favor extensive angular momentum loss by stars, still on the main sequence, that formed at initial separations of at least ten times their sizes (T. Rahunen and O. Vilhu, E. I. Popova *et al.*, L. Milano *et al.*, F. van't Veer), but this may be largely a function of who happened to attend the conference. The most unusual suggestion is undoubtedly that of Z. Kopal, who proposes that the W Ursae stars are really single stars, temporarily simulating binaries!

Most of these points and others addressed in the volume are unlikely to change much our basic understanding of stellar evolution or binary systems. Thus this book is not really a "must buy" for general science libraries, though many of them seem to have standing orders for the series to which it belongs.

VIRGINIA TRIMBLE
Astronomy Program, University of Maryland, College Park 20742 and *Department of Physics, University of California, Irvine 92717*

The Buildup of CO_2

Carbon Dioxide Review 1982. WILLIAM C. CLARK, Ed. Clarendon (Oxford University Press), New York, 1982. xx, 470 pp., illus., + loose map. $35.

This massive and expensively produced volume, printed on high-quality paper no more than 60 percent covered by text, is a multiauthor review of the carbon dioxide buildup in the atmosphere, as things seem in 1982. For the readers of *Science* no more useful account is available. Specialists will have seen much of the material before, though some of it is being published for the first time. All the writers write with the special enthusiasm that for a few years attaches to each new controversy. The list of writers includes Roger Revelle, who with his colleagues at La Jolla was the instigator 25 years ago of the present surge of interest. Today, if we can trust this volume, the buildup of CO_2 is unmistakably real, and the problem is attracting more interest than ever, from the media as well as from the scientific community.

Papers by Robert E. Dickinson and Charles F. Baes, on modeling the climatic response to the buildup and on the role of ocean chemistry, are excellent summaries of present knowledge. Dickinson reduces what is usually seen as a complex problem in three-dimensional modeling to a series of well-thought-out statements of simple physical process. Any scientist could follow him, and I for one am grateful for his account. Baes discusses a medium where large-scale modeling is difficult and where a qualitative grasp of the essential chemistry is a prerequisite to progress. He deals at length with the role of plankton in holding total carbon in surface waters well below the levels that a lifeless and well-mixed ocean would display. If this biotic sink did not exist atmospheric CO_2 pressures would rise strongly, perhaps to three times present levels. Climatologists are used to thinking of the ocean as a sink for CO_2; about half the CO_2 added to the atmosphere disappears, presumably into the ocean. If Baes's analysis is correct, there would be a strong reverse flow if anything happened to reduce the productivity of the plankton. This is a feedback that few climatologists are much aware of.

What emerges from the book in spite of these pellucid essays is a mass of uncertainty. The buildup of CO_2 is a reality, monitored with increasing precision since 1957 and inferred for much earlier dates. A statistical section gives the monitored values to 1980, as well as a review of a long series of measurements made at Mauna Loa by the pioneers of such monitoring, Charles D. Keeling, Robert B. Bacastow, and Timothy P. Whorf. There the confidence ends. The volume is a long litany of uncertainties—of the internal transport processes in the ocean, of ocean-atmosphere interaction, of the magnitude of forest and soil carbon wastage, of the future course of fossil-fuel consumption. Yet something else emerges, too: *if* (the most frequent word in the book) the CO_2 buildup continues, *if* the big general circulation models are right about its impact on climate, and *if* we have not miscalculated the potential role of the oceans, then we face a climatic change in the next century and a half like nothing the post-glacial world, and hence civilized humanity, has seen.

Late in the volume Charles F. Cooper tries to assess what such a change might mean for society. With the commentators on his paper (Sylvan H. Wittwer, Norman J. Rosenberg, and Peter A. Oram) he appears to think that CO_2 buildup implies large economic, social, and political impacts but not necessarily disaster. In fact the direct impact on crops and forest growth may be positive, allowing for technological adaptation. The common prejudgment that all environmental change is bad is absent. No firm conclusion is reached, however; and on present evidence none is possible. Three world agencies—the World Meteorological Organization, the United Nations Environment Programme, and the International Council of Scientific Unions—have the issue of CO_2 buildup on their agendas, because many individuals and even nations see it as a threat to their security. A consensus on possible world action is to be attempted in 1985. Those involved will have to take this volume very much into account.

F. K. HARE
Trinity College, Toronto, Ontario M5S 1H8, Canada

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Advances in Organometallic Chemistry. Vol. 20. F. G. A. Stone and Robert West, Eds. Academic Press, New York, 1982. x, 370 pp., illus. $56.

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Animal Models of Inherited Metabolic Diseases. Proceedings of a symposium, Bethesda, Md., Oct. 1981. Robert J. Desnick, Donald F. Patterson, and Dante G. Scarpelli, Eds. Liss, New York, 1982. xx, 522 pp., illus. $54. Progress in Clinical and Biological Research, vol. 94.

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