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have enough now to experiment in a brain science that melds physics and psychology to finally explain consciousness.

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BIOLOGY AS ENGINEERING


The field called biomechanics is now about a century old, conceived as the science describing the mechanics of biological tissues. It represents a continuation of the much older tradition of Borelli and Perrault, who aimed to characterize the ways animals functioned. During the last three decades, the term biomechanics has been coopted by engineers. The evolutionary pursuit of understanding mechanics is then referred to as functional morphology, whereas biomechanics is devoted to forming the basis of a set of practical applications. For engineers, the ultimate aim has been an understanding of physical aspects of biological structures to facilitate the design of prosthesis, sports equipment, and tools and similar applications.

This book (the third in a series entitled "Biomechanics," including The Mechanical Properties of Living Tissues [1981] and Circulation [1984], from the same publisher) derives from this engineering tradition. It is written in a style requiring a substantial background in physics and mathematics, and the examples presume the kind of previous training common in engineering curricula. The extensive equations, partial differentials, and matrix algebra may scare off many biologists. The writing style is reasonably terse and quite clear. Whereas the text uses and may introduce these mathematical methods and principles, the text is probably insufficient to justify their use or train the student adequately in their broader applications.

The sequence of chapters treats many topics previously reviewed by Y. C. Fung and his group. They range widely, across motion and vibration, external influences in flying and swimming, flow of blood and respiratory gases, muscle atrophy during space flight, diffusion, healing of surgical wounds, physical conditions of tissue grafts, mass transport, and the mechanical properties of tissues and organs. The examples mention pulmonary function tests, stress and strain in the mammalian heart, tests for the strength of soft tissues, engineering for trauma prevention, the types and design of wings, and sports techniques; however, the treatment of the musculoskeletal system is specifically omitted as being beyond the scope of this book. The organization of material into chapters and the assignment of space is somewhat idiosyncratic and probably reflects the availability of practical applications more than a theoretical series of physical principles. Each discussion is followed by an extensive series of problems and a brief set of references (one to two pages per chapter).

Recently, a number of books on nonzoological biomechanics has been published that offered little more than an explanation of the simplest stress-strain relations. Although this book does not address questions in evolutionary biology, it certainly and clearly offers much more than many of the earlier technique-oriented texts and will repay study by students of functional morphology. The well-designed illustrations clarify many issues; they are supplemented by a curious but pleasant assemblage of Chinese sketches associated with poetic sayings. The printing is in a clear font and there are author and subject indices of equivalent length.

In some cases, understanding the principles will require some ancillary reading. Not all the examples will
prove to be pertinent or necessarily correct; however, readers able to navigate this rather complex account will be exposed to an interesting treatment of a diverse topic. They are likely to find themselves stimulated to solve many biological problems not even alluded to here.

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NEW TITLES

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