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NEW FOSSIL MAMMALS FROM THE DEEP RIVER BEDS OF MONTANA

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PART I. OCCURRENCE

BY C. C. MOOK

The Deep River Beds of Montana were discovered by Grinnell and Dana in 1875, and named Deep Creek Beds. Later the names Deep River and Smith River were applied to the same series, and the name Deep River has been generally adopted. In 1878, Cope placed them stratigraphically as the base of the Loup Fork Beds. Later he placed them below the Loup Fork and above the John Day horizons, as understood at the time, and called them *Ticholeptus* Beds.

In 1893, Scott described additional material and recognized two distinct levels, an older one, equivalent to upper John Day, and an upper which was Cope's *Ticholeptus* Beds zone. E. Douglass in various contributions from 1899 to 1909 recognized the same division. In 1899, W. D. Matthew assigned part of the Deep River Beds to the lower part of the Upper Miocene.

The geological character of the country in which Deep River sediments and their included fossils are found necessitates great care in making correlations. The beds are exposed in isolated blocks along the Deep River, or Smith River, between White Sulphur Springs and Fort Logan, Montana. Exposures also occur south of White Sulphur Springs, some distance from the river. These isolated blocks are fault blocks. One may follow a creek bed through the Deep River sediments for a short distance in almost any direction and find a sharp fault contact with Palæozoic or older rocks. The faults appear to extend across the country in several directions, and the faulting has broken the country up into a rough checker-board pattern. The vertical component of movement in a large series of blocks must necessarily have been unequal, and erosion operating after faulting would leave various stratigraphic levels at the same topographic level. As the Deep River Beds do not vary to any great extent lithologically in the vertical direction, great

[1]Posthumous.

care must be exercised in comparing life zones in blocks whose nearness to each other and lithologic similarity might suggest exact correlation.

The specimens described by Doctor Matthew in Part II of this contribution were collected by Coleman S. Williams and C. C. Mook in 1925. They were found in a fault-block of Deep River sediments east of Smith River (Deep River) about seven miles southeast of Fort Logan, Montana. In the same block, within a few hundred yards of the specimens described, and at the same level, were found *Merychippus, Mookomys altifluminis, Merychyus, Cyclopidius?, Dromomeryx, Alticamelus, Promerycochœrus,* and a number of other artiodactyls.

This fauna would indicate the upper rather than the lower of the two zones recognized by Scott and Douglass, but might be slightly higher or lower. In any case they may be considered as in the lower part of the Upper Miocene, or Middle Miocene.

Part II. DESCRIPTIONS

By W. D. Matthew

Brachyerix macrotis,[1] new species

Type.—Amer. Mus. No. 21335, a skull from the Deep River Miocene of Montana. Collected by C. C. Mook and C. S. Williams, 1925, near Fort Logan, Montana.

Diagnosis.—Two upper molars, M^1 quadrate, M^2 reduced and triangular. P^4 with large, subtrigonal, nearly conical anteroexternal cusp, large crested internal heel and posteroexternal crest. P^3 much reduced, small and simple, two-rooted, with longitudinally crested crown; two alveoli in front of P^3 were probably for one small two-rooted premolar. Premaxilla unknown. Postpalatal region short, the basisphenoid expanded into a large nearly complete ossified bulla extending anteriorly considerably in advance of the articulation of the lower jaw, posteriorly covering over a corner of the basioccipital, while medially the two bullæ are separated by a straight narrow channel continuous with the posterior narial gutter, which is much smaller and more constricted than in *Erinaceus*. From the posteroexternal angle of this bulla, a high continuous crest extends directly backward to the paroccipital process. This crest apparently represents the mastoid process, and the mastoid exposure is almost wholly lateral instead of being posterior as in *Erinaceus*. The occiput is rather strongly pitched forward, and the occipital crest well defined and continuous with the posterior wing only of the lambdoidal crest, the anterior wing being absent. The sagittal and postorbital crests are distinct but low. The lachrymal foramen is internal to the orbital rim in consequence of the prominence of the prelachrymal orbital crest. The infraorbital foramen lies close in advance of the orbit; its position is above P^3, however, instead of above the anterior end of P^4 as in *Erina-*

[1]Derivation, βραχυς, short, -erix by analogy with *Galerix, Proterix* [the derivation of *Galerix* is obscure, possibly from some little-known Greek root connected with the Latin *ericius*, a hedgehog]. The species name refers to the large well-calcified bullæ and inferentially well developed external ears.

ceus, owing to the shortened dentition in the present genus. The muzzle evidently much more slender and shorter than in *Erinaceus*, but the specimen lacks the premaxillæ and anterior part of nasals, so that its exact proportions are uncertain.

