Article XVIII.—THE PROBLEM OF THE UINTATHERIUM MOLARS

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The question of the homologies and derivation of the uintatherian upper molars presents a difficult problem. My attention was directed to it by Doctor W. K. Gregory, who has also given me in generous measure the benefit of his criticism and suggestions. The drawings are the work of Miss Marcelle Roigneau.

Osborn (1898, 1907) tentatively accepted the view first advanced by Cope (1884) that the upper uintathere molars developed from the Coryphodon type as follows (see Figs. 1, 2, 3): “The ectolph swung around so as to form with the protoloph a V opening outwards. Just internal to the apex of the V the hypocone is often developed.” He says further (1907): “The lower molars of Uintatherium are closely linked with those of Coryphodon and Pantolambda through the genus Bathyopsis, which is strictly intermediate in its mandible and inferior molars and thus supports the view that the upper molars also of Uintatherium have passed through stages represented in a general way by Pantolambda and Coryphodon. The steps in this evolution are the most complicated and difficult to understand, especially the rotation of the ectolph, a feature which is less positively demonstrated than the other features of this exceptional evolution.” Finally, he says (1913): “The specimen (i.e., Bathyopsis) thus throws no light upon the still unsettled question of the derivation of the uintathere molar from the primitive amblypod type. . . As a whole the skull and dentition are so closely related to the females of the primitive species of Uintatherium as to fall almost within the same generic definition. The skull, however, is that of a robust male, with well-developed canine tusks, and is consequently to be regarded as in a typical ancestral stage.”

Gregory (1910) accepted the “ectolph rotation hypothesis,” “fide Osborn.” This has become the traditional view, although Scott (1913) enters a slight demurrer when he refers to the Pantodonta as “not ancestral to them (Dinocerata), but collaterally related and descended from a common ancestry.” The context and page 285 show that Scott regards Pantolambda as probably the common ancestor of the coryphodonts and uintatheres.

Although the anterior half of the upper molars of the uintatheres resembles that of Coryphodon strikingly, the posterior half is utterly
different. On the other hand, there is a striking uniformity throughout the uintathere premolars and molars, both upper and lower, and the rotation of the ectoloph, as Osborn admitted, is so difficult to understand that it seems worth while to review the whole question of the homologies of the upper cheek teeth of the Uintatheriidae.

![Diagram of occlusal relations of molars](image)

Fig. 1. Occlusal relations of the molars in: a, Coryphodon testis; b, hypothetical intermediate form (after W. K. Gregory); c, Uintatherium stenops. ×\(\frac{1}{2}\).

There are a number of objections to the "ectoloph rotation hypothesis." Osborn, with more complete material, apparently withdrew his earlier suggestion that Bathyopsis was intermediate between Coryphodon and Uintatherium (see above). In any case, the lower molars are far more like Uintatherium than Coryphodon. They are merely a fraction of a stage nearer than Uintatherium to the primitive ungulate type represented by Coryphodon or Homogalax (Systemodon).

I feel that too high a value has been placed upon the resemblance between the lower molars of Coryphodon and Uintatherium (see Figs. 2, 3). If lower molars alone are considered, Homogalax is perhaps as good
an ancestor for Uintatherium as is Coryphodon. In other words, the lower molars of Coryphodon and Homogalax are equally more primitive than those of Uintatherium. An inference of true genetic connection must be founded on stronger evidence than this alone.

The upper molars, always more progressive, must furnish the decisive evidence. The rotation of the ectoloph postulates a surprising fluidity of the ectoloph, associated with virtual immobility of the lower

Fig. 2. Coryphodon testis: a, left upper and b, right lower, cheek teeth. After Osborn. ×1/2.

molars, of the protoloph and of the hypocene (see above). The cusp which Osborn calls the hypocone (see Fig. 4) can, however, hardly be the hypocone on his theory, unless it split off from the cingulum after the upper uintathere molars had been fully developed in all other respects.

Doctor Matthew contributes a note pointing out that Granger has found an as yet undescribed Bathyopsis-like uintathere in the summit of the Paleocene and the base of the Eocene in the Clark Fork Basin of Wyoming.1 Both molars and premolars, upper and lower, have the uintathere pattern most unmistakably. As Coryphodon is not known from the Paleocene, the likelihood that the Uintatheriidae and Coryphodontidae are parallel phyla is increased. Pantolambda itself is virtually a contemporary of this earliest uintathere.

The possibility of the "ectoloph rotation hypothesis" as far as the occlusal relations go, must be admitted. (See Fig. 1.) Hypertrophy of the hypoconulid in Coryphodon, associated with partial atrophy of the

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1American Museum No. 16084, Clark Fork Formation; No. 16786, ? Clark Fork Formation; Nos. 15860, 16063, 16064, Ralston Formation.
posterior V in the lower molars, might change the upper molars from the Coryphodon to the Uintatherium type. There are, however, no intermediate stages and such a revolution should not be accepted without strong evidence. The resemblance in the body structure of Coryphodon and Uintatherium is granted (although numerous differences are also present), but it is no greater than might well occur in two parallel phyla which descended from a common pre-pantolambdid ancestor and acquired giantism independently.

The uintatherian lower molars and premolars are strikingly similar to each other in pattern (see Fig. 3). There is, fortunately, entire agree-
ment that the corresponding cusps are truly homologous throughout the lower cheek teeth. Since, however, the lower premolars have become molariform independently of the molars, it suggests the likelihood that the upper premolars, bound up occlusally with the lower premolars and becoming molariform pari passu, are now homologous, as well as analogous, with the upper molars. There seems little reason to doubt that the upper premolars are of normal tritubercular pattern, being composed of the "protocone," deutocone and tritocone of Scott's nomenclature. Reversing the reaction P²-M¹, we reach the tentative conclusion that the V in the upper uintathere molars is (as it seems at first glance), a normal trigon instead of a spurious substitute. The postero-internal cusp of the upper molars fits into this theory as the hypocone, or as a pseudo-hypocone split off from the protocone, and analogous to the tetartocone of premolars. In either case its occlusal relations are absolutely normal.

![Fig. 4. Third left upper molar of Uintatherium stenops. A, Cusps labelled according to Osborn; b, cusps as identified in this paper. X1/2.](image)

Although recognizing the deceptiveness of convergence, I feel very strongly the essential unity in ground-plan of the upper cheek teeth. From P² to M³ there are three main cusps, which I believe to be the paracone, metacone and protocone of molars. These cusps form a V of strikingly similar pattern throughout the series. (See Fig. 3.) The para-style may be traced in all, flattened against the anterior edge of the paracone. The basal cingulum is identical throughout. The lowest point in each V, from P³ to M³, is on the anterior crest of the V, just external to the protocone.

It seems probable therefore that in the Uintatheriidae the trigons and cusps in the molars are homologous with those of the premolars, representing the "secondary trigon" of Gregory (1922). Uintathere molars have a very different pattern from those of Coryphodon, formed, accord-
ing to the theory here advanced, from different cusp elements. (See Figs. 1, 4.) This agrees with Scott’s view that the Uintatheriidae and Coryphodontidae are parallel but independent phyla. In fact, it separates them somewhat more widely since, if this theory is correct, *Pantolambda*, although an ideal ancestor for *Coryphodon*, is already too highly specialized to give rise to the uintatheres. *Pantolambda* is to the Uintatheriidae as *Paleotherium* is to the Equidae.

The ancestry of the uintatheres is still uncertain.

**BIBLIOGRAPHY**


