Reprinted for private circulation from
BULLETIN OF THE ATOMIC SCIENTISTS
Vol. XXIV, No. 10, December 1968

Science for Man: The Development Gap

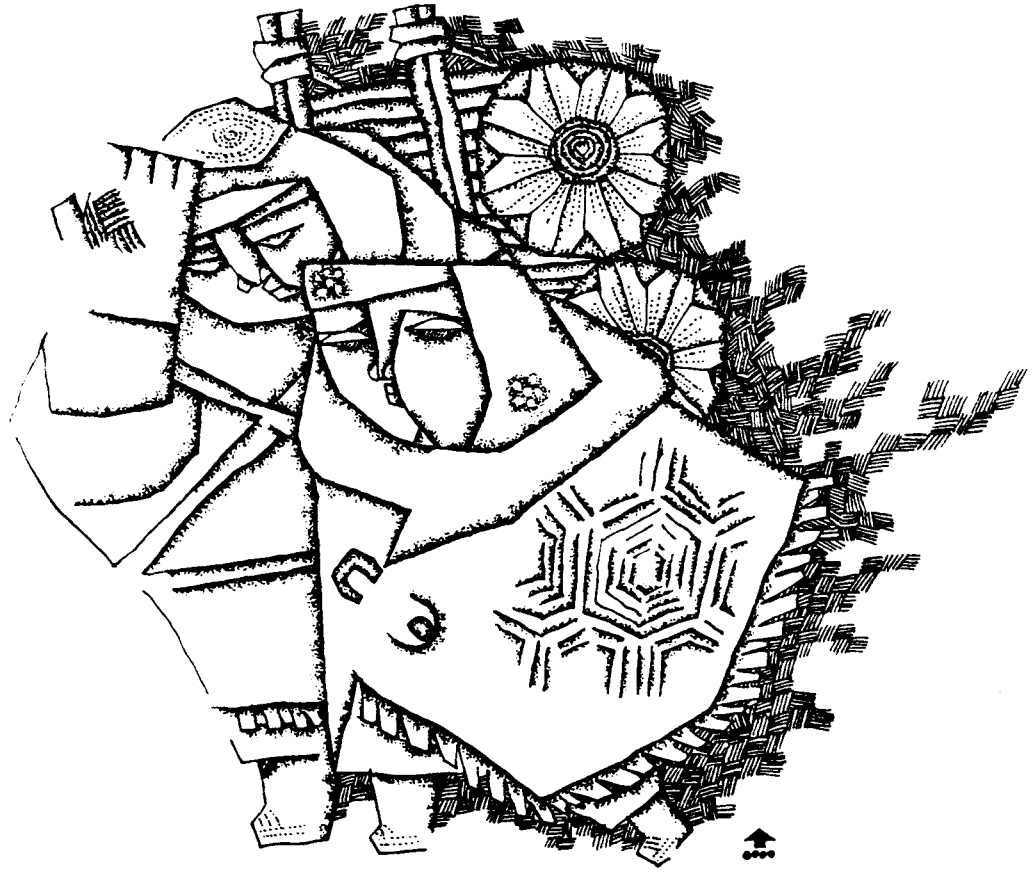
J. LEITE LOPES

This outspoken analysis of the gap between the underdeveloped and the rich countries was first presented before the Seventeenth Pugwash Conference on Science and World Affairs held in Ronneby, Sweden, last year. Dr. Lopes believes that in order to enhance the dialogue in such areas as the necessity for international scientific exchange, including the establishment of an international science foundation, views different from those usually evinced by scientists in the advanced countries must also be examined. J. Leite Lopes is president of the Brazilian Physical Society and professor of physics at the Federal University of Rio de Janeiro.

A few generations ago it was usual to regard the world as composed of two main groups of peoples: the rich, civilized peoples, the conquerors and builders of empires; and the poor, backward peoples, those who did not have or could not develop means of effective defense against conquest—the political or economic colonies.

