the first tubercular molar, but they are not elevated, and stand on one side of the crown. In comparing this genus with types other than *Canidae*, one can recognize in its characteristic peculiarity of the sectorial

tooth, one well-known in the typical genera of *Vicerridae* and *Mustelidae*. *Temnocyon* is, however, truly canine in other details, and appears to approach the genus *Palaocyon* of Lund. According to this author, the posterior inner tubercle of the anterior part of the crown of the sectorial tooth is wanting in that genus, so that it is distinct from the North American form.

Specif. Char. The mandibular ramus is rather deep and compressed, much more so than in the *Canis latrans*, with which it agrees in the length of the dental series. As compared with the existing species of *Canis* and *Vulpes* of North America, the sectorial tooth is relatively smaller and the premolars larger. In this respect it agrees with most other dogs of the Lower Miocene, and differs from those of the Upper Miocene (Loup Fork).* The posterior tubercle is wanting from the premolars, excepting the last, where it is large and obtuse, differing in this respect also from most recent dogs, and from the cotemporary *Canis gregarius*. In the sectorial tooth the principal cusp is much elevated above the anterior, while the inner median is small, with its apex in line with the anterior. The cutting edge of the heel is not acute, and is a little external to the median line; there is a weak cingulum-like angle at its inner base. The first tubercular tooth is large, nearly equaling in antero-posterior diameter the base of the third premolar. It is parallelogrammic in transverse section, and supports two principal cusps and an anterior ledge. The cusps are pronounced and stand exterior to the middle line; their inner side slopes to the base of the crown where there is no cingulum. The ledge is higher on the inner than the external side. There are no basal cingula on either side of the bases of any of the teeth. The second tubercular molar is lost.

The alveolar margin of the jaw rises behind the sectorial tooth, and the inferior margin begins to ascend below the middle of the same tooth more decidedly than in *C. lupus*, *latrans* or *cuspidigerus*. The two large mental foramina, are situated, the one below the second, the other below the third premolars.

<i>Measurements.</i>	M.
Length of anterior six molars.....	.073
" " four " .....	.045
" base of second premolar.....	.011
Elevation of crown " .....	.011
Length of base of fourth " .....	.015
Elevation of crown " .....	.014
Length of base of sectorial tooth.....	.0185
Elevation of principal cusp of sectorial tooth .....	.0160
" anterior " .....	.009
Length of heel of sectorial.....	.007
Elevation " .....	.0085
Length of crown of first tubercular.....	.0115

* See Proceedings Academy Philadelphia, 1875, p. 22, where I have discussed the origin and history of the sectorial tooth.

<i>Measurements.</i>	M.
Width of crown of first tubercular.....	.0065
Depth of ramus at P. M. 2.....	.024
“ “ at sectorial. ....	.028
Thickness “ “ .....	.010

CANIS CUSPIGERUS, sp. nov.

This peculiar species is indicated by the greater part of the cranium with dentition, to which are united both rami of the lower jaw with nearly all of the teeth in place. These indicate a dog of small size, about equaling the *Canis gregarius* Cope, but one presenting marked characters.

The third premolar tooth in both jaws differs from the corresponding one in the *C. gregarius* and in most recent species, in lacking the lobe of the posterior cutting edge, agreeing in this (as regards the inferior series) with the *Temnocyon altigenis*. It is present in the fourth inferior premolar, which has besides, a low heel. The inferior sectorial tooth is characterized by its great robustness; the internal median tubercle is much elevated, while the principal cusp is short. The heel is wide and basin-shaped, with the inner border as much elevated as the outer. The first tubercular molar is characterized by its width as compared with its length being nearly as wide transversely as fore and aft. It has two anterior cusps followed by a basin with elevated borders simulating two posterior cusps. There are an anterior and a exterior cingulum. The second tubercular is a miniature of the first, differing in the more robust external posterior cusp, and the absence of external basal cingulum. There are no complete cingula on the external bases of the other inferior teeth. The second superior tubercular is well developed, having two external tubercles. The anterior inner cusp of the superior sectorial is distinct and acute, and there is a cingulum along the inner base of the crown. The exerted portion of the canines is long, slender, and with an oval section narrowed behind. The enamel of all the molars is more or less rugose, a character which is only found among our extinct dogs in the *C. geismarianus*.

