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New Paromomyid Primate from Middle Paleocene Beds, Kutz Canyon Area, San Juan Basin, New Mexico

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ABSTRACT

A new species of paromomyid primates is described from the middle Paleocene beds of Kutz Canyon Area, San Juan Basin, New Mexico. *Palaechthon nacimienti* Wilson and Szalay, new species, is similar to *P. alticuspis*, the generotype, in size and molar morphology, but shows more primitive proportions between the canine and antemolar teeth. A crushed skull of this species shows the primitively dominant facial cranium of early primates.

INTRODUCTION

A large area of badlands, carved from sediments of the Nacimiento and San Jose formations, lies in the upper part of the Kutz Canyon drainage some 12 miles south of Bloomfield in the San Juan Basin, New Mexico. The first mammalian fossils known from this area were found by Walter Granger in 1916, and are of medial Paleocene (Torrejonian) age. These fossils were in most cases rather poorly preserved and scattered over a considerable area of the Kutz Canyon badlands. In 1948 personnel of the Museum of Natural History, University of Kansas were fortunate in discovering a rich and varied fauna concentrated in a zone approximately

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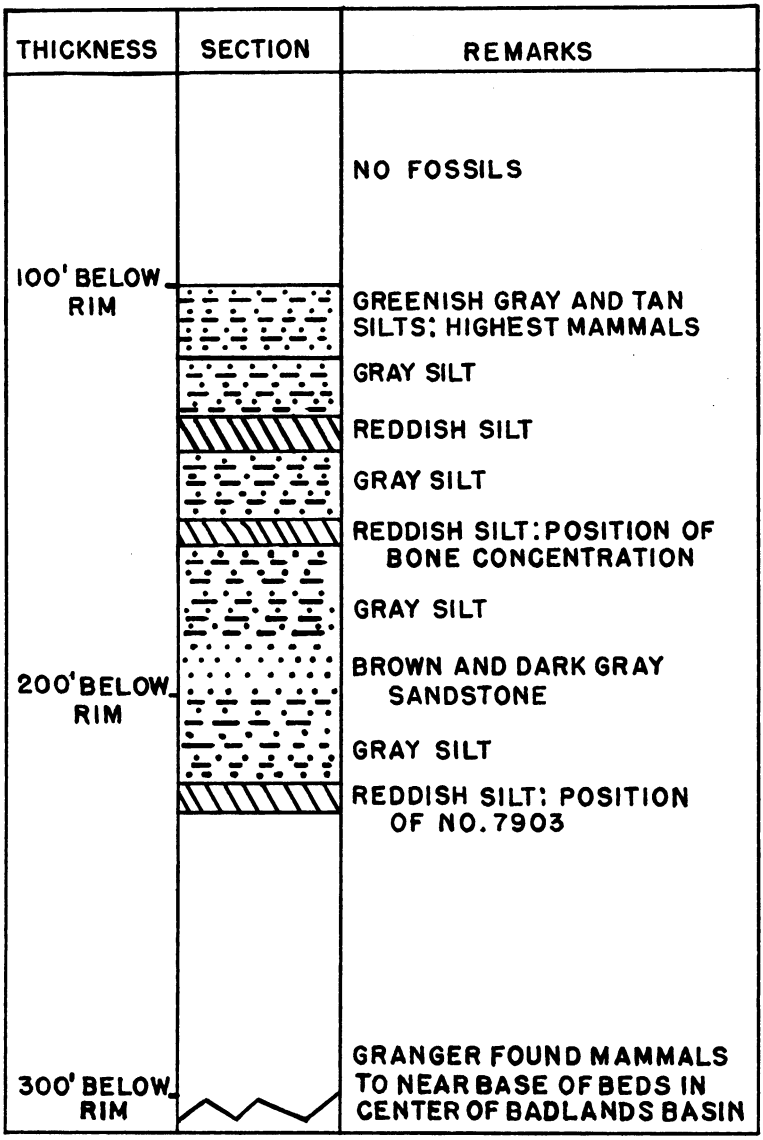

FIG. 1. Columnar section, West Rim of Kutz Canyon, San Juan Basin, New Mexico.

160 feet below the western rim of these badlands. Subsequent work in 1950, 1956, and 1962 resulted in a collection of more than 300 identifiable

