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THE AFTONIAN AGE OF THE AFTONIAN MAMMALIAN FAUNA

BY SAMUEL CALVIN.

The publication of the paper on the Aftonian Mammalian Fauna, in the Bulletin of the Geological Society of America, volume XX, pages 341-356, has very naturally elicited a number of questions which, however, bear chiefly on two points: First, are we certain as to the precise age of the gravels? and, second, are we certain that the mammalian remains described may not be older than the Aftonian? Two papers prepared by Professor Shimek and published in the Bulletin of the Geological Society of America, volumes XX and XXI set out the evidence bearing on the first of the questions; it will be sufficient here to consider the second. The first mammalian bones which came into my hands from the Aftonian were few in number and small in size. As to age there were just two possibilities, as there are but two with respect to any and all the fossil remains found in the gravels. The animals represented were either contemporary with the deposition of the gravels—or practically so—or they lived in preglacial time. They certainly did not live during the interval of pre-Kansan glaciation. The bones that first came to hand were assumed to be preglacial because that seemed best to accord with the state of knowledge at the time relative to the age and genesis of the gravels. On that assumption their history could be easily sketched. They had been imbedded and preserved in some preglacial deposit; they had been separated from the original deposit by washing or weathering, or the gouging action of glacial ice; they had been picked up by the pre-Kansas glaciers and incorporated in the sub-Aftonian drift; they had been washed out of the drift in Aftonian time and carried by Aftonian streams to be eventually laid down as part of the assorted Aftonian gravel. This assumption tallied very well with what certainly was the history of a number of other fossils taken at the same time from the gravels. These include parts of the dentary bone with broken teeth of Clidastes, two fragments of guards of belemnites, and an internal cast of one of the air chambers of Placenticeras, all from Upper Cretaceous horizons; there is also a left valve of a narrow Gryphaea which may be Jurassic; and there is a fragment of a corallum of Favosites from the Niagara.
Now the question is pertinent: If Clidastes and Favorites and these other things represent pre-Aftonian faunas, why may not all the fossils be older than the gravels in which they are imbedded? The fossils themselves furnish the answer. All the pre-Aftonian types, even those that are completely silicified, are very much battered and worn; they are mere weathered and abraded fragments retaining nothing of the beauty and freshness of corresponding fossils taken from their original matrix, and they occur in very limited numbers. On the other hand the fossils referred to the Aftonian occur in far greater numbers than could be expected in accordance with any reasonable probability if they have been washed out of the pre-Kansan drift. If they are pre-Aftonian they must have come out of the drift, for the Boyer, the Soldier, the Maple and the other streams along whose valleys the fossil-bearing gravels occur, have no access to any preglacial surface anywhere. Their valleys are excavated in drift. The bones and teeth would have to be very plentiful in the drift if the drift has furnished all we find in the gravels, but there is no record of the finding of any mammalian remains in the pre-Kansan.

A very large proportion of the Aftonian fossils are not abraded or worn in even the slightest degree. They are fresh and perfect as a Placenticeras taken directly from concretions in the Pierre shales around the Black Hills. Some are broken, as would be expected, but many that would be liable to breakage under hard usage are perfect. The imperial jaw represented in figure 1, plate 25, of the Bulletin paper, would not travel very far as part of a ground moraine. The tibia, figure 5 of the same plate, is not marred or scratched; the same is true of the great tooth and the cervical vertebra, figures 7 and 8. The specimens shown in figures 2, 4 and 6 are broken, but the fractures are fresh and there are no signs of abrasion. The fine mastodon tooth above 7 is absolutely perfect so far as signs of wear or weathering are concerned. A few small chips are broken from some of the cups, but the fracture surfaces are as recent in appearance as if the breaking had been done in taking the tooth from the pit. There is practically no wear showing on any of the material represented in the plates of the published paper, and there is much more equally as perfect. The contrast between this material and that which is known certainly to be pre-Aftonian is very striking.

