

ART. XXVIII.—*Preliminary Description of New Tertiary Mammals*; by O. C. MARSH. Part II.

THE present communication is a continuation of the article in the preceding number of the Journal (p. 122), in which were described some of the new mammalian remains discovered by the Yale College expeditions to the Rocky Mountain region. Among the animals briefly described in the present paper are several which appear to be Marsupials, the first fossil species of the group detected in this country, and hence of much interest.

Limnofelis ferox, gen. et sp. nov.

A gigantic carnivore, nearly as large as a lion, is represented in our collections by portions of a skull, a fragment of a lower jaw containing the sectorial molar, and by some vertebræ and

other less important parts of the skeleton of the same individual. The remains show that the animal was a typical carnivore, one of the largest and most powerful yet discovered. The tooth preserved resembles the corresponding one of the lion in its general shape, but is proportionally broader anteriorly, the base of the crown being subtrilateral in outline, with the inner side the longest. This tooth was in close contact with the one in front. The zygomatic process of the squamosal is proportionally more massive than in the lion, although similar in form.

Measurements.

Antero-posterior diameter of lower sectorial molar,-----	24.5 ^{mm} .
Greatest transverse diameter,-----	11.75
Height of tooth above jaw,-----	14.
Greatest vertical diameter of zygomatic process of squamosal,-----	32.

This interesting specimen was found, in September last, by Mr. J. F. Page, of the Yale party, near Henry's Fork, Wyoming. The geological horizon was Eocene, or Lower Miocene.

Limnofelis latidens, sp. nov.

A second very large carnivore, but inferior to the preceding in size, is indicated by a last upper premolar, and probably by some other fragmentary remains. This premolar is unusually broad, and is remarkable for its large posterior tubercle, which is two-thirds the size of the main cusp. The anterior tubercle is very small. On the outer face there is a well-marked basal ridge. The crown is 16.5^{mm} in longitudinal diameter, 11.1^{mm} in transverse diameter, and 15.1^{mm} in height. Another specimen, apparently of this species, is the left lower jaw of a young individual. It contains the canine, and three molars, the last of which is still nearly enclosed in the jaw. The space occupied by the three molars is 46^{mm}.

The only known remains of the species were discovered by Mr. G. M. Keasbey and the writer, last autumn, in the Tertiary beds of Grizzly Buttes, near Fort Bridger, Wyoming.

Limnocyon riparius, sp. nov.

A new species of *Limnocyon*, about the size of a fox, is represented by both lower jaws and a single upper molar from the same animal. The lower jaws are long and massive, and throughout the space occupied by the premolars and molars they maintain nearly the same width and depth. The symphysis is elongated, and the rami were but slightly coössified. There were six teeth behind the canine, all close together and each with two fangs. The last two are tubercular. The canine was large, and near the symphysis.

Measurements.

Space occupied by lower premolars and molars,	47· mm.
Space occupied by last three molars,	26·
Antero-posterior diameter of penultimate lower molar,	9·
Transverse diameter,	5·
Depth of jaw below this molar,	12·5

The specimens on which this description is based were found, in August last, by Mr. O. Harger, at the same locality as the preceding species.

Limnocyon agilis, sp. nov.

A still smaller species, apparently of the same genus, is well represented by the greater portion of a skull with teeth, and the more important parts of the skeleton of the same individual. In the lower jaws, the premolars are separated from each other and from the canine, and the first premolar has but a single fang. The first upper premolar is separated nearly its own longitudinal diameter from the canine. The penultimate upper molar has its elevated pair of cusps more closely united than in the last species. The present animal had a long tail, and claws resembling those of a fox.

Measurements.

Space occupied by three lower premolars,	27·6 mm.
Depth of jaw below third lower premolar,	12·
Antero-posterior diameter of penultimate lower molar,	7·75
Transverse diameter,	3·6
Length of astragalus,	21·
Transverse diameter of distal end of humerus,	27·

The above remains were found by the writer, in September last, in the Tertiary shale of Grizzly Buttes, Wyoming.

Thinocyon velox, gen. et sp. nov.

A small carnivore, about as large as a cat, is represented by a nearly perfect lower jaw with several teeth, and perhaps by some less characteristic remains of other individuals. The jaw somewhat resembles in its proportions that of *Limnocyon*, but it is more elongated, and the symphysis is more nearly horizontal. The angle of the lower jaw is inflected, thus probably indicating the marsupial affinities of the species. The condyle, also, was evidently but little elevated. The number of teeth in each lower jaw was nine, divided as follows: Incisors 2, canine 1, premolars and molars 6. The incisors are small and compressed. The canine is large, and nearly round at the base. The last two molars are tubercular; and the four anterior teeth compressed, and each has two fangs.

Measurements.

Longitudinal extent of lower premolars and molars,	30.5 mm.
Extent of last three teeth,	16.
Depth of jaw below last molar,	7.5
Length of symphysis,	17.
Longitudinal diameter of canine at base,	3.75
Space occupied by two left incisors,	2.

The specimen on which the present description is based was found, in September last, by the writer, during the explorations of the Yale party in Grizzly Buttes, Wyoming.

Viverravus (?) *nitidus*, sp. nov.

A diminutive mammal, about the size of a weasel, is clearly indicated by a perfect penultimate lower molar, which agrees so nearly with the corresponding tooth of *Viverravus gracilis* Marsh, that the species it represents may for the present be referred to that genus. Other remains in our collections probably pertain to the same species. The crown of this molar is composed of a posterior tubercle, which has its summit near the outer side; next a pair of elevated, pointed cusps, of equal size, the exterior being slightly in advance of the other; and in front a small, slightly bifid tubercle.

Measurements.