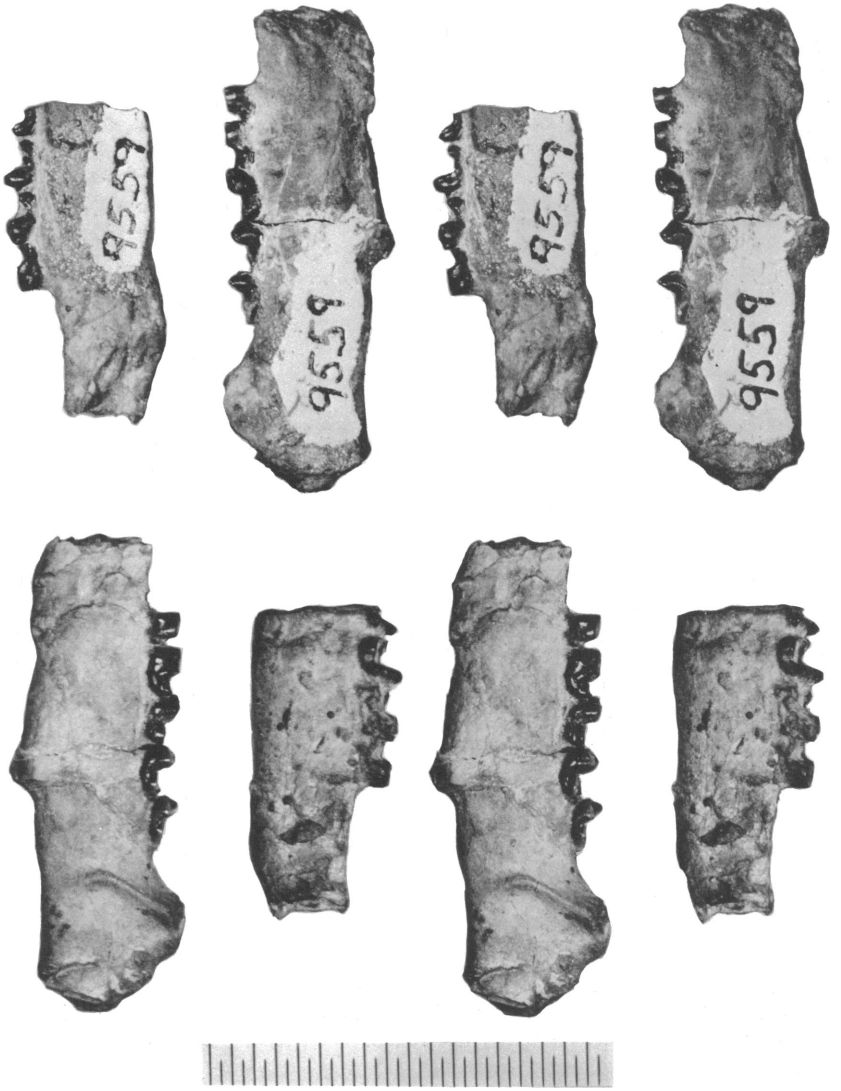

FIG. 2. *Palaechthon nacimienti*, new species, UKMNH 9559, holotype, left mandible with P_3-M_3 and right mandible with P_3-M_2; stereoscopic pairs of lingual (*above*) and buccal (*below*) views. Scale 0.5 mm. intervals.

specimens. A preliminary account of this fauna was given by Wilson (1951), including a faunal list and notes on the geologic occurrence. Modified

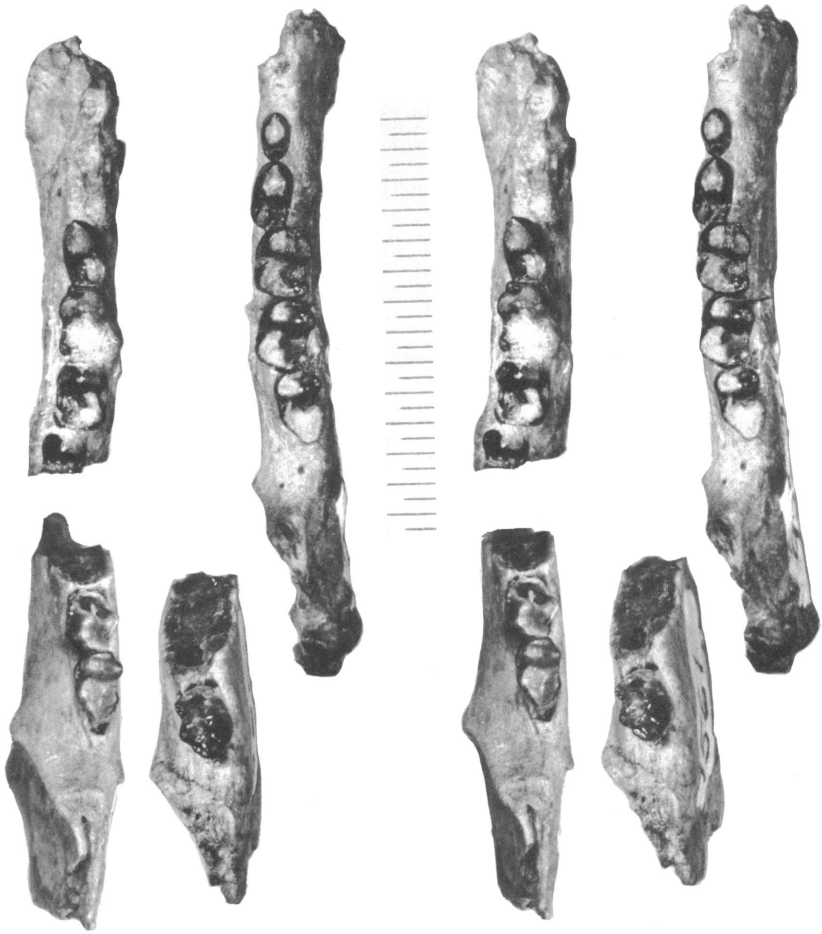

FIG. 3. *Palaechthon nacimienti*, new species, UKMNH 9559, holotype, left mandible with P_3-M_3 and right mandible with P_3-M_2 (*above*); UKMNH 7751, left M_2 talonid and M_3, UKMNH 9561, left M_3 talonid (*below*); stereoscopic pairs of occlusal views. Scale 0.5 mm. intervals.

faunal lists were given in 1956 (Wilson) and 1967 (Russell). Among the mammalian taxa listed were species of the order Primates, an order unknown from the Torrejonian of the San Juan Basin prior to 1948.

Curiously, the first mammal specimen of any kind found by the University of Kansas party working in Kutz Canyon was a maxillary dentition described herein as a referred specimen of *?Palaechthon nacimienti*, new

species. It should be noted that this initial specimen was found some 70 feet below the remaining specimens of the Kutz Canyon concentration, and approximately ¼ mile southeast in an otherwise—so far as Kansas parties were concerned—barren area. Two fragmentary additional lower jaws of primates were found in 1948. The summer of 1950 produced more specimens, including a skull fragment, and finally, in 1962, a last palatal fragment. The columnar section (fig. 1) illustrates the general stratigraphic situation at the Kutz Canyon locality.

