contain any difficult mathematics. The result of the author's own work in the field, which has extended over many years, the book represents an attempt to extend the range of applicability of thermodynamics particularly to include metastable states.

The first part of this two-part book is devoted to classic thermodynamics, of which the treatment is excellent. It covers, with emphasis on its difficulties and limitations, the most important concepts in the field, such as the equation of state; the law of conservation of energy; temperature; entropy; the Kelvin-Planck and Clausius principles; and the general thermodynamic system of Gibbs.

The second part is a presentation of generalized thermodynamics. The author's basic postulate is that a thermodynamic system has more degrees of freedom than are usually assigned; by virtue of this metastable states may be incorporated into the equation of state, enlarging the scope of this equation and the scope of thermodynamics. Agreement of the generalized point of view with the laws of conservation of energy and the Kelvin-Planck and Clausius principles is demonstrated and is followed by a discussion of systems in which energy is dissipated, of systems in which energy changes occur under equilibrium and nonequilibrium conditions, and of phenomena at low temperature and absolute zero.

A discussion of the potential character of entropy leads to the conclusion that entropy is not a function of state in a system of more than two independent variables and that this demands new criteria of equilibrium and stability of systems. Near the end of the book the enthalpy and latent heat are calculated for ammonia and water from an explicit equation by use of pressure, volume, and temperature as the independent variables. The agreement is excellent for ammonia and good for water.

The author is to be complimented for a thought-provoking work.

HOWARD LITTMAN

Reader Reaction

HEAT TRANSFER

The introductory paragraph of the article "Heat Transfer to Water in an Annulus" by Miller, Byrnes, and Benforado, published in the December issue of the *Journal*, contains a statement which I fear might mislead someone into repeating old research. The statement that ". . . literature contains only a limited amount of data for annular flow heat transfer . . ." seems hardly appropriate to me when the proper paragraph in "Perry" [J. H. Perry, "Chemical Engineers' Handbook," McGraw-Hill Book Company, Inc., New York] lists about nine articles, in the bibliographies of which will be found at least thirty other references to similar work.

The general tone of these articles parallels the conclusions reported in this article, to the effect that the conventional equation underpredicts the coefficient, but further research would show that the divergence is not neatly relatable to any physical dimension.

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