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PHILIP D. GINGERICH

MUSEUM OF PALEONTOLOGY
THE UNIVERSITY OF MICHIGAN
ANN ARBOR

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Philip D. Gingerich, Director

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EARLY EOCENE *TEILHARDINA BRANDTI*: OLDEST OMOMYID PRIMATE FROM NORTH AMERICA

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Abstract— A new species of early Eocene omomyid, *Teilhardina brandti*, is described, based on an isolated but well preserved M_2. The specimen comes from basal Wasatchian zone Wa-0 in the northern Bighorn Basin, Wyoming, the zone that marks the beginning of Eocene time in the North American succession of land-mammal ages and zones. Stratigraphic superposition and mammalian faunal correlation indicate that *T. brandti* is older than all previously known North American species of *Teilhardina*, and suggest that it is at least as old as the known European species. Measurements show *T. brandti* to have had a relatively narrow M_2, as is characteristic of contemporaneous or later European *T. belgica*. M_2 is conspicuously narrower than later *Teilhardina* found in North America, lying outside the range of a shape quotient calculated from measurements of the latter. The new species is significantly larger than European *T. belgica*, lying outside the range of M_2 size measured in the type sample from Dormaal. Overlap in shape, but not size, with European *T. belgica*, and overlap in size, but not shape, with North American *T. americana* means *T. brandti* is intermediate morphologically. It links lineages on both continents, and may represent the common ancestor of both. Adapidae and Omomyidae are not known in Paleocene faunas of North America, and this new discovery confirms that both families appeared together, probably as immigrants, at the beginning of Eocene time.

INTRODUCTION

Two families of primates of modern aspect are known from the early Eocene of North America, Europe, and Asia: Adapidae and Omomyidae. Adapids are generally larger and, in some aspects, more lemur-like, while omomyids are smaller and more tarsier-like. Both families are frequently mentioned as possible stem groups having given rise to Anthropoidea.

The oldest North American adapid is *Cantius torresi* from the basal zone, Wa-0, of the Wasatchian land-mammal age in Wyoming (Gingerich, 1986, 1989). This zone is poorly fossiliferous, but it does yield important specimens with persistent prospecting. In 1992 the oldest North American omomyid, a new species of *Teilhardina*, was discovered in zone Wa-0 during field research on early Wasatchian faunas. The species is described here, followed by a brief discussion of its significance for primate evolution.

SYSTEMATIC PALEONTOLOGY

Order Primates
Infraorder Tarsiiformes
Family Omomyidae Trouessart, 1879
Subfamily Anaptomorphinae Cope, 1883
Genus *Teilhardina* Simpson, 1940

Teilhardina brandti, new species

Holotype.— University of Michigan [UM] specimen 99031, isolated right M_2 (Fig. 1).

Type locality.— UM locality SC-351 at the head of Big Sand Coulee in the Clarks Fork Basin, northwestern Wyoming. Detailed locality information has been published elsewhere (Gingerich, 1989, p. 12).

Age and distribution.— *T. brandti* is known only from earliest Wasatchian zone Wa-0 (earliest Eocene) in northwestern Wyoming.

Diagnosis.— *Teilhardina brandti* differs from European *T. belgica* (Teilhard, 1927), in being significantly larger (Fig. 2), and it differs from the North American species *T. americana* Bown, 1976; *T. crassidens* Bown and Rose, 1987; and *T. tenuicula* (Jepsen, 1930) in having a relatively narrow lower second molar (Fig. 3), with the labial cingulid conspicuously less developed.

Etymology.— Named for Ms. Kari Brandt of the University of Michigan, who found the type specimen.

Description.— The holotype is an isolated right lower second molar (M_2) with the small size, relatively low trigonid, and basined talonid characteristic of *Teilhardina*. All three trigonid cusps are about the same height and size, and all three are perforated by wear. The paraconid is positioned anterior to the metaconid. Occlusal wear on the protoconid and metaconid makes them appear to be positioned slightly more anteriorly than they were before being worn. The hypoconid and entoconid are well developed on the talonid, but the hypoconulid is small and would be less noticeable if not perforated by occlusal wear. The cristid obliqua joins the back of the trigonid near the protoconid as is typical on M_2 of *Teilhardina*. The talonid is basined, but it is no broader than the trigonid. There is a faint cingulid bordering the tooth along the labial (lateral) side from the anterior to posterior margins of the crown. Surface enamel is slightly damaged on a small part of the cingulid, but this has not altered the size or shape of the cingulid significantly.

