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NEW PALEOCENE MAMMALS FROM THE FORT UNION  
OF MONTANA

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IN 1901, Earl Douglass, working for Princeton University, discovered and collected mammal remains in the Fort Union Group east of the Crazy Mountains in central Montana, and Princeton expeditions under Dr. M. S. Farr also made small collections in 1902 and 1903. A. C. Silberling, now of Harlowton, Mont., accompanied these expeditions, and ever since then he has continued to collect in this field. Some of his earlier material went to the Carnegie Museum, and recently some has been acquired by the American Museum of Natural History, but most of it is in the United States National Museum. The largest collections were made by him from 1908 to 1911, under grants from the United States Geological Survey and the National Museum. The result is one of the richest, most varied, and most important Paleocene mammal collections ever made.

The late Dr. James W. Gidley, assistant curator of fossil mammals in the National Museum, visited the field in 1909. Concurrently with his other duties and interests, Dr. Gidley set about the long task of preparing the specimens in the National Museum, and essentially completed it in 1920. He published four papers based on or including part of this material,<sup>1</sup> and he planned to publish a memoir

<sup>1</sup> Notes on the fossil mammalian genus *Ptilodus*, with descriptions of new species. Proc. U. S. Nat. Mus. vol. 36, pp. 611-626, 1909.

An extinct marsupial from the Fort Union with notes on the Myrmecobidae and other families of this group. Proc. U. S. Nat. Mus., vol. 48, pp. 395-402, 1915.

New species of claudodonts from the Fort Union (Basal Eocene) of Montana. Bull. Amer. Mus. Nat. Hist., vol. 41, pp. 541-555, 1919.

Paleocene primates of the Fort Union, with discussion of relationships of Eocene primates. Proc. U. S. Nat. Mus., vol. 63, art. 1, pp. 1-38, 1923.

of the whole fauna, but this hope was still unfulfilled at the time of his death in 1931. In 1932, Dr. Alexander Wetmore and C. W. Gilmore, of the National Museum, invited me to carry out Dr. Gidley's plan and to write the proposed memoir, an invitation gratefully accepted as an opportunity for useful work and for a most fitting and practical tribute to the memory of a friend and colleague. The American Museum has permitted the use of my time as a cooperative undertaking with the National Museum.

This study and the even slower preparation of the illustrations are now well advanced, but it will be at least a year and possibly several before it can be published. In the meantime, it seems necessary to facilitate the work of others and the study of the Paleocene in general by publishing names and brief diagnoses of the new genera and species so far recognized. Those studied are here published, and possibly some others may appear in similar preliminary form before the entire memoir is published. Full descriptions, discussions of affinities, and illustrations will appear in the memoir.

Aside from a few records and notes for his published papers, Dr. Gidley left 27 sheets of manuscript in various stages of preparation, in part duplicated or different drafts of the same subject. These limited notes were evidently prepared over a long period, all some time ago, and they probably do not express Dr. Gidley's definitive opinions. In studying the collection, I have first examined the specimens independently and then have ascertained whether new genera or species recognized by me are named and defined in Gidley's notes. In several cases they are (and in these instances I publish the names as of Gidley, *ex ms.*, quoting his diagnosis and, if necessary, following it by an emended diagnosis by me). This will, I hope, make the work unified and abreast of recent knowledge, and at the same time will give Dr. Gidley proper credit for the discoveries that he had reduced to paper. In a few other cases there are notations on labels that specimens represent new species, but with no manuscript name or diagnosis. Of these (so far as I agree that the species are new) I am forced to assume authorship, but I also record their recognition by Dr. Gidley.

Following is a list of the mammals so far recognized in the Fort Union of the Crazy Mountain Field. It includes 40 genera (15 new herein) and 57 species (37 new). Even this large list does not fully represent the variety actually present, for there are numerous species not yet adequately studied. Most of the listed mammals are from the Gidley and Silberling Quarries, but some are from markedly different levels, although all appear to be Middle Paleocene. Exact distributional data are available and will be published later.

## Order MULTITUBERCULATA:

## Ptilodontidae:

- Ptilodus montanus* Douglass, 1908.  
*Ptilodus douglassi*, new species.  
*Ptilodus gidleyi*, new species.  
*Ptilodus sinclairi*, new species.  
*Ectypodus grangeri*, new species.  
*Ectypodus russelli*, new species.  
*Ectypodus silberlingi*, new species.  
*Parectypodus jepseni*, new species.  
*Eucosmodon* sp.

## Order INSECTIVORA:

## ?Deltatheridiidae:

- Gelastops parvus*, new genus and species.

## Leptictidae:

- Myrmecoboides montanensis* Gidley, 1915.  
*Prodiacodon concordiarcensis*, new species.  
*Leptacodon ladae*, new species.  
*Leptacodon minusculum*, new species.  
*Emperodon acmeodontoides*, new genus and species.

## Nyctitheriidae:

- Stilpnodon simplicidens*, new genus and species.

## Pantolestidae:

- Aphronorus fraudator*, new genus and species.  
*Palacosinopa diluculi*, new species.

## Mixoeetidae:

- Eudaemonema cuspidata*, new genus and species.

## Order PRIMATES:

## Plesiadapidae:

- Pronothodectes matthewi* Gidley, 1923.

## Carpolestidae:

- Elphidotarsius florencae* Gidley, 1923.

## ?Anaptomorphidae:

- Paromomys maturus* Gidley, 1923.  
*Paromomys depressidens* Gidley, 1923.  
*Palaechthon alticuspis* Gidley, 1923.  
*Palenochtha minor* (Gidley, 1923), new genus

## Order TAENIODONTA:

## Stylinodontidae:

- Conoryctes comma* Cope, 1881.  
*Psittacotherium multifragum* Cope, 1882.

## Order CARNIVORA:

## Arctocyoniidae:

- Claenodon ferox* (Cope, 1883).  
*Claenodon montanensis* (Gidley, 1919).  
*Claenodon silberlingi* (Gidley, 1919).  
*Claenodon latidens* (Gidley, 1919).  
*Claenodon vecordensis*, new species.  
*Deuteronodon montanus*, new genus (Simpson) and species (Gidley).  
*Prothryplacodon furens*, new genus and species.  
*Chriacus pusillus*, new species.  
*Chriacus pugnax*, new species.  
*Metachriacus punitor*, new genus and species.

## Order CARNIVORA—Continued.

## Arctocyonidae—Continued.

*Metachriacus provocator*, new species.

*Spanoxyodon ltrunculus*, new genus and species.

*Tricentes latidens*, new species (Gidley).

*Coriphagus montanus* Douglass, 1908.

## Miacidae:

*Ictidopappus mustelinus*, new genus and species.

*Didymictis tenuis*, new species.

*Didymictis microlestes*, new species.

*Didymictis haydenianus* Cope, 1882.

## Order CONDYLARTHRA:

## Phenacodontidae:

*Tetraclaenodon symbolicus*, new species (Gidley).

?*Tetraclaenodon superior*, new species.

*Gidleyina montanensis*, new genus (Simpson) and species (Gidley).

?*Gidleyina silberlingi*, new species (Gidley).

## Hyopsodontidae:

*Ellipsodon aquilonius*, new species.

*Litalctes disjunctus*, new genus and species.

*Litomylus dissentaneus*, new genus and species.

*Haplalctes disceptatrix*, new genus and species.

## Order AMBLYPODA:

## Pantolambdidae:

*Pantolambda intermedius*, new species.

*Pantolambda* cf. *cavirictus* Cope, 1883.

## Periptychidae:

*Anisonchus sectorius* (Cope, 1881).

## INCERTAE SEDIS:

*Picrodus silberlingi* Douglass, 1908.

*Megopterna minuta* Douglass, 1908.