The age of the Kutz Canyon local fauna is clearly Torrejonian. The faunal sample is also evidently from the Deltatherium zone of Osborn, Matthew, and others, and possibly low in this zone. The Kutz Canyon primates are almost surely older than *Torrejonia wilsoni* Gazin, 1968, from the upper collecting level (Pantolambda zone) at Arroyo Torrejon.

The long-postponed description and figures of these important specimens follow. We thank Dr. Craig C. Black for permission to study and describe the Kutz Canyon material in his care at the Museum of Natural History, University of Kansas. The research was supported by NSF Grant GB 20085 to Szalay. Photographs were taken by Mr. Spencer Gustav, and figure 10 was prepared by Miss Anita J. Cleary.

ABBREVIATIONS

AMNH, Department of Vertebrate Paleontology, the American Museum of Natural History
MNHN, Museum National d'Histoire Naturelle, Paris
UKMNH, University of Kansas Museum of Natural History

SYSTEMATICS

ORDER PRIMATES LINNAEUS, 1758

SUPERFAMILY PLESIADAPOIDEA TROUESSART, 1897

FAMILY PAROMOMYIDAE SIMPSON, 1940

SUBFAMILY PAROMOMYINAE SIMPSON, 1940

TRIBE PALAECTHONINI SZALAY, 1969

Palaechthon nacimienti, NEW SPECIES

Figures 2–10; Table 1

ETYMOLOGY: In reference to the provenance of the type and referred specimens from the Nacimiento Formation.

TYPE: UKMNH 9559, left mandible with P_3–M_3, and right mandible with P_3-M_2. The type was collected at Locality NM 13 (Torrejonian) of the University of Kansas, at Kutz Canyon, Nacimiento Formation, San Juan Basin, New Mexico. The exact position of Locality 13 is: NW¼

sec. 14, T. 27 N, R. 11W, San Juan County.

HYPODIGM: The type and UKMNH 9561, left M_3 talonid, UKMNH 7751, left M_2 talonid and M_3, UKMNH 7752 left M_{1-2} in mandible fragment, UKMNH 9558, left P^4–M^3, UKMNH 9560 right M_{1-2} in mandible fragment, UKMNH 13481, palate with right P^3–M^2 and left M^{1-3}, UKMNH 9557, crushed skull with C–M^3. Provenance of the specimens is same as for holotype.

SPECIFIC DIAGNOSIS: *Palaechthon nacimienti* differs from *P. alticuspis*, the generotype, in the following characters: P_2 smaller than the canine anterior to it; P_3 has an incipient talonid; P_4 talonid lingually open, not slightly closed; paraconid smaller and metaconid absent on P_4 trigonid; molar paraconids less medial. *Palaechthon nacimienti* differs from *P. alticuspis* and *P. woodi* Gazin, 1971 in being larger in size.

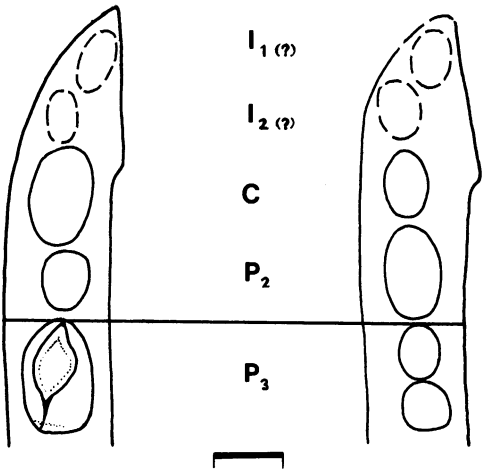

FIG. 4. Relative proportions of the anterior lower dentitions, I-P_2, shown by the alveoli, in *Palaechthon nacimienti*, new species, at left (UKMNH 9559) and *Palaechthon alticuspis* at right (AMNH 35428). Bar represents 1 mm.

DISCUSSION: The Kutz Canyon sample of the lower dentition consists of one measurable lower jaw with P_3-M_3 (UKMNH 9559) and a few additional fragments with teeth (UKMNH 7751, 7752, 9560, and 9561). One of the most noticeable differences between UKMNH 9559 (figs. 2–4) and specimens of *Palaechthon alticuspis* from Gidley Quarry, Montana (AMNH 35484 and 35478) is the relative sizes of the second lower premolar and the canine anterior to it. In the best preserved *P. alticuspis*, AMNH 35484, the length of P_2 alveolus, anterior to the double alveoli of P_3, is approximately subequal to P_3 in length, and longer in diameter than that of the canine anterior to it. It is equally clear in UKMNH 9559 from the Nacimiento beds that the second lower premolar alveolus was smaller

TABLE 1

MEASUREMENTS (IN MILLIMETERS)[a] OF *Palaecthon nacimienti* FROM THE ANGELS PEAK LOCALITY, DELATHERIUM ZONE, NACIMIENTO FORMATION, NEW MEXICO

