

ART. XXII. — *Wasatch and Wind River Primates*; by  
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THE Amherst College expedition of 1904 made a considerable collection of Primates from the Wasatch and Wind River beds, especially from the latter, which are the basis of the following study, supplemented by reference to other collections from the same horizons.

*Anaptomorphidae* Cope.

The genus *Anaptomorphus* was established by Cope when he described the Bridger species, *A. aemulus*,\* known by a single but nearly complete lower jaw. In 1882 the Wasatch species, *A. homunculus*, was added to the genus,† being an unusually complete skull. Later, lower jaws were found, and the lower dentition mostly made out. The type species has but eight teeth in the lower jaw, the formula being  $i\frac{2}{2} c\frac{1}{1} pm\frac{2}{2} m\frac{3}{3}$ ; while the lower jaw of *A. homunculus* is not so much shortened, having apparently nine teeth in the series, making a formula  $i\frac{2}{2} c\frac{1}{1} pm\frac{2}{2} m\frac{3}{3}$ .‡ Then while in *A. aemulus* the paraconid is wanting, in *A. homunculus* it is present though reduced. These two marked differences led Wortman to suggest§ that these two species should be placed in different genera, but for lack of more abundant material, he did not propose a new one.

In the Wasatch the Amherst expedition found one new *Anaptomorphus*, little over half the size of *A. homunculus*; and nine specimens of a second new species in the Wind River beds. While these do not add to our knowledge of the generic features, their rarity and the interest in American Primates seems to require their description. They are both closely related to *A. homunculus* and should a new generic name be proposed would go along with that species.

The affinities of the family seem to the writer to be with the modern *Tarsius*, as pointed out by Cope (Tertiary Vert. 1884, p. 246) and Wortman. The latter authority has proposed the following classification of Primates,|| which is adopted in this paper.

\* Proc. Amer. Phil. Soc. Phila., 1872, p. 554.

† Proc. Amer. Phil. Soc. Phila., 1882, p. 152.

‡ See Osborn, Bull. Amer. Mus. Nat. Hist., vol. xvi, 1902, p. 200.

§ This Journal, 1904, p. 213.

|| This Journal, 1904, p. 213.

Primates	{	Cheiromyoidea	Gnawing forms like Cheiromys, Mycosyops, etc.
		Lemuroidea	Lemurs
		Anthropoidea	Arctopithecini Palaeopithecini
			Neopithecini { Adapidae Cebidae Cercopithecidae Simiidae Hominidae

*Anaptomorphus minimus* sp. nov.

The type consists of a portion of the right mandibular ramus, containing molars 1 and 2, and a part of premolar 4, found in the lower Wasatch at the foot of Tatman Mt., Wyoming.

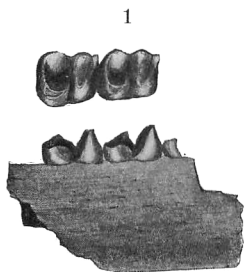


FIG. 1. *Anaptomorphus minimus*, type,  $\times 5$ .

The teeth are wide and low with acute cusps, the talonid being slightly larger than the trigonid. The paraconid is distinct and stands close to the inner margin of the tooth. The protoconid is connected with the paraconid by a long low protolophid, and with the metaconid by a comparatively high metalophid. The hypoconid and entoconid are of about equal size. No hypoconulid is present.

Specific characters are found in the position and development of the paraconid, and the extreme small size of the animal. The two lower molars measure together  $3.4^{\text{mm}}$  in length and  $1.4^{\text{mm}}$  in width; the depth of the jaw under molar 2 is  $3.2^{\text{mm}}$ .

*Anaptomorphus homunculus* Cope.

For excellent figures and description of this species, see Osborn, Bull. Amer. Mus. Nat. Hist., vol. xvi, p. 200, and comparisons in the table on the following page.

*Anaptomorphus abbotti* sp. nov.

The type consists of a right mandibular ramus containing premolars 3 and 4 and molars 1–3, found in the middle beds of the Wind River formation on Bridger Creek, Wyoming. The species is named for Mr. L. F. Abbot, to whose interest much of the success of the expedition was due.

The molar teeth are low with low cusps, but rise progressively to the fourth premolar, which has a prominent crown. All the teeth in the short jaw are compressed from front to back, making them proportionally wide. A distinct cingulum runs along the front and external side of each molar. On

ANAPTOMORPHIDAE.