Antero-posterior diameter of penultimate lower molar,	4. mm.
Transverse diameter in front,	1.5
Transverse diameter behind,	2.
Height above jaw of central tubercles,	3.

The above specimen was discovered last autumn, by G. G. Lobbell, Jr., in the Tertiary shale near Henry's Fork, Wyoming.

Thinolestes anceps, gen. et sp. nov.

The collections made by the Yale party include the remains of a number of small carnivorous mammals, which are apparently very unlike any hitherto known. In dentition, they somewhat resemble several extinct species, supposed to be of suilline affinities, but their carnivorous characters appear unmistakable. All apparently had the angle of the lower jaws inflected, and present other marsupial characters, although in general structure they are very different from any known form of that group. The teeth in the present genus are similar to those of *Limnotherium*, and the two genera are evidently nearly related. In the complete description, the characters and affinities of this peculiar group, which may be called *Limnotheridæ*, will be fully discussed.

The lower jaws in this species are short and stout. The teeth agree in number and general form with those of *Limno-*

therium tyrannus Marsh, and may be divided as follows: Incisors 2-2, canines 1-1, molar series 7-7. There are seven teeth, also, in the upper jaw behind the canine. The first pre-molar above and below has only a single fang. The upper molars have an external pair of pointed cusps, and on the inner side the first and second true molars have a pair of nearly confluent cones, of which the anterior is much the larger. The last upper molar has but one inner cone. The lower jaws are coössified at the symphysis, but the suture is visible externally. The head of the humerus is much like that of the opossum, and the distal end has a similar supra-condilar foramen. The astragalus resembles that of the raccoon. The animal had a long slender tail, and was nearly as large as an opossum. Its food was probably, in part, insects.

Measurements.

Longitudinal extent of upper molar series,	28· mm.
Extent of three upper true molars,	15·5
Extent of three lower true molars,	18·
Antero-posterior diameter of last lower molar,	6·6
Transverse diameter,	4·
Depth of jaw on posterior face below last lower molar, ...	10·

This species is represented in the Yale Museum by the more important part of several skeletons, which were found, last autumn, by Mr. J. F. Quigley, Mr. G. G. Lobdell, Jr., and the writer, in the Tertiary deposits of Western Wyoming.

Telmalestes crassus, gen. et sp. nov.

This genus, which closely resembles *Thinolestes* in the dentition of the lower jaws, may be readily distinguished from it by the upper molars, which have the inner pair of cones of the first and second true molars separate, and of nearly equal size. The last upper molar has but one inner cusp. So far as is now known, the dental formulæ of the two genera are the same, and in the proportions of the jaws they are very similar. The present species was about as large as a raccoon, but the lower jaws are much stouter, and are ankylosed at the symphysis.

Measurements.

Longitudinal extent of lower molar series,	37· mm.
Extent of three lower true molars,	23·5
Antero-posterior diameter of last lower molar,	9·5
Transverse diameter,	5·5
Extent of last three upper molars,	18·
Transverse diameter of last upper molar,	7·8

The specimen on which the above description is mainly based was discovered, last September, near Henry's Fork, Wyoming, by Mr. O. Harger, of the Yale party.

Limnotherium affine, sp. nov.

A species of *Limnotherium*, somewhat smaller than *L. tyrannus* Marsh, is well represented in the Yale Museum by portions of a skull with teeth, both lower jaws, and a considerable part of the skeleton of the same animal. The lower jaws are much more slender than in *L. tyrannus*. The lower molars have their crowns more compressed, and the canine is but little larger at the base than the first lower premolar. This and the following premolar have each but one fang. The upper true molars closely resemble those of *Thinolestes anceps*.

Measurements.

Longitudinal extent of lower molar series,	32· mm.
Extent of last three lower molars,	17·
Antero-posterior diameter of last lower molar,	7·
Transverse diameter,	4·
Depth of jaw on posterior face below last lower molar, ...	9·
Antero-posterior diameter of lower canine at base,	2·3

The type specimen of this species was found, last September, at Grizzly Buttes, by Mr. J. F. Quigley, of the Yale party.

Orohippus pumilus, gen. et sp. nov.

The remains on which the following description is principally based consist of two separate series of upper molar teeth, four of each. They indicate a new genus of small solipeds, nearly allied to *Anchitherium*, and which possibly may include the species described by the writer as *A. gracile*. The crowns of the upper true molars are composed of a pair of external cusps similar to those of *Anchitherium*. There are two corresponding inner tubercles, from which ridges extend obliquely to the anterior inner margin of the outer cusps, but the anterior ridge is divided so as to form an intermediate anterior tubercle. All the teeth preserved have a distinct basal ridge. The species was about the size of *Anchitherium gracile*, and appears to have had a long slender tail.

Measurements.

Longitudinal extent of four upper posterior molars,	27· mm.
Antero-posterior diameter of last upper molar,	7·
Transverse diameter,	8·
Antero-posterior diameter of penultimate upper molar,	7·5
Transverse diameter,	8·5

The specimens here described were found, in August last, at Grizzly Buttes, Wyoming, by Mr. G. M. Kearsbey and the writer.

Helohyus plicodon, gen. et sp. nov.

An interesting genus of small pachyderms, nearly related to *Hyracotherium*, is indicated by an upper molar tooth in perfect

preservation. An isolated third upper premolar, and probably some other fragmentary specimens from the same deposits, may belong to the same species. The molar tooth is apparently the last of the upper series. The crown is composed mainly of four cones of nearly equal size. On the outer side, there is a pair of regularly conical tubercles, quite similar in size and shape. At the inner anterior corner, there is another cone, and behind, and partly inside of this, is the inner posterior cone. Between the anterior pair of cones, there is a smaller tubercle. The crown is surrounded by a strong basal ridge, and the entire surface of the enamel is delicately wrinkled. The species was about the same size as *Hyracotherium leporinum* Owen, from the London Clay.