		UKMNH 9557	UKMNH 13481	UKMNH 9558	UKMNH 9559	UKMNH 9560	UKMNH 7752
C	L	1.83	—	—	—	—	—
	W	1.0	—	—	—	—	—
P^2	L	1.34	—	—	—	—	—
	W	0.85	—	—	—	—	—
P^3	L	2.1	1.9	—	—	—	—
	W	1.54	1.54	—	—	—	—
P^4	L	2.54	2.65	2.52	—	—	—
	W	2.68	2.65	2.7	—	—	—
M^1	L	2.65	2.65	2.61	—	—	—
	W	3.6	3.35	3.44	—	—	—
M^2	L	2.5	2.4	—	—	—	—
	W	3.55	3.6	—	—	—	—
M^3	L	1.84	1.8	1.46	—	—	—
	W	2.6	2.48	2.3	—	—	—
P_3	L	—	—	—	1.65	—	—
	PW	—	—	—	1.0	—	—
P_4	L	—	—	—	2.25	—	—
	PW	—	—	—	1.3	—	—
M_1	L	—	—	—	2.3	2.4	2.65
	PW	—	—	—	1.7	1.86	2.0
	AW	—	—	—	1.7	1.8	1.97
M_2	L	—	—	—	2.35	—	—
	PW	—	—	—	1.75	—	—
	AW	—	—	—	1.75	1.9	2.0
M_3	L	—	—	—	2.5	—	—
	PW	—	—	—	1.45	—	—
	AW	—	—	—	1.5	—	—

[a] Taken as shown in Szalay (1969).

than either the alveoli of the crown of P_3, and it is distinctly smaller than the alveolus of the canine anterior to it. A comparable situation exists in the anterior part of the maxilla. The length of the double-rooted P^2, inferred from its alveoli, was approximately the same as that of P^3 in the Montana *Palaechthon alticuspis* (AMNH 35472). In this species the upper canine, judged by its alveolus, was not longer than the second upper premolar. In all three known maxilla specimens of *Palaechthon nacimienti*, which preserve the antemolar morphology (UKMNH 7903, 9557, and

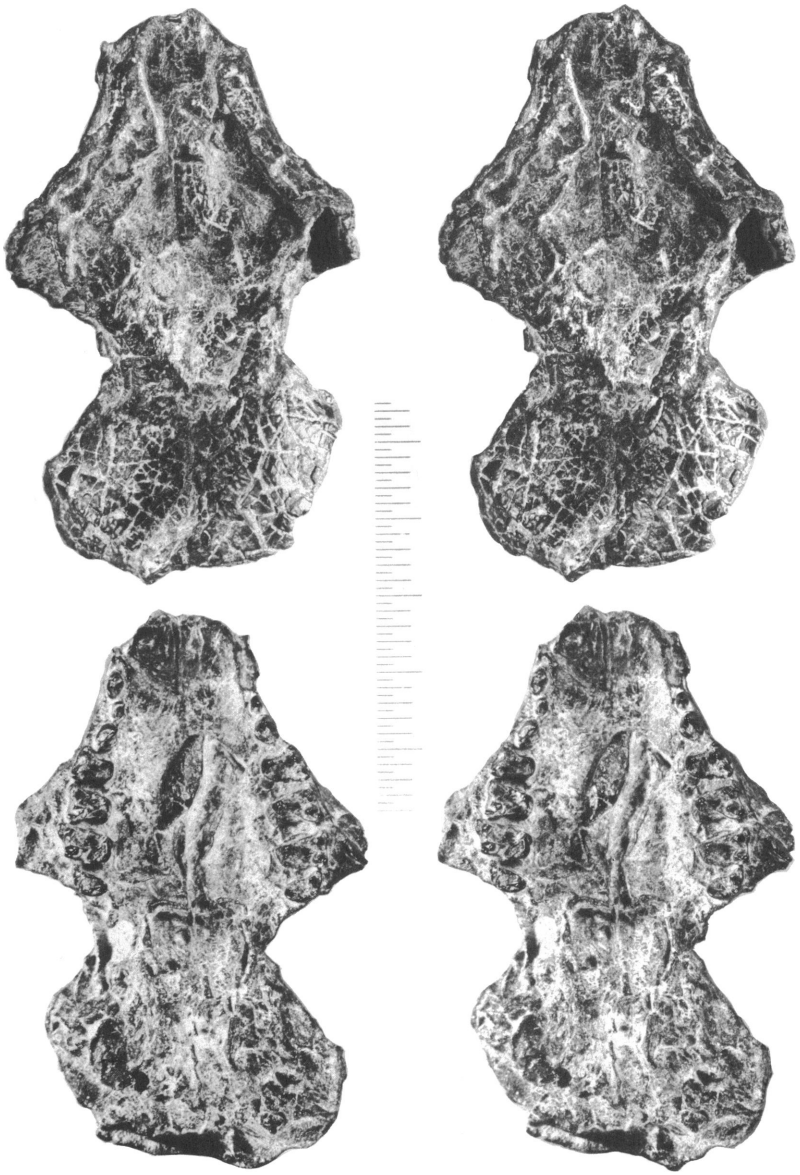

FIG. 5. *Palaechthon nacimienti*, new species, UKMNH 9557, crushed skull with C-M^3; stereoscopic pairs (*above*) dorsal view; (*below*) ventral view. Scale 0.5 mm. intervals.

