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OPPORTUNITIES FOR PAHO'S PARTICIPATION IN THE
INTERNATIONAL BIOLOGICAL PROGRAM

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Opportunities for PAHO's Participation in the
International Biological Program *

This presentation will describe the forthcoming International Biological Program (IBP) and open up discussion on possible avenues of cooperation and participation of interest to PAHO.

The administrative background of the IBP is as follows: In 1960 the International Council of Scientific Unions (ICSU) established a Planning Committee to consider the desirability and feasibility of an International Biological Program. This Planning Committee included representatives of the International Union of Biological Sciences, the International Union of Geography, the International Union of Biochemistry, and the International Union of Physiological Sciences, all of which Unions are members of ICSU, plus representatives of two Unions which are not members of ICSU, the International Union for the Conservation of Nature and Natural Resources, and the International Union for Nutritional Sciences.

The objectives of this program were envisioned by ICSU as the world-wide study of

- (1) organic production on the land, in fresh waters, and in the seas, and the potentialities and uses of new as well as existing natural resources,
- (2) human adaptability to changing conditions.

The Planning Committee established a number of sub-committees to consider various aspects of the program and to elaborate a more extended plan. These various sub-committees combined their efforts into a series of suggestions and recommendations which the Planning Committee coordinated and submitted to ICSU in November of 1963. ICSU accepted the report, and in July of 1964 convened a First General Assembly for the International

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- 2 -

Biological Program in Paris, at which an effort was made by officers of ICSU and the officers and members of the Sectional Committees for IBP to begin to work out the multitudinous scientific and administrative details of the program.

The general program which was evolved was then referred back to the various appropriate national Societies for their consideration. In most countries, following the pattern established during the International Geophysical Year, the 'appropriate national Society' has been the National Academy of Sciences or its equivalent.

It should be emphasized that the program developed by the Planning Committee is broad and tentative. It has been a firm principle from the outset that no attempt be made to impose a rigid program on any country or any society. Rather, in the planning the objective has been to formulate a broad and sound program, with each participating country having the option of implementing such aspects of the program as it sees fit.

Turning now to the program itself, as noted above, it is two-pronged. The productivity aspect is obviously aimed at the increasingly demanding problem of reconciling population with food resources. This is largely an ecological program. The human adaptability aspect is of more immediate concern to this Organization.

The most succinct statement of the general program envisioned under the heading, 'Human Adaptability' is found in IBP News Bulletin No. 2, issued in February, 1965, from which the following detailed quotation is taken:

- 3 -

SCOPE

It is fitting that the International Biological Programme should include a section aimed at the world-wide comparative study of human adaptability. The IBP as a whole is concerned essentially with the functional relationship of living things to their environments, in the sea, in fresh water and on the land; it is conceived as the world-wide ecological study of communities of plants and animals - those still existing in relatively natural habitats and those in more disturbed or artificial conditions.

An analogous approach can be made to the ecology of mankind. At this stage of human history vast changes are affecting the distribution, population density, and ways of life of human communities all over the world. The enormous advances in technology make it certain that many communities which have been changing slowly or not at all will relatively soon be totally transformed. We are therefore in a period when the biology of the human race is undergoing continuous change measured in terms of health, fitness and genetic constitution. The International Biological Programme provides a great opportunity to take stock of human adaptability as it is manifested at the present time in a wide variety of terrains, climates and social groups, to deepen our knowledge of its biological basis and to apply this knowledge to problems of health and welfare. To do all this satisfactorily, for communities ranging from the very simple to the highly industrialized, requires an integrated approach and an application of methods drawn from many fields, particularly those of human environmental physiology, population genetics and developmental biology aided by auxiliary disciplines, for example in medicine, anthropology, ecology and demography.

CATEGORIES OF RESEARCH ACTIVITIES*

The problems of human biology which are appropriate for study within the IBP are manifold; many examples are given in the lists in HA 14 (1964). At the Paris Assembly of IBP, it was agreed that these should be regrouped and that national contributions to IBP should be selected from amongst the following categories in accordance with the interest and resources of the countries concerned.

* In accordance with documents HA 14 (Annex 1) and GM 35. [Copies of these are still available from the Convener, Dr. J.S. Weiner, Royal Anthropological Institute, 21 Bedford Square, London, W.C.1.].
Note: The references in the text are to appropriate sections of HA 14 (see Annex 1).

Category 1.Survey of sample populations in conformity with a world scheme

The general aim is to obtain as rapidly as possible surveys on a wide geographical range using standardized methods. Surveys will be intended to make good as rapidly as possible deficiencies in our present knowledge of the distribution of important population characteristics. A knowledge of the distribution of these characteristics will, in itself, throw light upon many problems of human variability, adaptation and welfare.

