

NATIONAL ACADEMY OF SCIENCES

THE WHITE HOUSE  
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RECEIVED  
April 21, 1954

OFFICE OF THE PRESIDENT  
2101 CONSTITUTION AVENUE  
WASHINGTON 25, D. C.

The Honorable  
Sherman Adams  
The Assistant to the President  
The White House  
Washington, D. C.

Dear Mr. Adams:

I have followed with enthusiastic interest the President's various statements having to do both with international cooperation and with science. As you know, the President has also combined these broad and humane views in his expressions of the desirability of international cooperation in science, as in the recent announcement of his intention to call an international scientific conference on peaceful uses of atomic energy.

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This announcement suggested to me that the President may be interested in a major international cooperative undertaking in geophysics, called the International Geophysical Year, covering research in such fields as meteorology, oceanography, solar activity, longitude and latitude determinations, cosmic rays, magnetism, and studies of the upper atmosphere. Some thirty nations will cooperate in these world-wide studies during 1957-58, now being planned and budgeted for. The United States program, developed by the U. S. National Committee appointed by the National Academy of Sciences, has already been presented to the Bureau of the Budget by the National Science Foundation. Some details of this program are presented in the enclosed memorandum. I am also enclosing comments from two leaders in the Administration on this activity.

From the President's point of view, I believe that the essential feature is the aspect of international cooperation in science. Moreover, the topics involved are close to the daily lives of all of us. Agriculture, industry, commerce depend in one fashion or another upon weather, navigation, and communications, and the proposed studies promise to contribute significant advances in these and related areas. These advances are marked by their peace-time applications, and the prospect of an international cooperative effort of this kind should have a refreshing appeal to all men.

For such reasons I believe that the International Geophysical Year affords an unusual opportunity for imaginative leadership on the part of the United States. The program now under consideration by the Bureau of the Budget also provides an opportunity for an expression of American views consistent and in harmony with those made by the President in the past, which would strike a responsive chord in nations and peoples everywhere. If the program meets with the approval of the President, then in my judgment there is an opportunity for the expression of his views at the time the program is submitted to the Congress. //

While the enclosed memorandum discusses several aspects of the program, I shall be happy to discuss it with you, particularly in terms of the approach I have tried to suggest in this letter.

Yours sincerely,



Detlev W. Bronk  
President

Enclosures (3) ✓

## A Memorandum on the United States Program for the International Geophysical Year

### International Relationships

#### Scientific Aspects

The fields of science that make up the general discipline of geophysics and are the subject of the international effort called the "International Geophysical Year," are characterized by their global nature. The chemist and physicist can perform an experiment in a laboratory, establishing and controlling the conditions of the experiment. In contrast, the laboratory of the geophysicist is the earth itself, and the experiments are performed largely by nature. The task confronting the geophysicist is to observe these natural phenomena with suitable techniques and instruments, on a global basis, if he is to secure solutions to his problems and to develop adequate understanding, thus providing for the best and most efficient exploration of his environment. The compelling reasons, therefore, for the world-wide program include the following: to observe phenomena simultaneously and to secure geophysical data from all parts of the earth, and to conduct this effort on a coordinated basis by fields and in space and time so that the results secured not only by American observers but by others can be correlated in a technically meaningful and productive manner.

#### Historical Background

That problems of a geophysical type could benefit from international cooperation was recognized in 1882-83 when the First Polar Year was launched and, again, in 1932-33 when the Second Polar Year was undertaken. Both of these ventures were limited in space and in scope: regions of the North Pole were the sole subject of study. Though the results that accrued were therefore limited (in contrast to expectations from the current global program), one can cite that a single area yielded rewards far exceeding expectations: the studies during the Second Polar Year of the ionosphere, by techniques then recently developed by two American scientists, gave rise to communications data that have been estimated to have a value in the hundreds of millions of dollars.

#### International Geophysical Year

Several factors led to the proposal of an International Geophysical Year. The solution to various problems in geophysics requires data synchronously taken over the earth. Such problems include the better prediction and perhaps even the eventual control of weather and the better prediction of radio "weather" needed in modern communications and navigation. The nature of cosmic rays may be established through

a concerned effort, and the results have large potentialities in terms of nuclear physics. At the same time, our needs for better information about the earth and its atmosphere have grown markedly as a result of practical advances in transportation (in particular, high-altitude, high-speed aircraft) and of the possible importance of remote and isolated geographical regions.

