

INSTITUT DE LA VIE

**SCIENCE IN THE
SERVICE OF LIFE
GLOBAL PROBLEMS**

INSTITUT DE LA VIE

Founder : Maurice Marois

Tour C.I.T., 3 rue de l'Arrivée, BP 244
75749 PARIS Cedex 15 — France

INTRODUCTION

(translation)

A quarter of century ago, in 1960, a few men rose up at our appeal to lay the foundation of « the Institut de la Vie ». During their long march the cohort has grown until now it includes 2 500 men and women scientists, from 60 different countries, including 50 Nobel Prize Winners. The Institut de la Vie hopes to provide a voice for the conscience of science and the will of mankind to live.

On February 12, 1986, letters expressed in the same terms were delivered to the Ambassadors to France of the United States and the Soviet Union. The letters proposed a challenge and a theme. A challenge : Yes to life. A theme of international cooperation : Science in the Service of Life : Global Problems. The Institut de la Vie wanted to seize this rare moment in which the Heads of State of the two very great powers are exchanging their views on the world situation.

The two long and very impressive replies from Secretary General Gorbatchev on March 7, 1986 and from President Reagan on April 29, 1986 are of extreme importance. They give to life its political nobility. They give to science its place in the great affairs of the world. They are expressed in a language of values and responsibility. They demonstrate a willingness to work in a spirit of bilateral and world-wide cooperation.

And thus the Institut de la Vie finds itself entrusted with a unique mission : to build up proposals on which a universal consensus may be established.

From October 13 to 17, 1986 and from January 5 to 9, 1987, scientists from eleven countries came together in Switzerland at the invitation of the Institut de la Vie. These men have formed themselves into a permanent committee which will be joined by scientists from at least twelve other countries. The purpose of the conferences was to

prepare a first program on the theme : « Science in the Service of Life : Global Problems ». The Heads of State or of Government of eight countries have honoured the Institut de la Vie and shown their interest by generous messages conveying good wishes.

At the end of these meetings, the attached resolutions were approved unanimously. They were written with the will to be useful to all the peoples in the world.

The Institut de la Vie does not presume to substitute itself for the great national and international scientific organizations nor for the government or inter-governmental organizations or agencies. It calls for a trusting and fruitful cooperation.

The activities of the Institut de la Vie are carried on with scientific rigor and objectivity. Operating on an inter-disciplinary basis, they are inspired by a global vision. They have no political character. The Institut de la Vie refuses to interfere in the internal affairs of countries. Its philosophy is positive, aware of essential values, conscious of ethical issues, deeply concerned with life, in the service of the whole man and of all men.

Because of its acquired experience
its scientific representativeness
its moral and diplomatic credit
the strength of its structures
its doctrinal security
the rigor of its method

it seems that the Institut de la Vie is designated by its own history to continue to inspire the healthy development of the concept of life.

Life is bursting forth in the great international debates and will provoke a historical change in orientation of the policy of the nations : the challenge of life will dominate human history for centuries to come.

Maurice MAROIS

SCIENCE IN THE SERVICE OF LIFE GLOBAL PROBLEMS

Documents originaux

PREAMBLE : SCIENCE AND HUMANITY

RESOURCES OF MANKIND

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PREAMBLE : SCIENCE AND HUMANITY

Life on this planet, especially the life and wellbeing of all mankind, is in peril. Thoughtful people all over the world, including the majority of scientists, recognize this danger. The Institut de la Vie seeks to bring the powers of science to bear on these problems with the conviction that rational human minds will triumph and that life, in all its magnificent diversity, will survive and develop to new heights of achievement, in spite of global pollution of the environment, the reduction of biological and genetic diversity, and the degradation of protective features such as atmospheric ozone. To provide another example, acid rain creates injury far beyond the sources of origin. Thus mankind is entering an epoch in which it is becoming necessary to restrict many activities by sets of regulations. All persons have the right to know what activities are not acceptable under all circumstances.

Fortunately, under conditions appropriate for international scientific cooperation, modern science and technology have the means to supply much of the knowledge needed to correct actions that have the potential for driving mankind to the verge of disaster.

In order to realize these benefits, it is necessary to formulate a body of authoritative international opinion based on quantitative analyses of the ecological consequences of largescale human activities influencing the welfare of mankind and the environment, thus providing the basis for warning people of potential dangers in time to prevent evil consequences.

Eventually, adequate, internationally accepted ecological regulations must be established to safeguard the further development of civilizations in harmony with flourishing of life in general.

Both man's relation to man and man's relation to nature present profound moral and ethical aspects. These are insufficiently understood, and merit further thoughtful research.

Knowledge of man occupies the forefront of human thought, and all mankind shares a common destiny.

To meet the challenges before us, we must draw on the achievements of the natural sciences and of the humanities, and must base our work on understanding of and respect for the cultures of all people, of West and East, of North and South.

We propose the creation of an international program with the purpose of studying mankind in relation to life in general and to all global problems generated by man's activities.