After World War II a new nomenclature was invented to give more dignity to representatives of newly independent countries together with those of the older, also backward, ones; the world was to be regarded as composed of developed nations—the rich and civilized peoples; and of underdeveloped nations—the backward peoples.

After the creation of international agencies for the



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purpose of aiding the underdeveloped countries, after several years of experience in bilateral and multilateral programs of cooperation among rich and poor nations, it was found convenient to change the nomenclature once more. The world is now thought of as being divided into developed nations and developing nations.

An increasing number of papers have been written in the last few years, devoted to analysis of the many and complex problems of underdevelopment. And in 1963 an international conference on the applications of science and technology to aid less developed areas was sponsored by the United Nations in Geneva. This conference was followed by regional meetings on the same subject, one on research organization and formation of personnel in Africa, held in Lagos in 1964, and the Unesco conference on the applications of science and technology to the development of Latin America, held in Santiago in 1965. Thus, in addition to studying the economic, social, and political aspects of the complex conditions which characterize underdevelopment, the importance of applying and stimulating science and technology in the underdeveloped areas themselves was finally acknowledged in areas of assistance, such as the U.N. Special Fund, which had been more or less hostile to investment in basic scientific research and education.

It is not my purpose to repeat here what has already been said and written on the many obstacles to the full development of the so-called Third World and of healthy and vigorous universities, or on the lack of appropriate conditions for the growth of scientific institutions in such countries. I shall, rather, limit myself here to some observations on the grave problems which the Third World faces today.

PRIVATE ENTERPRISE?

First, it is quite clear that the economic development of the underdeveloped areas through private enterprise on the part of rich nations, as postulated and defended by leading personalities in some powerful countries, cannot give rise to genuine progress in these areas, even in the domain of science and technology. Clearly, such a hypothetical development is conditioned by the fulfillment of the fundamental interests of these enterprises and of the countries to which they belong.

These companies maintain great laboratories in their own countries, where scientists conduct basic and applied research, where most of their young scientists and engineers find jobs, where their inventions originate and are protected by patents. The royalties which the underdeveloped peoples pay to make use of such patents, to import, assemble, or locally produce the goods under such protection, constitute a part of the invisible contribution from these peoples to further research in the advanced nations. It is these laboratories, and those in the universities and official scientific institutions, that ensure technological development, under the present dynamic and aggressive form in some advanced countries. It would be an illusion to think that a country can have a flourishing university system and creative institutes without an economic and political structure t will connect intimately its cultural, social, and industrial complex with the output of these institutions.

In fact, to be sure of this, it is sufficient to examine what goes on in Latin American countries. There has been a failure of development in some of the largest countries of Latin America under a policy of creating subsidiary companies of great foreign industrial enterprise in their territories. This same policy has also failed to avoid inflation and to make larger fractions of the population wealthier. The universities in these countries which have contributed most to the study of their problems have been violated. In fact, throughout many of the countries of the Third World there has been an upsurge of political regimes of force, characterized by systematic persecution of professors, scientists, economists, writers, and scholars in the fine arts.

Students, in particular, have generally been subject to systematic repression, simply because in many of these nations authorities (although, or perhaps as a consequence of, being advised by experts of advanced countries) have been unable to promote generalized education, good and efficient university systems, and scientific and technical research for the benefit of the peoples of these areas. Students who, as a privileged sector of the youth, have access to information, to books and journals from the exterior world; who can understand the implications of certain policies about their future and that of their countries, do not accept the permanence of such a situation. In many countries of Latin America, while large numbers of scientists are forced to emigrate and work in universities and scientific institutes of advanced countries, programs for the reform of educational systems and the planning of universities are entrusted to missions from agencies of the powerful, advanced nations. Thus, experts from such agencies are entitled to make policies and have working conditions, including salaries, which are denied to native, local scientists and experts.

International scientific exchange is essential to sci-

ence, to culture, to knowledge. International scientific cooperation follows from the need for such exchange, for sharing the benefits and joys of making a discovery, of inventing, of deciphering the laws of nature.

