

diagrams of mining areas and sections of uranium deposits, particularly of occurrences in France and elsewhere in Europe, will be found useful.

The emphasis of the book is primarily what one would expect from an able student of mineral deposits who writes for others in the same field. The principles of uranium occurrence take precedence, and an abundance of illustrative material has been introduced to support the text. Future books, written in English, on the geological occurrence of uranium will doubtless show the influence of this French text.

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Manual on Rockets and Satellites. vol. 6, *Annals of the International Geophysical Year, 1957-1958.* L. V. Berkner, Ed. Pergamon, New York, 1958. xx + 508 pp. Illus. \$25.

One of the greatest scientific achievements of recent times—the International Geophysical Year—has just been completed. A very large part of the Geophysical Year program was centered around the use of rockets and satellites, the subject of this book. The book is a compilation of articles by authors from all of the many countries which participated in this gigantic, world-wide undertaking. The fact that publication of this book was possible, that the IGY itself was possible, is a tribute to the willingness of scientists everywhere to cooperate in a difficult, complex, and closely integrated scientific effort.

Lloyd Berkner, who edited the volume, was the reporter for rockets and satellites of the Comité Spécial de l'Année Géophysique Internationale; he was greatly assisted in accumulating and preparing the information for publication by associate editors Reid, Hanessian, and Cormier. The editors are also indebted to scientists too numerous to mention who were responsible for the individual articles. Although it was published in 1958, the book was prepared in the middle of the IGY effort; in the main, therefore, it discusses the plans of the various countries for carrying out their IGY programs in the areas of satellite research and rocket probing of the upper atmosphere. Now that the IGY is officially over and has been succeeded by the program of International Geophysical Cooperation, one can see in retrospect that the planning for the IGY was good; the experiments as actually carried out are described quite well in this book.

An excellent introduction by Berkner gives in capsule form the reasons for the IGY rocket and satellite effort and ex-

plains the principal experiments that were planned to implement this effort. The book then describes many of the programs in detail, each chapter being made up mainly of articles by individual experimenters. Despite the diversity of the contributors, there is good continuity.

The first 100 pages are devoted to a description of the rocket programs planned by Australia, Canada, France, Japan, the U.S.S.R., the United Kingdom, and the United States. This section is replete with photographs and drawings of the experimental equipment and of the rockets. Included also are reports of some of the earlier results—data on pressures, densities, and temperatures in the upper atmosphere. The section ends with a detailed schedule of the types, dates, locations, and principal experiments of the United States rocket firings.

It is interesting to note that the principal objectives of the U.S.S.R. and United States programs were remarkably similar. These dealt primarily with the following areas of research: structural parameters and optical properties of the atmosphere; ultraviolet, x-ray, and corpuscular solar radiation; aurorae; cosmic rays; ionospheric phenomena; the magnetic field of the earth; micrometeors and meteorites; and physical and chemical processes in the upper layers of the atmosphere.

The next 330 pages of the book give a description of the satellite programs planned by the United States and the U.S.S.R. This is an excellent treatise on the problems that arise in the launching and use of close-in earth satellites. This section, again, is a compilation of separate articles, but it is a well-integrated, effective treatment of the satellite problem and of the principles employed by these two countries to conquer the problem during the IGY. The section deals first with general satellite information, with problems relative to the orbit and its determination, and with the scientific information that can be garnered from the expected perturbations of the orbit. This is followed by a presentation of the U.S.S.R. satellite program, in which the experimentation is dealt with in very general terms; the experimentation plan closely resembles that for the rocket program. Following this is a treatment of the United States satellite program; much more detailed information is given on the launching vehicles and on the experiments planned. Quite a bit of space is given to the optical and radio satellite tracking programs and to the effort that was made to interest groups in the United States and abroad to participate in them.

One of the major problems in an effort of this magnitude is that of gather-

ing the large number of data received and of assembling them in world data centers where they will be available to students for years to come. The planning for this is treated in the 20 pages that follow. The book closes with two addenda, which report the first three successful satellite launchings.

This book is of great interest in that the reader will see evidence of the tremendous effort made by many groups to allow man to break away from the environment in which he has been confined since the beginning of history. The plan was successful. New objects in nature have been created, and the door is now open for us to make full use of this new frontier. Our knowledge of the universe had been limited to what we could see through our murky atmosphere. Now, through the medium of satellites, we can see the rest of the universe in its full spectrum, and we are only beginning to sense the increase in our knowledge which will thereby be made possible. For any who desire an understanding of the problems and pains involved in work with rockets and satellites, this book brings together as does no other single source a wealth of useful information.

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Geology of the Great Lakes. Jack L. Hough. University of Illinois Press, Urbana, 1958. xviii + 313 pp. Illus. \$8.50.

The Great Lakes occupy deep basins in ancient crystalline and sedimentary bedrock, but they are truly a product of the Ice Age. Hough has published a summary of information on the lakes and their formative history, but in the same year that the basic concept of multiple glaciations has been subject to severe criticism. Accordingly, this book represents an era of thought on the records of the Great Lakes which may be subject to revisions of interpretation in the future.

Changes of concept in lake history have been many over the years. In 1915 Frank Leverett and Frank B. Taylor summarized the information to that time in a U.S. Geological Survey monograph. Twenty-four years later the evidence for an important submerged lake stage unknown to those authors was discovered and described by George M. Stanley; this altered the accepted understanding of the historical record and introduced new problems. These Hough, whose long experience in the Great Lakes has given him extensive knowledge of their sediments, has endeavored to