It is but just to say that there is in the collection a considerable amount of fragmental material that shows the effects of weathering and abrasion, but it is exactly what would be expected of animal remain...
mains exposed for some time to atmospheric weathering and subsequently transported by energetic gravel-bearing streams.

Another point in favor of the Aftonian, rather than a pre-Aftonian age for the fossils is that some of the finds indicate that the bones had been floated into place while yet some of the ligaments were intact and the skeleton was not completely dismembered. The teeth of Mastodon mirificus, plate 27, were taken from a well, and in the limited space covered by the bottom of the well the workmen found the two upper molars, parts of the tusks, a large amount of cranial bones and other bones of the skeleton, that could not, by any conceivable probability have been there if the specimen had gone through the vicissitudes experienced by the pre-Aftonian fossils. A more convincing case is that of the complete tusk of the American mastodon, unbroken, unmarred, eight feet in length around the curve and eight inches in diameter at the larger end, taken from Aftonian gravels penetrated in digging a well near Mapleton. With the tusk were found one upper tooth, a large amount of the cranial, bones of the legs and others, showing that a considerable portion of the skeleton has been deposited while yet the bones were held together. The pieces of the craniumal bones show the socket for the tusk and sockets for the fangs of the teeth. The proximal end of the ulna is among the material taken from the well. The bottom of the well could cover only a small part of the space where the skeleton lay. Most of the breakage was evidently due to the well diggers. The Gladwin horse, plate 17, affords another illustration of the same kind. A full set of upper and lower molars were found, lying in their natural relations to each other: with quite a large number of bones properly related, but too soft to be preserved except for some fragments of the lower jaw. The chances that the true relations of so many parts of the skeleton could have been maintained through all the movements and processes to which they would have been subjected before reaching the position in which they were found, in the case of a horse that lived and died in preglaclial time, are so few as to be negligible.

The phalanx of Mylodon, plate 26, had the claw sheath almost complete when found. During the life of the animal this sheath was exceedingly vascular to afford nourishment to the hornly nail or claw proper. After death the nail quickly decayed and left the sheath unsupported when, owing to the great number of vascular channels, it became exceedingly fragile. The specimen can hardly be handled without breaking off some of the sheath. Had this animal lived in preglaclial time and been preserved in preglaclial deposits, no part of
this delicately fragile sheath could have survived the mechanical attrition which necessarily would have attended its removal by glacial ice and swollen streams to the place where it was found. The horny part of the claw decays rapidly. Bears’ claws buried with Indians which inhabited Iowa since the coming of the white man have this horny part completely decayed. It is safe, therefore, to infer that if our Mylodon were preglacial, the claw proper would have disappeared by natural process of decay long before the advent of the pre-Kansan ice, and we should have to believe that the specimen, in essentially its present condition, had been transported by at least two energetic and none too gentle agents without injury to the fragile sheath. Even if the glaciers had treated the specimen ever so tenderly, a very short journey in gravel laden streams would have obliterated every vestige of the very vascular bone that covered the root of the horny claw. In this case, as in most of the others, a pre-glacial age for the animals represented by the fossil bones is simply unthinkable.

Another point must not be overlooked. If the fossils under consideration had been incorporated in the pre-Kansan drift as would certainly have been the case with many of them if they are of preglacial age, the larger pieces could never have found their way into the Aftonian gravels retaining anything like their present state of perfection. A large bone or an entire tusk would not be washed out of the tough glacial clays all at once. An end or a side would be exposed long before the whole specimen could be completely freed and this, affected by corrosion and weathering, would crumble into small fragments; the process of waste would keep pace with the rate of removal of the covering till, little, if anything, would be left to be transported and deposited by Aftonian streams. But there is no need of multiplying arguments; the improbability of these fossils being pre-Aftonian will be recognized and acknowledged by any one who has seen the material and knows the conditions under which it was found.