CARLOS CHAGAS (*)

The Role of the Academies of Science in Developing Countries (**)

I should like to underline that when I refer to academies, I speak of the developing countries and not of the academies of developed countries. So that the criticisms, or maybe the more difficult points which I am going to treat here refer really to developing countries and have nothing to do with the academies of developed countries.

Secondly, my experience is much bigger in my region, which means Latin America and the Caribbean, even if I have had so many contacts with Africa and Asia.

It is my belief that under certain conditions an Academy of Sciences can play an important role in the societal growth of a developing country. However, it is a rather difficult task to define this role in more than general terms, as science and technology are part of the culture of each people. This role as such may vary from one country to another and, what is more significant, in the very large countries like Brazil, inside the same country from one region to another.

It is on these general terms that we state that the role of scientific academies in developing countries cannot be compared to that which was exerted by older academies of the industrialized world in the past. It must have broader action in the growth of the now developing countries. This is so because times have changed and so has the praxis of science. Societies have also changed and so has the interaction of science and technology with them. These are aspects I would like to discuss with you.

(*) Foreign member of the Academy, President of the Pontifical Academy of Sciences, Vatican.

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However, I should like to begin this presentation by stating what I believe an academy in a developing country should not be. It appears clear to my mind that it should not be an institution of prestige only, where chosen members meet, and one to which each younger scholar looks as a goal to insure his position in the academic world. It has to be an active body. Its prestige will come only from the action it exerts in promoting science and its application in its own country, and in integrating science in the mind of the people from which stem the ruling classes.

This stimulating action, which may sometimes be in opposition to governmental policies, is a question which we will have to discuss, and it deals not only with fundamental knowledge but also with its application. As such — and I repeat — an academy in a developing country has to deal not only with fundamental science but also with the application of science, or in other terms, with technology.

First of all, to fulfil its purpose, an academy of sciences in a developing country should be an open institution, electing each year by exclusive choice of its members, a certain number of new members, whose tenure should become effective only after some years of participation in the scientific evolution of his country. The choice of new members is one of the difficult problems of every academy, and may be still more difficult in developing countries, yet it has to be based on the real scientific value of each new member and not on his political status or social position, and has to be made without any discrimination whatsoever. This is an important basis, if not the most important one, for the success of the academy.

However, scientists and technologists not yet included in the cadre of the academy should participate in its activities. Only in this way can the academy be kept an open institution. These activities should not be limited to large cities but must try to extend to the less cultured regions of a country, through lectureships, workshops, etc., the scientific and technological knowledge it possesses.

Part of the emphasis of the academy's work should be given to establishing the core of scientists, whose knowledge may liberate developing countries from the scientific and technological colonialism which exists because of the lack of a group of indigenous specialists, a situation to which developing countries are now subjected more and more and which destroys the effectiveness of technology. Here the action of academies must supplement that of the government, whose science policy is generally tied to gigantic projects all based on the false belief that technology will, in a short or medium term, give to the developing countries the self-reliance they need. This self-reliance is obtained only by a harmonious cultural development.

To fulfil its role, the academy has to organize colloquia and symposiums, an activity of great importance which we may place in two categories. The first one should deal with problems of major interest which have to be treated in the realm of national situations, such as environment and pollution, food production,

nutrition, energy, science policy, science education, health, sanitation, etc. The second objective will be to introduce to the country new fields of science or of knowledge. This will allow the academy to play an active part in updating the position of scientists not only in scientific institutions but also in the university establishments.

The academy has still other roles to play. One is the regular publication in the most rigid editorial way of a scientific journal, preferably in English, the scientific and universal language, but with each article supported by an extensive summary in the principal language of the country. This publication is important in order to liberate the younger, or not so young scientist, from the dictatorial powers of the editorial boards of so many of the periodicals of developed countries.

An academy may also help to publish, or even publish by itself, a journal of scientific diffusion in the national language. Furthermore, it has to be an alert observer of the attitude of the government in relation to its scientific development. It may also find means to stimulate the younger scientist, and promote science in secondary education and stimulate public interest in science. Furthermore, it has to propose ways and means which may render minimal the brain drain. To fulfil these objectives the academy has not to wait for the action of a government but must act in a preventive way.

