

# AMERICAN MUSEUM NOVITATES

Number 345

Published by  
THE AMERICAN MUSEUM OF NATURAL HISTORY  
New York City

March 18, 1929

56.9(1181.78.6)

## THIRD CONTRIBUTION TO THE FORT UNION FAUNA AT BEAR CREEK, MONTANA

BY GEORGE GAYLORD SIMPSON

In two previous papers,<sup>1</sup> the discovery of a new Paleocene mammalian fauna at Bear Creek, Montana, has been announced and discussed. During the summer of 1928 further collections have been made at this locality for the American Museum of Natural History by Miss Rachel A. Husband, of the Department of Vertebrate Palæontology, and by Mr. J. F. Lobdell, superintendent of the Eagle Coal Mine at Bear Creek. These add somewhat to our knowledge, and it is proposed here to describe some new material and to discuss the age and relationships of the whole fauna so far as now known.<sup>2</sup>

### MAMMALIAN FAUNAL LIST

#### MULTITUBERCULATA

##### Ptilodontidæ

*Litotherium complicatum*, new genus and species

#### INSECTIVORA

##### Plagiomenidæ

*Planetetherium mirabile* Simpson

##### Nyctitheriidæ

*Protentomodon ursirivalis* Simpson

##### ?Pantolestidæ

?*Pentacodon* cf. *inversus* Cope

##### Leptictidæ

*Leptacodon* (*Leipsanolestes*) *siegfriedti* (Simpson)

#### ?PRIMATES

##### ?Plesiadapidæ

?*Plesiadapis* sp.

*Labidolemur kayi* Simpson

##### Anaptomorphidæ

*Carpolestes nigridentis* Simpson

*Carpolestes aquilæ*, new species

#### TÆNIODONTA

##### Stylinodontidæ

?*Psittacotherium lobdelli*, new species

<sup>1</sup>American Museum Novitates, No. 297, Feb. 2, 1928. "A Collection of Paleocene Mammals from Bear Creek, Montana," Annals Carnegie Museum, Art. VI, 1929

<sup>2</sup>As a matter of possible historic interest, the original discovery was made on Nov. 5, 1926. The first paper (Novitates No. 297, p. 1, line 14) contains an obvious typographic error, 1927 for 1926.

## CREODONTA

## Oxyclaenidae

*Thryptacodon pseudarctos* Simpson

## Mesonychidae

*Dissacus* cf. *navajovius* Cope

## CONDYLARTHRA

## Phenacodontidae

*Phenacodus* cf. *primævus hemiconus* (Cope)

## CORRELATION

Bear Creek Mammals	Closest Allies
<i>Liotherium complicatum</i> .....	{ ?Ptilodontidae—Cretaceous to Lower Eocene.
<i>Planetetherium mirabile</i> .....	<i>Plagiomene</i> —Lower Eocene (Gray Bull).
<i>Protentomodon ursirivalis</i> .....	Nyctitheriidae—Lower and Middle Eocene.
	{ ? <i>Pentacodon</i> —Middle Paleocene (Torrejon).
? <i>Pentacodon</i> cf. <i>inversus</i> .....	Pantolestidae—Middle Paleocene to Middle Eocene.
<i>Leptacodon</i> ( <i>Leipsanolestes</i> ) <i>siegfriedti</i> ...	<i>Leptacodon</i> —Upper Paleocene (Tiffany).
? <i>Plesiadapis</i> .....	{ ? <i>Plesiadapis</i> —Upper Paleocene (Tiffany, Clark Fork).
<i>Labidolemur kayi</i> .....	<i>Labidolemur</i> —Upper Paleocene (Tiffany).
<i>Carpolestes nigridentis</i> }	<i>Carpodaptes</i> —Upper Paleocene (Tiffany).
<i>Carpolestes aquilæ</i> }	
? <i>Psittacotherium loddelli</i> .....	{ <i>Psittacotherium</i> —Middle Paleocene (Torrejon).
	<i>Calamodon</i> —Lower Eocene.
<i>Thryptacodon pseudarctos</i> .....	<i>Thryptacodon</i> —Upper Paleocene (Tiffany, Clark Fork) and Lower Eocene (Sand Coulee, Gray Bull).
<i>Dissacus</i> cf. <i>navajovius</i> .....	<i>Dissacus</i> —Middle Paleocene to Lower Eocene.
<i>Phenacodus</i> cf. <i>primævus hemiconus</i> ....	<i>Phenacodus</i> —Upper Paleocene and Lower Eocene.