Measurements.

Antero-posterior diameter of last upper molar, 9· mm.
 Transverse diameter, 10·2
 Distance between summits of external pair of cones, 4·
 Distance between summits of anterior pair of cones, 5·3

The known remains of this species were found by Mr. H. D. Ziegler and Mr. G. G. Lobdell, Jr., last summer, at Grizzly Buttes, near Fort Bridger, Wyoming.

Thinotherium validum, gen. et. sp. nov.

A portion of a lower jaw containing the last true molar, and two isolated lower molars, which were found near, and may pertain to the same animal, indicate a new ungulate mammal, about as large as the preceding species. The ultimate molar resembles in its form and structure of crown the corresponding tooth of *Elotherium lentum* Marsh. The four principal tubercles are similar, and have the same relative position, but at the posterior extremity of the crown there is but a single small cusp, and the antero-interior cone was but slightly, if at all, divided. There is a marked lateral construction of the crown between the anterior and central pair of cones, and no basal ridge on the sides.

Measurements.

Antero-posterior diameter of last lower molar, 11· mm.
 Transverse diameter in front, 7·
 Transverse diameter through central pair of cones, 6·
 Distance between summits of central cones, 3·1
 Antero-posterior diameter of first lower true molar, 8·4

The only known specimens of this species were discovered last autumn, near Henry's Fork, by Mr. G. G. Lobdell, Jr.

Passalacodon litoralis, gen. et sp. nov.

Several small mammals, evidently insectivores, about the size of the European hedge-hog, were among the interesting discov-

eries of the Yale party last year. One of these is at present known by a lower jaw with the last two molars perfect, and by a few other fragmentary remains. The jaw was rather slender and compressed, and much prolonged backward at the angle. The two molars preserved have their crowns composed of an anterior pair of high cusps, and a posterior pair less elevated. At the anterior and posterior margin of each molar, there is a small intermediate tubercle which projects beyond the border, especially in the penultimate molar. The rami were apparently not coössified. The inner incisor is large and near the symphysis.

Measurements.

Antero-posterior diameter of last lower molar,.....	5· mm.
Transverse diameter,	3·
Antero-posterior diameter of penultimate lower molar,....	4·8
Transverse diameter,	3·1
Depth of jaw below first lower premolar,	6·

This unique specimen was found, in September last, near Henry's Fork, by Mr. J. F. Quigley, of the Yale party.

Anisacodon elegans, gen. et sp. nov.

Another genus, nearly allied to the preceding one, may be established on a lower jaw with teeth, which belonged to an animal about the same size as the one last described. In the present specimen, the last lower molar is smaller than the penultimate. In both, the cavities between the cusps are much more deeply excavated than in the same molars of *Passalacodon*, and the small intermedial tubercles are less prominent.

Measurements.

Antero-posterior diameter of last lower molar,	4· mm.
Transverse diameter,	3·9
Antero-posterior diameter of penultimate lower molar,....	4·6
Transverse diameter,	3·1
Depth of lower jaw on posterior face below last molar,....	6·5

The only known specimen of this species was found, last autumn, by the writer, near Henry's Fork, Wyoming.

Centetodon pulcher, gen. et sp. nov.

A small insectivorous mammal, not larger than a mole, is likewise indicated by part of a lower jaw, with the last true molar well preserved. Several other specimens in our collections probably should be referred to the same species. The lower molar is quite different from that of the recent small insectivores, and resembles somewhat the corresponding tooth in *Centetes*, although probably there is little affinity between the two genera. The posterior part of the crown is formed by a

low tubercle, which is separated by a deep notch from the anterior elevated portion. The latter is composed of three pointed cones, the front one being the highest.

Measurements.

Space occupied by last two lower molars,.....	3.6 mm.
Antero-posterior diameter of last lower molar,.....	1.8
Transverse diameter,	1.1
Depth of jaw below last lower molar,.....	3.5

The specimen here described was found, last September, by the writer, near Henry's Fork, Wyoming.

PART III.

Nearly all the remains briefly described in this section of the present communication belonged to quite small animals, many of them insectivorous, and several evidently marsupials. In the complete description, now in course of preparation, these various species will be fully described, and their more exact affinities determined.

Stenacodon rarus, gen. et sp. nov.

A new genus of very small mammals, apparently related tentatively to *Hyopsodus*, may be established on a single last lower molar, in good preservation, which is one of the rarities of our collections. The crown of the tooth is remarkably narrow. It is composed essentially of four main cusps, nearly of the same size, and a larger posterior tubercle. The main cusps are arranged in two transverse pairs, and the posterior pair are the highest. There is no basal ridge. The species was somewhat smaller than *Hyopsodus paulus* Leidy.

Measurements.

Antero-posterior diameter of last lower molar,.....	6.5 mm.
Transverse diameter through anterior pair of cones,.....	2.9
Transverse diameter through posterior tubercle,.....	2.
Height of posterior pair of cones above jaw,.....	2.7

The above specimen was found by the writer, last autumn, near Henry's Fork.

Antiacodon venustus, gen. et sp. nov.

This species, which is about the same size as *Homacodon vagans*, is at present represented only by part of a lower jaw, with the characteristic lower molar, so often alone preserved. The crown of the present tooth has a similar composition to that of the same molar in *Homacodon*. The four principal cones stand in nearly opposite pairs, but the posterior tubercle is less widely

separated from the central pair of cones, and the inner anterior cusp has its summit distinctly cleft. The crown, also, is proportionally shorter longitudinally. There is a distinct basal ridge on the front and outer sides of the crown.

