Earth and Beyond

The International Geophysical Year in retrospect: Was it a "turning point in history"?

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"Looking back upon the IGY, there seems little doubt that it marked a major turning point in history." Thus writes Walter Sullivan, the gifted and learned chief science writer for the New York *Times,* in the last chapter of his fascinating book about the International Geophysical Year—**Assault on the Unknown** (McGraw-Hill, New York, 1961. 461 pp. $7.95). At the close of the last IGY Assembly in Moscow (1958) I gave a more modest estimate: ". . . a time will come when our great enterprise, the IGY, will be viewed as an important but primitive landmark in the history of man's exploration of the cosmos." But it cannot be doubted that the IGY also had significant political results. It made valuable contacts possible between the scientists of the East and the West, contacts that were previously handicapped by inhibitions on both sides. And it led to the drafting of the Antarctic Treaty that aims to exclude military action from Antarctica.

Some research scientists look down their noses at science journalists. Certainly garbled accounts of what has been gathered in reading or at interviews are often presented by some science writers to their readers. Sullivan's book is a fine vindication of the value of good scientific reporting, both to the public he mainly aims to serve and to science. From the early days of IGY planning and development Sullivan enabled readers of the New York *Times* to follow its progress, whereas the Manchester *Guardian* could refer in its columns to "the mumbo-jumbo of the IGY."

In his reports Sullivan helped to inform an important section of the U.S. public on the aims and significance of the IGY. He traveled to many sites of IGY research, near and remote, and made well-used contacts with large numbers of scientists engaged in its varied programs. Thus, and by his reading, he gained an exceptionally wide and balanced knowledge of its vast scope and, later, of its results so far obtained. His new book, the fruit of years of such effort, marks an important stage in the presentation to the public of the IGY harvest to date. It deserves, and will certainly gain, wide and appreciative acceptance from a large circle of readers. Like everything human, it is not perfect. But to draw attention here to the very few and minor errors noted would be to give them disproportionate emphasis. A reviewer may better privately help the author to eliminate them from later editions.

Several books as well as multitudes of articles have already been written about the IGY. Many more will be written, and there is need for them. Sullivan in his preface indicates that "more space has been devoted to the United States effort than to that of any other nation"—as is very natural. "Nevertheless the author has sought to bring out the international character of the IGY. . . ." In this Sullivan's approach is fair and impartial. But the IGY was so extensive in scope that even as ample a book as *Assault on the Unknown* must deal but scantily with many aspects of interest. Ten years hence, and subsequently, scientific historians should have many other and later accounts, by authors of different backgrounds and knowledge, from many lands, on which to base more definitive studies.

The author, former president of the Special Committee for the International Geophysical Year (CSAGI) set up by the International Council of Scientific Unions to coordinate the IGY, is now associated with the Geophysical Institute, College, Alaska; the High Altitude Observatory, Boulder, Colo.; and the Institute of Science and Technology, University of Michigan, Ann Arbor. He reviews here three books: *Assault on the Unknown; Man and Space;* and *A Hole in the Bottom of the Sea.*

Journalistic Quandary

One of the major chapters of the book is devoted to that wonderful, global, U.S. experiment known as "Argus"—the series of high-level, nuclear bomb explosions suggested by Nicholas Christofilos. This project was outside the U.S.-IGY program, in one sense, but IGY colleagues in other lands might with some justice charge inadequate disclosure of information in connection with it. This event, besides its intense scientific interest, illustrates the quandaries in which journalists are placed, when they obtain information that its originators wish to keep secret. Officials may regard the acquisition of such information as receipt of stolen property, or as larceny by finding. But officials keep secret many things that should be revealed. Debate on such points has lately been revived in another context, and may never lead to agreed conclusions. In another chapter Sullivan summarizes much unpublished correspondence from the central IGY Bureau, without indicating how it was obtained.

The 12 main branches of the IGY scientific program are discussed in turn, naturally with different degrees of competence and completeness. Much analysis of IGY data is still in progress, but major attention is given to the two most outstanding branches of the program—those concerned with Antarctica and the artificial earth satellites. Probably the greatest discoveries made during the IGY concerning the earth and space beyond relate to the oceans, Antarctica, and the Van Allen belts.

IGY as a Political Example

The harmonious development and execution of the IGY enterprise set a pattern that might serve as an example to be emulated in more difficult, political fields. Two of the very few discords that marred the perfection of IGY harmony are discussed at some length—the entry and exit of the Peking Academia Sinica as a participant and the American discontents at the 1958 Moscow Assembly. In both cases it seems to me that political hands were thrust unwisely and with only harmful effect into our scientific affairs.

So many people and nations gave their best service to the IGY that mention of them in due degree is impossible in such a book. References to

particular contributions must depend much on the author's partly fortuitous contacts. Among the national programs those of the U.S.A. and the U.S.S.R. were pre-eminent, but Japan's effort was so great (having regard to its resources) that it deserves special comment. As to the contributions of individuals, the same may be said of Nicolet and Laclavère; their work, though not unmentioned, was outstanding in amount and range, and it is continuing.

