The Challenges of Sciences. A Tribute to Carlos Chagas
Pontifical Academy of Sciences, *Scripta Varia* 103, Vatican City 2002
www.pas.va/content/dam/accademia/pdf/sv103/sv103-pavan.pdf

SOCIETY, SCIENCES, AND THE FUTURE OF OUR SPECIES

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Among computer annotations made by my friend Julio Viegas (10 years of age), I found the following reflection: 'The Universe is very big, the Earth, the sky, the stars; and I don't have any idea of what we are doing here'. This doubt burdens a good part of humanity and has given rise to interesting answers even from great thinkers. Certainly it is an important thought that reflects among other things, the mystery that is the origin of the Universe and the existence in it of a thinking-being *Homo Sapiens*. We should not forget however that one should also consider, beside that transcendental reflection, the material part of the problem and the role of *Homo Sapiens with his* activities and consequences on the surface of the earth. *Homo Sapiens* has characteristics not found in any other species, but shares with them the capacity, among others, of reproducing and evolving. This allowed mortal individuals organized as species to compose the immense system of living beings which has survived for about 3.5 billion years without interruption, and will continue existing for a length of time.

Species have been extinguished by asteroid accidents, competition with other species or changes in their environment. On the other hand, new species are produced by the interaction of mutations and natural selection. This process in the more developed organisms which include *Homo Sapiens* always obey the same principle: species are relatively long-lived in spite of being formed by short-lived individuals.

In the past, cultural inheritance has created enormous amounts of aggressivity among different cultural groups, with consequences as disastrous as the destruction of entire civilizations. As a result of our increasing population, and its excess of activities, the very survival of the human

species is in jeopardy. Fortunately, after the dramatic crisis of the second world war, a general tendency toward cooperation among countries and races is developing. This creates the possibility of sustained ethical advance, but involves a tremendous responsibility.

We are not presenting any theory about 'the position of man in the Universe'. We only suggest that we take into account that man has a very active part and is immersed into the perpetual flow of life and, through the hazards of evolution, has conquered unique features. This enables man to overcome a great number of other species by creating technology and using it to transform the environment and modify other species according to its necessities and fantasies.

Unfortunately, this apparent success in life, is creating very undesirable situations that is causing serious concerns about the future of the species on earth. With the ability to think and foresee, man has the obligation of attending to the crucial problems confronting him. Some of these problems will be commented.

A. The shameful social, economic and cultural inequalities existing today inside each nation and in the human population as a whole.

Homo sapiens, as it was said above, is distinguished today from all the other existent species, by having beside a genetic inheritance, that also exists in the other species, its own cultural inheritance that is the main basis of his success in nature.

Intellectual capacity and its manifestation are the result of the sum of genetic heredity and cultural inheritance.

The latter is controllable by society, the former, even though understood in many details, has its millions of types distributed at random in the population. Privileged genotypes, good and bad occur by chance in the individuals of any human population.

Presently, cultural inheritance privileges preferentially people of some countries and also certain individuals, among others, inside each country. This is the result of the absurd social and economic inequalities prevalent in all parts of the world.

Actually those developed groups are immersed in the exhilaration of progress – progress and more progress without any consideration of the impact on civilization and the so called 'rich' (groups in populations) and self proclaimed 'privileged' are taking from nature all that they can with very few considerations for the consequences of what they are doing, not only for the society, but also in the destruction or pollution of the environment with bad consequence for the future generations.

Without a doubt, a great part of the human development and progress, is directly linked to the use of science and should be a very universal one. Unhappily, in some cases it is being used improperly and even in a nonethical way used by groups not only in the exploitation of the environment as well as in an immoral exploitation of fellow creatures less fortunate, of the same or of different races.

The profits obtained with patent of linked genes in the processes of production of food and medicines is acceptable when applied in the developed countries, but without a doubt it is immoral and unjust when applied, as it happens today, for underdeveloped countries.

Human food and medicines, two basic elements for the development of an individual are not only scarce but are expensive for a great part of the populations of the underdeveloped countries. This situation causes an enormous amount of deaths and, not less important, disabilities in the physical and mental development of that majority that doesn't get a decent survival level in the fight for the life.

