constant. (ii) The marked asymmetry in the scattering phase function noted for comet grains allows large increases in the ratio of reflected to emitted radiation during the orbital interval of forward scattering. The onset of forward scattering geometry along a cometary orbit can lead to dramatic increases in the visual brightness of the comet. The coma of Comet West was easily seen through finder telescopes at perihelion roughly 7° from the sun. The grains observed include dielectrics with the characteristic 10-μ signature commonly attributed to silicates and are fairly good absorbers of visible radiation. These comet grains are apparently physically quite similar to the material detected in the varied environments of circumstellar and interstellar space.

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Mammal Teeth from the Forest Marble (Middle Jurassic) of Oxfordshire, England

Abstract. *A very early stage in the evolution of the talonid basin is seen in a eupantothere lower molar from the Upper Bathonian of central England. The corresponding upper molars and the first known Middle Jurassic morganucodontid, kuehneotheriid, and dryolestid teeth are briefly described and illustrated.*

The mammals arose from reptilian ancestors near the end of the Triassic period and persisted as several distinct groups of small unspecialized animals throughout the remainder of the Mesozoic era. The modern orders of therian mammals then arose from one of these archetypal groups (the Eupantotheria) by rapid radiative evolution in Late Cretaceous and Early Cenozoic times. Only this therian radiation is well documented in the fossil record, the critical early steps of mammalian evolution in the Mesozoic being very poorly known. For example, after their first occurrence in the Rhaeto-Lias (~ 190 million years ago), mammalian fossils do not again occur in any abundance until the Upper Jurassic, a stratigraphic gap that represents 40 million years. Only two localities of intermediate age have previously yielded fossil mammals, both dated to the Bathonian (~ 165 million years ago, Middle Jurassic) (*1, 2*).

I have recently discovered another three mammal-bearing sites of Middle Jurassic age (*3, 4*), of which the most productive has been a bed of nonmarine clay within the Forest Marble formation (Upper Bathonian) of Kirtlington, Oxfordshire, England (*5*). Wet-sieving of this sediment has produced numerous teeth (34 from 0.27 m^3) that provide significant new information on the early stages of mammalian evolution. In particular, the order Eupantotheria is represented by fossils of at least three families, one of which, the Peramuridae, known previously only from the Late Jurassic, appears to lie close to the main line of therian evolution.

Order Eupantotheria Kermack and Musset

Family (?) Peramuridae Kretzoi

Genus *Palaeoxonodon* (nov.)

Diagnosis: Lower molar with small but distinct "posterior accessory cusp" (*6*) on the crista obliqua, which forms a continuation of the distal metaconid crest and runs distobuccally into a prominent talonid cusp. Anterobuccal cingulum only weakly developed, if at all. Referred upper molars with prominent metacone and stylocone, and distinct "cusp c."

Species *ooliticus* (nov.)

Diagnosis: As for genus. Upper Bathonian.

Holetype: Author's collection (*7*), No. FM/K8 (Fig. 1, a and b). Lower right molar has two subequal roots. Paraconid is broken. Protoconid is high and has a mesial edge which recurves sharply at its midpoint; its lingual face is planar, giving the protoconid a roughly semicircular cross section. The large, erect talonid cusp has a concave lingual face, which forms a part of a shallow talonid basin situated on the lingual side of the crista obliqua. The distolingual rim of this basin bears two barely perceptible swellings, which judging by their positions, may be incipient developments of a hypoconulid and an entoconid.

Referred specimens: Incomplete lower molar FM/K7; here only one talonid cusp is present, which is quite unbasined.

Three upper molars (FM/K4, FM/K12, FM/K30) are referred to *P. ooliticus* chiefly because they are similar in size to the two lower molars. The best preserved of these (Fig. 1c) has a high paracone on whose distal flank is a smaller, but well-defined metacone, the two cusps sharing a common base. A metacrista runs distobuccally from the apex of the metacone, bearing three small cusps, the largest of which is directly distobuccal to the metacone. In this position, it seems to correspond with the virtually obsolete "cusp c" in Crompton's (*8*) figure of the *Peramus* upper molar. The stylocone is only slightly smaller than the metacone, and is significantly larger than the stylocone of *Peramus*.