The holotype M_2 measures 1.87 mm in crown length from the anterior edge of the paracristid to the posterior edge of the hypoconulid. It measures 1.58 mm in maximum breadth across the trigonid, and 1.58 mm in maximum breadth across the talonid. The natural logarithm of length multiplied by width of M_2, Ln (L × W) of M_2, is 1.08.

Discussion.— The holotype M_2 of *Teilhardina brandti* is longer than any tooth of European *T. belgica* in a sample of twelve M_2s from the type locality (Gingerich, 1977), and it is about 8% larger than their mean length. It falls within the range of *T. belgica* in width of M_2, and it is about 6% larger than their mean width. Statistics for Ln (L × W) of M_2 in the Dormaal sample of *T. belgica* are as follows: $n = 12$, $\bar{x} = 0.944$, $s = 0.052$. The type specimen of *T. brandti* is more than two standard deviations from the mean of the Dormaal sample, meaning that *T. brandti* is significantly larger than *T. belgica* ($p < 0.05$). The position of the type specimen of *T. brandti* is shown graphically in Figure 2 in terms of size relative to European and North American samples.

The holotype M_2 of *Teilhardina brandti* falls within the range of North American specimens in crown length, while its width is less than that of all but two of 41 specimens in the University of Michigan collection. *T. brandti* has a lower shape index, Ln (W / L) of M_2, than

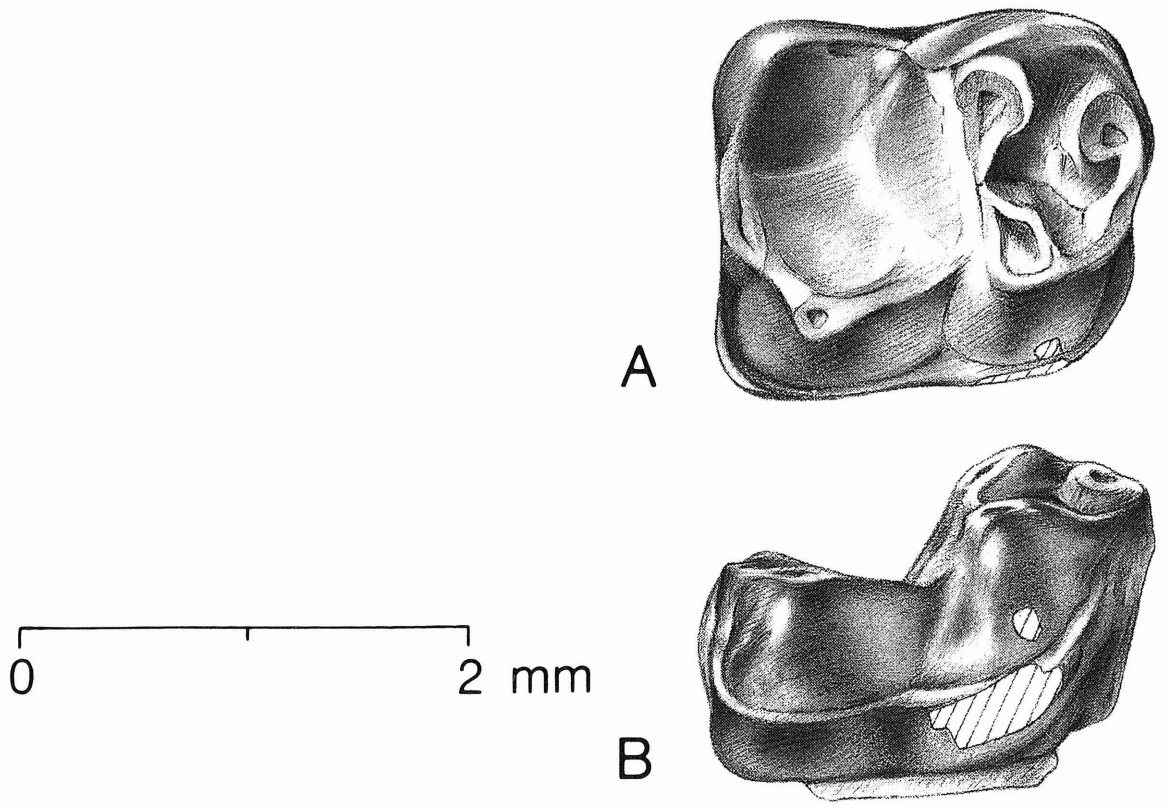

FIG. 1—Right M_2 of *Teilhardina brandti* (UM 99031, holotype) in occlusal (A) and lateral view (B). Note relatively narrow crown and weakly developed labial (lateral) cingulid at the base of the crown compared to those of other North American *Teilhardina*.

any previously known North American specimen of *Teilhardina*. Statistics for this shape index for the Clarks Fork Basin sample are as follows: $n = 43$, $\bar{x} = -0.031$, $s = 0.044$. The type specimen of *T. brandti* is more than three standard deviations from the mean of the Clarks Fork Basin sample, meaning that *T. brandti* has a significantly narrower M_2 than any other North American species of *Teilhardina* ($p < 0.01$). The position of the type specimen of *T. brandti* is shown graphically in Figure 3 in terms of shape relative to European and North American samples.

