A lighter touch is given to this somewhat weighty subject—a connecting link with more transcendent things—by the text which appears in the upper corner of the page of preface. This is taken from Deuteronomy XXXII. 31, and reads as follows:—

> For their rock is not as our rock, even our enemies themselves being the judges.

Certainly if the opponents of the Quantitative Classification have visited upon them the fate set forth as awaiting their representatives in the context of this passage from the Song of Moses, the Quantitative Classification of igneous rocks will be firmly established for all generations.

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A REVIEW OF SOME PAPERS ON FOSSIL MAN AT VERO, FLORIDA

In the number of the *American Anthropologist* for the first quarter of 1918 the writer is publishing a paper which deals with the discovery of Pleistocene man in North America. In that paper notice is taken of the literature which had appeared up to the time of writing it on the finding of human remains at Vero, Florida. Since then other articles on the subject have appeared, and I feel constrained to review briefly some of them. One of these papers is the official account of Dr. Hrdlička.[1] The gist of this account is found in these words:

> The only satisfactory explanation of the conditions can be found in the assumption that the remains are those of intentional burials.

Naturally, this means satisfactory to the writer of the report; for six other men have furnished explanations on the same subject, each apparently satisfactory to its author, and all differing much from that of Dr. Hrdlička. At least three of those six men are experts in the solution of geological problems, but not one of the six sustains Dr. Hrdlička in his theory of intentional burial. Meanwhile he hardly attempts to remove the difficulties which beset his assumption. His method may be defined as the easy one of solution by fiat.

[1] Rep. Sec. Smithson. Inst. for 1917, p. 10.

Three papers on the same subject appear in the *Journal of Geology* for October–November, 1917. They are the outcome of a week's collaboration and consultation at Vero on the part of Drs. E. H. Sellards, R. T. Chamberlin, and E. W. Berry. No comment is here made on Sellards's paper; for, so far as Sellards has expressed himself, the present writer is in accord with his views.

Dr. Berry's paper deals especially with the fossil plants found in the muck bed; but he discusses other important matters. He concludes that the muck deposit and, of course, the stratum of sand beneath it, belong undoubtedly to the Pleistocene; that the human remains were not buried intentionally; and that man lived there contemporaneously with the extinct vertebrates. He generously excuses Dr. Chamberlin's theory of the in-wash of the fossil bones and Dr. Hrdlička's theory of intentional burial on the ground that the age of the extinct vertebrate fauna had been overestimated. It is to be regretted if these experienced men were constrained to resort to desperate measures in order to save their anthropological theory.

It seems to the writer that Berry assumes to be true too many debatable matters. He says that the shell marl which underlies the other beds at Vero is late Pleistocene in age; and he bases this statement on the asserted fact that its species all now exist in near-by waters. Mansfield's list of mollusks[2] does not exactly support this statement. There are more than a dozen species about which there is doubt of one kind or another. Furthermore, if the molluscan fauna were not essentially that of Recent seas the beds would have to be assigned to the Tertiary.

Again, Berry takes it for granted that the lowest and youngest terrace, the Pensacola, is of late Pleistocene age; but this view lacks confirmation. This terrace is supposed to continue northward into the Talbot of Maryland and thence into the Cape May of New Jersey. The present writer is not inclined to question the conclusion of Salisbury and Knapp that the Cape May was coincident with the Wis-

[2] Ninth Ann. Rep. Fla. Geol. Surv., p. 78.

consin; nor that the Talbot represents about the same period of time. Both of these formations are singularly destitute of vertebrate fossils. On the other hand, the lowest terrace in Florida, Georgia, and the Carolinas is filled with remains of extinct vertebrates down to salt water. At Wilmington, N. C., the great sloth *Megatherium* and horses are found. The latter occur all along the coast of North Carolina, along the Potomac, and on the west shore of Chesapeake bay. The line of horse-bearing localities is then taken up at Swedesboro, N. J., is continued past Philadelphia, and ends at the Navesink Hills. From the Potomac to Raritan bay it keeps far away from the Atlantic coast. In the Fish House clays, opposite Philadelphia, considerable horse remains have been found. By the New Jersey geologist these clays are regarded as belonging to the Pensauken formation; and this is referred to the early Pleistocene. The vertebrate fossils appear, therefore, to connect the lowest terrace of the south Atlantic states with the Pensauken, rather than with the Wisconsin. Berry's admission that the Vero deposits may be as old as the Peorian shows that he does not believe that any connection with the Wisconsin drift has been established.

The writer contends likewise that the Pensacola terrace has not yet been geologically correlated in the Mississippi Valley with any definite glacial stage.

Inasmuch as Berry grants that the Pensacola terrace may be as old as the Peorian interglacial stage he and I need have no quarrel about the age of the Vero muck bed. He may perhaps yet come to acknowledge that it may be as old as the Sangamon.

As regards Dr. Chamberlin's paper it may be stated that he has decided to abandon his theory of the secondary inclusion of the vertebrate fossils—"unless all other explanations fail." He asserts (p. 667) that the dates of the appearance of man and of the disappearance of the extinct animals were among the very points brought into question and could not themselves be used as decisive criteria. With that part of this statement which concerns man I agree; but with that which regards the vertebrates I dissent. The time when those vertebrates lived and when they disappeared is to be determined by their relation to the deposits in which they have been found in a thousand or more other places in our country; and it is legitimate to apply the knowledge gained therefrom to the situation at Vero. Chamberlin seems to respect rather lightly the vertebrate fossils, for he believes that the time relations of the deposits were quite well indicated by the physical criteria, irrespective of their fossil contents. He believes, with Berry, that the marine marl bed and with it the Pensacola terrace is late Pleistocene in age. The writer takes this occasion to say that if the geologists can prove that proposition it will at once end the dispute about the time of the disappearance of the fauna represented at Vero; and vertebrate paleontology will become once more indebted to geology. Pending that proof I shall maintain, on the evidence of the vertebrate fossils, that that terrace belongs to the early third of the Pleistocene.

Dr. Chamberlin's faith in the value of fossils seems to be somewhat livelier when, in order to determine the age of the human relics at Vero, he cites the age of European pottery and men's bones; but what connection has been established between the use of pottery in Europe and its use in America?

It is not a little amusing to observe that the camels and horses and their fellows, which under the designation of a "Pliocene fauna" were used at Table Mountain to combat the existence of early man, are now, at the other, far distant, end of the line, mustered in as a "mid-Recent fauna" and called into service to continue the same war.

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SPECIAL ARTICLES

THE ANIMAL CENSUS OF TWO CITY LOTS

ASIDE from articles by McAtee, Banks and Herbert Osborn,[1] very little attention has

[1] McAtee, W. L., "Census of four square feet," SCIENCE, Vol. 26, pp. 447–49, 1907; Banks, N., "A 'census of four square feet,'" SCIENCE, Vol.