Measurements.

Antero-posterior diameter of last lower molar,.....6.2 mm.
 Transverse diameter through anterior pair of cones,.....3.6
 Transverse diameter through central pair of cones,.....3.6
 Height of anterior inner cusp above jaw,.....3.7

The only known specimen of this species was found, last September, by the writer, near Henry's Fork, Wyoming.

Bathrodon typus, gen. et sp. nov.

In this genus, the first and second lower true molars have crowns with a similar composition to those of *Limnotherium*, but the anterior pair of cusps are more elevated, and the posterior pair are nearly equal in size. The last lower molar is quite different from the corresponding tooth in that genus. It is more like the preceding molar with the addition of a posterior tubercle, which is near the inner margin. The present species is based mainly on a portion of a lower jaw containing the last three molars. They indicate an animal about as large as *Limnotherium elegans* Marsh, and one probably allied to that species.

Measurements.

Longitudinal extent of last three lower molars,.....12.5 mm.
 Antero-posterior diameter of last lower molar,.....5.
 Transverse diameter, 3.5
 Height of penultimate lower molar above jaw,.....2.6

The only known remains of this species were found by Mr. F. Mead, Jr., at Grizzly Buttes, near Fort Bridger, Wyoming, in September last.

Bathrodon annectens, sp. nov.

Another species, about as large as a rabbit, is indicated by a fragment of a lower jaw with the last lower molar perfect. In its composition, and the position of its cusps, this tooth resembles the corresponding molar of *Anisacodon elegans*, but differs from it in having the anterior half of the crown narrower than the posterior portion. The former is elevated, and has its inner cusp the highest. There is no distinct basal ridge.

Measurements.

Antero-posterior diameter of last lower molar,.....5.8 mm.
 Transverse diameter in front,.....3.4
 Transverse diameter through posterior half,.....3.5
 Depth of jaw on posterior face below last lower molar,..10.6

This unique specimen was discovered, in September of last year, near Henry's Fork, by Mr. F. Mead, Jr., of the Yale party.

Mesacodon speciosus, gen. et sp. nov.

This species and genus is based essentially on a nearly perfect lower jaw, with most of the teeth in good preservation. In its general features, the jaw resembles that of *Limnotherium*, and the molars are similar in composition to those of *L. elegans*, although considerably narrower. The teeth form a continuous series. The canine is large and compressed, and almost in contact with the symphysis. There are three premolars, and three true molars. The first premolar had but a single fang. The second is compressed, and the third is very similar to the next true molar. The last lower molar is narrower than the penultimate. The jaw is short, twisted longitudinally, and was not coössified with its fellow. The lower border was produced posteriorly, and the angle inflected. The remains indicate an animal about the size of the preceding species, and probably insectivorous.

Measurements.

Longitudinal extent of six lower molars,.....	20·2 mm.
Extent of three lower true molars,.....	12·2
Antero-posterior diameter of last lower molar,.....	4·3
Transverse diameter,	3·
Depth of jaw on posterior face below last lower molar,...	7·

The jaw described above was found by the writer, last September, at Grizzly Buttes, Wyoming.

Hemiacodon gracilis, gen. et sp. nov.

A genus of small mammals, apparently insectivorous, with molar teeth resembling those in *Mesacodon*, is well represented by portions of several lower jaws, and possibly by other characteristic remains. All appear to belong to the same species, which was somewhat smaller than that last described. The lower jaws preserved are rather slender and compressed. The teeth form a continuous series, and the dental formula appears to be as follows: Incisors 2, canine 1, premolars 3, and molars 3. There were evidently two small incisors, and the canine was but little larger. The first premolar has but a single fang. The two following are compressed, subtriangular at the base, and both quite different from the first true molar. There was an external basal ridge on the crowns of the lower molars. The jaws were not coössified at the symphysis. The lower margin was produced posteriorly, and the angle inflected.

Measurements.

Longitudinal extent of nine lower teeth,.....	20·5 mm.
Extent of premolar and molar series,.....	17·2
Extent of true molars,.....	11·

Antero-posterior diameter of last lower molar,.....	4·	mm.
Transverse diameter,	2·4	
Depth of jaw below last lower molar,.....	6·3	

The type specimen of this species was discovered, last autumn, near Henry's Fork, Wyoming, by Mr. G. G. Lobdell, Jr. Other specimens were found in the same region by Mr. O. Harger, Mr. J. J. DuBois, and Mr. T. G. Peck, of the Yale party.

Hemicodon nanus, sp. nov.

A much smaller species, of the same genus apparently, is indicated by a right lower jaw, with the last four molars in perfect preservation. The teeth in this specimen have crowns with the same composition as in the preceding species, and there is the same marked difference between the last premolar and the first true molar. The teeth preserved have a distinct basal ridge. The jaw is less compressed than in the larger species. It indicates an animal about the size of a weasel, whose food was probably insects.

Measurements.

Longitudinal extent of last four lower teeth,.....	11·	mm.
Extent of three lower molars,.....	9·	
Antero-posterior diameter of last lower molar,.....	3·5	
Transverse diameter,	2·	
Depth of jaw below first lower true molar,.....	4·6	

The specimen on which the above description is based was discovered by Mr. O. Harger, in September last, near Henry's Fork, Wyoming.

Hemicodon pucillus, sp. nov.

A still smaller species, not larger than a mole, is indicated by a fragment of a lower jaw containing the penultimate molar in good condition. The jaw was proportionally more compressed than in the specimen last described, but the tooth preserved agrees closely in the composition of its crown with the corresponding molar of that species. On the outer side of the crown, there is a distinct basal ridge.

Measurements.