You may contend that these are roles which pertain to the research council and partly to the university, and you may be right. However, there are differences in the structure and in the mode of action of research councils and academies. This difference may show how effective and complementary to the scientific evolution of a country the action of an academy can be.

I would like to point out that developing countries in general have a fragile social and political structure and as a consequence are subject quite frequently to changes in their governments, and even in their social structure, or are subject to a political establishment which keeps in its hands the evolution of its society and uses its science and technical institutions to pursue its economic planning. In other words, science and technology are subject to the will of the political class, which does not see them as a part of the culture of the country but only as an instrument of economic development.

In general, important items on which the future of a nation depends, like ecological protection, the limits of deforestation, the wise use of renewable resources, etc., (and those may be items of worldwide significance) are decided only on the advice of institutions whose existence depends exclusively on the government itself. On those occasions academies must act and they have the duty to intervene and to explain to the rulers of the country and to the people the mistakes or errors that the adopted policy contains. To that end an academy must be a free institution, and it can be useful only if it keeps its freedom in relation to political, military or economic power.

It is clear that to be free means that you must have the necessary endowment or budget, which in most developing countries can come only from the government. But there are so many advantages for the societal development of a country, in having a free and enlightened body to advise it, that only blind regimes or those obsessed by econometric perspectives will not recognise this advantage.

I have spoken of a free institution. It is my belief that the pursuit of scientific knowledge brings with it a sense of freedom and the need to express its feelings to such an extent that the real scientists have the urge to interfere by means of articles, public appearances and letters when they see a government taking a wrong direction in a problem where science and technology are concerned. This can be done much better through the commitment of the academy as a body to public service.

I do not want to speak of extreme circumstances when freedom is limited in its expression by the heavy hand of censorship, and anxiety and despair are raised. However, I repeat my belief that it is such an advantage for governments to receive a requested or in many cases voluntary expertise that this situation will gradually disappear. One must not forget that an academy with its complete spectrum of specialized knowledge can give so much that no government, regardless of its political régime, has the right to refuse it. It is clear that the role of the academy should be a scientific one and its most important duty is to present the scientific data related to a problem in question. But to govern, to meet the challenges every society faces, the needed "technique" to overcome many of these challenges is scientific knowledge associated with moral values and public interest.

A second role an academy can play is to exert its influence to change the distortions which have been imposed on scientific, technological or academic careers in developing countries, with models copied from developed nations. One example is the way in which in general the Research Councils evaluate scientific activity, which cannot be measured by quantity but by a sense of quality, which should be developed and never emarginated. Scientific productivity is an intensive quality and not an extensive one.

The new academies should also find ways and means to develop mostly in the younger generations an interest in the use of the manifold aspects which "natural laboratories" offer. This interest would also facilitate a closer relationship with scientists of industrialized countries.

The academies have also an important role to play in establishing a continuous interchange of science not only on an international level but also on an inter-regional one.

Last, but not least, I would like to express a particular feeling. I believe that science and technology have a unique role to play. This is not to increase military or economic power but to improve the social and cultural conditions

of the people, in other words to improve the quality of life and the human condition.

Human dignity is a most vital part of the human condition. This is a question to which the awareness of the academies of the developing countries should be drawn, and because the academies should be constituted by free human beings, the defense of human dignity, which comprises freedom from inhuman conditions of life, freedom from hunger, poverty and oppression, should come in the forefront of their interface with governments.

This is the only political action an academy of a developing country cannot avoid taking, as it must raise its voice to defend, in every instance, human dignity.

DISCUSSION

JACQUINOT

I would like to congratulate Dr. Chagas on his excellent address, in which he put his finger on a number of very sensitive issues, which as you rightly said yourself, touched not only the developing countries but the developed countries as well. In particular it has been my experience in my connections with UNESCO and the Intergovernmental Oceanographic Commission that members, scientists from developing countries in particular, are given fellowships to go to developed countries, in order to establish and develop an expertise with which it is expected that they will return to their countries and feed it back into the system. Very frequently this does not happen, and there are a variety of reasons for this. One of the reasons for this is that in the developing country from which such a scientist came there is no structure, no provision is made for a post, for an institution, for a group, for finances to enable him to continue work of the same caliber as he is accustomed to in the country of his temporary adoption, one might say. And I would think that one of the most useful purposes that the academies of sciences in many developed countries could serve is to impress on their government, most emphatically and very strongly, that a satisfactory structure should be established to receive back in the developing country such expertise, thus creating centers of excellence around the world.