- (a) Extensive surveys to determine gene frequencies of known polymorphic systems (see G.1[‡]).
- (b) Extensive surveys on growth and physique (see F.7 to F.12).

Category 2.Intensive multi-disciplinary regional studies based on habitat contrasts
(see Annex 2)

The general aim is to elucidate physiological and genetic processes concerned in adaptation and selection in relation to climatic and other environmental factors. This requires an analytical ecological approach, appropriate to the particular research problem and area, based on an integration of the following components:

- (a) A basic socio-demographic assessment of the community (for sampling genetic and other purposes).
- (b) A basic assessment of the environment.
- (c) A general survey of genetic constitution (following Category 1 (a) above).
- (d) An assessment of medical status of the subjects.
- (e) An assessment of dental condition.
- (f) An assessment of nutritional condition.
- (g) A background description of the daily and seasonal activities.
- (h) An assessment of physique and growth (following Category 1 (b) above).
- (i) An assessment of working capacity as an index of fitness.
- (j) Environmental physiological studies.
- (k) Genetic studies.

[‡] The references to G.1 etc. in the text refer to the sections in HA 14, given in Annex 1.

-5-

Every population chosen is to be studied by this comprehensive multi-disciplinary approach. The particular problems of interest will determine which elements are to receive special and sustained attention. The emphasis could fall on environmental physiological studies (see E.1 to E.16); on population genetic studies (see G.2 to G.5); on intensive studies of growth and physique (F.7 to F.13); on intensive studies of fitness (F.1 to F.6). In addition, certain of the special investigations (Category 3) could find a place in these multi-disciplinary studies, particularly nutritional and demographic studies.

Category 3.

Special investigations on selected populations

A number of problems requiring intensive study but on a less comprehensive basis than that of Category 2 have been selected for the consideration of national committees:

- (a) Studies of physiological fitness (working capacity and pulmonary function) of particular population samples - as far as possible on a longitudinal basis. Three groups in particular are of interest (see also F.1 to F.6);
 - i) Samples from urban industrialized populations.
 - ii) Samples from non-industrialized populations.
 - iii) Athletes.
- (b) Disease as a selective agent of genetic constitution (see G.5).
- (c) Particular socio-demographic factors affecting genetic constitution (see G.3 and G.4).
- (d) Factors controlling population dynamics. (This proposal has still to be formulated in detail).
- (e) Special nutritional problems. (FAO has placed particular emphasis on 'calorie intake in different habitats').

Category 4.

Investigations related to current WHO activities (see Annex 3)

It seems feasible in many cases to include in the above categories certain observations which are complementary to current WHO interests, for example:

- (a) Surveys of blood pressure in relation to age, sex, occupation (see H.2).

- (b) Haematological data (total red cell counts, etc.) (see H.4).
- (c) Antibody levels in blood (see H.3).
- (d) Certain blood constituents (see H.8).
- (e) Surveys of congenital abnormalities (see H.6).

You will note the reference in Category 4 to the World Health Organization. WHO through its liaison with ICSU has been from the first represented by an observer at the various meetings just described. In considering its role in this program, WHO has recognized that the surviving so-called primitive cultures of the world represent the norms under which human physiological and genetic adaptability evolved, and that perhaps WHO was in a position to facilitate studies on such groups. To this end, WHO convened a Scientific Group on Research in Population Genetics of Primitive Groups, which met in Geneva in late 1962. I should like to quote at some length from the opening paragraphs of the report of that group, published as WHO Technical Report No. 279.

1. INTRODUCTION

Many of the primitive communities of the world face immediate disintegration of their culture, with consequent far-reaching biological changes. This presents a challenge to biomedical scientists which has an urgency and importance quite out of proportion to the relatively small number of people directly involved, or the known health problems concerned.

In the present report, the Scientific Group has attempted to outline the nature of this important problem and to suggest the way in which it may be approached through studies in the population genetics of longstanding, but now rapidly changing, human indigenous populations. Such studies will need to give special attention to the ecological and sociological factors bearing on the genetic structure of small populations, particularly those with a hunter-gatherer, simple pastoral, or digging-stick-and-hoe type of agricultural economy.

Although there is a substantial body of generally accepted theory regarding the factors that govern the distribution of genes in time and space, few groups, either primitive or civilized,

have been fully described genetically. Still less have the biological and sociological parameters relevant to their genetic structure been adequately investigated.

The present emphasis on primitive communities of the types mentioned above springs from a number of considerations:

(a) Such groups present both in their size and level of economy the closest approximation one can find to the conditions under which man has lived for the greater part of his existence. It is probable that much of the genetic endowment of modern man has been shaped by the action of natural selection and other evolutionary processes at these cultural levels.