The mandibular rami are shallow, and their inferior margin is not stout. A gentle elevation of the latter commences below the first tubercular tooth and the alveolar border rises but little behind. The masseteric fossa is deep and well defined.

<i>Measurements.</i>	M.
Length of inferior molar series.....	.041
“ bases of four premolars.....	.023
“ base of second “ .....	.005
Elevation crown “ “ .....	.005
Length of base of fourth “ .....	.0072
Elevation of crown “ “ .....	.0055
Length of base of sectorial. ....	.010
Elevation of principal cusp.....	.006
Width of heel of sectorial.....	.006

<i>Measurements.</i>	M.
Diameter of first tubercular { antero-posterior.....	.006
{ transverse.....	.005
Antero-posterior diameter second tubercular.....	.0037
Length of base of superior sectorial.....	.009
“ bases of two tuberculars.....	.012
“ base of first tubercular.....	.0064

CANIS GEISMARIANUS, sp. nov.

This species of dog may be placed with reference to the size of its inferior sectorial tooth between the *C. lippincottianus* and *C. hartshornianus*. In the robust proportions of this tooth it more nearly resembles the *C. cuspidigerus*. The mandibular ramus is robust and shallow, and quite distinct from the deep jaw of *C. hartshornianus*. The sectorial has perhaps twice the bulk of those of the *C. lippincottianus* and *C. cuspidigerus*. From that of the latter it differs further in the small inner tubercle and contracted heel.

The sectorial part of the tooth is relatively small, not exceeding the heel in length, and its cusps are low. The heel is notable for the elevation of the tubercle of the inner side—which exceeds that of the outer; the latter also, is contracted, standing within the external base, which is represented by a short cingulum. A weak cingulum below the sectorial blades. Surface of the enamel rugose where not exposed to friction.

<i>Measurements.</i>	M.	
Diameters of sectorial {	vertical, anterior cusps.....	.006
	“ heel.....	.0038
	antero-posterior.....	.0115
	transverse, middle.....	.006
Depth of ramus at sectorial.....	.012	
Thickness of “ “.....	.007	

The affinities of this species are evidently with the *C. cuspidigerus*. It is named in honor of Jacob Geismar, a skillful naturalist of Philadelphia.

MACHÆRODUS STRIGIDENS, sp. nov.

This obviously distinct species is only represented by the crown of a superior canine tooth, from which the apex has been broken. Its characters are so peculiar that I record it under the above name, not knowing whether I shall have better specimens.

The tooth is long and very much compressed, much more so than in any species of the genus known to me. Its anterior and posterior edges are finely and very perfectly denticulate without lateral flexure near the base. The centre of each side of the tooth is occupied by a wide open gutter, so that the greatest transverse diameter of the crown is not at its middle. These gutters become planes towards the apex, giving an elongated hexagonal section. The size indicates an animal of the proportions of the *M. primævus*, and smaller than the *M. brachyops*.

As compared with the superior canine of the *Daptophilus squalidens*, which the present specimen resembles in its compression and fine denticulation, it differs in its greater relative length and in the presence of the lateral open sulci.

		<i>Measurements.</i>	M.	
Diameter at base	{	antero-posterior.....	.0120	
		transverse	greatest.....	.0036
			median.....	.0032
Length of a denticle on base.....			.000143	

MACHÆRODUS BRACHYOPS, sp. nov.

This species, which ranged in size from that of the puma to that of the jaguar, is represented in my collection by parts of two crania; by an entire cranium; by a left mandibular ramus with parts of the skeleton, and by several isolated teeth. The characteristics of the molars in both jaws are those of the other species of this genus. The first superior premolar is two-rooted and small, occupying the middle of the short space between the canine and the second premolar. The latter is large, and has no anterior basal tubercles. Sectorial without anterior basal tubercle. Tubercular tooth small, transverse.

The crania of the three individuals mentioned agree in many particulars; and especially in the very short face and muzzle. This may be more exactly expressed by comparing the interspace separating the second and third premolar from the canine with the length of the base of the latter. From this it is seen that the two dimensions are equal, while in the *M. primævus* the first mentioned is much the longer of the two. In the mandible referred to this species another character is seen in the relatively large size of the premolars, which much exceeds that of the corresponding teeth in *M. primævus*. The first is stated by Leidy to have an anterior basal cusp, which is wanting in the *M. brachyops*.