It was difficult, even for those most closely connected with the IGY plan, to get as broad a picture of the whole enterprise as is now portrayed in *Assault on the Unknown*. Scientists and nonscientists alike will welcome this interesting presentation of the scope and achievements (to date) of the IGY.

Assault on Space

In **Man and Space** (Harper, New York, 1961. 184 pp. $4.95), another eminent science writer, Ralph E. Lapp, describes the background history, development, and results of the space researches undertaken during and since the IGY—thus overlapping *Assault on the Unknown,* though with more detail in many respects. But as the subtitle, "The next decade," indicates, a main purpose of his book is to discuss future objectives in space research, and the present plans to achieve them. Though now a writer and lecturer, Lapp has held important posts in government scientific institutions, and at the end of World War II he was assistant director of Argonne National Laboratory. His experience as an active scientist and administrator adds weight to his words, which are clear, illuminating, and outspoken. They include individual characterizations such as "personable" (page 41), "Washington-wise" (page 42), "imaginative and resourceful" (page 46), and so on. Opinions may differ as to whether occasional pungent remarks hit the mark or go too far beyond it—for example when he comments on the plus and the minus, to the National Aeronautics and Space Administration, of its endowment with the National Advisory Committee on Aeronautics as "encumbering" NASA with the "barnacles and deadwood of an old-line government bureau" or when he refers (page 27) to the National Academy of Sciences as "a rather somnolent organization of elderly scientists," unmindful of the Academy's highly successful management of the United States' great national IGY program. Indeed there is a strong contrast between the attitudes adopted toward the IGY in *Assault on the Unknown* and in *Man and Space,* which mentions it only twice, incidentally, on pages 28 and 51.

America's Space Effort

As Sullivan also indicated, with reference to the satellites, *Man and Space* points out (page 28) that "The Soviets were not nearly so close-mouthed as they are often believed to be." The fact was that in the United States and elsewhere "No one paid much attention" —or even knew of the advance Soviet information. Chapter 4 ends with the following interesting lines: "If the Soviets are the first to send astronauts to the moon, the first to man a huge earth satellite, the first to land on the moon, then the world will appraise the American space effort as second best. For myself, I find that the 10-year U.S. space program is adequate scientifically, but I do not believe it to be really competitive with the Russians in the real space race. The penalty for starting so poorly in the contest is that we must now make up for the lost years; this inevitably means an accelerated program and a doubling or tripling of the space budget."

Together with much technical discussion of the hardware and instruments of space research, *Man and Space* includes brief but well informed descriptions of its scientific problems and objectives. Lapp outlines the nature of the moon and planets and considers the likelihood or otherwise of life existing on them. Within its relatively short compass the book covers its subject in a clear and enlightening way, which will be appreciated by many readers among both the general and scientific public. They will be helped by the glossary with which the book concludes.

Project for Future Research

A Hole in the Bottom of the Sea (Doubleday, New York, 1961. 352 pp. $3.95) is Willard Bascom's story of the Mohole project. Here he deals with a more limited field of future scientific exploration. He describes the background and plans for the official U.S. effort to explore the earth's crust and mantle. This effort dates from 1958 when the U.S. National Academy of Sciences assumed sponsorship of the deep-hole project. Bascom is now the "director of the Mohole project" for what is called the AMSOC committee in the Academy's Division of Earth Sciences. AMSOC stands for the American Miscellaneous Society, an informal group of scientists connected, in some cases tenuously, with the Office of Naval Research. Its activities are described in a manner at times facetious, and this facetiousness also occurs elsewhere in the book. The name for the project, Mohole, is in the same vein, "honoring" Mohorovičić (whose portrait is given), the Croatian scientist who first indicated the presence of a major discontinuity of earth structure about 55 kilometers deep. The discontinuity is now regarded as the division between the crust and mantle of the earth.

The book opens fancifully with an imagined scene on board ship when the first sample of the mantle is drawn up from a hole drilled right through the crust. It then describes Charles Darwin's proposal, made in 1881, for experimental drilling of coral atolls to 500 or 600 feet and shows how this idea was extended as seismic researches gradually revealed many main features of the inner structure of the earth. Succeeding chapters are entitled: "Science fiction and pseudo science inside the earth"; "Evidence in the rocks"; "Exploring the crust with gravity"; "Probing with earthquakes and explosions"; "The examination of the oceans"; "Magnetism, heat, and pressure"; "Evidence in the skies"; "Objectives and sites"; "Modern oil-well drilling"; "The oil rig goes to sea"; "Experimental holes in deep water"; "On to the Moho"; "The future."

The author writes mostly in a plain matter-of-fact way, easily understood by general readers. He covers a wide field, partly beyond his main experience as an engineer specially associated with oceanography. He is enthusiastic for the project, whose success is made more promising by the exploratory drillings off California, under the auspices of his committee, since his book went to press.

