The specimen is virtually perfect, although apparently somewhat emaciated. How it was swallowed is not explained, but it is evident that its sharp dorsal spines would hold it in place once swallowed. The specimen was presented to Stanford University by Dr. Toyoji Nishiyama, of the Municipal Hospital at Kuverme, at the suggestion of Dr. Chiyomatsu Ishikawa, of the Imperial University of Tokyo.

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SCIENTIFIC BOOKS

Human Origins, a Manual of Prehistory. By GEORGE GRANT MACCURDY, *Ph.D.* Vol. I, *The Old Stone Age and the Dawn of Man and his Arts,* 440 pages; Vol. II, *The New Stone Age and the Ages of Bronze and Iron,* 516 pages. D. Appleton and Company, New York.

A READER whose interest in the prehistoric archeology and ethnology of Europe is professional will scrutinize the qualifications of the author of any work on this subject before turning over the pages of the work itself. Such a reader will desire to know whether or not the author has a first-hand knowledge of his subject. What experience has he had in the excavation of archeological sites? Does he know the collections of prehistoric material in European museums? Is he competent to pronounce upon geological and paleontological questions? Is he a physical anthropologist? Unless he is satisfied with the qualifications of the author, the worker in the field of knowledge dealt with will decline to give serious consideration to his writings.

In the present instance the reader may proceed to the perusal of "Human Origins" with complete confidence that it is the output of a competent scientist writing within the field of his own special knowledge and experience. Dr. MacCurdy has been trained in the methods of European prehistoric archeology and in the technique of physical anthropology by the foremost Continental authorities in these subjects. For many years he himself has conducted excavations in prehistoric European sites; his writings have furnished American anthropologists with the latest information on progress of the science in Europe; he is one of the two or three Americans who are recognized abroad as authorities on European prehistoric archeology. Further, he brings to bear upon European questions his extensive experience in the archeology and physical anthropology of the New World.

To a teacher of European prehistory the outstanding merit of Dr. MacCurdy's work is its comprehensiveness. It deals with the entire prehistoric period. It does not leave the reader stranded on a terminal moraine in the company of fossil men, extinct animals and chipped stone implements. With the exception of Déchelette's great work ("Manuel d'archéologie préhistorique, Celtique et Gallo-Romaine"), now somewhat out-of-date, "Human Origins" is the one satisfactory attempt to carry the prehistory of man in Europe through to the present era in an adequately detailed treatment.

The first volume deals with the Old Stone Age and fossil man. Here Dr. MacCurdy is at his best. Climatic and geographical conditions, prehistoric chronology, types of fossil men and animals, industries and arts of the various archeological periods—all these subjects are thoroughly discussed, but with due regard for their relative importance. A disproportionate amount of space is not allotted to any particular feature. MacCurdy does not build his book upon some one aspect of prehistory, subordinating all other subjects to that of his own specialized knowledge and interest. A few crucial points in this volume should be noted. The author accepts the Foxhall eoliths of the Pliocene period; he assigns the Acheulian industry to the Rissian glaciation and places the beginning of the Mousterian industry in the third interglacial (Riss-Würm) period; he regards the Piltdown mandible as human, but is not certain that it belongs with the associated brain-case fragments. The section on fossil man is concise but complete. In the opinion of the reviewer, Dr. MacCurdy does not sufficiently consider the evidence pointing toward the existence of an essentially modern type of man in the Lower Paleolithic Age.

The second volume is devoted to the Mesolithic, Neolithic, Iron and Bronze Ages and to valuable appendices dealing with the stratigraphy of paleolithic sites and with the distribution of paleolithic art and of prehistoric monuments. Appreciation of the inclusion in this work of a summary of the early metal periods has already been expressed. What the author has to say of the Bronze and Iron Ages is, so far as it goes, excellent. But of the 918 pages of text, plates and bibliography included in the two volumes, only 52 pages are devoted to the Bronze Age, and the Iron Ages are crowded into 71 pages. Yet from the historical, ethnological or archeological viewpoints these are the most important periods of European prehistory. Fossil man is accorded 136 pages of discussion and recent man receives a scant 7 pages. There is no adequate treatment of late prehistoric and proto-historic racial movements. The reviewer does not cavil at the thorough and detailed treatment of the Paleolithic Age to which Dr. MacCurdy has devoted the bulk of his work. He only regrets that the author did not extend his treatise sufficiently to satisfy also the acute academic need

for a full discussion of the later periods. Civilization, after all, is cumulative and the nearer the archeologist approaches to the historical period the more extensive his material becomes and the more numerous and vital are the problems which he must endeavor to solve.

