forms of coronary artery occlusive disease also reflect a concern on the part of these writers with establishing the validity of a method of treatment by properly controlling the conditions under which it is applied. It is quite evident that these principles have been neglected in the past by many, in their enthusiasm to follow what appears to be a logical method of treatment—either by anticoagulants or by direct arterial surgery.

Although one short session is devoted to the difficulties of radiographic visualization of the carotid artery system, I would consider that this was a rather inadequate treatment for a very challenging problem. Inasmuch as the circulation of the brain depends to a greater or lesser extent upon the anastomoses around its base, visualization of the four principal vessels supplying it has been urged by many authors. From a practical point of view, this is extremely difficult to do, particularly when other parts of the arterial tree are involved by arteriosclerosis. However, practical aspects of this problem were scarcely presented and possible solutions were not offered.

In summary, this is no "do-it-yourself" handbook, nor textbook for the beginner, but it provides elegant reading for those who are struggling with problems in the area covered.

MICHAEL HUME

Bioastronautics. Edited by Karl E. Schaefer. New York, The Macmillan Co., 1964. ix, 406 pp. $16.00.

With many of man's older pursuits in eclipse, the adventurous spirit may find comfort in noting that one of the oldest, exploration, is still flourishing. Deep under the sea or far out in space lie vast claims to be staked, and the lure remains with one notable difference: the preparation for exploration. The old explorers prepared by gathering together conventional transport and stouthearted men willing to risk unknown horrors. Today preparation includes the attempt to predict the "unknown," to stimulate its circumstances, and to test man's ability to adapt. This is all included in Bioastronautics.

The book has four sections. The first deals with acceleration, vibration and noise, gaseous requirements, thermal problems, radiation, magnetic fields, physiological rhythms, and psychophysiological problems. Some have been thoroughly studied by conventional methods, but earthbound space limitations make the study of acceleration for more than brief periods difficult except for the angular acceleration of a centrifuge. Long term radiation effects must be inferred from small animal studies, and some forms such as heavy nuclei have uncertain significance. In contrast to most other types of radiation the biological threshold of heavy nuclei appears to be low or absent. Magnetic fields influence growth and possibly gene mutation in some species but no specific effect on man has been found. Although space imposes alterations in biological rhythms some astronauts can comfortably modify their natural rhythms. Is it likely, however, that a single astronaut could adapt to all of the vagaries of space? We must remember that one type of exposure may alter the organism's response to another as Schaeffer emphasizes in describing the synergistic
tendency to pulmonary collapse produced by oxygen breathing and acceleration combined.

The second section considers problems of engineering space vehicles and space ecology or providing a satisfactory environment for man. As Konecci puts it, "Man is an essential part of space exploration; in fact, he is the reason for space exploration." Space ecology is really the crux of the whole thing. We can gain only limited extension of our capabilities by selecting adaptable astronauts for, as Schaeffer states in the preface, "The logical step to extend man's capacity to enter and manage new environments is to develop new tools." These tools must be useable and the vehicles habitable in very strange environments.

The third section deals with medical and physiological aspects of flight and constitutes a special extension of the earlier chapters, and the final section concerns "perspectives" of biological computers and space-time perception. There is some unevenness in style but the authors speak authoritatively and the editor has succeeded in providing wide scope without being superficial.

FRANK D. GRAY, JR.

PULMONARY DEPOSITION AND RETENTION OF INHALED AEROSOLS. By T. S. Hatch and Paul Gross. New York, Academic Press, Inc., 1964. xiv, 192 pp. $5.95 clothbound, $3.95 paperbound.

This monograph represents the first volume of a series now being written under the auspices of the United States Atomic Energy Commission's division of technical information on titles pertaining to selected industrial hygiene aspects of the United States atomic energy programs. This is a most authoritative and well-written monograph quite in keeping with the current surge of interest in pulmonary disease that has characterized the past several years. The work mainly emphasizes the many important variables, at the aerosol level, which operate from the time the patient finds himself in a contaminated atmosphere to the point of actual lung tissue damage. The relative importance of such variables as particle size of the aerosol, its shape and density, locus of deposition, and air flow characteristics are discussed in detail and one finds this most interesting and informative reading. The chapter dealing with pulmonary clearance is excellent. The role of the cilia and mucous blanket in upper respiratory tract clearance and the various elements of alveolar clearance of inhaled aerosoles are clearly reviewed. One of the most interesting chapters—experimental studies on pulmonary clearance—welds together much of the experimental data on this subject and includes the role of the pulmonary lymphatic system. The physician will find the chapter on diseased states resulting from various inhaled aerosoles to be of practical interest. The authors discuss such entities as pneumoconiosis, systemic poisons, radioactive hazards, air-borne infection, and particulate contaminants in community air pollution. The final chapter discusses the measurement of respirable aerosol exposure.

The readers will find that the chapters follow a very logical sequence. There is an excellent bibliography. The authors ought to be commended for their concise and rational approach to a difficult subject. This mono-