to securing a wider interest in this extensive field. No other man could have brought a wider knowledge or a more skillful hand to this noble task and the accomplished work is a credit to its author and to his country.

G. A. Miller

University of Illinois

Additional Studies in the Pleistocene at Vero, Florida. Pages 17–82, 141–143, from the Ninth Annual Report of the Florida State Geological Survey, 1917.

The pamphlet, just arrived, comprises five articles of particular interest to anthropologists: one by Professor E. W. Berry, of Johns Hopkins University, on Fossil Plants; one by Dr. R. W. Schufeldt on Fossil Birds; one by Dr. O. P. Hay, of the Carnegie Institution, on Fossil Vertebrates; and a final paper (with a supplement) by Dr. E. H. Sellards, state geologist of Florida, summing up the evidence and the discussion to date with reference to the antiquity of the associated human remains. The three special papers, it should be noted, are concerned mainly with data from stratum No. 3, *i. e.,* the top formation in and at the base of which most of the human remains occur. Of the organic forms found here those either totally or locally extinct are given approximately as follows: mollusks 0 per cent., turtles 50 per cent., birds 33 per cent., mammals 40 per cent., and plants 20 per cent. Dr. Sellards deems this record consistent and after affirming that the exposed Vero section shows "distinct uninterrupted lines of stratification beneath which human materials are found," pens his conclusions in these words: "The human remains and artifacts are contemporaneous with extinct species of mammals, birds, reptiles, and at least one extinct species of plants, as well as with other animal and plant species that do not at the present time extend their range into Florida. The age of the deposits containing these fossils according to the accepted interpretation of faunas and floras is Pleistocene."

The full significance of these remarks is of more than ordinary importance. With the findings of specialists in the fields of geology and paleo-biology no anthropologist will be disposed readily to take issue; and the writer in particular, having spent only a few hours at Vero, is in no position to challenge directly any of the alleged facts; but he ventures, nevertheless, to offer some remarks having general bearing on the situation as now developed.

In the first place, anthropological literature records a score or more of isolated archeological discoveries (Dr. Hay cites some of them) which, because of attending circumstances, have by some been adjudged proofs of extraordinary human antiquity and which thus lend substantial support to the appearances at Vero. Many of these discoveries, like the one before us, are of the *bona fide* sort, requiring no affidavits, and they range from the Tertiary gravels of California to the glacial deposits of New Jersey. Nevertheless, whatever the merits of these data, they have not been generally accepted because their acceptance, in view partly of the known conditions of paleolithic Europe, involved tremendous difficulties in the way of assumptions rather than doing away with them. At the same time it can not be doubted that these very finds have directly inspired many students to the investigation of artificially stratified deposits, both in caverns and elsewhere with a view, if possible, to obtaining supporting evidence that would ultimately result in the credibility of these isolated and questionable discoveries. Now, up to the present time, although this indirect effort has been continued for more than a generation and has ranged geographically from Alaska to Patagonia, nothing satisfactory has come of it. Within the United States alone, both cave and mound deposits have repeatedly been shown to record a considerable range in cultural development, but the associated faunal remains of even the oldest strata have never yielded any but modern species; and this, so far as the published data goes, is true also for the shell mounds of Florida. Under those circumstances no archeologist can be expected to relinquish at once his scepticism concerning the Vero discovery.

In the second place, anthropological investigations go to show that of the fundamental primitive arts, pottery-making, for various obvious reasons, is of relatively late date in culture history, throughout the world. The archeology of the eastern United States seems particularly clear on this point. Thus, it has been demonstrated over and over again that the lower strata of artificial deposits from the Ozark uplift to the Atlantic coast and from lower New York state to Florida are devoid of ceramics. Narrowing the field to the east coast of Florida, we have on record several independent determinations (one by the writer only last spring and not yet published) to the effect that the shellmound people did not at first possess any pottery at all, that after a time they began making a plain dull-reddish earthenware, and that finally, some time before the arrival of European explorers, they took to ornamenting this ware by impressing upon it some simple geometric patterns.

Now pottery fragments, apparently of the undecorated variety, occur also in the Vero deposit, and the archeologist, rather than accepting an extraordinary hiatus in his own data, will be disposed to consider the section in which it was found to be synchronous with the middle period of the local shellmound occupation. To accept the Vero date at its present face value would compel him not only to relegate the development of pottery to an unheard of date but also it would oblige him to assume that this early culture of Pleistocene times was snuffed out and that after some millenniums marked by the arrival of the modern fauna a new and lower type of culture became established which only after a very considerable period reached the level of the original culture. Such a happening is conceivable, but it is not plausible.

So far as the writer can see, the archeologists can do very little more than they have done already toward the solution of the Vero problem. Extended investigation by an archeologist would in all probability yield nothing, because on the real points at issue he would always have to defer to the geologist and the paleontologist. If we could persuade the paleontologist to satisfy himself about the fauna of the shellheaps something might result. Errors of identification may have been made in the past. If he can close the gap between the shellmound fauna and that of the Vero section nobody will be happier than the passing generation of archeologists. But even then the complete solution will not have been reached because we shall still be facing a situation which appears to require one of two things: either the anthropologist must surrender not only his present lightly held opinion regarding the antiquity of man in America, but also his rather more firmly fixed notion regarding the order and progress of cultural traits in general, or else the paleontologist must concede us a very much narrower margin of time as having elapsed since the close of the Pleistocene than he has hitherto.

N. C. NELSON
THE AMERICAN MUSEUM OF NATURAL HISTORY

SPECIAL ARTICLES

A NEW METHOD FOR INVESTIGATION OF THE PERIPHERAL NERVOUS SYSTEM, MUSCLES AND GLANDS

IN preparing and preserving animals for investigation of the gross anatomy of the peripheral nervous system, muscles and glands, simple methods commonly in use have not proven very satisfactory.

For the study of anatomical structures alcohol does not differentiate sufficiently either to separate the parts from each other or from surrounding tissues. Aside from its cost, moreover, alcohol is open to the objection that it makes the parts brittle. Formalin has been used with better results and is now the standard means employed in preparing, and particularly in preserving, portions of the central nervous system. While both these reagents are preservatives of the peripheral nerves, muscles, and glands, neither is a satisfactory preparative for their dissection.

A successful fluid for this purpose should not only preserve, but it should also differentiate the anatomical systems from each other and bring to view the constituents of the