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The International Geosphere-Biosphere Program

Continuing and increasing concern about possible anthropogenic influences and other factors that determine habitability of the earth has led to initiation of a decades-long international program by the International Council of Scientific Unions (ICSU). Authorization of the International Geosphere-Biosphere Program (IGBP) occurred at ICSU's 21st General Assembly in Berne, Switzerland, 14 to 19 September 1986. The International Council of Scientific Unions is one of a number of organizations fostering this program,* and it has limited financial resources. However, when a global scientific effort is to be made, ICSU is the best today to coordinate the effort. It has the necessary convening power and prestige to elicit cooperation of leading scientists of countries of the East and the West, the North and the South. The objectives of IGBP are "to describe and understand the interactive physical, chemical and biological processes that regulate the total Earth system, the unique environment it provides for life, the changes that are occurring in that system, and the manner by which these changes are influenced by human actions." What makes these objectives approachable is the existence and potential existence of enormously powerful new instrumentation coupled with data-handling systems, computational power, and models to be tested.

Thomas Malone reminds us that "the emerging capabilities of remote sensing from satellites are making possible global synoptic measurement of . . . the surface temperature of the earth to an accuracy of 1°C; the global distribution of atmospheric clouds, ocean waves, currents, and eddies; the extent of ice on both sea and land; the mean chlorophyll density on land and in the ocean surfaces; and global patterns of agriculture and forests."*

Geophysicists have taken a leading role in the formulation of the program. However, they realize the importance of biological processes in determining global conditions. For example, enhanced production of methane by methanogenic organisms is influencing ozone content of the atmosphere. Careful measurements of production of gases at biomes will produce important information. Satellite measurements of vegetation and chlorophyll content of marine organisms require calibration and interpretation.

The program will include observations that extend from the sun to the interior of the earth. The study of the sun will include observations at many wavelengths. Variations in solar radiation striking the earth are thought to have had a key role in great climatic changes such as the ice ages. Thus one of the difficulties of detecting and measuring a greenhouse effect is uncertainty about variations or trends due to changing relationships between the sun and the earth.

It is accordingly particularly desirable to continue to examine evidence of prehistoric environmental changes. The global changes in the past half-million years were far larger than anything seen in historic times and may have been more rapid. Sea level fluctuated more than 100 meters during the transition from eras that were warm and wet to those that were cold and dry. The indicators of change or objects to be studied include global ice volume, tree-ring widths, ice cores, and isotope and chemical ratios in lake and ocean sediments.

The likelihood is that the International Geosphere-Biosphere Program will begin slowly during a continuing planning stage as various countries decide how they will participate. During the early phases the National Science Foundation will be a key supporter of U.S. activity related to the program. Eric Bloch, director of NSF, has announced an effort in Global Geosciences for fiscal year 1987 that includes global tropospheric chemistry, global ocean climate, global ocean flux, global ecosystem dynamics, oceanic ridge crest processes, and a global digital seismic network. Other U.S. agencies such as NASA and NOAA will participate and more intensively later. In any event, the United States is beginning fast. It cannot alone carry out a global program, but its commitment and example will not be lost on others.—PHILIP H. ABELSON

*T. F. Malone, *Environment* 28, 6 (1986).