

Otto Wolfbeis, discuss chemical sensors in much greater depth. A serious researcher would certainly have to consult those texts, or something similar to them, to find out the complete story of chemical sensors.

Jiri Janata

*Georgia Institute of Technology
Atlanta*

Physics of the Human Body

Irving P. Herman

*Springer, New York, 2007. \$129.00
(857 pp.). ISBN 978-3-540-29603-4*

Sometime this year the Scientific Foundation for Future Physicians Committee will issue a report reevaluating the basic science training of future physicians. The effort is jointly sponsored by the Howard Hughes Medical Institute and the Association of American Medical Colleges. The anticipated outcome of both the committee's work and a proposed follow-up conference on introductory physics for the life sciences will be a set of recommended competencies in basic science that will most likely define new standards for medical-school admissions and the Medical College Admission Test. Thus Irving Herman's *Physics of the Human Body* comes at a propitious time for a careful rethinking of how physics should be taught to pre-medical students and for designing a curriculum that goes beyond the foundational physics topics clearly required for the study of other sciences.

The text is a welcome alternative approach to introductory physics for pre-medical students and is an excellent prelude to topics in bioengineering. Medically oriented physics texts at the introductory level are few and far between and sometimes out of date, although readers will find in Herman's book a helpful and thorough bibliography of similar works. Herman, a professor in and chair of the applied physics and applied mathematics department at Columbia University, developed the book from lecture notes he used to teach an engineering course. His intensive engagement shows in the quality of the prose and the extensive and interesting set of problems accompanying each chapter.

Because the author's interest is in using physics rather than in teaching the subject from scratch, the level is more appropriate for a second-semester course that follows an introductory me-

chanics course or for a second-year sequence that includes the book's chapters on advanced topics such as feedback and control. The author suggests that instructors use the text as a companion book for a sequence of physics courses for the life sciences. Herman presumes that students will be comfortable with integral and differential calculus and willing to use simple applications of ordinary differential equations.

The book's emphasis is on the macrophysics of body physiology, a subject highly relevant to first-year medical students. However, in a few instances, the microphysics is also described, notably in the chapter on the molecular mechanisms behind muscular activity. The book does not cover topics in biomaterials, biophysics, and medical physics, such as applications of radiation in therapy and imaging. The organization varies appropriately between topics related by a common physical basis (for example, fluids, metabolism, statics of the body, and applications of electricity and magnetism) or by body systems (cardiovascular, respiratory, auditory, and visual).

One novel and useful feature of Herman's book is the first chapter, which is a self-contained guide to medical terminology, including anatomical terms and the systems used by physicians for describing the body's orientation and motion. Students and physics instructors will appreciate the author's inclusion of a pronunciation guide and handy tables of physiological data for modeling a standard (male) human body. Also appealing is the author's canny inclusion of topics engaging to students. He includes the design of sports equipment and apparel to optimize their athletic utility while minimizing the potential for injury, the mechanics of bone fracture, and a thorough analysis of the energetics of weight loss in which Herman wryly defines the "standard donut" as a unit of measurement.

In short, *Physics of the Human Body* contains much to enrich the training of life sciences students and help them appreciate how even basic physics is increasingly important to medicine. Although the book requires a real commitment on the part of physics instructors who are unfamiliar with physiology, its pedagogical approach makes it a suitable textbook.

Suzanne Amador Kane

*Haverford College
Haverford, Pennsylvania*

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