Only two forms, ?*Pentacodon* and ?*Psittacotherium*, suggest Torrejon age, but in neither case is reference to the Torrejon genus certain and both belong to groups which range into the Eocene and of which the Upper Paleocene representatives are not available for comparison. They are of no value at present in exact correlation, although the *tæniodont* does appear to be somewhat more advanced than the Torrejon species and somewhat more primitive than those from the Wasatch. *Planetetherium* and *Protentomodon* have their only known allies in the true Eocene, but they do not belong to the Eocene genera and probably will be found to be more closely allied to the otherwise still unknown Upper Paleocene representatives of their families. There are no exclusively

Eocene genera in the fauna as now known. *Litotherium* is of such uncertain exact affinities as to be of little use in correlation. All the other known forms have their closest allies in the Upper Paleocene. The *Phenacodus*, or, at least, phenacodont with a very strong mesostyle, can hardly be older than Upper Paleocene. The cumulative evidence now seems to indicate beyond reasonable doubt that this is the true age of the fauna. It is approximately equivalent to the Tiffany of Colorado, the Clark Fork of Wyoming, the "Erickson's Landing" Paskapoo of Alberta, and the Cernaysian of France.

Resemblance to the Tiffany fauna of southwestern Colorado is especially close. Although they are separated by about 550 miles and neither fauna is very well known, 6 of the known Bear Creek genera also occur in the Tiffany in a closely comparable stage of evolution, while of the six other genera, one (*Carpolestes*) finds its closest ally (*Carpodaptus*) in the Tiffany, and four belong to families not yet discovered in the latter formation (although known to have been present in North America at that time) and give no evidence against correlation. This rather close resemblance is due in part to the fact that both the Tiffany and Bear Creek beds have furnished good microfaunas, whereas the Puercio, Torrejon, and Clark Fork microfaunas are less well known. It is, however, valid and, I believe, rather conclusive evidence of essential contemporaneity, since regardless of facies such close resemblance is not found in beds which differ much in age, and since several of the mammals do belong to groups which are known from earlier and from later stages.

The Tiffany and Bear Creek faunas are not of exactly the same facies even though they do both include mostly minute forms (in the Tiffany notably those of the Mason Pocket). The geologic conditions suggest this, the Tiffany being deposited largely by running water and being little carbonaceous, while the Bear Creek deposit is that of a coal swamp and, even in the mammal-bearing clay seam, very highly carbonaceous. The relative abundance of the different types of mammals, given the apparent fact that the faunas are at least of about the same age, proves some difference of facies. In the Mason Pocket, multituberculates, didelphids, and *Plesiadapis* are abundant, while *Carpodaptus* is represented by only one specimen, leptictids (*Xenacodon*, *Leptacodon*) by three, and plagiomenids are unknown. In the Bear Creek Fort Union, multituberculates are rare, didelphids have not been found, and *Plesiadapis* is doubtfully represented by a single specimen, while plagiomenids (*Planetetherium*) are far the most common with *Carpolestes* (very close to *Carpodaptus* in adaptation as in relationship) and leptictids (*Leptacodon*)

next in order of abundance. The evidence of the Tiffany, aside from the Mason Pocket, and of such larger mammals as have left fragmentary remains in the Bear Creek stratum suggests that the general faunas of the two regions may have been similar in character but that the Mason Pocket on the one hand and this particular fossil-bearing layer at Bear Creek on the other represent very special and rather different local facies.