More than *Man and Space,* and much more than *Assault on the Unknown,* this book is "domestic" for the U.S. public. Many scientists of other nations, some of them contemporary,

are mentioned in the background chapters. But little stress is laid on the desirability of international cooperation in the study of the earth's mantle by drilling. The IGY is mentioned only once, incidentally, and only brief reference is made to the active interest in the project shown by the International Union of Geodesy and Geophysics (IUGG). It is related (page 50) that when IUGG considered the project at Toronto in 1957 ("prodded by AMSOC members and by Dr. Tom Gaskell, a British geophysicist"), a resolution supporting it was adopted, and that "a Soviet scientist" arose and said: "We already have the equipment to drill such a hole, we are now looking for the place." By the following September, Bascom states, the Soviet Academy of Sciences was rumored to have appointed its equivalent of a deep-drilling committee. Regrettably (doubtless because of the date on which the book went finally to press) it is not mentioned that at the Helsinki meeting of IUGG (July 1960) the deep hole was a main subject of the presidential address by V. V. Beloussov. He was a member of the central IGY bureau and is now head of the geophysical committee appointed by the U.S.S.R. to organize their part of the effort to complete, continue, and extend the work of the IGY.

The IUGG appointed an international organizing committee, presided over by Beloussov, to further the study of the mantle by deep drilling and in other ways. The mantle should be probed at more than one point, and international pooling of experience and results is obviously desirable.

Future International Cooperation

The wonderful response by so many nations to the scientist-originated proposal for the IGY is encouraging for the future. Governments and academies alike should keep it in mind as a stimulus to further action. Amidst much that is good in the individual and organized efforts of mankind, greed, pettiness, and duplicity show their ugly faces. Perhaps the best counteraction is positive cultivation of the impulse to cooperate and emphasis on the generous aspects of emulation. Scientific projects beneficial to our race as a whole give ample scope for this. Geophysics offers several: besides the deep hole studies there are world weather research and the World Magnetic Survey. This last is a deferred item in the IGY program, and one that needs indefinitely continued, periodic repetition; it should be organized permanently and internationally. Most of all, academies and governments should make an urgent resolute push to exclude military efforts from space exploration, as has been done for Antarctica.

Aztec Culture Today

The Virgin's Children. Life in an Aztec village today. William Madsen. University of Texas Press, Austin, 1960. xv + 248 pp. Illus. $4.50.

Most educated Americans know something about the prehistoric cultures of the Aztecs and Mayas, but they are surprised to discover that descendants of these Middle American civilizations are still vigorously carrying on many fundamental aspects of their ancient traditions. It is true that the decendants no longer build pyramids, sculpt images of their aboriginal gods, or paint murals. But they speak Nahuatl or Maya as their primary language, grow corn and make tortillas, and maintain many more aspects of their ancient social structures and belief systems than I think anyone would expect in the mid-20th century.

Throughout large areas of central Mexico there are still an enormous number of Nahuatl-speaking communities which have yet to be studied by anthropologists. The Nahuatl peoples living in and around the Valley of Mexico are clearly descendants of the Aztecs whose ancient capital of Tenochtitlan has become modern Mexico City, second largest city in the Western Hemisphere. In 1952 Madsen selected the small village of San Francisco Tecospa (population 800) in the Milpa Alta district just south of Xochimilco for a 16-month field study of contemporary Aztecs.

In this delightfully written book Madsen has two purposes: to provide an ethnographic description of the culture of this Aztec village and to elucidate the cultural processes, especially syncretism, by which this culture came to be a complex combination of the ancient Aztec heritage and the Spanish Catholic traditions of the conquerors. The San Francisco Tecospans now regard themselves as children of the Virgin of Guadalupe, but this Catholic virgin is still called Tonantzin and is obviously closely related to the old Aztec earth goddess of that name.

On the whole the book comes off well, and it is an important contribution to our knowledge of contemporary Aztec ethnography and to our understanding of the processes of cultural change. It also has some weaknesses. If Nahuatl is the primary language in San Francisco Tecospa, one wonders why Madsen did not present Nahuatl terms for all the tools, customs, and concepts that he discusses instead of giving some in Nahuatl and some in Spanish. The reader has no way of determining whether the Spanish terms are actually used by the Tecospans themselves or whether perhaps Madsen presents the Spanish terms simply because he used Spanish rather than Nahuatl as his basic field language. At several points I had the impression that the analysis was not as penetrating as it might have been. Instead of a carefully worked analysis of certain aspects of the social structure and of the structure of the belief system, one finds pages of anecdotal material drawn from Madsen's field journal. While this style of presenting ethnography is vivid and will undoubtedly capture the imagination of the layman, it will not satisfy the professional anthropologist interested in problems of social structure and culture patterns.

The book is beautifully illustrated with photographs taken by Madsen and drawings by a Tecospa boy, both of which add much to the understanding and appreciation of the culture of the community.

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Young Intellectuals

Gifted Children. Their psychology and education. Maurice F. Freehill. Macmillan, New York, 1961. 412 pp. $5.50.

Gifted Children is a comprehensive book that deals primarily with problems of educating gifted children and secondarily with the psychology of gifted children. How to identify gifted children is the first educational problem discussed. Two basic methods are given for solving the problem: obser-