

Preface

The diversity and adaptations of the several million species that make up the Animal Kingdom provide endless fascination and delight to those that love nature. Not the least of this pleasure derives from a consideration of how the bodies of animals function. At first it might appear that with so many kinds of animals adapted to such a variety of life styles and environments, the task of even beginning to understand and appreciate the physiology of animals would be overwhelming. Fortunately (for scientist and student alike), the concepts and principles that provide a basis for understanding animal function are relatively few, for evolution has been conservative as well as inventive. The basic principles and mechanisms of animal physiology form the central theme of this book.

A beginning course in physiology is a challenge for both teacher and student because of the interdisciplinary nature of the subject. Not all students, even by their junior and senior years, have had exposure to all the chemical, physical, and biological subject matter required for an adequate background. On the other hand, most students are eager to come to grips with the subject and get on with the more exciting levels of modern scientific insight. For this reason, I decided several years ago to prepare a textbook in animal physiology that presents the essential background material in a way that allows the student to review it on his or her own. In that way it is hoped that the student is led gently but quickly to the ideas and principles of animal function and an understanding of their experimental elucidation.

Thus this book was written with the student's comprehension the major consideration.

This book attempts to develop the major ideas in a simple and direct manner, stressing principles and mechanisms over the compilation of information, and illustrating the functional strategies that have evolved within the bounds of chemical and physical possibility. This is done with examples selected from the broad spectrum of animal life, ranging from the protozoa at one end to our species and other vertebrates at the other end. It is the common principles that have been stressed, however, rather than the exceptions. Thus the more esoteric and peripheral phenomena have intentionally received only passing attention, if, indeed, any at all, so as not to distract from central ideas. Math is used where essential, but priority is given to the development of a qualitative and intuitive understanding rather than to quantitative derivations.

The ideas developed in the text are illuminated and augmented by liberal use of illustrations and parenthetical "boxes." Other pedagogical aids are a 1000-word glossary and various chapter end materials, including summaries, exercises, suggested readings, and lists of literature cited. References to the literature within the body of the text and in legends have been made unobtrusively, but hopefully with enough frequency so that the student becomes aware of the role of scientists and their literature in the development of the subject. The text often uses the device of a narrative describing actual, composite, or thought experiments to provide a feeling for methods of investigation while presenting information.

Originally I set out to write this book alone, but it became evident that this would take too long and spread my efforts too thin. I was fortunate, therefore, to have been able to enlist the collaboration of David Randall of The University of British Columbia to write the two chapters on respiratory and circulatory physiology.

The chapters of this book can be grouped into five sections. The first two chapters are intended primarily as introduction and for review of the essential physical and chemical background not covered in later chapters. Chapters 3 and 4 are devoted to a survey of cell energetics and regulation of the intracellular milieu. Chapters 5 through 8 deal with excitable membranes, nerve signals, sensory mechanisms, and the function of the nervous system. Chapters 9 and 10 consider the phenomena of contractility and motility, and Chapters 11 through 14 cover the systems (endocrine, osmoregulatory, respiratory, and circulatory) responsible for the homeostasis and supply of the internal environment. Certain special topics, such as temperature regulation, reproductive mechanisms, and adaptations to stressful environments, are considered along with those subjects to which they are most closely related, an approach that we feel is appropriate for an elementary book that stresses the general principles of animal function.

Finally, I would hope that our readers will not hesitate to help us with their suggestions for improvements and corrections for the next edition.

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