Aside from Bear Creek, the Fort Union has hitherto supplied only one well known fauna, that from Fish Creek in Sweetgrass County discovered by Douglass and worked especially by Silberling.<sup>1</sup> The fine collection in the United States National Museum from this locality (principally Silberling, 1908-1911) has been published by Gidley only in part, but enough has been done to give some conception of the general character and age. Most of the specimens came from near the same level and represent a relatively short span of time. The following genera have been positively identified:

Fish Creek Fauna	Remarks
<i>Ptilodus</i> .....	Genus elsewhere confined to the Torrejon, so far as surely known. Comparable and in some cases apparently identical species.
<i>Picrodus</i> } <i>Coriphagus</i> } <i>Megopterna</i> }	Affinities very doubtful. No value in correlation.
<i>Myrmecoboides</i> .....	Leptictidæ, Cretaceous to Oligocene. An isolated genus of no precise bearing on correlation.
<i>Promothodectes</i> .....	More primitive than its ally <i>Plesiadapis</i> in the Upper Paleocene.
<i>Paromomys</i> } <i>Palæchthon</i> }	No closely comparable forms elsewhere known in the Paleocene. More primitive than their Wasatch allies.
<i>Elphidotarsius</i> .....	Probably allied to, but if so more primitive than, <i>Carpodaptes</i> of the Tiffany and <i>Carpolestes</i> from Bear Creek.
<i>Neoclænodon</i> .....	Genus elsewhere confined to the Torrejon, so far as known. Species closely comparable.
? <i>Psittacotherium</i> .....	Identification not wholly certain, but species apparently close to one from Torrejon.

<sup>1</sup>On the Fish Creek Fauna, see especially:

Douglass, E. 1908. Ann. Carnegie Mus., V, 11-26.  
Gidley, J. W. 1909. Proc. U. S. Nat. Mus., XXXVI, 611-626.  
1915. Proc. U. S. Nat. Mus., LXVIII, 395-402.  
1919. Bull. Amer. Mus. Nat. Hist., XLI, 541-55.  
1923. Proc. U. S. Nat. Mus., LXIII, 1-38.  
Matthew, W. D. 1914. Bull. Geol. Soc. Am., XXV, 381-402.  
1921. Amer. Jour. Sci., (5) II, 209-227.

<i>Mioclaenus</i> .....	{	Confined elsewhere to Puerco and Torrejon. Ft. Union includes one indistinguishable from <i>M. acolytus</i> , a Torrejon species.
<i>Anisonchus</i> .....	{	Elsewhere confined to Puerco and Torrejon. Species doubtful.
<i>Tetraclænodon</i> .....	{	Elsewhere confined to Torrejon. Species comparable.
<i>Pantolambda</i> .....	{	Elsewhere confined to Torrejon. Species comparable.

The other published material, especially several creodont fragments found by Douglass, is not certainly identifiable as to genus, but is generally of Torrejon aspect. The large amount of unpublished material contains many new and distinctive forms, but none appears to oppose the evidence of the listed genera as to age. The evidence is conclusive that this fauna is of approximately Torrejon age, that is, Middle Paleocene, as already concluded by Douglass, Matthew, and Gidley. It may not be the exact equivalent of either of the two Torrejon fossil levels, but it is certainly later than the known Puerco and earlier than the Tiffany or Clark Fork. It is possibly the equivalent of the lower part of the Torrejon, as would be suggested by the rather meager and indirect stratigraphic evidence noted below.

