PERSPECTIVES IN BIOLOGY : THE INTERNATIONAL BIOLOGICAL PROGRAMME

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THE human population on this planet is increasing at an alarming rate and the problem of feeding, clothing, housing and providing gainful and satisfying employment to this ever-increasing population is becoming a formidable task. If the population explosion goes on, in much the same manner as it has done in the last few decades, it will outstrip all efforts to increase world's resources. Concerted efforts are therefore being made all over the world to take stock of our biological resources, preserve and exploit them, and explore the untapped food resources of the seas, rivers, lakes, and land. This is a world-wide problem and no single country or nation could do this on its own. International co-operation is imperative. Such co-operation has, in the past, produced significant advances in other fields in the physical sciences. It has hardly been tried in biology. Even the techniques used by biologists the world over are not standardized, and often, data from one part of the world cannot be compared with those from other areas, nor inferences drawn.

The International Biological Programme (IBP) has been set up for this purpose. It will stimulate studies in environmental Biology and direct its activities towards a renewed thinking of Man in relation to his environment; it will focus attention on world's resources and their proper utilization; it will help create new resources; it will assist in the understanding of the needs of man in his wide and varied environments.

The IBP is motivated by a global purpose. Its objectives are essentially twofold: it has conceived a world-wide basic inquiry into organic production on land, in the freshwaters and the oceans of the earth with a view to making estimates of the possible output of existing as well as new and potentially promising natural resources. In addition, the programme envisages an international basic study of human adaptability under varied and changing conditions.

There is a great urgency for conducting these studies. Time is of essence. Man and his environment are undergoing rapid changes. This is not a local or isolated phenomenon. These vast changes in human societies and the milieu in which human beings live are taking place gradually in some places and with dramatic suddenness in others all over the world. Before opportunities for such a study are irretrievably lost, the international programme will have to be completed.

There are many ways of looking at the problem. Ideally it can be thought of as having 4 essential components: Basic biological investigations in relation to (1) human genetics and adaptability, (2) human nutrition, (3) human health and freedom from disease, and (4) conservation and study of natural biological communities.

Admittedly this is an ideal approach which however cannot be implemented in practice. Realizing the many practical difficulties, the IBP has delimited its activities to the following sections:

PT : Productivity of Terrestrial Communities.
PP : Production Processes.
CT : Conservation of Terrestrial Communities.
PF : Productivity of Freshwater Communities.
PM : Productivity of Marine Communities.
HA : Human Adaptability.
UM : Use and Management of Biological Resources.

An International Scientific Committee (SCIBP) consisting of about 25 members representing the principal regions of the world has been set up with its headquarters in London. The present President of the Scientific Committee is Prof. J. G. Baer of Switzerland and the Scientific Director, Dr. E. B. Worthington. The Central Office of the IBP is located at 7, Marylebone Road, London N.W. 1.

Each of the sections has a Committee to assist it in the formulation of the relevant part of the programme. All sections have one

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common aim, *viz.*, *"The Biological Basis of Productivity and Human Welfare"*.

The first phase of the programme comprises design and feasibility studies, initiation of pilot projects and organization of symposia. In the second phase, due to start in 1967, the full programme will be operative.

In India, a National Committee for Biological Sciences has been set up by the Government of India to co-ordinate and serve as a clearing house for the biological work conducted under the various organizations in the country and to co-operate with the International Special Committee (SCIBP). Sectional Committees for the seven sections will soon be constituted and the IBP programme initiated.

India like many other developing countries is faced with the twin problems of population explosion and inadequate food supplies. We should not only produce more, to feed the 12 millions being added to our population every year, but we should also check population growth. We have only just realised the need for improved agricultural methods and technology towards increased food production but the spectre of over-population stalks all the time bringing in its wake several problems often entirely unrelated to food shortage and improper housing. It is therefore clear that improvement of our resources should keep pace with all-out efforts to check population growth.

The objectives of the different sections are :

PT.—The section comprises studies of selected communities representing major ecosystems to obtain basic data on production levels, energy flow and mineral and water cycling. It involves close co-operation between plant and animal biologists, chiefly ecologists, taxonomists and physiologists. Collaboration with specialists in other disciplines such as meteorology, pedology, geography, agronomy and forestry is necessary for fruitful investigations. In India, delimitation of different vegetational zones and study of vegetation succession in them have been accomplished in the Terai forests of Himalayas, the Tectona forests of Madhya Pradesh and the humid forests of Western Ghats. However, studies of energy flow in these ecosystems are yet to be initiated on a large scale. Also, under this section, cereal crops will be given high priority as they form an important part of our diet.

PP.—The aim of this section is to study biological fixation of nitrogen and its circulation in living matter and also the utilization of solar energy. Methods and techniques for evaluation of photosynthetic activity should be standardized so that they could be used for determining photosynthetic activity per unit area.

