obtainable. The terms with the F in (17) can be omitted for both interpretations, if the X_r are expressed explicitly as such functions of the y, which depend only on the relative configuration.

It will be noticed that whenever any two of the t_p become equal, the principal axes of inertia as well as the standard position become indetermined. This manifests itself in the equations by producing singularities of the first and second order for these configurations. As a result, the wave functions will not be continuous as t_p and $t_{p'}$ approach equality from the two sides $t_p > t_{p'}$ and $t_{p'} > t_p$. However, a detailed discussion of this behavior will not be given in this paper.

[1] For application to the He-atom see G. Breit, *Phys. Rev.*, **35**, 569 (1930). In a paper which appeared a short time ago (*Phys. Rev.*, **46**, 383 (1934)) C. Eckart developed the theory of rotation and inner motion of a system of particles in classical dynamics. His results are such, however, that one can deduce from his eq. (26) a quantum mechanical equation, which must be equivalent to our (17), except for the use of different coördinates. It does not seem to be quite easy, however, to specify Eckart's coördinates in such a way as to conserve the symmetry between identical particles. The elimination of the translational coördinates and applications of the resulting equation were given already by D. S. Hughes and C. Eckart, *Phys. Rev.*, **36**, 694 (1930).

[2] The system must be considered as being in a finite box in order to make the integrals finite. However, the box may be made sufficiently large so as to have no effect on the system.

[3] See any book on the applications of group theory to quantum mechanics, e.g., H. Weyl, *Theory of Groups and Quantum Mechanics*, or E. Wigner, *Gruppentheorie*, etc. Formulas (3) and the expressions for the $D^{(l)}(R)_{\mu r}$ may be found in the latter one in chapters XIX and XV, respectively.

[4] This can be proved directly by substituting $f(I_1, \ldots, I_6)X_r$ for the X_r in (17), where $I_1, \ldots, I_6$ are the expressions on the left side of the identities. The new X's will still satisfy (17) for all points $I_1 = \ldots = I_6 = 0$.

PLESIOMIACIS, A NEW CREODONT FROM THE SESPE UPPER EOCENE, CALIFORNIA

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Introduction.—The creodont described in this paper was found recently at Calif. Inst. Tech. Vert. Pale. Locality 207 in the Brea Canyon section of the Sespe deposits north of the Simi Valley, California. The faunal stage occurring here has a stratigraphic position approximately 675 feet lower in the section than Locality 150, and is unquestionably more closely related in age to that found at Locality 180 approximately 3 miles to the

east along the strike of the Sespe deposits. These lower faunal horizons in the Sespe are now regarded as belonging to the Upper Eocene, while the stage recorded at Locality 150 has been assigned to the uppermost Eocene.

It may be recalled that two members of the Miacidæ were described recently[1] from Locality 180. The present type is quite different from these forms and appears to be a representative of the viverravine division of the miacid family.

Viverravus (Plesiomiacis) progressus, n. subgen. and n. sp.

Type specimen.—A right ramus of the mandible with $P\bar{1}$-$M\bar{2}$, No. 1776, Calif. Inst. Tech. Vert. Pale. Coll., plate 1, figures 1, 1*a*.

Paratype.—A fragment of the right maxillary with $P\underline{4}$-$M\underline{3}$, No. 1777, plate 1, figure 2.

Locality.—Sespe Upper Eocene, north of the Simi Valley, Ventura County, California; Locality 207 C.I.T.

Subgeneric and Specific Characters.—Molars $\frac{2}{2}$. $P\bar{1}$ with single root. Anterior end of crown in $P\bar{2}$, $P\bar{3}$ and $P\bar{4}$ turned inward more than in *Viverravus sicarius*. Trigonid wider and talonid shorter in $M\bar{2}$, relative to length of tooth, than in *Viverravus*. Parastyle in $P\underline{4}$ compressed antero-posteriorly and not so well developed as in Bridger genus. Upper molars with antero-external corner extended; parastyle less distinct from paracone than in *Viverravus*. Size slightly larger than *V. sicarius*, but lower premolars shorter than in this species.

Description.—Plesiomiacis resembles the Bridger *Viverravus* in absence of the third molars, in presence of a well developed tubercle posterior to the principal cusp in $P\bar{3}$ and $P\bar{4}$, and in the characters displayed by the lower molars (except that the talonid in $M\bar{2}$ is not extended so far posteriorly). The Sespe type is more progressive than the Bridger form in reduction of parastyle in $P\underline{4}$ and in presence of a single-rooted $P\bar{1}$.

In the right ramus No. 1776, figures 1, 1*a*, the anterior premolars ($P\bar{1}$, $P\bar{2}$ and $P\bar{3}$) are more openly spaced than in *V. sicarius*. $P\bar{4}$ is shorter and relatively slightly wider than in the latter species as represented by the type specimen, No. 11521 A.M.N.H. Moreover, the trigonid is wider and the talonid is shorter in $M\bar{2}$, relative to the length of this tooth, than in No. 11521. A distinct cingulum extends along the base of the antero-external face of the paraconid-protoconid blade. In contrast to $M\bar{1}$ and $M\bar{2}$, comprising the type specimen of *Miacis* (?) *hookwayi* from the Sespe (Locality 180), the molars in *Plesiomiacis progressus* possess higher trigonids and smaller talonids. $M\bar{2}$, in particular, exhibits decidedly greater reduction in the heel region and the length of this tooth, in comparison to the length of $M\bar{1}$, is less than that in the specimen from Locality 180. The broad

posterior border of this tooth in *M*(?). *hookwayi* may be interpreted as implying the presence of a third lower molar. Characters seen in the lower jaw and lower dentition of *Tapocyon occidentalis*, readily distinguish this type from *Plesiomiacis*.

