PHYSIOLOGICAL PHENOMENA

Analisis Experimental de los Fenomenos Fisiologicos Fundamentales. By JOSÉ J. IZQUIERDO. xxii + 334 pp. Mexico, 1939.

DR. IZQUIERDO presents in this volume, which has been prepared for serious students of biology, a well-selected series of illuminating experiments accompanied by explanations and by stimulating questions. The procedure is that of letting the experiments lead the student from observations on physical and physico-chemical states and processes to observations on the properties and responses of living structures as affected by these conditioning agencies. Thus, diffusion, osmotic pressure and the characteristics of solutions are first considered, and then these phenomena are applied to an understanding of changes induced in simple biological units. Similarly, hydrogen-ion concentration, colloidal solutions and properties of interfaces, the polarization of membranes, chemical equilibria and the processes of oxidation and reduction are dealt with in such manner as to yield insight into an understanding of biological events. The final sections of the book are devoted to the phenomena of excitability and the contractions of cilia and muscles. Throughout, the student learns not only the important facts of general physiology but the application of the physical and chemical methods which are employed in examining biological responses to experimental tests. An introduction to the use of mathematics in evaluating data obtained by experimentation is a feature of the discipline imposed by the book. Frequent references to the original investigators whose experiments the student repeats bring him in touch with the masters of the subject.

In a preface Dr. Merkel H. Jacobs has characterized Dr. Izquierdo's book as "an admirable introduction to the fundamental principles of physiology." This judgment is well warranted. Spanish-speaking students who follow Dr. Izquierdo's excellent experimental course in the basic aspects of biological reactions should not only be very soundly instructed but should be stimulated to further studies.

WALTER B. CANNON

SPECIAL ARTICLES

SPERM AGGLUTINATION IN THE KEYHOLE LIMPET AND THE SEA-URCHIN

THE spermatozoa of the giant keyhole limpet, *Megathura crenulata,* show a striking agglutination reaction upon addition of egg water. The reaction differs from that described by Lillie[1] and Just[2] in the sea-urchin and other animals in that it does not spontaneously reverse. Instead of the clumps breaking up they continue to enlarge by fusion with one another and, in a sufficiently high concentration of the agglutinin, one large agglutinate forms containing most of the sperm. The spermatozoa agglutinate by the tips of their tails as well as by their heads. The agglutinates are spherical in shape with a thin shell of sperm heads at the surface separated from the central mass of sperm by a distance roughly equal to the length of the tail. In small agglutinates, the tips of the tails occupy the center. The reaction resembles that described by Sampson[3] for chiton sperm and by Henle, Henle and Chambers[4] for bull sperm in anti-sera. The head agglutination is, however, not due to a separate head agglutinin present in the egg water but represents an aggregation reaction.

The limpet agglutinin precipitates in nearly saturated ammonium sulfate, and it is retained by a collodion membrane. By these means active concentrates have been prepared. The preparations give definite xanthoproteic, Millon's and biuret tests. The agglutinin is inactivated by solutions of crystalline trypsin or chymotrypsin (supplied by the courtesy of Dr. J. H. Northrop). Complete inactivation is obtained in 6 days with 1 per cent. chymotrypsin at pH 8 and 22° C.; in 7 days with 1 per cent. trypsin. The controls retain practically their full activity during this period. During the first 3 to 4 days of digestion there is no appreciable loss of activity. After complete inactivation of an agglutinin solution of such titer as to give, when mixed with an equal volume of 1 per cent. sperm, a 10 second macroscopic reaction, the formol titration showed 8×10^{-6} equivalents of $-COOH$ per ml. of solution for the trypsin digests and 13×10^{-6} for the chymotrypsin.

In the sea-urchin, *Arbacia punctulata,* Glaser[5] reported obtaining no definite protein tests except for a faint xanthoproteic reaction. In *Strongylocentrotus purpuratus* we obtain, with material prepared by $(NH_4)_2SO_4$ precipitation and dialysis of concentrated egg water (care being taken to avoid injury to the eggs), the same protein tests as with the limpet. Also, the sea-urchin agglutinin is rapidly inactivated by one of the crystallized proteinases, namely, chymotrypsin.

[1] F. R. Lillie, "Problems of Fertilization," The University of Chicago Press. 1919.
[2] E. E. Just, *Protoplasma,* 10: 300, 1930.
[3] M. M. Sampson, *Biol. Bull.,* 50: 301, 1926.
[4] W. Henle, G. Henle and L. A. Chambers, *Jour. Exp. Med.,* 68: 335, 1938.
[5] O. Glaser, *Biol. Bull.,* 26: 367, 1914.