Antero-posterior diameter of penultimate lower molar, ...	2·3	mm.
Transverse diameter,	2·	
Height above jaw of anterior tubercles,.....	1·7	
Depth of jaw below this molar,.....	3·7	

This specimen, the only known remains of the species, was found in September, 1870, by Mr. H. B. Sargent, of the Yale party. The locality was at Grizzly Buttes.

Centetodon altidens, sp. nov.

A fragment of a lower jaw in our collections contains a penultimate molar, which agrees so nearly in its main features with the last lower molar of *Centetodon pulcher*, that the species it represents may provisionally be referred to that genus, although the species differ widely in size and other respects. The tooth preserved is remarkable for its great height above the jaw. The notch between the low posterior tubercle and the elevated anterior trifold portion of the crown is not so deep as in the small species, and more like that in the genus *Centes*. There is a faint basal ridge around the crown, except on the inner side.

Measurements.

Longitudinal extent of last two lower molars,	5.5 mm.
Antero-posterior diameter of penultimate lower molar,	3.
Transverse diameter,	2.3
Height above jaw,	3.1
Depth of jaw below penultimate molar,	6.

This specimen was found by the writer, last autumn, near Henry's Fork.

Entomodon comptus, gen. et sp. nov.

Another genus of insectivores is represented by several isolated teeth, one of the most characteristic of which is a last lower molar, in excellent preservation. This tooth is very narrow, and its crown is composed of a low posterior tubercle slightly bifid; a pair of elevated central cones, the outer being the highest, and slightly in advance of the other; and a small compressed anterior tubercle. Behind the inner central cone is a deep depression. There is no basal ridge. The tooth indicates an animal about as large as a weasel. It is probable that the small mammal referred provisionally by the writer to the genus *Viverravus*, under the name *V. nitidus*, may belong to the present genus. The species is rather smaller than the one here described.

Measurements.

Antero-posterior diameter of last lower molar,	5.3 mm.
Transverse diameter through central cones,	2.5
Height of outer central cone above jaw,	4.4
Height of anterior tubercle above jaw,	3.4

The type specimen of this species was found near Henry's Fork, last September, by Mr. G. M. Keasbey.

Entomacodon minutus, gen. et sp. nov.

A small insectivorous mammal, about as large as a mouse, is indicated by a fragment of a lower jaw with the last molar per-

fect, and probably by some other equally characteristic remains. The crown of the lower molar has its main cusps very similar to those of *Entomodon*, but all are pointed. The outer of the three anterior points is the highest, and the posterior cusp is trifid. There is no basal ridge. An upper true molar found near this specimen, and perhaps belonging to the same animal, resembles in the composition of its crown the first upper true molar in the genus *Erinaceus*.

Measurements.

Antero-posterior diameter of last lower molar,.....	2·2 mm.
Transverse diameter,	1·
Height above jaw,	2·
Depth of jaw below last lower molar,.....	2·5

The specimens now representing this species were found, last autumn, near Henry's Fork, by Mr. O. Harger.

Centracodon delicatus, gen. et sp. nov.

One of the treasures of our collections is a small, nearly perfect lower jaw, containing seven teeth, most of them in good preservation. The specimen clearly represents an insectivore, about as large as a mole, and apparently a marsupial. The jaw is slender, and its lower border regularly curved longitudinally. There were three true molars with pointed cusps, and four premolars more or less compressed. The first and second premolars are inclined forward, and separated from each other. The last molar has a low, sharp, posterior tubercle, and in front a high pointed external cusp, with two small inner tubercles.

Measurements.

Longitudinal extent of seven posterior lower teeth,.....	12·8 mm.
Extent of last three molars,.....	6·
Antero-posterior diameter of last lower molar,.....	2·
Transverse diameter,	1·2
Depth of jaw below last lower molar,.....	3·

The above specimen was discovered, in September of last year, near Henry's Fork, by Mr. F. Mead, Jr.

Nyctilestes serotinus, gen. et sp. nov.

An interesting genus of very small bats is indicated by part of a lower jaw with the last three molars perfect. On the outer side, these molars resemble those of *Nyctitherium*, but differ essentially from the same teeth in that genus in having the pair of pointed anterior tubercles of equal height. The jaw is slender, and proportionally less deep than in *Nyctitherium*. The present species was somewhat smaller than *N. velox*.

Measurements.

Longitudinal extent of last three lower molars,.....	4.2 mm.
Antero-posterior diameter of last lower molar,.....	1.3
Transverse diameter,	1.
Depth of jaw below last lower molar,.....	2.

This specimen, the only known remains of the species, was found by the writer, last September, at Grizzly Buttes, Wyoming.

Ziphaodon rugatus, gen. et sp. nov.

A new carnivore, about the size of a civet cat, is represented in our Wyoming collections by the anterior part of a lower jaw, and probably by other less important remains. The premolars in this specimen have their main cusps peculiarly sharp and effective. Their anterior and posterior tubercles, also, are pointed, and placed near the base of the crown. The first premolar is large, and near the canine. The latter was of medium size, and inserted in the jaw more nearly vertically than in most carnivores. The adjoining incisor was large. The premolars have the enamel of the crown coarsely wrinkled.

Measurements.

Longitudinal extent of canine and five next lower teeth,..	30. mm.
Extent of four premolars,	19.2
Antero-posterior diameter of third premolar,.....	6.
Transverse diameter,	3.
Depth of jaw below fourth premolar,.....	8.5

The type specimen of this species was found by Mr. J. J. DuBois. The locality was near Henry's Fork.

Harpalodon sylvestris, gen. et sp. nov.