Despite the fact that they are nominally from the same formation, the Fish Creek fauna is quite unlike that from Bear Creek. Not even one genus is common to the two as now known.<sup>1</sup> This might be due to differences of facies, and doubtless it is in part. But the Fish Creek fauna is represented by a very extensive collection which also is largely made up of the microfauna, many of the members of which are analogous in adaptation to the Bear Creek mammals. If the two deposits were contemporaneous, some closer agreement would surely be expected. Furthermore, in the very clear case of *Phenacodus* as against *Tetraclænodon* and the more doubtful but cumulatively important cases of *?Psittacotherium* (advanced type) vs. *Psittacotherium* (Torrejon type), *Carpolestes*—*Elphidotarsius*, and *?Plesiadapis*—*Pronothodectes*, the two faunas do contain members of the same or closely related phyla, and those from Bear Creek are more advanced than those from Fish Creek. The internal evidence therefore seems in agreement with that derived from comparison with the San Juan Basin faunas: the Fish Creek Fort Union fauna is definitely earlier than that from Bear Creek, the former being Middle and the latter Upper Paleocene in age. The two localities are about 65 miles apart.

<sup>1</sup>The undescribed material, which I have seen through the courtesy of Dr. Gidley, probably will not alter this statement.

The term "Fort Union" has been very loosely used and it is still uncertain just how much of any given series it should properly include. Its subdivision and correlation have rested largely on stratigraphic data which, in general, are unsatisfactory. The best recent treatment, and one which may form a basis for future work, is that of Thom and Dobbin.<sup>1</sup> They divide the Cretaceous-Eocene transition beds of Eastern Montana as follows:

Wasatch.....	{	Ulm Coal Group
		Sentinel Butte Shale
Fort Union.....	{	Tongue River
		Lebo Shale
Lance.....	{	Tullock
		Hell Creek

The term Fort Union is commonly used to include the Tullock and (or) the Sentinel Butte as well as the limited Fort Union of Thom and Dobbin. In most cases it is difficult to gather from published statements just how much of the column is included in the "Fort Union" of a given locality.

The "Hell Creek Member" of the Lance is the Hell Creek or Lance, *sens. strict.*, of vertebrate palæontologists. No dinosaurs occur in the Tullock, and its champsosaurs, crocodilians, and turtles could be either Paleocene or older. Mammals have not yet been found in this formation. The Tullock is younger than the true Lance or so-called "*Ceratops*" beds,<sup>2</sup> and from its position it is probably the equivalent of the Puerco. If this proves to be the case, its continued inclusion in the Lance would be quite improper.

The main Fish Creek fauna is from the Lebo, about 30 to 65 feet below the top of this member at Bear Butte.<sup>3</sup> The top of the Lebo is, therefore, of Torrejon age. About 50 feet above the base of the Lebo<sup>4</sup> were found *Clænodon* sp. nov. and ?*Mioclænus* sp. These are not certainly diagnostic, but also suggest the Torrejon, so that the entire Lebo may provisionally be considered as of that age. The Lebo is here 1334 feet thick, according to Stone and Calvert.

The Tongue River member has furnished very few fossils. On Fish Creek, about 3000 feet above the "Fish Creek Fauna" or "Gidley-Silberling Quarries" level, and presumably in the Tongue River, Gidley

<sup>1</sup>1924, "Stratigraphy of Cretaceous-Eocene Transition Beds in Eastern Montana and the Dakotas," Bull. Geol. Soc. Amer., XXXV, 481-506.

<sup>2</sup>A very objectionable term, as *Ceratops* does not occur in them.

<sup>3</sup>Gidley (Bull. Amer. Mus. Nat. Hist., XLI, 550) says 30 feet. Stone and Calvert (Econ. Geol., V, 755) say 65 feet.

<sup>4</sup>Stone and Calvert, *op. cit.*

records *Clænodon ferox* and *Pantolambda ?cavirictis*,<sup>1</sup> both Torrejon species.