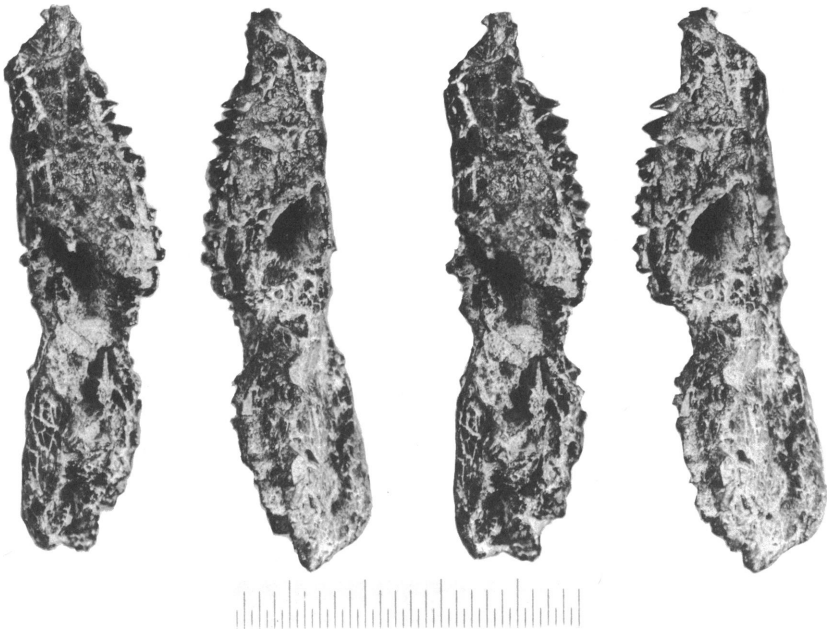

FIG. 6. *Palaechthon nacimienti*, new species, UKMNH 9557, crushed skull with C-M^3; stereoscopic pairs of the lateral views. Scale 0.5 mm. intervals.

13481), the double-rooted second premolar is clearly smaller than P^3. In both UKMNH 7903 and 9557 the canine is distinctly larger than either the second or third upper premolars.

There are some consistent differences between the good Gidley Quarry lower jaw sample (up to a dozen individual specimens showing the homologous teeth) on one hand, and the few adequate Kutz Canyon mandibles (UKMNH 9559, 9560) with more than one cheek tooth (figs. 3, 4, and 9). Although the New Mexico sample is small, we maintain that the comparisons are meaningful; the morphology shown by the Kutz Canyon teeth does not occur in the whole sample of teeth of *P. alticuspis* from Gidley Quarry. In *P. nacimienti* P_3 has an incipient talonid, whereas in *P. alticuspis* this is lacking, having only a tiny cusp. In the northern species P_4 has a distinct paraconid, relatively differentiated metaconid, and a talonid slightly closed off lingually. In the southern species P_4 paraconid is barely perceptible, the metaconid is lacking, and the talonid is open lingually. The molars seem to differ in one minor but easily noticeable feature. In the Gidley Quarry species the paraconids extend nearly to the lingual

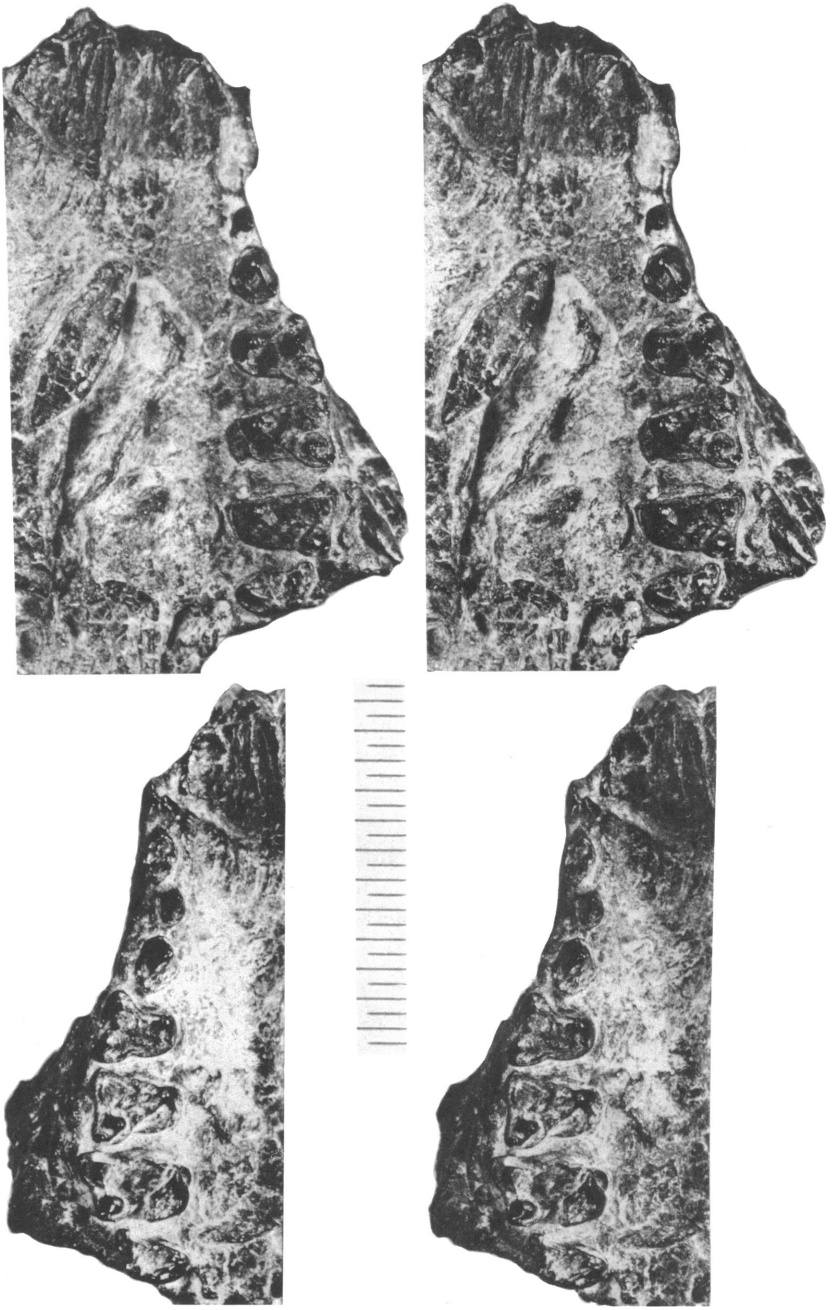

FIG. 7. *Palaechthon nacimienti*, new species, UKMNH 9557, stereoscopic pairs of occlusal views of left (*above*) and right (*below*) upper dentitions. Scale 0.5 mm. intervals.

border of the teeth, whereas in the Kutz Canyon species the paraconids extend only about halfway along the transverse width of the molars.

