

On the distribution of the Loup Fork formation in New Mexico. By E. D. Cope.

(Read before the American Philosophical Society, December 7, 1883.)

In his report on the Geology of New Mexico to the Secretary of the Interior, by Dr. F. V. Hayden, in 1869, this eminent geologist described the Santa Fé marls in their principal physical features. In 1874, in my report to Capt. George M. Wheeler, U. S. Engineers, I showed that this formation is a member of the Loup Fork division of the Miocene Tertiary, a conclusion clearly deducible from the remains of vertebrata which it contains. An illustrated report on the latter was published in the fourth volume of the report of the United States Geographical and Geological Survey, W. of the 100th meridian, Capt. G. M. Wheeler in charge (1877).

Since that time the writer has made several visits to parts of New Mexico not previously explored, and I am able to show that the Loup Fork formation has a much wider distribution in that Territory than has hitherto been supposed to be the case.

In descending the Rio Grande, beds appear on the west side of the river, which strongly resemble those of Santa Fé. They extend along the eastern base of the Magdalena mountains, and as far south as Socorro, in considerable extent and thickness. South of Socorro they appear, but less extensively. The eastern part of the plain which lies between the Rio Grande and the Mimbres mountains is composed of beds of this age where cut by the grade of the Atchison, Topeka and Santa Fé railroad, west of Hatch station. West of the Mimbres mountains the valley of the river of the same name is filled with débris of the bed of eruptive outflow which once covered the country, as far as traversed by the railroad from Deming to Silver City. Its age I could not ascertain.

A great display of the Loup Fork formation is seen in the drainage basins of the heads of the Gila river. In traveling westward from Silver City, its beds first appear in the valley of Mangus creek, which enters the Gila from the east. Crossing the Gila, the mail route to the west passes through the valley of Duck Creek, which flows eastwards into that river. Though bounded by eruptive hills and mountains and their outflows, the valley was once filled with Loup Fork beds, which have been extensively eroded, the principal exposures being on the north side of the valley, forming the foot hills of the Mogollon range. On the divide between the waters of the Gila and San Francisco rivers the formation rises in bluffs of 300 feet elevation. The descent into the valley of the San Francisco brings to light a still greater depth of this deposit. The valley which extends from the canyon which encloses the river south from the mouth of Dry creek to the Tulerosa mountains on the north, and between the Mogollons on the east and the San Francisco range on the west, was once filled with the deposit of a Loup Fork lake. This mass has been reduced by the erosive action of the San Francisco and its drainage, to a greater or less

extent, as it has been protected by basaltic outflows or not. When so protected, the river flows through comparatively narrow canyons. Where the outflow is wanting, the valley of the river is wider, and the Loup Fork formation remains as wide grassy mesas which extend to the feet of the mountain ranges.

The age of these beds would have remained problematical but for the fortunate discovery by Mr. Robert Seip, of the skull of a species of Rhinoceros of the typical Loup Fork genus, *Aphelops*. It is apparently the *A. fossiger* Cope, a species abundant in the Loup Fork beds of Kansas and Nebraska. It was found near the mouth of Dry creek in a conglomerate bed of the formation.

In the valley of the San Francisco the Loup Fork beds reach a thickness of 500 feet, and consist of sand, clayey sand, soft sandstone, and conglomerates of larger and smaller pebbles of eruptive material, having a near resemblance to those of the region of Santa Fé.

*Second Addition to the Knowledge of the Puerco Epoch. By E. D. Cope.**

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Recent collections from the formation above-named, include many finer specimens than have been previously obtained. Skulls of several species in calcareous concretions were received, so that their characters can be developed more fully than heretofore. I mention especially *Deltatherium fundaminis*; *Periptychus rhabdodon* and *P. coarctatus*; *Haploconus lineatus*; *H. entoconus*; *Anisonchus sectorius*; *Protogonia plicifera*; *Mioclanus turgidus*, *M. ferox*, *M. subtrigonus* and *M. cuspidatus*, sp. nov. Some species hitherto rarely seen, prove to be abundant, as *Hemithlæus kowalevskianus*, *Protogonia plicifera*, *Mioclaenus minimus* and *M. subtrigonus*. With the additional species now described, the number of Mammalia from the deposit of the Puerco epoch amounts to seventy-four species.

DIDYMICTIS PRIMUS, sp. nov.

That the genus *Didymictis* existed during the Puerco epoch, has been already demonstrated by the discovery of the *D. haydenianus* Cope. This species is of aberrant form however, so that it remained to prove that the typical form had appeared so early in Tertiary time. This is now shown to have been the case by the discovery of the present animal, which is allied to the *D. leptomytus* of the Wind river and Wasatch epochs.

The *Didymictis primus* is known from two maxillary bones with teeth,

*The "First addition" appeared in the Proceedings of the American Philosophical Society for 1883, beginning at page 545. Since that date I have described in the Proceedings of the Philadelphia Academy, 1883, p. 168, the following species: *Periptychus coarctatus*, *Pantolambda cavirictus*, *Zetodon gracilis* (g. n.) and *Conoryctes ditrigonus*.