PREFACE

Although ciliary movement was first observed by van Leeuvenhoek about the middle of the seventeenth century, it was not until 1834 that Purkinge and Valentin discovered the ciliated epithelium on the oviductal walls of the vertebrates. From that year, cilia may be said to have become the subject of serious physiological study.

In some cases the movements of an animal's body are due to the activity of muscles, but in others corresponding movements are effected by cilia. Since the mechanical powers of a cilium are slight in comparison to those of a muscle fibre, it is not surprising to find that most movements of large or active vertebrates are executed by muscles. In such organisms, cilia are restricted to limited regions of the body, and their functions, although important, are not spectacular. On the other hand, in very small animals or in invertebrates where the velocity of movement is very low, cilia and not muscle fibres often play the dominant rôle as organs of contraction and locomotion. The importance of ciliary movement in the life of many invertebrate animals has now become abundantly clear, and in most cases the ciliated surfaces are co-ordinated in a way quite unknown in higher animals. A comparative account of such ciliary mechanisms is urgently required, but in the present volume I have adopted a physiological rather than a morphological point of view.

Since muscular units are of overwhelming importance for the movement of vertebrate animals it is natural that physiological text-books should give only a brief account of the properties of ciliated epithelium. Those interested in the physiology of the lower animals may feel, however, that ciliary movement deserves more adequate analysis than it has yet received, and since so few facts have been established, it seemed desirable to set forth our knowledge in such a form as might indicate the possibilities of further research.

Any real conception of ciliary movement must eventually rest on a proper understanding of the hydrodynamical problems which

are involved. At present, little is known of the forces which surround very small elongated structures when they are moving through water at very low speeds. In a few places I have tried to indicate the value of such knowledge and in doing so I have run considerable risk of error. Should such errors attract attention and thereby lead to a better understanding of the facts, one of the main purposes of the book will have been fulfilled. To even a casual reader it will be obvious that I have not restricted myself to a statement of established facts, but have expressed, too freely perhaps, hypotheses which are not always capable of experimental test.

To all those who have read and criticised the manuscript I owe my sincere thanks. I also have to acknowledge permission to reproduce many of the diagrams.

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27 *October* 1927