

## BOOK REVIEWS

B. N. Yudaev

### TEXTBOOK ON "HEAT TRANSMISSION"\*

Reviewed by B. M. Smol'skii

The science of heat and mass transfer has been developing very rapidly during the past few years, the number of problems studied is increasing, more insight is gained into the physical aspects of phenomena, and the entire research apparatus is expanded as well as improved. More information is exchanged about latest progress in the field of heat and mass transfer, which tends to raise the scientific content of articles and monographs.

The new textbook on "Heat Transmission" by B. N. Yudaev covers problems which have not been considered before or have only been touched upon in the earlier scientific literature.

For instance, an entire chapter is devoted to the heat transfer at the stagnation point of a body; a great deal of attention is paid to heat transfer processes in high-velocity gas streams; problems are discussed concerning the effect of dissociation processes on the heat transfer, problems of aerodynamic heating, and heat transfer in rarefied gases. All these problems have been tackled intensively during the past years. They are amply covered in the textbook to the advantage, of course, of readers specializing in these areas.

The chapter on "Heat Emission at High Gas Velocities" is a long one and deals with very complex problems. The author has managed, without too much effort, to explain modern methods of analysis and design, being helped in this by his rational organization of the material in the preceding chapters and thus by providing in proper sequence what is needed for analyzing the problems in this chapter.

It is noteworthy that, for the analysis of such complex problems as heat transfer in a turbulent boundary layer at high gas velocities, the author makes use of a rather intricate mathematical apparatus and, in this way, is able to familiarize the reader with modern engineering design methods. The author explains these methods and their simplifications, while also thoroughly enough explaining the intricate mathematical techniques: such a systematic approach must be applauded. The textbook describes various successfully used approaches. For example, Chapter VII on "Study of Heat Emission by Methods of the Boundary-Layer Theory" has been added by the author as a general theoretical introduction to the study of specific problems concerning the transfer processes in moving media and considered in subsequent chapters. Such an organization is, beyond any doubt, a rational one.

Here is another example. B. N. Yudaev has succeeded, in a rather simple way, to demonstrate the effects of the quite complex compressibility and dissociation phenomena on the heat transfer, by comparing the heat transfer processes near critical points of a body at moderate gas velocities (Chapter VIII) with those at high gas velocities (Chapter XI).

Proper attention is paid in this textbook to the use of numerical methods for the solution of heat transfer problems. The gist and the capability of these methods are illustrated on examples of heat conduction (Chapter VI). The fundamentals of generalized analysis are presented here in a fully up-to-date fashion (Chapter III).

At the same time, there are also a few deficiencies in the book. This reviewer believes that numerical examples and problems should have been included so as to make it easier for the reader to grasp the theoretical content. Furthermore, Chapter XIV on "Heat Exchangers" should have been expanded so as to include problems involved with various methods of effectively increasing the rate of heat transfer.

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On the whole, B. N. Yudaev has written the textbook on "Heat Transmission" in a modern scientific style, utilizing the more prominent work of both foreign and Soviet scientists, himself included. The selection and the layout of the material are excellent. There is no doubt that a good modern textbook has thus been made available to students of machine design and aviation at higher educational institutions.

We wish the author further successes in his useful endeavors.