Thom and Dobbin state that the vertebrate remains recorded by Lloyd and Hares<sup>2</sup> from the Fort Union in Billings County, North Dakota, also came from the Tongue River. Gidley identified these as *Tetraclænodon* sp. and *Pantolambda cavirictus*. The remains are poor, but as identified they indicate Torrejon age.

The Sentinel Butte Shale has no previously recorded mammal fauna, although the single tooth from the Fish Creek region named *Tetonius rex* by Gidley may have come from this member. It was found about 4000 feet above the "Silberling Quarry"—"Gidley Quarry" level, which is said to be in the Lebo. The specimen is quite insufficient to establish the age of the horizon, but it is of Upper Paleocene or even Lower Eocene aspect, and, for the very little that this evidence is worth, agrees with Thom and Dobbin's correlation of this higher "Fort Union" as about equivalent to the Clark Fork or lower Wasatch. The possible age of this member is mentioned again below.

The tentative correlation which one would reach by adding the vertebrate evidence so far adduced to Thom and Dobbin's stratigraphic work would thus be:

Ulm.....	True Wasatch
Sentinel Butte.....	Clark Fork and Tiffany
Tongue River.....	} Torrejon
Lebo.....	
Tullock.....	Puerco

This is very much in need of further palæontologic data before it can definitely be accepted, either as to the correlation or as to the practicability of the suggested division. There is no direct faunal evidence as yet that the Tullock is of Puerco age. The Lebo certainly includes a Torrejon equivalent, but there is no good evidence as to whether the present boundaries correspond to the limits of the vertical range of the Torrejon fauna. The evidence that the Tongue River is also of Torrejon age is rather inconclusive.

To return once more to the bearing of the Bear Creek fauna on the general Fort Union problem, its position in the Tullock-Ulm Coal sequence and its stratigraphic horizon relative to the Silberling and Gidley Quarries (Fish Creek fauna) is not certain.

Woodruff (Bull. U. S. Geol. Sur., No. 341, pp. 92-107) has discussed the Red Lodge Coal Field, in which Bear Creek is located. He states

<sup>1</sup>Gidley, *op. cit.*, p. 545. Stone and Calvert, *op. cit.*

<sup>2</sup>Jour. Geol., XXIII, 538-9.

that the Fort Union is here 8500 feet thick—obviously including some beds not admitted as Fort Union by Thom and Dobbin. Coal Bed No. 3, just above which the mammals occur, would be, by his figures, about 6175 feet above the base and about 2325 feet below the top of the formation. Brown (personal communication) states, on the other hand, that it is about 1500 feet above the base. The datum planes of the two observers are obviously entirely different.

Thom and Dobbin, taking the data given by Woodruff supplemented by unpublished work by Hares, questionably assign 700 feet of Woodruff's section to the Colgate Sandstone and Hell Creek, 4300 to the Tullock and Lebo, no definite thickness to the Tongue River, and 3200 feet to the Sentinel Butte and Ulm Coal. This would place the mammal horizon probably in the Sentinel Butte. If this proves to be its correct position, the fauna furnishes strong and very important confirmation of the approximate contemporaneity of the Sentinel Butte and the Clark Fork.

If this distinctly Paleocene type of fauna does belong in the Sentinel Butte, it would be much more satisfactory from a faunal point of view to retain this member in the Fort Union Formation or Group, rather than to follow Thom and Dobbin in placing it in the Wasatch. Equivalence with the Clark Fork does not necessitate inclusion in the Wasatch. The known Clark Fork fauna may be slightly later than the Bear Creek fauna, although this is not based on any positive evidence and is merely a possibility to bear in mind, but it is still essentially of final Paleocene type. The marked faunal break is between this horizon and the Sand Coulee. The presence of an unconformity in this part of the geologic column usually has little bearing on age unless it is very marked, but there is evidence of at least a local unconformity between the Clark Fork and Sand Coulee. The time break, however, either at the top or bottom of the Clark Fork, is probably negligible, and in this general region there is said to be almost complete continuity between undoubted Cretaceous beds and the true Eocene Wasatch or Upper Wasatch.