Advances in various fields of science have also contributed to the realization that a major geophysical effort offered substantial promise of success. In particular, recent developments in instrumentation and methods of measurement permit the taking of data that could not be achieved twenty-five years ago. It was, thus, the combination of important problems, needs for better knowledge for practical as well as scientific reasons, and the current availability of suitable instruments that led to the present proposal of the International Geophysical Year.

Thus, the International Geophysical Year represents a broad, international cooperative program of research in the major fields of geophysics: aurora and airglow, cosmic rays, geomagnetism, glaciology, ionospheric physics, meteorology, oceanography, longitude and latitude, rocket exploration of the upper atmosphere, and solar activity. It denotes the period of time during which these intensified studies will be made (1957 and 1958). It also denotes that, while each Nation's program will be its sole responsibility and prerogative, mutual advantages can accrue from simultaneous, coordinated measurements of critical phenomena.

#### ICSU and UN Organizations

The proposal for the international geophysical effort originated in the International Council of Scientific Unions (ICSU), which consists of the various specialized international scientific unions. Toward the end of 1952, in consideration of the scientific aspects outlined above, ICSU deemed it of value that the International Geophysical Year program be pursued in order that advantage be taken of the period of maximum solar activity in 1957-58 and of the concurrent eclipses. ICSU accordingly established a Special Committee for planning on an international scientific level, and adhering bodies of the various nations were called upon to establish National Committees for the planning and undertaking of the program of specific nations.<sup>1/</sup> The adhering body in the United States is the National Academy of Sciences - National Research Council, which established a U. S. National Committee for the preparation of the United States program that would take advantage of the International Geophysical Year. Out of these acts and activities arose the proposal noted in this memorandum.

The cognizance of ICSU in scientific matters on an international level goes back in time to the Inter-Allied Conference on International Scientific Organizations, London, October, 1918. In the ensuing years

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<sup>1/</sup> Membership lists for the ICSU Special Committee and the U. S. National Committee are attached to this memorandum.

ICSU has played an important role in the deliberations of the various member international scientific unions, largely concerned with basic science, and with such matters as nomenclature, fundamental standards, etc., as well as specific scientific research requiring more than single-nation activity.

With the establishment of various United Nations organizations -- in particular, UNESCO and WMO (World Meteorological Organization) -- ICSU and these organizations deemed it appropriate to clarify their relationships. Accordingly, in January, 1947, an agreement was established between ICSU and UNESCO, calling in part for mutual recognition and consideration, and reciprocal representation.

The undertaking of the International Geophysical Year by ICSU has proceeded with knowledge of the activity on the part of UNESCO, and direct participation in the planning by WMO. The scope and magnitude of the program, however, precludes substantial UNESCO support, although UNESCO plans to assist the ICSU secretariat to at least the extent of \$5,000 this coming, and \$12,000 the following year. Moreover, the nature of the program, while calling for international collaboration on a scientific level, does not envisage international collaboration on a political or financial level. In part, this is so because of the magnitude of the program: it is estimated that the overall international program may reach \$100 million, a sum exceeding many times the funds available to UNESCO; and, in part, because each Nation's program is conceived of as within the prerogatives and total jurisdiction and option of that particular country, the scope and magnitude of such programs depending upon the interests and needs of each nation. In short, the pattern is primarily one of unilateral activity, but coordinated into multilateral activity because significant advantages are to be gained from simultaneity of observations and exchange of information.

#### Description of the United States Program

##### National Science Foundation

On November 25, 1953, following informal discussions with members of the U. S. National Committee for the International Geophysical Year, the committee working on the program, the National Science Foundation received a letter from the Chairman of the National Research Council, briefly describing the proposal and requesting the Foundation "to take responsibility for obtaining and administering Government funds for the contemplated work." In the course of this letter, the Council pointed out: "In transmitting this recommendation ... to you, we are mindful of the advantages of integrated planning and of a unitary presentation for financial support. It seems wholly appropriate ... to recommend that the Foundation, as the civilian agency with the broadest scientific responsibilities in the Federal Government, be requested to act as the channel through which the integrated program is administered."

In response to this request, arrangements were made for representatives from the National Academy of Sciences - National Research Council, including members of the U. S. National Committee, to appear before the

National Science Board on December 6, 1953, and again on January 29, 1954. Following the latter presentation, the Board authorized Dr. Chester I. Barnard (Chairman of the Board), Dr. Detlev W. Bronk (Chairman of the Board's Executive Committee), and Dr. Alan T. Waterman (Director of the Foundation) to submit the program and budget to the Bureau of the Budget as a special, nonrecurring item, for the Bureau's analysis and consideration as an item that would be an addition to the President's current program for the fiscal year 1955.