SIGNIFICANCE FOR PRIMATE EVOLUTION

Discovery of the new species *Teilhardina brandti* is important for several reasons. First, it extends the stratigraphic range of Omomyidae to the very beginning of the Wasatchian land-mammal age (early Eocene). Omomyidae and Adapidae made their first appearance in North America together at this time. Sudden appearance without precursors in Paleocene rocks indicates that both evolved elsewhere, while appearance together suggests both may have evolved in the same area and dispersed to North America at the same time. Dental similarity of the earliest omomyids and adapids suggests that the two families are probably closely related (Gingerich, 1986; Rose and Bown, 1991), and the emergence and diversification of true primates was evidently associated with mammalian faunal change through the Paleocene-Eocene transition.

Teilhardina brandti resembles later North American species of *Teilhardina* in size, but it resembles European *T. belgica* in the narrowness of M_2 and in having a weakly developed labial cingulid on this tooth. Intermediate forms like *T. brandti*, of equal or greater geological age compared to other *Teilhardina*, are the best evidence of common ancestry and evolutionary transition one can possibly hope to find, and *T. brandti* is interpreted to represent the common ancestry, if not the common ancestor, of the two major *Teilhardina* lineages found in Europe and North America. This interpretation may change when more complete specimens are found,

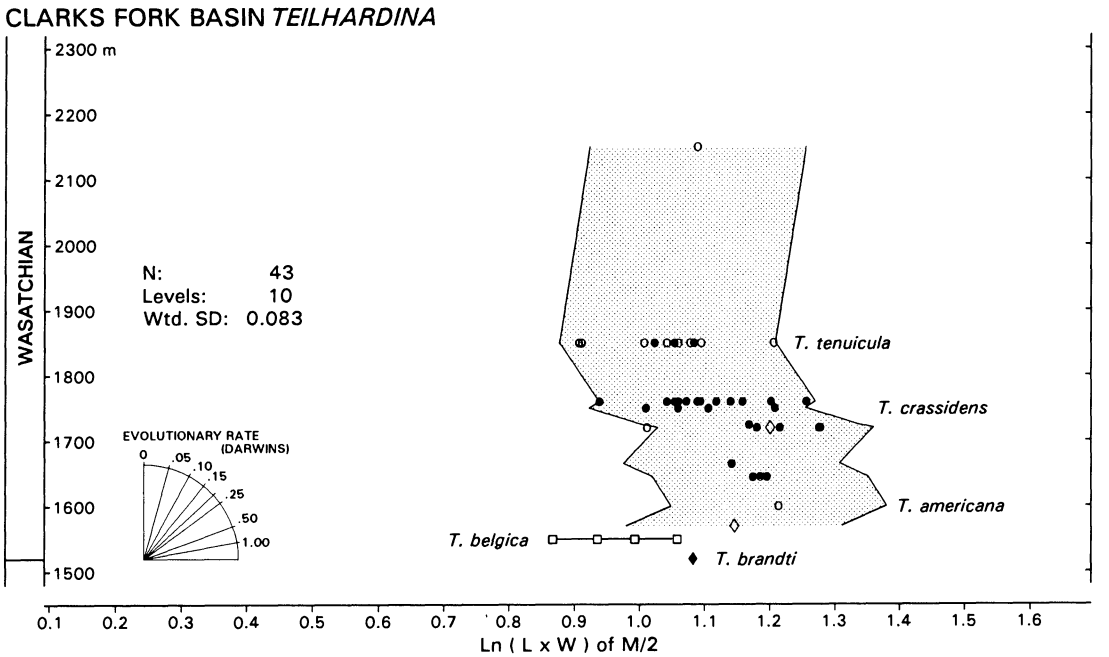

FIG. 2—Size of M_2 in type specimen of *Teilhardina brandti* (solid diamond) shown in relation to European *Teilhardina belgica* (open squares) and later North American *Teilhardina* species (shaded). Abscissa is Ln (L × W) of M_2 as a measure of tooth size and, by inference, body size. Ordinate is measured level in Clarks Fork Basin stratigraphic section (early to middle Wasatchian section shown here spans about 2 million years of geological time). Comparative sample from North America includes 43 specimens from 10 levels, and weighted standard deviation of samples (0.083) determines width of shading (±2 standard deviations on each side of mean). Stratigraphic levels for open symbols are based on associated faunas: open diamonds are type specimens of *T. americana* and *T. crassidens*, respectively (measurements from Bown and Rose, 1987). Note that *T. brandti* is significantly larger than European *T. belgica*, and it resembles North American *Teilhardina* in size.

and it could change if refined geochronology alters the correlation of early Eocene faunas on the two continents.