In the accompanying table is given a tentative correlation of the mammal-bearing formations of the American Paleocene.



## DESCRIPTIONS OF SOME NEW MATERIALS

## MULTITUBERCULATA

## Ptilodontidæ

*Litotherium complicatum*,<sup>1</sup> new genus and species

TYPE.—A. M. No. 22196. Isolated last upper premolar? Collected by Miss R. Husband, 1928.

HORIZON AND LOCALITY.—Just above Coal Vein No. 3, Fort Union Group, Eagle Coal Mine, Bear Creek, Montana.

CHARACTERS.—Tooth with three rows of cusps. The largest row (probably internal) with five cusps, forming a shearing edge. A median row, dependent on this, of three cusps, the terminal one poorly differentiated. The shortest row (?external) with two cusps, opposite one end of the longer row, enclosing a basin between themselves and the median row. Enamel wrinkled. Length 3.2 mm., maximum width 2.3 mm.



Fig. 1. *Litotherium complicatum*, new genus and species. Last upper premolar. Type. Crown view. Four times natural size.

Although so isolated, this tooth deserves designation because it is so extraordinary and because it is the best evidence yet obtained of the presence of multituberculates in this deposit. Its affinities are doubtful, but it is very probable that it is a multituberculate of the family Ptilodontidæ. In no other group known to me do teeth even distantly similar occur. The resemblance, so far as it goes, is with the last upper premolar of *Ptilodus*. If this homology is correct, this tooth of *Litotherium* differs from that of *Ptilodus*, chiefly in the fewer cusps of the internal row, very feeble development of the median row, and squarer truncation of the end. The external two cusps are very like those of *Ptilodus mediævus* ("*Chirox plicatus*"), save for the presence of a basin between these and the mid-row, apparently related to the deficiency of the latter. The character of the cusps and of the enamel and the broader character of crown shape and structure are also sufficiently similar to warrant a tentative hypothesis of relationship.

## ?PRIMATES

## ?Plesiadapidæ

Cf. *Labidolemur* sp.

In the collection is a single upper molar (A. M. No. 22195) of very small size, measuring only 1.5 mm. anteroposteriorly. Paracone and metacone are conical, the protocone internal to the paracone. There are no external or internal cingula, but there is a narrow anterior cingulum and

<sup>1</sup>Λιτότης, frugal θηρίον, beast—from its want of prodigality in leaving evidence of its existence. *Complicatum*, from the form of the type tooth.

a broad basined posterior cingulum, without a definite hypocone. The tooth evidently belongs to a plesiadapid or tarsioid and resembles *Phenacolemur* save in its smaller size, absence of external cingulum, slightly less developed hypocone cingulum. For this reason it may well belong to *Labidolemur* which, as known from lower jaws, also resembles *Phenacolemur* but is also much smaller, and which is known to occur at Bear Creek (*L. kayi* Simpson). The present specimen seems too small for *L. kayi*, although it might belong here. The variety of these small primates (or insectivores) is so great, however, that little weight attaches to this reference.



Fig. 2. Cf. *Labidolemur* sp. Upper molar. Crown view. Four times natural size.

### ?PRIMATES

#### ?Tarsiidæ

#### *Carpolestes aquilæ*,<sup>1</sup> new species

TYPE.—Amer. Mus. No. 22233, Right lower jaw with  $P_4$ - $M_3$ .

PARATYPE.—Amer. Mus. No. 22190, right lower jaw with  $P_4$ - $M_2$ . Both type and paratype collected by R. Husband.

HORIZON AND LOCALITY.—Above Coal Vein No. 3, Fort Union Group. Eagle Mine, Bear Creek, Montana.

DIAGNOSIS.—Length  $P_4$ - $M_2$ , 6.2 mm.  $P_4$  about 10% smaller than in *C. nigridentis* and slightly smaller relative to the molars. Molars relatively narrower basally.