## Order MULTITUBERCULATA

## Family PTILODONTIDAE

Ptilodontids are very abundant and surprisingly varied in the collection. After prolonged analysis, which cannot be published here, eight sharply distinct species are definable and at least one other is represented by fragmentary specimens. Although the species are readily distinguishable from one another and from all others known, their generic assignment is uncertain in every case but one. There are five named genera of ptilodontids in the American Paleocene, and some of these species almost certainly belong to new genera, but these cannot now be defined. It is usually impossible to be sure of a generic assignment without associated incisors, last lower premolars, and last upper premolars, which are not available for seven of the eight species in the collection. Generic assignments are thus made with a query on an insecure basis of general resemblance, and the definitions distinguish the species from all known ptilodontids and not merely from those of the genus to which each is referred. Far the most abundant

species is *Ptilodus montanus* Douglass, 1908, with which I find *Ptilodus gracilis* Gidley, 1909, to be synonymous.<sup>2</sup> The other seven species are new and are diagnosed below. They are named for students and collectors of the American Paleocene.

Genus **PTILODUS** Cope

?**PTILODUS DOUGLASSI**,<sup>3</sup> new species

*Type*.—U.S.N.M. no. 9795, right lower jaw with P<sub>4</sub>-M<sub>2</sub>. Collected by A. C. Silberling.

*Horizon and locality*.—Gidley Quarry (and referred specimens from Silberling Quarry), Fort Union, Middle Paleocene horizon, Crazy Mountain Field, Mont.

*Diagnosis*.—Structurally similar to *P. montanus*, but P<sub>4</sub> and M<sub>2</sub> significantly smaller both absolutely and in relation to M<sub>1</sub>. Length of P<sub>4</sub> (mean of 3 specimens) 6.6 mm. Length of M<sub>1</sub> (type) 3.7 mm. Length of M<sub>2</sub> (type) 2 mm. Ratio length P<sub>4</sub> : length M<sub>1</sub> (type) 1.8. Ratio length M<sub>1</sub> : length M<sub>2</sub> (type) 1.8. Serrations of P<sub>4</sub> 13 in known specimens.

?**PTILODUS GIDLEYI**,<sup>4</sup> new species

*Type*.—U.S.N.M. no. 9763, left lower jaw with P<sub>4</sub> and broken M<sub>1</sub>. Collected by A. C. Silberling.

*Horizon and locality*.—Gidley Quarry, Fort Union, Middle Paleocene horizon, Crazy Mountain Field, Mont.

*Diagnosis*.—Close to *P. montanus* in proportions and structure, but P<sub>4</sub> and M<sub>1</sub> significantly smaller. M<sub>1</sub> significantly smaller relative to P<sub>4</sub> than in *P. trovessartianus* or ?*P. douglassi*. Length P<sub>4</sub> 6.1 mm (to 5.9 in referred specimen). Length M<sub>1</sub> 2.5 mm. Ratio length P<sub>4</sub> : length M<sub>1</sub> 2.4. Serrations of P<sub>4</sub> 14 in known specimens.

?**PTILODUS SINCLAIRI**,<sup>5</sup> new species

*Type*.—U.S.N.M. no. 9770, left lower jaw with P<sub>4</sub>-M<sub>2</sub>. Collected by A. C. Silberling.

*Horizon and locality*.—Gidley Quarry (and referred specimens from Silberling Quarry), Fort Union, Middle Paleocene horizon, Crazy Mountain Field, Mont.

*Diagnosis*.—Significantly smaller than any possibly related species except ?*Ectypodus silberlingi* (diagnosed below) and *Parectypodus tardus* (from which it differs in the presence of P<sub>3</sub>). Length P<sub>4</sub>, 16 specimens, 2.5-3.7 mm, mean 3.1 mm, type 3.3 mm. Length M<sub>1</sub>, 8 specimens, 1.7-2 mm, mean 1.9 mm, type 1.7 mm. Length M<sub>2</sub>, 5 specimens, 0.9-1.1 mm, mean 1 mm, type 0.9 mm. Ratio length P<sub>4</sub> : length M<sub>1</sub>, 8 specimens, 1.3-2, mean 1.6, type 1.9. Ser-

<sup>2</sup> It was, in any event, a homonym of *Ptilodus gracilis* (Cope) Osborn, 1893, and was replaced by *Ptilodus admirabilis* Hay, 1930, which is also added to the synonymy of *P. montanus*.

<sup>3</sup> Named for the late Earl Douglass, discoverer of the Crazy Mountain Field.

<sup>4</sup> Named for the late Dr. J. W. Gidley, of the U. S. National Museum.

<sup>5</sup> Named for the late Prof. W. J. Sinclair for his work on the Puerco, Torrejon, and Clark Fork.

rations  $P_4$ , 16 specimens, 10-13, mode 12, type 11. Cusps  $M_1$ , 7 specimens, 6-7:4, mode 7:4, type 6:4.

Genus *ECTYPODUS* Matthew and Granger

?*ECTYPODUS GRANGERI*,<sup>6</sup> new species

*Type*.—U.S.N.M. no. 9801, left lower jaw with  $P_4$ - $M_1$ . Collected by A. C. Silberling.

*Horizon and locality*.—Gidley Quarry, Fort Union, Middle Paleocene horizon, Crazy Mountain Field, Mont.

*Diagnosis*.—Structurally similar to *Ectypodus musculus* but significantly larger. Length : width ratio  $M_1$  larger and cusps  $M_1$  more numerous than in any species referred to *Ptilodus*.  $P_3$  present. Length  $P_4$  (mean of 4 specimens) 5.3. Length  $M_1$  (mean of 3 specimens) 3.4. Ratio length  $P_4$  : length  $M_1$  (type) 1.56. Ratio length  $M_1$  : width  $M_1$  (mean of 3 specimens) 2.4. Serrations  $P_4$ , 4 specimens, 13-14, mode and type 14. Cusps  $M_1$ , 3 specimens, 8:6-7, mode and type 8:7. Apex of  $P_4$  nearly on a level with grinding surface of  $M_1$ .

?*ECTYPODUS RUSSELLI*,<sup>7</sup> new species

*Type*.—U.S.N.M. no. 9765, left lower jaw with  $P_4$ - $M_2$ . Collected by A. C. Silberling.

*Horizon and locality*.—Gidley Quarry, Fort Union, Middle Paleocene horizon, Crazy Mountain Field, Mont.

*Diagnosis*.—Similar to *?E. grangeri* but slightly smaller, external cusps of  $M_1$  more numerous, and  $P_4$  more elevated above  $M_1$ .  $P_3$  present. Also similar to *E. cochranensis*, but notch in anterior base of  $P_4$  much more pronounced. Length  $P_4$  (mean of 3 specimens) 5 mm. Length  $M_1$  (2 specimens) 2.9 mm. Ratio length  $P_4$  : length  $M_1$  (2 specimens) 1.7. Ratio length  $M_1$  : width  $M_1$  (type) 2.4. Serrations  $P_4$  (3 specimens) 13-15, type 14. Cusps  $M_1$  (2 specimens) 10-11:6, type 10:6.

?*ECTYPODUS SILBERLINGI*,<sup>8</sup> new species

*Type*.—U.S.N.M. no. 9798, left lower jaw with incisor and  $P_4$ - $M_2$ . Collected by A. C. Silberling.

*Horizon and locality*.—Gidley Quarry, Fort Union, Middle Paleocene horizon, Crazy Mountain Field, Mont.

*Diagnosis*.—(Type specimen unique.) Similar to *E. musculus* but smaller and more cusps on  $M_1$ . Size close to *?Ptilodus sinclairi*, but  $M_1$  significantly longer absolutely and relative to its width and with more cusps. Length  $P_4$  3.3 mm. Length  $M_1$  2.3 mm. Ratio length  $P_4$  : length  $M_1$  1.4. Length  $M_1$  : width  $M_1$  2.6. Serrations  $P_4$  12. Cusps  $M_1$  9:5 (or perhaps, counting rudiments, 10:6). Crest of  $P_4$  relatively low.

<sup>6</sup> Named for Dr. Walter Granger for his work on the Paleocene of North America and Asia.

<sup>7</sup> Named for Dr. L. S. Russell for his work on the Paskapoo.

<sup>8</sup> Named for A. C. Silberling, who collected most of the mammals herein described.

## Genus PARECTYPODUS Jepsen

?PARECTYPODUS JEPSENI,<sup>9</sup> new species

*Type*.—U.S.N.M. no. 9769, left lower jaw with P<sub>4</sub>-M<sub>1</sub>. Collected by A. C. Silberling.

*Horizon and locality*.—Gidley Quarry, Fort Union, Middle Paleocene horizon, Crazy Mountain Field, Mont.

