

RECEIVED

AUG 15 1974

IN REPLY  
REFER TO

AT

J. P. HOWE

AT

DATE August 13, 1974

SUBJECT Book Review - The New Heat Transfer by Eugene F. Adiutori, Ventuno Press  
(Cincinnati, Ohio), 1974

It is my recommendation that the book not be formally reviewed for the Annals of Nuclear Science and Engineering.

A reading of the book indicates that it is more a propoganda device for the author's ideas than a serious attempt to offer useful contributions to the field of heat transfer. The nuclear energy field has been a boon to developments in heat transfer with significant advances being made in both theory and application. Therefore, I don't feel that Nuclear Science and Engineering should be the forum for a formal review of this book which expounds ideas that would amount to a giant step backward in heat transfer.

Although not meant to be a detailed review, the following comments formed the basis for my recommendation.

1. The author proposes to discard the convective heat transfer coefficient,  $h$ , in favour of data being presented as heat flux versus temperature difference ( $q$  vs.  $\Delta T$ ). The reason presented for this is that  $h$  is a function of  $\Delta T$  and  $q$  vs.  $\Delta T$  is in reality non-linear. The proposal is not new and has never been adopted because the concept of  $h$  is quite useful. Even though  $h$  is a function of  $\Delta T$ , it turns out to be a weak function of  $\Delta T$  for single phase systems. In two-phase systems (boiling liquids)  $h$  loses its usefulness and it is the customary practice to present data as  $q$  vs.  $\Delta T$ . However, because  $h$  is not useful in two-phase heat transfer that is no reason to abandon it for single phase systems.
2. The problems of Chapter 2 and 3 are artificially contrived by the author to show the advantages of his so-called "new" heat transfer. The tone of these chapters, and indeed, the entire book is negative. The author could have made a valuable contribution by pointing out that the first step of solving some practical problems is to prepare a graph of  $q$  vs.  $\Delta T$ . This is a convenient starting point for a certain class of problems and it is reasonable to expect the analyst to calculate the information from existing correlations. It isn't necessary to invent a "new" heat transfer for a special class of problems.

3. In Chapter 4 the author discusses his invention of "dynamics and stability" in heat transfer. What he is really making reference to is perturbation analysis and it was not necessary to define new words for an old concept. He decries the fact that no textbook deals with these subjects even though his articles on the subject appeared long ago. I would agree that many textbooks don't treat practical engineering methods but that is an entirely different subject. Again the author could have made a valuable contribution by describing a technique for determining the reliable and safe performance of a thermal system which is an important step in any design. Instead he took an option which obscures the purpose and method for treating the subject.
4. By Chapter 5 the author has gotten up to full stride in regard to defining terms which do not correspond to accepted useage in technology. One does not have to be a mathematical purist to be appalled to read that "some nonlinear equations" include  $y = 3.2 x +14$  and  $y = 1.567x$ . I don't know whether this is just a misprint or oversight but there seems to be little point in the authors redefining words and making an issue over the difference between the equations  $y = mx+b$  and  $y = mx$ .
5. In Chapter 6 the author attacks dimensional analysis. This seems ludicrous in light of the fact that the technique of dimensional analysis was very instrumental in unifying much of heat transfer. His arguments against dimensionless analysis are distortions stating (1) that it is useless unless all the assumptions are correct, (2) that it clouds the mind, (3) that it is not scientific and (4) that it undermines the literature. All bunk! In the course of his discourse the author invents a dimensionless number which he calls the Jenner number. It is customary to name a dimensionless number after some eminent worker who has made a contribution in the field but he fails to explain the reason for this choice. (Who is Jenner?) All valid dimensionless numbers have physical meaning; for example, the Reynolds number is the ratio of inertial forces to viscous forces. The "Jenner number" is the product of the Grashoff, Nusselt and Prandtl numbers and has no physical interpretation that I can determine.
6. Chapter 7 is devoted mainly to a criticism of boiling heat transfer. His contention is that the nucleate boiling and film boiling regimes should properly be correlated as a linear function of  $\Delta T$  rather than as  $\Delta T^n$  with the magnitude of n ranging from 2-4. If he is correct, a book is no place to hide these results. They should be stated in a technical note or article and submitted to any one of several journals. In this chapter, as well as the former, he attacks dimensional analysis as being responsible for researchers correlating heat transfer by means of power laws and argues that log-log graph paper be banned. He apparently doesn't appreciate that so-called power laws are results not a priori assumptions. Also there is no restriction on anyone plotting results from a log-log representation to a linear one. Making an issue of log-log plots and creating a new heat transfer from such insignificant arguements doesn't make sense.

7. Chapter 7 is an expansion of the authors definition of "dynamics". The chapter is fraudulent. It deals with the problems of fluid flow and only considers heat transfer by analogy. There is nothing wrong with using analogous concepts but if the author can't illustrate the technique on a realistic problem in heat transfer the entire subject should be omitted.

In summary, the authors "new" heat transfer would set the technology of heat transfer backward. His proposals, if adopted, would mean a return to "handbook engineering" and the unifying concepts in heat transfer and the chance for new discoveries and deeper meaning would be lost. It is curious that, although the author repeatedly refers to "new" and "21st century" engineering there is no reference to computers and numerical techniques. Apparently he believes all problems can be solved by looking up a plot of  $\dot{q}$  vs.  $\Delta T$ .