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BOOK REVIEW

Introduction into the Similarity Theory: A. A. GUKHMAN. Gosizdat "Vysshaya Shkola", Moscow, 1963.

THE similarity theory is widely used in the work of Scientific Research Institutes and Plant Laboratories as the method of correlation of experimental data and the basis of simulation of processes which proceed in various apparatuses. The fundamentals of the similarity theory of thermal processes, at one time developed by A. A. Gukhman and M. V. Kirpichev, were assumed a basis for essentially the whole bulk of experimental investigations into heat and mass transfer in moving media. Wide use of the similarity theory and a study of some new processes, in addition to the previously investigated ones, produced interesting and new results which are valuable to the engineer and which widen the knowledge of the physical processes being studied. In a number of cases, however, the application of rather simple formal apparatus of the similarity theory without understanding its physical nature led to wrong correlations and quantitative relations.

In A. A. Gukhman's monograph the fundamentals of the similarity theory are stated in relation to the modern development of science and problems facing the present investigators. The interpretation of the formal apparatus for the similarity theory covers only two chapters, its contents in the main being devoted to the physical nature of the similarity theory as a guidance to the generalized variable characteristics of each process being studied. In the third chapter a boundary problem is considered and basic criteria are given which characterize processes in solid media in the presence of temperature field and motion of particles. In the fourth chapter similar transformations and simulation of processes are discussed. Finally the fifth chapter deals with dimensional method and correlates the similarity problem with dimensional analysis.

The whole book is aimed at the interpretation of the ideas which constitute the similarity theory, at the analysis of their physical meaning and at revealing the relation between these ideas and the mathematical apparatus of the theory.

The nature of the generalized analysis and generalized variables is clearly presented, the correlation and relationship between the similarity theory, its modelling, analogue transformation and the analysis of dimensions are found. The basic ideas are illustrated with examples of particular problems, the effect of one or another generalized co-ordinate being analysed over a wide range of its variations. Consideration of typical limiting values of the generalized co-ordinates allows both the physical nature of the dependence of the studied process on the criteria in question and the relation between the parameters characterizing the process to be clearly presented. Such a composition of the text in conjunction both with distinct physical statement of the questions and their profound analysis has led to an original and outstanding book.

A. A. Gukhman's monograph will find its own broad section of readers and become a handbook for each scientist and engineer engaged in heat and mass transfer.

Unfortunately in the monograph the author has not touched upon the specific conditions and criteria set, characteristic of heat transfer in moving media at high flow velocities.

Some not quite successful author's statements on p. 9 should be pointed out which can make a wrong impression as far as the rôle of numerical methods for the problem solution and experimental investigations is concerned. It is also desirable that the section dealing with modelling of more complicated problems, such as those of the flow of conducting media and liquid metals, be somewhat expanded.

The above remarks do not lower the general appreciation of the book, which is a considerable contribution to heat- and mass-transfer theory.

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