The fundamental knowledge of science is thus universal. The fruits and benefits of scientific research, the possibility of applying scientific laws and mechanisms to the economic and social advances of human communities, are not, however, universal. As political, economic, and social instruments, science and technology are obviously universal only within the reduced universe of the rich and advanced nations themselves. And making the benefits of scientific research and technological inventions applicable to the so-called developing peoples constitutes the task of the legitimate leaders of these peoples, of their scientists and intellectuals.

DEVELOPMENT TO WHAT POINT?

One cannot, however, accept the tnesis, defended in some circles in advanced countries, that the underdeveloped nations must prepare themselves only up to the stage of buying or renting technology invented abroad; that advanced nations constitute a kind of huge scientific and technical supermarket where men of government and men of enterprise from the less developed countries would come to buy the goods on sale. Can countries in a primitive stage of economic development afford this? Do they have money to buy what they need and to fill their basket? Is the price—and the fluctuation in prices—of the primary goods of the underdeveloped countries, of the raw materials they produce or that foreign companies explore in their territories, enough to pay for these purchases?

Clearly, such a thesis is unacceptable as a final goal, as a fulfillment of the aspirations of the underdeveloped peoples. One must certainly buy technology, import goods and knowledge, set up industries from abroad inside one's developing country. But this cannot be the final solution. Science advances continuously, technology becomes rapidly obsolete, new machines replace old ones. And this progress is the result of research, of inquiry, of creative thought. Underdeveloped nations, individually and by regional association among themselves, must aim at having the means to create knowledge in their own institutions; by their own men of science and culture they must integrate plans for an autonomous and socially significant development with plans for spreading education throughout their population, for producing competent men, for stimulating creative thought, for the growth of good universities and excellent research institutes.

Government officials and businessmen of these poor countries are deaf to such suggestions. And a realistic analysis of experimental facts tends to show that the making of such plans and programs would collide with the vested interests. It has not been in the interest of the great industrial enterprises which operate in the Third World, and of the local minor partners, to open research laboratories in the countries where they operate. Such laboratories have been a prerogative of the mother countries where they contribute to a fierce competition among these enterprises, and whence original ideas, machines, and tools are delivered for sale abroad. Once new technologoical breakthroughs are achieved, these enterprises feel the need to win new markets for their new goods. And intensive propaganda induces underdeveloped nations to buy such fashionable products before they can implement programs which should have a higher priority. After the First International Conference for the Peaceful Uses of Atomic Energy, convened by the United Nations in 1955, these industries rushed to sell research reactors, and several countries of the Third World were led to buy them, although intensive programs for the spread and improvement of primary, secondary, and university education, endowed with at least an equal priority, were not carried through. Yet some of these countries were forced to shut down these reactors later, due to the lack of the necessary research personnel. And at present, the need for space research bases on the part of some superdeveloped countries leads to an associated program with some underdeveloped nations. These nations are then persuaded to devote a large fraction of their research budgets to such studies, with a corresponding sacrifice of basic programs for fundamental research in their own universities.

It is therefore no wonder that a relatively large number of scientists from underdeveloped countries have to emigrate to the universities and scientific institutes of the rich nations. At the same time, missions of technical and education "experts" from foreign agencies are brought into underdeveloped countries and are entrusted with the task of reforming their educational system, of planning the educational, scientific, technological, and economic system of these nations—tasks that outstanding local educators, scientists, and experts are not themselves allowed or recruited to do at home.

FACING THE PROBLEM

The problem is clearly complex and its solutions do not all depend on the action of scientists. Many of them are beyond their power of decision. But this must not be an excuse for the scientific community of the developed world not to know that the problem exists: the question of the relationship between the powerful economies of advanced nations and the national aspirations of the underdeveloped peoples.

Only intensive national efforts to promote education, culture, scientific and technological research—open to supplementary international cooperation but without abdication of the power of decision—can lead to a legitimate development. This attitude, in fact, simply follows the historical examples of those rich countries which until 50 or so years ago were underdeveloped themselves.