In the first cranium the sagittal crest is well developed. The canine tooth has an oval section at the base of the crown, whose long diameter somewhat exceeds the distance between it and the anterior base of the second premolar. The infraorbital foramen is large. The second specimen, the left maxillary and part of malar bones with teeth, shows that the length of the base of the sectorial tooth equals the space between it and the middle of the first premolar. The superior aspect of the proximal portion of the malar bone is horizontal, constituting a surface not seen in the species of *Felis*. The canine is robust, with an oval section at the base. The posterior denticulate cutting edge extends higher up than the anterior, and ceases at the base of the enamel. The anterior cutting edge is on the inner side of the anterior face of the tooth.

Measurements.

		No. 1.	M.
Length of muzzle in front of canine.....			.017
Diameter of canine at base	{	antero posterior.....	.018
		transverse.....	.011
Distance from canine to p. M. 2.....			.017

Measurements.

	No. 2:	M.
Length of base of series to canine.....		.063
“ “ second premolar.....		.018
“ “ sectorial.....		.025
Elevation to summit of infraorbital foramen.....		.033

The characters displayed by the second cranium lead me to suspect that it is that of a female. A striking feature of the superior dental series is the small size of the canine, which is also not much compressed at the base. As regards the cranium, the sagittal crest is only distinct over the posterior part of the brain case; the zygomata are not very widely expanded, and the muzzle is narrowed. The external infraorbital foramen is large.

The mental border of the mandibular ramus is not flared downwards but is continuous, but the external is separated from the anterior and inferior faces by strong angles. The diastema is long. Three molars, all large; the first without anterior basal tubercle, the second with a large one. Sectorial tooth the longest, with well developed simple cutting heel.

Measurements.

	M.
Total length of cranium.....	.192
Greatest width “ .....	.123
Length of dental series with canine.....	.077
Diameter of canine at base { antero-posterior.....	.012
{ transverse.....	.008
Distance between canine and second premolar.....	.019
Length base second premolar.....	.019
Length base sectorial.....	.023
Length inferior dental series, with canine.....	.094
“ diastema.....	.025
Length base of first premolar.....	.015
“ “ sectorial.....	.027
Depth of ramus below second premolar.....	.032
“ “ superior canine.....	.027

This sabre-toothed tiger is larger than the *Machcerodus primævus*, and is more like the animal indicated by a fragment of the lower jaw named by Leidy, *M. occidentalis*. But the latter agrees with the *M. primævus* in the relatively small size of teeth, especially of the first premolar, and in their oblique position, characters not seen in *M. brachyops*.

PERISSODACTYLA.

ANCHITHERIUM EQUICEPS, sp. nov.

This animal is represented by a portion of the skeleton including a complete cranium of one individual with mandibular rami of several others. The characters of the species are well marked, and do not approach very nearly to those of any other known to me.

The skull is considerably larger than that of *A. bairdi*, and the length

is greater as compared to the transverse and vertical diameters. The pre-orbital region is but little concave, and the anterior border of the orbit is above the posterior half of the first true molar. The molar teeth present a tubercle between the anterior lobes, and a weak cingulum extends round the inner base of the anterior one, and in the second premolar, round the base of both inner lobes. Thence it passes round the anterior base of the crown and ceases in a tubercle which rises in contact with the anterior median crest. On the posterior side of the crown the cingulum in like manner terminates in the large three-sided posterior marginal tubercle. The anterior median tubercle-crest is well distinguished from the anterior inner tubercle and is directed very obliquely. The posterior median crest is continuous with the inner, and is well separated from the external crests. The external basal cingulum is robust, the columns are prominent, and the outer faces of the external crescents deeply impressed but with a well marked median ridge. The external cingulum and its margins is rugose; other parts of the enamel smooth. The first premolar has two roots; the second premolar is as long as the fourth, and longer than the last true molar.

<i>Measurements.</i>	M
Total length of cranium.....	.280
Length of dental series to first incisor.....	.147
" " " canine.....	.130
" molar " .....	.100
" premolars.....	.053
" second premolar.....	.015
Width of " " .....	.015
Diameter first true molar { antero-posterior.....	.0135
{ transverse.....	.0165
Diameter of last true molar { antero-posterior.....	.0135
{ transverse.....	.0170

From *A. condoni* Leidy, this species differs materially in the composition of the superior molars. In that species there are no inner tubercle and cingulum; the anterior median crest is more completely separated; the anterior cingulum does not cease with the anterior marginal tubercle, and the posterior marginal tubercle is linear, not trihedral.