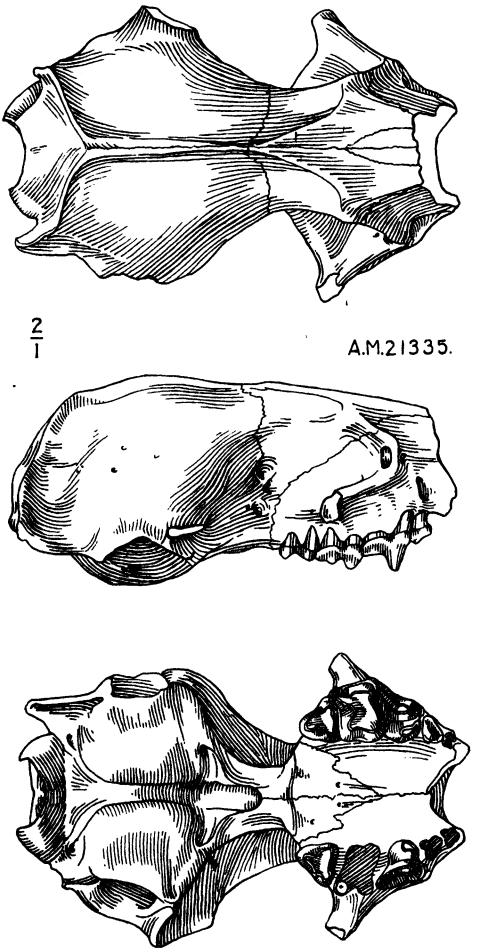

Fig. 1. *Brachyerix montanus* Matthew, n. sp. Type, skull. Amer. Mus. No. 21335. Twice natural size.

Upper figure, superior view; middle figure, lateral view, right side; lower figure, inferior view.

The dentition differs from that of *Erinaceus* in the lack of hypocone on P^4, reduction and trigonal form of M^2 and absence of M^3. The skull characters also show wide differences and quite diverse specializations.

The skull of *Proterix* of the White River does not approach this one in any of the points indicated above; it is a pro-erinaceid, whereas the present genus is a para-erinaceid. None of the European genera are at all near it. *Dimylus* has the reduced number of molars, but the pattern of both molars and premolars differs widely. *Galerix* has three upper molars, and the pattern of the teeth is no nearer than in *Erinaceus*. *Neurogymnurus* also has three upper molars and the tooth pattern near that of *Erinaceus*. *Gymnura* and *Hylomys* show no special approach.

The family and ordinal position of this skull appear to be beyond doubt. It is sufficiently excluded from Chiroptera by the character of the bulla and other cranial features; from Carnivora by the bulla, the mastoid region, reduction of zygomata, character of lachrymal, proportions of teeth, etc.; from Primates by the teeth, zygomatic arch, occipital and various other cranial features. No suggestion of relationship to any other order, except Insectivora, appears in the specimen, and among Insectivora the only family that shows any helpful resemblances is Erinaceidæ. In this family it must represent a diversely specialized phylum, not primitive and synthetic as is *Proterix* (which combines characters of erinaceids and leptictids), but a special early side branch from the Erinaceinæ. It is somewhat remarkable that the two[1] known American erinaceids should each be represented by a single specimen and that a skull. No jaws or jaw fragments of either have ever been identified so far as I am aware.

Sciurus angusticeps, new species

TYPE.—Amer. Mus. No. 21336, a skull from the Deep River Miocene of Montana. Collected by C. C. Mook and C. S. Williams, 1925, near Fort Logan, Montana.

DIAGNOSIS.—Size of *S. aberti* but with narrower skull, smaller brain-case, smaller and somewhat narrower tympanic bullæ, upper teeth less transversely crested in pattern, zygoma narrower, the prezygomatic plate for the masseter less extensive either backward or forward, its posteroinferior border opposite P^4 instead of M^1, while the crest that marks its anterosuperior margin is less prominent, and fades away before reaching the maxillo-premaxillary suture. Muzzle and incisors somewhat heavier than in *S. aberti*.

This skull, uncrushed and well preserved, is very instructive in that it provides definite evidence as to the relations of a Miocene squirrel to the various modern species of the genus *Sciurus* and its allies. It

[1]Since Doctor Matthew wrote the manuscript of this article two other American erinaceids have been described. The four forms are:
Proterix loomisi Matthew, 1903, from the Upper Oligocene of South Dakota.
Metechinus nevadensis Matthew, 1929, from the Lower Pliocene of Nevada.
Meterix latidens Hall, 1929, from the Lower Pliocene of Nevada.
Brachyerix macrotis, gen. and sp. nov., described above.
Walter Granger

differs from modern squirrels very materially, but in characters that one might expect, *à priori*, of a primitive ancestral type. The brain-case is decidedly less developed, the peculiar sciuroid specialization of the masseter less advanced, the bulla smaller and more normal. These differences underlie a variety of other structural differences that may be seen in the drawings. The third premolar is fairly well developed, whereas it is minute or absent in some species of *Sciurus* and *Tamias*, but much enlarged in *Cynomys* and *Arctomys*. The Miocene species differs much more from the different species or subgeneric groups of *Sciurus* than they differ from each other. It compares on the whole more nearly with the large southwestern squirrels of which *Sciurus*

