BOOK REVIEWS

Heat and Mass Transfer in Gasoline and Diesel Engines
Edited by D. B. Spalding and N. H. Afgan
Hemisphere Publishing Corp., $120, 650 pp.

This book contains the papers presented at a conference on internal combustion, engine heat and mass transfer in Yugoslavia in 1988, arranged by the International Center for Heat and Mass Transfer. It includes fifty papers from the United States, Europe, Asia, and Australia, arranged under the following headings: Engine Heat Transfer, Vaporization and Spray, External Heat Transfer, Numerical Flow Simulation, Applications and Devices, Ignition and Quenching, and Measurement Techniques.

Since there is no dearth of conferences on engines these days, an important question regarding this book is: does it add anything new to our understanding of engine processes? Its value lies in its focus on the heat transfer (and to a lesser extent mass transfer) phenomena that have an important impact on engine operation. The available literature on engine heat transfer is limited, and it is helpful to collect in one volume papers that contain experimental data on engine heat transfer rates, scaling relationships for predicting the magnitude of engine heat transfer, numerical simulations of engine flow processes where heat transfer is important, the overall energy analysis of engines, and heat transfer measurement techniques. This book is the proceedings of a conference and has the inevitable unevenness in quality that goes with that; however, its focus, engine heat transfer, makes it a useful reference source.

John B. Heywood

The New Heat Transfer
Eugene F. Adiutori
Ventuno Press 1989, $29.95, 434 pp.

This is the second edition of a book originally published in 1974 that generated some controversy at that time among the heat transfer fraternity. The essence of *The New Heat Transfer* is an emphasis on the development of "free form" descriptions of thermal (and other) behavior on the grounds that they encourage one to think about the true relationships between dependent and independent variables. A consequence is that it is necessary to discard various contrived parameters, such as heat transfer coefficient, thermal conductivity, electrical resistance, pipe friction factor, etc.

One objection to these terms is that they say little, if anything, about the functional relationship between variables, e.g., in $q = h\,\Delta T$, h is nothing more than a ratio of $q/\Delta T$; it has no fundamental meaning. A second objection is that all too often h and the other "coefficients" are assumed constant when, in fact, they are not, leaving students and researchers with a sort of tunnel vision when attempting to explain experimental data on natural phenomena. The author's case is that one should work from $q = f(\Delta T)$ and develop only the functional relationship between heat flux q and the temperature difference ΔT. Introducing h is unnecessary and may even be a hindrance in solving problems.

Anyone who has struggled to convince first year engineering students that accelerations, for example, are seldom constant will sympathize with the author's aims. In principle, he has some serious points to make and he presents a number of worked examples to develop his concept of thermal behavior.

It is a pity therefore that his style of writing, especially in the early chapters, is egotistical and unnecessarily provocative. A number of claims are made but not really substantiated. Without giving or explaining the solution, statements such as "My solution was obviously correct because it was so simple," are not constructive. Nondimensional groups such as Nusselt and Reynolds numbers, friction factors, etc., are dismissed out of hand, and the need for dimensional consistency in equations is "obviously irrational." Yet sections dealing with designing experiments, selecting the important parameters, data reduction, the use and abuse of power laws and log-log graphs, etc., are important and need saying.

About 25% of the book focuses on electrical science, and the author makes a few sorties into kinematics and pipe flow. The remainder of the book develops the new heat transfer, with some emphasis on pool boiling and thermal stability. The material might have been arranged in the form of two sections, or even monographs. One could be on the use of free form or functional relationships for handling nonlinear phenomena, and the other could concentrate on thermal behavior and heat transfer.

In its present form, despite the important points that the author seeks to make, it is unlikely that the book would be adopted as a major course text.

A. R. D. Thorley