ANCHITHERIUM BRACHYLOPHUM, sp. nov.

Portions of the maxillary bones supporting molar teeth, indicate a species of the size of the *A. equiceps*, but differing in various respects.

The median and inner tubercles are not deeply separated, and the former are cut off from the external crescents by a deep fissure. There is no tubercle between the bases of the inner cones, nor is there any internal cingulum. The anterior cingulum does not develop a distinct tubercle, and does not extend to the anterior extremity of the anterior outer crescent. The posterior cingulum develops a large trihedral tubercle, and then extends nearly to the external crescent. The external cingulum is

robust, and the external columns are prominent; the intervening spaces are impressed, and have a distinct median ridge. Enamel smooth or slightly rugose at base of crown.

<i>Measurements.</i>	M.
Length of two superior molars.....	.030
Diameter of first superior molar	{
antero-posterior.....	.015
transverse.....	.017

These dimensions are those of the *A. equiceps*.

ANCHITHERIUM LONGICRISTIS, sp. nov.

This is a smaller species than the two above described, having the dimensions of the *A. bairdi*. The best specimen representing it consists of a right maxillary bone, which supports all the molars excepting the last. The infraorbital foramen issues above the third premolar. The first premolar is two-rooted; the second is not elongate, and is equal to the other premolars, or the penultimate true molar, in antero-posterior diameter. There are no interior basal tubercles or cingula, but the anterior cingulum has a tubercle which is appressed closely to the anterior median. The posterior cingulum expands into a large trihedral posterior marginal tubercle. The anterior median tubercle-crest, appears in the worn state to be moderately distinct from the internal; both it and the posterior middle are characterized by their production outwards; the latter passing between the exterior crescents and forming a junction with their common connection. The external cingula are not strongly marked, nor the external faces of the crescents impressed; the latter are convex, and with the median ridge little distinct. Enamel smooth.

<i>Measurements.</i>	M.
Length of anterior six molars.....	.063
" premolar series.....	.044
Diameter of second premolar	{
antero-posterior.....	.013
transverse.....	.014
Diameter of second true molar	{
antero-posterior.....	.0125
transverse.....	.0165

In the Annual Report of the U. S. Geol. Surv. Terrs. for 1873,* I gave the comparative characters of the three species of this genus then known to me, viz.: *A. bairdi* Leidy; *A. cuneatum* Cope, and *A. exoletum* Cope. I now give a table in which the three species above described are introduced, with the *A. condoni* Leidy.

- A* A tubercle between the internal lobes of the superior molars.
- Larger; median tubercles well separated; large anterior and posterior marginal tubercles..... *A. equiceps*.
- Smaller; median tubercles not separated; no anterior marginal and a small posterior marginal tubercle. *A. bairdi*.
- AA* No tubercle between inner lobes.

* Page 496.

i. External cingulum robust.

 β Anterior median crest little or not distinct.

- Larger; median crests cut off externally; no anterior marginal tubercle; external faces impressed. *A. brachylophum*.
 Small; posterior median crest confluent with external crests; an anterior marginal tubercle; external face little impressed. *A. longicristis*.

 $\beta\beta$ Anterior median crest isolated.

- Larger; a large anterior marginal tubercle; posterior marginal linear; wrinkled. *A. condoni*.
 Small; anterior marginal tubercle minute, posterior triangular; median crests short; smooth. *A. cuneatum*.

ii. External cingulum narrow.

- External faces without median rib; median crests short, the anterior cut off; marginal tubercles small. *A. exoletum*.

STYLONUS SEVERUS, gen. et sp. nov.

Gen. Char. These are derived from superior molar teeth *Stylonus* is allied to *Hippotherium* in details, including the isolation of the anterior internal enamel covered column, which thus forms an island of dentine, and in the prismatic character of the tooth. It differs from it in the fact that the posterior internal column is isolated in the same manner as the anterior, thus forming a second island on the triturating surface of the crown.

This interesting new genus adds one to the already numerous forms of extinct equine animals. It carries to its limit the line of development which retains the inner tubercles of the molar crown distinct from the median. The preceding station on this line which we know is the genus *Anchippus*, where the median crests have not assumed the antero-posterior direction belonging to the higher equine genera, and where the molars have short crowns and long roots. We may then believe that the line which includes *Anchippus*, *Hippotherium*, and *Stylonus*, is a side branch from that which terminated in *Equus*. The line of *Equus* must be traced from *Anchitherium* through *Protolippus* and *Hippidium*.

