Animal mechanics

How Mammals Run: Anatomical Adaptations. By P. P. Gambaryan. Pp. xiv+367. (Israel Program for Scientific Translations: Jerusalem; Wiley: New York and Chichester, April 1975.) £10.80.

GAMBARYAN and his colleagues have assembled a large body of knowledge on terrestrial locomotion which has hitherto been available only in Russian, and little known in the West. They have dissected, and measured the limb bones and muscles of, about a hundred species from seven orders of mammals and filmed nearly half these species running at various speeds. Their data was collected, with data from other sources, and translated into English.

The book includes a large collection of illustrations traced from film sequences and still photographs. There are a great many illustrations of small mammals, as well as of the larger ones which are well illustrated in other books such as Muybridge's *Animals in Motion*. These illustrations are well chosen, and Gambaryan makes good use of them. His comparison of the gallop and ricochet and discussion of the circumstances in which each evolved is particularly interesting.

The data on muscle weights is extensive, but of limited use. Gambaryan is well aware of the significance of moment arms, cross-sectional areas and pennation patterns, but tells us little about them.

Recent Western research on terrestrial locomotion has used a wide variety of techniques including light and X-ray cinematography, electromyography, force transduction and measurement of oxygen consumption. The Russian work reported in this book used a more restricted range of techniques. No X-ray cinematographs or measurements of oxygen consumption were made. Electromyography was carried out but only on the cat, duplicating work done in the West. Force platforms were used but they were capable of registering only vertical components of force.

Much of the book is devoted to comparisons between mammals, some of which are most enlightening but others are unconvincing because of lack of rigorous mechanical analysis. Assumptions are made about the directions of the forces exerted by feet which conflict with all force platform records, including those in Manter's paper of 1938 (which is cited). The attempts at theoretical mechanical analysis are more ele-

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One of Muybridge's illustrations

mentary and less penetrating than the analysis in Smith and Savage's paper of 1956 (which is cited). There is no appreciation of the roles of elastic storage of energy or of negative work in running.

This is a valuable book but it is not an adequate account of current knowledge in this subject.

R. McNeill Alexander

Structural Materials in Animals. By C. H. Brown. Pp. xv+448. (Pitman: London, July, 1975.) £10.50.

STRUCTURAL studies on the fibrous molecules of skeletal systems in organisms were important contributions to the early growth of Molecular Biology. Nowadays it is more fashionable to identify Molecular Biology with the study of enzymes and nucleic acids, and the problems involved in synthetic, metabolic and genetic processes. Happily, the fibrous molecules have not been entirely neglected. Several excellent books on the chemistry and conformation of structural biopolymers have appeared recently. Dr Brown's addition to this literature is a thorough, somewhat laborious, account of how and where these materials occur throughout the animal kingdom. Her book is aimed primarily at zoologists, who will be familiar with the standard textbook approach.

An elementary introduction to the chemistry, conformation and molecular organisation of the main structural molecules prefaces detailed descriptions of their occurrence and incorporation into skeletal structures and tissues in each phylum from Protozoa to Chor-

data. A short chapter on decay of structural materials is followed by some general conclusions in which an attempt is made to develop a more comparative theme. The style of writing is clear, direct and unpretentious, but in common with many similar catalogues of research results, the narrative is apt to be pedestrian. In general the illustrations are well chosen for their good quality and pertinence to the text, but some diagrams seem to be superfluous. For example, the diagram showing the comparative volume of coelenterates occupied by mesogloea may have done much to clarify the original article from which it has been taken, but in this book it adds little to the accompanying text.

There are a number of trivial factual mistakes, and the text is littered throughout with spelling and printing errors—a deplorable feature which is all too common in scientific volumes nowadays. But the worst feature of this book is the inexcusable and inordinate number of bibliographical errors. So many authors' names are mis-spelled in the text or reference list, and sometimes in both. One particular name is spelled in three different ways in the space of two pages, whereas some others appear in two different versions on the same page. Inattentive proof reading—or none at all—has devalued what is otherwise a useful book. Such errors may not deter the general reader, but for research workers who may wish to consult this book these mistakes will be a constant source of irritation. Furthermore, it is very frustrating when (on at least one occasion) a paper quoted in the text is not listed in the references.

W. Kenchington