US–UNESCO discord threatens proposed global study

The idea is boggling: "If we could launch a cooperative interdisciplinary program in the earth sciences on an international scale, we might hope to take a major step toward revealing the physical, chemical and biological workings of the Sun–Earth system and the mysteries of the origin and survival of life in the biosphere."

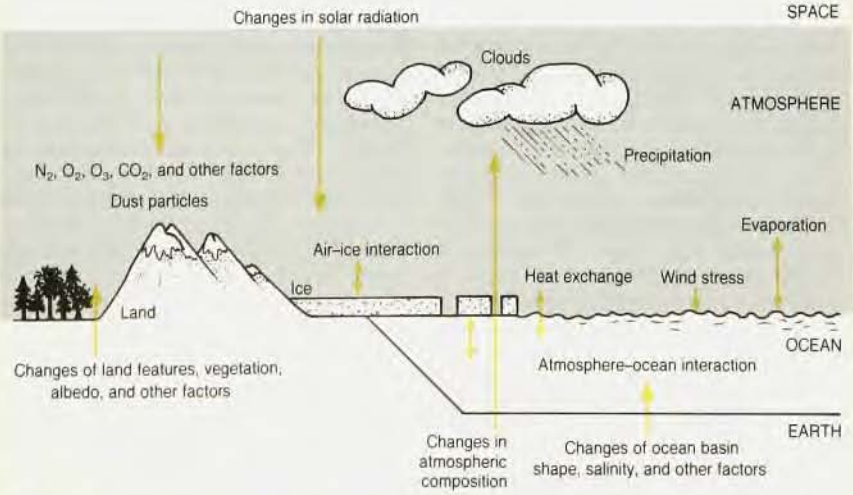
So begins the preface by Herbert Friedman, chairman of the Commission on Physical Sciences, Mathematics and Resources of the National Research Council (within the National Academy of Sciences), in a new report, *Toward an International Geosphere–Biosphere Program*, which calls for a worldwide study of the causes and consequences of global changes. The report, released by NRC in December, represents the conclusions of a conference the commission organized last July at Woods Hole, Massachusetts. IGBP's grand design requires wider fields of research and larger periods of time than any scientific venture ever attempted—clearly more complex and certainly far longer than the International Geophysical Year (1957–58) and Global Atmospheric Research Program (1975–80) and possibly the Global Environmental Monitoring System or "Earthwatch" (running since 1972). The scope of IGBP demands international cooperation and interdisciplinary approaches on an unprecedented scale over a period covering at least two 11-year Sun cycles.

The executive committee of the International Council of Scientific Unions (a group affiliated with UNESCO) endorsed the concept of IGBP at its meeting in Warsaw last August. The concept was reaffirmed by ICSU at Paris in November, though the USSR did not attend the Paris meeting and, according to US science leaders, finds it difficult right now to endorse programs that require observations or measurements of Soviet territory. IGBP now awaits final approval at the ICSU general assembly to be held next September in Ottawa, Canada.

Expanding IGY. During IGY, thousands of scientists from 67 nations coordinated geophysical observations gathered from pole to pole in a program that significantly improved the understanding of physical processes in and around the Earth and, in the event, transcended political differences. Studies of ecological and biological processes were essentially neglected in IGY, along with questions requiring multidisciplinary approaches for their solution. Today, with heightened awareness of such environmental concerns as the CO_2 "greenhouse effect" on the Earth's temperature or the biospheric implications of a nuclear war causing a "nuclear winter" (see page 17), policy makers need to have better scientific understanding of biogeochemical cycles and links between geophysical and biophysical processes.

Friedman, chief scientist emeritus at the E. R. Hulburt Center for Space Research of the Naval Research Laboratory, terms IGBP "a bold, holistic venture in organized research." It will attempt to coordinate thousands of scientists in hundreds of programs, using space satellites, high-altitude balloons, ocean vessels and other vehicles equipped with sensors, cameras and computers and new seismic and acoustic devices, to unlock the mysteries of the planet and solar system. The biggest problem for IGBP, according to Friedman, is not its price tag—variously estimated at $300 million to $1 billion per year when fully operational, though much of this will be spent in the home countries—but the job of organizing and coordinating the collection and interpretation of data about the atmosphere, oceans, lithsophere, biosphere and solar–terrestrial system.

Complex processes. No area exemplifies the need for joint and interrelated research among scientific disciplines more clearly than the processes of world climate and complexities of climate change. As Friedman points out in his preface to the report, climate variations appear to depend on "a long and convolved set of interactions," including such human activities as burning fossil fuels, destroying forests, and releasing fluorocarbons, along with solar radiation, volcanism, ocean circulation, polar ice, the chemistry and dynamics of the atmosphere itself, gravitational perturbations of the Moon and planets and possibly varying densities of interstellar matter encountered by the Sun in recurrent passages through the spiral arms of the Milky Way. "No single factor is clearly dominant," writes Friedman.



The major components of the global climatic system are illustrated in this drawing based on a figure in a 1975 National Academy of Sciences report, *Understanding Climatic Change*.

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IGBP will have to rely on a variety of historical, paleontological and geochemical records for comparisons and insights. Tree-ring data, lake deposits and pollen samples, for instance, along with ocean and polar-ice cores provide natural diaries of meteorological events, sea temperatures, ice cover, atmospheric and biotic conditions, crustal magnetism and solar behavior. Thus, studies of oxygen isotopes in ocean sediments laid down during the Cretaceous period 60 million to 120 million years ago show that ocean temperatures in high latitudes were about 15 degrees warmer than today. What's more, ice cores from Greenland and Antarctica indicate that CO_2 and methane, two of the important greenhouse gases, were much lower than at present. Such records know no national boundaries, nor is their interpretation the exclusive province of a specific scientific discipline," observes Friedman.