This is necessary because some human activities have short or long-term consequences, often of a harmful nature. These consequences can harm large populations, or even all mankind. Widespread, long-term effects can impair the welfare of people for generations to come. Hence we must recognize the profound ethical implications of large-scale human activities and point the way to protect our own and future generations from their unfavourable effects.

This protection can be achieved only on the basis of broad, interdisciplinary approaches and with the cooperation of scholars at national and international levels.

For our next steps, we recommend that the Institut de Vie focus increased attention on the problems affecting MAN, especially on the interrelated destinies of all mankind in this dangerous world, with its many ambiguities and contradictions.

We can hope to prepare people for a new, more broadly based role and to adapt new, broader and more humane ways of thinking, without which we may not be able to save our planet.

RESOURCES OF MANKIND

As the people of every nation join in common concern for life on this earth, they find themselves using improvidently and dangerously the very resources on which depend their own lives and those of their descendents for generations to come. All living things of every kind depend for their existence on the gases, waters, salts, minerals and soils of this earth, and on energy derived from sunlight, or less commonly from chemical bonds resident in mineral components. Very precious amongst these resources are the genes of the living world, which determine the hereditary characteristics of every living being. Human life and human civilizations depend on these resources. All living things are interdependant ; and all living things depend, in turn, on the integrity of the non-living resources of this motherly earth.

Man represents a unique species among different forms of life on this planet. Uniquely for mankind, an essential and distinctive set of resources lies in the knowledge, in the experience, in the senses of right and wrong, and in the human wisdom which is often encoded in philosophies and in religions. Creations of the human mind and spirit: the art, architecture, prose, poetry, painting, sculpture and music constitute priceless treasures of mankind. Some of these have been damaged, destroyed or placed in danger by the products of man's improvident practices. Yet, in their entirety, the resources of the human mind and of the human spirit can provide the motivation and the means to protect life on this planet, to preserve our civilizations, and to raise human culture to new heights of achievement and virtue.

Important portions of these great assets of civilization are under threat. As examples, the marble treasures of the Acropolis of Athens and the brilliant medieval and renaissance architectural and sculptural monuments of Krakow are rapidly eroding under the pressures of industrial pollution.

a. Non-renewable Resources

Mankind's activities are now assaulting the irreplaceable natural resources on which civilization is based at rates unprecedented in the history of this earth. The rate of destruction at man's unkind hands is accelerating. In the aggregate, these uncomprehending and careless destructive practices are no trivial matter. We are destroying some of our fine agricultural soils, our productive fisheries, our forests and even important properties of the air we breathe: our air: which protects us to some extent from cancers produced by excessive sunlight and which regulates the temperatures of our lands and oceans, the distribution of rain and snow, and even the areas of habitable land available for our cities, our farms, our recreation and our pasturage.

Let us look at some of the ways in which our short-sighted misjudgements are eroding the bases for life and for civilization. We here suggest an example:

A considerable group of hazards derive from the world-wide use of fossil fuels, represented in coal, oil and natural gas. Thoughtful and informed persons recognize challenges to life resulting from the extraction, the transportation and the combustion of these useful and valuable substances. Combustion of these fuels is leading to a steady accumulation of carbon dioxide (CO₂) in the atmosphere. Careful study has led to the conclusion that this global increase in CO₂ is leading to global climatic changes, characterized principally by an appreciable warming of climatic temperatures on a world-wide scale. Detailed prediction of regional effects of these warming trends poses some uncertainties, but at present scientists anticipates shifts of agricultural production to regions closer to the arctic circle, together with a global rise in sea level of uncertain extent and rapidity, but perhaps amounting to 60 cm, or about two feet, in a century. Such rises in sea level will pose serious problems for low-lying areas such as southern Florida, The Netherlands and coastal Bangladesh.

If the rise in sea level is greater than estimated, or if it continues at anticipated rates for several centuries, the consequences will be even more severe and millions of people may be displaced, their homes becoming seabottom.

The extraction, transportation and combustion of fossil fuels also poses other serious challenges to life. Several thousand persons are killed and many more injured and rendered sick each year in the mining and transportation of coal. Spillage from wrecked tankers, both ships and land vehicles, has spread pollution and danger over considerable areas of coastline and along highways and railways, though recovery has been relatively rapid. Acid water drainage from coal mines and disturbances of top soil from strip mining and from deposits of mine tailings have impaired the productivity of much land, with little recovery. Effluents from smokestacks and exhausts of coal and oil burning plants and equipment spread acid-generating substances, soot and dust, carcinogens, and even radioactive material, in addition to CO₂, to the peril of life: life ranging from mankind to the vegetation and microorganisms on which many living things depend. The sources of these problems are distributed all over the industrial world, and safeguards sufficient to protect life from the consequences must be deployed globally.

b. Renewable Resources : Genes of the Living World

In nature itself, the world's resources of genes, which have developed, matured and diversified over three billion (three thousand million) years, are eroding and diminishing in richness under the destruction, at mankind's hands, of wilderness areas, and under the effects of pollution of wetlands, rivers, lakes, estuaries, and coastal waters. Once extinct, a gene or a species cannot be replaced or renewed.