*Diagnosis*.—(Type specimen unique.) P<sub>3</sub> absent and no notch in base of P<sub>4</sub>. Distantly suggestive of *Parectypodus simpsoni*, but very distinct, with fewer serrations on P<sub>4</sub>, absolutely and relatively longer M<sub>1</sub>, and markedly different cusp formula of M<sub>1</sub>. Length P<sub>4</sub> 4.3 mm. Length M<sub>1</sub> 3.1 mm. Ratio length P<sub>4</sub>: length M<sub>1</sub> 1.4. Ratio length M<sub>1</sub>: width M<sub>1</sub> 2.2. Serrations P<sub>4</sub> 11. Cusps M<sub>1</sub> 7:6. P<sub>4</sub> long and low.

## Order INSECTIVORA

## Family ?DELTATHERIDIIDAE

## Subfamily DIDELPHODONTINAE

GELASTOPS,<sup>10</sup> new genus

*Type*.—*Gelastops parvus*, new species.

*Distribution*.—Middle Paleocene, Fort Union, Mont.

*Diagnosis*.—Resembling *Didelphodus* in the known parts but canine more erect, premolars more crowded, trigonid of M<sub>1</sub> longer relative to talonid, trigonids of M<sub>2-3</sub> shorter and more elevated, M<sub>2</sub> and particularly M<sub>3</sub> smaller relative to M<sub>1</sub>. M<sup>2</sup> (referred) extremely short and wide, paracone and metacone slightly more external than in *Didelphodus*, metaconule vestigial, no trace of hypocone.

GELASTOPS PARCUS,<sup>11</sup> new species

*Type*.—U.S.N.M. no. 6148, right lower jaw with canine, M<sub>1</sub>, M<sub>3</sub>, and alveoli. Collected by A. C. Silberling.

*Horizon and locality*.—Referred specimens from Gidley Quarry, type probably from same level, Fort Union, Middle Paleocene horizon, Crazy Mountain Field, Mont.

*Diagnosis*.—Sole known species of genus as defined above. M<sub>1</sub> (type) length 3.5 mm, width 2.3 mm. M<sub>2</sub> (referred specimen) length 2.5 mm, width 2 mm. M<sub>3</sub> (type and one referred specimen) length 2.7-2.9 mm, width 1.8-1.9 mm. M<sup>2</sup> (referred specimen) length 2.7 mm, width 5 mm.

<sup>9</sup> Named for Dr. G. L. Jepsen for his work on the Paleocene of Wyoming.

<sup>10</sup> Γελαστός, peculiar+ψ, aspect.

<sup>11</sup> *Parvus*, thrifty, small. From its scanty remains and its small size. Gidley noted this as new but left no designation or diagnosis.

## Family LEPTICTIDAE

## Genus PRODIACODON Matthew and Granger

PRODIACODON CONCORDIARCENSIS,<sup>12</sup> new species

*Type*.—U.S.N.M. no. 9637, left lower jaw with P<sub>2</sub>, P<sub>4</sub>, M<sub>3</sub>, and alveoli. Collected by Dr. J. W. Gidley.

*Horizon and locality*.—Gidley Quarry, Fort Union, Middle Paleocene horizon, Crazy Mountain Field, Mont.

*Diagnosis*.—Much smaller than *Prodiacodon puercensis*. P<sub>4</sub> with paraconid projecting more anteriorly and median, talonid with 3 cusps (4 in *P. puercensis*). M<sub>3</sub> with trigonid slenderer, paraconid more median, talonid less elongate, and 3 (not 4) talonid cusps. P<sub>4</sub> length 2 mm, width 1.1 mm. M<sub>3</sub> length 1.9 mm, width 1.2 mm. (The species may not belong in *Prodiacodon*, but it is evidently closely allied to it, and the specimen is insufficient basis for a generic definition.)

## Genus LEPTACODON Matthew and Granger

LEPTACODON LADAE,<sup>13</sup> new species

*Type*.—U.S.N.M. no. 9640, right lower jaw with P<sub>4</sub>–M<sub>3</sub>. Collected by A. C. Silberling.

*Horizon and locality*.—Gidley Quarry, Fort Union, Middle Paleocene horizon, Crazy Mountain Field, Mont.

*Diagnosis*.—Slightly larger than *L. tener* or *L. packi* and slightly smaller than *L. siegfriedti*, structurally closer to the former (subgenus *Leptacodon*) than to the latter (subgenus *Leipsanolestes*). P<sub>4</sub> elongate, paraconid median, metaconid very small but in the same position as in *L. tener*, talonid as in that species. Molar paraconids smaller than in *L. tener* but distinct and internal. Hypoconulids of M<sub>1-3</sub> more projecting than in *L. tener*. Talonid of M<sub>3</sub> more elongate and entoconid smaller. Length M<sub>1-3</sub> in type 4.5 mm.

LEPTACODON MUNUSCULUM,<sup>14</sup> new species

*Type*.—U.S.N.M. no. 9819, left lower jaw with M<sub>1</sub> and M<sub>3</sub>. Collected by A. C. Silberling.

*Horizon and locality*.—Gidley Quarry, Fort Union, Middle Paleocene horizon, Crazy Mountain Field, Mont.

*Diagnosis*.—Slightly smaller than *Leptacodon tener*, paraconids more reduced and more strictly internal, talonid of M<sub>3</sub> relatively narrower. M<sub>1</sub> length 1.2 mm. M<sub>3</sub> length 1.1 mm.

<sup>12</sup> *Concordia*, union + arz, fort + -ensis. From the Fort Union Group.

<sup>13</sup> *Ladae*, Latin genitive of Λάδας, a Greek (Laconian) athlete famous for his agility and speed, this species presumably having the same qualities.

<sup>14</sup> *Munusculum*, a small gift.

EMPERODON,<sup>15</sup> new genus

*Type*.—*Emperodon acmeodontoides*, new species.

*Distribution*.—Middle Paleocene, Fort Union, Mont.

*Diagnosis*.—P<sub>4</sub> with distinct, subequal paraconid and metaconid, a deep vertical posterior groove between the latter and the posterior crest from the protoconid, the latter crest with a vaguely cusplike swelling (smaller than in *Acmeodon*), external wall of protoconid concave vertically, talonid bicuspid. Molars leptictid, cf. *Prodiacodon*, but paraconids relatively large and internal, cf. *Acmeodon*.

EMPERODON ACMEODONTOIDES,<sup>16</sup> new species

*Type*.—U.S.N.M. no. 9850, right lower jaw with P<sub>4</sub>, M<sub>2</sub>, and part of P<sub>3</sub>. Collected by A. C. Silberling.

*Horizon and locality*.—Gidley Quarry, Fort Union, Middle Paleocene horizon, Crazy Mountain Field, Mont.

*Diagnosis*.—Sole known species of genus. P<sub>4</sub> (type) length 2.8 mm, width 1.9 mm. M<sub>2</sub> (type and one referred specimen) length 2.9–3 mm, width 2.2–2.3 mm. M<sub>3</sub> (referred specimen) length 2.9 mm, width 1.9 mm.

## Family NYCTITHERIIDAE

Although very distinct from any other known genus, the following form is more conveniently placed in this family than any other.

STILPNODON,<sup>17</sup> new genus

*Type*.—*Stilpnodon simplicidens*, new species.

*Distribution*.—Middle Paleocene, Fort Union, Mont.

*Diagnosis*.—P<sub>4</sub> with very high, slender main cusp, minute rudimentary anterior basal cuspule, no metaconid, simple nonbasined talonid with one cuspule. M<sub>3</sub> reduced, distinct, low, nearly median paraconid, trigonid erect and moderately elevated above talonid, protoconid large, trigonid nearly as long as talonid, talonid short.

STILPNODON SIMPLICIDENS,<sup>18</sup> new species

*Type*.—U.S.N.M. no. 9629, left lower jaw with P<sub>3-4</sub>, M<sub>3</sub>, and alveoli.

*Horizon and locality*.—Gidley Quarry, Fort Union, Middle Paleocene horizon, Crazy Mountain Field, Mont.

*Diagnosis*.—Sole known species of genus. P<sub>4</sub> length 1 mm. M<sub>3</sub> length 1.2 mm.