CHAGAS

I think that you are presenting here the problem of what is called the *brain drain* in other terms, and you pointed out quite rightly that the tendency for instance in many countries, that I know, is to believe that the *brain drain* is the fault of the developed countries. In my opinion, the *brain drain* is the fault of the developing countries themselves. First of all, because they do not give to the scientists the tenure and the conditions of work they need, or they create such difficult social and ideological conditions that the scientists have to leave. It is a national problem, as you said, and I can say that I have a particularly good example in Brazil, where some of the better institutes of the centers of excellence have had a minimum, I would say even no *brain drain* at all. Mostly, I would say 90% or 95% of those students, graduate students of the younger members of the faculty who go abroad, come back because they know they have possibilities of work. So that I agree completely with your point of view.

MENON

First of all I would like to thank Professor Chagas for his most scholarly presentation, with which I agree. I would also like to thank the chairman of our session for quickly reminding Professor Chagas that the problems he has pointed out are not unique to the Third World academies but are common to practically all academies throughout the world in the developed as well as in the non-developed countries. One point where I slightly differ with Professor Chagas is the point he just mentioned: the question of the *brain drain*, where he put the whole blame on the developing countries. I quite disagree with you there, Professor Chagas, because the *brain drain* is happening not only from the developing countries to the developed countries but, it is also happening within the developed country itself. And social and economic pressures are also found in the developed countries, where you find that scientists unable to freely pursue their scientific research in their own countries are seeking refuge in more liberal countries.

Similary you find scientists in developed but less wealthy or less affluent countries also fleeing from those countries and going to countries where there is more work, where there are more riches — that is why countries like America, the United States, have attracted so much brain from practically all over the world, including the whole of Europe, not just from Third World countries.

I want to go back to the point of a slight difference, which you mentioned, where you were detailing the requirements of an academic, of a scientific academy in the Third World. I am not disagreeing with you there, but I think the things you were touching upon were true from the theoretical point of view, but sometimes when it comes to practicalities it is very difficult to put those things into facts. How can you, for instance, stop a government from interfering in the affairs of the academy when it is the government itself that established and finances that academy? And is not that same thing to a certain extent even happening in the developed countries, if I may ask? Even in Great Britain, or say in continental Europe, where you have classical academic institutions, you still have governmental interference, and pressures. Where there is no positive pressure, there is negative pressure. As Sir Andrew was telling us, the government can afford to completely ignore the academy and pursue its own course.

CHAGAS

I am very happy to answer you. First of all maybe in the question of brain drain I was too excessive, but what I say is that when a scientist has in his own country working conditions which suffice for him to work, he would prefer to stay in his country, at least a great majority. And when I say the solution is a national one, I will give you an example. I do not know if you are a soccer fan, as I am, — as a Brazilian I am a soccer fan — well, in soccer there is a rule which keeps five players as a reserve, so that if a player is found unfit his reserve goes to play for him. I think this is rule three. I think for developing countries the second way to *avoid brain drain* is to create a mass of scientists that it can use always — rule three of the soccer game — so that you always have someone to substitute for those who go away. And I think that this is something which gradually the developing countries are reaching.

Now, you mentioned the problem which I touch very delicately here, — that is the relationships of governments and the scientific community. And

as a matter of fact, in the greater part of the developing countries I know, most of the scientific community sometimes disagrees with government, because the governments have exactly the tendency to force their programs on the scientific community, either through the Research Council, which is the easiest way, or directly by cutting funds from the academy, and so forth. But as I said — I am idealistic or optimistic — I think that the contribution which can be given to a country by its scientific community, if it is free from the oppression of government, is so important that gradually the governments of developing countries will consider it useful to have and to support a free academy.

MENON

The difference between academies in developed countries and academies in non-developed countries seems to be one of degree rather than a difference of nature. The tendency for academies in third world countries to corrupt is much greater than for academies in the developed countries. There I quite agree with you 100%. Now to help the situation, would it not be a good idea for our colleagues in the academies of developed countries to put more efforts into the development of free scientific academies in the Third World instead of letting *their* governments operate through governments in the Third World for the development of these academies? Would not you think it would be much better, say for instance, for an academy of Sciences, of Europe, or your university to deal directly, for instance with an African Academy? That will give the African Academy a certain leeway, or a certain amount of independence from its government, if I may just give you an example?