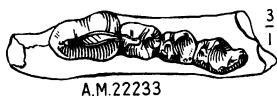


Fig. 3. *Carpolestes aquilæ*, new species. Right lower jaw with  $P_4$ - $M_3$ . Type. Crown view. Three times natural size.

Various isolated specimens of  $P_4$  suggested that two species were probably present, and the present material apparently establishes this.

From the adaptive type, one might suppose that this genus would have an enlarged gliriform incisor, but no incisor root is to be observed under  $P_4$  in any specimen examined by me, nor is one present in *Carpodaptes*.  $P_4$ - $M_2$  of *Carpolestes aquilæ* agree, save in proportions, with those of *C. nigridentis*. The present type reveals  $M_3$  in this peculiar genus. As inferred, it is closely similar to that of *Carpodaptes* and is of tarsioid or plesiadapid type. The trigonid is short and is somewhat broader than that of  $M_2$ . As in the latter, the paraconid and metaconid are closely approximated, the former slightly smaller and more external, while the protoconid is lower than either. The talonid is similar in general structure to that of *Washakius* or *Plesiadapis*, for example, elongate, bilobed

<sup>1</sup>In allusion to its source, the Eagle Mine.

(the posterior lobe the narrowest part of the tooth), distinct entoconid, double hypoconulid.

## TÆNIODONTA

### Stylinodontidæ

#### ?*Psittacotherium lobbelli*,<sup>1</sup> new species

TYPE.—Amer. Mus. No. 22234. Isolated cheek tooth.

PARATYPES.—Amer. Mus. No. 22235, incisor. Carnegie Museum No. 11560, canine. Type and paratypes presented by J. F. Lobbell.

HORIZON AND LOCALITY.—Above Coal Vein No. 3, Fort Union Group, Eagle Mine, Bear Creek, Montana.

DIAGNOSIS.—Upper premolar (?) one-rooted, higher crowned than in *Psittacotherium multifragum*, but lower than in *Calamodon* and with external and internal band-like basal expansions of enamel only incipient. Lower canine with longer enamel band and more persistent growth than in *P. multifragum*, enamel not grooved longitudinally, enamel-free portion compressed transversely.

The canine has been described in the Annals of the Carnegie Museum, where it was pointed out that it does not belong to any previously established species. With the discovery of two more specimens, it seems best to assign a name to this little-known but clearly distinct form. The known material suggests that the Bear Creek animal is intermediate in structure between *Psittacotherium multifragum* and *Calamodon simplex*, but probably somewhat closer to the former.

The cheek tooth, Amer. Mus. No. 22234, is probably an upper premolar. The upper teeth are not well known in any tæniodont, and comparisons are hence difficult, but there are isolated teeth of *Psittacotherium* and of *Calamodon* in the collection, which, although of doubtful position, are apparently homologous with this tooth. The root is single, but with vestigial vertical sulci. The oval crown bears a large cusp on one side, from which there extends along one end a cuspidate ridge to a point near a smaller but

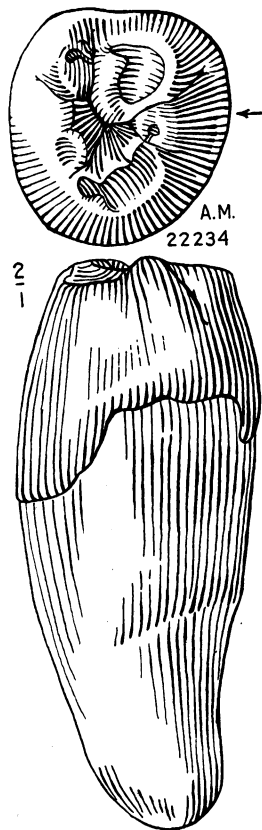


Fig. 4. ?*Psittacotherium lobbelli*, new species. Cheek tooth. Type. Crown and end views. Arrow in upper figure marks direction from which lower figure was drawn. Twice natural size.

