Treatise on Solar Energy, Volume I: Fundamentals of Solar Energy, by H. P. Garg, John Wiley & Sons, New York, 1983, 587 pages. $56.00

Professor Garg has produced the first of what he promises will be a three-volume set devoted to solar energy. If his next two volumes are as complete and authoritative as his first, he will have indeed produced the long-awaited treatise on solar energy utilization.

This first volume covers only two solar topics: flat-plate collectors (a chapter each on liquid and on air collectors) and solar radiation (prediction and measurement). The other three chapters, which make up just under half of the book, are devoted to world energy resources, "fundamentals" of heat transfer, and the optical properties of materials. Although Professor Garg indicates that "the level of presentation . . . assumes that the reader has had a course in basic thermodynamics, has had some background in physics, and has a knowledge of calculus and ordinary differential equation," I doubt that anyone with this minimal background would get much out of his chapters on heat transfer and radiative properties. And these two chapters are referred to repeatedly in the flat-plate collector chapters. However, the heat transfer chapter is an excellent survey and thorough review (110 references) of heat transfer topics and configurations utilized in solar thermal design.

The book has 70 pages of appendices, including the usual solar tables, plus an extensive glossary, astronomical data for the solar system, the error function, detailed centigrade to Fahrenheit conversion tables (3 pages!), standard steel pipe dimensions, heat transfer data, etc. A unique feature of the book is the exposure given to the large amount of work which has been dome in India on solar energy but which is not widely available in the west.

The book should rapidly become a standard reference book for persons already knowledgeable in solar energy utilization. However, it could not be used effectively as a textbook. The book emphasizes facts, results, and state-of-the-art technology. Little of the explanation could be followed by someone unfamiliar with the topic. This work could be useful as a graduate level textbook, except that there are no numerical examples and no problems included. Also, the high price for Volume I alone might discourage its use.

The book is not without errors. Most are topographical, and these are few. There are some incorrect statements. For example, on radiative transfer, it is stated that "a surface is grey if $\alpha = \epsilon$," and "when a surface is grey the emissive power of the surface is equal to the absorptive power, i.e., $\alpha = \epsilon$." However, there are remarkably few errors, especially when the diversity and number (478) of references is considered. Especially impressive is the fact that even with all the references cited (incidently, I noticed my named misspelled in the author index), most are actually used in the book. That is, there are only a few instances where groups of references are noted but not discussed. On the contrary, the information in the references is summarized, reviewed, critiqued, and compared.

There is a remarkable amount of information contained in the book, and it is up-to-date. It certainly deserves a place on the bookshelf of any serious solar researcher.

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