Another new genus of carnivores, apparently allied to *Viverravus*, is indicated, also, by part of a lower jaw containing the last two premolars, and the following tubercular molar. The former differ from the corresponding teeth in *Viverravus*, in the absence of the upper posterior tubercle on the third lower premolar. On the fourth premolar, this tubercle is rudimentary. The premolars preserved are much compressed, and have the anterior tubercle well developed. The present species was somewhat larger than *V. gracilis* Marsh.

Measurements.

Longitudinal extent of last two premolars and first true lower molar,	16.2 mm.
Antero-posterior diameter of first true molar,.....	5.3
Antero-posterior diameter of last premolar,.....	5.8
Transverse diameter,	2.7
Height above jaw,	4.6

The above specimen was found by Mr. O. Harger, near Henry's Fork.

Harpalodon vulpinus, sp. nov.

A larger species, apparently of the same genus as the preceding, may be based on part of a lower jaw containing the last premolar. Some other isolated specimens probably belong to the same species. The premolar has the posterior tubercle proportionally more developed than in *H. sylvestris*, and is consequently broader at this part of the crown. The main cusp is less elevated.

Measurements.

Space occupied by four lower premolars,.....	22· mm.
Antero-posterior diameter of last premolar,.....	7·
Transverse diameter,	2·3
Height above jaw,.....	4·3
Depth of jaw below last premolar,.....	8·

The known remains of this species were found by Mr. T. G. Peck, in September last, near Henry's Fork, Wyoming.

Orotherium Uintanum, gen. et sp. nov.

This genus is nearly allied, apparently, to *Lophiotherium*, but differs from the known remains of that genus in having, on the second lower premolar, a prominent posterior tubercle. In the true lower molars, also, the anterior inner cone is slightly bifid, a character not indicated in the figures given of the corresponding teeth of *Lophiotherium*. The present species is based on a nearly entire lower jaw, with the last six teeth in perfect preservation. The first true lower molar is very similar to the fourth premolar, but is rather broader anteriorly. The second premolar is narrow, with the anterior cusp compressed and separated from the posterior tubercle by a wide notch. The lower teeth resemble those of *Lophiotherium sylvaticum* Leidy, as well as those of the smaller species, *L. Ballardi* Marsh, and both these species should doubtless be placed in the genus *Orotherium*. The relations of this genus to *Orohippus* cannot at present be fully determined.

Measurements.

Longitudinal extent of last six lower teeth,.....	47· mm.
Extent of last three lower molars,.....	26·5
Antero-posterior diameter of last lower molar,.....	11·5
Transverse diameter,	5·
Antero-posterior diameter of fourth lower premolar,.....	7·
Transverse diameter,	5·

This specimen was found near Henry's Fork, Wyoming, by the writer, in September last.

Heleletes boops, gen. et sp. nov.

Among the Tapiroid mammals in the Green River Tertiary deposits, there are two distinct genera which have been referred to *Lophiodon*. Dr. Leidy has given the name *Hyrachyus* to one of these, which embraces the larger species, and the other may be called *Heleletes*. In this genus the last lower molar has a third, posterior lobe. The upper molars resemble those of *Lophiodon*. The astragalus differs widely from the Tapiroid type, and in its narrow oblique condyles is very similar to that of the Equidæ. Other characters of the genus will be given in the full description.

The present species is based upon the greater portion of a skull with teeth, and the more important parts of the skeleton of the same individual. The teeth agree in size with those of *Lophiodon nanus* Marsh, but the last upper molar has a small tubercle on the outer margin between the cusps, which appears to be wanting in the type specimen of the latter species. There are also other differences of importance. Both species doubtless belong to the same genus.

Measurements.

Longitudinal extent of last three lower molars,.....	33· mm.
Antero-posterior diameter of last lower molar,.....	12·2
Depth of jaw below last lower molar,.....	21·
Antero-posterior diameter of last upper molar,.....	11·1
Transverse diameter,	11·5
Length of astragalus,	27·
Width between condylar ridges,.....	11·5

The type specimen of this species was discovered, last autumn, at Grizzly Buttes, Wyoming, by Mr. G. G. Lobdell, Jr.

PART IV.

Paramys robustus, sp. nov.

A new rodent, with lower molar teeth similar to those of *Paramys*, but a much larger animal than the known species of that genus, is represented by two lower molars, and by other less important remains. An isolated incisor probably belongs to the same species. The lower molars preserved are proportionally broader than those in *Paramys delicatus* Leidy, and the penultimate molar is more constricted medially, the notch on the inner side being nearly as deep as the external depression. The known remains of this species indicate an animal somewhat larger than the common woodchuck (*Arctomys monax* Gm.).

Measurements.

Antero-posterior diameter of last lower molar,.....	6·5 mm.
Transverse diameter,	5·5

Antero-posterior diameter of penultimate lower molar,	6 [·] mm.
Transverse diameter,	6 [·] 4
Transverse diameter of incisor,	4 [·]

The specimens above described were found by Mr. G. G. Lobdell, Jr., and Mr. G. M. Keasbey, in the lower Tertiary deposits of Grizzly Buttes and Henry's Fork, Wyoming.

Tillomys senex, gen. et sp. nov.

A small rodent, about the size of a rat, is represented in our Wyoming collections by a fragment of a lower jaw with the second molar in place, and apparently by some other uncharacteristic remains. The crown of this molar is somewhat worn, but was composed essentially of an anterior transverse crest, and a pair of posterior tubercles, the outer and larger one being connected by a small intermediate tubercle with the outer posterior angle of the anterior lobe. The jaw in the present species is slender, and the tubercle at the anterior margin of the masseteric fossa is under the center of the second molar.

Measurements.

Space occupied by four lower molars,	11 [·] mm.
Antero-posterior diameter of second lower molar,	2 [·]
Transverse diameter,	1 [·] 8
Depth of jaw below second molar,	5 [·]

The known remains of this species were found, in September last, by the writer, near Henry's Fork.