As in *Viverravus sicarius* the anterior mental foramen in the ramus No. 1776 is situated below $P\overline{1}$ while the posterior one is situated below $P\overline{3}$. Fortunately the coronoid process is preserved in the Sespe specimen. Slightly more space prevails between the anterior border of the process and

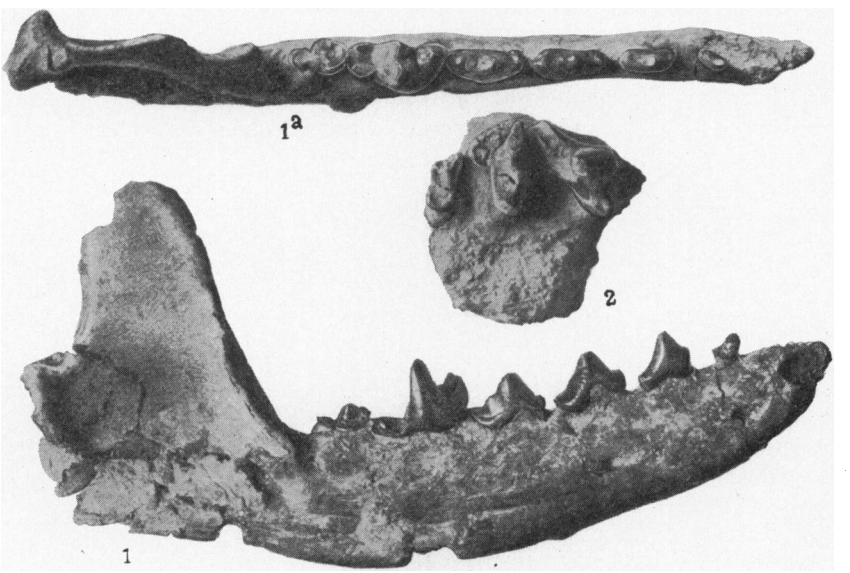

PLATE 1

Viverravus (*Plesiomiacis*) *progressus*, n. subgen. and n. sp.

Figures 1, 1*a*, type specimen, right ramus of mandible with $P\overline{1}-M\overline{2}$, No. 1776; lateral and occlusal views. Figure 2, paratype, fragment of maxillary with $P\underline{4}-M\underline{2}$, No. 1777; occlusal view. All figures × 1½.

California Institute of Technology Collections. Sespe Upper Eocene, California.

the posterior end of $M\overline{2}$ than in *V. sicarius*. The condyle is placed well above the level of the tooth-row.

In the maxillary fragment, No. 1777 C.I.T., figure 2, $P\underline{4}$ differs from the comparable tooth in the viverravine creodonts in the reduction in size of the parastyle. This cuspule is compressed and consequently the protocone projects farther forward, with reference to the anterior border of the parastyle, in *Plesiomiacis* than in *V. sicarius*. The upper molars are unfortunately considerably worn. However, it is apparent that the paracone was a distinctly larger cusp than the metacone and that the parastyle, at least in $M\underline{1}$, was extended in an outer anterior direction and was more ridge-like in its development than in *Viverravus*. The roof of the palate between

$P\underline{4}$ and $M\underline{1}$ is deeply excavated to accommodate the trigonid of $M\overline{1}$ and a similar but smaller excavation is present between $M\underline{1}$ and $M\underline{2}$, marking the position in occlusion of the trigonid of $M\overline{2}$. The space between the opposing walls of the first and second upper molars is also greater in No. 1777 than in *Miacis*.

Remarks.—Plesiomiacis from the Sespe (Locality 207) is referred to the viverravine division of the Miacidæ because of the important structural characters exhibited by Nos. 1776 and 1777, as indicated above. In reduction in size of parastyle in $P\underline{4}$ and in character of heel in $M\overline{2}$ our type from the Sespe may show greater resemblance to members of the Miacinæ. In either case, *Plesiomiacis* has advanced beyond the Bridger representatives of the Miacidæ and points toward a post-Bridger age for this stage in the history of the family.

MEASUREMENTS (IN MILLIMETERS)

	Type No. 1776 C.I.T.
Length from anterior end of symphysis to posterior end of condyle (approximate)	71.5
Depth of ramus taken between $P\overline{3}$ and $P\overline{4}$ and normal to inferior border	10.8
Depth of ramus at posterior end of $M\overline{2}$ and normal to inferior border	11.1
Length of tooth-row, $P\overline{1} - M\overline{2}$	38.3
$P\overline{1}$, anteroposterior diameter	2.6
$P\overline{2}$, anteroposterior diameter	4.8
$P\overline{3}$, anteroposterior diameter	6.4
$P\overline{4}$, anteroposterior diameter	7.3
$P\overline{4}$, greatest transverse diameter	3.0
$M\overline{1}$, anteroposterior diameter	9.0
$M\overline{1}$, width across metaconid-protoconid	4.6
$M\overline{1}$, width of heel	3.4
$M\overline{2}$, anteroposterior diameter	4.9
$M\overline{2}$, width across trigonid	2.9

	Paratype No. 1777 C.I.T.
Greatest length from anterior end of $P\underline{4}$ to posterior end of $M\underline{2}$	17.3
$P\underline{4}$, length from anterior end of protocone to posterior end of tooth	10.6
$P\underline{4}$, greatest transverse diameter	6.0
$M\underline{1}$, greatest transverse diameter along anterior face of tooth (approximate)	8.3
$M\underline{2}$, greatest transverse diameter	4.9
$M\underline{2}$, anteroposterior diameter	2.4

[1] Stock, C., *Proc. Nat. Acad. Sci.*, 20, 423–427, pl. 1 (1934).