

Progress in Heat and Mass Transfer, Vol. 2, Eckert Presentation Volume. Pergamon Press, Oxford (1969). 499 pp, £12.

THIS volume of the monograph series is dedicated to Professor Ernest Rudolf George Eckert on the occasion of his 65th birthday. The volume has become a nice and very well deserved birthday present to Professor Eckert containing 29 original contributions from 57 authors. It is quite evident that the present review cannot give proper attention to all contributions and that the papers commented upon more in detail reflect the reviewers interests rather than indicate any rating of importance.

To some extent it may seem as if the book is edited to cover certain classes of problems. Free convection is thus treated between finite vertical plates by Novotny, in thermally stratified fluids by Eichhorn, in a horizontal layer of air by Goldstein and Chu, by heating from above by Luikov, Berkovskii and Fertman, from downwardfacing horizontal surfaces of finite dimension by Singh, Birkebak and Drake. The effect of baffles on transient natural convection of a confined fluid is treated experimentally by Pollard and Carlson, and the stability of laminar natural convection boundary layers has been treated by Knowles and Gebhart. The wall jet with reference to film cooling is treated by Kacker, Pai and Whitelaw and the transpiration cooling correlations for air and non-air free streams is given new attention by Simon, Hartnett and Liu. Hartnett has with Sastri as co-author also investigated the effect of an unheated solid starting length on skin friction and heat transfer in a transpired laminar boundary layer.

The melting ablation for two-dimensional and axisymmetric blunt bodies is treated by Ching-Jen Chen and Ostrach. This is a very interesting paper with the fundamental problem kept so general that not only are gas and liquid solutions at the interface matched, but even the shape of the ablating body is to be determined from first principles. So is also the temperature at this interface as well as the heat transfer and the melting rate. However, in view of his own work, the reviewer wants to point out that the Oseen-like approximation made in the fundamental equations describing the liquid flow will prevent a description of the ablation patterns observed on reentry vehicles. The formation of such patterns seems at least under certain conditions to be a part of the ablation problem, which indicates that fundamental equations failing to exhibit such phenomena may perhaps not always be adequate for describing the problem at hand. A related problem is treated by Koh, Price and Colony when considering the heat and mass transfer with two moving boundaries. This is an attempt to study the heat shield of reentry space vehicles in terms of the single space dimension normal to the surface with the main emphasis placed on the two-phase material of the shield.

Kestin and Wood have a very interesting paper on enhancement of stagnation-line heat transfer by turbulence. They use a cylinder in cross flow and show how stream-wise directed vortices will appear in the flow. The enhancement of heat transfer is attributed to the appearance of such vortices. It is usually accepted that such vortices will appear as a result of instability in the flow, but the authors' examination of theoretical investigations on this point seems to indicate that part of this problem is not yet really under-

stood. The authors give a very nice contribution to a field in which several people at the moment are eagerly seeking new information.

A study of heat transfer from rotating heat exchangers is given by Eisele, Leidenfrost and Muthunayagam which may be more closely related to the previous paper than is immediately apparent from the paper itself. Another interesting paper on heat transfer at very high Prandtl numbers is given by Soehngen.

Spalding presents a paper on the length scale of turbulent in some shear flows remote from walls. He bases his arguments on Rotta's differential equation for the rate of change of the length scale of turbulent motion and succeeds at least partially in explaining several of the puzzling features of free turbulent flows.

A series of articles are concerned with the boiling problem. Subcooled transient film boiling of water on a horizontal wire is treated by H. Yen, Jackson and Pitts. Beer has given a rather extensive contribution to the transfer of heat at boiling and Burmeister and Schoenhals concern themselves with the effect of pressure fluctuations on laminar film boiling. Closely related to the boiling problem is also the paper on bubble growth rates in non-uniform temperature fields by Mikic and Rohsenow.

Another set of contributions is concerned with electric arcs and plasmas. Anderson treats the very difficult problem of the curvature and the stability of an electric arc in cross-flow. Wutzke and Pfender treat the electrical breakdown and anode heat transfer in a d.c. arc with superimposed axial flows and J. T. Yen gives his contribution on the thermal properties of highly nonequilibrium plasmas. Petrie and Pfender have an article on the sweeping wire probe for the study of local heat transfer in plasmas.

By mentioning that Haji-Sheikh and Sparrow discuss the probability distributions and error estimates for Monte Carlo solutions of radiation problems, that Grigull and Straub discuss the temperature dependence of surface tensions in the critical area, that Luikov, Shulman, Puris and Zhdanovich present an experimental study of rheodynamics and mass transfer in a forced non-Newtonian fluid flow around bodies, that Carofano and McManus, Jr. present an analytical and experimental study of the flow of air-water and stream-water mixtures in a converging-diverging nozzle and that the transport properties of the hydrogen-methane systems are discussed by Ibele and Desmond, all contributions in the volume have been listed. It should finally be mentioned that the academician A. V. Luikov gives a very nice tribute to Professor E. R. G. Eckert in addition to the dedication which is signed by R. J. Goldstein, J. P. Hartnett, W. E. Ibele and T. F. Irvine, Jr.

The reviewer takes great pleasure in complimenting Pergamon Press for its high standards in preparing this volume, and, in joining the ranks of those who pay tribute to Professor Eckert, he can only recommend the volume to everybody who is interested in this important field of engineering science.

LEIF N. PERSEN

*Institutt For Mekanikk
Norges Tekniske Hogskole
Trondheim, Norway*