## Letter to the Editor

Recently the review of my supplemental paperback **A Different Approach to Thermodynamics** in your July issue has been called to my attention. I feel that this review is so unfair that it demands a reply. To answer all its allegations would make this letter much too long. Therefore, I shall consider a few of them, hoping that readers of the review will check the book to judge for themselves on the other criticisms of it.

The reviewer states that Chapter 4 of the book "deals with phenomena almost entirely outside the realm of thermodynamics." However, a careful reader will note that this chapter is primarily concerned with the conductance method of evaluating ionization constants. For many people, ionization constants are an important part of thermodynamics.

The reviewer criticizes my statement that $C_v$ is $3/2R$ for an ideal gas, and then goes on to say that the definition of an ideal gas is concerned only with intermolecular forces. On the contrary, the ideal gas equation assumes not only that the molecules have no forces acting among them but, also, that the molecules have no volume. This is the reason that many people regard the ideal gas as a collection of points that can have only translational energy; hence $C_v$ is $3/2\ R$ for the ideal gas. Consequently, to speak of a monatomic or diatomic ideal gas is another of the so called "semantic absurdities" with which the book attempts to cope.

In criticizing my discussion of another so called "semantic absurdity", the reviewer says that he fails to see the distinction the book makes between the expressions *irreversible process* and *spontaneous change*. If he had included one of my examples readers of the review would have been able to judge for themselves whether the distinction is valid. The book states that the reaction between Zinc and Copper Sulfate, at 25°C. and with all activities concerned equal to one, is a *spontaneous reaction* regardless of the manner in which it is carried out. When this spontaneous reaction is effected by mixing the reagents in a beaker, so that no work is done, that method is the most *irreversible process*. Other methods in which increasingly larger amounts of work are done by a motor connected to a cell in which the same spontaneous reaction is effected are less irreversible. The one method of effecting the same spontaneous reaction in which the maximum limit of work is done is (in the hypothetical limit) the *reversible process* for effecting the given *spontaneous reaction*.

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COMMUNICATIONS TO THE EDITOR

ERRATUM

## INFORMATION RETRIEVAL

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**A generalized B-W-R equation of state,** Edmister, W. C., J. Vairogs, and A. J. Klekers, **AIChE Journal, 14,** No. 3, p. 479 (May, 1968).

**Key Words:** A. Equation Of State-8, Generalized Constants-8, Hydrocarbons-9, Least Squares-10, Density-4, 7, Critical Temperature-6, Critical Pressure-6, Acentric Factor-6, Pressure-4, 7, Enthalpy-4, Carbon Dioxide-9.

**Abstract:** The Benedict-Webb-Rubin Equation of State has been generalized by expressing the eight constants as functions of critical pressure, critical temperature, and acentric factor.

**Local and average interphase heat transfer coefficients in a randomly packed bed of spheres,** Gillespie, Bernard M., Edward D. Crandall, and James J. Carberry, **AIChE Journal, 14,** No. 3, p. 483 (May, 1968).

**Key Words:** A. Heat Transfer Coefficients-7, 8, Spheres-9, Packed Beds-9, Fixed Beds-9, Heat Transfer-7, 8, Entrance Region-6, Boundary Layer-9, Position-6, Design-4, Reactors-9, Catalyst-10.

**Abstract:** Local and average heat transfer coefficients were measured for a sphere in a randomly packed bed. Average heat transfer coefficients were measured at twenty-five positions permitting the assessment of the effect of position. An entrance region limited to the first two particle layers in the bed was verified. Distributions of the local heat transfer coefficient os the surface of a single sphere in the top layer and in the nineteenth layer of the bed were also measured. These distributions indicate that a laminar boundary layer exists over portions of the sphere surface.

**Quasilinearization, difference approximation, and nonlinear boundary value problems,** Lee, Stanley E., **AIChE Journal, 14,** No. 3, p. 490 (May, 1968).

**Key Words:** A. Quasilinearization-8, Two-Point Boundary Value Problem-4, Nonlinear Ordinary Differential Equation-4, Numerical Solution-8, 10, Tubular Reactor-9, Finite Difference Method-8, 10, Runge-Kutta Method-10, Numerical Stability-8, Axial Diffusion-9, Tridiagonal Matrix-10, Arrhenius Equation-4.

**Abstract:** A finite difference method combined with the quasilinearization technique is used to solve the nonlinear two-point boundary value problems. This method does not have the stability problem connected with the marching integration techniques. A scheme which can be used to reduce the rapid access memory requirements of digital computers is also proposed. The steady state equations resulting from mass and energy balances in a tubular reactor with axial diffusion are solved by this method. With very poor initial approximations, only three to seven iterations are needed to obtain the correct answer.

**Free tear sheets of the information retrieval entries in this issue may be obtained by writing to the New York office.**

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Other examples to show that *spontaneous reaction* and *irreversible process* are not synonymous are given in the book. This distinction is part of the different approach to entropy and free energy developed in Chapter 2. The reviewer says he "was unable to find the 'different approach' indicated in the title." However, the reviewer of the book for the *Journal of Chemical Education* wrote as follows: "Ample justification of the claim to a 'different approach' is to be found especially in Dr. Luder's clear and original exposition, in the second chapter, of the concept of entropy and of the relationship between entropy and free energy."

The examples I have mentioned are typical. I believe that careful readers of the book will find that most of the reviewer's other allegations are also unfounded.

W. F. Luder
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## ERRATUM

In "A Method of Finding Simultaneously the Values of the Heat Transfer Coefficient, the Dispersion Coefficient, and the Thermal Conductivity of the Packing in a Packed Bed of Spheres: Part 1, Mathematical Analysis" by G. A. Turner [Vol. 13, No. 4, pp. 678-682 (1967)], several errors should be corrected in the Appendices.

In Appendix A, the equation immediately following the sentence "Substitution of Equation (2) into Equation (1) gives" should read

$$\exp\,(i\omega t)\,\Big[\,P\frac{d^2\overline{E}}{dx^2}-\frac{d\overline{E}}{dx} - i\,[(\epsilon\omega L)/(U\epsilon')]\overline{E} - 3\,[(1-\epsilon)hL)]/[U\,\epsilon'\,r_o(\rho c)_g]\,(Q+iR)\overline{E}\exp i\phi\Big] = 0 \text{ at } \chi = 1$$

In Appendix *B*, Equation (*B*1) should read

$$\frac{d\Pi}{dn} = \text{function }(g, b) = \text{function }(\lambda, X) = \text{function }(Q, R, \phi)$$

and Equation (*B*2) should read

$$\frac{d\psi}{dn} = \text{function }(Q, R, \phi)$$