CHAGAS

I agree completely with you. As the President of the French Academy is here next to me, I can say that the scientific relationship of Brazil with France has deteriorated very much since all interchange between scientific institutions has been taken over by governments. On the contrary, when there were direct ties between institutions, it was much easier and much more effective. He knows that I am correct in that. One point which is very important and should be taken into consideration is the fact that a better relationship should exist between scientific communities of the Third World, of developing countries. Moreover we have to establish in our countries a corps of scientists and technologists to overcome — I am using a strong word but it is a true word — the scientific and technological colonialism to which we are subject.

BADRAN

Really I would like very much to thank Professor Chagas for his wonderful illustration of the things which academies in the developing world have to avoid. It was very instructive, but I would like to touch on something different I would like to read to you a few lines which I gathered regarding "pains" of academies in the developing world, just to give you an idea of what to avoid when you are running an academy in the developing world. Actually there are five "pains" or five areas of problems which we suffer from regarding the developing world, looking from the point of view of the developing world

— there are five areas of pain. Excuse me if I use medical terms, I am a medical man. The first one is the unfair international economic structure, the disparities suffered by developing countries in world trade, debts and world monetary arrangements. Worldwide inflation, slowness of industrialization processes, traditional agriculture and food production and ineffective foreign aid, all call for restructuring of the international economic order. The effect of this restructuring must be to eliminate the inequitable economic relations that exist between developing and developed countries by doing away with the dependence and subjection suffered by the former and putting an end to the domination exercised by the latter. The principles of the new international economic order are set out in the Charter of Economic Rights and Duties of States which has been adopted by the United Nations General Assembly in the last few years.

The second area of "pain" is world politics to keep peace. Many in the developing countries have felt that the achievement of political independence was one step on the road to true national sovereignty. A major objective for them has been the achievement of economic as well as political independence, but the challenges between the world big powers and their strategic interests in the Third World countries are always the source of continuous political conflicts and local wars, as seen in the Middle East, Southeast Asia, Africa and Latin America. A large part of their national efforts and resources is being consumed in military arrangements instead of development processes. Here since scientific and technological processes may be utilized both for the good and for the evil of mankind, the task before the world community is to humanize this progress, and I feel that science technology for development should be looked upon as an endeavor essentially concerned with human benefit, not with human achievement.

The third area of "pain" is the problem of man in this environment. The main problems here derive from interrelationships of man, society and the environment, particularly those of energy, food, raw material supplies needed for an ever-growing population. By the way, it is supposed that by the year 2025 the world population will be doubled if it is counted today, thanks to the developing world. Pollution of the environment, the necessity to protect it against multiple dangers of uncontrolled technological progress, the rational use of water resources, the struggle to eradicate dangerous diseases, public health services, desertification, eradication of illiteracy and promotion of education and public understanding — all these are problems that should be faced by a person responsible for an academy in the developing world.

The fourth challenge is the challenge of modern science and the rate of advancing technology. Several factors connected with the growing disparity in living standards, norms of life styles, the regular decrease in the size of the globe — the globe is getting smaller, people here see people there, and the psychological contrast breaks the hearts of the deprived. This represents a serious challenge to science and technology. It is well known now that the factors behind this are the high rates of savings and investment, the rapid advances in science and technology, and the upgrading of general education and skilled levels in working forces, a fall in birth rates, (which is really the main problem in the developing world); all these are a very important economic hazard.

The fifth painful area is rather personal and depends on local environment. I am going just to touch on three items of these personal things. One of them is the *brain drain*, and we cannot blame the scientists in the developing world

for leaving their mother land. I am sure that they prefer to live there, provided that they have sufficient incentive, sufficient laboratories and possible information for their needs. The second thing is the rising rate of prices for procuring information and instrumentation. Science has become an industry, and there are people who are concerned today to sell scientific equipment and scientific knowledge for mad prices. The third is the difficulty of misunderstanding and local communication between us as developing countries and developing academies.

MARINI-BETTÒLO

I am very sorry we cannot continue the discussion, because we will be closed in and I think it is not fair to spend all the night here. So I suggest that tomorrow in the general discussion we shall take up this important item again.