THE MIOCENE OF WESTERN NEBRASKA.

C. BERTRAND SCHULTZ.

ABSTRACT.

The continued use of the term Arikaree as a group name is suggested for one of the major divisions of the Miocene of Nebraska and adjacent areas. Gering, Monroe Creek and Harrison are considered as formations of the Arikaree group. The Harrison formation is restricted to the upper part of the Arikaree group as used by Mr. J. B. Hatcher in 1902. The name Marsland is proposed for the formation (until now incorrectly called "upper Harrison") which lies above the Harrison and below the Sheep Creek.

During the past forty years much has been published on the Miocene deposits of Nebraska, South Dakota and Wyoming. At the present time it is evident that but few students are in accord as to the relation of these formations, which consist of nearly 1,000 feet of deposits in Nebraska.

The writer, with the permission of Dr. Erwin H. Barbour, Director of the Nebraska State Museum, University of Nebraska, began a study of the lower Miocene deposits of western Nebraska in 1930 in connection with the collecting of fossil vertebrates. This study has been pursued for seven consecutive field seasons (1931-1937) of four to five months each.

The first systematic work in the lower Miocene of western Nebraska was done by Dr. N. H. Darton in 1896 and 1897.[1] Many of the field data were gathered in coöperation with Dr. Erwin H. Barbour, who at that time was State Geologist of Nebraska. The "formations" were briefly described in 1899.[2] The name "Gering formation" was given to the deposits immediately above the White River group. Darton proposed the names "Arikaree" for the "lower member" of the old "Loup Fork" in the Pine Ridge region and "Ogallala" for the "considerably younger member" which extends southward into Kansas.

Later Doctor Darton,[3] discussing the Arikaree and Gering, added:

"*Arikaree formation.*—In the western portion of Nebraska there is found underlying the Ogallala formation a series of sands of gray color everywhere characterized by layers of dark-gray concretions which often have tubular form. . . . It has a

[1] Science (N.S.), Vol. 7, No. 167, pp. 358-359, 1898.
[2] Darton, N. H.: Am. Geol., Vol. 23, p. 94, 1899.
[3] Darton, N. H.: U. S. Geol. Surv., Nineteenth Annual Report, Pt. 4, pp. 735-736, 1899.

thickness of 400 feet in Scotts Bluff County and 500 feet in Sioux and Dawes counties. . . . In its *upper* portion are the beds containing the large Daemonelix of Barbour. The name Arikaree has been applied to the deposit for the reason that the Arikaree Indians were at one time identified with the area in which it is most largely developed. . . .

"*Gering formation.*—It consists of laminated, massive, and cross-bedded, light-gray, mainly coarse sands and soft sandstone at the base of the Arikaree formation. . . . It has been found in Scotts Bluff, Banner, Cheyenne, Sioux and Dawes counties, and locally attains a thickness of 200 feet. . . . The materials are sands, which vary from coarse to fine, and they are often sufficiently lithified to be classed as soft sandstone. At the base there is usually more or less conglomerate of local origin."

Mr. J. B. Hatcher, who collected fossil vertebrates from the Miocene of western Nebraska, divided the Arikaree into *two* parts,[4] "The Monroe Creek Beds" and "The Harrison Beds." He based this division on both the lithology and the fauna. It would be well to quote from Hatcher:

"1. *The Monroe Creek Beds.*—These are well shown in the northern face of Pine Ridge, at the Monroe Creek cañon, five miles north of Harrison, Nebraska, where they overlie the Gering sandstones, and are composed of some 300 feet of very light-colored, fine-grained, not very hard, but firm and massive sandstones. . . .

"2. *The Harrison Beds.*—These are well shown in the bluffs of all the small streams that head near the summit of Pine Ridge, in the vicinity of Harrison, Nebraska. They are also known to cover a considerable area to the east, west and south of that village, extending well into the State of Wyoming. They are composed of about 200 feet of fine-grained, rather incoherent sandstones, permeated by great numbers of siliceous tubes arranged vertically rather than horizontally. They are further characterized by the presence, often in the greatest abundance, of these peculiar and interesting, but as yet not well understood, fossils known as Daemonelix. . . . Above these come: The Nebraska Beds of Scott."

The lower part of the Monroe Creek formation, at the type section north of Harrison, is characterized by the horizontal, dark-gray "tubular" or "pipy" concretions of Darton and the upper-most part by "pseudo-pipes."[5] True pipy concretions

[4] Hatcher, J. B.: Proc. Am. Phil. Soc., Vol. 41, No. 169, pp. 115-119, 1902.

[5] A term suggested to the writer by Mr. S. R. Sweet of Bridgeport, Nebraska, for concretions which are irregular in shape. These are often small knob-like forms, but in places form layers or sheets of irregularly shaped concretions.

are comparatively rare in the Gering and Harrison formations. Hatcher pointed out that the "pipes" in the Pine Ridge region have a northwesterly and southeasterly trend, while Darton reported a southwesterly and northeasterly trend in the North Platte valley area. A check of the directions of the pipy concretions in these and in intermediate localities indicates that the concretions are somewhat systematically directed but their shapes may vary.