The differences relating to the proportions of the third and second premolars and the canines are probably taxonomically and paleogeographically more significant between the northern and southern species than the minor differences in the molar crown morphology. The reduction in the relative size of the canines in the generotype denotes an advanced character compared with that in the new species. *Palaechthon nacimienti* retains a relatively large canine compared with the premolars, although it is already in a somewhat reduced stage. In our opinion the morphological differences displayed by the two samples, reflected mainly by the proportions of the antemolar teeth, warrant assigning species rank.

The overall similarity of the morphology of the cheek teeth, both lower and upper, between *Palaechthon alticuspis* and *P. nacimienti* makes it imperative that the newly described *Palaechthon* from New Mexico be retained in the genus *Palaecthon.* We do not as yet know enough of consistent antemolar proportions of Paleocene primate taxa to use that criterion in generic distinctions.

Cranium of *Palaechthon nacimienti*

The crushed cranium of this species UKMNH 9557 (figs. 5, 6, and 10) is more tantalizing than informative, although there are some important conclusions that can be drawn concerning the level of organization of primitive plesiadapoid crania. The general proportions of the skull are different from those of any of the living primates. The facial skull, particularly the palate, is decidedly the more dominant half of the cranium, as in *Plesiadapis* (fig. 12) or as presumably in *Phenacolemur* (fig. 11). In spite of the slight separation of the palate posteriorly at the mid-sagittal suture the shape of the entire palate is similar to *Cheirogaleus major*, yet closer in size to *Lepilemur* (the total length of the palate is somewhat more than 20 mm.). The posterior palatine torus is slightly thickened, and the pterygoid crests are only 0.7 mm. apart. This condition is more like that in *Ptilocercus* than that of comparably sized lemuriforms.

It is difficult to judge the degree of the axis of the orbits with the longitudinal axis of the skull. The position of the orbits appears very lateral, more so than in the insectivoran *Ptilocercus*, for example.

Virtually nothing is preserved of the ventral side of the neurocranium, although there are signs that a sizable bulla was present. There is no indication that this bulla was formed from bones other than the petrosal.

The most important inference to be drawn from UKMNH 9557 concerns cranial proportions among the paromomyids. As in *Plesiadapis*

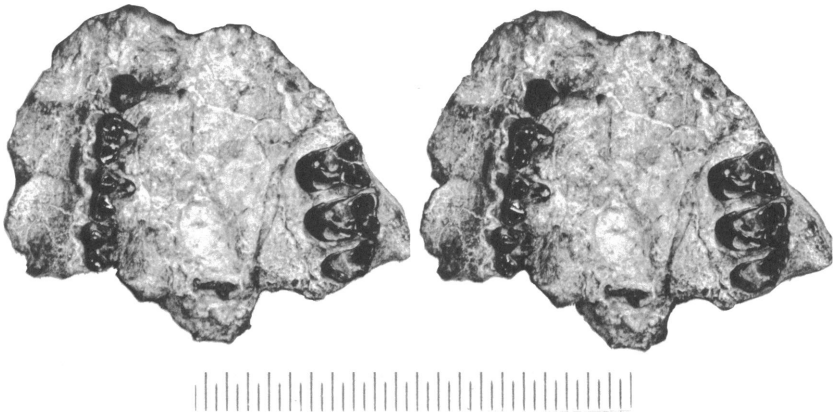

FIG. 8. *Palaechthon nacimienti*, new species, UKMNH 13481, palate with right P^3-M^2 and left M^{1-3}, stereoscopic pairs of occlusal view. Scale 0.5 mm. intervals.

(Russell, 1964), the dominant facial part suggests a relatively low value for relative brain size in plesiadapoids. Although body weight estimates are clearly not obtainable for plesiadapoids, comparisons of homologous skeletal elements of *Plesiadapis* with similar-sized lemuriforms strongly suggest that relative brain size among the plesiadapoids was well below that of any living primate.

Because the unique skull of *Palaechthon* preserves part of the neurocranium, a note is added here concerning relative brain size among early Tertiary primates. Radinsky (1970) has criticized Hofer (1962), LeGros Clark (1962), and Jerison (1961) for suggesting that Eocene adapids had relatively smaller brains than living lemuriforms. Radinsky (1970, pp. 223–224), using the foramen magnum area as a substitute for body size in his log endocranial volume/log foramen magnum area plot to arrive at relative brain size found "*Smilodectes* to fall slightly outside of, and *Adapis* within the range of modern prosimians." Comparison of the postcranial remains of the middle Eocene *Notharctus tenebrosus* Leidy, 1870, with those of the living *Propithecus verrauxi* indicates a similar-sized skeleton and presumably a similar body weight, yet the brain size of the Eocene species is distinctly smaller than that of *Propithecus verrauxi*. It is suggested that the log/log plots of endocranial volume to foramen magnum area are not an accurate substitute for a weight estimate based on the whole skeleton of a fossil. The assumption that log/log plots of endocranial volume to foramen magnum area are valid substitutes for endocranial volume plotted against estimates of body weight either for living or fossil mammals has