The extinction rate of plant and animal species has also been accelerated by human agricultural practices during the last centuries, and the diversity of the inherited characteristics of many crops and

domestic animals has been impoverished by selective breeding in the interests of greater yields. These practices have brought benefits, but have at the same time created perils for future generations. Adequate protection of life in the future require careful husbanding of the genetic diversity of imperiled species, particularly of the major food crops of the world. This must be done on an international scale, in a cooperative manner, in such a way as provide for unfailing maintenance of valuable germplasm and to insure ready availability of genes so stored to qualified persons in all countries, whenever needed.

The rich, diverse stores of genes in the living world are embodied in and influence the destinies of living beings of every kind. These diverse species are, of course, interdependant, and human understanding of the extent; the subtlelies and the importance of these interdependencies grows year by year. The ultimate dependence of all living things on the energy of sunlight has long been understood, as has the interdependent nature of plant and animal populations and their joint dependence on the integrity of the atmosphere, the waters and the soils of mother earth. Newer, and growing in significance every year, is our understanding of the extent and the subtlelies of the interactions between the genes of the world, and of their importance to human life. The importance of interactions of genes achieved through sexual reproduction has long been recognized. It is now evident that small bits of genic material can be transferred from one microbial species to another. For example, viruses can mediate such transfer. In special cases, bacterial genes of a suitable species can be transferred to cells of many plants species, with resulting altered growth patterns of the plant cells carrying the bacterial gene. The frequency and the diversity of such inter-specific genic transfers is not yet fully known. Though they seem to be rare, such interspecific exchanges can have far-reaching effects.

These considerations lead us to realize that all genes of all living organisms constitute a unique, diverse resource of great relevance to future generations of mankind. This relevance leads to the

necessity of protecting, of safeguarding, and of preserving in all possible detail this essential and irreplaceable resource. For it is now very clear that common basic mechanisms apply to all living organisms on this planet, including man, animals, plants and microorganisms. So viewed, man is a particularly favored member of a very rich, interdependent, extraordinarily diverse population of living organisms.

More than a century of thoughtful research has led to a considerable understanding of the natural history leading to the appearance of vast numbers of species of living things. We understand the origin and the importance of mutations, which are changes occurring at the level of the hereditary material. We also understand that internal and external environmental conditions represent the selective forces allowing certain particular genetic combinations to propagate more readily than others. Hence, the genetic diversity found on this planet today is the result of a very long (about 3×10^9 years) period of diversification and development. We do not understand very well the role of interspecific, non-sexual exchanges of small numbers of genes in this historical development, yet we believe that future improvement of the progeny of a given living organism of today may depend on the genetic makeup of many other, perhaps somewhat unrelated species. These insights into the forces leading to biological development and diversification provide a better scientific basis than we ever had before for evaluating the long range consequences of technological practices on human civilizations.

Thus we see that attrition or extinction of genetic resources may seriously impair the future of mankind.

Important new insights into mechanisms of biological functions accumulate daily from research in molecular and cellular biology. Many of the results obtained are fully unexpected. They surprise the scientists and they deepen their admiration for the natural ingenuity of creation. Many of these new findings will open new

approaches for biotechnological applications. As a matter of fact, such applications strictly depend on previous understanding of the specific mechanisms of biological functions and cannot be envisaged without this insight. This situation is an additional reason for undertaking all possible measures to preserve as many existing genes as possible from disappearance. Many of them might become of relevance for specific applications only in future generations.

Can we make new genes synthetically, by chemical means in the laboratory? With today's knowledge, we do not how to design a functional gene. Moreover, statistical considerations clearly show that it is not possible to obtain a desired gene by random attempts. Thus we must regard the genes of the living world collectively as a unique and irreplaceable resource which may be of even greater value for future generations than it is for us today. We see before us the clear and inescapable duty, in the name of humanity and of our children's descendents, to safeguard, conserve and protect the genes of the living world as a priceless, irreplaceable treasure for the future of mankind.

What about artificial, experimental manipulation of genes in the laboratory? Experimental recombinations of genic material and the induction of mutations at specific, known, genic locations form the bases for extraordinarily useful experimental and industrial technologies. There is general agreement that possible ecological consequences of such projects require particular attention. This must include risk assessment experiments, particularly in cases of approved, deliberate release of artificially modified organisms into the environment. However, in the general context of natural laws governing directional development of species and their interactions, it seems clear that risks of harm to ecology from genetically altered organisms are minute.

Looking at possible future applications of scientific knowledge for the benefit of mankind, we are of the strong opinion that the full

integrity of the genetic setup of man himself should not be touched by any kind of genetic manipulation, unless indicated by a generally approved medical approach to alleviate a severe congenital disease.

Turning now from a consideration of the genetic setup of man to a consideration of the complex nature of human society, we discover an important parallel. The cultural and ethical diversity of human society is highly desirable and should not be hampered by any regulatory means. We would consider any such restrictive regulations as contradicting the ethical principles forming the basis of human societies.

