Book Reviews

Global Environment

Man's Impact on the Climate. WILLIAM H. MATTHEWS, WILLIAM KELLOGG, and G. D. ROBINSON, Eds. M.I.T. Press, Cambridge, Mass., 1971. xviii, 594 pp., illus. $19.50.

Inadvertent Climate Modification. Report of the Study of Man's Impact on Climate (SMIC). M.I.T. Press, Cambridge, Mass., 1971. xxiv, 308 pp., illus. Paper, $2.95.

Growing numbers of scientists have begun to examine environmental problems, and moreover to present their conclusions in forums accessible to the public and in forms useful to the policymaker. These books originate directly from such efforts. The overlap in subject implied by the titles is more than a coincidence. The larger volume is a compilation of source materials relating to climate from a study of critical environmental problems that took place in Williamstown, Massachusetts, during the summer of 1970, under M.I.T. sponsorship. The editors of this source book were principals in organizing a second, more international study of three weeks' duration last summer, also under M.I.T. sponsorship and with the Swedish Academies of Science and Engineering Science as hosts. The smaller volume is the report of this second study, which was conducted by 30 assorted specialists (mostly atmospheric scientists) from 14 countries. In both studies the participants, with an eye to the United Nations Conference on the Environment to be held in Stockholm this summer, attempted to draw attention to potential problems caused by man's activities, to summarize briefly what is known about such problems, and to recommend steps for closing gaps in our present knowledge.

The larger volume contains a number of excellent papers, but the reader who wants a general introduction to climatology and the problems that man's activities raise will do better to acquire the smaller book. The specialist, too, may find the SMIC report valuable in that it includes an up-to-date discussion of the stratospheric ozone layer and provides a better bibliography than the larger collection.

For the most part, the SMIC report contains little that is new. Before we can evaluate the possibilities of man-caused climatic changes, the report points out, we need to ascertain the role that sea ice plays in moderating climate, to understand better the effects of particulates (natural and man-made) on the lower atmosphere, and to improve monitoring and modeling capabilities. One subject of special concern is the potential of nitrogen oxides and other trace contaminants of the upper atmosphere for depleting the ozone that shields the earth and its biota, including man, from dangerous amounts of ultraviolet radiation. Several investigators have recently suggested that nitrogen oxides injected into the upper atmosphere by supersonic transports could play a catalytic role in a series of photochemical reactions leading to removal of ozone, possibly to an extent that would admit biologically significant amounts of ultraviolet radiation. The contribution of the SMIC report to what is still an ongoing debate on the subject is to point out that, while the threat is real, it is not yet possible to determine the magnitude of the effect; there are uncertainties about the rates of some of the reactions involved, about the dynamics of the stratosphere and the amount of mixing to be expected, and about the naturally occurring concentrations of trace constituents in the upper atmosphere. Similar conclusions were reached by an ad hoc panel of the National Academy of Sciences that has recently looked into the question.

The SMIC report recommends, as do all parties concerned, that questions about ozone depletion should be answered before large numbers of SST's are permitted to fly. One gets the impression, however, that the SMIC study group does not believe there is an immediate danger from this problem. It is interesting that the earlier Williamstown study, whose recommendations concerning the climate are reproduced in the source book, dismissed ozone depletion entirely as a problem and overlooked the role of nitrogen oxides. These two books together thus provide us with a lesson—a warning, perhaps, that the considered judgment of assembled experts can be wrong, and a caution to accept the conclusion of this or any similar report only tentatively. What should be remembered, as the SMIC report itself emphasizes, is that the range of our ignorance about the climate is greater than that of our knowledge.

The SMIC report provides an important set of policy recommendations and a good treatment of man's potential impact on climate. Its most attractive feature, however, is its summary of our understanding of climatic processes and the discussion of research approaches and problems. Written for the nonspecialist, these sections of the report are clear and direct. A brief outline of climatic history, for example, points out the extent of climatic changes in the past, thus providing a perspective that is important for evaluating man-made changes. The discussion of the types of mathematical models of climate and their assumptions and limitations makes clear both how difficult it is to provide unambiguous answers to questions about climate and how crude, relative to the task, our present research tools are.

ALLEN L. HAMMOND

Science

Marine Pollution

Impingement of Man on the Oceans. DONALD W. HOOD, Ed. Wiley-Interscience, New York, 1971. xii, 738 pp., illus. $24.95.

There is a lot of arrant nonsense being written and said about pollution of the ocean these days. When well-known ocean specialists imply that the open oceans are going to "die" (whatever that means) in a few decades it is clearly time for a responsible look at the facts. Of course, such assessments seldom achieve the global publicity that is accorded to the prophets of doom, but they are essential if sensible actions are to be taken to protect the marine environment. Exposure to the facts may also have a salutary effect on those who consider the ocean too vast to be spoiled by man.

For these facts one can turn to the excellent studies, such as those on radioactivity in the marine environment and on chlorinated hydrocarbons, pub-