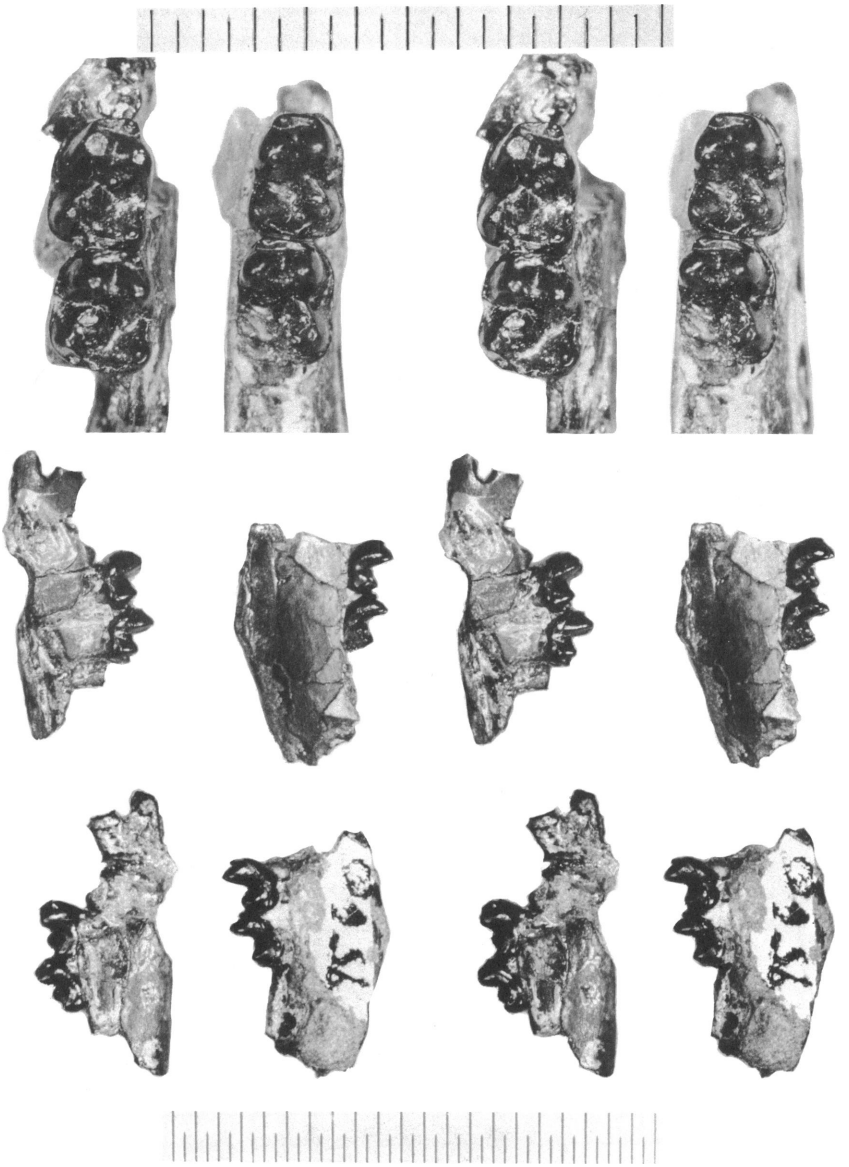

FIG. 9. *Palaechthon nacimienti*, new species, UKMNH 7752, left mandible fragment with M_{1-2} (*at left*) and UKMNH 9560 (*at right*) right mandible fragment with M_{1-2} (M_2 talonid broken); stereoscopic pairs of occlusal (*above*), lingual (*middle*), and buccal (*below*) views. Scale 0.5 mm. intervals.