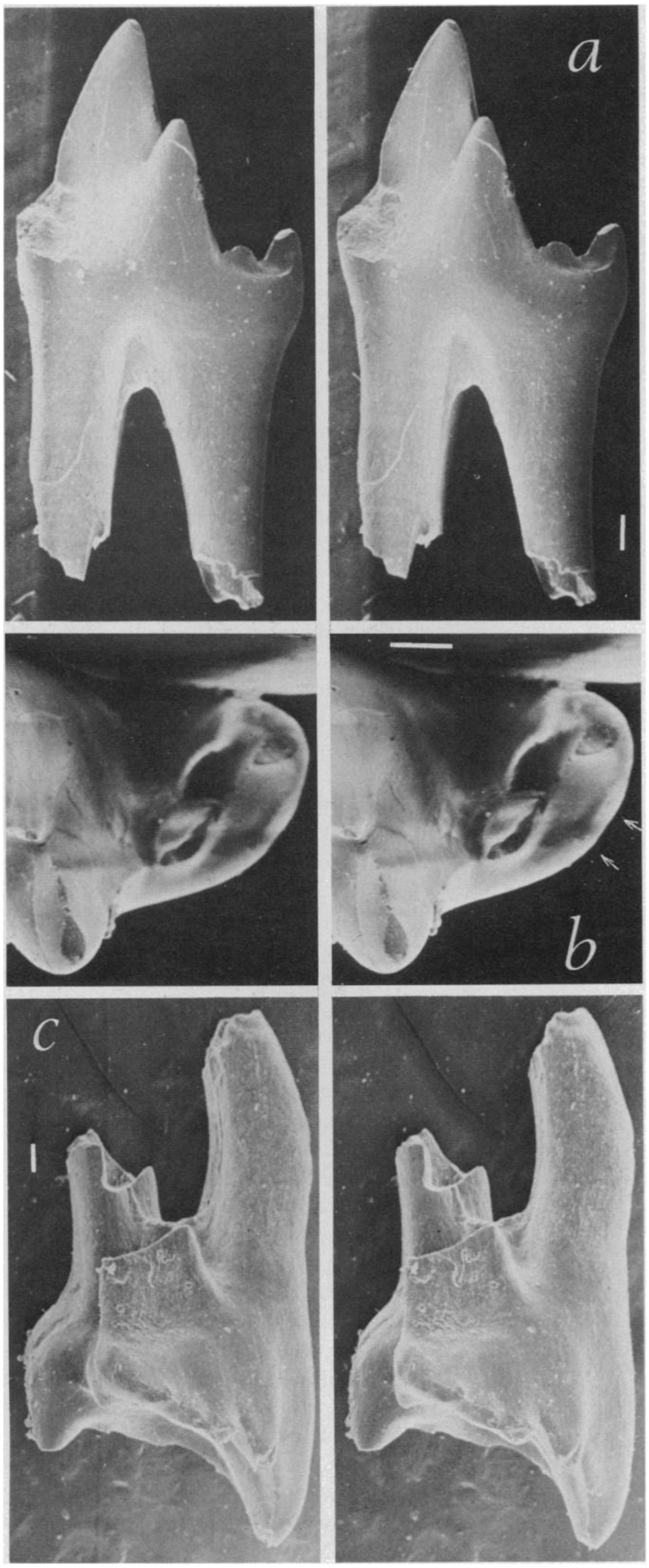
Another type of eupantothere upper molar (Fig. 2, a and b) is somewhat larger than and shows distinct differences in structure from those referred to *P. ooliticus*. For example, the parastylar region is relatively larger, producing a pronounced hooklike structure at the anterobuccal corner of the tooth. The metacrista bears only two cusps, but these are more clearly defined than in the referred *P. ooliticus* upper molars. Finally, the metacone does not share a common base with the paracone and is more distobuccally situated, in which feature it somewhat resembles Mills' (*6*) reconstruction of the upper molar of *Amphitherium*.

The dryolestids, hitherto known from the Late Jurassic and Early Cretaceous, are represented by two rootless lower molars, both of which show the anteroposterior compression of the crown typical of the family. Their talonids are broken off, but must have been small structures situated low on the distal flank of the metaconid. Both specimens have a well-developed anterobuccal cuspule (see Fig. 2, d to f).

An incomplete symmetrodont lower molar (Fig. 2c) strongly resembles those of both *Kuehneotherium* (Rhaeto-Lias) (*9*) and the Middle Jurassic amphilestids (*1*). This suggests that the latter are symmetrodonts (order Eupantotheria) as was proposed by Mills (*10*), and not triconodonts, as is usually thought.

The true triconodonts are represented in the new fauna primarily by a well-preserved lower molar of a morganucodontid (Fig. 2g), which is larger and has a more inflated shape than those of *Morganucodon/Eozostrodon* itself. Furthermore, its kuehneocone is displaced anteriorly so as to be directly lingual to the main cusp, as in the docodonts, teeth of which have also been found at Kirtlington (Fig. 2h).