	<i>A. homunculus</i>	<i>A. abbotti</i>	<i>A. minimus</i>
Premolar 3	Internal cingulum Posterior cingulum slightly raised medianly	No internal cingulum Posterior cingulum raised medianly	
Premolar 4	Posterior cingulum not raised	Posterior cingulum raised medianly	
Molar 1	Trace only of cingulum Protolophid short Metalophid low Talonid larger than trigonid	Strong cingulum in front and outside Protolophid very short Metalophid low Talonid larger than trigonid	No cingulum Protolophid long and low Metalophid high Talonid only slightly larger than trigonid
Molar 2	Trace only of cingulum Paraconid close to metaconid Protolophid low Metalophid low	Strong cingulum in front and outside Paraconid close to metaconid Protolophid low Metalophid moderate	No cingulum Paraconid very distinct Protolophid low and long Metalophid high
Molar 3	Trace only of cingulum Paraconid small but distinct Metalophid low and notched Talonid about equal to tri- gonid	Strong cingulum in front and outside Paraconid a mere rudiment Metalophid deeply notched Talonid longer than trigonid	
Horizon	Wasatch	Wind River	Wasatch
3 molars length	6.5 <sup>mm</sup>	7 <sup>mm</sup>	About 4.5 <sup>mm</sup>

molar 1 the paraconid is strong and well separated from the metaconid; on molar 2 it is less independent; and on molar 3 is barely distinguishable. The last molar is small, the talonid elongated and narrow with a strong hypoconulid; the hypoconid and entoconid being merely indicated on the raised margins running from the hypoconulid forward. On molars 1 and 2 the hypoconid and entoconid are well developed, and the hypoconulid is wanting. The fourth premolar has a high protoconid over the front root, and the merest rudiment of a deuterconid beside it. The posterior cingulum is raised

medianly, suggesting a hypoconulid. The third premolar

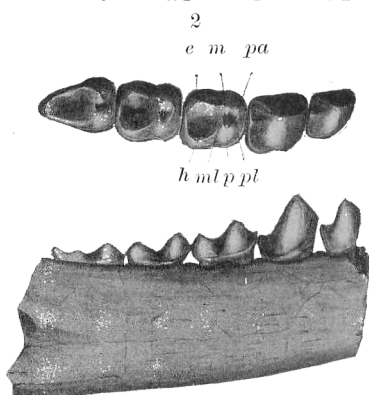


FIG. 2. *Anaptomorphus abbotti*, type,  $\times 4$ .

is two-rooted, and has but a single cusp. Its posterior cingulum is also raised medianly, suggesting a forming cusp.

Specific features are found in the external cingulum of the molars, the elongated talonid of molar three and in the raised posterior cingulum of the third and fourth premolars.

Nine specimens were found on Bridger Creek in the Wind River beds.

The three molars measure  $7^{\text{mm}}$  in length and molar 2 is  $2^{\text{mm}}$  wide.

#### *Adapidae Schlosser.\**

In this family the American genus *Notharctus* approaches the European genus *Adapis* closely, especially the new species *N. minutus* from the Wind River. Two genera are represented in America, the simpler and apparently ancestral *Pelycodus* from the Wasatch, and the more advanced *Notharctus* of the Wind River and Bridger.

The family may be defined as follows; dentition  $i\frac{3}{2} c\frac{1}{1} pm\frac{4}{4} m\frac{3}{3}$ ; molars low crowned and with low cusps; paraconid reduced but present; external cusps more or less crescentic; hypoconid small; the last lower molar with a weak and varying heel.

The family makes its appearance in Europe and America suddenly and at almost the same time, apparently migrating from some northern center of distribution onto the two continents; the climate being a warm temperate or tropical one, as shown by the fauna† and flora collected in the basal beds of the Wasatch by the Amherst expedition.

The two genera are distinguished as follows:

<i>Pelycodus</i>	<i>Notharctus</i>
Outer cusps of lower teeth more or less conical:	Outer cusps of lower teeth more or less crescentic:
No mesostyle on upper teeth:	Mesostyle on upper teeth:
Hypocone weak:	Hypocone strong:
Heel of last lower molar large, tending to have two or more cusps:	Heel of last lower molar weak with a single cusp only:
Fourth lower premolar simple.	Fourth lower molar complex.

\*Affer, Lemuren, Chiropteren, etc., 1887, Pt. 1, p. 21.

† Wortman, this Journal, 1903, p. 419.

*Pelycodus* Cope.

The genus is founded on *P. jarrovi* from the New Mexico Wasatch, the type among others from that region having disappeared. Specimens of the various species are abundant throughout the Wasatch of the Big Horn basin and run up into the Wind River, where they give place to the more specialized *Notharctus*. On Bridger Creek, Wyo., where a rich pocket of Wind River was found, *Notharctus* specimens were second in abundance to *Hyposodus* only. While several species occurred, the smaller sorts were the more abundant.

*Pelycodus frugivorus* Cope var.