<sup>15</sup> Ἐμπερονος, deformed + ὀδοός, tooth. From its peculiar P<sub>4</sub>.

<sup>16</sup> *Acmeodon*(t) + -oides, from its resemblance to *Acmeodon*.

<sup>17</sup> Στιλπνός, glistening + ὀδοός, tooth.

<sup>18</sup> *Simplex*, simple + *dens*, tooth. From the simple P<sub>4</sub>.

## Family PANTOLESTIDAE

The following genus, fairly common in the quarry collections, is evidently allied to *Pentacodon*, but the pertinence of it and *Pentacodon* to the Pantolestidae is not well established. Another form is generically indistinguishable from *Palaeosinopa* and surely belongs in the Pantolestidae, but is not closely related to *Pentacodon* or *Aphronorus*.

APHRONORUS,<sup>19</sup> new genus

*Type*.—*Aphronorus fraudator*, new species.

*Distribution*.—Middle Paleocene, Fort Union, Mont.

*Diagnosis*.—Generally similar to *Pentacodon*. P<sub>4</sub> with anterior end less produced downward than in *Pentacodon*, talonid more distinctly basined, with second cuspule more distinct. M<sub>2-3</sub> less reduced relative to M<sub>1</sub>. Trigonid of M<sub>1-2</sub> relatively shorter and entoconids relatively higher than in *Pentacodon*. Three talonid cusps of M<sub>3</sub> more distinct. P<sup>4</sup> with metacone well differentiated but smaller than paracone, protoconule distinct. M<sup>1</sup> and to less degree M<sup>2</sup> slender and more transverse than in *Pentacodon*, more leptictid in aspect.

APHRONORUS FRAUDATOR,<sup>20</sup> new species

*Type*.—U.S.N.M. no. 6177, left lower jaw with P<sub>4</sub>-M<sub>3</sub>. Collected by A. C. Silberling.

*Horizon and locality*.—Gidley Quarry (one specimen from Silberling Quarry), Fort Union, Middle Paleocene horizon, Crazy Mountain Field, Mont.

*Diagnosis*.—Sole known species of the genus. Much smaller than *Pentacodon inversus*. Lengths of lower teeth, in millimeters: P<sub>4</sub> (10 specimens) 3.2-3.8, M<sub>1</sub> (10 specimens) 2.8-3.1, M<sub>2</sub> (12 specimens) 2.5-2.9, M<sub>3</sub> (7 specimens) 2.6-2.9.

## Genus PALAEOSINOPA Matthew

PALAEOSINOPA DILUCULI,<sup>21</sup> new species

*Type*.—U.S.N.M. no. 9810, left lower jaw with P<sub>4</sub>-M<sub>2</sub>. Collected by A. C. Silberling.

*Paratype*.—U.S.N.M. no. 9553, left upper jaw with P<sup>4</sup>-M<sup>3</sup> (somewhat broken). Collected by A. C. Silberling.

*Horizon and locality*.—Gidley and Silberling Quarries, Fort Union, Middle Paleocene horizon, Crazy Mountain Field, Mont.

*Diagnosis*.—Much smaller than any other known species of *Palaeosinopa*. P<sub>4</sub> strongly trenchant, with large anterior basal cusp and incipient basining of talonid. Molar cusps high and slender. M<sup>1-2</sup> with smaller hypocones than in most advanced species. Metacone of M<sup>3</sup> distinct. Length M<sup>1-2</sup> 6.1 mm.

<sup>19</sup> Ἀφρων, crazy + ὄρος, mountain. From the locality; also in analogy with the many American fossils named for mountain ranges.

<sup>20</sup> *Fraudator*, deceiver. From its resemblances to various different families (as Arctocyonidae, Leptictidae, and Hyopsodontidae), resemblances of which the majority must be deceitful.

<sup>21</sup> *Diluculi*, of the dawn. From its great age.

## Family MIXODECTIDAE

The following genus is so distinctive that it may not belong in this family, but it compares more nearly with *Mixodectes*, *Cynodontomys*, and their respective allies than with other genera known to me.

EUDAEMONEMA,<sup>22</sup> new genus

*Type*.—*Eudaemonema cuspidata*, new species.

*Distribution*.—Middle Paleocene, Fort Union, Mont.

*Diagnosis*.—Dental formula  $\frac{2.1.4.3}{}$ . Median incisor much enlarged.

Canine reduced, but larger than lateral incisor or P<sub>1</sub>. P<sub>1-2</sub> small, one rooted. P<sub>4</sub> submolariform, comparable with *Cynodontomys*, with distinct paraconid, large, high metaconid, and basined, tricuspid talonid. Molar structure nearly as in *Mixodectes* (or *Indrodon*) but trigonids more elevated and all six cusps sharper and more distinct.

EUDAEMONEMA CUSPIDATA,<sup>23</sup> new species

*Type*.—U.S.N.M. no. 9314, left lower jaw with C, P<sub>2</sub>-M<sub>3</sub>, and roots or alveoli of all other teeth. Found by Dr. J. W. Gidley.

*Horizon and locality*.—Gidley Quarry (and one specimen from Silberling Quarry), Fort Union, Middle Paleocene horizon, Crazy Mountain Field, Mont.

*Diagnosis*.—Sole known species of genus as defined above. M<sub>1-3</sub> (type) 10.9 mm.

## Order PRIMATES

Dr. Gidley (1923, *op. cit.*) published thorough descriptions of the Fort Union Primates, and this is the only part of his projected memoir that can be considered as definitively completed by him. The rapid advances in knowledge during the past 12 years, nevertheless, necessitate reconsideration of his conclusions. These do not affect taxonomy, the sole concern of this paper, except in requiring the generic separation of one of Gidley's species. Gidley foresaw that this species was probably generically distinct, but with proper conservatism did not give a name that would require fuller validation by later research. The family position of these primate genera is dubious and requires more detailed discussion than can be given here.

PALENOCHTHA,<sup>24</sup> new genus

*Type*.—*Palaechthon minor* Gidley, 1923.

*Distribution*.—Middle Paleocene, Fort Union, Mont.

*Diagnosis*.—Dental formula probably  $\frac{?.?.?.3.}{1.1.2.3.}$ . Anterior lower dentition shorter than in *Paromomys* or *Palaechthon* and apparently

<sup>22</sup> Εὐδαμόνημα, a piece of good fortune. Analogous with *Olbodotes* ("bearer of bliss").

<sup>23</sup> *Cuspidata*, cuspidate. I borrow the name from a label by Gidley, "*Indrodon* or new genus, *cuspidatus*", on a specimen probably of this species. There is no manuscript by him definitely referring to this form. The specimens referred to this species are highly variable—Gidley's labels suggest that he was inclined to place them in several different genera and species—but they seem not to be clearly separable specifically.

<sup>24</sup> Anagram of *Palaechthon*.

with one more tooth absent, probably  $P_2$ .  $P_4$  of about the same length relative to  $M_1$  as in *Palaechthon*, but relatively higher, with no trace of the metaconid and only a very vague rudiment of the paraconid.  $M_{1-2}$  similar to *Palaechthon*, but  $M_3$  with smaller third lobe and undivided hypoconulid. Upper molars comparable with *Paromomys* and *Palaechthon* but very slender, transverse, and more triangular, posterointernal expansion much weaker, inner base not bilobed, and  $M^3$  shorter relative to  $M^2$ .

## Order CARNIVORA

### Family ARCTOCYONIDAE

Gidley (1919, *op. cit.*) placed most of the Fort Union and some of the Torrejon arctocyonines in a new genus, *Neoclaenodon*. Thorough restudy with greatly augmented materials shows that the separation from *Claenodon* is not valid. It was based essentially on one specimen of each supposed genus, and analysis of many specimens shows that a generic distinction does not exist. Among many other points this is emphasized by the fact that *Neoclaenodon* as having the premolars more reduced than in *Claenodon*, and Matthew (ms.) says they are less reduced in *Neoclaenodon*.

There is a new species of this group, collected since Dr. *Gidley's* death, and a new genus based on a new species recognized but not published by him.

#### Genus CLAENODON Scott

##### CLAENODON VECORDENSIS,<sup>25</sup> new species

*Type*.—U.S.N.M. no. 13781, left  $M^{2-3}$ . Collected by A. C. Silberling and G. G. Simpson, 1932.