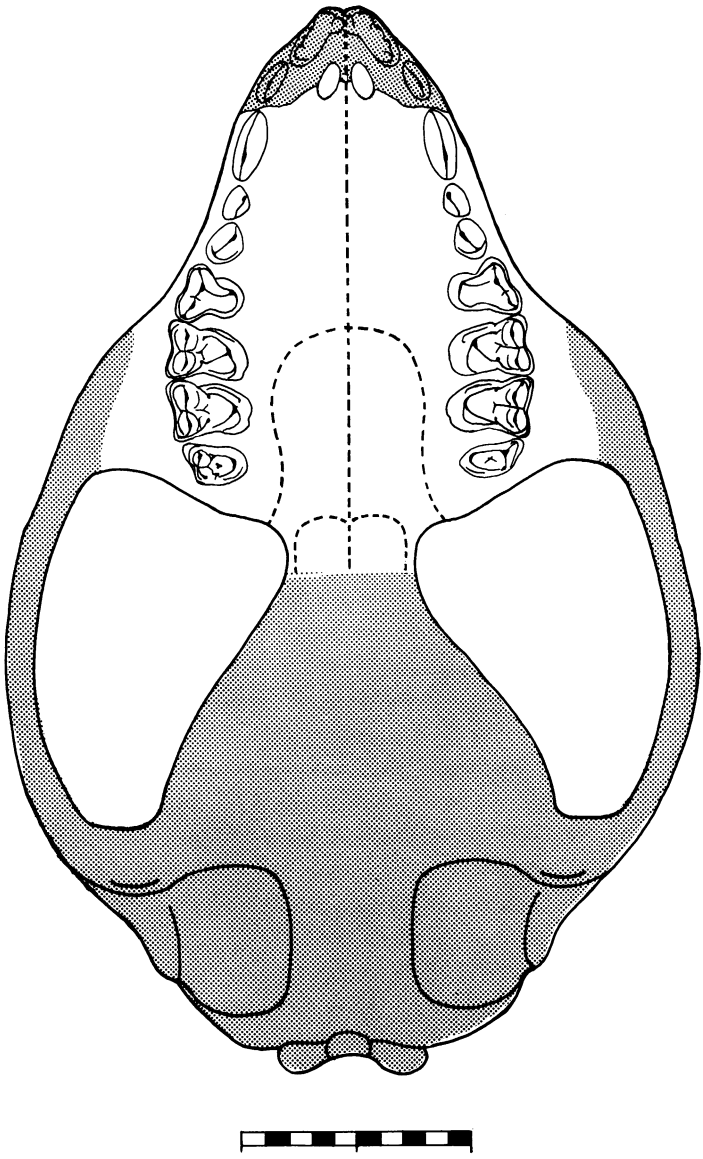

FIG. 10. *Palaechthon nacimienti*, new species, reconstruction of skull based primarily on UKMNH 9557. Stippled areas are either crushed or missing. Scale 1 mm. intervals.

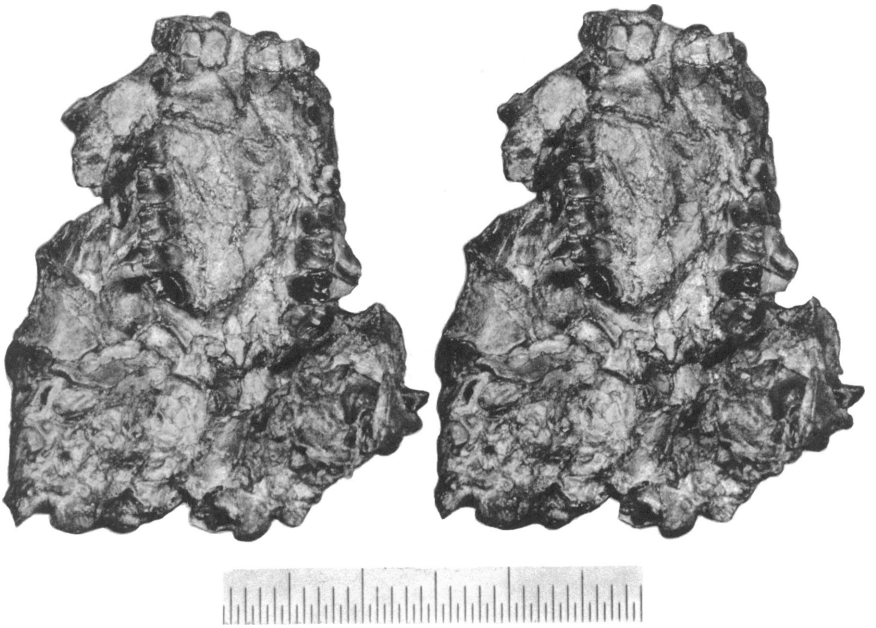

FIG. 11. *Phenacolemur jepseni*, AMNH 48005, early Eocene, San José Formation, New Mexico. Ventral view of somewhat crushed skull. Scale 0.5 mm. intervals.

not been adequately tested. The usefulness and validity of this method appears to be contradicted by the fossil primate record.

?Palaechthon nacimienti

UKMNH 7903 is probably the upper dentition of this species, although this is yet to be proved by a larger sample and by direct association from locality 14, which is 70 feet lower stratigraphically and ¼ mile southeast of locality 13. It is sufficiently different from the upper dentitions of *Palaechthon nacimienti* from the same formation to question its allocation to this species. It differs from *Palaechthon nacimienti* upper dentitions from Locality 13 in having transversely relatively narrower molars with a hypocone extending lingually past the protocone, particularly on M^2, in having a relatively larger and more robust P^3 and P^2, and P^3 possessing an incipient protocone.

It is likely that UKMNH 7903 is merely an unusual variant of *Palaechthon nacimienti*, yet one highly crenulated tooth crown and the generally robust nature of the cheek teeth do set this specimen apart from the upper teeth from locality 13. Whether these differences are representative of intra-

FIG. 12. *Plesiadapis tricuspidens*, MNHN CR 125, late Paleocene, Cernay, France. Dorsal (*above*) and ventral (*below*) views of skull. Scale 1 cm. intervals.

FIG. 13. *?Palaechthon nacimienti*, UKMNH 7903, right maxilla fragment with P^2-M^3; stereoscopic pairs of occlusal view. Scale 0.5 mm. intervals.

specific variation or show species differences cannot be determined in the light of the meager sample.

The following are measurements, in millimeters, of UKMNH 7903. LP^2: 1.7, WP^2: 1.2; LP^3: 1.9, WP^3: 1.9; LP^4: 2.2, WP^4: 2.4; LM^1: 2.4, WM^1: 2.95; LM^2: 2.45, WM^2: 3.58; LM^3: 2.3, WM^3: 2.9.

A note may be added here about *Torrejonia wilsoni* Gazin, 1968, also from the Nacimiento Formation. *Torrejonia* is unquestionably distinct generically from *Paromomys* Gidley, 1923, but generic separation of *Torrejonia* from *Plesiolestes* is yet to be proved. When described (Gazin, 1968), *Torrejonia wilsoni* was not adequately compared with *Plesiolestes*. It was stated in the diagnosis of *Torrejonia* that it is close to *Paromomys*, yet the genoholotype resembles *Plesiolestes problematicus* more than does either of the species of *Paromomys*. Unlike the advanced condition of the trigonids of *Paromomys*, in which the trigonid basins are extremely shallow and

filled up between the protoconid and metaconid, the primitively V-shaped trigonid notch persists in *Torrejonia*, *Plesiolestes*, and *Palaechthon*.

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