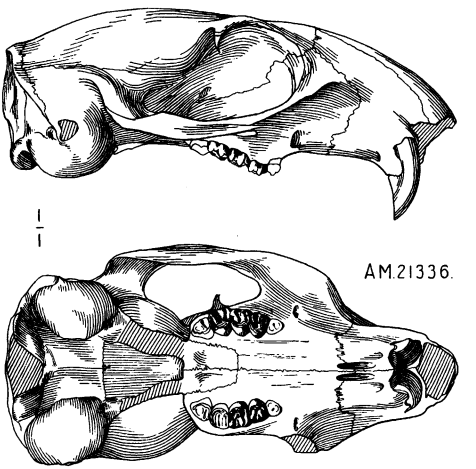

Fig. 2. *Sciurus angusticeps* Matthew, n. sp. Type, skull. Amer. Mus. No. 21336. Natural size. Upper figure, lateral view, right side; lower figure, inferior view.

(*Otosciurus*) *aberti* is type. Yet it really affords no sound evidence for the view that it is ancestral to *Otosciurus* any more than to other groups of modern squirrels. It might just as well have given rise to various other groups or be the common ancestor of the whole genus.

It does not appear, therefore, that this finely preserved skull gives sufficient evidence to warrant its being placed in the subgenus *Otospermophilus*. Nor does it seem to be justifiable to place it in a separate subgenus or genus of its own. For the differential characters would be almost wholly of a primitive type, differences which would characterize the ancestors of every subgenus of *Sciurus* at a corresponding

stage of their phyletic evolution. As all the other subgenera represent end-stages of sub-phyla, a subgenus erected for *S. angusticeps* would represent something different in type, a mutation as opposed to a series of variations. It really calls for a different nomenclature, to be consistant, and rather than use a misleading term it is better to avoid any further nomenclative refinements and refer it simply to *Sciurus*.

If a well preserved skull does not provide adequate evidence for subgeneric reference, it is obvious that the much slighter evidence of a lower jaw is very far from adequate. Yet Doctor Merriam, following J. W. Gidley, has not hesitated to refer such a lower jaw from the Rattlesnake formation of Oregon, to the subgenus *Otospermophilus*. Such precise references of scanty material are little better than guesswork. They may serve to give a false impression of exact knowledge that does not really exist, and may be seriously misleading as to various larger problems. One would conclude that if one of the closely allied subgenera of *Sciurus* was already well distinguished at the end of the Miocene, the antiquity of the genus and of the family must be far greater, in due proportion to their structural diversity, and in fact Mr. Gidley's *à priori* views as to the great antiquity of rodent genera and species would receive strong support from this kind of evidence if it were really sound. But it is not sound, and the far better material herein described shows in this instance how utterly unreliable such scantily based evidence may be. I may add that thirty years of practical experience has convinced me reluctantly, that no amount of intensive study of fragmentary and insufficient material will discover in that material the sufficient evidence that is not there. One may by concentrated research discover mare's-nests aplenty, but true science is better advanced by going out and getting more and better evidence, and, until that is at hand, by refraining from conclusions that are not conclusively proved.

BIBLIOGRAPHY

Only a few of the more important articles on the Deep River Beds and their fauna are listed.

DOUGLASS, EARL. 1899. 'The Neocene Lake Beds of Western Montana,' 27 pp., 4 pls., University of Montana.

1906. 'Generic Names of Merycoidodonts,' Sci., N.S., XXIV, pp. 565–567.

1907. '*Merycochœrus* and a new Genus of Merycoidodonts, with some Notes on the Agriochœridæ,' Ann. Carnegie Mus., IV, pp. 84–109, Pls. XXI–XXX.

1909, '*Dromomeryx*, a new Genus of American Ruminants,' Ann. Carnegie Mus., V, pp. 457–479, Pls. LXI–LXIII.

MATTHEW, W. D. 1899. 'A Provisional Classification of the Fresh-water Tertiary of the West,' Bull. Amer. Mus. Nat. Hist., XII, pp. 19, 75.

OSBORN, H. F., AND MATTHEW, W. D. 1909. 'Cenozoic Mammal Horizons of Western North America,' Bull. U. S. Geol. Surv., No. 361, 136 pp., 15 figs., 4 pls.

SCOTT, W. B. 1893. 'The Mammals of the Deep River Beds,' Amer. Nat., XXVII, pp. 659–662.