*Horizon and locality*.—Locality 9, 300 feet above base of the recognized Fort Union, Crazy Mountain Field, Mont. (This is about 900 feet below the *Gidley Quarry*, but probably still in the Middle Paleocene.)

*Diagnosis*.— $M^2$  similar to that of *C. silberlingi* in outline but 10 to 20 percent larger, somewhat more transverse, hypocone vestigial, and strong, crenulated internal cingulum.  $M^3$  relatively as large as in *C. ferox* and similar, but metacone smaller, external border more evenly rounded, and hypocone present although rudimentary.  $M^2$  length 9 mm, width 13.5 mm.  $M^3$  length 6.7 mm, width 10 mm.

##### DEUTEROGONODON,<sup>26</sup> new genus

*Type*.—*Deuteronodon montanus* *Gidley*, new species.

*Distribution*.—Middle Paleocene, Fort Union, Mont.

<sup>25</sup> *Vecors*, crazy+-ensis, geographical adjectival suffix.

<sup>26</sup> Δεύτερος, second, subsequent +γωνία, angle +δούς, tooth. Named in analogy with *Protogonodon*.

*Diagnosis.*—Dentition basically arctocyonic and resembling *Protogonodon* and *Claenodon*. Distinct, small hypocone on  $M^{2-3}$  (at least), cingula almost completely circling these teeth. Small but well-defined mesostyle present. Parastyle of  $M^3$  a distinct, strongly projecting cusp. Lower molars with trigonid only slightly higher than talonid, metaconid smaller than but as high as protoconid. Paraconid very small, subconical, on anterior slope of metaconid. Talonid basin open with continuous crescentic lophid differentiated into three apices. Enamel wrinkled, but little or no tendency to form accessory cuspsules.

**DEUTEROGONODON MONTANUS** Gidley, new species, ex ms.<sup>27</sup>

*Type.*—U.S.N.M. no. 6160, part of right maxilla with  $M^3$  complete and broken  $M^{1-2}$ , and left lower jaw fragment with talonid of  $M_1$  and most of  $M_2$ . If these should prove not to be of one individual, the upper jaw is to be taken as type and the lower as a paratype. Collected by A. C. Silberling.

*Paratype.*—U.S.N.M. no. 6161, isolated right  $M_2$ .

*Horizon and locality.*—Locality 25, about 400 feet below Gidley Quarry, Fort Union, Middle Paleocene horizon, Crazy Mountain Field, Mont.

*Diagnosis.*—Gidley: "Somewhat larger than *P.* [*Protogonodon pentacus* (Cope)."

Simpson: Sole known species of genus as defined above.  $M^2$  median width 14.6 mm.  $M^3$  length 10 mm.  $M_2$  (paratype) width 10.5 mm, length 12.6 mm.

The following new genus is in several ways transitional between the so-called arctocyonic and oxyclaenine creodonts. It helps to emphasize the fact that a separation of more than subfamily rank, at most, is unjustified between these two groups. Among the smaller and more strictly carnivorous forms, the oxyclaenines proper, there are two new sharply distinct species of *Chriacus*, two new genera probably allied to *Chriacus*, and a species related to *Tricentes* and tentatively retained in that genus but so distinctive that it may be necessary to create another genus for it when it is better known.

**PROTHRYPTACODON**,<sup>28</sup> new genus

*Type.*—*Prothryptacodon furens*, new species.

*Distribution.*—Middle Paleocene, Fort Union, Mont.

*Diagnosis.*—Canine semiprocumbent, root extending beneath premolars (as in *Thryptacodon*).  $P_{1-2}$  spaced widely.  $P_4$  similar to

<sup>27</sup> Dr. Gidley's notes contain two drafts of a description of this species, in both of which it is referred to *Protogonodon*. On one the words "new genus" have later been written under "*Protogonodon*," but there is no generic name or diagnosis. Dr. Gidley thus recognized both genus and species as new, but only the latter can be published as by him.

<sup>28</sup> Πρό, before + *Thryptacodon*.

*Thryptacodon*. Molar trigonids higher than in *Thryptacodon*, paraconids reduced and in nearly same position as in *Thryptacodon*, but more distinct, higher on crown, trigonids less basined and with fewer accessory cuspules. Only one distinct inner talonid cusp, the entocoid (two in *Thryptacodon*).

PROTHRYPTACODON FURENS,<sup>29</sup> new species

*Type*.—U.S.N.M. no. 9260, right lower jaw with P<sub>4</sub>–M<sub>3</sub> and alveoli. Collected by A. C. Silberling.

*Horizon and locality*.—Gidley Quarry (referred specimen from Silberling Quarry), Fort Union, Middle Paleocene horizon, Crazy Mountain Field, Mont.

*Diagnosis*.—Sole known species of genus. Measurements of type in millimeters:

P <sub>4</sub>		M <sub>1</sub>		M <sub>2</sub>		M <sub>3</sub>	
Length	Width	Length	Width	Length	Width	Length	Width
4.9	2.7	5.2	3.7	5.2	4.2	5.3	4.0

Genus CHRIACUS Cope

CHRIACUS PUSILLUS,<sup>30</sup> new species

*Type*.—U.S.N.M. no. 9270, right lower jaw with P<sub>2</sub>–M<sub>2</sub>. Collected by Dr. J. W. Gidley.

*Horizon and locality*.—Gidley and Silberling Quarries, Fort Union, Middle Paleocene horizon, Crazy Mountain Field, Mont.

*Diagnosis*.—Much smaller than *C. pelvidens*, lower premolars high and slender. Anterior basal cusp and talonid of P<sub>4</sub> relatively small. Trigonoid of M<sub>1</sub> short. M<sub>3</sub> slightly reduced. Measurements of type in millimeters:

P <sub>1</sub>		P <sub>3</sub>		P <sub>4</sub>		M <sub>1</sub>		M <sub>2</sub>	
Length	Width								
2.8	1.6	3.5	2.0	4.4	2.6	4.9	3.7	5.0	4.3

<sup>29</sup> *Furens*, raging.

<sup>30</sup> *Pusillus*, puny.

CHRIACUS PUGNAX,<sup>31</sup> new species

*Type*.—U.S.N.M. no. 13782, right lower jaw with  $M_{1-2}$  and alveoli. Collected by A. C. Silberling and G. G. Simpson, 1932.

*Horizon and locality*.—Locality 78, Fort Union, probably Middle Paleocene (older than Gidley Quarry), Crazy Mountain Field, Mont.

*Diagnosis*.—Much larger than *C. pusillus*, about the size of *C. pelvidens*, but molars markedly wider, trigonids less elevated, talonid of  $M_1$  notably wider than trigonid.  $M_1$  length 7 mm, width trigonid 4.9 mm, width talonid 5.9 mm.

METACHRIACUS,<sup>32</sup> new genus

*Type*.—*Metachriacus punitor*, new species.

*Distribution*.—Middle Paleocene, Fort Union, Mont.

*Diagnosis*.—Premolars like *Chriacus*. Molar trigonids less elevated, paraconids reduced but near metaconids, trigonid basin with crenulated anterior margin, accessory cuspules also tending to develop elsewhere, especially on notched metaconid-entoconid crest. Molars wide and heavy, especially  $M_2$ .

METACHRIACUS PUNITOR,<sup>33</sup> new species

*Type*.—U.S.N.M. no. 9288, left lower jaw with  $M_{1-3}$ . Collected by A. C. Silberling.

*Paratype*.—U.S.N.M. no. 9286, right lower jaw with  $P_3-M_3$  ( $M_1$  and  $M_3$  broken). Collected by A. C. Silberling.

*Horizon and locality*.—Gidley Quarry, Fort Union, Middle Paleocene horizon, Crazy Mountain Field, Mont.

*Diagnosis*.—Heel of  $P_4$  squarely truncated, inner side nearly basined, with two cuspules. Molars relatively weak, crenulation moderate. Measurements of type in millimeters:

$M_1$		$M_2$		$M_3$	
Length	Width	Length	Width	Length	Width
4.7	3.9	4.9	4.4	6.0	3.8

METACHRIACUS PROVOCATOR,<sup>34</sup> new species

*Type*.—U.S.N.M. no. 9278, left lower jaw with  $P_4-M_3$ . Collected by Dr. J. W. Gidley.