Teilhardina brandti combines characteristics of *Teilhardina* in Europe and North America, and, together with contemporary *Cantius* species, indicates that the two continents shared a common primate fauna at or near the beginning of the Eocene. Stratigraphic superposition indicates that Wa-0 *Teilhardina brandti* is older than *Teilhardina* from higher stratigraphic zones, and that Wa-0 *Cantius torresi* is older than *Cantius* from higher stratigraphic zones. Each appears to be the most primitive omomyid and adapid, respectively, known from North America. Similar species of *Teilhardina* and *Cantius* from Meudon (Gingerich and Russell, in prep.) and elsewhere may be the most primitive omomyids and adapids in Europe. The oldest Asian primate, early Eocene *Altanius orlovi*, has characteristics of both families (Gingerich et al., 1991) and more evidence will be required to determine whether adapids evolved from omomyids or vice versa.

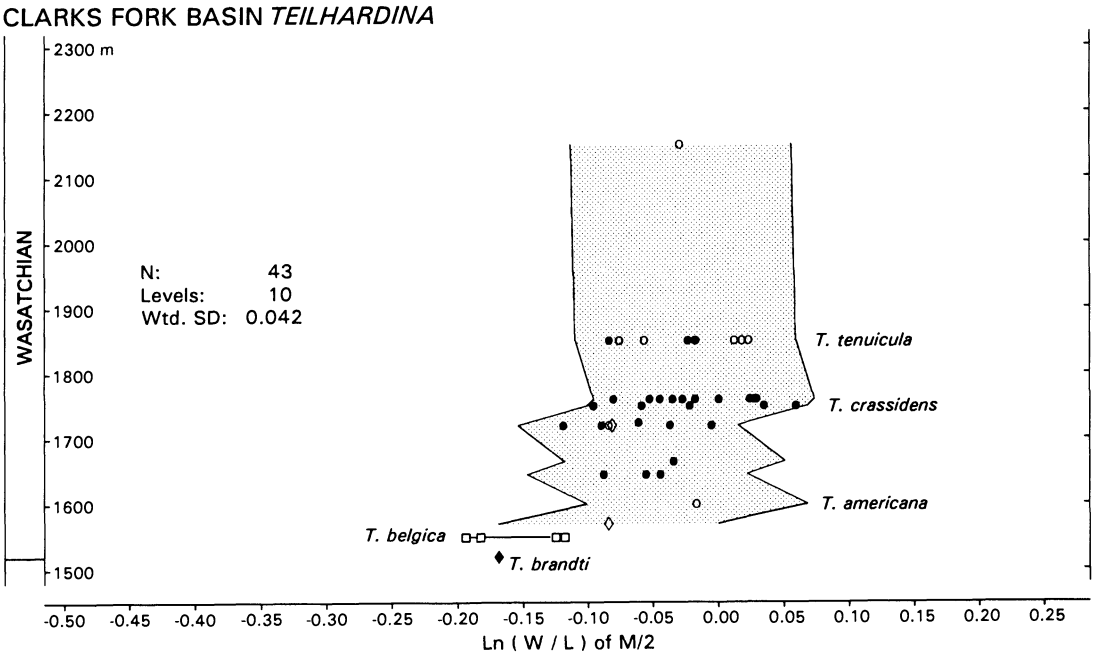

FIG. 3—Shape of M_2 in type specimen of *Teilhardina brandti* (solid diamond) shown in relation to European *Teilhardina belgica* (open squares) and later North American *Teilhardina* species (shaded). Abscissa is Ln (W / L) of M_2 as an index of tooth shape. Ordinate is measured level in Clarks Fork Basin stratigraphic section (early to middle Wasatchian section shown here spans about 2 million years of geological time). Comparative sample from North America includes 43 specimens from 10 levels, and weighted standard deviation of samples (0.042) determines width of shading (± 2 standard deviations on each side of mean). Stratigraphic levels for open symbols are based on associated faunas: open diamonds are type specimens of *T. americana* and *T. crassidens*, respectively (measurements from Bown and Rose, 1987). Note that *T. brandti* has a significantly smaller shape index (relatively narrower M_2) than any later North American *Teilhardina* specimen or species, and it resembles European *T. belgica* in shape.

ACKNOWLEDGMENTS

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