(b) The relatively small size of these populations and the simplicity of their ecology render them more manageable for intensive studies than larger, more complex groups with their special problems of sampling.

(c) The majority of these populations are threatened with imminent cultural disintegration and, in some instances, loss of physical identity in the face of advancing civilization. It is therefore imperative to study them as fully and as soon as possible.

(d) The appropriate techniques for such intensive studies are now available.

The studies envisaged will require the close co-operation of specialists from many overlapping disciplines, including not only human geneticists, but also social, cultural and physical anthropologists, linguists, demographers, ecologists, geographers and medical scientists.

1.1 Objectives of studies

The study of population genetics in primitive groups should clarify the following problems:

(a) The genetic component in mortality and fertility differences through the study of familial factors on the one hand, and the study of variations in birth-and-death-rates in relation to different genetic structures on the other.

(b) The biological consequences of inbreeding. Such populations also provide opportunities for examining the biological consequences of formal kinship and marriage systems.

(c) The disease pattern of relatively undisturbed primitive populations. Attempts should be made to relate disease susceptibilities to specific genetic structures.

(d) The possible evolutionary implications of differing disease patterns in males and females.

(e) The biological relationship of the group under study to neighbouring groups or to those more remote in time or space. This is likely to require collaborative study involving, for example, cultural, anthropological, linguistic, historical and archaeological investigations.

(f) The effects of contact with more advanced cultures, in particular the effect on gene frequencies, the emergence of new disease patterns, the possible relationship of these to genetic constitution, and the alteration in physical measurements and physiological and biochemical characteristics.

Such studies will involve the careful collection of a large amount of information by experts from many disciplines, both in the field and in the laboratory. The data which the Group considers should be collected in a carefully planned and co-ordinated investigation are set out below. It is realized that there are many factors that may make it difficult to assemble all this information for any particular group, such as lack of full rapport with the group under study (problems of language or other difficulties in communication); breakdown in the collection and transport of specimens; limited availability of trained personnel or specialist facilities. The Group wished to emphasize, however, that every attempt should be made to carry out such studies as intensively as possible so that valuable information can be recorded before it is too late.

Your attention is directed to another recently published report, entitled "The Biology of Human Adaptability," edited by P. T. Baker and J. S. Weiner (Oxford University Press). This contains the papers presented at a conference sponsored by the Wenner-Gren Foundation, aimed at considering in some detail the various problems involved in implementing the Human Adaptability Aspects of IBP.

Let us turn now to the specific matter of "Opportunities for PAHO's Participation in the IBP." It would be most presumptuous of me on the occasion of my first meeting with this group, when I have so much to learn of the organization's functioning and program, to attempt to present any kind of detailed outline. Rather, I would like to advance a few tentative suggestions, and then open the matter for general discussion.

- 9 -

As currently envisioned, the studies of human adaptability sponsored by IBP will be of two principal types, namely, physiological and genetical. It is an extraordinarily fortunate coincidence that a Special Session on Life at High Altitudes is scheduled for tomorrow, under the chairmanship of Dr. Hurtado. The types of problems and investigations which will undoubtedly be considered in the course of this session represent, as I understand it, precisely the type of investigation which IBP hopes to encourage. I suggest we leave further consideration of this aspect of IBP until tomorrow, and devote the remainder of this presentation to the kinds of genetic studies contemplated under IBP, and how PAHO might facilitate them.

It seems clear that a principal focus of interest of IBP will be unusual human populations, of a type to disappear in a relatively few years. These are of many kinds. Thus, almost every country has its racial and religious isolates, many now in a process of dissolution. Furthermore, here in the Americas we have a second type of population of great humanitarian and scientific interest. These are our Indians.

Man reached the American continent at a relatively late stage in his evolution. That the Bering Straits constituted his major, and perhaps sole route of access, and that he may first have trod this route some 30,000 years ago, seem relatively clear. Much less clear are such details as the period of time over which this immigration was spread; whether it was a more or less continuous process or occurred in waves, perhaps separated by minor periods of glacial advance and retreat; and the numbers of people involved. For no other large area of the earth can we date and place the arrival of its first inhabitants with such accuracy, inhabitants whose descendants then fanned out over vast areas in small bands, to occupy almost all the types of ecological habitats now recognized.