#### Scientific Aspects of U. S. Program

The subjects with which the geophysical program is concerned are characterized by their close interrelationships. Thus, solar activity has pronounced and perhaps controlling influences on the ionosphere and on the electric currents of the atmosphere that contribute a variable component to the earth's magnetic field, and these strongly affect radio communications and navigation. The earth's magnetic field also has a significant effect on cosmic ray paths and motions.

Within each of the fields there exists a need for detailed information as a prerequisite to a fuller understanding of our geographical and geophysical environment. This information is needed not only within each field, but, because of the actual and suspected interrelationships among the fields, is needed simultaneously in all if we are to make a marked advance. Recent advances in the sciences broadly as well as advances in recent years in instruments and methods of measurements make propitious the timing of the proposed program. Increased knowledge of the upper atmosphere is needed for aviation, guided missiles, and electronic communication.

Moreover, the timing -- 1957 and 1958 for the years of intensified, special experimentation and observation -- coincides with a maximum in solar activity, which fluctuates over a period of about eleven years, and also coincides with some significant eclipses, which will permit careful examination of some aspects of the effects of solar activity perhaps best observed then, upon ionospheric, geomagnetic, and cosmic phenomena.

The objectives of the United States program involve the establishment of temporary stations in various quarters of the Northern and Southern Hemispheres of the Americas and adjacent regions and the stationing of observers, with appropriate instrumentation, at many existing stations in these regions. The zones involved include the continental United States, Alaska, South America, Central America, equatorial regions of the Atlantic and Pacific Oceans, the Arctic, and the Antarctic. While the problems associated with manning most of the stations in these regions are relatively simple, the Antarctic presents formidable problems, requiring major expeditionary activity that can probably only be achieved through logistic cooperation extended by the Department of Defense. This aspect is discussed further below.

### Budget Aspects

It is expected that the program will require a budget of approximately \$12 millions. The program is, however, nonrecurring in nature: a single appropriation for the total program is contemplated, which will be expended for the most part over a period of five fiscal years (1955-1959 inclusive), but obligated for the most part in the coming fiscal year. By way of example, a considerable amount of instrumentation and equipment must be ordered in the coming fiscal year if the scientific program is to be begun in calendar year 1957. An added consideration with respect to the timing is the need for coordinating the various programs of the participating nations, scheduled for October 1-4, 1954, in Rome. More than 20 nations will then integrate the various programs; this will require rather definite knowledge as to the technical contents of each program and as to the scope of effort contemplated by each nation.

### Federal Aspects

The need for Government support rests largely (1) on the nature of the program. Concerned as it is with phenomena that affect our entire civilian and defense economies and each and every citizen; (2) on the traditional and Congressionally-recognized interest of the Government in such problems as weather, communications, surveying and mapping, and national defense; (3) on the magnitude of the program, which is beyond the means of private interests; and (4) on the international aspects which have been discussed above.

The participation and cooperation of a number of Federal agencies has already been a matter of informal agreement in many instances. The program as a whole is of particular interest to the Departments of Defense and Commerce.

Several aspects characterize the nature of such cooperation. First, the data now accumulated by such agencies as the Weather Bureau as part of its current functions and responsibilities represent a background desideratum of considerable value in the total effort. Second, the special geophysical projects making up the new, non-recurring program may in some instances best be given overall supervision by such agencies. Third, in some instances existing field facilities of these agencies in out-of-the-way places can be used.

One of the important remote regions in the U. S. program is the Antarctic. The Antarctic requirements of the program envision the establishment of a base at Little America and two satellite stations, one at the geographic South Pole, the other at the suspected "source" of Antarctic weather. While the scientific costs are to be presented in the forthcoming budget, the expeditionary costs remain a subject for additional exploration with the Department of Defense.

### Other Cooperative Aspects

In the course of the preparation of the program by the National Research Council, it has become apparent that a large number of private

and public institutions will cooperate in the program. Scores of the leading universities have, through their scientific staffs, participated in the formulation of the program. In the course of these formulations, not only has the participation of many key scientists and groups been assured, but it has become apparent that services of the highest order of competence will be made available to the program. From a budgetary point-of-view, it is estimated that these volunteered services may total several million dollars in value; at the same time, various institutions -- for example, many astronomical observatories -- will engage in unusual (as against normal) operations in order to assist in the program.

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