This, the smallest and most abundant of the Wasatch species, was founded by Cope on a portion of a jaw from New Mexico; and, on account of the correspondence in size, the Big Horn specimens have been associated with it. While the two faunas closely resemble each other, and are doubtless closely related, the northern species differ slightly from the southern; for which reason the writer has used the variety designation. In this instance the last lower molar of the New Mexico form has fewer cusps on the less developed heel, than does the Big Horn.

The species is characterized by low chunky teeth; a moderate external cingulum on the lower molars; the last lower molar having an elongated heel with three small cusps occupying the position of the hypoconulid; the hypoconulid of molars 2 and 3 being small and situated close to the hypocone.

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FIG. 3. *Pelycodus frugivorus* Cope, var.,  $\times 2$ .

In the position of the hypoconulid and development of the cingulum, the species is closest to *P. tutus*; in the modifications of the heel it is nearer *P. nuniensis*. Specimens were collected from all levels in the Wasatch on Gray Bull River and in the Buffalo Basin. The last three lower molars measure very uniformly 15<sup>mm</sup> in length and 4<sup>mm</sup> in width.

*Pelycodus tutus* Cope var.

Like the foregoing, this species is based on a New Mexico fragmentary mandible, which carried only the third and fourth premolars and the first molar. Like the foregoing, the Big Horn specimens vary, especially in the premolars, the third premolar being simpler, and the fourth having the two principal cusps much closer together.

The species is marked by stout low teeth; an external cingulum on the lower molars; the hypoconulid of molars 1 and 2 being small and close to the hypocone; the last lower molar being shortened and having but one cusp on the heel, the hypoconulid.

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FIG. 4. *Pelycodus tutus* Cope var.,  $\times 2$ . The last molar is restored, the original being crushed.

The species is close to *P. frugivorus*, but differs especially in the larger size, and in the single cusp on the last lower molar. The species is rather rare on Gray Bull River, only four specimens being found. The last three lower molars measure 18<sup>mm</sup> in length and 4½<sup>mm</sup> in width.

*Pelycodus jarrovii* Cope.

See Final Rep. Surv. West of 100th Meridian, vol. iv, 1887, p. 137.

This large species from New Mexico has not been found elsewhere as yet. It is marked by a simple heel on the last lower molar, on which is merely a wall without any cusps. The hypoconulid of molars 1 and 2 is barely perceptible.

The three lower molars measure 20<sup>mm</sup> in length.

*Pelycodus angulatus* Cope.

Last cit., p. 144.

This is a dubious species founded on a single molar tooth from New Mexico.

*Pelycodus nuniensis* Cope.\*

This is the only species of *Pelycodus* to carry over into the Wind River, and is by Osborn considered a transition to the *Notharctus* species. However, on account of its stocky build it appears to the writer a typical *Pelycodus*.

The species is marked by low stout teeth; the third lower molar having its heel elongated and carrying two cusps where the hypoconulid is usually situated; the hypoconulid of molars 1 and 2 being small and central in position; and the paraconid being weak.

While the last lower molar resembles *P. frugivorus*, the species is larger and chunkier, and has the hypoconulid placed

\* See Bull. U. S. Geol. Surv. Terri., vol. vi, 1881, p. 187.

medianly. It is fairly common in the Bridger Creek beds,

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FIG. 5. *Pelycodus nuniensis* Cope,  $\times 2$ .

eight specimens being found. The last three molars measure  $16^{\text{mm}}$  in length and  $3\frac{1}{2}^{\text{mm}}$  in width.

*Notharctus minutus* sp. nov.

This, the smallest species of the family, is founded on a right mandibular ramus, containing the molars and the roots of the third and fourth premolars, found in the Wind River beds on Bridger Creek, Wyoming.

The low teeth have rather acute cusps, those on the trigonid being higher than those on the talonid. The external cusps are strongly crescentic. The paraconid is moderately strong, and stands well to the inner margin of the tooth. There is a strong protolophid but no metalophid, so that there is a basin on the trigonid as well as on the talonid. The heel of the last

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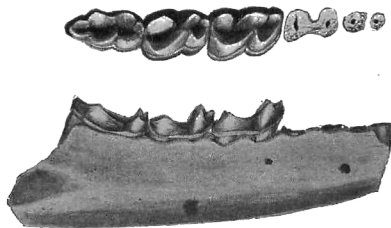


FIG. 6. *Notharctus minutus*, type,  $\times 5$ .

molar is surrounded by a raised rim on which there are no cusps. There is a strong external cingulum on all the molars. The form is a tiny one, and the jaw very slender.

The crescentic cusps, lack of a metalophid, and the basin on the trigonid causes the species to strongly resemble the European genus *Adapis*. Three specimens were found on Bridger Creek. The three lower molars together measure  $5^{\text{mm}}$  in length.

*Notharctus palmeri* sp. nov.