Since Hatcher made this division of the Arikaree, the term has been used widely as a series or group name and the Gering formation, as well as the Monroe Creek and Harrison formations, has been included in it. In 1905[6] "Lower Harrison" was applied to the *whole* of the already named Harrison beds of Hatcher and "Upper Harrison" was used for the overlying, buff-colored deposits which Hatcher miscalled "The Nebraska Beds of Scott."[7] This has resulted in much confusion as to what constitutes the Harrison.

The term "Rosebud"[8] is a generalized, indefinite name for deposits in the vicinity of the Rosebud Agency in South Dakota. It appears to include deposits of more varied age than the Arikaree. The "Rosebud" was divided into upper and lower and the use extended by Dr. W. D. Matthew.[9]

The purpose of this paper is to suggest the continued use of the term Arikaree[10] as a group name in the Miocene and the inclusion in it of only the Gering, Monroe Creek and Harrison formations (the latter as Hatcher defined it). To the deposits ("upper Harrison beds") which immediately overlie the Arikaree group and which are faunally and lithologically distinct from the typical Arikaree, the writer suggests the name Marsland formation. This formation is best exposed

[6] Peterson, O. A.: Annals Carn. Mus., Vol. 4, pp. 21-24, 1906.

[7] The "Nebraska beds" were named by Dr. W. B. Scott in 1893 (Bull. Geol. Soc. Am., Vol. 5, pp. 594-595) as the "middle horizon" of the old "Loup Fork" which "covers a vast area from Nebraska to Mexico." *Cosoryx* was mentioned as the most characteristic fossil of this indefinite formation. The "Nebraska beds" are now considered a lower Pliocene equivalent (Valentine, etc.).

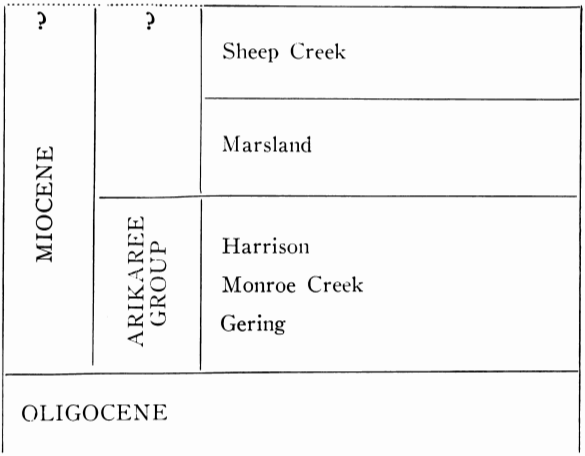
[8] Matthew, W. D., and Gidley, J. W.: Bull. Am. Mus. Nat. Hist., Vol. 20, pp. 241-268, 1904.

[9] Matthew, W. D.: Bull. Am. Mus. Nat. Hist., Vol. 23, Art. 9, pp. 169-219, 1907.

[10] The name "Arickaree" (note spelling) was proposed by Mr. F. W. Cragin (Colo. College Studies, Vol. 6, p. 52, 1896) for shales of Cretaceous age occurring in Kansas and Colorado. These were later referred to the Pierre by G. I. Adams (Uni. Geol. Surv. Kans., Vol. 4, Pt. 1, pp. 23-27, 1898) and since then the name does not seem to have been used.

in Nebraska in the region about Marsland along the Niobrara River where it includes some 150 feet of buff and gray, soft sandstones. The Marsland consists, in part, of valley fills, and in places seems to mantle the slopes of certain large valleys. The upper part of the Marsland formation in this region is more gritty and is mostly buff-colored. The fauna of the Marsland formation seems to be intermediate between that of the Harrison formation and the overlying Sheep Creek formation and perhaps should provisionally be considered as the lower part of the upper Miocene. The characteristic fossils are *Merycochoerus, Merychyus, Aletomeryx, Oxydactylus*, and advanced *Parahippus* or (and) *Merychippus*, etc.

The relation of the Marsland to the other formations of Miocene age is shown in the following chart:



A detailed description of the various Miocene formations of Nebraska and adjacent areas will be published soon.

The writer is indebted to the following for their helpful suggestions and aid: Dr. Erwin H. Barbour, Mr. Childs Frick, Mr. Charles H. Falkenbach, Dr. N. H. Darton, Dr. Malcolm R. Thorpe, Dr. A. L. Lugn, Prof. E. F. Schramm, Mr. Thompson M. Stout and Mr. S. R. Sweet. Thanks are also due to other geologists and paleontologists who have been consulted.

Nebraska State Museum,
University of Nebraska,
Lincoln, Nebraska.