*Horizon and locality*.—Locality 51 (probably referable specimen from locality no. 24, near same level, both below Gidley Quarry), Fort Union, Middle Paleocene horizon, Crazy Mountain Field, Mont.

*Diagnosis*.—Heel of  $P_4$  more pointed, only one distinct cusp. Molars very broad and heavy, crenulations pronounced. Measurements of type in millimeters:

<sup>31</sup> *Pugnax*, combative.

<sup>33</sup> *Punitor*, avenger.

<sup>32</sup> *Meta*, prefix of change of condition, etc. + *Chriacus*. <sup>34</sup> *Provocator*, one who challenges to combat.

P <sub>4</sub>		M <sub>1</sub>		M <sub>2</sub>		M <sub>3</sub>	
Length	Width	Length	Width	Length	Width	Length	Width
5.0	2.9	5.5	4.1	5.7	5.2	ca. 6.5	4.0

SPANOXYODON,<sup>35</sup> new genus

*Type*.—*Spanoxyodon latrunculus*, new species.

*Distribution*.—Middle Paleocene, Fort Union, Mont.

*Diagnosis*.—Symphysis long, subcylindrical, with procumbent canine. P<sub>1-2</sub> absent. P<sub>3</sub>-M<sub>2</sub> closely similar to *Chriacus* but metaconid of P<sub>4</sub> larger and paraconid of M<sub>2</sub> more median than in the genotype and probably other species of *Chriacus*.

SPANOXYODON LATRUNCULUS,<sup>36</sup> new species

*Type*.—U.S.N.M. no. 9287, left lower jaw with canine alveolus and P<sub>3</sub>-M<sub>2</sub>. Collected by Dr. J. W. Gidley.

*Horizon and locality*.—Gidley Quarry, Fort Union, Middle Paleocene horizon, Crazy Mountain Field, Mont.

*Diagnosis*.—Sole known species of genus. Measurements of type in millimeters:

P <sub>3</sub>		P <sub>4</sub>		M <sub>1</sub>		M <sub>2</sub>	
Length	Width	Length	Width	Length	Width	Length	Width
3.8	2.3	5.0	2.8	5.2	3.9	5.8	4.5

## Genus TRICENTES Cope

TRICENTES LATIDENS<sup>37</sup> Gidley, new species, ex. ms.

*Type*.—U.S.N.M. no. 9269, left lower jaw with canine and P<sub>2</sub>-M<sub>3</sub>. Collected by Dr. J. W. Gidley.

*Horizon and locality*.—Gidley Quarry, Fort Union, Middle Paleocene horizon, Crazy Mountain Field, Mont.

<sup>35</sup> Σπᾶρός, few + ἄγῆς, pointed + ὀδοίς, tooth. From the reduced premolars.

<sup>36</sup> *Latrunculus*, a small bandit.

<sup>37</sup> *Latus*, wide + *dens*, tooth, in allusion to the wide talonids. Dr. Gidley's notes are sketchy and were clearly only preliminary, but they plainly distinguish the species and apply a name to it. I designate as type a specimen surely conspecific with that suggested in the notes and much better preserved. It seems almost certain that this change was intended by Gidley, although not clearly made in his notes.

*Diagnosis.*—Gidley: "About the equivalent of *T. subtrigonus* in size but presents the following differences: (1) The teeth are more massive, (2) the molars are relatively wider especially in the region of the heel \* \* \* (4) \* \* \* the paraconid is \* \* \* more closely appressed to the metaconid \* \* \*".

Simpson: P<sub>3-4</sub> markedly heavier than in *T. subtrigonus*. M<sub>1-2</sub> similar but paraconid more internal and nearly confluent with metaconid. M<sub>3</sub> relatively shorter and wider. Measurements of type in millimeters:

P <sub>2</sub>		P <sub>3</sub>		P <sub>4</sub>		M <sub>1</sub>		M <sub>2</sub>		M <sub>3</sub>	
Length	Width										
3.6	2.8	4.6	3.3	5.4	4.0	5.5	4.7	6.0	5.5	6.1	4.7

Family MIACIDAE

There are at least four very distinct species of miacids in the collection. One is poorly known and near *Didymictis haydenianus*, from which it cannot properly be distinguished. Of the others, one certainly represents a new genus and the other two may be referred to *Didymictis*, although sharply distinct from other species of that broadly drawn genus.

ICTIDOPAPPUS,<sup>38</sup> new genus

*Type.*—*Ictidopappus mustelinus*, new species.

*Distribution.*—Middle Paleocene, Fort Union, Mont.

*Diagnosis.*—Differing from *Didymictis* in the relatively smaller and much simpler P<sub>3-4</sub> and relatively lower and longer trigonid of M<sub>1</sub>, from *Viverravus* in the wider and more triangular P<sub>4</sub> and more definitely basined talonids, and from other miacids in the absence of M<sub>3</sub>. P<sub>4</sub> shorter than M<sub>1</sub> but nearly as high, relatively wide, subtriangular, not markedly trenchant, paraconid and metaconid barely indicated, talonid very short, vaguely cusped, no other cuspules and no cingulum.

ICTIDOPAPPUS MUSTELINUS,<sup>39</sup> new species

*Type.*—U.S.N.M. no. 9296, right lower jaw with P<sub>3</sub>–M<sub>1</sub> and talonid of M<sub>2</sub>. Collected by A. C. Silberling.

*Horizon and locality.*—Gidley Quarry, Fort Union, Middle Paleocene horizon, Crazy Mountain Field, Mont.

*Diagnosis.*—Sole known species of the genus as defined above. Measurements of type in millimeters as follows:

<sup>38</sup> Ἰκρίς, weasel+πάππος, grandfather. Also in analogy with *Viverravus*.

<sup>39</sup> *Mustelinus*, relating to or resembling a weasel.

P <sub>3</sub>		P <sub>3</sub>		M <sub>1</sub>	
Length	Width	Length	Width	Length	Width
2.0	1.4	2.9	1.9	3.8	2.3

## Genus DIDYMICTIS Cope

DIDYMICTIS TENUIS,<sup>40</sup> new species

*Type*.—U.S.N.M. no. 9297, part of left lower jaw with broken P<sub>4</sub> and complete M<sub>1</sub>. Collected by Dr. J. W. Gidley.

*Horizon and locality*.—Gidley Quarry, Fort Union, Middle Paleocene horizon, Crazy Mountain Field, Mont.

*Diagnosis*.—Much smaller than any comparable miaeid. P<sub>4</sub> with short high main cusp and single posterior cusp, both subconical, M<sub>1</sub> with very elevated trigonid, hypoconid and entoconid about equally high and distinct. M<sub>1</sub> length 2.9 mm, width 1.8 mm.

DIDYMICTIS MICROLESTES,<sup>41</sup> new species

*Type*.—U.S.N.M. no. 9301, left lower jaw with P<sub>4</sub>-M<sub>2</sub>. Collected by Dr. J. W. Gidley.

*Horizon and locality*.—Gidley Quarry (and one referred specimen from Silberling Quarry), Fort Union, Middle Paleocene horizon, Crazy Mountain Field, Mont.

*Diagnosis*.—Generally similar to *D. haydenianus* but much smaller, anterior cusp of P<sub>4</sub> higher and more trenchant, heel of P<sub>4</sub> with one central cuspule and one very small marginal posterior cuspule, posterior end of P<sub>4</sub> relatively wider and more transverse, talonid of M<sub>2</sub> almost as wide as trigonid. Measurements of type in millimeters as follows:

P <sub>4</sub>		M <sub>1</sub>		M <sub>2</sub>	
Length	Width	Length	Width	Length	Width
4.2	2.1	4.3	3.2	3.3	2.2

## Order CONDYLRATHRA

## Family PHENACODONTIDAE

Most of Dr. Gidley's manuscript notes refer to this group, and he evidently planned a preliminary paper on it. There are three separate

<sup>40</sup> *Tenuis*, feeble. Gidley notes that two or three new species of this genus or family are present, but his records contain no exact reference to these species.