"Human Origins" is the most useful manual of prehistory available to readers of English. It surpasses the work of Déchelette in its superior grasp of problems of physical anthropology. The illustrations of MacCurdy's work are also more numerous and better. The classical French work is, however, better balanced. The scant notice accorded to the archeology of the Eastern Mediterranean area is less excusable in a general manual of prehistory than in a work primarily concerned with the archeology of France. But, without a doubt, students of prehistory are to be congratulated upon the publication of this scholarly treatise which is the work of no amateur but of a dependable authority.

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SPECIAL ARTICLES

ELECTRIC TRANSPORT OF FLUID ACROSS MAMMALIAN SEROUS MEMBRANES

EXPERIMENTS performed during the past year have shown that the serosae of mammals are amphoteric membranes. If the membrane is bathed in dilute blood or buffer more alkaline than a certain critical hydrogen-ion concentration and traversed by an electric current, the liquid streams through the membrane toward the cathode. With buffers more acid than the reversal point, streaming is toward the anode. A reversal in sign of the electrokinetic potential difference[1] between the membrane pore walls and the liquid in the pores is thus indicated.

The mesenteries of anesthetized living dogs, cats and rabbits, the mesenteries and parietal pericardia and pleurae of the same species, post-mortem, and two human pericardia, post-mortem, have thus far been tested. These membranes are essentially sheets of connective tissue, bearing blood vessels, lymphatics and nerves, and in some instances, fat cells, lined on each surface by a single layer of pavement mesothelial cells. Intercellular fibers form the major bulk of the lean membranes; these are predominantly collagenous except in the pleural sheet between pericardium and diaphragm where elastin fibers may be present in large proportion.

The reversal point of a complex, amphoteric membrane may be defined as that concentration of H-ions in a given solution within the pores of the membrane, traversed by an electric current, at which the total electroendosmotic current through the membrane is zero.

The mean values of the reversal points with citrate-phosphate buffers for all tissues studied have been between pH = 4.3 and pH = 5.3. By using buffers alternately more acid or alkaline than the reversal point the direction of liquid flow across any given membrane site may be reversed an indefinite number of times. The time interval required is only that taken for the requisite manipulation in changing buffers and making the runs.

The buffers used have been dilutions of McIlvaine's[2] citric acid-sodium phosphate mixture and certain isotonic, physiologically balanced buffers. The latter were citrate-phosphate mixtures containing Na, K and Ca in the proportion of Ringer's solution, and made isotonic by the addition of glucose or of glycerin. The glycerin buffer was found preferable.

The mean values of the reversal points for the several membranes when bathed in the hyptonic unbalanced buffer and in the isotonic, physiologically balanced buffers showed only small and inconstant differences.

The fat and lean membranes in each category similarly showed small if any difference in the positions of the mean reversal points.

The apparent reversal points for the mesenteries of living animals proved to be lower than those for the mesenteries post-mortem. This low value in the animals with functioning circulation has been interpreted as essentially due to admixture with the buffers of buffer salts from the blood. Distinct differences have not been detected between the reversal points of the membranes in the first compared with later hours or days post-mortem, with the possible exception of a small shift toward the acid range of the fat pericardia reversal points when tested several days post-mortem.

The approximate mean reversal points found with the citrate-phosphate buffers were as follows: for mesenteries of living animals, pH = 4.4; for pleurae, post-mortem, pH = 4.6; for mesenteries, post-mortem, pH = 4.8; for lean and fat pericardia, post-mortem, pH = 5.1. The mean reversal point estimated for the human pericardia was about pH = 5.0. The concentration of hydrogen-ions requisite for reversal of the membranes with these buffers containing polyvalent anions is greater than with an acetate buffer.

The ready reversibility of the membranes would seem to indicate that their charging, *i.e.*, electrokinetic p. d., is ultimately dependent largely upon the dis-

[1] Freundlich, H., and Gyemant, A., *Ztschr. f. physik. Chem.*, 1922, c, 182.

[2] McIlvaine, T. C., *J. Biol. Chem.*, 1921, xlix, 183.