Scientific research in underdeveloped nations would

certainly be greatly stimulated if a new international cooperation program could be established which would help to stimulate the efforts of scientists of these nations who remain at home. This kind of program, however, would have to be formulated so as not to compete with existing international agencies, such as Unesco.

An editorial in the October 1966 *Bulletin*, titled "An International Science Foundation," revives a proposal made by Professor Roger Revelle at the Fourteenth Pugwash Conference in Venice: the establishment of an international science foundation, the purpose of which "would be to assist individual scientists and scientific research groups in the parts of the world where their work is now stymied, either by national poverty or by lack of enlightened interest from their national (and industrial) leaders." After mentioning the important role played by several organizations from the United States to spur scientific research in that country, the editorial goes on to say: "What is needed in developing countries is, however, something both larger and more selfless, something that is not influenced by American research interest. The organization required must be a well-endowed, independent body, advised by outstanding scientists from both the help-giving nations and the help-receiving nations; a foundation to which individual scientists, including above all young researchers at the beginning of their careers, as well as research groups, could apply for grants to acquire instrumentation and materials."

The practical measures needed for the establishment of such an international science foundation probably do not constitute an easy task. Funds for this organization might well come from a small fraction of the military budgets for all nations of the world allocated for this purpose, for a more significant impetus to the scientific progress of the less developed nations. Is this possible? Is such progress not an obstacle to the expansion of the industrial empire of powerful nations? Is scientific research in the most advanced countries not becoming more and more involved with the development of war industries?

Clearly, to be successful, such an international science foundation must receive the support of outstanding scientists from many of the advanced and underdeveloped nations, and its financial support must be insured by many rich nations and not by only one or two. An international science foundation cannot be the creation by some agency of only one rich nation; it must be the result of cooperation between many rich and many underdeveloped nations. It must aim at stimulating the work, in their own countries, of outstanding scientists from underdeveloped nations. It must help these scientists in their day-to-day work to transform their universities and scientific institutions into culturally alive and creative establishments. Moreover, such an international organization must not interfere in the internal life of a country. International programs of exploration of regions of underdeveloped countries can only have colonial characteristics if the national community of scientists and experts are not called by their governments to know these programs, to approve them, and to work for them in their specialities. Such international exploration programs will be suspect if they are not fully publicized in all countries concerned, and thrown open to a democratic debate about their validity. If an international science foundation were to devote itself to secret or semi-secret programs, it had better not be created.

THE SCIENCE GAP

The question of a scientific gap between European countries on one side, and the United States and the Soviet Union on the other, has been the subject of intensive studies in the past few years. Inquiries are made, proposals are put forward to eliminate this gap, including an association of the European countries among themselves, and fuller cooperation among their universities, research institutions, and technological and economic systems.

The gap between the Third World and the rich countries, both the superpowerful and the developed nations, is wider and keeps increasing. In fact, the relative rate of development, the relative speed of growth between the Third World and the ensemble of the "first two worlds" is such that the components of the Third World might well be called "underdeveloping nations," or in French, *pays en voie de sous dévleoppement*, if one does not want nomenclature to become obsolete. Thus, the production of food per capita in the United States has increased by 17 per cent, relative to the production before World War II, whereas in Latin America there has been a decrease of three per cent.

The fact is that the emigration of research personnel from Europe to superdeveloped nations does not constitute, as far as we know, a major obstacle to the modernization of European universities; on the contrary, it has spurred studies and measures for solving the so-called brain drain problem. In the underdeveloping world, however, local governments are not always conscious of the situation, or do not have the means, or are not allowed by certain interests, to improve in a significant way the educational systems and the scientific and technological institutions, in ways that would attract and keep their youth, and stop the emigration of their outstanding research men.

Let us hope that a new and significant cooperation program, such as an international cooperation program will contribute to a liberation of science from the complex of war technologies and war industries. Let us hope that scientists of all nations will reestablish the peaceful and constructive role of science and of culture in favor of all men of the world.