The report reveals that a few of the Woods Hole participants expressed caution about the need for IGBP. Though they all want to answer such perplexing questions as the effects of interactions between tropical oceans and global atmosphere, which seem to explain the El Niño–Southern Oscillation phenomenon, the dynamics of plate tectonics processes and the physics of solar cycles, some questioned the underlying conceptual unity and coherence, as well as practical necessity, of IGBP. A possible threat to IGBP is President Reagan's recent decision to withdraw US support from the United Nations Educational, Scientific and Cultural Organization after 1984. One of the casualties of this action would be the international network that UNESCO provides American scientists through ICSU and such projects as the World Climate Research Program. The US traditionally has contributed about 25% of the UNESCO annual budget of $374 million. In turn, UNESCO puts up 25%, or roughly $417 000, of ISCU's annual funding of some $1.7 million.

The US position is that UNESCO, founded soon after the United Nations was formed in 1945, has "politicized virtually every subject it deals with, subjected almost every institution to hostility and demonstrated unrestrained budgetary expansion," according to Charles E. Horner, deputy assistant secretary for science and technology at the State Department. "It now threatens the customary free spirit of science, education and culture by restricting the exchange of ideas and information."

US withdrawal from UNESCO, however, need not dismay American scientists, says Horner. ICSU is not, strictly speaking, a daughter of UNESCO. It was organized in 1919 as the International Research Council, mainly through the work of George Ellery Hale, the astronomer who was president of the National Academy of Sciences. "The government not only remains committed to advancing science and the original objectives of UNESCO, but is prepared to redouble its efforts," says Horner. "If we withdraw from UNESCO, science will not be jeopardized." —IG

NCAM light source rejected again

After meeting with some 75 scientists and reading letters from dozens of others in such diverse fields as biology, chemistry and physics, as well as medical and materials technologies, a committee appointed by the Department of Energy to review advanced synchrotron-radiation facilities for the coming decade submitted its list of priorities on 14 November. Of its four recommendations, the committee placed the proposed $84-million Advanced Light Source at Lawrence Berkeley Laboratory last on the list. Thus, LBL suffered a second blow to its plan to create a National Center for Advanced Materials around a new synchrotron light source. Last August, another peer group, under the chairmanship of Albert Narath of Sandia National Laboratory, told DOE it opposed the idea of a 1.3-GeV soft x-ray synchrotron-radiation facility for NCAM, recommending instead that the light source be considered separately and urging that the department allocate $9.3 million for Berkeley's materials center in fiscal 1985 (PHYSICS TODAY, December, page 44).

The latest recommendations came in a letter to Alvin W. Trivelpiece, DOE's director of energy research, from committee cochairmen Peter Eisenberger of Exxon Research and Engineering Company and Michael L. Knotek of Sandia. The letter is an interim report representing the committee's unanimous conclusions, which DOE needed to prepare its fiscal 1985 budget request for the Reagan administration's presentation to Congress this month. The committee's complete report is due later this month.

As its top priority, the committee recommends "that steps be taken to assure the timely completion of commissioning of NSLS [the National Synchrotron Light Source at Brookhaven] and SRC [the Synchrotron Radiation Center at the University of Wisconsin] as well as providing adequate operations budgets to assure the effective utilization of all existing facilities." It became clear during the review, says Eisenberger, that even a small increase in operating funds for the Stanford Synchrotron Radiation Laboratory would lead to as much as a doubling of productivity at SSRL.

The second priority is directed at expanding the full potential of existing facilities by "expeditious completion of current projects to construct insertion device beamlines at SRC, NSLS and SSRL." Insertion devices are special magnet structures ("wigglers" and "undulators") that provide huge gains in radiation flux and spectral brightness as compared with dipole magnets. In their letter, Eisenberger and Knotek say that synchrotron-radiation facilities in Japan and Europe are preparing to use insertion devices as the basis for "a revolutionary new generation of machines."

6-GeV priority. The third recommendation calls for constructing a 6-GeV storage ring beginning in 1987 as a dedicated national facility. "To achieve this objective," says the committee, "appropriate R&D funds must be allocated in FY85 and FY86." In a comment section, the committee decided that "if only a single new facility was to become available, the 6-GeV facility must have priority because it addresses regions of the [x-ray and xuv] spectrum and new science not accessible with insertion devices on existing dedicated facilities."

With that proviso and the admonition that "no action on a lower priority recommendation interfere with the timely pursuit of the higher priority items," the ALS was ranked fourth, not as a part of NCAM, but as a separate facility, as the Narath panel had recommended. President Reagan's science adviser, George A. Keyworth II, who introduced NCAM, with ALS as its centerpiece, in the fiscal 1984 budget, still supports the original concept as a model for industrial participation in ongoing research at national laboratories. But it is unlikely that he will try to overturn the decisions of two peer groups.

The Eisenberger–Knotek committee received strong support for synchrotron-radiation work from a broad range of scientific, industrial and defense interests. Because such activity is certain to excite further growth in synchrotron radiation at the labs, the committee proposed "that a group such as ours be convened on not less than a yearly basis to review current developments in the entire field and to make recommendations for future actions." What the committee has in mind is a small overview group, not a formal blue-ribbon committee with the clout of DOE's High Energy Physics Advisory Panel. —IG