CT.—The object of this section is to study wild and semi-wild ecosystems and conserve them. The IBP will not undertake a preservation action programme but will make a scientific evaluation of the natural areas of the world as a basis for such a programme.

PF.—The scope of this section is to determine the basic factors of production and metabolism at all trophic levels in representative running and standing waters, scattered over the major climate regions. Primary productivity studies in the lakes, rivers and reservoirs of India have been few and far between and there is great need for intensifying them.

PM.—The object of this section is to study production in the marine environment and to exploit the fishery resources of the sea. In addition to rainfall and radiation, the marine meteorological conditions, such as vertical water movement, which bring nutrients upto the euphotic zone from the deeper layers, are important in enriching the sea. Upwelling of deep nutrient-rich waters influences the distribution and abundance of plankton and in turn of fishes. New areas of upwelling in the Arabian Sea and the Bay of Bengal have been recently discovered, largely due to the co-operative efforts of the countries participating in the International Indian Ocean Expedition. Since these areas are potential fishing grounds, efforts must be made to ensure proper exploitation. Oceanographic research can aid in a practical way in utilizing the resources of the sea.

This section also deals with fundamental ecological aspects as a necessary prelude to the scientific basis for the improvement of accessible resources in the seas and oceans. These would include coastal belts, lagoons, estuaries and mangrove swamps. Admittedly, these are useful to man as productive ecosystems but owing to reclamation, pollution and indiscriminate and unscientific methods employed to exploit them, their productivity is seriously impaired.

HA.—Modern man is busy altering his environment at an ever-increasing rate. He is synthesizing new chemical compounds with which life has never been confronted before,

using some as drugs, putting others in the atmosphere as wastes and spreading still others on crops as insecticides. Modern medical and public health practices have resulted in whole populations being injected with new chemical and biological additives. Man is migrating and mixing and he is rapidly altering his social, familial and marital patterns. The enormous advances in Science and Technology have led to many communities, which in the past were changing slowly, being transformed in a relatively short period. It is therefore appropriate that the IBP has included *"Human Adaptability to Changing Environment"* as one of the sections.

India is unique in several respects as far as its human populations are concerned. It has within its national boundaries almost all the major racial groups under a social structure which has preserved many of its early characteristics. Moreover, climatic conditions in the sub-continent vary from the extreme cold and high altitude of the Himalayas to the humid tropical conditions of South India. What is even more interesting and perhaps unique is, some of the population groups have undergone a high degree of occupational specialization extending over tens and even hundreds of generations. Some of the communities have practised inbreeding as a social norm over two or three millennia. Thus the populations of India provide unequalled opportunities for studies of human adaptability as envisaged under IBP.

The international programme under this section consists of three main categories of research projects:

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

(*a*) extensive surveys of blood groups and other related genetic traits and

(*b*) extensive surveys on growth and physique.

2. Intensive multi-disciplinary regional studies based on habitat contrasts to elucidate physiological and genetic processes concerned in adaptation and selection in relation to climatic and other environmental factors.

3. Special investigations on selected populations.

The actual research projects may be listed under the following heads:

(*i*) Environmental physiology.

(*ii*) Fitness, growth and physique.

(*iii*) Genetics of populations.

(*iv*) Health, nutritional and epidemiological aspects.

Although this framework is sufficiently wide, it is not unlikely that we in India might be able to enlarge upon this and may even be able to develop newer lines of investigation not envisaged here.

UM.—The primary object of this section is the co-ordination of applied programmes of International Organizations such as FAO, WHO, WMO and UNESCO. Exploration of new biological resources, improvement in methods of food preservation, pest and plant disease control are under the purview of this section. Control of pests and plant diseases are engaging the attention of many organizations in the country. Though work on food preservation and exploration of new biological resources is in progress in India, there is need for intensification of these efforts to make an impact on the large population. Seaweeds could be processed for human consumption as in Japan. Cultivation of fungi and mushrooms could be developed to augment our food resources.

The IBP is of interest to all countries of the world but is of special significance for developing countries like India. As a result of three successive plans of economic development, we have now a clearer picture of our national problems although a satisfactory solution of many of them is not yet in sight. Better standards of health that the people now enjoy as a result of these plans have given rise to a rapid rate of increase of the population. Food production has also increased during these successive plans but not enough to make a serious dent in malnutrition which is still widespread.

The practical aspects of these problems are being dealt with at the highest levels in the governmental organization with the assistance of national and international agencies. These activities, however, depend on basic biological knowledge which in many cases is at present wholly inadequate and there is wide scope for promotion of appropriate studies. The value of IBP lies in strengthening international co-operation which is so essential for increasing the tempo of these activities and raising their quality. Biologists in India should look forward to a fruitful participation in this great International venture for the prosperity and well-being of man and his biological environment.