<sup>1</sup>In honor of Mr. J. F. Lobbell, superintendent of the Eagle Mine, discoverer of the species.

prominent cusp on the other side of the tooth. Below the main cusp, on the internal side, if this is truly an upper premolar, the enamel extends downward for some distance, forming an incipient band, while on the other side the extension is less marked and the enamel terminates in two sharp points. These characters are advances over *P. multifragum* and definitely foreshadow the more specialized *Calamodon*.

### CONDYLARTHRA

#### Phenacodontidæ

##### *Phenacodus* cf. *primævus hemiconus* (Cope)

The facies of this deposit is such that ungulates, predominant in most fossil faunas, are excessively rare. In the American Museum collection there is only one tooth surely referable to this group, A. M. No. 22197. This is the right M<sup>2</sup> of a phenacodont. It is broken around the edges, but all the cusps are present and are almost unworn. It is much more progressive than *Tetraclænodon*, the Torrejon genus which occurs also in the Sweetgrass County (Fish Creek) Fort Union, and it has a very strong, distinct mesostyle. In point of evolutionary grade, the isolated tooth cannot be distinguished from Gray Bull (classic Wasatch) specimens. It agrees exactly in size and all other observable characters with a specimen from the Clark Fork referred to *Phenacodus primævus hemiconus*. It is possible, although improbable in view of this exact agreement, that a complete dentition would align this form rather with the long suspected but not yet exactly defined intermediate grade which



Fig. 5 *Phenacodus* cf. *primævus hemiconus* (Cope). Right M<sup>2</sup>. Crown view. Twice natural size.

is supposed to occur in the Upper Paleocene and to be transitional between *Tetraclænodon* on the one hand, and *Phenacodus* and *Ectocion* on the other. The latter genera do occur, typically developed, in the Upper Paleocene, however. But the exact reference is not very important, while the fact that this is a progressive and surely post-Torrejon type of phenacodont is established and is highly important.

AGE	SAN JUAN BASIN (N. M.—COLO.)	NORTHERN WYOMING	SOUTHERN MONTANA		CENTRAL ALBERTA	PRINCIPAL CHARAC- TERS OF VERTEBRATE FAUNAS	
LOWER EOCENE	LARGO	GRAY BULL ETC.	——?——		(Absent)	First Perissodactyls, Artio- dactyls, Rodents, and Adapids <div>MARKED FAUNAL CHANGE</div>	
	ALMAGRE		ULM COAL GROUP				
	(Absent or non- fossiliferous)	SAND COULEE					
PALEOCENE	UPPER	CLARK FORK  ——?——  (No Mammals)	FORT UNION	SENTINEL BUTTE (Bear Creek Fauna)	PASKAPOO	Last Champsosaurs Last <i>Periptychus</i> First <i>Phenacodus</i> , Menisco- theres, etc. <i>Plesiadapis</i>	
				TONGUE RIVER	——?——		
	MIDDLE			TORREJON	LEBO (Fish Creek Fauna)	(Absent or non- fossiliferous)	<i>Ptilodus</i> , <i>Chriacus</i> , <i>Clænodon</i> , <i>Tetracænodon</i> , <i>Pantolambda</i>
	LOWER			PUERCO	TULLOCK  (No Mammals)		First Carnivores and Un- gulates. <i>Tæniolabis</i> , <i>Triisodon</i> , <i>Ectoconus</i> , <i>Conacodon</i> <div>GREATEST FAUNAL CHANGE</div>
UPPER CRETA- CEOUS	(Absent)	[LANCE]	HELL CREEK		(Absent?)	Last Dinosaurs. Mam- mals: Only Insectivores, Didelphids, and Multitu- berculates	
	OJO ALAMO				EDMONTON		
Provisional Correlation of American Paleocene							