The argument that if patents not be allowed for production of foods and of medicines, the great firms won't apply resources for researches in those areas with the consequences that they won't obtain very desirable progress for the species, is inconsistent and cynical.

The situation is such that in the current world organization, about 80% of the victuals and 80% of the medicines are consumed by approximately 20% of the world population, as represented by the developed countries. Are not the obtained profits of those 80% consumed by the priviledged ones enough to cover the expenses of the researches to obtain the processes patented along with the due profits?

The problem is moral and of justice, because the application of those patents causes a situation which contributes to the malnutrition that affects billions of people in the underdeveloped countries and hundreds of millions of children die in several parts of the world from a combination of malnutrition and the impossibility of obtaining medicines by the members of poor populations.

Three are the basic and necessary conditions that a person can have a normal development and be capable to participate in the natural competition in the society, using their physical and mental resources to obtain what they deserve to have as a human being.

In a natural sequence the three basic conditions are: feeding, health and education. It is obvious that rare cases are found today of people that had in the childhood deficiencies of one or more of those basic conditions and

that still has achieved success in life. Those cases are rare and without a doubt he/she would still have larger success had they received the normal basic conditions.

Those conditions are basic and they should be supplied for all. However, in the current situation in the human populations the privileged ones are few that in childhood and youth receive them and many or the great majority receive them with different degrees of deficiencies and even a portion die for not receiving them at all.

Report of UN 1998 informs us: 'World consumption has expanded at an unprecedented pace over the 20th century, with private and public consumption expenditures reaching $24 trillion in 1998, twice the level of 1975 and six times that of 1950. In 1900 real consumption expenditure was barely $1,5 trillion'.

In another chapter of the same report we found: 'The poorest 20% of the world's people and more have been left out of the consumption explosion. Well over a billion people are deprived of basic consumption needs. Of the 4,4 billion people in developing countries, nearly three-fifths lack basic sanitation. Almost a third have no access to clean water. A quarter do not do adequate housing. A fifth have no access to modern health services. A fifth of children do not attend school to grade 5. About a fifth do not have enough dietary energy and protein. Micronutrient deficiencies are even more widespread. Worldwide, two billion people are anaemic, including 55 million in industrial countries. In developing countries only the privileged minority have motorized transport, telecommunications and modern energy'.

All these deficiencies are important and we should be ashamed to have them existing in such proportions in the human populations, but worse is that due to the lack of nutrition and health at the youth stage, we have the existence of billions of persons which, in their entire life, never reached the stage of normal human development.

If the firms that possess the patents of foods and medicines are not satisfied with the profits they are obtaining from the 80% or more of the market, that is the percentage of food and medicines consumed today by the developed countries, then we find that such an inhuman and egotistical attitude must be counterbalanced by removing from these 'little ethical groups' the privilege that is given them through patents which provide incredible profits and produce benefits for the rich while neglecting the poor, that represent an enormous portion of the human population.

It is of interest to evidence that the sub-human situation in which a

great percentage of the human population of the underdeveloped countries live today is not just a repugnant social excrescence that should be avoided but also represents important focuses of serious problems, mainly on public health that affect the global population, as we shall see further on.

By the initiative of the London Royal Society, the US Academy of Science and the adhesion of the Brazilian, the Chinese, the Indian, the Mexican and the Third World Academies of Science a proposition was made to facilitate food production to meet the needs of the poor farmers of the world. The project Transgenic Plants and World Agriculture is extraordinary in its purpose and in the way it should operate. It is not a project of charity, but of human cooperation following the chinese proverb:

'If you want to solve the problem of the hunger, don't give him fish, teach him how to fish'.

The basic beginning is, through agronomic researches, to produce organisms genetically modified and to cultivate a high production for several areas, supplying seeds to the farmers at low prices or even free, without any restrictions on the repeated use of the initial seeds.

It is without a doubt a project of high human interest and great humanitarian value which deserves the collaboration of all.

Unhappily, the improper use of the industrial property (patents) by multinationals as discussed above and later the excessive admonitions of possible negative consequences for the environment has resulted in the use of organisms genetically modified being incriminated by groups of people in several countries.