<sup>41</sup> Μικρός, small+λήστης, plunderer.

drafts of part of his brief account of the phenacodonts. None is complete, it is not certain which is most recent, they are not consistent with each other, and they have notations for further study never made or, at least, recorded. It is thus improper to publish these notes as they stand and impossible to edit them in such a way as to be sure of representing Dr. Gidley's views correctly. I have therefore studied the group *de novo*, but have incorporated as many of Gidley's names and diagnoses as possible.

#### Genus TETRACLAENODON Scott

##### TETRACLAENODON SYMBOLICUS Gidley, new species, ex ms.

*Type*.—U.S.N.M. no. 6169, part of right lower jaw with  $M_1$  and alveoli of  $P_{3-4}$  and  $M_2$ . Collected by A. C. Silberling.

*Paratype*.—(Added by Simpson.) U.S.N.M. no. 6168, jaw fragment with right  $M_{1-2}$  and an isolated left  $P_4$ . Collected by A. C. Silberling.

*Diagnosis*.—Gidley: "This species is smaller than *E. [Tetraclaenodon] puercensis*, being about intermediate in size between that species and *E. minor [Tetraclaenodon pliciferus]*. The lower molars are proportionately narrower transversely than those of the former species and the lower jaw is much shallower. This last character may be due in part, however, to a less mature condition of the specimen which represents a young individual with the first true molar just coming into use. The striking similarity in detail of the lower molars with those of *E. [T.] puercensis* is a notable feature of the species and separates it clearly from *E. minor [T. pliciferus]*. The more notable points of similarity are the slight roughening and wrinkling of the enamel surface and a tendency of the teeth to break up into small cuspules."<sup>42</sup>

Simpson: Intermediate between *Tetraclaenodon pliciferus* and *T. puercensis* in size but nearer the former both in size and structure. The only constant difference from *T. pliciferus* is greater size, inadequate for specific differentiation were it not correlated with wide geographic separation. Crenulations perhaps slightly more pronounced and paraconid weaker than in *T. pliciferus*, but these are highly variable characters of doubtful taxonomic value.  $M_1$ , 3 specimens, length 7.5–7.9 mm, width 6.3–6.4 mm.  $M_2$ , 2 specimens, length 7.8–8.2 mm, width 7 mm. Ratio trigonid width : talonid width  $M_2$  1.01–1.06.

##### ?TETRACLAENODON SUPERIOR,<sup>43</sup> new species

*Type*.—U.S.N.M. no. 11913, part of left lower jaw with talonid of  $M_1$ , unworn  $M_2$ , and  $M_3$  in capsule. Collected by A. C. Silberling.

*Horizon and locality*.—Locality 11 or 13, about 3,000 feet above the Gidley Quarry, Fort Union, Middle or perhaps Upper Paleocene horizon, Crazy Mountain Field, Mont.

<sup>42</sup> This appears to be a good distinction from figures of *T. pliciferus*, but actual specimens of the latter do not differ markedly from *T. symbolicus* in this respect.—G. G. S.

<sup>43</sup> *Superior*, higher, in reference to its stratigraphic position.

*Diagnosis*.—Molars about as long as in *T. symbolicus*, but markedly narrower. Crenulation slight. Paraconid vestigial, trigonid broadly basined with crenulated anterior margin. External cingulum absent.  $M_2$  length 7.7 mm, width 6.2 mm. Ratio trigonid width: talonid width  $M_2$  1.13. This species may belong to *Gidleyina* (infra).

GIDLEYINA, new genus <sup>44</sup>

*Type*.—*G. montanensis* Gidley, new species.

*Distribution*.—Paleocene, Fort Union, Mont.

*Diagnosis*.—Closely resembling *Ectocion*, but upper premolars with much smaller metacones, first and second molars with smaller mesostyles and hypocones, protoconules of  $P^{3-4}$  and  $M^{1-2}$  slightly more united by lophs to protocone. Among Middle Paleocene genera closest to *Protoselene*, but sharply distinguished by large postero-internal protocone on  $P^3$ , distinct conules on  $P^4$ , and other details.

GIDLEYINA MONTANENSIS Gidley, new species, ex ms.

*Type*.—Princeton no. 12048, part of left maxilla with  $P^3$ - $M^2$  and a probably associated right  $P^2$ .

*Horizon and locality*.—Locality 68, about 1,000 feet above Gidley Quarry, Fort Union, Crazy Mountain Field, Mont.

*Diagnosis*.—Gidley: <sup>45</sup> "Parastyle and mesostyle prominent, mesostyle angular and continuous with the ectoloph;  $P^4$  with internal cingulum and with low but well-defined lophs connecting the summit of the protocone with the protoconule and base of the metacone, respectively."

Simpson: Measurements in millimeters as follows:

$P^2$		$P^3$		$P^4$		$M^1$		$M^2$	
Length	Width								
4.5	3.1	5.9	5.8	5.7	7.2	7.0	9.0	6.9	9.9

?GIDLEYINA SILBERLINGI Gidley, new species, ex ms.<sup>46</sup>

*Type*.—U.S.N.M. no. 6166, partial left lower jaw with  $P_3$ - $M_3$ . [Three other fragments are included in the same lot and probably are

<sup>44</sup> In one draft of Gidley's notes the genotype is referred to *Euprotogonia*, in another to *Ectocion*, and in another to a new genus. Even supposing the last to be his latest opinion, as it probably was, I cannot validate Gidley's authorship of the genus as the name he uses is preoccupied. It is appropriate that a genus that he recognized and one of the most important in the collection that he worked on for so long should be named for Dr. Gidley. (*Gidleya* Cossman, 1907, is a fossil bovid.)

<sup>45</sup> Much of the diagnosis consists of measurements, which I replace with new figures.

<sup>46</sup> This species was at first referred to *Euprotogonia* and then to *Ectocion* by Gidley. Probably he finally recognized its probable pertinence to the genus I have called *Gidleyina*, but this does not appear in his notes. Only enough of his diagnosis is quoted to validate his authorship of the species; it is based on reference to *Euprotogonia* [*Tetraclaenodon*] and is therefore not fully appropos.

conspecific, but more than one individual is present, and I exclude all but the principal specimen from the type material.—G. G. S.] Collected by A. C. Silberling.

*Horizon and locality*.—Locality 27, about 500 feet above the Gidley Quarry, Fort Union, Crazy Mountain Field, Mont.

*Diagnosis*.—Gidley: “\* \* \* Jaw relatively long and slender, especially anteriorly; the teeth proportionately narrow transversely \* \* \* with a decided tendency to selenodonty \* \* \*. The paraconid in the molars is vestigial or lacking, and  $P_4$  is submolariform \* \* \* the heel \* \* \* having the crescentic form of that of the molars, while the metaconid is large and as high as the protoconid.”

Simpson: Not directly comparable with *Gidleyina montanensis*.<sup>47</sup> Generically distinct from any other described lower jaws. Differing from all species of *Ectocion* in the crescentic talonid crest of  $P_3$ , less molariform  $P_4$ , and some details in the molars, from *Tetraclaenodon* in the talonid basin and crescent of  $P_3$ , somewhat less distinct molar paraconids, smoother enamel and fewer crenulations, and from *Protoselene* in the much more molariform  $P_{3-4}$ . Measurements in millimeters as follows:

$P_3$		$P_4$		$M_1$		$M_2$		$M_3$	
Length	Width								
6.7	3.9	7.2	4.7	7.0	5.4	7.3	5.4	7.3	4.6

### Family HYOPSODONTIDAE

Hyopsodontids are very abundant in the quarry collections. The most typical and common Torrejon genus, *Mioclaenus*, has not been identified in the collection, but there is a distinctive species tentatively referable to the Torrejon genus *Ellipsodon*, and there are three new genera. All these, even including the species placed in *Ellipsodon*, show a more marked resemblance to the later hyopsodontids, or to the hyopsodontines as opposed to the mioclaenines, than do the Torrejon forms. They thus tend in a very important way to corroborate Matthew's union of the frequently separated supposed families Mioclaenidae and Hyopsodontidae, and they make even a subfamily distinction between the two groups impractical on present data.

<sup>47</sup> This may be the lower dentition of *G. montanensis*, but this cannot be demonstrated, and there is some indirect evidence against it, making even generic identity uncertain. In view of these doubts it seems practical and warranted to follow Gidley and list this important form as a species.