Tillomys parvus, sp. nov.

A smaller species, which appears to agree generically with the specimen last described, may be established on a lower jaw, also containing the second molar. In this tooth, the longitudinal connecting ridge, or tubercle, between the anterior and posterior parts of the crown, is more nearly central. The masseteric fossa, moreover, terminates in front just at the anterior margin of the last lower molar. The species was but little larger than a mouse.

Measurements.

Length of lower molar series,	7 [·] 1 mm.
Antero-posterior diameter of second lower molar,	1 [·] 9
Transverse diameter,	1 [·] 5
Space between incisor and first lower molar,	3 [·]

This specimen was found by Mr. O. Harger, at Grizzly Buttes, Wyoming, in September last.

Taxymys lucaris, gen. et sp. nov.

The existence of another small rodent, evidently belonging to the Sciuridæ, is clearly proved by a fragment of an upper jaw,

with the first two molars in position. A vertebra found with this specimen probably belonged to the same animal, which was rather smaller than the common flying squirrel (*Pteromys volucella* Desm.). The first upper molar is nearly round, and diminutive, as in many of the recent squirrels. The second upper molar has its crown composed of two main transverse ridges, which start from the outer side, and meet in a prominent inner and slightly bifid tubercle. There are two low ridges outside of the main pair, which meet in the same tubercle.

Measurements.

Space occupied by first two upper molars,.....	2.5 mm.
Antero-posterior diameter of second upper molar,.....	1.7
Transverse diameter,	2.
Transverse diameter of first upper molar,.....	1.

The above remains were found, last autumn, by the writer, near Henry's Fork, Wyoming.

Sciuravus parvidens, sp. nov.

A diminutive rodent, with molar teeth resembling those of *Sciuravus*, is evidently represented in our collections by a lower jaw containing the third molar, part of an upper jaw with the penultimate molar, and several isolated teeth. These remains indicate an animal about half the bulk of *Sciuravus undans* Marsh. The lower incisor is more convex in front than in that species. The jaw is short and deep, and the masseteric fossa ends in front under the second molar. The upper penultimate molar has three fangs, and the last one had four.

Measurements.

Space occupied by three posterior lower molars,.....	5.2 mm.
Antero-posterior diameter of third lower molar,.....	2.
Transverse diameter,	1.9
Depth of jaw below second lower molar,	5.3
Transverse diameter of lower incisor,.....	1.2

The remains at present representing this species were found, last autumn, at Henry's Fork and Grizzly Buttes, Wyoming, by Mr. G. M. Keasbey and the writer.

Colonymys celer, gen. et sp. nov.

Another small rodent, about the size of the animal last described, is indicated by several isolated molars, which differ widely from the corresponding teeth in any genus of this group from the Green River Tertiary deposits. A typical upper molar in perfect condition has its crown composed of four principal cusps, regularly arranged in two pairs. The outer pair are entirely separated from each other. The inner pair are very near together, and have their summits turned toward the center

of the tooth. The two anterior cusps are connected by an outward curving basal ridge. A similar ridge passes from the outer posterior cone inward, but does not reach the opposite cusp. This upper molar, which is apparently the penultimate, measures 2.4^{mm} in antero-posterior diameter, and 2.1^{mm} in transverse diameter. The known remains of the present species were found, last autumn, near Henry's Fork, by Mr. H. D. Ziegler and Mr. A. B. Mason, of the Yale party.

Apatemys bellus, gen. et sp. nov.

A new and peculiar genus of very small mammals may be based on part of a lower jaw, with the penultimate molar in place, and well preserved. Extending through the base of the specimen is a portion of a large rodent-like incisor. The molar is of the insectivore type, and the animal should probably be placed with that group. The crown of this tooth has its posterior half deeply excavated, with the outer rim of the cavity the highest, and rising at the inner posterior angle into a pointed tubercle. The anterior half of the crown consists of a transverse pair of high pointed cusps, opposite each other, and connected together. An elevated basal ridge, rising into a sharp inner cusp, completes the anterior margin. The large incisor is oval in transverse section, and extends under all the molars. The animal was about as large as a mole.

Measurements.

Antero-posterior diameter of penultimate lower molar, 2.3^{mm}
 Transverse diameter, $2^{\cdot}$
 Depth of jaw below, 5.6
 Transverse diameter of incisor, 1.6

This unique specimen was found, last September, near Henry's Fork, by Mr. G. G. Lobbell, Jr.

Apatemys bellulus, sp. nov.

Another diminutive mammal, apparently of the same genus, but somewhat smaller than the species last described, is well represented by a lower jaw with the last three molars perfect. The penultimate molar agrees in the composition of its crown with that of *A. bellus*. In the last lower molar, the outer border of the posterior cavity forms a slightly curved longitudinal ridge, which terminates in a small tubercle. The molar teeth are narrow, and the jaw compressed. The cavity for the incisor extends below all the lower molars.

Measurements.

Space occupied by last three lower molars, $6^{\cdot\text{mm}}$
 Antero-posterior diameter of last lower molar, 2.1
 Transverse diameter, 1.6
 Antero-posterior diameter of penultimate lower molar, $2^{\cdot}$
 Transverse diameter, 1.7

This interesting fossil was found, last autumn, near Henry's Fork, Wyoming, by Mr. G. M. Keasbey.

Entomacodon angustidens, sp. nov.

A very small insectivore, which appears to belong to the genus *Entomacodon*, left its remains in the Green River Tertiary deposits, and our collections contain a left lower jaw, with the last premolar and the two following molars in good preservation. The molars agree essentially in the composition of their crowns with those of *E. minutus*, but the three anterior cusps are nearer together, and the one in front is nearly as high as the others. The specimen indicates, also, a smaller animal than the type of that species. The jaw is much compressed, and the teeth are very narrow. The last premolar resembles the adjoining molar, but has the anterior cusp rudimentary.

