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to burrow into the mathematics in order to understand the discussion. The first section on acoustic gravity waves—containing fifteen equations in its first two paragraphs—sets the tone for the book as a whole. It is really a reference book for serious theorists; neither its style nor its price would suggest its use as an introductory text. A large and recent (though not comprehensive) bibliography enhances its usefulness as a reference volume.

A few topics are noteworthy by their omission. For example, there is no discussion of the substantial work on acoustic gravity waves generated by atmospheric nuclear explosions, which, because the source was a delta function in space and time, proved particularly useful in elucidating atmospheric wave behavior. However, such omissions are few. In general the book is thorough and deep.

The text is pervaded by passages with stilted English or minor grammatical errors. Although the meaning is usually clear or can be inferred from the context, such passages are distracting. The reviewer is led to wonder why foreign publishers of books in English do not subject their manuscripts to copy-editing by native speakers.

In sum, the book presents a reasonably comprehensive, noncontroversial, well-balanced, mathematically oriented review of the current status of upper-atmospheric physics. Although by no means easy reading, it is likely to find its place as a reference book for those engaged in serious study in this growing field.

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An Introduction to Atmospheric Radiation

K. N. Liou
Academic, New York, 1980. \$32.50

That electromagnetic radiation is essential to the running of the weather machine is incontrovertible: Were there no Sun, weather maps would be quite uninteresting—and irrelevant. But radiation plays subtler roles in the atmosphere than just that of its prime mover. Scattering by molecules and particles provides a wealth of atmospheric displays: sunset colors, rainbows, haloes, and glories. Radiation as a probe is of great practical importance to meteorology: radar to follow storms; infrared and microwave radiation to infer temperature and humidity profiles. Despite its obvious relevance to meteorology, however, radiation as part of the curriculum is often treated like an illegitimate child

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at a family reunion. Part of this no doubt stems from the predominance of dynamics, the study of atmospheric motions, in the minds of meteorologists. Contributing to this neglect has been the absence of a suitable textbook. Although there are several fine monographs on topics of such limited scope as radiative transfer and inversion theory, none of them taken separately meets the needs of instructors of introductory courses. Therefore, the effort of K. N. Liou, who is a member of the meteorology faculty at the University of Utah, to fill this gap with *An Introduction to Atmospheric Radiation* is to be greeted with enthusiasm: The table of contents promises a set of topics that would be ideal for senior and graduate-level courses.

Enthusiasm soon gives way to disappointment, however, as one encounters page after page of awkwardly written prose full of errors in grammar and syntax. The author's consistent inability to use the definite article idiomatically ("Figure 1.8 shows an energy level diagram for the hydrogen.") suggests that English is not his first language. If this is so, the publisher had a responsibility to edit the manuscript carefully. This, however, was not done. No competent copy editor, even one working in haste, could have failed to notice the many glaring errors.

The author, however, must assume responsibility for the conceptual errors: Their abundance seriously flaws the book. Radiometric and photometric units are confused (page 6). In the derivation of the Schwarzschild equation (page 22) the medium is said to be a blackbody, which it is not unless it is optically thick. What is meant is that it emits according to the Planck function. The author repeatedly refers to the refractive index of molecules when he means gases, and on page 79 the refractive index of anisotropic molecules is said to be a vector, which it is not. The derivation of the optical theorem on page 136 is an incoherent and confusing mixture of two approaches. The author's grasp of the physical significance of the complex refractive index is particularly weak: On page 78 the real part is associated with scattering and the imaginary part with absorption; a perfect reflector is asserted to be one with a vanishing imaginary part (page 138).

This book is a collection of formulae unilluminated by physical insight and bound together by uninspiring, unidiomatic prose. Clear physical explanations of basic concepts and physical phenomena are not given. A course taught from this book would pit its author against the instructor, who would have to correct the numerous errors. Indeed, one of my colleagues at another university is using it: Both he

and his students find it confusing and lacking in physical interpretation.

CRAIG BOHREN
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ceedings, Granada, 1980. R. Guardiola, J. Ros, eds. 372 pp. Springer, New York, 1981. \$23.00

Differential Geometric Methods in Mathematical Physics. Proceedings, Clausthal, 1978. H. D. Doebner, ed. 329 pp. Springer, New York, 1981. \$20.00

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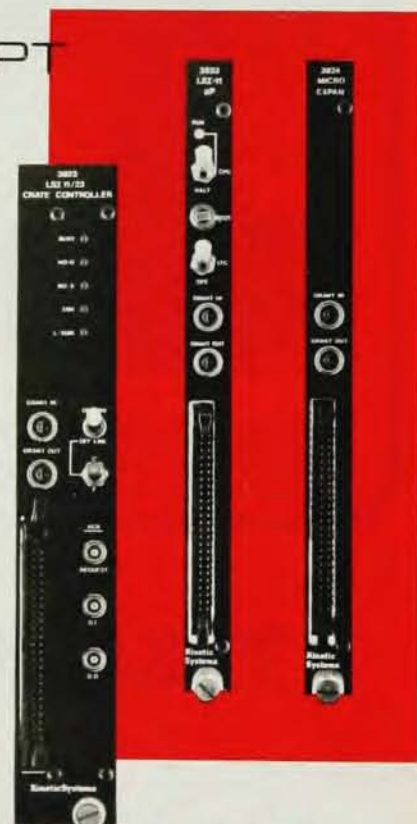
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