efficient heat transport mechanism. It may be significant in this respect that there are at least four dark-haloed craters along the fault line, and these features are generally considered to be gas explosion craters of internal origin (*10*). In addition, no fewer than 12 transient events, usually in the form of reddish flashes or patches, were reported for Gassendi during 1966 and 1967 (*12*).

The geological evidence, like the thermal behavior of the anomaly during the afternoon is, however, more suggestive than conclusive. Further high-resolution thermal measurements throughout a lunation are urgently needed in order to determine the origin of this thermal anomaly.

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Earliest Known Marsupials

Abstract. *The infraclass Metatheria has not been reported from deposits predating the mid-Cretaceous. Fossil material just recovered from Albian deposits in northcentral Texas has definite characteristics of the family Didelphidae and is submitted as being from the oldest known marsupials. The same locality has also produced remains referable to Eutheria, demonstrating a somewhat earlier divergence of these two important groups than was known before.*

In 1956 Patterson (*1*) described isolated teeth representing more than one species of metatherian-eutherian grade from middle Cretaceous (Albian) deposits near Forestburg, Texas. Since then "Forestburg Therians" appeared at the base of phylogenies for both marsupials (*2*) and placentals (*3*). Additional fossil material of the same age from another locality near Decatur, Texas, was reported (*4*), and the family Pappotheriidae was proposed. This locality also produced (*5*) submolariform premolars unknown among Metatheria and almost universal in Eutheria, and these were offered as evidence that eutherians are present in the assemblage. Although these premolars are too large to belong to *Pappotherium pattersoni*, Romer (*6*) and Van Valen (*3*) referred Pappotheriidae to the order Insectivora. I now believe that fossil material has been found which, although fragmentary, can be referred with some confidence to Metatheria.

There is no assurance that at a point so close to divergence, Metatheria and Eutheria were the only lineages of this grade. Even so, without evidence of nonmarsupial or nonplacental mammals of metatherian-eutherian grade, it seems best to make reference on the basis of characters known to be, or at least suspected to be, diagnostic.

Subclass Theria, Parker and Haswell
Order Marsupialia, Illiger
Family Didelphidae, Gray
Clemensia, new genus

Diagnosis: Parastyle hookshaped and larger than stylocone; metacone relatively larger than that of *Pappotherium*, nearly size of paracone. Stylar cusp C (*7*) large and adjacent to notch between paracone and metacone.

Clemensia texana, new species

Etymology: Generic designation is made in honor of Dr. William A. Clemens for his encouragement and in recognition of his work on Mesozoic mammals.

Holotype: SMP-SMU 61997 (Fig. 1, B and G). Upper molar with protocone missing.

Paratype: SMP-SMU 62009 (Fig. 1, A, E, and F). Ultimate upper molar.

Referred specimen: SMP-SMU 62131 (Fig. 1, C and D). Lower molar.

Type locality: Butler Farm locality about 30 m below the top of the Antlers formation; 5 km northwest of Decatur, Texas; 230 m northeast of U.S. Highway 81; on the property of Mr. Lee Butler.

Diagnosis: Same as for genus plus characters of paratype; stylar cusp C well developed on last molar; distinct conules present, but without wings.

Description: Parastyle (stylar cusp A) of holotype hookshaped, rounded labially and faceted lingually. Stylocone is somewhat smaller, conical, and connected to parastyle by a ridge. Stylar cusp C is extremely large, conical, and not connected to stylocone or metastylar area by ridges. At the posterolabial corner of the tooth there is a conical cusp about the size of the stylocone and a much smaller one (stylar cusp D) between this and stylar cusp C. An anterior cingulum is connected to the parastyle and extends to the protoconal basin but is not so well developed as in *Pappotherium*. Paracone is connected to the stylocone by a ridge. Although paracone and metacone are well worn, evidently the paracone was the larger of the two. Unlike *Pappotherium*, the base of the metacone extends almost as far lingually as the paracone.

Morphology and relative size of paracone, stylocone, and stylar cusp C of the ultimate upper molar (paratype) are about as that of the holotype. Metastylar area is greatly reduced, and metacone is much smaller relative to paracone. Paracrista fades before reaching the stylar cusps and is directed more toward the parastyle. Simple distinct conules are present but lack the wings of most later therians and are closer to the apex of the protocone than the bases of paracone and metacone.

Lower molars referred to *Clemensia texana* are of type 5 of the Trinity molars (*4*). They are referred on the basis of size and ease of occlusion. These teeth are very similar to others in the collection which are of quite different taxonomic affinity, but which probably reflect proximity to the point of divergence. All of the lower molars in the collection, representing eutherians, metatherians, and possibly even pantotherians, share one character: more extreme anteroposterior compression of the trigonid than in most later therians. This could suggest the ancestral condition. The single mammal of metatherian-eutherian grade known to be older than the Texas material is *Aegealodon* from the Neocomian of England (*8*). This form is based on a lower molariform tooth which does not have a particularly compressed trigonid, but considering the forward pitch of the

paraconid I suspect this specimen is the most anterior molariform tooth, M1 or possibly $P\bar{4}$ if it is eutherian. This being the case, one would not expect the trigonid to be compressed.