Measurements.

Space occupied by last four lower teeth,.....	5.5 mm.
Antero-posterior diameter of last lower premolar,.....	1.6
Antero-posterior diameter of penultimate lower molar,....	1.7
Transverse diameter,	1.
Depth of jaw below last lower molar,.....	2.5

This specimen was found by Mr. J. J. DuBois, at Grizzly Buttes, Wyoming, in September of last year.

Triacodon grandis, sp. nov.

The genus *Triacodon* was established, by the writer, on a single lower premolar, which differed widely from any corresponding tooth then known. The species thus represented was called *T. fallax*, and its possible marsupial affinities were suggested.* The researches of the Yale party during the past year, in the same region where the original specimen was found, have added something to the knowledge of this peculiar mammal, but much still remains to be ascertained. A portion of a skeleton was found at Grizzly Buttes by the writer, and fortunately the peculiar premolar was in the jaw, although the other teeth were too imperfect for study. The jaws were stout, but not deep, and the lower border was convex longitudinally. There was a prominent canine, and the last lower molar was tubercular. The skull had a distinct sagittal crest. The humerus was slender, and curved as in the otter. The animal was probably a carnivorous marsupial.

A second and much larger species of the genus is represented by the corresponding right lower premolar, in excellent preservation. It agrees closely in its main features with the type specimen of *T. fallax*, but has a distinct antero-external basal

* This Journal, vol. ii, p. 123, August, 1871.

ridge. It indicates, moreover, an animal several times the bulk of that species. Probably other remains of both species were found by our party, but have not been recognized as pertaining to this genus.

Measurements.

Antero-posterior diameter of last lower premolar,	5. mm.
Transverse diameter,	5.8
Height of anterior cusp above jaw,	5.2
Height of exterior cusp above jaw,	8.

This rare specimen was found, by Mr. O. Harger, in the shale near Henry's Fork. The geological horizon was essentially the same as at Grizzly Buttes.

Triacodon nanus, sp. nov.

A much smaller species, apparently not more than one-half the bulk of *T. fallax*, is indicated, likewise, by the peculiar last lower premolar. This tooth, like that in the other species, has two fangs. There is a faint basal ridge, and the three pointed cusps, that give the crown its character, are more nearly of equal size than in either of the larger species.

Measurements.

Antero-posterior diameter of last lower premolar,	3. mm.
Transverse diameter,	3.
Height of anterior cusp above jaw,	2.5
Height of exterior cusp above jaw,	4.

This specimen, the only remains of the species at present known, was discovered at Grizzly Buttes, in September last, by Mr. G. G. Lobdell, Jr.

Euryacodon lepidus, gen. et sp. nov.

A small mammal, doubtless an insectivore, is represented by a fragment of an upper jaw containing the last two molars in perfect condition. Our collections contain other characteristic fossils which appear to be specifically identical with this specimen. The teeth preserved agree nearly in the composition of their crowns with the molars described by Dr. Leidy under the name, *Palaeacodon verus*, but each has its inner margin produced into a small tubercle. In the penultimate upper molar, this tubercle is especially prominent. The outer margin, also, of these molars has but a single faint indentation between the external cusps. Both teeth are surrounded by a distinct basal ridge. The specimens preserved indicate an animal about as large as a weasel.

Measurements.

Space occupied by last two upper molars,	4.3 mm.
Antero-posterior diameter of penultimate upper molar,	2.4
Transverse diameter,	3.8
Transverse diameter of last upper molar,	3.2

The type specimen of this species was found, last autumn, at Grizzly Buttes, by the writer, and other remains were discovered, at the same locality, by Mr. O. Harger.

Palæacodon vagus, sp. nov.

Another small insectivore, about the same size as the preceding species, is clearly indicated by part of an upper jaw, with the last three molars perfect. In this specimen, the last two upper teeth are broader transversely than in *Euryacodon lepidus*, and both lack the inner tubercle. The outer margin of the crown and the basal ridge are very similar in the corresponding teeth of the two specimens. The first upper true molar has externally a deeper notch between the outer cusps, and at each external angle the basal ridge rises into a small tubercle. It is possible that the small tooth mentioned by Dr. Leidy, in his description of *Palæacodon verus*, may prove to belong to the present species. In that case his specific name may be retained for the animal represented by the larger tooth, which mainly is described, and the smaller species may bear the name here given.

Measurements.

Space occupied by last three upper molars,.....	7· mm.
Antero-posterior diameter of penultimate upper molar,....	2·7
Transverse diameter,	4·
Antero-posterior diameter of last upper molar,.....	2·1
Transverse diameter,	3·6

The only known remains of this species were found at Grizzly Buttes, Wyoming, by Mr. F. Mead, Jr.

Yale College, New Haven, August 15th, 1872.

Postscript.

The original specimens of the fossil mammals described by the writer in this and preceding articles are carefully preserved in the Museum of Yale College. The dates of publication of the principal papers are as follows: The two articles in Volume II. of this Journal (pages 35–44, and 120–127, July and August, 1871) were published together, in pamphlet form, and widely distributed, June 21st, 1871. The species there described, therefore, bear that date. The various parts of the present communication were issued separately as follows:—Part I, July 22d, 1872; Part II, August 7th, 1872; Part III, August 13th, 1872; and Part IV, August 17th, 1872,—the date of publication being printed on each pamphlet.

The brief descriptions here given are merely preliminary to a full description, with illustrations, now in preparation.

Yale College, August 19th, 1872.