It is generally considered that successive stages in the evolution of the therian tribosphenic molar are demonstrated by the dentitions of *Kuehneotherium* (Rhaeto-Lias), *Amphitherium* (Middle Jurassic), *Peramus* (Late Jurassic), *Aegialodon* (Early Cretaceous), and *Pappotherium* (Middle Cretaceous) (*8*). The holotype of *Palaeoxonodon* is roughly intermediate in structure between the lower molars of *Amphitherium*, where the talonid contains only one cusp and has no basin, and *Peramus*, where all three of the tribosphenic talonid cusps are present on the rim of a small but distinct talonid basin. If the identification of the incipient hypoconulid and entoconid in



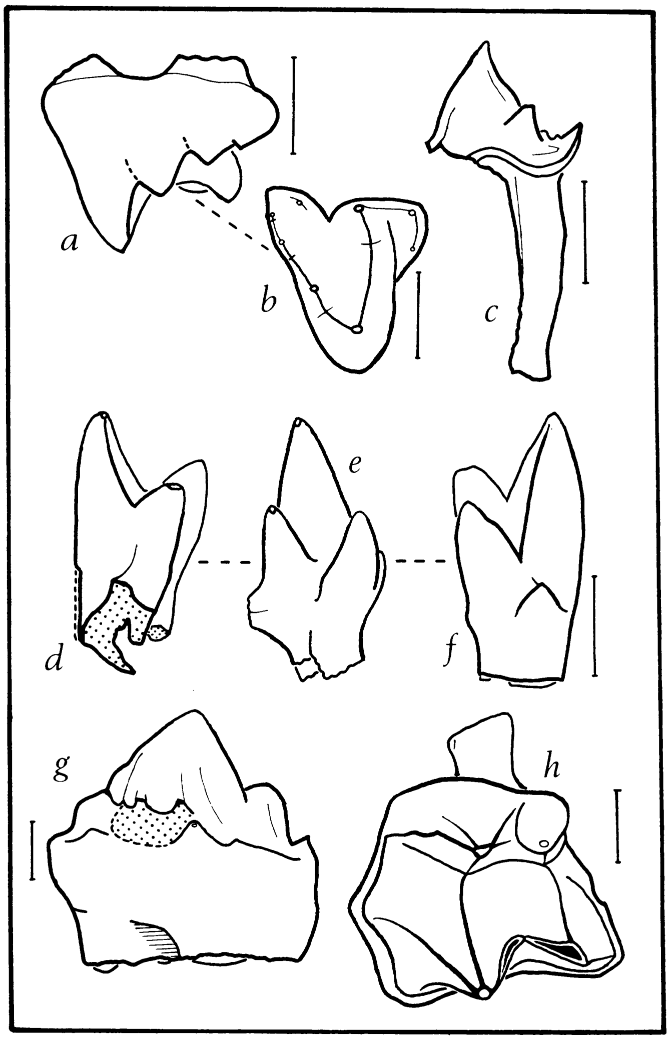


Fig. 1 (left). *Palaeoxonodon ooliticus* (gen. et sp. nov.) stereophotographs. (a) Holotype, lower molar, FM/K8, lingual view. (b) Holotype, occlusal view of talonid, showing possible incipient hypoconulid (upper arrow) and entoconid (lower arrow). (c) Referred upper molar, FM/K12, distal view. The scale bars represent 0.1 mm. Fig. 2 (right). Outline drawings of mammal teeth from the Forest Marble of Kirtlington. (a and b) Eupantothere upper molar, FM/K32, distal and occlusal views, respectively. (c) Symmetrodont lower molar, FM/K38, lingual view. (d to f) Dryolestid lower molar, FM/K29, distal, lingual, and mesial views, respectively. (g) Morganucodontid lower molar, FM/K25, lingual view. (h) Docodont upper molar, FM/K24, linguo-occlusal view. The scale bars represent 0.5 mm.

Palaeoxonodon is correct, it follows that the talonid cusp seen in *Amphitherium* is the hypoconid, and not, as commonly supposed, the hypoconulid.

The upper molars which are here referred to the taxon *P. ooliticus* could have evolved into the types seen in *Peramus* and *Pappotherium*, the former by merely increasing the height of the metacone and displacing it lingually, while reducing the sizes of the metacrista cusps and the stylocone, and the latter by the development of a protocone on the lingual face of the paracone. In light of the incipient talonid basin in the holotype of *P. ooliticus*, the absence of even a cingulum on the lingual face of the paracone in the corresponding upper molars lends weight to Clemens' (*11*) conclusion that the early development of the talonid proceeded independently from that of the protocone.

Finally, as *Amphitherium* was nearly contemporaneous with *Palaeoxonodon* and the Kirtlington dryolestid, it cannot be the common ancestor of the dryolestids, the peramurids, and the higher theria, although it may illustrate what such an ancestor was like. It would seem that the Eupantotheria diversified earlier than is currently believed, certainly before the Bathonian, and probably during the Early Jurassic.