The criticisms in relation to the nonethical and inhuman use of the industrial patents against the poor farmers are justifiable, but the prohibition of the use of the genetically modified organisms because of the possible dangers to the environment or human health is absurd.

The transgenesis is an extraordinary technique with great potency in food production and great economical value and, when controlled, it is as safe or even more so than the conventional processes. In relation to the negative effects on public health and the environment, the transgenic is less offensive than the traditional approaches to the problem.

Another series of important negative circumstances created by human activities deals with changes in the biosphere, the earth environment on which humans depend for survival.

The continuous deterioration of the ecosystems is the consequence of the absurd and irrational processes of pollution of water, soil and air which are

eliminating so many different species of organisms. This has to be curtained or otherwise grave problems will descend upon the future generations.

As stated by Raven (1998), over the last 50 years, about 25 percent of the world's topsoil has been lost and at present we are losing about 26 billion tons of topsoil a year. Also 15 to 20 percent of the land under cultivation in 1950 has been lost. We have to emphasize, however, that even with this loss of topsoil the food produced has still been sufficient to feed the extra 3.5 billion people added to the population between 1950 and 1998. We should not be proud of this, since the loss of part of the topsoil system will produce dire consequences in the future.

It is also true that 2 billion, or one third, of the people in the world subsists on less than one dollar a day. They are living in a condition that the World Bank defines as extreme poverty, therefore they lack adequate nutrition.

The problem is of such importance that in May of 2000 an assembly of 63 National Academies of Sciences published a statement entitled 'Transition to Sustainability in the 21st century'. In the chapter on scientific achievements and future challenges, the following problems are discussed:

a) Meeting the needs of a Large World Population, Reducing Hunger and Poverty and Preserving Human Wellbeing;

b) Preserving and Maintaining the Environment and the Natural Resource Bases;

c) Moving toward Sustainable Human Consumption Patterns.

The document follows with: what can and must be done by the Scientific and Technological Community and the Necessary Steps to transform the statements in Action.

This joint declaration of the 63 Academies constitute a paradigm for multiple coordinated actions, aimed at mitigating the terrible situation in which a great part of humanity lives, jeopardizing the happiness of future generations. It is mandatory that the leading countries in the world accept their responsibility and attend to this problem mobilizing resources and ingenuity, as if they were in times of war.

Another anguishing situation that necessitates the urgent support of the developed countries is the aids epidemic that is occurring principally in the subsaharan African countries.

The situation is extremely serious not only for the African countries but for the entire global population. Of the 36 million people stricken with aids that existed in the world in the year 2000, about 25 million of them live in subsaharan Africa and from the way that this epidemic is being treated in

these countries we may consider the situation as being the perfect biological laboratory for the improvement of the HIV against humans.

To this we must add the fact that the HIV presents various biological characteristics that make the problem even more serious.

'Genetics variability is the hall mark of HIVs. A major source of variation is the high error rate of the viral reverse transcriptase, which generates approximately one mutation per replication cicle' (Thomson, 2000). This without a doubt gives it a large adaptive capacity; the HIV inside the human body maintains itself in direct contact with the microrganisms responsible for practically all the infections diseases of man. The very large number of people afflicted with aids are characterized by possessing in the organism a large quantity of HIV frequently associated with different infections agents (microrganisms) of the other human diseases. This contact, direct and frequent, becomes extremely serious when we realize that the HIV also possesses a capacity to function as a transposon. As such it can be moved horizontally by means of other infections agent such as herpes simplex. It can also acquire a piece of genetic material of one of the microrganisms accompanying the infection that would cause the newly infected undesirable complications.

The possibility that the HIV acquires by this process the capacity to be transmited in the different form from one individual to another cannot be discounted.

To show that the problem is even more serious we must not forget the fact that the HIV is transported by their hosts from one end of the world to the other becoming a global pandemic.

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ACKNOWLEDGEMENT

Many thanks to Prof. Elisabeth F. Pessoa and Prof. Oswaldo Frota Pessoa for the pleasant discussions and observations on the text, also to Prof. Paolo Zanotto for the informations on the HIV.