in the book, this reviewer would rate it highly compared with other publications having similar topics and formats. It is easy to read and permits a rapid selection of those chapters or sections pertinent to a reader's immediate need.

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Heat Transfer, J. P. Holman, McGraw-Hill, New York (1972). 462 pages. $13.50.

Elementary textbooks which introduce a potentially difficult subject without overly rigorous mathematical treatments and yet without oversimplification are not very common. Professor Holman has succeeded in writing a well-balanced text in heat transfer for the beginning engineering student. The student is introduced to the concept of energy balances in the very first chapter where the three-dimensional heat conduction equation is derived and convection and radiation are also introduced. Since, however, only a background in ordinary differential equations is considered a prerequisite, the subsequent chapters on conduction either consider cases which are easily reduced to ordinary differential equations or, when this is not possible, simply present the solutions. By including a chapter on the elements of fluid mechanics, Professor Holman makes it unnecessary to have a course in fluid mechanics as a prerequisite. The derivation of the laminar boundary layer equation and the use of the von Karman momentum integral equation are clearly demonstrated. Turbulent effects, separation of boundary layers, and more complicated geometrics are accounted for by including a chapter on empirical relations for forced convection heat transfer. The best chapter in the book is that on radiation heat transfer. By means of careful diagrams and step-by-step derivations, shape factors are explained and with extensive use of the electrical analogue solutions, too, complicated radiative heat transfer cases have been illustrated. This use of the electrical analogue will be of considerable help to the student's understanding of the subject. The chapter on heat exchangers is adequate for an elementary text, as also that on condensation and boiling heat transfer where empirical relations have been presented. Insofar as the chapter on mass transfer shows the student the analogy between heat and mass transfer, it serves its purpose; otherwise it is quite inadequate and would be better ignored. The last two chapters are what may be called in today's parlance *relevant* and introduce the student to such concepts as magnetofluidynamic systems, ablation, and to heat transfer in the environment. The treatment shows how the field of heat transfer participates on the frontiers of present-day technology and also how products of technology and natural heat sources combine to affect our ecology. There are numerous examples solved in the text, and references cited at the end of each chapter would satisfy any interested student's needs.

There are two minor deficiencies in this book. In a book presenting as many correlations between dimensionless groups as this one, no discussion of dimensional analysis appears. Also, despite the author's claim in the preface, there are few problems at the end of the chapters which extend the subject matter or challenge the student's understanding of the subject.

Although I would not recommend this book as a reference volume, as indeed it is not intended to be, people in industry who need an elementary text, and beginning engineering students will find this a thoroughly satisfactory book.

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Transport Phenomena in the Cardiovascular System, Stanley Middleman, Interscience, New York (1972). 299 pages. $19.95

The Transport Phenomena phenomenum has spilled over into physiology and related fields, with a generally beneficial effect. Author Middleman has studiously surveyed the literature which deals with engineering-type analyses of cardiovascular mass and momentum transfer and compiled some of this material into a very readable book. The purpose of the book is to show both engineers and biologically-trained readers how the transport phenomena approach can be utilized in physiological and biophysical studies.

The material covers the mechanical properties of the large blood vessels, pulsatile flow of a Newtonian fluid in large vessels, the flow properties of blood and blood flow in small vessels, models of oxygen transfer within blood and from blood to the surrounding tissue, mass transfer across semipermeable capillary walls, compartment models of the circulatory system, single organs and the entire human body, and microscopic-level models of organs. Usually, the results of modeling are compared with experimental data.

The various topics are treated in varying degrees of completeness. The discussion on the mechanics of large blood vessels is very good, probably reflecting the author's interest since this topic is closely related to his area of expertise. On the other hand, the section on blood viscosity and the dynamics of the microcirculation is relatively weak: important work is not mentioned; viscometric data on red cells suspended in saline, on defibrinated ox blood, and on red cells in plasma (blood) are all incorrectly considered representative of human blood behavior; a constitutive rheological equation valid over a limited shear rate range is used over a wider range, an invalid peripheral layer model is presented to describe blood flow in small diameter tubes, etc. These omissions or confusions probably arise because the author has not been involved with research in this area and is mainly repeating the work reported in a narrow selection of the pertinent literature. However, most topics seem to be presented at a competent level.

A partial differential equation is the main starting point of most of the book's presentations. Bessel functions and complex numbers occasionally show their faces. The interwoven text does a good job of introducing background information, in smoothly carrying the mathematical development along, and in relating the model results to experimental facts. A good senior or graduate chemical engineering student should be able to read and understand this book with little difficulty. Most physiologists probably do not have the mathematics background needed to fully appreciate the book.

For a person whose curosity about the interaction between chemical engineering and medicine needs to be satisfied, this is an excellent book. For the person interested in initiating research in this area, the book is still an excellent survey point, but sections of it may be incomplete or incorrect to varying degrees of seriousness. The book also can be advantageously used as a starting point in developing material for chemical engineering courses.

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