Journal of Applied Mechanics

Book Reviews

An Album of Fluid Motion. By M. Van Dyke. Parobolic Press, Stanford, Calif. 1982. 176 Pages. Price $20.00, Clothbound; $10.00, paperback.

REVIEWED BY S. WIDNALL[1]

This book is a unique publishing event in the field of fluid mechanics. Since its arrival, I have seen many small clusters of enraptured graduate students work through its rich offerings. The book contains 166 pages of photographs of fluid motion displaying a wide variety of phenomena, utilizing many different flow-visualization techniques. The only text beyond a short introduction are the figure captions, which contain a description of the phenomenon, an interpretation, and a reference to the original work or a credit.

The phenomena include low Reynolds number flows, separation, vortices, flow instability, turbulence, free-surface flow, convection, subsonic flow, shock waves, and supersonic flow. The book has the power to excite and inform students about the complexity of possible fluid motions, arising even in simple geometries. Its price is low and its quality is so high that instructors can recommend it without reservation as a supplemental text or for independent study at both the undergraduate and graduate level. No faculty member who teaches fluid mechanics should be without a copy.

The clothbound version would make an ideal gift or coffee-table book for any one with an interest in the natural sciences. The high artistic quality of many of the photographs will also appeal to those of a more general audience who chance to come upon this book.

One unfortunate feature is the absence of color photographs. Although there are many such photos available, which would have added to the appeal of the book, it is clear that they would have increased the cost well beyond the current price. This book, at this price, is certainly to be recommended.

Entropy Generation Through Heat and Fluid Flow. By A. Bejan. Wiley, New York, 1982. 248 Pages. Price $39.95.

REVIEWED BY J. KESTIN[2]

It is fair to assume that readers of the JOURNAL OF APPLIED MECHANICS are unaware of the existence of Public Law 95-619-Nov. 9, 1978 entitled *National Energy Conservation Policy Act*. There, on page 3287, we read:

SEC. 683. SECOND LAW EFFICIENCY STUDY.

(a) Study.—(1) The Secretary of Energy, in consultation with the Director of the National Bureau of Standards and such other agencies as he deems necessary, shall conduct a study of the relevance to energy conservation programs of the use of the concept of energy efficiency as being the ratio of the minimum available work necessary for accomplishing a given task to the available work in the actual fuel used to accomplish that task.

Never mind that the ratio of the *actual* available work employed by a device to either the available energy residing in the fuel or to the minimum available work necessary for accomplishing a given task would be more appropriate measures. The fact remains that in 1978, as distinct from 1983, the country was genuinely concerned about its energy future. A. Bejan's book is the outgrowth of that concern in 1978 and earlier. In a number of well-known papers Bejan made the concept of available energy (otherwise known as exergy) accessible in detail to practicing engineers. The present book is a connected and thoughtful restatement of Bejan's very useful contributions.

The basics of the subject are clearly presented in Chapters 1 and 2. Chapters 3 and 5—10 contain applications to fluid flow, convective heat transfer, heat-transfer enhancement, heat exchangers, storage and low temperature. Chapter 11 contains an accurate application of so-called second-law analysis to solar energy which corrects many erroneous earlier analyses and convincingly demonstrates the "high-temperature" nature of solar radiation. In this the author is right, contrary opinions expressed by certain popularizers notwithstanding. Throughout the book, good use is made of the Gouy-Stodola theorem which connects entropy production to losses in available energy (exergy).

Chapter 4, entitled "Theory of Turbulent Flow," constitutes a surprising anomaly. In it the author rejects what most of use have learned, and learned to accept, about the origin of turbulence. He rejects the relevance of the theory of hydrodynamic stability and makes the astonishing statement:

> "It seems that by focusing on the transition regime as a way of explaining the nature of turbulence, researchers have complicated their work beyond need. First let us agree on what a "transition regime" is. It is simply that domain in which *two* different and competing mechanisms fight one another for dominance.

No. We do not agree. Neither do we accept the role the author assigns to the "buckling property of inviscid layers." Chapter 4 should never have been included in this book because, even if it were revealingly correct, its topic is irrelevant to the eminently useful message contained in the remainder of the book.

The last chapter, Chapter 12, by Mary Bejan discusses energy policy in more sociological terms; it is a very good basis for thinking about this aspect of the subject.

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