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Effect of Charcoal-Broiled Beef on Phenacetin Metabolism in Man

Abstract. *When charcoal-broiled beef was fed to human volunteers, who were then given phenacetin orally, the concentration of phenacetin in the plasma was lowered, but its half-life in the plasma was not changed. The data suggest that feeding charcoal-broiled beef enhances the metabolism of orally administered phenacetin in the intestine or during its first pass through the liver, or both.*

Variability in drug response is a major therapeutic problem, and it is important to know whether normal dietary constituents can stimulate or inhibit the metabolism of drugs and thereby alter their biological effect in man. Charcoal-broiled beef contains benzo[*a*]pyrene and other polycyclic hydrocarbons (*1*). The *O*-dealkylation of the analgesic, antipyretic drug phenacetin to its major metabolite, *N*-acetyl-*p*-aminophenol, is catalyzed in rats by an enzyme system inducible by the polycyclic hydrocarbons benzo[*a*]pyrene (*2, 3*) and 3-methylcholanthrene (*4, 5*). These observations led to studies that we recently reported which showed, in rats, a stimulatory effect of a diet containing charcoal-broiled beef on the metabolism of phenacetin by intestine in vitro (*6*). We therefore initiated a study in humans to determine the effect of a diet containing charcoal-broiled beef on the metabolism of phenacetin. We now report that feeding charcoal-broiled beef to man enhances the metabolism and lowers the plasma levels of orally administered phenacetin.

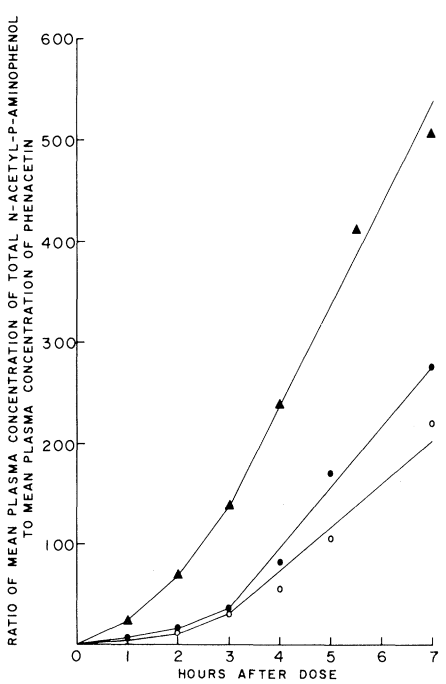

Fig. 1. Effect of a diet containing charcoal-broiled beef on the ratio of the plasma concentration of total (conjugated plus unconjugated) *N*-acetyl-*p*-aminophenol to the plasma concentration of phenacetin in subjects administered phenacetin. Subjects were given 900 mg of phenacetin orally after each dietary regimen. Each value represents the ratio of the mean plasma level of total *N*-acetyl-*p*-aminophenol to the mean plasma level of phenacetin for nine subjects. ▲, charcoal-broiled beef diet; ●, control hospital diet, second time; and ○, control hospital diet, first time.

Phenacetin metabolism was studied in nine healthy volunteers after they had been fed (i) a control hospital diet which was a balanced diet containing beef that had been cooked over burning charcoal but separated from the burning charcoal by aluminum foil, (ii) a charcoal-broiled beef diet which was a diet identical to the control hospital diet except that the beef had been exposed directly to the burning charcoal during cooking, and (iii) the control hospital diet for a second time. The phenacetin metabolism studies were carried out the morning after the subject had eaten (i) the control hospital diet for 7 days, (ii) the control hospital diet for an additional 3 days followed by the charcoal-broiled beef diet for 4 days, and (iii) the control hospital diet for the next 7 days.

The subjects were between 21 and 35 years old and weighed between 62 and 77 kg. Eight were male and one was female. The subjects were all nonsmokers and none were heavy drinkers of alcohol, coffee, or tea. No subject used any drug habitually, and no subject used any drug other than aspirin in moderation during the study.

Breakfasts were prepared by the subjects and eaten at home, and lunches and dinners were prepared by the diet kitchen of the Rockefeller University Hospital and eaten at the hospital. Breakfasts included only eggs, cereal, bread, rolls, muffins, pancakes, waffles, donuts, butter, syrup, jelly, fruit, fruit juice, carrots, milk, coffee and tea. Lunches consisted of a hamburger on a bun, tossed salad with French dressing, dessert (canned peaches, fresh apples, canned pears, fresh pears, fresh fruit cup, watermelon, canned fruit cocktail), and a beverage (coffee, tea, milk). Dinners consisted of steak, potato, vegetable (green beans, asparagus, carrots, peas, beets, waxed beans), bread and butter, dessert (ice cream, sherbert), fruit juice, and a second beverage (coffee, tea, milk). The hamburgers and steaks were lean beef and weighed, respectively, 8 and 6 ounces (1 ounce = 28 g) prior to cooking. They