Didelphids have their hypoconulids very close to the entoconids, being almost twinned (*9*). Shrews also have the twinning character, and therefore the character may be untrustworthy for distinguishing marsupials from placentals (*10*). However, all known didelphids have the character, and eutherians with extreme development of the twinning are restricted to the Cenozoic. The migration of the hypoconulid is apparently related to the increased distance from the lingual-most point of the metacone to the labial-most point of the notch between metacone and paracone. Presumably the primitive condition was a metacone which did not extend nearly so far lingually as the paracone, as in the case in *Pappotherium*. The hypoconid can then bite between the paracone and metacone and shear against the posterolingual face of the paracone with all talonid cusp equidistant. The method employed by didelphids, tupaids, shrews, and bats to increase the shearing surface, while maintaining considerable grinding surface as well, has been to create a W-shaped ectoloph by increasing the size of the metacone. This allows the posterolabial face of the hypoconid to shear against the anterolingual face of the metacone. When the metacone becomes as large as the paracone (for example, *Alphadon*) the hypoconulid must move lingually if the hypoconid is to reach the groove between the paracone and metacone. When the metacone becomes even larger than the paracone (for example, Cenozoic didelphids) extreme twinning is necessary. Although related to the same transverse length of the anterolingual face of the metacone, twinning in tupaids and shrews and the loss of the hypoconulid in bats are reached in a different way; the notch between the paracone and metacone moves almost to the tooth's labial border creating a more extreme W-shaped ectoloph.

In *Clemensia* the metacone is not so large relative to the paracone as it is in *Alphadon*, and the hypoconulid would not be expected to be quite so displaced. However, the metacone is larger than that of *Pappotherium* and the hypoconulid might be expected to show the first signs of lingual movement. Lower molars of *Clemensia* are not only of the proper size but also have their hypoconulids closer to the entoconids than other teeth in the collection.

In conclusion, *Alphadon*, a multispecies genus, has been until now the oldest known didelphid (*2*). The genus could easily have been derived from *Clemensia* by increasing the length-width ratio of the upper molars, reduction in the size of stylar cusp C, increased size of stylar cusp D, further increase in the size of the metacone and consequent depth of the notch between this cusp and the paracone, and the accompanying movement of the hypoconulid closer to the entoconid; an increase in the length-width ratio of the trigonids and broadening of the talonid basin. This relation between lower molars of *Clemensia* and *Alphadon* is apparent.

Clemensia is referred to Metatheria on the basis of its large stylar cusp C, increased size of the metacone, and accompanying incipient twinning of the hypoconulid and entoconid. Eutheria is also represented in the same assemblage by an unnamed form (*5*) and probably by *Pappotherium*. *Cimolestes* (*11*), the heretofore oldest known eutherian, and *Pappotherium* both have a well-developed cusp on the metacrista which I have not observed on molars of primitive marsupials. Both genera also lack the *Clemensia-Alphadon* characters mentioned above.

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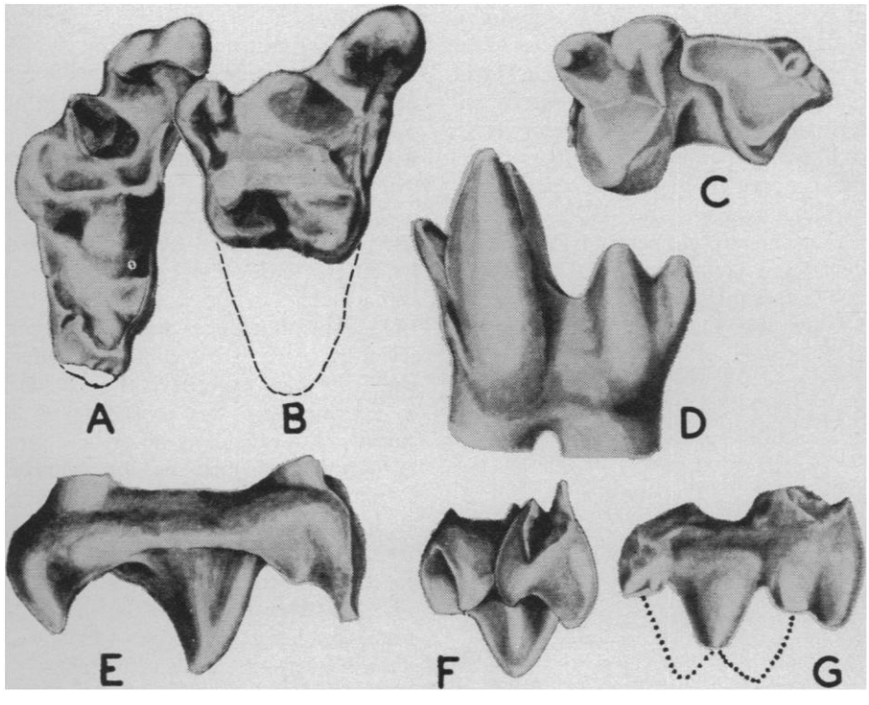

Fig. 1. *Clemensia texana*, new genus and new species. (A) Occlusal view of paratype (SMP-SMU 62009); (B) occlusal view of holotype (SMP-SMU 61997); (C) occlusal view of referred specimen (SMP-SMU 62131); (D) labial view of referred specimen (SMP-SMU 62131); (E) anterior view of paratype (SMP-SMU 62009); (F) labial view of paratype (SMP-SMU 62009); (G) labial view of holotype (SMP-SMU 61997). All × 20.

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