The genetic problems posed by the descendants of these immigrants would appear in the main to fall into three overlapping categories, as follows:

(1) What is the degree of genetic divergence which has arisen between the various tribal subdivisions of the descendants of the one or more founding stocks? This is in many respects a taxonomic problem, involving not only a determination of the frequencies of genes responsible for specific traits, but also the continuing study of certain physical characteristics whose precise genetic basis is now unclear but will surely be better understood in the future. Because, as noted above, we can time the arrival of the Indian on the American continent with some accuracy, here is an unusual opportunity to determine the tempo of human evolution.

(2) For such of these groups as still persist in an essentially pre-Columbian state, to what extent can we identify the significant biological parameters, parameters which we may presume to have obtained over the majority of human evolution? In connection with this question, let us quickly recognize that there is no Indian group completely untouched by the discovery of America and subsequent contacts, direct or indirect, with the Western World. But the fact remains that there are still a number of Indian groups whose economy is essentially that of hunting and gathering, supplemented by incipient agriculture. What are the significant biological determinants in these groups? More specifically, to what extent do these groups provide an opportunity to study the nature of the natural selection to which man was subjected during most of his evolution?

(3) What new disease patterns will emerge as these primitive groups make the transition from a near-Stone Age to an Atomic Age existence, and to what extent is there provided an opportunity to study in an intensified and telescoped form the genetic adjustments which presumably occurred as

- 11 -

other groups, including our own ancestors, made this transition?

South America today contains more different groups of relatively untouched primitive man than any other part of the world. Table 1 presents a listing, almost certainly incomplete, of tribes still surviving under conditions where their culture is essentially intact.

There is a widespread feeling that the past study of these groups has been on a small and inadequate scale. It has also been curiously disjointed--the cultural anthropologist seeing culture apart from biological implications, the physical anthropologist elaborating measurements without the proper statistical tools for their analysis, the geneticist counting genes with little appreciation of the milieu from which they were drawn. The emphasis now is on a multi-disciplinary approach, which places in the field representatives of the various disciplines--medicine, anthropology, genetics--on a working level.

If, now, in connection with the IBP, the study of these groups is to be greatly intensified in the future, not only because of the stimulus of IBP but because of the general realization of the speed with which the groups are disappearing, what, if any, role should PAHO play? I should make it very clear that it is not my intention to urge a course of action, but rather to acquaint you with developments which might lead to actions on the part of PAHO. At the one extreme, PAHO might recognize multi-disciplinary studies of various kinds of populations--Indians at various stages of acculturation, Mestizo, Caucasian and other isolates--as a type of activity it wishes to sponsor. At the other extreme, PAHO might consider practical measures it would encourage to attempt to minimize the usual deleterious impact on the health of the Indian of first contacts with our culture, and thus aid studies by insuring the persistence of the peoples concerned.

On a somewhat different level, given the existence of a large number of semi-acculturated Indians, PAHO might consider whether they present any special health problems. The numbers involved are not inconsiderable--perhaps 10,000,000 persons.

In this presentation, an attempt has been made to acquaint you with the principal outlines of the emerging International Biological Program. It is still largely in the planning stage--the 'official program' is expected to extend from 1968 through 1972. PAHO member countries now known to be planning IBP activities are the following:

Argentina	Mexico
Brazil	Peru
Canada	Uruguay
Chile	Venezuela
Colombia	

In closing, I emphasize that it has not been my purpose to suggest any particular course of action for PAHO. The success of an IBP is not contingent on PAHO participation. On the other hand, some of the objectives of IBP may correspond with the interests and responsibilities of PAHO, to an extent that common cause is indicated.

T A B L E 1

Some surviving primitive groups in the Americas

<u>Location</u>	<u>Group</u>
Nicaragua	1.- Sumu 2.- Ulva
Panamá - Colombia border	3.- Choco
Venezuela	4.- Bari (Motilones Bravos) 5.- Panare 6.- Piaroa 7.- Warao
Venezuela - Brazil border	8.- Yanoama Group (Waica, Shiriana, etc.)
Brazil - British Guiana border	9.- Parikotó 10.- Wai-wai
Brazil - Surinam border	11.- Tirió
Brazil	12.- Araras 13.- Asurini 14.- Boca Negra 15.- Canoeiros 16.- Gaviões 17.- Guajá 18.- Ipewi 19.- Kabixi 20.- Maku 21.- Mandawáka 22.- Maopityan 23.- Mayongong (Iekuana) 24.- Northern Cayapo 25.- Parakanan 26.- Sheta 27.- Suyá 28.- Tapayúna 29.- Waimirí 30.- Xavante
Brazil - Bolivia border	31.- Pakaánovas
Peru	32.- Amahuaca 33.- Jivaro 34.- Mashoo 35.- Yaminahua
Bolivia	36.- Siriono
Paraguay	37.- Guayaki
Argentina	38.- Morotoko