Sp. Char. Two superior molar teeth were accompanied by a number of inferior molars as having been all found together, but whether they belong to one individual is uncertain. The dentinal lakes of the superior molar are confluent by the median transverse valley, and increased wear would probably join the posterior pair by their posterior angles. The borders of the cementum lakes are simple, except one or two plications on their opposed adjacent borders, and one at the posterior inner part of the posterior. The internal columns are small, and their sections form two equal ovals with their long axes antero-posterior. The anterior dentinal lake sends off a narrow loop towards the posterior part of the anterior column. The shaft of the tooth is incurved, and the external face is unequally divided by the usual ridge. The wide gutters on each side of the latter are uniformly concave, and contain a rather shallow deposit of cementum.

In the inferior molars the two median interior tubercles are stout, and the loops which they bound, are nearly enclosed. There is a tubercle between the bases of the external columns.

<i>Measurements.</i>		M.
Length of crown of superior molar. ....		.028
Diameter superior molar {	antero-posterior.....	.018
	transverse.....	.016
Long diameter internal column-lake.....		.005

From the Pliocene formation of Cottonwood, Grant co., Oregon.

DÆODON SHOSHONENSIS, gen. et sp. nov.

Gen. Char. These are indicated by the terminal portion of the lower jaw of a huge mammal, which does not resemble that of any known genus of this order. It supports on the side, three incisors, one canine, and two premolars, which form an uninterrupted series. The first premolar has two roots; and the canine is of huge proportions. The mandibular symphysis is coëssified, and there are no osseous tuberosities on it nor on the adjacent parts of the rami.

The characters of the piece on which this genus is established indicate that the latter probably pertains to the *Chalicotheriidae* along with *Menodus* and *Symborodon*. From these its six inferior incisors distinguish it, while the absence of a diastema separates it from *Chalicotherium*. From *Palæosyops* and *Limnohyus* it may be known by the large two-rooted first premolar, or more correctly, in all probability, by the absence of the first premolar of the inferior series. In the relatively powerful canines it resembles the last named rather than the first named genera.

Specif. Char. The canine teeth are very robust, as in the species of *Elotherium*. The inferior face of the symphysis is not steeply inclined, and is quite elongate. It is narrowed near the bifurcation and expands to a rounded incisive border. The first incisor is narrower than the second and third, which are robust. There are two small mental foramina, the larger below the anterior root of the anterior premolar; the second below the anterior root of the second premolar.

<i>Measurements.</i>		M.
Length of symphysis above.....		.155
Width between bases of canines.....		.100
Antero-posterior diameter of base of canine.....		.055
Transverse " " second incisor.....		.022
Diameter of base of first premolar {	antero-posterior....	.040
	transverse.....	.025

This species is the largest of the North American *Perissodactyla*, with the possible exception of the *Menodus proutii*.

ARTIODACTYLA.

HYOPOTAMUS GUYOTIANUS, sp. nov.

This species of a genus little known in North America, is represented by

a portion of the left mandibular ramus, in which only the last molar is sufficiently well preserved for identification. The latter is, however, perfect, and furnishes clear evidence of the former existence on the west side of the Rocky Mountains of a species distinct from the *H. americanus* Leidy from the more eastern regions. The cones are in pairs and are directly opposed; their section is sub-trihedral, the two external sides of the external cones, forming a regular convexity. The cusps are acutely produced and slightly divergent. The posterior side of each outer cusp is excavated; the exterior side of the same presents a median rib with a concavity on each side, which is terminated below by an imperfect cingulum. The latter terminates on each side of the base of the cusp in a rudimental cusp, of which there are thus four on the external side of the tooth. The boundaries of the inner face of the external cusps are angular; the posterior one joins a corresponding ridge from the inner cusps, but there is no descending ridge on the anterior inner side of the internal cusp, which therefore forms no junction with the opposite part of the external cusp. The fifth cusp is well developed, and sends a crest inwards to the interior base of the interior cusp of the adjacent pair.

Measurements.

M.

Diameter of last inferior molar	{	antero-posterior.....	.022
		transverse.....	.010

This species is smaller than the *H. americanus*, and differs much in details. It is dedicated to Prof. Arnold Guyot, of Princeton, New Jersey.

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