This small form is abundant in the Wind River beds of the Bridger Creek exposure. The type is two fragments of the lower jaws of one individual, the one containing the left fourth premolar, the other carrying the second and third molars of the right side. The species is named for W. W. Palmer on account of his success in collecting in these beds.

The fourth premolar has but a trace of an external cingulum and a well developed posterior cingulum on which two cusps are developed, the larger to the outer side. On the molars there is also but a trace of an external cingulum. The last molar has the hypoconid and entoconid about equally developed and a small medianly placed heel on which there is a moderate hypoconulid.

The species differs from *N. cingulatus* in the lack of the cingulum and in the median position of the heel on molar 3. While eleven specimens were found, they are mostly very fragmentary, the jaws being extremely fragile. The three lower molars measure 11<sup>mm</sup> in length and 2.7<sup>mm</sup> in width.

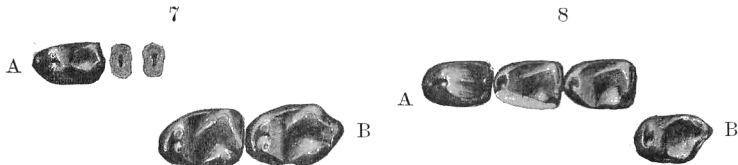


FIG. 7. *Notharctus palmeri*, type,  $\times 3$ . A, the fourth premolar of the left side; B, molars 2 and 3 of the right side.

FIG. 8. *Notharctus cingulatus*, type,  $\times 3$ . A, premolar 4 and molars 2 and 3 of the right side; B, molar 3 of the left side.

*Notharctus cingulatus* sp. nov.

This second small form is about equally abundant with the foregoing in the Wind River beds of Bridger Creek. The type is a right mandibular ramus containing the fourth premolar and molars 1 and 2. With it is associated a third molar of the left side which may belong to the same individual.

While similar to the foregoing, the species is distinctive in that the fourth premolar has a complete external cingulum, and the posterior cingulum is simply raised medianly into a cusp-like process. Molars 1 and 2 have an almost complete external cingulum. The last lower molar has the hypoconid larger than the entoconid; and the small hypoconulid on a small heel, placed toward the inner side of the tooth.

Twelve specimens of this species were found on Bridger Creek. The three lower molars measure together 11<sup>mm</sup> in length and 2.7<sup>mm</sup> in width.

*Notharctus venticolus* Osborn.\*

This is a larger species founded by Osborn on the Wind River specimens which Cope had associated with *P. tutus*. None were found in the Bridger Creek locality. The three lower molars measure 17<sup>mm</sup> in length.

Amherst Biological Laboratory.

\* Bull. Amer. Mus. Nat. Hist., vol. xvi, 1902, p. 195.



ADAPIDAE.

	<i>P. fragiferus</i>	<i>P. tutus</i>	<i>P. nuniensis</i>	<i>N. minutus</i>	<i>N. palmieri</i>	<i>N. cingulatus</i>
Premolar 3	Cingulum on front, inside, and rear	Cingulum on rear				
Premolar 4	Cingulum inside and rear Rear cingulum not raised	Cingulum mostly in rear Rear cingulum raised medianly	Cingulum in rear only. Rear cingulum raised medianly		Cingulum behind only Rear cingulum with two cusps	Cingulum outside and rear Rear cingulum raised medianly
Molar 1 and 2	External cingulum weak Protolophid weak Metalophid weak Hypoconulid small near hypoconid	External cingulum strong No protolophid Metalophid none Hypoconulid small near hypoconid	No external cingulum No protolophid Metalophid moderate Hypoconulid moderate median	External cingulum strong Protolophid strong Metalophid none Hypoconulid none cusps crescentic	External cingulum as a trace only Protolophid moderate Metalophid weak Hypoconulid moderate near hypoconid	External cingulum moderate Protolophid strong Metalophid strong Hypoconulid small near hypoconid
Molar 3	External cingulum weak Protolophid weak Metalophid weak Heel long with 3 cusps	External cingulum strong Protolophid none Metalophid none Heel short with 1 cusp	External cingulum none Protolophid none Metalophid weak Heel long with 2 cusps	External cingulum strong Protolophid weak Metalophid none Heel moderate with a rim only	External cingulum as a trace only Protolophid strong Metalophid weak Heel small central with 1 small cusp	External cingulum moderate Protolophid strong Metalophid strong Heel small to inner side with 1 small cusp
Horizon	Wasatch	Wasatch	Wind River	Wind River	Wind River	Wind River
Length of 3 last molars	15 <sup>mm</sup>	18 <sup>mm</sup>	16 <sup>mm</sup>	5 <sup>mm</sup>	11 <sup>mm</sup>	11 <sup>mm</sup>