Genus **ELLIPSODON** Scott**ELLIPSODON AQUILONIUS**,<sup>48</sup> new species

*Type*.—U.S.N.M. no. 9280, right lower jaw with P<sub>3</sub>–M<sub>3</sub> and alveoli. Collected by A. C. Silberling.

*Paratype*.—U.S.N.M. no. 9567, right upper jaw with P<sup>3</sup>–M<sup>2</sup>. Collected by Dr. J. W. Gidley.

*Horizon and locality*.—Gidley and Silberling Quarries, Fort Union, Middle Paleocene horizon, Crazy Mountain Field, Mont.

*Diagnosis*.—Closest to *Ellipsodon acolytus* among previously named species. Teeth in general somewhat slenderer in build. Metaconid of P<sub>4</sub> more distinct. Talonid of M<sub>3</sub> more elongate and narrow. Resembles *Litaletes* in the advancing molarization of P<sub>4</sub>, but generally nearer to *Ellipsodon*. Measurements of type in millimeters:

P <sub>3</sub>		P <sub>4</sub>		M <sub>1</sub>		M <sub>2</sub>		M <sub>3</sub>	
Length	Width								
3.3	1.9	3.5	2.4	3.1	2.7	3.2	3.0	3.7	2.6

**LITALETES**,<sup>49</sup> new genus

*Type*.—*Litaletes disjunctus*, new species.

*Distribution*.—Middle Paleocene, Fort Union, Mont.

*Diagnosis*.—Resembles the most primitive species of *Hyopsodus* (e. g., *H. simplex*) in the molarization of P<sub>4</sub> and presence of a small, distinct hypocone separate from the protocone. Differs in the relatively larger M<sub>3</sub>, rudimentary protocone of P<sup>3</sup>, smaller hypocones than any typical *Hyopsodus*, protoconid-metaconid crest less oblique, and paraconid generally less reduced.

**LITALETES DISJUNCTUS**,<sup>50</sup> new species

*Type*.—U.S.N.M. no. 9323, right lower with C–M<sub>3</sub> (M<sub>3</sub> broken). Collected by A. C. Silberling.

*Paratype*.—U.S.N.M. no. 9324, right upper jaw with P<sup>3</sup>–M<sup>3</sup>. Collected by A. C. Silberling.

*Horizon and locality*.—Gidley Quarry, Fort Union, Middle Paleocene horizon, Crazy Mountain Field, Mont.

*Diagnosis*.—Sole known species of genus. Measurements of type in millimeters:

<sup>48</sup> *Aquilonius*, northern. Dr. Gidley recognized this species, and there is a rough draft of a diagnosis probably of this form, but the diagnosis and designation of type are ambiguous, and as there is no name in his notes or labels he cannot be quoted as author.

<sup>49</sup> Λιτάρος, simple + ἀλίεργος, grinder. From the simple molars and in analogy with *Haplomytus*, *Litonmytus*, and other genera.

<sup>50</sup> *Disjunctus*, disconnected. From its deviation from other members of the family.

P <sub>1</sub>		P <sub>2</sub>		P <sub>3</sub>		P <sub>4</sub>		M <sub>1</sub>		M <sub>2</sub>		M <sub>3</sub>
Length	Width	Width										
2.2	1.3	2.9	1.7	3.3	1.9	3.5	2.6	3.9	3.4	4.3	3.9	3.4

LITOMYLUS,<sup>51</sup> new genus

*Type*.—*Litomylus dissentaneus*, new species.

*Distribution*.—Middle Paleocene, Fort Union, Mont.

*Diagnosis*.—Lower teeth generally similar to *Protoselene* but relatively narrower and more lightly built. P<sub>4</sub> with sharp anterior blade, rudimentary anterior cuspule low on the crown, low well-defined metaconid separated from protoconid by a distinct pocket, talonid relatively shorter and lower than in *Protoselene*. Talonid of M<sub>3</sub> less elongate. Molar paraconids vestigial and median as in *Protoselene*; unlike *Ellipsodon* or *Litaletes*.

LITOMYLUS DISSENTANEUS,<sup>52</sup> new species

*Type*.—U.S.N.M. no. 9425, left lower jaw with P<sub>3</sub>–M<sub>3</sub>. Collected by A. C. Silberling.

*Horizon and locality*.—Gidley Quarry, Fort Union, Middle Paleocene horizon, Crazy Mountain Field, Mont.

*Diagnosis*.—Sole known species of genus. Measurements of type in millimeters:

P <sub>3</sub>		P <sub>4</sub>		M <sub>1</sub>		M <sub>2</sub>		M <sub>3</sub>	
Length	Width								
3.3	1.7	3.5	1.9	2.9	2.4	3.0	2.7	3.2	2.2

HAPLALETES,<sup>53</sup> new genus

*Type*.—*Haplaletes disceptatrix*, new species.

*Distribution*.—Middle Paleocene, Fort Union, Mont.

*Diagnosis*.—P<sub>3</sub> with small basal paraconid and rudimentary metaconid. (P<sub>4</sub> unknown.) Protocone distinct on P<sub>3</sub> and large on P<sub>4</sub>. Rudimentary metacone on paracone slope of P<sub>4</sub>. M<sub>1-2</sub> and particu-

<sup>51</sup> Ἰτὼς, simple + μῶλος, millstone. From the simple molars and in analogy with *Haplomytus*, *Litaletes*, and others.

<sup>52</sup> *Dissentaneus*, disagreeing. From its disagreement with the more common mioclaenines.

<sup>53</sup> Ἄπλωος, simple + ἄλετης, grinder. From the single molars and in analogy with *Haplomytus*, *Litaletes*, and others.

larly  $M_3$  short and broad, with very slightly elevated trigonids and low blunt cusps, paraconids vestigial, median, not fusing with metaconids, external cusps lower than internal.  $M^{1-3}$  similar to *Litaletes*, but protocones relatively smaller and hypocones relatively larger.

**HAPLALETES DISCEPTATRIX**,<sup>54</sup> new species

*Type*.—U.S.N.M. no. 9500, right lower jaw with  $P_3$ – $M_3$ . Collected by A. C. Silberling.

*Paratype*.—U.S.N.M. no. 9555, right upper jaw with  $P^2$ – $M^3$ . Collected by Dr. J. W. Gidley.

*Horizon and locality*.—Gidley Quarry, Fort Union, Middle Paleocene horizon, Crazy Mountain Field, Mont.

*Diagnosis*.—Sole known species of genus. Dimensions of type in millimeters:

$P_3$		$P_4$		$M_1$		$M_2$		$M_3$	
Length	Width								
2.1	1.4	2.5	1.6	2.4	2.2	2.6	2.6	2.8	2.2

## Order AMBLYPODA

The only periptychid so far found is an anisonchine apparently indistinguishable from the Torrejon *Anisonchus sectorius*. The absence of *Periptychus*, so abundant in contemporaneous beds elsewhere, is striking and emphasizes the poor representation of the macrofauna in contrast with the remarkable variety of the microfauna.

### Family PANTOLAMBIDIDAE

#### Genus PANTOLAMBDA Cope

##### PANTOLAMBDA INTERMEDIUS, new species

*Type*.—U.S.N.M. no. 8384, left lower jaw with  $M_{1,2}$  and alveoli of C– $P_4$ , associated with symphysis fragment with right  $I_{1,2}$  and alveoli of left  $I_{1,3}$ . Collected by Dr. J. W. Gidley.

*Horizon and locality*.—Gidley Quarry, Fort Union, Middle Paleocene horizon, Crazy Mountain Field, Mont.

*Diagnosis*.—Intermediate in size between *P. bathmodon* and *P. cavirictus*.  $P_1$  with one large root, close to canine, followed by short diastema.  $P_{2,4}$  2-rooted. Lower molars closely resembling those of *P. cavirictus* but entoconid more distinct.  $M_1$  length 13.2 mm, width 11.2 mm.  $M_2$  length 14.8 mm, width 12.1 mm. (The widths may have been reduced somewhat by corrosion.)

<sup>54</sup> *Disceptatrix*, one who decides. From its apparently decisive evidence of union between the hypsodonts and miochaenines.